

---

## Status of Mosses in Nilgiri Hills (Western Ghats), India

Praveen Kumar Verma<sup>1</sup>, Afroz Alam<sup>2</sup> and S. C. Srivastava<sup>3</sup>

<sup>1</sup>Rain Forest Research Institute,  
Sotai Ali, Deovan, Post Box # 136, Jorhat -785001(Assam), India

<sup>2</sup>Department of Biotechnology, Banasthali University,  
Banasthali Vidyapith, Rajasthan - 304022, India

<sup>3</sup>National Botanical Research Institute,  
Rana Pratap Marg, Lucknow - 226 001 (Uttar Pradesh), India  
E-mail Corresponding Arthur: [dr.pkverma2008@gmail.com](mailto:dr.pkverma2008@gmail.com)

**Abstract:** The present paper deals with the current status of mosses of Nilgiri hills. There is total of 157 taxa reported so far on the basis of all earlier records. In which 22 taxa new to Nilgiri hills. The socio-ecology of mosses of the Nilgiri hills is also discussed in the text.

**Key words:** Tamil Nadu/Nilgiri hills/ Bryophyta/Moss/ Morpho-taxonomy

### Introduction

The bryophytes, nonvascular cryptogams, a highly specialized group of plants with second highest assemblages among land plant often flowering plants. Their surviving capacity is enormous as they survive under wide variety of environmental condition and forming strong part of the ecosystem where they grow in forest, wet lands, desert (hot as well as cold) and other habitats. They have extensive phenotypic plasticity. They are classified under three diversified classes, are Hepaticae, Anthocerotae and Musci.

Among bryophytes mosses are a highly evolved group of bryophytes with *ca.* 17,000 species falling in 3 subclass, 4 order, 89 families, and *ca.* 898 genera across the world (see Richardson, 1981; Vitt, 1984). They attain a unique place between lower cryptogams and vascular cryptogams, as they possess filamentous protonema like lower cryptogams and conducting strand like higher (vascular) cryptogams. However these small plants though producing no colourful flowers and seemingly of no direct economic value to human, play a vital role ecologically they colonize the bare soil surface thus helping to stabilize the soil by protecting it from the erosive effect of wind or rain. Most mosses inhabit rock surface and together with lichen are the pioneers in the inhospitable environment. They also act as space fillers occupying niches which are unsuitable for other plants therefore constitute an important component of tropical rain forest ecosystem. The several numbers of mosses evolve their mode of growth through demanding environment condition like evolving special ecological, morphological and physiological

adaptations where the other groups plants fail to survive. The mosses also tend to be highly specific for particular microenvironment making them good ecological indicator species.

The Western Ghats of southern India are one of the country's most important natural assets, one of the hot spot of India, hosting 30% endemic flora and fauna. The Western Ghats is a major tropical evergreen region in India, spread over cardinal 22° N to 8° latitude, covering the length of 1400 Km. The Western Ghats, known locally as the Sahyadri Hills, are formed by the Malabar Plains and the chain of mountains running parallel to India's western coast, about 30 to 50 kilometers inland. They cover an area of about 160,000 km<sup>2</sup> and stretch for 1,600 kilometers from the country's southern tip to Gujarat in the north, interrupted only by the 30 kilometers Palghat Gap.

The Nilgiri hills of peninsular India is one of the most dominate treasure house of flora and fauna after the Eastern Himalayas. The Nilgiris (meaning the Blue Mountains) due to the predominant and verdant blue bloom of angiosperm – *Strobilanthus kunthianus* belongs to family Acanthaceae), is an ancient land mass that thrust upwards at the junction of the two major mountain ranges near the southern end of India some 70 million years ago. 57% of the surface of the Nilgiri hills rises over 1000 m above the mean sea level and 47% of that towers over 1800 m with the pinnacle formed by the Big Mountain at 2670 m. The Nilgiris, which is an administrative district of the state of Tamil Nadu, covers an area of 2478.63 km<sup>2</sup>. One of the most spectacular mountain ranges in South India, the Nilgiris are situated very near the rugged and magnificent mountains of the Western Ghats. They begin from the North East Corner of the State of Kerala, another tea growing state, but the main range lies in the State of Tamil Nadu, close to both Coimbatore and Wynad. It is a land of peaks and precipices, rolling grasslands in the foothills and dense forests. The world famous hill resort and the only one of its kind in South India Ootacamund (lovingly called Ooty) is situated in these hills, constitutes an integral component of Western Ghats, being a tropical rain forests it is biologically rich and blessed with the highest rate of endemism (up to 50 %) and consider as biodiversity hot spot. About 3000 varieties of plant species are found in this ecological paradise, about 80 spp. are endemic to the Nilgiri hills. The hills of Nilgiris are divided in 3 types of vegetational cover. I) Forests, II) Grasslands, and III) Water bodies

**I). Forest:** The Nilgiri hill forests are typically humid tropical type, characterized by persistent mist and low level clouds that make air at or near saturation for a long period that creates special environment and climate for the occurrence of abundant epiphytic community of bryophytes in contrast to the terrestrial individuals, categories in to 9see also (Venu and Sanjappa, 2001):

**1. Tropical wet evergreen forests:** Dodabetta, Mukuruthy National Park, Avalanche, Pykara, and Glenmorgan.

**2. Tropical semi evergreen forests:** Naduvattum Reserve Forest, Coonoor, Pykara and Kotagiri

**3. Tropical moist deciduous forest:** Masangudi reserve forest, Gudulur including Nilgiri part of Mudumalai National Park and Benn reserve forest.

**4. Thorn forest:** Glenmorgan, Kodnad, and Dodabetta, Theetukal.

**II). Grasslands:** In Nilgiri hills, the Savannah grassland is characterized by diffused wood lands intermixed with grasses that occur between an altitudinal range of 1200 m. to 2400 m. in Kunda, Avalanche, Mukuruthy National Park, Glenmorgan, Nellakotta and Pykara.

**III). Water bodies:** The water bodies of Nilgiri hills comprises of water falls (including St. Catherine water fall, Law's fall, Pykara water fall and Kalahatty water fall), lakes (reservoir at Pykara lake, Ooty lake, Kamraj Sagar, Western catchments and Avalanche lake) and rivers

---

(Pykara river, Kunda river, and Moyar river) with several undefined water bodies provide water all around the year.

