

**YONGLINGIA, CHAOCHIENCHANGIA, AND SINOBOUFFORDIA  
(ASTERACEAE: ASTEREAE),  
NEW GENERA SEGREGATED FROM ASTER IN CHINA**

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**ABSTRACT**

Two species of *Aster* are placed here in ***Yonglingia* Nesom, gen. nov.**, as ***Yonglingia hersileoides* (Schneid.) Nesom, comb. nov.**, and ***Yonglingia nitida* (C.C. Chang) Nesom, comb. nov.** ***Chaochienchangia* Nesom, gen. nov.**, includes ***Chaochienchangia falcifolia* (Hand.-Mazz.) Nesom, comb. nov.** ***Sinobouffordia* Nesom, gen. nov.**, includes ***Sinobouffordia poliothamnus* (Diels) Nesom, comb. nov.**, and ***Sinobouffordia sikuensis* (Smith & Farrer) Nesom, comb. nov.** Plants of *Yonglingia* and *Sinobouffordia* are shrubs; those of *Chaochienchangia* are herbaceous perennials; each of the three genera is endemic to China and characterized by solitary heads on axillary branches. In molecular analyses *Chaochienchangia* and *Sinobouffordia* are part of the *Asterothamnus* branch of subtribe Asterinae, while *Yonglingia* is sister to the combined *Asterothamnus*/"core *Aster*" branches.

As part of a taxonomic revision of tribe Astereae (Nesom 2020a), monophyletic species and species groups of Asian *Aster* unequivocally indicated by molecular data to be outside of "core *Aster*" (sensu Li et al. 2011) are given generic rank. This manuscript recognizes three new genera from the "Asterothamnus branch" — a fourth genus, *Cardiagyris* (Fig. 1), is described in a separate paper (Nesom 2020b).

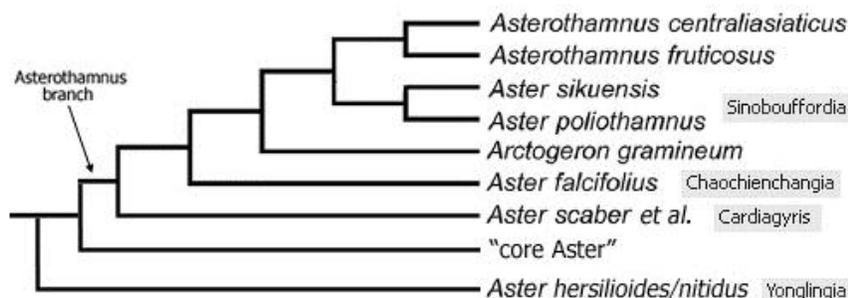


Figure 1. Evolutionary relationship of *Yonglingia*, *Chaochienchangia*, and *Sinobouffordia*, based on combined ITS, ETS and trnL-F data. Modified from Zhang et al. (2015). Part of subtribe Asterinae (Nesom 2020a).

**YONGLINGIA** Nesom, **gen. nov.** **TYPE:** *Yonglingia hersileoides* (C.K. Schneid.) Nesom

*Aster* ser. *Hersileoides* Y. Ling, Fl. Reipubl. Pop. Sin. 74: 177, 357. 1985. Type: *Aster hersileoides* C.K. Schneid.

Distinct in its perennial, shrubby-sprawling habit, eglandular vestiture, solitary heads terminal and diffusely arranged on axillary, few-bracteate branches, 2–4 nerved, eglandular achenes, and 2-seriate pappus of apically clavate bristles.

**Shrubs. Stems** 50–150 cm tall, erect to ascending or sprawling; leaf scars and axillary buds prominent; young branches purplish to reddish, usually hairy in decurrent lines below leaves; older stems apparently with secondary growth and up to 4 mm wide. **Leaves** cauline, narrowly obovate-oblongate to

elliptic-lanceolate, surfaces glabrous except for abaxial midvein, eglandular, margins entire to shallowly serrate. **Heads** solitary, terminal on second-year axillary branches; involucre campanulate, 2.5–3 cm wide (pressed); phyllaries in 3–4 graduate series, glabrous, oblong-lanceolate with acute apices, with a dark, slightly translucent, oblong to fusiform-lanceolate medial region, sometimes basally indurate proximally; receptacles alveolate. **Ray flowers** 18–30, ligules 9–13 mm long, 1–2.5 mm wide, coiling, white to pink or light purple. **Disk flowers** fertile, corollas cylindric, 3.5–4 mm long, limb gradually broadening above the tube, sparsely hairy, eglandular, lobes triangular, spreading to recurving. **Achenes** elliptic-oblong, 2–3 mm long, compressed with 2 lateral veins plus 1 on each face, sparsely short-strigose, eglandular; pappus 2-seriate, inner of subequal bristles 3.5–4 mm long, apically acute or sometimes innermost clavate, outer of slender bristles 0.5–1 mm long. Base chromosome number,  $x = 9$ .

