

A Collection of Hypnaceous Mosses from the East Himalaya and Yunnan

By

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Abstract Eighteen species of the family Hypnaceae are reported from the East Himalaya and Yunnan. Among them, *Gollania revoluta* Higuchi is described as new to science. Four species, *Ectropothecium sikkimense*, *E. zollingeri*, *Gollania ruginosa* and *Hypnum hamulosum*, are new to Bhutan. *Gollania japonica* is new to Yunnan.

This is a report on the hypnaceous mosses collected mainly by D. G. LONG in Nepal, India, Bhutan and China (Yunnan) in 1975–1990. A few collections made by R. J. D. McBEATH and W. D. FOSTER in Nepal, D. M. HENDERSON in Darjeeling and J. C. HUTCHISON in Bhutan are included. Among the collection, we recognized 18 species of hypnaceous mosses, including a new species, *Gollania revoluta* Higuchi. Four species, *Ectropothecium sikkimense*, *E. zollingeri*, *Gollania ruginosa* and *Hypnum hamulosum*, are new additions to the moss flora of Bhutan (cf. LONG 1994). All specimens cited here are deposited in the herbarium of Royal Botanic Garden, Edinburgh (E), and the duplicates in the herbarium of the National Science Museum, Tokyo (TNS).

Enumeration of species

1. *Ectropothecium sikkimense* (Ren. et Card.) Ren. et Card., Bull. Soc. R. Bot. Belg. 41(1): 109 (1905).

Nepal. Tamur River near Chirwa, 1350 m, on wet rock slab on riverbank in open woodland (Long 16564); between Khesewa and Kunjuri, 2130 m, on grassy slope on open ridge (Long 17453).

Bhutan. Hills above Phuntsholing (6 km beyond Kamji), 1625 m, on damp rocks in moist broad-leaved forest (Long 7767).

Distribution. India (Mussoorie, W. Bengal), Nepal and Sikkim. New to Bhutan.

Although RENAULD and CARDOT (1905), BRÜHL (1931) and GANGULEE

(1969–1980) reported this species from Bhutan, LONG (1994) pointed out that they are based on a DUREL specimen from Kalimpong district of West Bengal, India.

2. *Ectropothecium zollingeri* (C. Muell.) Jaeg., Ber. S. Gall. Naturw. Ges. 1877–78: 272 (1880).

Bhutan. Sarbhang district, Longa Khola near Phipsoo, 300 m, on vertical soil bank in subtropical riverine forest (Long 10630).

Distribution. Nepal, India (W. Bengal), Assam, Thailand, Laos, Malay Pen., Sumatra, Java, Borneo, Celebes, Seram (Amboina), China, Taiwan, Japan, New Guinea, New Caledonia, Fiji and Hawaii. New to Bhutan.

This species is characterized by acute, ovate-lanceolate, asymmetrical leaves and distinct, forked costae, and its median laminal cells are smooth to prorate at upper ends dorsally (cf. HIGUCHI and IWATSUKI, 1994). The plants in this specimen (Long 10630) have clearly prorate laminal cells.

3. *Gollania japonica* (Card.) Ando et Higuchi, Hikobia Suppl. 1: 192 (1981).

Syn. *Macrothamnium setschwanicum* Broth., Sitzungsber. Akad. Wiss. Wien Math.-Nat. Kl. Abt. 1, 131: 218 (1922). fide HIGUCHI (1985).

China. Yunnan Province, Tsang Shan, Xi Shan ridge W of Huadianba, 3395 m, on trunk of *Rhododendron* on exposed ridge with bamboo-*Rhododendron* forest (Long 19300).

Distribution. Nepal, China (Sichuan), Taiwan and Japan. New to Yunnan.

Plants in the specimen Long 19300 cited above show branches that are more slender and laminal cells somewhat shorter than those of the usual form. This slender form was named *Macrothamnium setschwanicum* by BROTHERUS (1922).

4. *Gollania ruginosa* (Mitt.) Broth. in Engler & Prantl, Nat. Pfl. 1(3): 1055 (1908).

Bhutan. Thimphu district, Dotena, Thimphu Chu, 2700 m, on river bank in *Quercus*-, *Picea-Rhododendron* forest (Long 10880).