Till today the biodiversity of the area is very inadequately known. As with flowering plants the modern scientific study of bryophytes of the Nilgiri Hills were started by European botanists and the most of the collection brought by nature lovers. It leads to lack of collection of data, brief description of taxa, and mainly the lack of any illustration. It's become several invalidly recorded. These collection mainly based on Gardner Fleischer, Foulkes, McIvor, Norkett, Schmid and Thomson., While the earlier collection of the mosses is not available in any of Indian Herbarium, most of the earlier report based on their own collection. There is lack of information regarding the moss flora especially in case of Nilgiri hills. The earlier all records of the mosses of the Nilgiri was entirely based on Montagne (1842) in "*Cryptogamme Nilgherensis*" and C. Muller (1853, 1854) in "*Musci Neilgherenses*". In spite of this several workers reported number of new addition to the area, but their work concise to hole of the peninsular India including Nilgiri Hills, are Mitten (1859), Brotherus (1899), Dixon (1909, 1914), Bruehl (1931), Noguchi (1958), Wadhawa (1969), Vohra *et al* (1982), Ellis (1989). Norkett (1966-70) had made bryological collections at Ootacamund, Nandi hills, Kovalam, Thekadi, Negarcoli, Manjoli and other places at the end of western ghats in Mysore and Kerala border (see also Udar, 1976). Dabhade (1971) also collected mosses from Karnataka, the resultant is that all the work regarding Western Ghats especially Nilgiri hills is in bits and pieces. In which the most of the species reported by Bruehl (1931) who listed 89 taxa fewer than 52 genera of the mosses. Recently Lal (2005) also gave a checklist of Indian mosses also include taxa from the Western Ghats but his work is basically a compilation of the previous reports not on the basis of recently collected plant specimens therefore the present status remain in the dark.

To fill these lacunae an attempt has been made on the basis of number of plant collections made during last seven years under All India Coordinated Project on Taxonomy of Bryophytes running in department of Botany, Lucknow University, Lucknow. In which collections were made from each and every possible explore able site of Nilgiri hills which provides the authentic current status of moss flora of the region. This preliminary record of the mosses provides characteristics of the existing taxa with their ecology, distribution and key diagnostic features. The generic treatment mainly based on this work is, *Campylopus* (Frahm, 1983), *Homaliodendron* (Ninh, 1984), Bartramiaceae (Allen, 1999; Virtanen, 2000), Ditrichaceae (Matsui and Iwatsuki, 1990), Mniaceae (Koponen, 1979, 1982), Meterioceae (Buck, 1994, Noguchi, 1976), Entodontaceae (Buck, 1980) Leucobryaceae (Yamaguchi, 1993), Thuidiaceae (Watanabe, 1991), Neckeraceae (Enorth, 1994) etc.

---

**Enumeration of Mosses recorded from Nilgiri Hills so far:**

The earlier all records from the Nilgiri hills with their status also provide in alphabetical order in which the taxa in **italics** as genuine record and taxa in **bold** are invalid or reported name of the taxa.

1. **Aerobrydium auronitens (Hook.) Broth.** reported by Bruhel, 1931 [This species is now synonym of *Aerobrydium filamentosum* (Hook.) Fleish.].
2. *Aerobrydium filamentosum* (Hook.) Fleish. reported by Bruhel, 1931.
3. *Aerobrydium punctatum* (C. Muell.) Dixon reported by Bruhel, 1931 [This species is now synonym of *Aerobrydium filamentosum* (Hook.) Fleish.].
4. *Aerobryopsis longissima* (Doz. & Molk.) Fleish. listed in Gangulee, 1974-77.
5. *Anomobryum auratum* reported by Bruhel, 1931.
6. *Anomobryum schmidii* (C. Muell.) Jaeg. reported by Bruhel, 1931.
7. *Archidium birmanicum* Mitt. Ex Dix. reported by Dhabade, 1998.
8. **Barbula schmidii C. Muell.** reported by C. Mueller, 1853 [This species is now synonym of *Tortula schmidii* (C. Muller) Broth.].
9. *Bartramia leptodonta* Wils. Listed in Gangulee, 1974-77.
10. *Bartramia dicranacea* C. Muell. reported by C. Mueller, 1853.
11. **Bartramia macrocarpa C. Muell.** reported by C. Mueller, 1853 [This species is now synonym of *Philonotis falcata* (Hook.) Mitt.].
12. **Bartramia schmidiana C. Muell.** reported by Bruhel, 1931 [This species is now synonym of *Bartramia leptodonta* Wils.].
13. *Bartramidula roylei* (Hook.f.) B.S.G. reported by Bruhel, 1931.
14. **Beddomiella funarioides** Dix. reported by Bruhel, 1931. [This species is now synonym of *Wilsoniella hampeana* (Müll. Hal.) E.S. Salmon. Thi]
15. **Brachymenium acuminatum** Harv. reported by Bruhel, 1931. [This species is now synonym of *Gemmabryum acuminatum* (Hook.) J.R.Spence & H.P.Ramsay]
16. *Brachymenium bryoides* Hook. ex Schwaegr. by Bruhel, 1931.
17. *Brachymenium buchananii* var. *cuspidatum* listed in Gangulee, 1978-80.
18. **Brachymenium clavariiforme (C. Muell.) Jaeger.** reported by Bruhel, 1931 [This species is now synonym of *Brachymenium nepalense* Hook.].
19. *Brachythecium buchananii* (Hook.) Jaeg. reported by Bruhel, 1931.
20. **Brachythecium oedistegum (C. Muell.) Jaeg.** reported by Bruhel, 1931 [This species is now synonym of *Brachythecium plumosum* (Hedw.) B.S.G.].
21. *Brachythecium procumbens* (Mitt.) Jaeg. reported by Bruhel, 1931.
22. **Breutelia indica Bruehl** reported by Bruhel, 1931 [This species is now synonym of *Breutella dicranacea* (C. Muell.) Mitt.].
23. *Breutelia dicranacea* (C. Muell.) Mitt. reported by Bruhel, 1931.
24. *Bryum alpinum* With. reported by Dhabade, 1998.
25. *Bryum apalodactyoides* C. Muell. reported by Bruhel, 1931 (status doubtful).
26. *B. argenteum* var. *lantum* (P. Bea.) Hamp. listed in Gangulee, 1978-80.
27. *B. capillare* L. ex Hedw. listed in Gangulee, 1978-80
28. **B. clavareiforme C. Muell.** reported by C. Mueller, 1853 [This species is now synonym of *Brachymenium nepalense* Hook.].
29. **B. formosum Mitt.** reported by Bruhel, 1931 [This species is now synonym of *Bryum wightii* Mitt.].
30. *B. lamprostegium* C. Muell. reported by Bruhel, 1931. [This species is an unresolved name now].