The genus commemorates Yong Ling (1903–1981), expert on Asteraceae at the Institute of Botany (PE), Chinese Academy of Sciences. He became Chief Editor of the *Flora Reipublicae Popularis Sinicae* in 1973 (Ma & Clemants 2006) and was co-editor of the Asteraceae (Vol. 74) and author of the *Aster* treatment (Ling 1985).

The morphological distinction of the Chinese species *Aster hersileoides* and *A. nitidus* has been previously recognized — they were placed together as *Aster* ser. *Hersileoides* (Ling 1985). Recent molecular-phylogenetic analyses indicate that they are evolutionarily isolated, comprising a group outside of what W.-P. Li et al. (2012) considered as *Aster* sensu stricto (the same phylogenetic topology shown by Zhang et al. 2015 and Z. Li et al. 2017, and essentially the same summarized by Nesom 2020a). Li et al. (2012) noted that it might be reasonable to treat these two species as a separate genus.

1. Leaves elliptic-oblong to narrowly obovate, 1–3 cm long, apex acute to obtuse, margins short-ciliate with stiffly spreading hairs ..... **Yonglingia hersileoides**

1. Leaves lanceolate, 2.5–6.5 cm long, apex acuminate, margins without spreading cilia ..... **Yonglingia nitida**

**1. *Yonglingia hersileoides* (C.K. Schneid.) Nesom, comb. nov.** *Aster hersileoides* C.K. Schneid. in Sargent, Pl. Wilson. 3: 459. 1917. **TYPE: CHINA. Sichuan.** "Maochon, western Szechuan" [= Mao Xian], 5000 ft, 24 May 1908, *E.H. Wilson 2234* (holotype: A-Fig. 2; isotypes: A-Fig. 4, E-Fig. 3).

**Leaves** narrowly elliptic-oblong to narrowly obovate, petiolate, 1–3 cm long, 3–7 mm wide, herbaceous, surfaces glabrous or adaxial midvein hairs, apex acute to obtuse, rounded, or truncate, apiculate to mucronulate, margins entire or rarely with 1 pair of sharp teeth, stiffly spreading-ciliate with short hairs, venation camptodromous to nearly brochidodromous. Chromosome number (Yin et al. 2010),  $2n = 18$ .

Flowering April–July. "Dry slopes on hills, rocky walls; 1300–2800 m" (FOC). Sichuan.

**2. *Yonglingia nitida* (C.C. Chang) Nesom, comb. nov.** *Aster nitidus* C.C. Chang, Bull. Fan Mem. Inst. Biol., Bot. 6: 47. 1935. **LECTOTYPE** (Qi & Zhi-Rong 2010): **CHINA. Chongqing.** Nanchuan, 1100 m, 29 Apr 1932, *T.H. Tu 2935* (PE 00029973, Fig. 5). Two collections were cited in the protologue.

Syntype: **CHINA. Sichuan.** Pangou [= Pujiang Xian, Pangou], under woods, 820 m, April 1932, *T.H. Tu 2849* (PE, Fig. 6).

**Leaves** lanceolate, petiolate or with a short subpetiolar region, 2.5–6.5 cm long, 5–18 mm wide, smaller on youngest branches, subcoriaceous, shiny adaxially, surfaces glabrous or adaxial veins hispidulous proximally, apex gradually narrowed to a sharply acute apex, margins entire or serrate with 1–4 pairs of teeth, glabrous to sparsely strigose, venation supra-basal acrodromous. Chromosome number (Yin et al. 2010),  $2n = 18$ .

Flowering February–May. "Forests on hills, streamside rocks; 500–1100 m" (FOC). Sichuan, Chongqing, Hubei, Yunnan.



Figure 2. *Yonglingia hersileoides*. Sichuan. Holotype (A).



