

Bryophyte Diversity in Mukteshwar (Uttarakhand): an overview

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Abstract: The present study deals with the investigation of bryophytic flora of Mukteshwar (Uttarakhand). The present account deals with the study of 38 species belonging to 31 genera of 21 families. The mosses are represented by 21 species of 20 genera and 12 families, while Liverworts are represented by 15 species of 10 genera and 8 families. Hornworts consist of 1 genus and 2 species. The dominant families are Aytoniaceae, Marchantiaceae, Thuidiaceae and Pottiaceae. The dominant genera are *Plagiochasma*, *Targionia*, *Marchantia*, *Plagiochila*, *Atrichum*, *Thuidium* and *Pogonatum*. *Macrothamnium stigmatophyllum* has been identified as new to western Himalaya, while *Thuidium philiberti* Limpr. is new to Uttarakhand.

Key-words: Mukteshwar, Bryophytes, Liverworts, Mosses.

1. Introduction

Mukteshwar is situated at an altitude of 2286m above sea level between 29.4722°N and 79.6479°E. It is surrounded by fruit orchards and thick coniferous forest. The diversity of Indian bryoflora needs a serious attention so that bryophytic wealth of the country may be assessed in its real form. Various workers (Kashyap, 1929; Chopra, 1975; Chopra and Kumar, 1981; Vohra, 1983; Tewari and Pant, 1994; Nath *et al.*, 2007, 2008; Srivastava, 2008; Asthana and Sahu, 2012) from time to time provided consolidated accounts on bryophytes of western Himalaya. As Mukteshwar harbours some rare and interesting bryophytes, an enumeration of bryophytes of Mukteshwar is provided with habitat, range of distribution in India and abroad along with details of specimens examined.

2. Materials and Methods

The plants were collected from different localities of Mukteshwar. The specimens have been deposited in the Bryophyte Herbarium, National Botanical Research Institute, Lucknow (LWG).

3. Results

3.1 Liverworts

1. *Plagiochasma appendiculatum* Lehm. et Lindenb; Pag. IV. 14 (1832). [Aytoniaceae]

Specimens examined: India, Mukteshwar, Near IVRI Check post, 3-11-2008; 248948A, 248949, 248950 (LWG); Tourist Rest House, 4-11-2008, 248957 (LWG); leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, alt. 2187-2270m.

Range of Distribution: Eastern Himalaya (Darjeeling), western Himalaya (Nainital, Ranikhet, Mussoorie, Dhanolti), Himachal Pradesh, central India (Pachmarhi, Amarkantak), south India (Munnar); Nepal, China, Manila.

2. *Plagiochasma intermedium* Lindenbg. et G. G. L. and Nees, Syn. Hep. 513(1846). [Aytoniaceae]

Specimens examined: India, Mukteshwar, Near IVRI Check post, 3-11-2008, 248951A (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, alt. ca 2270 m.

Range of Distribution: Eastern Himalaya (Meghalaya- Cherrapunji) western Himalaya (Dalhousie), south India (Panchgani, Purandhar, Nagpur), central India (Pachmarhi, Amarkantak, Bhopal, Sagar), Rajasthan (Mount Abu, Kota), Punjab, Gangetic Plains (Ranchi, Lucknow); Korea, Manchuria, Japan, China, Taiwan, Philippines, Mexico, Guatemala.

3. *Reboulia hemisphaerica* (L.) Raddi. Opusc. Scient. di Bologna 11, P. 357 (1818). [Aytoniaceae]

Specimens examined: India, Mukteshwar, 3-11-2008, 248945, 24894A (LWG); Near Meteorological office, 4-11-2008, 248970 (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, 2271m.

Range of Distribution: Eastern Himalaya (Darjeeling), western Himalaya (Mussoorie, Dhanolti, Kausani), Dalhousie, Simla, Pangi, Kulu, Spiti, Lahul, Kyelong, south India (Chennai, Nilgiris, Kanghan Valley); Asia, Europe, West Indies, Africa, Formosa, Sumatra, Java, Borneo, Australia, South America, Mexico, Bermuda.

