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Addition of three moss species to West Himalayan bryoflora

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Abstract – The present investigation on the bryoflora of western Himalaya revealed the occurrence of three moss taxa, viz., *Entodon concinnus* subsp. c*aliginosus*, *Entodon luteonitens* and *Hypnum subimponens* subsp. *ulophyllum*, which are new additions to the western Himalaya. *Entodon concinnus* subsp. *caliginosus* and *H. subimponens* subsp. *ulophyllum* have been discovered from Pauri, while *E. luteonitens* from Ghangharia, Pithoragarh and Binsar (Uttarakhand). The former two species were earlier known from Darjeeling, Naga hills, east Nepal and Bhutan, whereas the latter species was endemic to Darjeeling in eastern Himalaya.

Musci / bryoflora / *Entodon concinnus* subsp. *caliginosus* / *Entodon luteonitens* / *Hypnum subimponens* subsp. *ulophyllum* / western Himalaya

INTRODUCTION

Mosses of eastern India and adjacent regions have been comprehensively worked out by Gangulee (1969-1980), while west Himalayan mosses have received attention from Chopra & Kumar (1981), N. Chopra (1961), Tewari & Pant (1994), Dabhade (1998) provided a floristic account of mosses of Khandala and Mahabaleshwar (Western Ghats). A consolidated information about the Indian Mosses has been provided by Chopra (1975) and a checklist of Indian mosses has recently been prepared by Lal (2005). The present paper includes a study on the specimens collected from western Himalaya, which resulted in the addition of *Entodon concinnus* (De Not.) Paris subsp. *caliginosus* (Mitt.) Mizushima, *E. luteonitens* Renauld & Cardot and *Hypnum subimponens* Lesq. subsp. *ulophyllum* (Müll. Hal.) Ando to the west Himalayan bryoflora.

MATERIALS

The specimens collected from Pauri and Ghangharia by S. Chandra in 1964, from Binsar by Nath and Asthana in 1991 and from Thalkedar by Sahu in 2007 were studied and deposited in Bryophyte Herbarium, National Botanical Research Institute, Lucknow (LWG).

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DESCRIPTION AND DISCUSSION

***Entodon concinnus* (De Not.) Paris subsp. *caliginosus* (Mitt.) Mizushima,** *J. Hattori Bot. Lab.* 22: 116 (1960) **Figs 1-11**

Plants robust, brownish yellow, in tufts. Main stem pinnately branched, creeping, sometimes frondose. Leaves imbricate dense and apressed to stem (when dry), concave, ovate with acute tip, ± 1.6 × 0.8 mm on stem, 1.3-1.5 × 0.7-0.75 mm on branches; margin revolute usually on one side, smooth, costa short double, some times highly reduced. Leaf cells rhomboid, usually smaller at tips, 30-35 × 7.5 µm, apical cells some times show small papillae (in stem leaves); median leaf cells 67.5-80 × 7.5 µm, elongate; alar cells quadrate 17.5 × 17.5 µm to rectangular 27.5 × 17.5 µm, gradually become longer upwards, in 3-4 layers. Sporophytes on main branches; seta erect, reddish brown ± 1.4 cm long, capsule cylindrical, erect ± 3 mm long; Peristome double, annulus present, peristome teeth ± 350 µm long, 50 µm wide at base, endostome and exostome segments separate, well developed, more or less of same height. Spores 12.5-15 µm, minutely papillose.

Specimen examined: India. Western Himalaya: Pauri (alt. *ca* 6000 ft), 15.10.1964, leg. *S. Chandra, 200620-B* (LWG).