Figure 3. *Yonglingia hersileoides*. Stem from isotype (E).



Figure 4. *Yonglingia hersileoides*. Head from isotype (A).



Figure 5. *Yonglingia nitida*. Chongqing. Lectotype (PE).

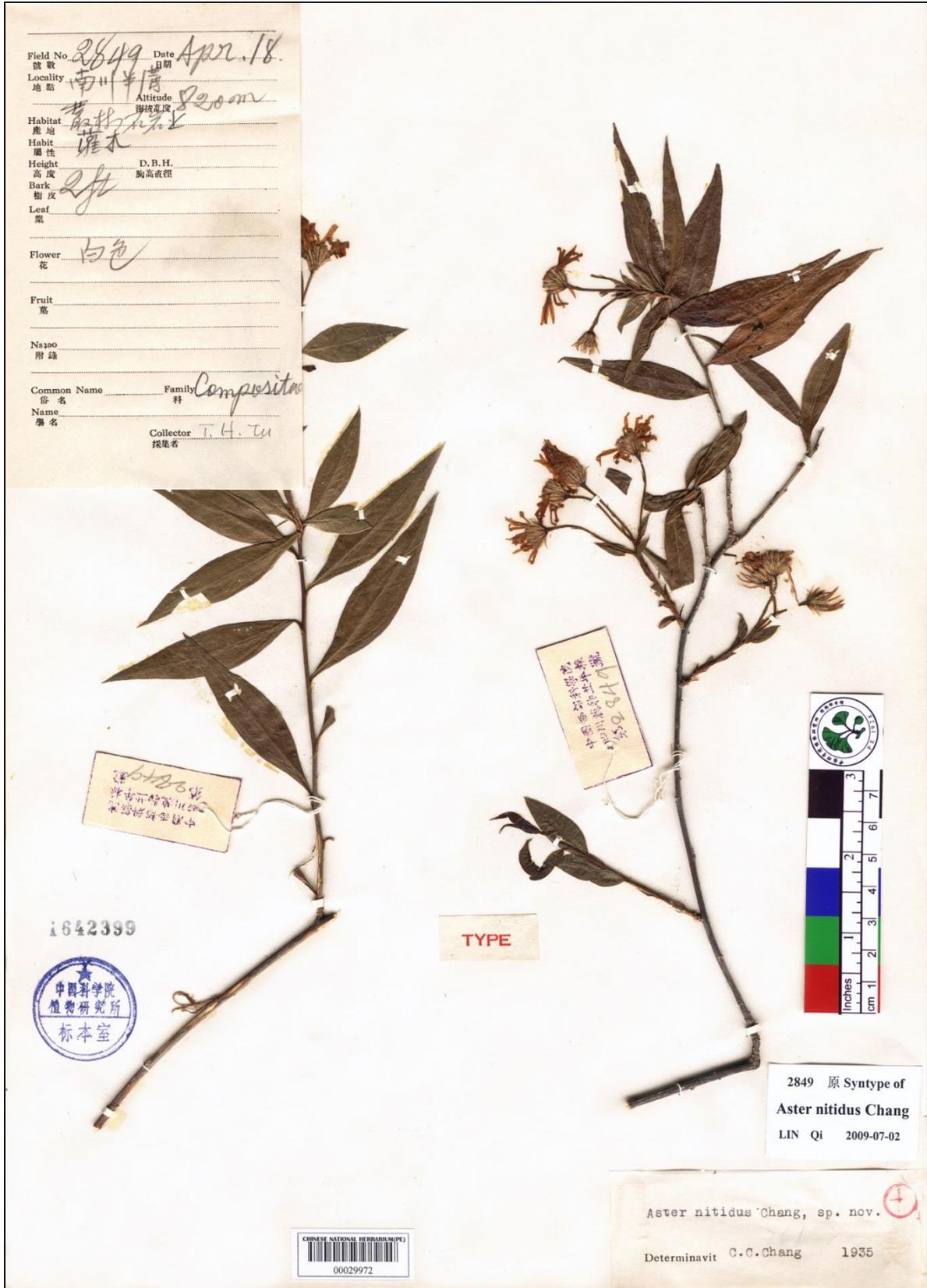


Figure 6. *Yonglingia nitida*. Sichuan. Syntype (PE).



Figure 7. *Yonglingia nitida*, bright-leaf aster. Flora of Sichuan and Chongqing website. The inflorescence and leaf margins match those of the lectotype. The shiny leaf surfaces are alluded to by the epithet.