4. *Asterella leptophylla* (Mont.) Pande et al. Journal of the Hattori Botanical Laboratory 11: 8 (1954), comb. inval. Art. 33.2 ex Grolle, Feddes Repertorium 87: 246 (1976). [Aytoniaceae]

Syn. *Asterella reticulata* (Kashyap) Pande et al. in Journ. Hattori. Bot. Lab. 11: 9 (1954).

Specimens examined: India, Mukteshwar, Near Meteorological office, 4-11-2008, 248967 (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, 2281 m.

Range of Distribution: Eastern Himalaya (Darjeeling, Sikkim, Assam), western Himalaya (Uttaranchal, Himachal Pradesh, Kashmir, Lahul), and South India (Tamil Nadu); Nepal, Pakistan, Bhutan, China, Korea, Russia, Far East, Japan, Indonesia and Philippines.

5. *Targionia hypophylla* L. Sp. Pl. p. 1136 (1753). [Targioniaceae]

Specimens examined: India, Mukteshwar, Near IVRI Check post, 3-11-2008, 248947 (LWG); Near Meteorological office, 4-11-2008, 248960, 248962, 248963 (LWG), leg. A.K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, 2270-2280m.

Range of Distribution: Eastern Himalaya (Darjeeling), western Himalaya (Mussoorie, Nainital, Dhanolti, Kausani); Nepal, China, Formosa, Korea, Japan, Madagascar, Canaries, Europe, North and South America, New Zealand, Australia and Tasmania.

6. *Marchantia paleacea* Bertrol. Opusc. Sci (Bologna) 1: 242 (1817). [Marchantiaceae]

Syn. *Marchantia nepalensis* Lehm. et Lindenb. in Lehmann, Nov. Strip. Pug. 4: 10 (1832).

Specimens examined: India, Mukteshwar, PWD inspection house, 4-11-2008, 248953D, 248955 (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, alt. ca 2187m.

Range of Distribution: Eastern Himalaya (Darjeeling, Meghalaya, Nagaland), western Himalaya (Nainital, Kausani, Ranikhet, Mussoorie, Dhanolti), south India, central India (Pachmarhi); Nepal.