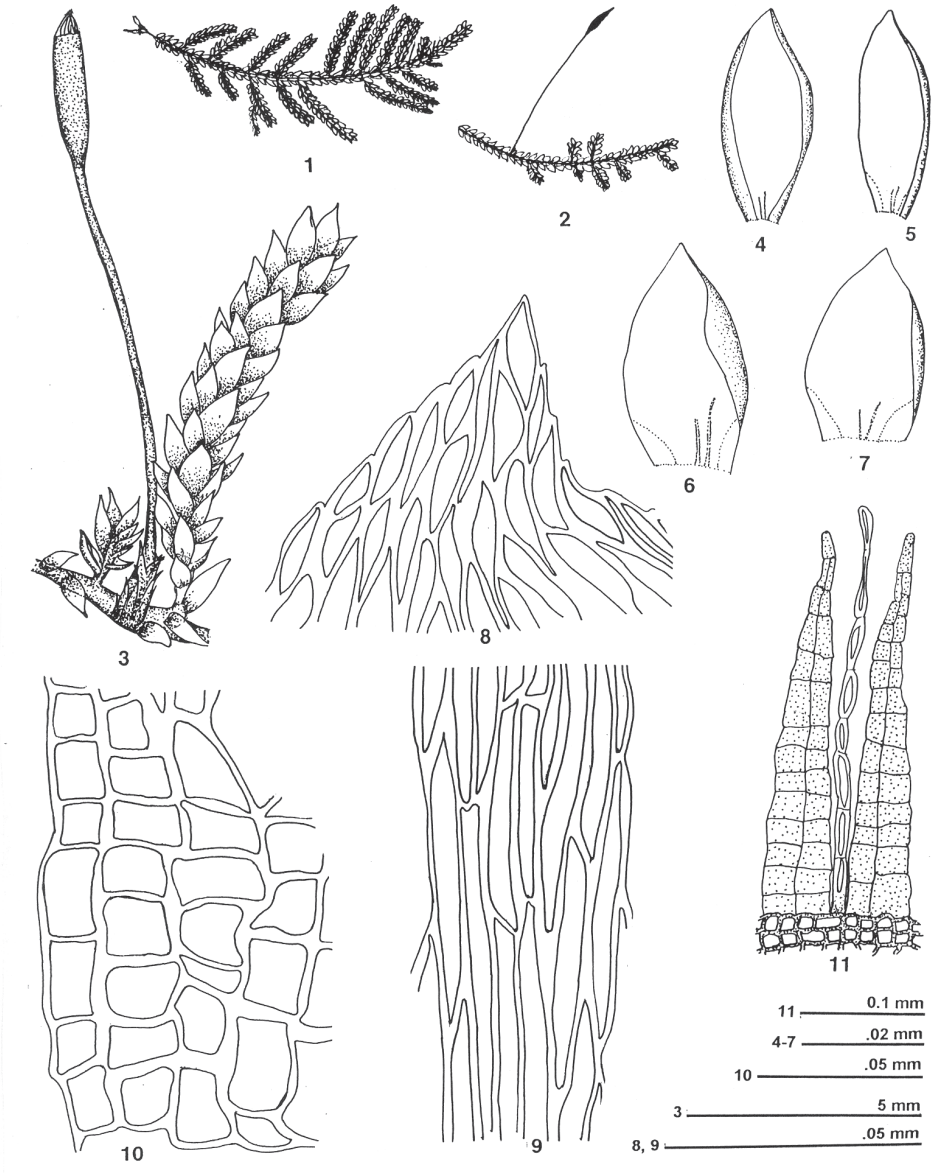
Entodon Müll. Hal. is represented by 127 species (Gangulee, 1978-80) worldwide distributed in the temperate-subtropical belt with a concentration in Pacific Asia, Pacific south America and towards eastern Himalaya. It is represented in India by 16 species (Chopra, 1975; Lal, 2005). Out of these, 7 species occur in eastern Himalaya alone, 3 commonly occur in eastern as well as western Himalayas, 3 in eastern, western Himalayas and south India, while 2 taxa are distributed in eastern Himalaya and south India, and only a single species is confined to western Himalaya. The distribution pattern shows a maximum concentration of 15 species in eastern Himalaya.

During the investigation of bryophytes from western Himalaya, *Entodon concinnus* subsp. c*aliginosus* was found at Pauri, which is a new addition to this bryo-geographical region of India. *E. concinnus* subsp. *caliginosus* has been earlier known from Darjeeling, Bhutan, east Nepal, China and Japan. Plants of *E. concinnus* subsp. *caliginosus* from Pauri (western Himalaya) exhibit a slight variation in having smaller peristome teeth (± 350 µm) as compared to the east Himalayan plants, possibly due to different ecological conditions.

