

Anastrophyllum lignicola (Lophoziaceae), a new species from the Sino-Himalaya, and *A. hellerianum* new to China

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Anastrophyllum lignicola Schill & D.G.Long is described as a new species from Bhutan and China (Yunnan Province). It is closely related to *A. hellerianum* (Nees) R.M.Schust. but differs primarily in its gemmae which are mostly regularly ellipsoid and 2-celled. The occurrence of *A. hellerianum* in Bhutan is confirmed and it is reported as new to China, also from Yunnan. Both species are typically found in temperate coniferous forests where they colonize decaying logs.

Key words: *Anastrophyllum*, flora, Hepaticae, liverwort, Lophoziaceae, taxonomy

Introduction

During a visit to Bhutan in 1975 a small liverwort was collected by the second author on a decaying log close to Thimphu, the capital of Bhutan, which was identified by Jirí Váňa as *Sphenolobus hellerianus* (Nees) Steph. (now *Anastrophyllum hellerianum* (Nees) R.M.Schust.). At the time this species was new to the Himalaya (Long 1979) though it was known elsewhere in Asia from Siberia and Japan (Schuster 1969). On a subsequent visit to Bhutan in 1979 two further collections were made which were identified as this species, and yet another in 1999. On two expeditions to Yunnan, Western

China, in 1990 and 1993 further collections were made of plants which were provisionally referred to this species but these records were not published. These plants were all similar to *A. hellerianum* in the field because of their minute size, and creeping stems with ascending shoots tipped by bright red gemmae.

In 2001 the first author took up a study of *Anastrophyllum* material from the Himalaya and Western China as part of a Masters project at the Royal Botanic Garden Edinburgh (registered at the University of Marburg, Germany). Study of the Sino-Himalayan material previously considered to be *A. hellerianum* revealed that the specimens could be separated into two distinct

taxa, distinguished on gemma morphology and other characters. One of these taxa matched European *A. hellerianum*, but for the second species no name could be traced. It is therefore described below as *Anastrophyllum lignicola*. Both taxa are found in Bhutan and Yunnan. *Anastrophyllum hellerianum* has not been previously reported in the bryological literature from China (Piippo 1990).

***Anastrophyllum lignicola* Schill & D.G.Long, sp. nova (Fig. 1)**

A. helleriano (Nees) R.M.Schust. simile sed cortice caulis bistratoso, foliis majoribus (320–)400–550(–820) × (280–)400–500(–790) μm, gemmis plerumque bicellularibus et ellipsoideis rarius unicellularibus et rotundatis.

TYPE: China. Yunnan Province, Diqing Prefecture, Zhongdian County, forested ridge above Na Pa Hai, N of Zhongdian, 27°55'N, 99°34'E, 3920m, steep mossy *Abies/Rhododendron* forest, on rotten *Abies* log, 12.VI.1993 D. G. Long 24249 (holotype E, isotypes H, JE, KUN).

Plants small to minute; shoots procumbent to suberect, up to almost 14 mm long and 1.4 mm wide, little branched; branches terminal, lateral- and often postical-intercalary. Stems light brown to middle brown, in t.s. (90–)120–180(–220) μm thick; cortex 1–2 cells thick, cells brown to yellowish-brown, very thick-walled; medullary cells larger, thin-walled. Rhizoids several, up to almost shoot tip. Leaves slightly falcate-secund at stem apex, patent, obliquely spreading to antical side below, smaller on lower part of stem, brownish green to greenish brown or bright green at stem apex when moist, appearing brown to yellowish brown when dry, (320–)400–550(–820) μm long and (280–)400–500(–790) μm wide, ovate to subquadrate, slightly to strongly boat-shaped, complicate-bilobed; lobes equal to subequal; leaf insertion postically oblique, not overlapping, antical insertion ± horizontal, not or only slightly decurrent and slightly overlapping; both lobes ovate, predominately apiculate or rounded, subacute, acuminate; sinus u-shaped. Only a few leaf cells at median leaf base elongated, cells in mid-leaf ± isodiametric, incrassate to convex, (5.8–)8–13(–17) μm di-

ameter. Gemmae always present and generally abundant, on ascending to erect gemmiferous shoots with purplish-red tip and reduced and appressed leaves, gemmae mostly 2-celled, 8–15 × 15–27 μm, ellipsoid, sometimes in chains, more rarely 1-celled, rounded, 11–15 μm diameter, red to purplish-red. Chromosome number unknown.

Dioicous. Male bracts bulging, sometimes on gemmiferous shoots, 2–8 per stem; antheridia usually 1(–2) per bract; antheridial stalk uniseriate. Female bracts either bilobed, cuspidate or apiculate, margins weakly sinuate, weakly denticulate or serrate or bracts 3–4-lobed, apiculate, subacute or rounded with margins sinuate to weakly and irregularly denticulate. Perianths terminal, ± cylindrical, gradually narrowing above and becoming pluriplicate distally, 1–2.4 mm long and 0.3–0.9 mm wide, mouth 4–8-lobed, lobes irregularly shortly-ciliate and hardly serrate. Sporophytes rare, June.