7. *Marchantia polymorpha* L. Sp. Pl., cd. 1: 1137 (1753). [Marchantiaceae]**Syn.** *Marchantia fauriana* Steph. in Bonner, Candollea 14: 106 (1953).**Range of Specimens examined:** India, Mukteshwar, 5 Km from Ramgarh, Mukteshwar 4-11-2008, leg. A. K. Asthana & Vinay Sahu; 248977A (LWG).**Ecology:** On wet rock, alt. ca 2175 m.**Range of Distribution:** Eastern Himalaya, western Himalaya, south India, Rajasthan (Mount Abu); Nepal, Pakistan, Afganistan, Auckland Is., Australia, Bhutan, Japan, Borneo, China, Iraq, Iran, Sri Lanka, Java, Korea, New Guinea, New Zealand, Syria, Taiwan, Tasmania, Turkey, Vietnam, Tadzhikistan, Uzbekistan.**8. *Pellia endiviifolia* (Dicks) Dum. Rec. d' Obs. Jungern. 27(1835). [Pelliaceae]****Syn.** *Pellia calycina* (Tayl.) Nees. Hep. Eur. Lab. 3: 386 (1838).**Specimens examined:** India, Mukteshwar, 5 Km from Ramgarh, Mukteshwar 4-11-2008, 248984 (LWG), leg. A. K. Asthana & Vinay Sahu.**Ecology:** On wet rock, alt. ca 2175 m.**Range of Distribution:** Eastern Himalaya (Sikkim, Assam) western Himalaya (Shimla, Nainital, Kulu, Dalhousie, Kashmir); Nepal, Pakistan, Bhutan, China, North America, Europe, Africa.**9. *Jungermannia subulata* Evans Trans. Connect. Acad. Arts Sci 8: 258 (1892). [Jungermanniaceae]****Syn.** *Jungermannia lanceolata* subsp. *stephanii* Amak., Journ. Hattori Bot. Lab. 22: 71 (1960).**Specimens examined:** India, Mukteshwar, 5 Km from Ramgarh, 4-11-2008, 248980C (LWG), leg. A. K. Asthana & Vinay Sahu.**Ecology:** on wet rock, alt. ca 2175 m.**Range of Distribution:** Western Himalaya (Simla, Nainital, Pithoragarh), south India (Nilgiris) Taiwan, Japan, Sri Lanka, Bhutan, Thailand, Soviet Union, Siberia, Caucasus, Europe, North America.**10. *Plagiochila uniformis* Mitt., J Proc. Linn. Soc., Bot. 5: 98 (1861); So. Syst. Bot. Monogr. 60 (2001). [Plagiochilaceae]****Specimens examined:** India, Mukteshwar, Near Metereological office, 4-11-2008, 248958, 248959, 248970B (LWG); 5 Km from Ramgarh, 4-11-2008, 248978, 248979B (LWG), leg. A. K. Asthana & Vinay Sahu.**Ecology:** On soil covered rock, alt. 2175-2281m.**Range of Distribution:** Eastern Himalaya (Darjeeling, Assam, Manipur, Meghalaya), western Himalaya (Mussoorie, Shimla); Bhutan, Nepal, Pakistan, Thailand.**11. *Plagiochila nepalensis* Lindenb., Sp. Hepat. (*Plagiochila* fasc. 2- 4): 93, 1840; Rawat and Srivastava, Genus *Plagiochila* in Eastern Himalayas (India) pp 186-183 (2007).****Specimens examined:** India, Mukteshwar, 5 Km from Ramgarh, 4-11-2008, 248985B (LWG), leg. A. K. Asthana & Vinay Sahu.**Ecology:** On wet soil covered rock, alt. ca 2140 m.**Range of Distribution:** Eastern Himalaya (Darjeeling, Assam, Sikkim, Kurseong, Meghalaya), western Himalaya (Mussoorie, Shimla, Valley of Flowers), South India Karnataka- Nandi Hills, Kerala- Vagavurrai,, Tamil Nadu – Nilgiris, Ootacamund, Palni Hills, Shembagnur, Madurai, Kodaikanal, Periakulam); Bhutan, China, Nepal, Japan, Myanmar, Philippines, Vietnam, Thailand.**12. *Frullania ericoides* (Nees) Mont., Ann. Sc. Bot. Ser 2, 12: 51 (1839). [Frullaniaceae]****Ecology:** Epiphytic, alt. ca 2281 m.**Specimens examined:** India, Mukteshwar, Near Metereological office, 4-11-2008, 248965 (LWG), leg. A. K. Asthana & Vinay Sahu.

Range of Distribution: Eastern Himalaya (Darjeeling, Assam, Khasia and Jaintia Hills), western Himalaya (Mussoorie, Almora, Dwali, Phurkia, Garhwal, Nainital, Tapovan, Dehradun, Chamba), Jammu and Kashmir Hills, south India (Kerala- Waynad, Tamil Nadu – Nilgiris, Ootacamund, Kodaikanal), central India (Pachmarhi); China, Nepal, Japan, Caledonia, Korea, Sumatra, Sri Lanka, Hawaii, Taiwan, North & South America, Australia, Europe, Africa, Java, Borneo.

13. *Frullania muscicola* Steph., Hedwigia 33: 146 (1894). [Frullaniaceae]

Specimens examined: India, Mukteshwar, Near Metereological office, 4-11-2008, 248975B (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: Epiphytic, alt. ca 2281m .

Range of Distribution: Eastern Himalaya (Meghalaya, Assam), western Himalaya (Mussoorie-Garhwal), South India (Tamil Nadu); China, Japan, Korea, Manchuria, Saghalin, Formosa.

14. *Chiloscyphus himalayensis* St., Sp. Hep., 3: 209 (1907). [Geocalyceaceae]

Specimens examined: India, Mukteshwar, Near Metereological office, 4-11-2008, 248975A (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: on wet rock, alt. ca 2175 m .

Range of Distribution: Western Himalaya (Bhowali, Chaubatia, Kausani, Kilbury, Mussoorie, Nainital, Seetalkhet).

15. *Lophocolea bidentata* (L.) Dum. Rec. d' Obs., P.17 (1835). [Geocalyceaceae]

Specimens examined: India, Mukteshwar, Near IVRI Check post, 3-11-2008; 248948B, 248949, 248950 (LWG); Tourist Rest House, 4-11-2008, 248957 (LWG); leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, alt. ca 2249 m.