- 
31. **B. medianum** Mitt. reported by Bruhel, 1931. [This species is now synonym of *Bryum neelgheriense* var. *neelghreniense*]
  32. **B. montagneanum** C. Muell. reported by Bruhel, 1931. [This species is now synonym of *Brachymenium pendulum* Mont.]
  33. *B. paradoxum* Schwaegr. listed by Gangulee, 1978 - 80. *B. porphyroneuron* var. *erythrinum* (Mitt.) Fleisch. listed in Gangulee, 1974-77.
  34. **B. rosulatum** C. Muell. reported by Bruhel, 1931 [This species is now synonym of *Bryum billardieri* Schwaegr.]
  35. **B. zollingeri** Dupy. reported by Bruhel, 1931 [This species is now synonym of *Bryum billardieri* Schwaegr.]
  36. *Campylopodum nodiflorum* C. Muell. reported by Bruhel, 1931.
  37. *C. caudatus* (C. Muell.) B. reported by Bruhel, 1931 [This species is an unresolved name now].
  38. *C. phaseoides* (C. Muell.) Par. reported by Bruhel, 1931.
  39. *C. recurvus* (Mitt.) Jaeg. reported by Bruhel, 1931.
  40. *C. schmidii* (C. Muell.) Jaeg. reported by Bruhel, 1931.
  41. *Campylopus introflexus* (Hedw.) Brid. listed by Gangulee 1969.
  42. *C. leatinervis* (Mitt.) Jaeg. reported by Dhabade, 1998.
  43. *Claopodium assurgens* (Sull. & Lesg.) Cord. listed by Gangulee, 1974-77.
  44. *C. prionophyllum* (C. Mull.) Broth. listed by Gangulee, 1974-77.
  45. *Ctenidium lychnites* (Mitt.) Broth. reported by Bruhel, 1931.
  46. *Diaphanodon blandus* subsp. *blandus* forma. *recurvidentatus* (Zanten) Zanten reported by Zanten and Townsend, 1999.
  47. *Diaphanodon blandus* subsp. *blandus* forma *blandus* Zanten & Townsend reported by Zanten and Townsend, 1999.
  48. *48.D. procumbens* (C. Muell.) Ren. & Cord. reported by Dhabade, 1998.
  49. **Dicranella divaricata** (Mitt.) Jaeg. listed by Gangulee, 1969. [This species is now synonym of *Aongstroemia divaricata* (Mitt.) Müll.]
  50. **Dicranoloma fragile** Broth. listed by Gangulee, 1969. [This species is now synonym of *Dicranum psathyrum* Klazenga]
  51. **Dicranum albescens** C. Muell. reported by C. Mueller, 1853 [This species is now synonym of *Campylopus albescens* (C. Muell.) Jaeg.]
  52. **Dicranum . involutus** C. Muell. reported by C. Mueller, 1853 [This species is now synonym of *Campylopus involutus* (C. Muell.) Jaeg.]
  53. *Entodon plicatus* C. Muell. reported by Bruhel, 1931.
  54. **Entosthodon diversinervis** C. Muell. reported by C. Mueller, 1853. [This species is now synonym of *Funaria diversinervis* (Müll. Hal.) Broth.]
  55. *E. perrottatii* C. Muell. reported by C. Mueller, 1853.
  56. *E. submarginatus* C. Muell. reported by C. Mueller, 1853. [This species is now synonym of *Funaria submarginata* (Müll. Hal.) Broth.]
  57. *Erythrodontium julaceum* (Schwaegr.) Par. reported by Bruhel, 1931.
  58. *Fabronia schmidii* C. Muell. reported by Bruhel, 1931 [This species is an unresolved name now].
  59. *Forsstroemia indica* (Mont.) Par. reported by Stark (1987).
  60. *Fissidens anomalus* Mont. Reported by Montagne, 1842
  61. *F. bryoides* Hedw. listed by Gangulee, 1969
  62. *F. ceylonicus* Dozy *et al.* reported by Bruhel, 1931.
  63. *F. ceylonensis* var. *ceylonensis* reported by Bruhel, 1931.
  64. *F. diversifolius* Mitt. listed by Gangulee, 1969.
  65. *F. grandiformis* Brid. listed by Gangulee, 1969.

- 
66. *F. nymanii* Fleish. listed by Gangulee, 1969.[The name is an unresolved name, may be *Fissidens hyalinus* Hook. & Wilson].
67. **F. schmidii C. Muell.** reported by C. Mueller (1853) [This species is now synonym of *Fissidens bryoides* Hedw.]
68. *F. sylvaticus* var. *acericulatus* reported by Bruhel, 1931.
69. *F. wilsoni* Mont. reported by Bruhel, 1931.
70. **Floribundaria sparsa (Mitt.) Broth.** synonymies by Menzel and Schultze-Motel, 1994 as *Trachycladiella sparsa*
71. *Funaria hygrometrica* var. *calvescens* reported by Bruhel, 1931.
72. *F. submarginata* (C. Muell.) Broth. reported by Brotherus, 1898.
73. *Glossadelphus ivoreanus* (Mitt.) Fleish. reported by Bruhel, 1931.
74. **Grimmia ovata Weber et Mohr.** reported by Bruhel, 1931 [This species is now synonym of *Grimmia ovalis* (Hedw.) Lind.].
75. *Homaliodelphus targionianus* (Mitt.) Dix. & Verd. listed by Gangulee, 1974-77.
76. *Homaliodendron flabellatum* (Dickson) Fleish. reported by Bruhel, 1931.
77. *H. montagneanum* (C. Muell.) Fleish. reported by Bruhel, 1931.
78. **Hookeria utacamundiana Mont.** reported by Montagne, 1842 [This species is now synonym of *Hookeriopsis utacamundiana* (Mont.) Broth.]
79. *Hymenostomum edentulum* (Mitt.) Besch. reported by Dhabade, 1998.
80. *Hyophila involuta* (Hook.) Jaeg. reported by Dhabade, 1998.
81. **Hypnum tamariscellum C. Muell.** reported by C. Mueller, 1853 [This species is now synonym of *Thuidium tamariscellum* (C. Muell.) Bosche & Lac.]
82. *Hypopterygium tenellum* C. Muell. reported by C. Mueller, 1854.
83. *Isopterygium albescens* (Hook.) Jaeg. reported by Brothrus, 1898.
84. *I. lignicola* (Mitt.) Jaeg. listed by Gangulee, 1978-80.
85. **Isothecium neilgheriense Mont.** reported by Montagne, 1842 [This species is now synonym of *Hamalothecium nilgheriense* (Mont.) Robins].
86. **Leskea consanguinea (Mont.) Mitt.** reported by Bruhel, 1931. [This species is now synonym of *Leskeella consanguinea* (Mont.) Broth.]
87. *Leucobryum nilgherense* C. Muell. reported by C. Mueller, 1854.
88. **Leucoloma amoene-virens Mitt.** listed by Gangulee, 1969. [This species is now synonym of *Poecilophyllum amoene-virens* (Mitt.) Mitt.]
89. *Macromitrium nilgherense* C. Muell. reported by C. Mueller, 1853.
90. *Macromitrium squarrosulum* Müll. Hal. ex A. Jaeger, reported by Bruhel, 1931.
91. *M. suclatum* (Hook.) Brid. listed by Gangulee, 1974-77
92. *Meteoriopsis squarrosa* (Hook.) Fleish. listed by Gangulee, 1974-77.
93. *Meteorium brevirameum* (C. Muell.) Broth. reported by Bruhel, 1931.
94. *M. buchananii* (Bridel) Broth. reported by Bruhel, 1931.
95. **M. miquelianum (C. Muller) Fleish.** reported by Bruhel, 1931 [This species is now synonym of *Meteorium. buchanani* forma *polytrichum* Gangulee].
96. *Microdus schmidii* (C. Muell.) Fleisch. reported by Bruhel, 1931.
97. *Mielichhoferia schmidii* C. Muell. reported by C. Mueller, 1853 [This species is an unresolved name now].
98. **Mnium rostratum Schrad.** listed by Gangulee, 19 74-77. [This species is now synonym of *Plagiomnium rostratum* (Schrad.) T. Kop].
99. *M. shynehophorum* Hook. reported by Bruhel, 1931.
100. *Neckera goughiana* Mitt. reported by Bruhel, 1931.
101. *N. aequalifolia* C. Muell. reported by C. Mueller, 1853 [This species is an unresolved name now].
102. **N. plicaeifolia C. Muell.** reported by C. Mueller, 1853 [This species is now synonym of *Meteorium buchananii* forma *polytrichum* Gangulee].