Distribution. N.W. India, China (Yunnan, Zhejiang, Shaanxi, Jilin, Heilongjiang), Taiwan, Japan, Korea and Russia Far East. New to Bhutan.

This species is sometimes very difficult to distinguish from *G. clarescens*, in particular when sterile. *Gollania clarescens* differs from *G. ruginosa* in flat ventral stem leaves and thin-walled, almost smooth median laminal cells.

5. *Gollania schensiana* Higuchi, J. Hattori Bot. Lab. 59: 29 (1985).

Nepal. Kathmandu Valley, Royal Botanic Garden, Godavari, 1550 m, on shady bank in open woodland (Long 17583); Hile (near Dhankuta), 2300 m, on damp soil (Foster M86).

Distribution. N.W. India, Nepal, Bhutan and China (Shannxi).

This species is the commonest species of *Gollania* in the Himalayas. Recently HIGUCHI and WU (1995) reported *G. schensiana* from Sichuan Province, China.

6. *Gollania turgens* (C. Muell.) Ando, Bot. Mag. Tokyo 79: 769 (1966).

China. Yunnan Province, Yulong Shan, Xie Ren Ji valley above Mu Zhou Go Valley, 3560 m, on shady limestone blocks under *Abies* in steep limestone valley with scree and degraded *Abies* forest (Long 19106).

Distribution. Nepal, China (Yunnan, Sichuan, Gansu, Shaanxi), Japan, Russia Far East, Alaska and W. Canada.

Recently HIGUCHI and WU (1995) reported this species from Yunnan Province, China.

7. *Hypnum hamulosum* B.S.G., Bryol. Eur. 6: 96 (1854). Det. H. ANDO.

Nepal. Lhonak to Pang Pema, Kangchenjunga Glacier, 4800 m, amongst block scree in rocky glacier valley (Long 16838).

Bhutan. Thimphu District, forested valley above Chenkaphug (east of Thimphu), 3150 m, on shrub in marshy hollow in mixed *Picea*-, *Tsuga*-, *Abies*-, *Larix*-, *Juniperus-Rhododendron* forest (Long 8799); tributary of Longte Chu at Charikhachor Chorten near Chendebi (west of Tongsa), 2450 m, on sloping rock slab by stream in deeply shaded ravine in forest (Long 8067).

Distribution. Widely distributed in arctic-alpine areas of the Northern Hemisphere. New to Bhutan.

8. *Hypnum lindbergii* Mitt., J. Bot. 2: 123 (1864). Det. H. ANDO.

China. Yunnan Province, Zhongdian District, river valley in Bi Ta Hai Forest Reserve, 3360 m, in marshy ground on river bank in pine forest (Long 18560).

Distribution. Widely distributed in temperate to arctic areas of the Northern Hemisphere and disjunctively in S. America (Brasil).

9. *Hypnum macrogynum* Besch., Ann. Sc. Nat. Bot. ser. 7, 15: 91 (1892). Det. H. ANDO.

Nepal. Kathmandu Valley, Royal Botanic Garden, Godavari, 1550 m, on mossy bank in open woodland (Long 17596); near Gupha Pokhari, 2920 m, on *Berberis* in open degraded *Rhododendron* forest (Long 17534); Ghunsa Khola between Kyapra and Pheri, 2850 m, on bank in *Abies*-, *Tsuga*-, *Quercus-Rhododendron* forest (Long 16683); Yalung Valley near Lapsang, 4325 m, on bank of moraine in open glacier valley (Long 17063).

Bhutan. Thimphu Chu (6 km north of Thimphu Dzong), 2600 m, under pine trees (Grierson & Long 149); above Motithang, Thimphu, 2600 m, on dead pine log (Grierson & Long 666); wooded valley, southwest of Dukye Dzong, Paro, 2800 m, on grassy ground under scrub (Grierson & Long 271); east side of Dochu La (ca. 200 m below pass), 3000 m, on roadside boulder (Grierson & Long 587); Dochu La, 3200 m, on earthy bank in forest (Grierson & Long 371); Bumthang District, Phok Phey below Rudong La, 3750 m, on boggy open ground among short grazed bamboo (Hutchison 5); near Byakar Dzong, Bumtang Chu, 2750 m, on turf slopes in open *Pinus wallichiana* forest (Long 8268); Thimphu district, Dechencholing Bridge, 2370 m, on bank under trees in *Quercus griffithii* forest (Long 7795).