Range of Distribution: Eastern Himalaya (Darjeeling, Sikkim), western Himalaya (Bhowali, Nainital, Mussoorie), south India (Tamil Nadu – Kodaikanal, Ootacamund); Nepal, Europe, North and South America, Australia.

3.2 Mosses

16. *Brachythecium buchananii* (Hook.) Jaeg. Ber. S. Gall. Naturw. Ges. 1876-77: 341 (1878). [Brachytheciaceae]

Specimens examined: India, Mukteshwar, Near Metereological office, 4-11-2008, 248975A (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: Epiphytic, alt. ca 2281m.

Range of Distribution: Eastern Himalaya (Darjeeling, Meghalaya, Naga Hills), western Himalaya (Himachal Pradesh, Mussoorie, Garhwal), South India (Nilgiris); Nepal, China, Bhutan, Japan, Myanmar, Thailand, Philippines, Korea, Vietnam, Laos.

17. *Brachythecium plumosum* (Hedw.) B.S. G. in Bryol. Eur. 6: 8(1853). [Brachytheciaceae]

Specimens examined: India, Mukteshwar, 5 Km from Ramgarh, 4-11-2008, 248985C (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: Epiphytic, alt. ca 2175 m.

Range of Distribution: Eastern Himalaya (Sikkim, Darjeeling, Meghalaya), western Himalaya (Kashmir, Garhwal, Mussoorie, Kumaon), south India (Nilgiris, Palnis) Nepal, Bhutan, Taiwan, China, Japan, Korea, Europe, Caucasus, Algeria, North America, Sri Lanka, Java, Celebes, Florida, New Zealand, Afghanistan.

18. *Rhynchostegium vegans* (Harv.) Jaeg. Ber. S. Gall. Naturw. Ges. 1876-77: 369 (1878). [Brachytheciaceae]

Specimens examined: India, Mukteshwar, 5 Km from Ramgarh, 4-11-2008, 248980E (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: on wet rock, alt. ca 2175 m

Range of Distribution: Eastern Himalaya (Sikkim, Darjeeling, Assam), western Himalaya (Garhwal, Dehradun), south India (Palnis); Nepal, Taiwan, Japan, Sri Lanka, Burma, Thailand, Laos, Cerom, Philippines, Indonesia, Hawaii.

19. *Anomobryum filiforme* ssp. *concinatum* (Spruc.) Amann in Rev. Bryol. 20: 43 (1893). [Bryaceae]

Specimens examined: India, Mukteshwar, 3-11-2008, 248946C (LWG), Near IVRI Office, 3-11-2008; 248951B (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, alt. ca 2249m.

Range of Distribution: Eastern Himalaya (Darjeeling), western Himalaya (Nainital, Almora, Ranikhet, Mussoorie, Shimla); Bhutan, Nepal, Ceylon, Tonkin, China, Taiwan, Japan, Korea, Siberia, Riukiu Island, Europe, North America, Mexico.

20. *Philonotis falcata* (Hook.) Mitt. in Musci Ind. Or. : 62 (1859). [Bartramiaceae]

Specimens examined: India, Mukteshwar, Ramgarh, 4-11-2008, 248981 (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On wet rock, alt. ca 2175 m.

Range of Distribution: Eastern Himalaya (Darjeeling, Sikkim, Meghalaya, Midnapore), western Himalaya (Nainital, Mussoorie, Jaunsar, Kashmir, Chitral), south India (Nilgiri); Tonkin, Java, Philippines, Taiwan, China, Korea, Japan, North America, Europe, Hawaii, South Africa.

21. *Atrichum undulatum* (Hedw.) P. Beauv. in Prodr. : 42 (1805). [Polytrichaceae]

Specimens examined: India, Mukteshwar, 3-11-2008, 248946B (LWG), Near IVRI Office, 4-11-2008, 248952, 248969 (LWG), PWD Inspection house, 4-11-2008, 248954B (LWG), Near Metereological office 4-11-2008, 248959E, 248970D (LWG), leg. A. K. Asthana & Vinay Sahu

Ecology: On soil covered rock, alt. 2188-2281m.