- 
103. *Papillaria fuscescens* (Hook.) Jaeg. reported by Bruhel, 1931.
104. *Philonotis pseudofontana* (C. Muell.) Jaeg.
105. *Physcomitrium curgens* Broth.
106. **Pilotrichum punctulatum C. Muell.** reported by C. Mueller (1854) [This species is now synonym of *Aerobrydium filamentosum* (Hook.) Fleish.].
107. **Pilotrichum reclinatum C. Muell.** reported by C. Mueller (1854) [This species is now synonym of *Meteoriopsis reclinata* (C. Muell.) Fleish.]
108. *Pilotrichopsis ferruginea* (Mitt.) Broth. reported by Bruhel, 1931.
109. *Pinnatella calcuttensis* (C. Muell.) Fleish. reported by Dhabade, 1998.
110. *Pinnatella alopecurooides* (Hook.) Fleish. listed by Gangulee, 1974-77.
111. *Pleuridium denticulatum* (C. Muell.) Mitt. reported by Bruhel, 1931.
112. **Pleuropus fenestratus Griff.** reported by Bruhel, 1931 [This species is now synonym of *Homaliothecium nilgheriense* (Mont.) Robin.].
113. *Pogonatum aloides* (Hedwig.) Palisot Beauv. reported by Bruhel, 1931.
114. **P. neesii C. Muell.** reported by Bruhel, 1931 [This species is now synonym of *P. aloides* forma *neesii* Gangulee].
115. **P. hexagonum Mitt.** reported by Bruhel, 1931. [This species is now synonym of *Pogonatum patulum* (Harv.) Mitt.].
116. *P. microstomum* (R. Brown) Bridel reported by Bruhel, 1931.
117. *P. himalayensis* Mitt. listed by Gangulee, 1969.
118. *P. perichaetiale* (Montag.) Jaeg. reported by Bruhel, 1931. [This species is an unresolved name now].
119. *Pterobrotopsis acuminata*
120. *P. flexipes* (Mitt.) Fleisch. reported by Bruhel, 1931.
121. *P. schmidii* (C. Muell.) Fleish. reported by Bruhel, 1931.
122. *P. walkeri* (Broth.) Broth. reported by Dhabade, 1998.
123. *Ptychomitrium tortula* (Harrey) Jaeg. reported by Bruhel, 1931.
124. *Racopilum cuspidigerum* (Schwaegr.) Aorgsti listed by Gangulee, 1969.
125. *Rematodon orthostegius* Mont. reported by Montagne, 1842.
126. *Rhynchastegiella humillima* (Mitt.) Broth. listed by Gangulee, 1969.
127. *Sematophyllum subhumile* (C. Muell.) Fleish. reported by Bruhel, 1931.
128. *Symphysodon perrottetii* Mont. reported by Montagne, 1841.
129. *Symphodon pygmaeus* (Broth.) He & Snider reported by He and Snider, 2000.
130. *Tayloria schmidii* (C. Muell.) reported by Bruhel, 1931.
131. **Thamnium arcuans (Mitt.) Jaeg.** reported by Bruhel, 1931 [This species is now synonym of *Thamnobryum subseriatum* (Hook.) Nog.]
132. *Thamnium schmidii* (C. Muell.) Jaeg. reported by Bruhel, 1931.
133. *Thuidium cymbifolium* Doz. et Molk. reported by Bruhel, 1931.
134. **Thysanomitrium involutum (C. Muell.) Broth.** [This species is now synonym of *Campylopus involutus* (C. Muell.) Jaeg.].
135. *Trachypus bicolor* Reinw. & Hornsch. Gangulee, 1974-79.
136. *Trematodon schmidii* C. Muell. reported by C. Mueller, 1853.
137. *Trichostomum orthodontum* (Mitt.) Broth. reported by Bruhel, 1931.
138. **Trichostomum stenophyllum (Mitt.) Broth.** reported by Bruhel, 1931 [This species is now synonym of *Oxystegus stenophyllum* (Mitt.) Gangulee].
139. *Ulota schmidii* (C. Muell.) Mitt. reported by Bruhel, 1931.
140. *Webera (Pholia) tremadodontoides* (C. Muell.) Broth. reported by Bruhel, 1931.
141. *Trematodon schmidii* C. Muell. reported by Bruhel, 1931.
142. **Zygodon acutifolius C. Muell.** reported by Bruhel, 1931. [This species is now synonym of *Codonoblepharon acutifolium* (Müll. Hal.) A. Jaeger.]
143. *Z. cylindrocarpus* C. Muell. reported by Bruhel, 1931.

**New records from the Nilgiri hills:**

1. *Actinohydium hookerei* (Mitt.) Broth.
2. *Bryoerythrophyllum recurvistrum* (Hedw.) Chen
3. *Campylodontium flavescens* (Hook.) Bosch. & al
4. *Ditrichium heteromallum* (Hedw.) Hamp.
5. *Ditrichum tortipes* (Mitt.) Kuntze.
6. *Entodon prorepens* (Mitt.) Jaeg.
7. *Entodontopsis wightii* (Mitt.) W.R. Buck & Ireland.
8. *Erythrodontium julaceum* (Schwaegr.) Par.
9. *Fabronia gougechii* Mitt.
10. *Floribundaria floribunda* (Doz. et Molk) Fleish.
11. *Hyophila kurziana* Gang.
12. *Hydrogonium arculatum* (Griff.) Wijk et Marg.
13. *H. consanguineum* (Thwait et Mitt.) Hilp.
14. *Isopterygium serrulatum* Fleish.
15. *Lopodium* sp.
16. *Neckeropsis exserta* (Schwaegr.) Broth.
17. *Octoblepharum albidum* Hedw.
18. *Plagiomnium integrum* (Bosch & Sande Lac.) T.J. Kop.
19. *Pohlia flexuosa* W.J. Hook.
20. *Sematophyllum humile* (Mitt.) Broth.
21. *Sematophyllum caespitosum* (Hedw.) Broth.
22. *Thuidium glaucinum* (Mitt.) Bosh. et Lac.