**CHAOCHIENCHANGIA** Nesom, **gen. nov.** **TYPE:** *Changia falcifolia* (Hand.-Mazz.) Nesom

Distinct in its herbaceous-perennial, rhizomatous habit, ovate-acuminate leaves, glandular stems, leaves, phyllaries, and achenes, solitary heads terminal on short, axillary, bracteate branches, linear, herbaceous, loose and sometimes squarrose phyllaries, 2-ribbed achenes, and multiseriate pappus of apically clavate bristles.

Perennial herbs, from an abbreviated caudex and slender, woody rhizomes. **Stems** 30–60 cm tall, erect, loosely strigose, minutely stipitate-glandular, often resinous. **Leaves** cauline, lowest withered by anthesis, mostly lanceolate to ovate-acuminate, 1–9 cm long, short-petiolate (petioles 1–3 mm long), base rounded to obtuse, apex acuminate to falcate-acuminate, margins entire or distally serrate with 1–3 pairs of sharp teeth, glabrous and punctate-glandular abaxially, adaxially scabrous and minutely stipitate-glandular on veins, slightly resinous; venation eucamptodromous, often with a strong suprabasal pair. **Heads** solitary, terminal on short, bracteate, axillary branches 1–20(–60) mm long, sometimes distributed along much of stem, bracts grading into phyllaries. **Involucres** campanulate, 10–14 mm wide (pressed); phyllaries in 3–4 subequal series, mostly linear-oblong to linear-lanceolate, herbaceous, apically acute, loose and often squarrose, with distinct midvein and 3–7 dark green striae, strigose, minutely stipitate-glandular and often resinous, often purplish apically. **Ray flowers** 30–35, ligules 8–10 mm long, white to lavender, tardily coiling. **Disk flowers** bisexual, fertile, corollas 6–7 mm long, eglandular, lobes triangular, spreading. **Achenes** oblong, 2.7–3 mm long, compressed, 2-ribbed, strigose, sparsely stipitate-glandular; pappus of barbellate bristles in 4 series of unequal length, the inner about as long as the disc corollas, weakly clavate apically, outermost 0.4–0.8 mm long.

The genus name commemorates Chao-Chien Chang (1900-1972; Zhao-Qian Zhang; C.C. Chang), a long-time student of Chinese *Aster* and Asteraceae as well as other families. He graduated from the Department of Biology of National Southeast University (Nanjing in Jiangsu Province) in 1926 and by 1928 was Assistant Curator in the herbarium there. His correspondence in May and June 1928 with the Director at Kew regarding an exchange of 200 specimens from Jiangsu is on record at K (via JSTOR Global Plants).

C.C. Chang was a researcher and acting director of the South China Institute of Botany (Guangzhou), Chinese Academy of Sciences, where he expanded it to include plant taxonomy, plant ecology, geobotany, plant physiology, and plant biology. He became part of the Fan Memorial Institute of Biology, which moved to Beijing with the end of WWII, and was appointed in 1955 to the faculty of the Chinese Academy of Sciences. The main set of his personal collections is at IBSC (South China Botanical Garden, Guangzhou).

**Chaochienchangia falcifolia** (Hand.-Mazz) Nesom, **comb. nov.** *Aster falcifolius* Hand.-Mazz., Notizbl. Bot. Gart. Berlin-Dahlem. 13: 610. 1937. **TYPE MATERIAL:** **CHINA. Hubei.** "W. Hupeh," July 1900, *Wilson with Veitch Exped. 1563* (K image, Fig. 8). **Protologue:** "W-Hupeh (Henry 1034); VII. 1900 (Wilson, Veitch Exp. 1563, Typus: Hb. Berlin, Mus. Wien)."

*Aster brachyphyllus* C.C. Chang, Bull. Fan Mem. Inst. Biol. Bot. 6: 44. 1935 (not *Aster brachyphyllus* (Sonder) F. Muell. 1865). **TYPE:** **CHINA. Sichuan.** Baoxing xian, Len-mogou, roadside, 950 m, Oct 1933, *H. Tu 4788* (holotype: PE image!, cited in protologue as "Sci. Soc. Nanking Biol. Lab. Herb.").

Slopes, roadsides, stream banks, rock outcrops; 600–1800 m. Gansu, Hubei, Shaanxi, Sichuan.