Range of Distribution: Eastern Himalaya (Darjeeling, Sikkim, Meghalaya, Naga Hills), western Himalaya (Mussoorie, Dhanolti), Nepal, Europe, Whole of Asia (China, Caucasus, Asia Minor, Persia, Burma, Indochina, Japan, Philippines), North Africa, North America.

22. *Pogonatum microstomum* (Schwaegr.) Brid. In Bryol. Univ., 2: 745 (1827). [Polytrichaceae]

Specimens examined: India, Mukteshwar, PWD Inspection house, 4-11-2008, 248946C (LWG), Near Metereological office, 4-11-2008, 248959D, 248969 (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, alt. 2188-2281 m.

Range of Distribution: Eastern Himalaya (Darjeeling, Sikkim, Meghalaya, Naga Hills), western Himalaya (Mussoorie, Dhanolti), south India (Nilgiri, Palni, western Ghats); Nepal, China (Szechuan, Yunnan), Formosa, Tonkin, Philippines.

23. *Pogonatum perichaetiale* (Mont.) Jaeg. in Ber. S. Gall. Naturw. Gos, 1873-74: 257 (1875). [Polytrichaceae]

Specimens examined: India, Mukteshwar, Near Metereological office, Mukteshwar 4-11-2008, 248970C (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, alt. ca 2281 m.

Range of Distribution: Eastern Himalaya (Darjeeling, Sikkim), western Himalaya (Mussoorie, Chakrata, Nainital), Himachal Pradesh (Khadrala, Dalhousie, Lahul, Beas valley, Kulu & Mandi), South India (Nilgiris); Bhutan, Nepal, China.

24. *Fissidens viridulus* (Sw.) Wahlenb. In Fl. Lapp: 334 (1812). [Fissidentaceae]

Specimens examined: India, Mukteshwar, 3-11-2008, 248946F (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, alt. ca 2249 m.

Range of Distribution: Western Himalaya (Ranikhet), Nepal, China, Caucasus, North and Central Africa, North America, New Zealand.

25. *Hymenostylium recurvirostrum* (Hedw.) Dix. Rev. Bryol., 6: 96 (1934). [Pottiaceae]

Specimens examined: India, Mukteshwar, PWD Inspection house, 4-11-2008, 248953 A (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, alt. ca 2188 m.

Range of Distribution: Eastern Himalaya (Darjeeling, Meghalaya), western Himalaya (Kashmir, Himachal Pradesh), south India; Bhutan, Nepal, Pakistan, Philippines, Japan, Myanmar, Korea, Europe, North, Central and South America, Africa, Australia, New Zealand.

26. *Oxystegus tenuirostris* (Hook. et Tayl.) A. J. E. Smith, J. Bryol., 9(3): 393 (1977). [Pottiaceae]

Specimens examined: India, Mukteshwar, Near Meteorological office, 4-11-2008, 248964 (LWG); 5 Km Ramgarh, 4-11-2008, 248985C (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock and wet rock, alt. 2175-2281m.

Range of Distribution: Eastern Himalaya (Darjeeling, Sikkim, Meghalaya, Nagaland), western Himalaya (Kashmir, Himachal Pradesh, Uttarakhand), Nepal, Sri Lanka, China, Japan, Korea, Asia Minor, Europe, Africa, America.

27. *Anoetangium thomsonii* Mitt., J. Linn. Soc. Bot. Suppl., 1: 31 (1859); Syn. *Anoetangium bicolor* Ren. et card., Bull. Soc. R. Bot. Belg., 41(1): 19 (1905). [Pottiaceae]

Specimens examined: India, Mukteshwar, 5 Km from Ramgarh, 4-11-2008, 248979A (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On wet rock, alt. ca 2175 m.

Range of Distribution: Eastern Himalaya (Darjeeling, Sikkim, Arunachal Pradesh), western Himalaya (Kashmir, Himachal Pradesh, Uttarakhand), south India (Tamil Nadu); China, Japan.