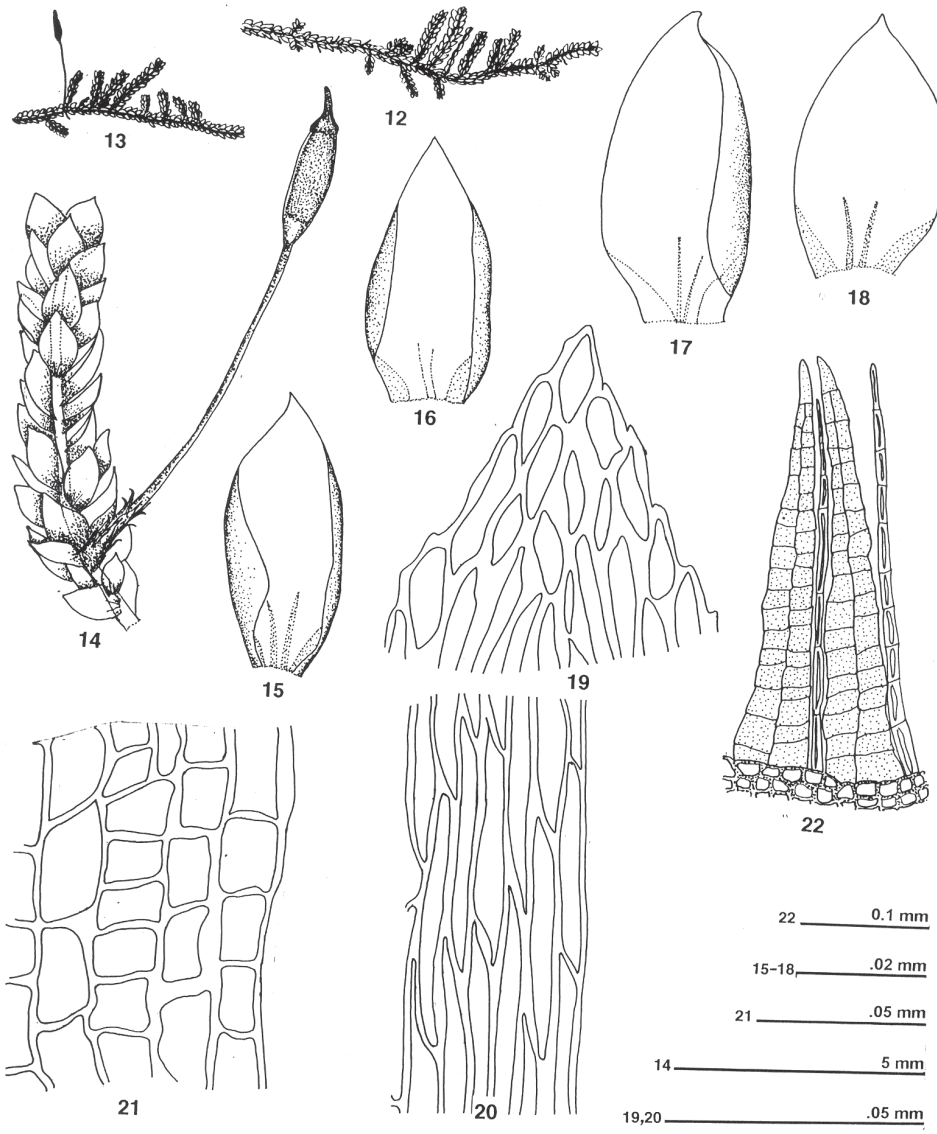
***Entodon luteonitens* Renauld & Cardot,** *Bull. Soc. R. Bot. Belg*. 38 (1): 34 (1900) **Figs 12-22**

Plants moderate, pale-yellow. Main stem prostrate, irregularly pinnately branched with numerous complanate branches. Leaves spreading, sub-imbricate, concave, oblong-ovate-lanceolate, 1.5 × 0.75mm, apex broadly acute, nearly cucullate, apical margin slightly crenulate-entire. Costa short, double. Leaf cells narrowly elongate, apical cells 42.5 × 4-6 µm, median cells 75-120 × 5-7.5 µm, alar cells quadrate-rectangular 28 × 20 µm. Sporophytes on main branches; seta reddish brown, 1-1.3 cm long; capsule erect, cylindrical in shape 3-4 mm long, operculum conic rostrate; peristome double, exostome and endostome of same height, 450-490 µm long, 60 µm wide at base, granular on the inner side. Spores 12.5-15 µm, minutely papillose.