The protologue of *Aster falcifolius* compared it to *A. turbinatus* S. Moore, which also produces solitary heads on short axillary branches, but *A. turbinatus* is highly distinctive, differing from *A. falcifolius* in leaf, involucre, and achene morphology and vestiture. Molecular data (Li et al. 2012) indicate that the evolutionary position of *A. turbinatus* is among species of the *Aster amellus* group, where its involucre morphology is similar to *A. baccharoides* and *A. jishouensis*.



Figure 8. *Chaochienchangia falcifolia*. Type material of *Aster falcifolius*, "W. Hupeh, July 1900," Wilson 1563 (K). Annotated by C.C. Chang as *Aster nitidus*.

Figure 9. *Chaochienchangia falcifolia*. Hubei, Kerong 451 (PE).



Figure 10. *Chaochienchangia falcifolia*. Sichuan, 236 Sichuan Task Force 977 (PE).

Figure 11. *Chaochienchangia falcifolia*. Sichuan, Yeqi 2046 (PE).



Figure 12. *Chaochienchangia falcifolia*. Hubei, 1980 Sino-American Botanical Exped. 1619 (E).

**SINOBOUFFORDIA** Nesom, **gen. nov.** **TYPE:** *Sinobouffordia poliothamnus* (Diels) Nesom

Shrubs from a woody taproot and short, woody, branching caudex, leaves densely arranged, epetiolate, glandular on both surfaces, heads small and solitary at ends of unbranched, leafy-bracteate branches, phyllaries strongly graduate, and achenes compressed, ellipsoid. Similar to *Yonglingia* in its shrubby habit, densely leafy stems, and solitary heads terminal on axillary branches but distinct in its glandular vestiture, more numerous and much smaller heads on leafier peduncles, phyllaries more indurate-scarious, and pappus bristles with tapering, flattened tips.

**Shrubs** from a woody taproot and woody caudex branches. **Stems** 15–100 cm tall, densely leafy, minutely stipitate glandular, hirsutulous or puberulent. **Leaves** narrowly oblong to narrowly oblong-lanceolate or oblong-elliptic, base attenuate to obtuse or rounded, epetiolate, not decurrent, apex acute to obtuse, margins entire, midcauline mostly 7–21 mm long, both surfaces dark green and gland-dotted. **Heads** solitary at ends of leafy-bracteate branches 1.5–10 cm long, numerous in a subcorymboid array. **Involucres** campanulate, 6.5–9 mm wide (pressed); phyllaries 4–5-seriate, strongly graduate in length, lanceolate with acute or rounded-obtuse apex, indurate, narrowly keeled, inner stramineous, outer and middle stramineous with a herbaceous, stipitate-glandular apical portion; receptacles epaleate. **Ray flowers** 12–22, ligules 6–10 mm long, coiling, white to lavender or light purple. **Disc flowers** bisexual, fertile, corollas 3.5–5 mm long, tube abruptly widening into the limb, lobes deltate-triangular, spreading to recurving. **Achenes** ellipsoid, 2–2.5 mm long, compressed, 2–3-ribbed, sparsely strigose, minutely stipitate glandular; pappus of barbellate bristles 2.5–5 mm long with tapering, flattened tips, outermost much shorter, 0.1–0.5 mm long.

The genus name commemorates Dr. David Boufford, Senior Research Scientist, Harvard University Herbaria, who has had a long-standing interest in the flora of China and southeast Asia (e.g., Boufford & Spongberg 1983; Ying, Boufford, & Zhang 1993). He has organized and participated in collecting trips in southwest China for three decades, contributed his collections, field notes, and photographs toward databases (e.g., Biodiversity of the Hengduan Mountains Project 2020), and served as a major editor for the new English language Flora of Japan, the Flora of China, Flora of Taiwan (ed. 2), the Flora of Korea, and the Flora of North America North of Mexico. With Ray Angelo of the New England Botanical Club, he published an annotated atlas of the New England flora. The name has long been in mind but the more direct version was preempted by *Bouffordia* H. Ohashi & K. Ohashi (K. Ohashi et al. 2018), a genus of Fabaceae, also named for Dave.

Plants of *Sinobouffordia* are shrubs from woody taproots, an unusual habit among asters but one that is matched in *Asterothamnus*. They are remarkably similar to *Yonglingia* (this manuscript, especially *Y. hersileoides*) in their shrubby habit, densely leafy stems, and solitary heads on axillary branches but *Yonglingia* is more distantly related (Fig. 1).