China. Yunnan Province, Anfengying (west of Kunming), 1850 m, on soil bank under trees in *Keteleeria-Calocedrus* woodland by village (Long 18466); Chingdien, near Kunming, 2100 m, on rocks by footpath on slopes with *Pinus yunnanensis* woodland (Long 18452); Tsang Shan, path below Longquan Peak, above Dali, 3460 m, on rocks under *Abies* in *Abies*-, *Rhododendron*-bamboo forest on exposed ridge (Long 19162).

Distribution. East and South Africa, Madagascar, Mascarene Is., Nepal, Sikkim, Bhutan, Assam, Burma, Malaysia, China (Xizang, Yunnan, Sichuan) and Taiwan.

Recently ANDO (1995) pointed out that '*Hypnum aduncoides* (Brid.) C. Muell.' (not *H. cupressiforme* var. *aduncoides* Brid.) of southeastern Africa is conspecific with *H. macrogynum* Besch.

10. *Hypnum submolluscum* Besch., Ann. Sc. Nat. Bot. ser. 7, 15: 93 (1892). Det. H. ANDO.

China. Yunnan Province, Zhongdian District, Ge Zao area (15 km north of Zhongdian), 3550 m, on damp limestone slab on small rocky limestone hill (Long 18693); Yulong Shan, Xie Ren Ji valley, above Mu Zhou Go valley, 3620 m, on mossy limestone boulder under *Abies* in steep limestone valley with scree and degraded *Abies* forest (Long 19112).

Distribution. Bhutan and China (Yunnan, Sichuan).

11. *Leptohyemenium tenue* (Hook.) Schwaegr., Sp. Musc. Suppl. 3(1): 246c (1828).

Nepal. Descent from Buje Daurali to Nesum, Tamur Valley, 2620 m, on bank in mossy oak-*Rhododendron* forest (Long 16515); Basantapur (NE of Dankuta), ca. 2300 m, on tree trunk (Foster M2).

Bhutan. Thimphu District, Pumo La, 3450 m, on trees in shaded wooded area (Hutchison 1).

Distribution. Nepal, Sikkim, Bhutan, Myanmar, Thailand, China (Yunnan) and Philippines.

This species, when sterile, is somewhat like *Macrothamnium macrocarpum*, but it is distinguished by its less serrate, longer decurrent leaves.

12. *Macrothamnium leptohymenioides* Nog., Kumamoto J. Sc. Biol. 11: 6 (1972).

Nepal. N bank of Simbua Khola below Tseram, 3450 m, on tree trunk in *Abies-Rhododendron* forest (Long 17116).

Distribution. Nepal.

This is the third record of this species in addition to 'Thakma Khola-Diorali Bhanjang, E. Nepal' (NOGUCHI, 1972) and 'Bakrekharaka, C. Nepal' (ANDO and NOGUCHI, 1979).

13. *Macrothamnium macrocarpum* (Reinw. et Hornsch.) Fleisch., Hedwigia 44: 308 (1905).

Nepal. Barun Khola below Makalu, 3200–4000 m, in *Abies-Rhododendron* forest (McBeath 1354); Shidua ridge above Hille, 2380 m, on boulder on cliff on open hillside (Long 16437); between Nesum and Buje Daurali, 2290 m, on bank in shady evergreen oak forest (Long 17498); Lower slopes of Dobala Danda above Yamphudin, 1920 m, on wet rocks by waterfall in ravine in warm broad-leaved forest (Long 17276); N-facing slopes of Dobala Danda above Kabeli Khola, 2350 m, on wet rocks stream in ravine in wet mossy oak/laurel forest (Long 17371).

India. Darjeeling, 2500 m, on tree trunk (Henderson s.n.).