28. *Entodon luteonitens* Ren. & Card. in Bull. Soc. R. Bot. Belg., 38 (1): 34 (1900). [Entodontaceae]

Specimens examined: India, Mukteshwar, Near Meteorological office 4-11-2008, 248966 (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On rock, alt. ca 2281 m.

Range of Distribution: Eastern Himalaya (Darjeeling), Western Himalaya (Binsar, Pithoragarh).

29. *Macrothamnium stigmatophyllum* Fleisch. In Hedwigia, 44: 310 (1905). [Hylocomiaceae]

Specimens examined: India, Mukteshwar, PWD inspection house, 4-11-2008, 248956 (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, alt. ca 2188 m.

Range of Distribution: Eastern Himalaya (Sikkim). New to western Himalaya

30. *Clapodium prinophyllum* (C. Muell.) Broth. In Engl. And Prantl, nat. pflanzenfam. 1(3): 1009 (1908). [Thuidiaceae]

Specimens examined: India, Mukteshwar, 5 Km from Ramgarh, 4-11-2008, 248980F (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: on wet rock, alt. ca 2175 m.

Range of Distribution: Eastern Himalaya (Darjeeling, Arunachal Pradesh, Meghalaya, Naga Hills), western Himalaya (Garhwal, Mussoorie), south India (Nilgiris, Palnis, Kerala); Nepal, Burma, China, Korea, Japan, Taiwan, Sri Lanka, Indonesia, Philippines, Fiji.

31. *Haplocladium microphyllum* (Hedw.) Broth. in Nat. Pfl., 1 (3): 1007 (1907). [Thuidiaceae]

Specimens examined: India, Mukteshwar, 5 Km from Ramgarh, 4-11-2008, 248985E (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: on wet soil covered rock, alt. ca 2175 m.

Range of Distribution: Eastern Himalaya (Darjeeling, Sikkim, Kurseong, Assam), western Himalaya (Kashmir, Tehri-Garhwal, Rishikesh, Ranikhet, Almora, Mussoorie), south India (Nilgiris, Palnis, Kerala); China, Korea, Japan, Taiwan, Tonkin.

32. *Thuidium assimile* (Mitt.) Jaeg. in. Ber. S. Gall. Naturw. Ges. 1876-77: 260 (1878). [Thuidiaceae]

Specimens examined: India, Mukteshwar, Near Meteorological office, 4-11-2008, 248972, 248969B (LWG); 5 Km from Ramgarh, Mukteshwar 4-11-2008, 248977D, 248980A (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: on soil covered rock, alt. 2175-2281 m.

Range of Distribution: Eastern Himalaya (Darjeeling), western Himalaya (Garhwal, Kumaon), Himachal Pradesh; China -Yunnan.

33. *Thuidium philiberti* Limpr. Laubm. Deutsch II: 835(1895). [Thuidiaceae]

Specimens examined: India, Mukteshwar, Near Meteorological office, 4-11-2008, 248959C (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: on soil covered rock, alt. ca 2281 m.

Range of Distribution: Western Himalaya (Jammu & Kashmir); Nepal Bhutan China, North America, Iceland, Europe, Siberia.

New to Uttarakhand.

34. *Meteoriopsis ancistrodes* (Ren. & Card.) Broth. In Nat. Pfl. 1 (3): 826 (1906). [Meteoriaceae]

Specimens examined: India, Mukteshwar, Near Meteorological office, 4-11-2008, 248976B (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: Epiphytic, alt. ca 2281 m.

Range of Distribution: Eastern Himalaya (Darjeeling), western Himalaya (Mussoorie, Garhwal, Kumaon); Nepal, Burma, Thailand, Taiwan, Sumatra, Java, North Borneo.

35. *Homali dendron exiguum* (Bosch & Lac.) Fleisch. In Musci Fl. Buitenz, 3: 897 (1908). [Neckeraceae]

Specimens examined: India, Mukteshwar, Near Meteorological office, 4-11-2008, 248976A (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: Epiphytic, alt. ca 2281 m.

Range of Distribution: Eastern Himalaya (Arunachal Pradesh, Meghalaya), western Himalaya (Mussoorie), South India (Palni); Sri Lanka, Burma, Thailand, Vietnam, Malay, Sumatra, Java, New Guinea, Celebes, Moluccas, Japan, Riukiu, Taiwan, Africa, Australia, Tahiti, Fiji..