*Aster poliothamnus* and *Aster sikuensis* are indicated to have a sister relationship in the analysis of Li et al. (2011). The analysis of Zhang et al. (2015) shows the pair as sister to *Asterothamnus* (Fig. 1). These species are part of the *Asterothamnus* branch of subtribe Asterinae (Nesom 2020a) and treated here apart from a more narrowly defined *Aster* L.

1. Leaf and phyllary surfaces evenly hirsutulous; phyllaries lanceolate-triangular, apices acute  
..... **Sinobouffordia poliothamnus**
1. Leaf and phyllary surfaces puberulent-hirsute with soft hairs; phyllaries elliptic-lanceolate, apices  
rounded-obtuse ..... **Sinobouffordia sikuensis**

1. ***Sinobouffordia poliothamnus*** (Diels) Nesom, **comb. nov.** *Aster poliothamnus* Diels in Limpricht, Repert. Spec. Nov. Regni Veg. Beih. 12: 503. 1922. **TYPE: CHINA. Sichuan.** "Dege—Bejü, Hobo," 3450 m, 9 Aug 1914, *W. Limpricht 2169* (holotype: WRS�-not seen, photo and fragment-A image; isotypes: WRS� not seen, photo and fragment-E image, WU image).

*Aster ramsbottomii* Hand.-Mazz., J. Bot. (Brit. Foreign) 76: 284. 1938. **TYPE: CHINA. Xizang** (Tibet). Charndo district, Salween Gorge, 9000-10,000 ft, undershrub under a foot in height, sometimes a yard across, bearing a hundred or more flowers, ... on the dry gravel or earth slopes, on cliffs, abundant throughout the arid region, 3 Aug 1933, *F. Kingdon-Ward 10675* (holotype: BM image-Fig. 16; isotype: E image-Fig. 17).

Gansu, Qinghai, Shaanxi, Sichuan, Xizang. Figure 13, in situ.

2. ***Sinobouffordia sikuensis*** (Smith & Farrer) Nesom, **comb. nov.** *Aster sikuensis* W.W. Smith & Farrer, Notes Roy. Bot. Gard. Edinburgh. 9: 80. 1916. **TYPE: CHINA. Gansu.** Stony places and hot banks about Siku, Kansu, Oct 1914, *F. Farrer and W. Purdom 456* (holotype: E 385637 image-Fig. 18; isotypes: E image-Fig. 19, E image-Fig. 20, MO image).

Gansu (the type), Shaanxi (voucher for Li et al. 2011), Sichuan (as cited by Chen et al. 2011).

*Aster sikuensis* was compared by Smith and Farrer in the protologue to *Aster holophyllus* (= *Aster pekinensis* = *Kalimeris integrifolia*), which is similar in aspect to *A. sikuensis* and also has glandular phyllaries and leaf surfaces and apically glandular achenes, but *A. pekinensis* is a taprooted, herbaceous perennial and part of the *Kalimeris* group morphologically (Gu & Hoch 1997) as well as molecularly (Li et al. 2012).

Online specimen images at PE identified as *Aster sikuensis* (via Chinese Virtual Herbarium 2020 — *Wang 7966*, *Fu 2127*, and *Y.Q. He 880-2* sheets, from Gansu and Sichuan) (*Yeqi 880* annotated as such by Ling) are perennial herbs and apparently are some other species even though similar in aspect to *A. sikuensis*. Other collections in the Chinese Virtual Herbarium identified as *A. sikuensis* (all from WUK, none with images) are from Gansu, Shaanxi, and Sichuan.

The plant illustrated by Ling (1985) as representative of *Aster sikuensis* (his Fig. 2, p. 152; reproduced in Chen et al. 2001 as Fig. 518) has a base clearly drawn from *Wang 7956* (PE), which perhaps accounts for disparities between Flora of China descriptions and plants of the *A. sikuensis* type. The voucher of *A. sikuensis* for the molecular analysis (Li et al. 2001) was collected in Shaanxi (LWP0510025, Lueyang County).



Figure 13. *Sinobouffordia poliothamnus*. Top: Northwestern Sichuan, 30 July 2005. Bottom: Southeastern Xizang (Tibet), 21 July 2009. Photos (from color transparencies) by David Boufford, "Biodiversity of the Hengduan Mountains and adjacent areas of south-central China" website.