Bhutan. Chukka district, forested ridge E of Jumudag, 2080 m, on log in evergreen oak forest (Long 10482); Gaylegphug district, summit ridge N of Chabley Khola, 66 km post, 2100 m, on

boulder in evergreen oak forest (*Long 10681*).

Distribution. Nepal, Sikkim, Bhutan, India, Sri Lanka, Thailand, China (Yunnan), Java, Philippines, Taiwan and Japan.

This species is very variable in size and leaf shape. Plants in the specimen *Long 17371* have dark-green colour, ovate and strongly concave leaves with weakly serrate leaf margins and thin-walled, indistinctly prorate laminal cells. This form is usually found in wet habitats.

14. *Macrothamnium submacrocarpum* (Ren. et Card.) Fleisch., Hedwigia 44: 308 (1905).

Nepal. N-facing slopes of Dobala Danda above Kabeli Khola, 2340 m, on mossy bank in steep valley in mossy oak-laurel forest (*Long 17337*).

India. Tongloo La, ca. 2300 m, on trunk of *Machilus* (*Henderson s.n.*), ca. 2900 m, on tree trunk (*Henderson s.n.*).

Bhutan. Dochu La, 3200 m, on earthy bank in forest (*Grierson & Long 370*), on humus on bank (*Grierson & Long 381*); Punakha district, between Dochong La and Menchunang, 2750 m, on mossy bank in evergreen oak forest (*Long 10949*); W slopes below Yuto La (E of Tongsa), 3120 m, on mossy log in moist *Tsuga-Rhododendron* forest (*Long 8257*), 3270 m, on damp boulder in mossy *Abies densa-Rhododendron* forest (*Long 8031*).

Distribution. W. Himalaya, Nepal, Sikkim, Bhutan, India, Myanmar, Thailand and Taiwan.

15. *Orontobryum hookeri* (Mitt.) Fleisch. in Broth. in Engler & Prantl, Nat. Pfl. ed.2, 11: 261 (1925).

Bhutan. Dochu La, 3200 m, on earthy bank in forest (*Grierson & Long 372*).

Distribution. Nepal, Sikkim and Bhutan.

16. *Ptilium crista-castrensis* (Hedw.) De Not., Cronac. Briol. Ital. 2: 17 (1867).

Nepal. Yalung valley near Lapsang, 4200 m, on moraine ridge at open glacier valley (*Long 17043*); Ghunsa Khola, Ghunsa, 3440 m, on steep rocky riverbank with *Larix-Rhododendron* scrub (*Long 16749*).

Bhutan. Nr summit of Thrumse La above Sengor, in mossy turf in mossy *Abies-Rhododendron* forest (*Long 8697*); Thimphu district, forested valley above Chenkaphug (E of Thimphu), 3300 m, on bank in mossy *Abies*-, *Juniperus-Rhododendron* forest (*Long 8800*).

China. Yunnan Province, Zhongdian district, Wu Fang Shan near Zhongdian, 3390 m, on humus on damp forest floor in mossy *Quercus-Larix* forest (*Long 18528*); Tsang Shan, path below Longquan Peak above Dali, 3470 m, in mossy clearing in *Abies*-, *Rhododendron-bamboo* forest on exposed ridge (*Long 19174*).

Distribution. Europe, Caucasus, Nepal, Sikkim, Bhutan, Burma, China, Taiwan, Japan, Korea, Siberia, N. America and Greenland.

17. *Pylaisiella falcata* (B. S. G.) Ando, Phyta 1: 14 (1978).

Bhutan. Below Umsho (W side of Dochu La), 3000 m, on shrub (*Grierson & Long 306*); Thimphu district, Thimphu above Pajoding monasteries, 3900 m, on Juniper stems on rocky scree with dwarf *Juniperus-Rhododendron* (*Long 10908*).

China. Yunnan Province, Zhongdian district, Wu Fang Shan near Zhongdian, 3450 m, on tree

trunk on wooded slope with *Betula*-, *Quercus*-, *Larix-Sorbus* (Long 18533).

Distribution. Nepal, Bhutan, Assam, China (Xizang, Yunnan, Sichuan), Mexico, Guatemala, Colombia, Ecuador, Bolivia, Costa Rica and Venezuela.