36. *Bryosedgwickia aurea* (Schwaegr.) Fleisch. in Hedwigia, 63: 211 (1922). [Hypnaceae]

Specimens examined: India, Mukteshwar, Near Meteorological office, 4-11-2008, 248973 (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: Epiphytic, alt. ca 2281 m.

Range of Distribution: Eastern Himalaya (Darjeeling, Sikkim, Khasi Hills), western Himalaya (Dharamsala, Ranikhet), central India (Amarkantak); Nepal, Bhutan.

3.3 Hornworts

37. *Phaeoceros carolinianus* (Michx.) Prosk. Bull. Torrey Bot. Club. 78: 347 (1951); Asthana and Srivastava; Indian Hornworts (A Taxonomic Study) Bryophytorum Bibliotheca Band 42 pp 125-129 (1991). [Phaeocerotaceae]

Specimens examined: India, Mukteshwar, Near Metereological office, 4-11-2008, 248961 A, 248968 (LWG); 5 Km from Ramgarh, 4-11-2008, 248980D (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, alt. 2175 - 2281 m.

Range of Distribution: Eastern Himalaya (Darjeeling, Teesta Valley, Ray Villi road, Gangtok, Manipur), western Himalaya (Mussoorie, Nagar road, Baijnath, Putlikuhl, Kausani), central India (Pachmarhi), south India (Kodaikanal); Subcosmopolitan.

38. *Phaeoceros laevis* (L.) Prosk. Rapp. et Comm. VIII. Congr. Intern. Bot., Paris 14-16: 69 (1954); Asthana and Srivastava; Indian Hornworts (A Taxonomic Study) Bryophytorum Bibliotheca, Band 42 pp 122-125 (1991). [Phaeocerotaceae]

Specimens examined: India, Mukteshwar, Ramgarh, 4-11-2008, 248982 (LWG), leg. A. K. Asthana & Vinay Sahu.

Ecology: On soil covered rock, alt. ca 2175 m.

Range of Distribution: Eastern Himalaya (Darjeeling, Ukhrol, Mongpo, Nathula road, Cherrapunji, Gangtok, Shergaon), western Himalaya (Mussoorie, Pauri, Shimla), south India (Kodaikanal, Ooty, Mukurty, Shembaganur, Devicolam, Mysore, Vagavurrai); North America, Madrid, Coimbra, Britain, Pompeii.

4. Discussion

During the present study it has been observed that terricolous forms are more than epiphytic forms, and out of 38 taxa investigated from Mukteshwar, mosses viz., *Pogonatum microstomum*, *Atricum undulatum*, *Thuidium assimlie* were more frequent in occurrence. Among liverworts *Plagiochasma appendiculatum*, *Targionia hypophylla*, *Reboulia hemisphaerica*, *Plagiochila uniformis* and hornwort *Phaeoceros carolinianus* have been frequently found in the area. Among the mosses, family Thuidiaceae seems to be more dominant in the region with 4 taxa, followed by Brachytheciaceae and Pottiaceae with 3 taxa. As far as liverworts are concerned, family Aytoniaceae is represented by a maximum of 4 taxa. The dominant genera are *Plagiochasma*, *Targionia*, *Marchantia*, *Plagiochila*, *Atrichum*, *Thuidium* and *Pogonatum*. In the present study *Macrothamnium stigmatophyllum* is new to western Himalayas while *Thuidium philiberti* Limpr. is new to Uttarakhand.

5. Acknowledgement

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Figure - 1: 1-2 *Plagiochasma appendiculatum*; 3. *Asterella leptophylla*; 4. *Marchantia paleacea*; 5. *Marchantia polymorpha* with *Brachythecium buchamanii* ; 6. *Targionia hypophylla*.



Figure 2: 1. *Pellia endiviifolia*; 2. *Reboulia hemispherica*; 3. *Phaeoceros carolinianus*; 4. *Plagioclada uniformis*; 5. *Entodon lateonitens*; 6. *Macrothamnium stigmatophyllum*; 7. *Bryosedgwickia aurea*; 8. *Anoetangium thomsonii*.