**The Ecological significance of the mosses of the Nilgiri hills:**

The mosses is the one of the most significant component of entire Nilgiri hills that is why they regulate water cycle (due to high absorbing capacity) recycling nutrient, providing shelter to several invertebrates especially epiphytic forms. Mosses are also balancing environment due to capturing atmospheric pollutants, because they do not possess true cuticle but more tolerant to heavy metals. In last some years the field study provided the social forms or life forms of the mosses of the region which would be significant tool for studying plant and environment relation.

The Mosses of the Nilgiri hills is a most fascinating group among bryophytes due to their sociology. These life forms actually correlated with physiological prevention of the particular taxa. The life forms or the social habit of the mosses directly influenced by the eco-physiological characters and this is largely based on field experiences. This is clearly evident there is no species of mosses growing individually, all of the species growing in colonies to enhance capillary uptake and retention of external water. These life forms also decorate the entire region like in 'Cushions', 'Mats' or 'Carpet', 'Turfs' 'Tails', 'Fan' or 'Feather' and 'Pendant'. In all of these the pendant or hanging forms forming forest festoons belonging to family Meteioceae, Neckeriaceae and Pterobryaceae.

**Discussion**

The forest of the many areas of the Nilgiri hills being destroyed at the mid of the century, and because of their variety of microhabitat which hosting rich diversity of bryophyte. This destruction



changes entire ecosystem especially number of mosses vanishing from the area. But last some decades the department of Forests, Tamil Nadu protected several areas as reserve forests.

The present study shows there is 157 taxa under 81 genera reported so far on the basis of all published record.. Out of 157 taxa 22 are new to Nilgiri hills, these are *Actinothuidium hookerei* (Mitt.) Broth., *Thuidium gluacium* (Mitt.) Bosh. et Lac. (Thuidiaceae), *Ditrichum heteromallum* (Hedw.) Hamp., *Ditrichum tortipes* (Mitt.) Kuntze (Ditrichaceae), *Hyophila kurziana* Gang., *Hydrogonium arculatum* (Griff.) Wijk et Marg., *H. consanguineum* (Thwait et Mitt.) Hilp., *Lopodium* sp. *Bryoerythrophyllum recurvistrum* (Hedw.) Chen (Pottiaceae), *Pohlia flexuosa* Hook., *Floribundaria floribunda* (Doz. et Molk) Fleish. (Meteoriaceae), *Plagiomnium integrum* (Mniaceae), *Neckeropsis exserta* (Schwaegr.) Broth. (Neckeraceae), *Fabronia gougei* Mitt. (Fabroniaceae), *Entodon prorepens* (Mitt.) Jaeg., *Erythrodontium julaceum* (Schwaegr.) Par., *Campylodontium flavescens* (Hook.) Bosch. et al (Entodontaceae), *Entodontopsis wightii* (Mitt.) Buck (Stereophyllaceae), *Sematophyllum humile* (Mitt.) Broth., *Sematophyllum caespitosum* (Hedw.) Broth. (Sematophyllaceae), *Octoblepharum albidum* Hedw. and *Isopterygium serrulatum* Fleish. (Hypnaceae).

### Acknowledgements

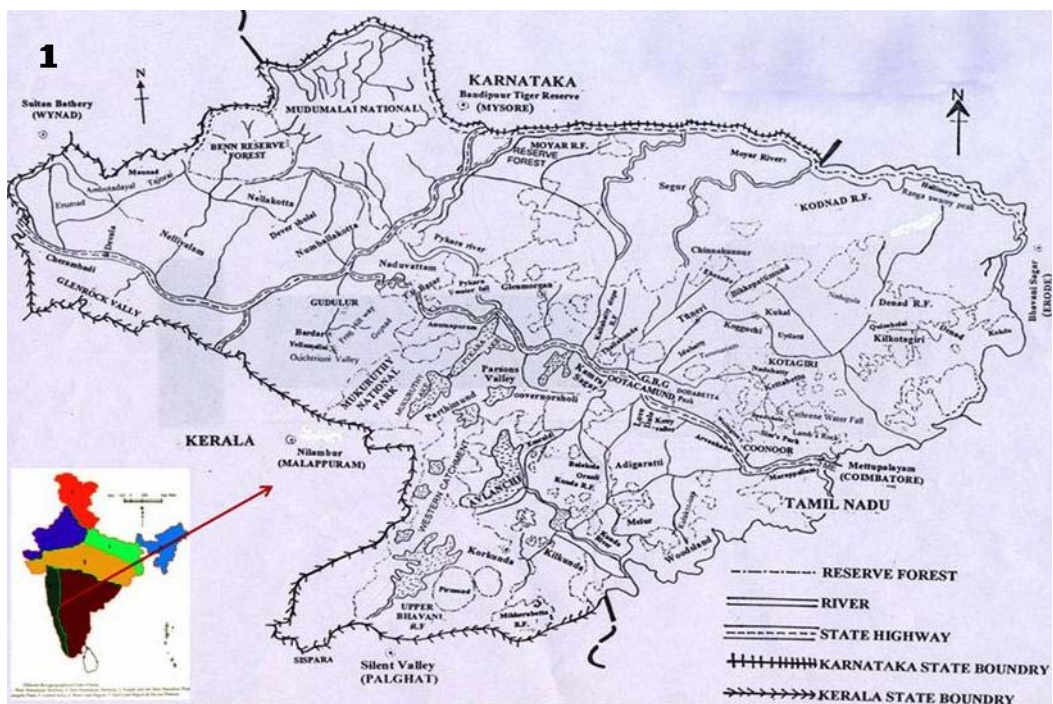
The authors are grateful to Department of Environment and forests, Govt. of India, New Delhi for financial assistance through AICOPTAX (All India Coordinated Project on Taxonomy).