Description of new species

Gollania revoluta Higuchi, sp. nov.

(Fig. 1)

Dioica? Caulis repens, ad 3 cm longus, complanatifoliosis, irregulariter pinnatim ramosus, ramis inaequilongis, complanatifoliosis, ad 0.5 cm longis. Pseudoparaphyllia foliacea, lanceolata. Folia caulina infirme falcato-secunda, ovato-lanceolata, apice sensim breviter acuminata, e basi subcordata, concava, nervis binis, distinctis, marginibus recurvis, superne serratis, inferne serrulatis, cellulis medianis linearibus, alaribus subquadratis vel rectangularibus. Folia ramea minora, oblongo-lanceolata, ceterum similia. Fructus ignotus.

Dioicous? Plants small for the genus, yellowish-green, somewhat glossy and tinged with red-brown. Stems prostrate, to 3 cm long, elliptical in cross-section, with a slightly differentiated central strand, irregularly pinnate-branched; leafy stems complanate; branches complanate, irregular in length, to 0.5 cm long. Pseudoparaphyllia lanceolate, 4–5 cells wide at base. Dorsal stem leaves weakly falcate, ovate-lanceolate, gradually or somewhat abruptly narrowed to a short acumen, subcordate at base, long-decurrent, deeply concave, sometimes plicate, $1.3\text{--}1.7 \times 0.7\text{--}0.9$ mm; margins recurved throughout (except for the apical part), irregularly serrate above, weakly serrulate below; costae double, distinct, $1/2\text{--}3/5$ the leaf length, convex on ventral surface, three layers of cell in cross-section of median part, usually united at base; median laminal cells linear, weakly flexuose, lumina $20\text{--}40(-50) \times 3\text{--}4$ μm , thin-walled, smooth; upper laminal cells rarely prorate at upper ends on dorsal side; basal laminal cells larger and thicker-walled than median cells, porose; alar cells differentiated, subquadrate to rectangular, 8–12 in median longitudinal row, 8–10 in transverse row. Ventral stem leaves round-ovate, scarcely or only slightly falcate. Branch leaves smaller, oblong-lanceolate, $0.9\text{--}1.5 \times 0.4\text{--}0.6$ mm.

Sexual organs and sporophytes unknown.

Type: China. Yunnan Province, Yulong Shan, Wo Tu Di, 3580 m, on wet

Fig. 1. *Gollania revoluta* Higuchi. 1. Plant. 2. Dorsal view of leafy stem. 3. Ventral view of leafy stem. 4. Dorsal stem leaf. 5. Lateral stem leaf. 6. Ventral stem leaf. 7–10. Laminal cells of stem leaf (7: apical part, 8: median central part, 9: median marginal part, 10: alar part). 11. Pseudoparaphyllia. 12. Axillary hairs. 13. Laminal cells of decurrent part of stem leaf on stem. 14, 15. Transverse sections of median part of stem leaves. 16. Dorsal branch leaf. 17. Lateral branch leaf. 18. Ventral branch leaf. 19–22. Laminal cells of branch leaf (19: apical part, 20: median central part, 21: median marginal part, 22: alar part). 23. Part of transverse section of stem. All drawn from holotype.