Anastrophyllum lignicola has been collected mostly in wet mossy coniferous forests, especially *Abies/Larix/Rhododendron* and *Tsuga/Rhododendron*, more rarely in *Betula/Sorbus* and *Pinus* forest; in these forests it grows on rotten logs and stumps, occasionally on living tree trunks. In Bhutan it is found from 3060–3820 m and in Yunnan 3350–4250 m.

Anastrophyllum hellerianum, however, is found in somewhat drier forests, especially *Pinus wallichiana* forest in Bhutan and *Picea-Quercus* forest in Yunnan, but has been found exclusively on rotten logs. *Anastrophyllum lignicola* is found at higher altitudes than *A. hellerianum* in Bhutan and Yunnan.

Anastrophyllum lignicola at present is confined to temperate forests of The E Himalaya (Bhutan) and W China (Diqing Prefecture of Yunnan Province). According to Schuster (1969) *A. hellerianum* is known from Europe, Siberia, Japan and North America; it has not been reported from China (Piippo 1990).

Anastrophyllum lignicola is very similar to *A. hellerianum* in the field and grows in very similar habitats; microscopically it can easily be distinguished by its mostly 2-celled ellipsoid gemmae; in *A. hellerianum* these are always 1-celled, mostly cubical or irregularly angular. It also differs in its slightly larger stature, having