### References

- ALLEN, B. (1999). The genus *Philonotis* (Bartramiaceae, Musci) in Central America. *Haus. Beih.* **9**: 19 – 36.
- BELLAND, J. R. (1987). The disjunct mosses element of the gulf of St. Lawrence region, glacial and postglacial dispersal and migration histories. *Journ. Hatt. Bot. Lab.* **63**: 1- 76.
- BRUEHL, P. (1931). A census of Indian Mosses. *Rec. Bot. Surv. India.* **13** (1): 1 – 135.
- BUCK, W. R. (1980). A generic revision of the Entodontaceae. *Journ. Hatt. Bot. Lab.* **48**: 71- 159.
- BUCK, W. R. (1994). A new attempt at understanding the Meterioceae. *Journ. Hatt. Bot. Lab.* **75**: 51-72.
- CHOPRA, R. S. (1975). *Taxonomy of Indian Mosses*. PID, C.S.I.R., New Delhi.
- CATCHESIDE, D. G. (1982) the geographical affinities of the mosses south Australia. *Journ. Hatt. Bot. Lab.* **52**: 57- 64.
- DIXON, H. N. (1909). Mosses from Western Ghats. *J. Bot., London* **47**: 157 –164.
- DIXON, H. N. (1914). Reports on the mosses of the Abor expedition 1911-12, and report on the mosses collected by Mr. C.E.C. Fisher and other from south India, Ceylon. *Rec. bot. Surv. India* **6** (3): 55-73, 75 – 89.
- ELLIS, L. T. (1989). A taxonomic revision of *Calymperes* in southern India & neighbouring Islands. *J. Bryol.* **15**: 697 – 732.
- ENORTH, J. (1994). On the evolution and circumscription of the Neckeraceae (Musci). *Journ. Hatt. Bot. Lab.* **76**: 13-20.
- FRAHM, J. P. (1983). A new infrageneric classification in the genus *Campylopus* Brid. *Journ. Hatt. Bot. Lab.* **54**: 207 – 225.
- GANGULEE, H. C. (1969-1980). Mosses of Eastern India & Adjacent regions, Fascicles 1-8, Calcutta.
- GAO, C. AND CHANG, K. C. (1983). Index Muscorum Chinae Boreali Orientalis. *Journ. Hatt. Bot. Lab.* **54**: 187 - 205
- HE, S. AND SNIDER, J. (2000). A taxonomic revision of *Symphiodon* (Musci: Symphyodontaceae). *The Bryologist.* **103** (1): 52-81.

- KOPONEN, T. (1979). Speciation on the Mniaceae. *Journ. Hatt. Bot. Lab.* **35**: 142 – 154.
- KOPONEN, T. (1996). Notes on *Philonotis* (Bartramiaceae, Musci), Status and distribution of *Philonotis falcata*. *Arctoa*. **6**: 113-117.
- KOPONEN, T. (1982). The family Mniaceae in Australia and Pacific. *Journ. Hatt. Bot. Lab.* **52**: 75-86.
- LONGTON, R. E. (1981). Inter-population variation in morphology and physiology in the cosmopolitan moss *Bryum argenteum* Hedw. *J. Bryol.*: 11: 501–520.
- MATSUI, T. AND IWATSUKI, Z. (1990). A taxonomic revision of the family Ditrichaceae (Musci) of Japan, Korea and Taiwan. *Journ. Hatt. Bot. Lab.* **68**: 317-366.
- MITTEN, W. (1859). Musci Indiae Orientalis. *Linn. Soc. Bot. Suppl.* **1**: -171.
- MONTAGNE, D.M. (1841). Second centurie de Plantes Cellulaires Exotiques Nouvelles. *Ann. Sci. Nat. Bot.*, ser 2, **16**: 266 – 282.
- MONTAGNE, D.M. (1842). Cryptogamme Nilgheriensis. *Ann. Sci. Nat. Bot.* **17**: 213-256; **18**: 12-23.
- MUELLER, C. (1853). Musci Neilgherienses I. *Bot. Ztg. Regensburg.* **11**: 17-21; 33-40; 57-92.
- MUELLER, C. (1854). Musci Neilgherienses I. *Bot. Ztg. Regensburg.* **12**: 556-559, 569-574.
- NINH, T. (1984). A revision of Indochinese *Homaliodendron*. *Journ. Hatt. Bot. Lab.* **57**: 1 - 39.
- NOGUCHI, A. (1958). A small collection of mosses from southern India. *Kumamoto. J. Sci.* ser. B. sec. 2, **4**: 1-4.
- NOGUCHI, A. (1976). A taxonomic revision of the family Meteoriaceae of Asia. *Journ. Hatt. Bot. Lab.* **41**: 231 - 357.
- RICHERDSON, D.H.S. (1981). The biology of Mosses. Blackwell Scientific Publication, London, 1-220.
- SCHOFIELD, W. B. AND HEBANT, C. (1984). The morphology and anatomy of the Moss gametophore. In: *New Manual of Bryology*. Vol. II (ed. Schuster, R. M.). The Hattori Botanical Laboratory Nichinan, Miyazaki Japan. Pp. 628-657.
- SPENCE, J. R. (1998). *Bryum* Hedw. (Bryaceae) in western North America. *The Bryologist.* **85**: 22-36.
- STARK, L. R. (1987). A taxonomic monograph of *Forsstroemia* Lindb. (Bryopsida: Leptodontaceae). *Journ. Hatt. Bot. Lab.* **63**: 133 – 218.
- STREIMANN, H. (1993). New records of Mosses for Norfolk Islands. *Journ. Hatt. Bot. Lab.* **74**: 219 – 225.
- TAN, B. C. AND IWATSUKI, Z. (1993). A checklist of Indochinese Mosses. *Journ. Hatt. Bot. Lab.* **74**: 325 - 405.
- UDAR R. (1976). *Bryology in India*. The Chronica Botanica, New Delhi. Pp.1–200.
- VENU, P. AND SANJAPPA, M. (2001). Forests. In: *Ecosystem of India* (ed. Alfred, J.R.B., Das, A.K. and Sangal, A.K.). ENVIS-2001. Surv. India 123-147. ZSI, Kolkata.
- VITT D. H. (1982). Populational variation and speciation in Austral mosses. *Journ. Hatt. Bot. Lab.* **78**: 137 - 182.
- VITT D. H. (1984). Classification of the Bryopsida. In: *New Manual of Bryology*. Vol. II (ed. Schuster, R. M.). The Hattori Botanical Laboratory Nichinan, Miyazaki Japan. Pp. 696-759.
- VIRTANEN, V. (2000). *Taxonomic studies of the Bartramiaceae, Bryopsida*. Published in botany from the University of Helsinki no. **31**: 1-34.
- VOHRA, J. N., ROYCHOUDHARY, K.N., GHOSH, K.N., KAR, R.K., SINGH, B.D. AND SINGH, R.K. (1982). Observation on the cryptogamic flora of the Silent valley. Mosses. 3-; 19-30. BSI publication. Howrah.
- WADHAWA, B. M. (1969). Checklist on the moss flora of the peninsular India including Western ghats and Nilgiris. I. M. V. M. *Patrica.* **4** (2): **74**-93.
- WATANABE, R. (1991). Notes on the Thuidiaceae in Asia. *Journ. Hatt. Bot. Lab.* **69**: 37- 47.