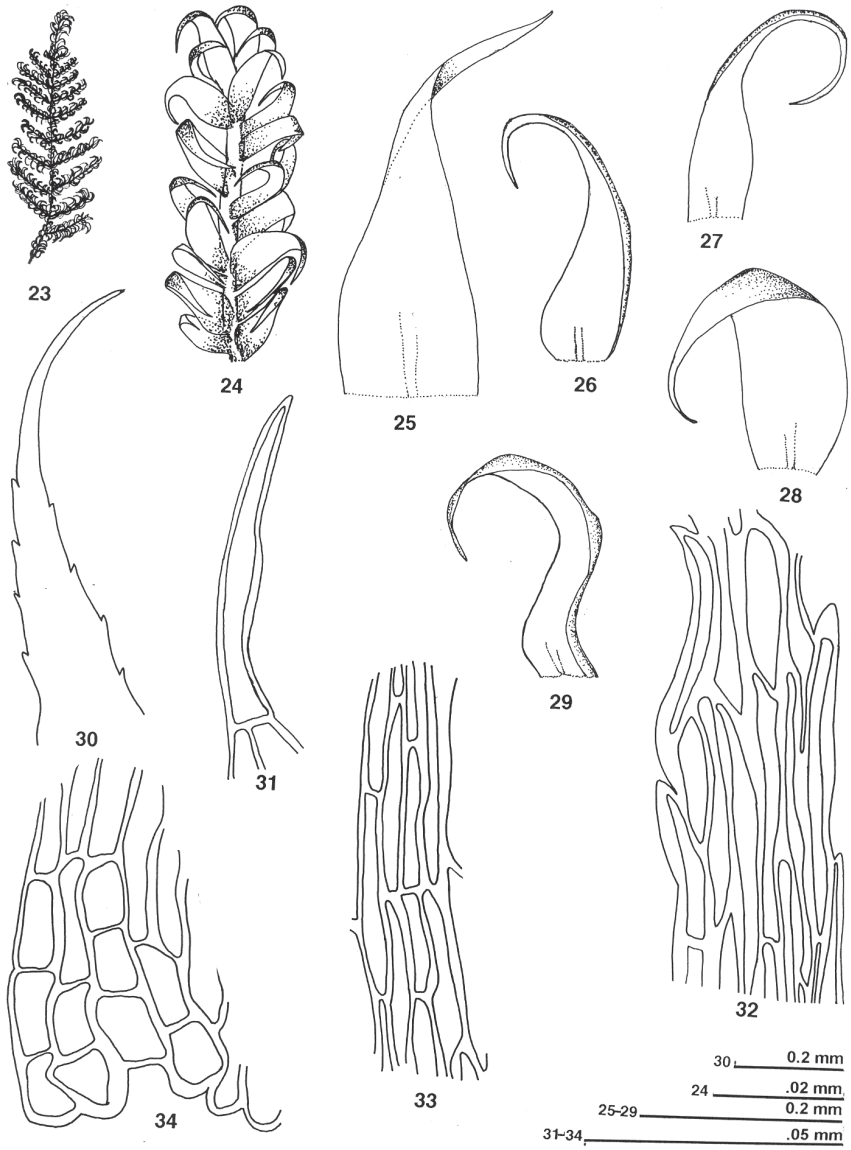
Specimens examined: India. Western Himalaya: Ghangharia (alt. *ca* 11,550 ft), 18.10.1964, leg. *S. Chandra, 200708–D* (LWG); Binsar (Dist. Almora, alt. *ca* 7,500 ft), 4.10.1991, leg. *V. Nath & A.K. Asthana, 205367– B* (LWG); Thalkedar (Pithoragarh, alt. *ca* 6000 ft), 16.03.2007, leg. *V. Sahu, 247543-B, 247556* (LWG).