Figure 14. *Sinobouffordia poliothamnus*. Detail from *Aster ramsbottomii* holotype (BM).



Figure 15. *Sinobouffordia sikuensis*. Detail from *Aster sikuensis* holotype (E).

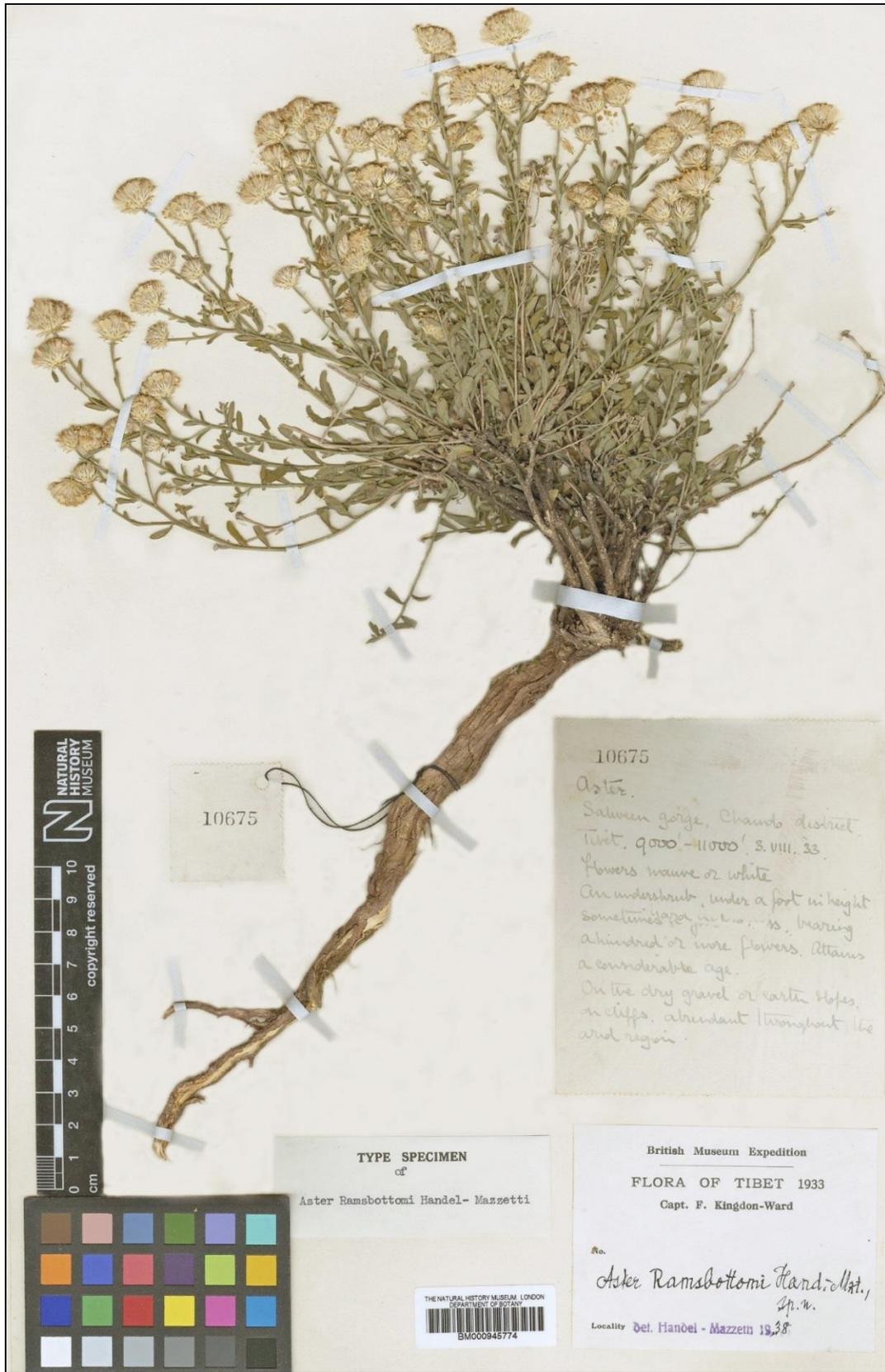


Figure 16. *Sinobouffordia poliothamnus*. Holotype of *Aster ramsbottomii* (BM).