- 
- YAMAGUCHI, T. (1993). A revision of the genus *Leucobryum* (Musci) in Asia. *Journ. Hatt. Bot. Lab.* **73**: 1 - 124.
- YANO, O. (1995). A new additional annotated checklist of Brazilian Bryophytes. *Journ. Hatt. Bot. Lab.* **52**: 153 – 159.
- VON ZANTEN, B.O. AND TOWNSEND, C. C. (1999). A re-evaluation of the genus *Diaphanodon* Renauld & Cardot (Trachypodaceae, Bryopsida) *Hausk. Beih.* **9**: 399-409.



**Figure 1:** Map showing different Bryo-rich localities in Nilgiri hills



**Figures 2 & 3.** 2. *Thuidium* sp., 3: *Fissidens* sp. Intermixed with *Anthoceros* (hornwort)



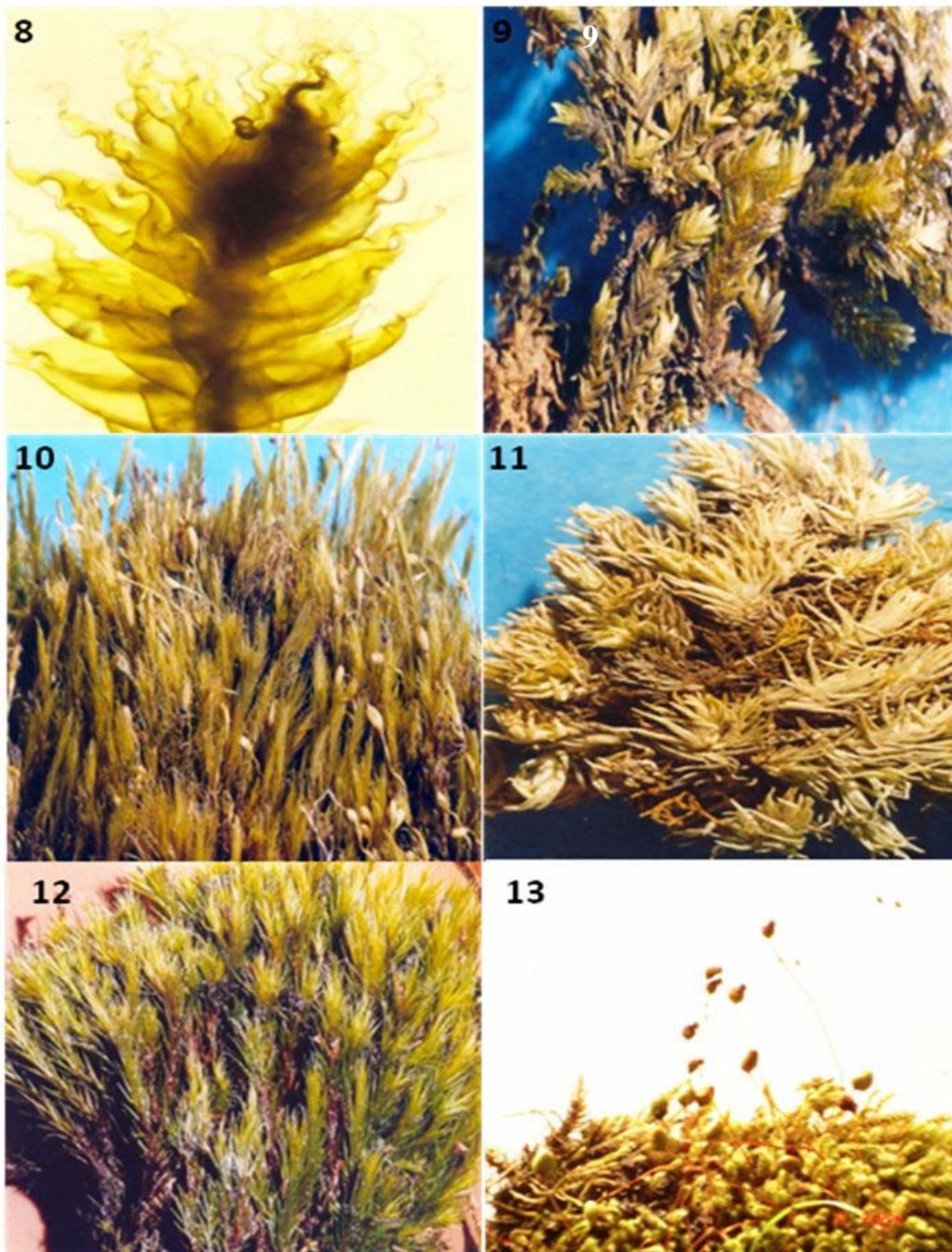


Figures 4 & 5: Growth habit of *Leucobryum* sp., a common corticolous moss