Figs 1-11. *Entodon concinnus* subsp. *caliginosus* (Mitt.) Mizushima. **1**, **2**. Habit of the plant (diagrammatic); **3**. A portion of plant with sporophyte; **4-7**. Leaves; **8**. Apical cells of leaf; **9**. Median cells of leaf; **10**. Basal and alar cells of leaf; **11**. Peristome teeth.



Figs 12-22. *Entodon luteonitens* Ren. & Card. **12**,**13**. Habit of the plant (diagrammatic); **14**. A portion of plant with sporophyte; **15-18**. Leaves; **19**. Apical cells of leaf; **20**. Median cells of leaf; **21**. Basal and alar cells of leaf; **22**. Peristome teeth.



Figs 23-34. *Hypnum subimponens* Lesq. subsp. *ulophyllum* (C. Muell.) Ando. **23**. Habit of the plant (diagrammatic); **24**. A portion of plant; **25-29**. Leaves; **30**. Apex of leaf; **31-32**. Apical cells of leaf; **33**. Median cells of leaf; **34**. Basal and alar cells of leaf.

During the investigation of bryophytes from western Himalaya, *Entodon luteonitens* was found at Ghangharia, Binsar and Pithoragarh, which is a new addition to this bryogeographical region of India. *E. luteonitens* has been earlier known to be endemic to Darjeeling. *Entodon luteonitens* approaches to *E. concinnus* subsp. *caliginosus* in leaf shape, size, position of sporophyte, shape of capsule, arrangement of peristome segments, however, former can be distinctly recognized from the latter by the pale yellow colour of plants, irregularly pinnate stem branches, narrowly elongate leaf cells and longer (450-490 μm) peristome teeth.

***Hypnum subimponens* Lesq. subsp. *ulophyllum* (Müll.Hal.) Ando,**
Bot. Mag. Tokyo 79: 766 (1966) **Figs 23-34**

Plants robust, yellowish brown with coppery tinge, forming dense tufts. Main stem prostrate, pinnately branched. Leaves densely arranged, oblong-lanceolate with falcato-secund tip, 1.17-1.3 × 0.25-0.45 mm, apex narrow acuminate, apical margin dentate and narrowly revolute at some places. Costa short double, sometimes obscure. Leaf cells linear, apical cells 62.5-75 × 7.5 μm, alar cells irregularly quadrate to rectangular, 22.5-25 × 10-12.5 μm.

Specimen examined: India. Western Himalaya: Nagdeva (Pauri, alt. *ca.* 6000 ft) 15.10.1964, Leg. *S. Chandra, 200621-A* (LWG).

Genus *Hypnum* Hedw. is diversified into 86 species all over the world (Gangulee, 1978-80). Plants of *Hypnum* usually grow in cooler regions but there are rather few species in the southern Hemisphere (Gangulee, 1978-80). The genus exhibits a remarkable range of diversity of taxa, which sometimes poses ambiguity in their accurate identification. In India 8 taxa of this genus have been validly recognized (Chopra, 1975; Lal, 2005), out of these, a maximum of seven taxa are distributed in eastern Himalaya, whereas one each is distributed in western Himalaya and south India.

A recent survey of west Himalayan mosses has revealed the occurrence of *H. subimponens* subsp. *ulophyllum* at Pauri and Pithoragarh for the first time, which is an addition to this bryo-geographical region. It has been known from Naga Hills (eastern Himalaya), Pakistan, east Nepal and Bhutan.

Hypnum subimponens subsp. *ulophyllum* approaches to *H. flaccens* Besch. in having regularly pinnate stem, hooked apices of leaves and in leaf size, but the former is distinctly different from the latter in coppery tinge of the plants, dentate margin of the leaf tip, and comparatively longer (75-87.5 × 5 μm) elongated leaf cells.

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