Figure 17. *Sinobouffordia poliothamnus*. Isotype of *Aster ramsbottomii* (E).

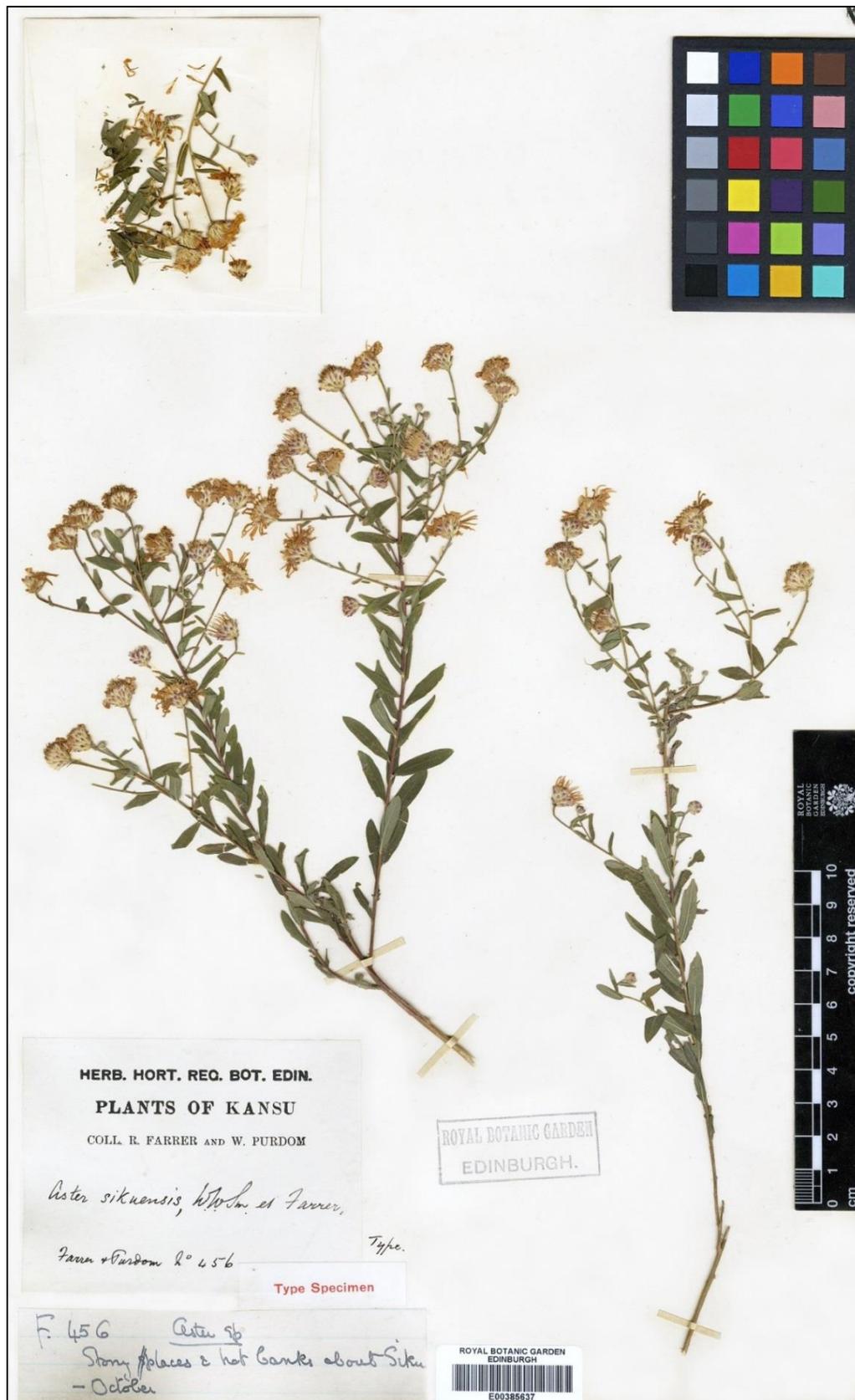
Figure 18. *Sinobouffordia sikuensis*. Holotype of *Aster sikuensis* (E).



Figure 19. *Sinobouffordia sikuensis*. Isotype of *Aster sikuensis* (E).



Figure 20. *Sinobouffordia sikuensis*. Isotype of *Aster sikuensis* (E).

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