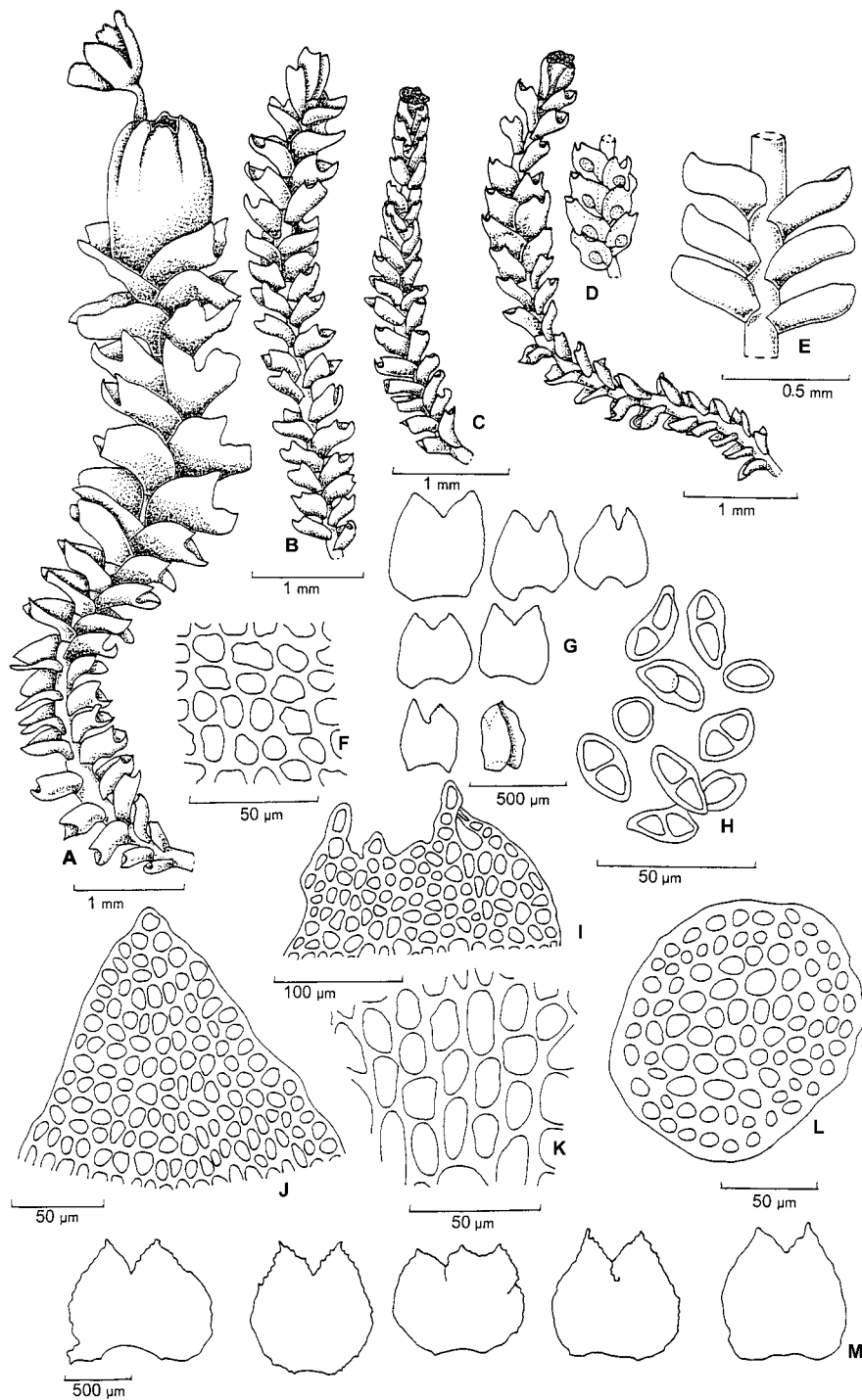


Fig. 1. *Anastrophyllum lignicola* (from the holotype). — **A:** Fertile shoot, antical view, showing perianth and sporophyte. — **B:** Sterile shoot, antical view. — **C:** Gemmiferous shoot, antical view. — **D:** Gemmiferous male shoot with bulging bracts bearing antheridia. — **E:** Postical leaf insertion. — **F:** Median leaf cells. — **G:** Vegetative leaves. — **H:** Gemmae. — **I:** Lobe of perianth mouth. — **J:** Leaf lobe apex. — **K:** Basal leaf cells. — **L:** Stem transverse section. — **M:** Female bracts.

leafy shoots up to 1.4 mm wide and leaves up to 820 µm long. In fact, *A. lignicola* can sometimes be almost as robust as *A. minutum* (Schreb.) R.M.Schust. in stature but can also be distinguished by its gemmae; in *A. minutum* these are 1–4-celled and variable in colour (green, yellow, orange or red) and in shape (subspherical, cubical, ovoid or angular) (Paton 1999); in *A. lignicola* they are always red and regularly ellipsoid to subspherical. In *A. minutum* the cells of the leaf lobes are arranged in concentric rows, whereas in *A. lignicola* and *A. hellerianum* they are not. *Anastrophyllum minutum* more typically grows on rocks and only occasionally on logs, whereas *A. lignicola* is known exclusively from wood.

ADDITIONAL SPECIMENS OF *ANASTROPHYLLUM LIGNICOLA* STUDIED (paratypes). — **Bhutan.** Tongsa District, W slopes below Yuto La, 27°31'N, 90°34'E, 3060 m, moist mossy *Tsuga/Rhododendron* forest, on tree trunk, 19.V.1979 Long 7995 (E), 7997 (JE); Bumthang District, below Resang La, 27°25'N, 90°44'E, 3820 m, *Abies/Rhododendron* forest, on stump, 14.IX.1999 Long 28646 (E). **China.** Yunnan, Diqing Prefecture, Zhongdian County, forested ridge S of lake in Bi Ta Hai forest reserve, 3620 m, mossy *Oak/Rhododendron* forest, on mossy log, 26.IX.1990 Long 18586-b (E); Diqing Prefecture, Bai Ma Shan, by logging road on N-facing slopes below W pass, 28°24'N, 98°58'E, 3815 m, logged scrubby *Abies/Rhododendron* forest, on rotten *Abies* log, 6.VI.1993 Long 24067 (E); *ibid.*, on log under *Betula* and *Sorbus*, 6.VI.1993 Long 24074 (E); Diqing Prefecture, Bai Ma Shan, slopes below E pass, 28°19'35"N, 99°05'16"E, 4205 m, slopes with *Abies/Larix/Rhododendron* forest, on rotten *Abies* logs, 9.VI.1993 Long 24179 (E); Diqing Prefecture, Bai Ma Shan, below logging road below E pass, 28°20'N, 99°05'E, 4090 m, *Abies/Rhododendron* forest, on log, 9.VI.1993 Long 24198 (E); Diqing Prefecture, Zhongdi-

an County, near Churung, between Zhongdian and Jiulong, 45 km SE of Zhongdian, 27°41'31"N, 100°01'11"E, 3350 m, small ravine in *Pinus*/mixed broad-leaved forest, on old pine log, 14.VI.1993 Long 24387 (E).

Confirmed records of *Anastrophyllum hellerianum* from the Sino-Himalaya. — **Bhutan.** Thimphu District, E bank of Thimphu Chu, 10 km N of Thimphu Dzong, 2600 m, on rotten pine log in forest, 21.VI.1975 Grierson & Long 647 (E); Thimphu District, valley above Taba, Thimphu, 27°30'N, 89°39'E, 2450 m, open mixed forest, on rotting log by stream, 11.V.1979 Long 7818 (E). **China.** Yunnan, Diqing Prefecture, side valley 13 km N of Geza, 28°16'N, 99°45'E, 3260 m, small valley with mixed *Picea/Quercus* forest, on log, 30.V.1993 Long 23890 (E).

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