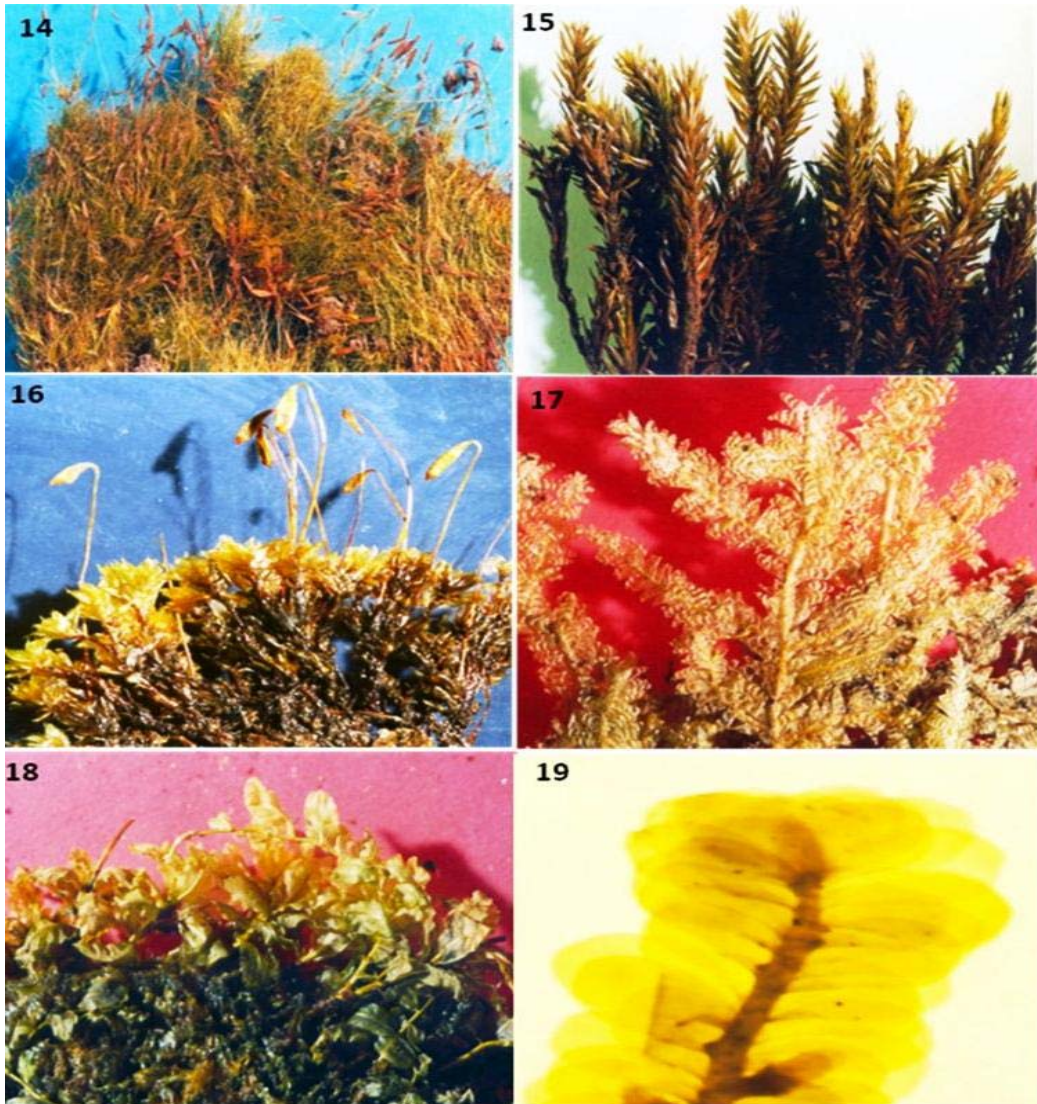
Figures 6 & 7: 6. *Bryum* sp., 7. *Pogonatum* sp. respectively



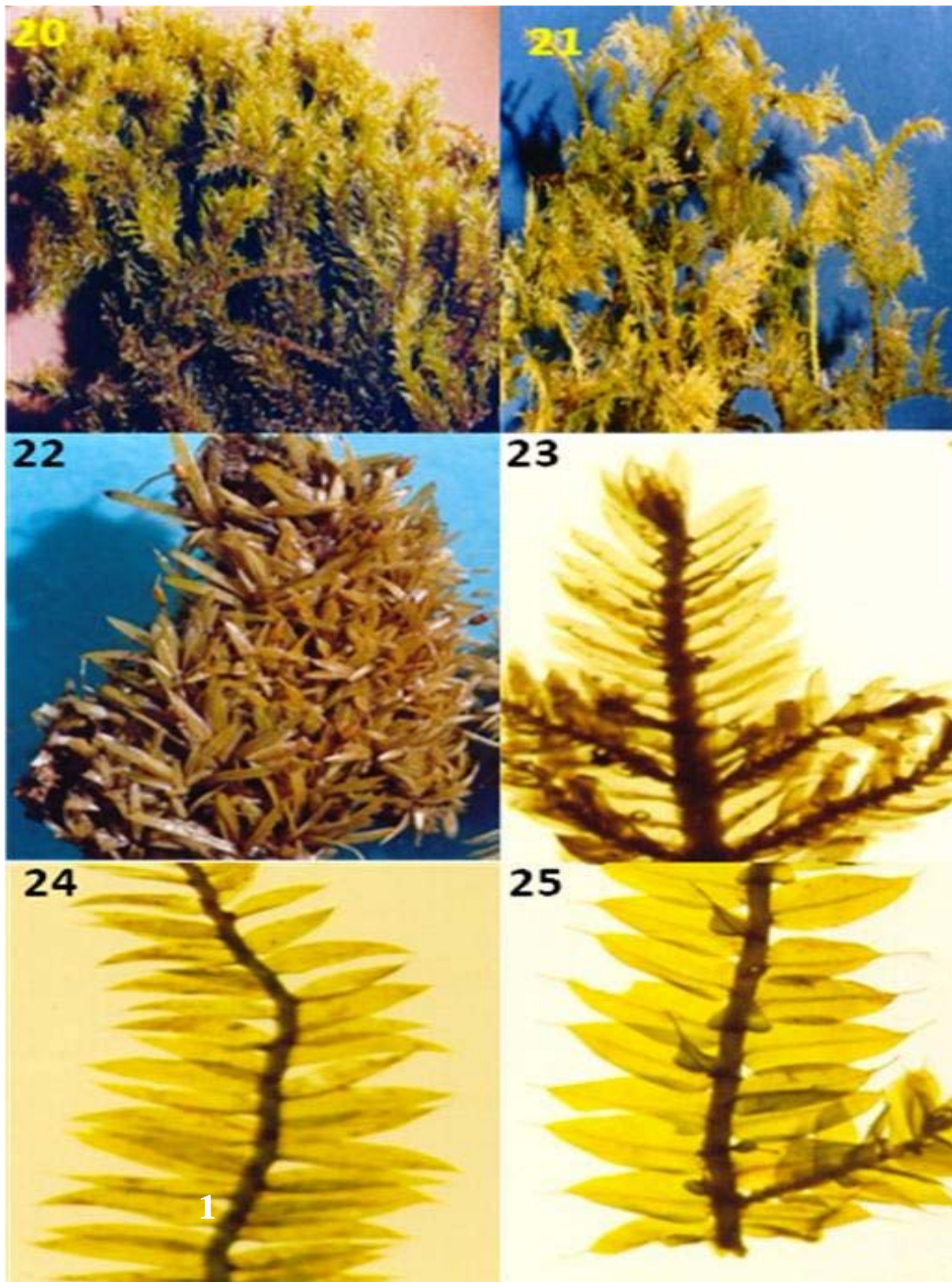


**Figures 8-13:** 8. *Aerobryidium filamentosum*, 9. *Fissidens ceylonensis*, 10. *Campylopus involutus*, 11. *Leucobryum nilgiriense*, 12. *Campylopus introflexus*, 13. *Philonotis falcata*





**Figures 14-19.** 14: *Ditrichum tortipes*, 15: *Pogonatum macrostomum*, 16: *Bryum wightii*, 17: *Neckeropsis exserta*, 18: *Mnium integrum*, 19: *Homalioadelphus targionianus*



**Figures 20 – 25:** 20. *Macromitrium perrottetii*, 21. *Thuidium tamariscellum*, 22. *Octoblepharum albidum*, 23. *Lopodium* sp., 24. *Entodon prorepens*, 25. *Racopilum cuspidigerum*.

*Published Sept. 26, 2011*