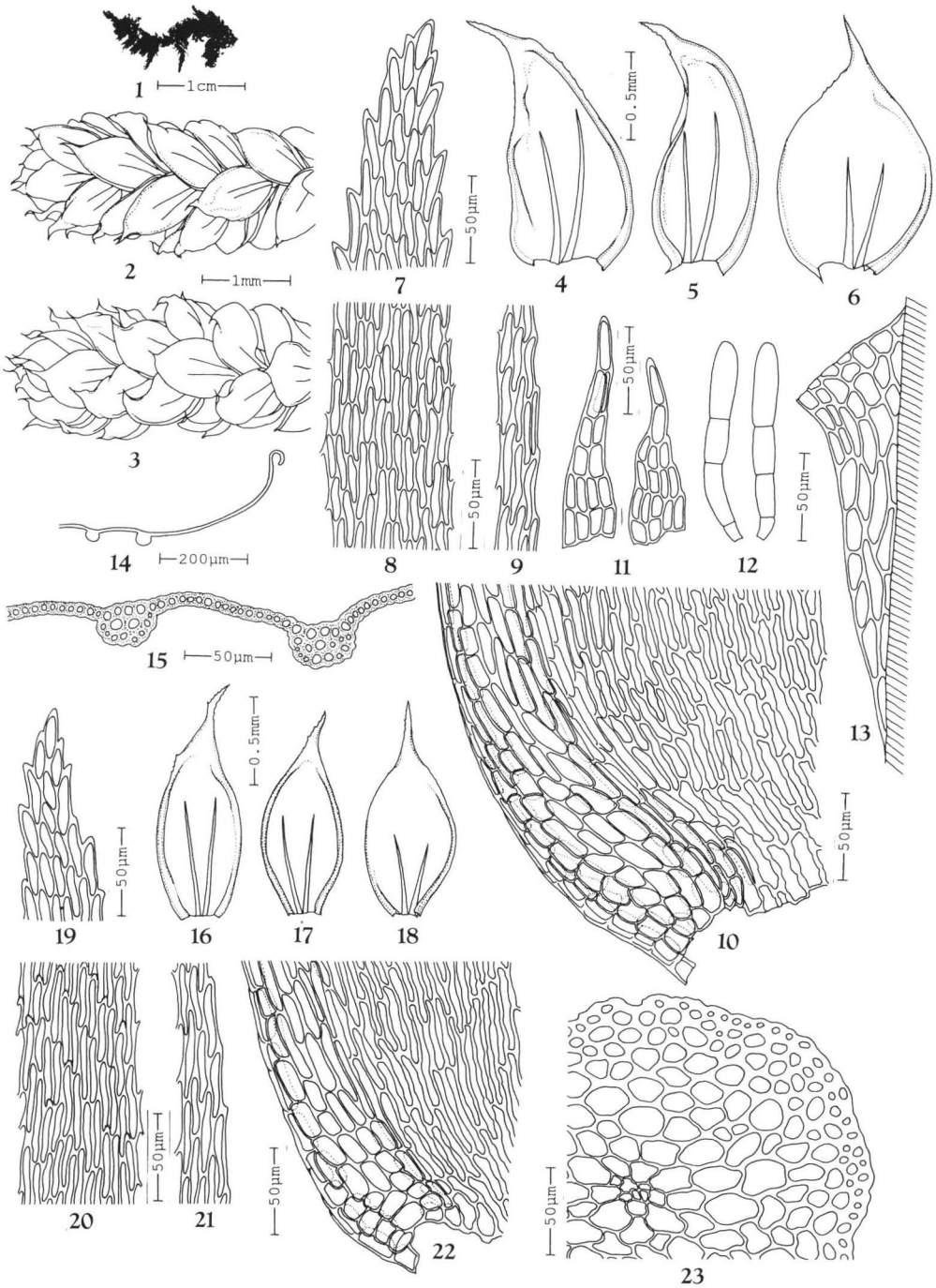


Fig. 1.

limestone rocks by stream at limestone ravine on steep mountain slope (Long 18950, holotype in E; isotypes in HIRO, KUN, TNS).

Other specimen examined. China. Yunnan Province, Bi Ye Go Valley, N of Yangtze Bridge at Lou Swang, 3100m, on steep mossy bank in gully in steep valley with wet *Abies*-bamboo forest (Long 18745).

Distribution. China (Yunnan).

This new species is distinguished from the other known species of the genus by the following characters: (1) plants small; (2) leafy stems complanate; (3) leaf margins recurved throughout (except for the apical part); (4) leaves long-decurrent; and (5) costae distinct, $1/2-3/5$ the leaf length, consisting of three layers of cells in cross-section at median part. The decurrent parts of leaves sometimes remain on the stem when the leaves are removed (Fig. 1: 13).

Gollania tereticaulis Broth., known from China (Yunnan), resembles the present new species by the plant size and falcate, deeply concave leaves, but is easily distinguished by the plane leaf margins, shorter costae ($1/9-1/5$ the leaf length) and distinctly prorate laminal cells.

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