

Systematic studies on Bryophytes of Northern Western Ghats in Kerala

Final Report

Council order no. (T) 155/WSC/2010/KSCSTE dtd. 13.09.2010



**Principal Investigator
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**Malabar Botanical Garden
Kozhikode-14
Kerala, India**

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Dr. Manju C. Nair

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INTRODUCTION

Bryophytes, the amphibians of the plant kingdom growing preferably in aquatic and wet habitats are the second largest group of plants. They are non-tracheophytes and non flowering plants. In bryophytes the plant body is gametophyte which is haploid and the diploid structure, the sporophyte is parasitic on the gametophyte and completely depend on gametophyte for their growth and development.

They inhabit in a variety of microhabitats. Some are periodically submerged (*Fissidens* spp.). Some growing on different types of rocks called lithophytes, soil (terrestrial), tree bark (epiphytes), leaves (epiphylls) and water (aquatic). They prefer wet regions and form a green carpet on a stone wall, crevices of rocks, earth cuttings, tree roots, bricks and bottom of tree trunks.

Bryophytes include 3 distinct lineages - liverworts, hornworts and Mosses. Around 30,000 species of bryophytes are distributed world over, out of which around 4500 species are reported from India and about 700 species from Kerala. Mosses are the most speciose group with over 18,000 species in the world. Among this about 3000 species of mosses are reported from India and about 400 species from Kerala. Mosses are divided into 2 groups based on their growth habits, Acrocarpic and Pleurocarpic. Acrocarpic plants are those which are erect and sporophyte is produced at the tip of the gametophyte. Acrocarpic mosses ranges its size from about 1mm (*Fissidens* sp.) to 40 cm (*Polytrichum* sp.). Pleurocarpic plants shows much branching, here the main stem and the lateral branches bear sporophyte.

The present project proposes to study the Taxonomy and diversity of Acrocarpic mosses of Thusharagiri hills.

Significance of Mosses

Horticultural uses

Horticulturalists and landscape architects have found them valuable, particularly peat moss, for the construction of moss gardens and miniature gardens. They serve as ground cover for Bonsai, as soil additives in mulching and root packing materials (Perin, 1962). Acrocarpic mosses such as *Leucobryum bowringii* and *L. neilgherriense* are mixed with soil or sand for cultivation of *Rhododendron*

shrubs. *Sphagnum* and *Campylopus* are widely used for packing and layering in horticulture industry. Several species of Acrocarpic mosses such as *Rhodobryum* spp., *Campylopus* spp., etc have been used in bowl cultivation.

Medicinal uses

Mosses such as *Sphagnum* is known for the layman as a packing material from the early days. It was found as a better absorbent than cotton in addition to its antibiotic qualities and was frequently used for surgical dressing by the people in armies (Schofield, 1969). The oil extract from the hair cap moss (*P. commune*) is used to beautify and strengthen the hair.

Pant and Tewari (1989) reported that burned moss ash mixed with fat and honey in the form of ointment is used for cuts, burns and wounds by the people of Himalayan region.

Microorganisms do not play important role in the decay of moss species, both Acrocarpic and Pleurocarpic. This is because several antibiotics and phenolic compounds have been produced by mosses. Terpenes, bibenzyls, bisbibenzyls, derivatives of fatty acids and acetophenones are known in bryophytes as antifungal compounds and isoflavanoids, flavonoids and bioflavonoids are reported to be possible chemical barriers against micro organisms.

Pollution indicators

Many of the mosses can act as indicators of environmental pollution. The ability of many mosses to sequester heavy metals make them good biomonitors. Nash (1972) suggested that Acrocarpic mosses such as *Ceratodon purpureum*, *Polytrichum piliferum* and *Atrichum undulatum* are best bioindicators of air pollution.

Ecological importance

The most important role played by mosses are in Ecological activities, the Acrocarpic mosses such as *Philonotis*, *Bryum*, *Philonotis*, etc. forms a thick mat on the substratum in which it grows. Eventhough the rhizoids of Acrocarpic mosses are very less which grows deep into the substratum, this helps in rock binding, prevent in soil erosion, in land sliding, etc. In forest areas after the fire the first grown plants are *Polytrichum* and *Pogonatum* along with *Pteridium* because of the growth of its roots grow deep into the substratum.

STUDY AREA

The Western Ghats, located in the southwest corner of the Indian Peninsula, is one among the notable areas of rich biodiversity in the world. Its unique location and long geological history as the part of Gondwanaland moulded its ideal climate and diverse vegetation types that support rich flora including bryophytes. Even though the bryophytes form an important component in the forest ecosystems, the detailed studies have been started only recently.

The present study involves the collection of plant specimens from Northern Parts of Western Ghats in Kerala including six districts such as Palakkad, Malappuram, Kozhikode, Wayanad, Kannur and Kasaragod.

The major areas surveyed for Bryophytes

Wayanad- Chembra, Soochippara, Periya, Thamarassery churam, Kuruva deep, Edakkal cave, Chandanathode, Thirunelli, Muthanga forest, Banasurasagar dam.

Kasaragod -local areas

Kannur- Aralam WLS, Pal Churam, Irutti, Madayippara and local areas.

Kozhikode: Vellarimala, Anakkampoyil, Thusharagiri, Aripara, Noolpuzha, Muthappan puzha, Malabar WLS (Kakkayam, Peruvannamuzhi) Ambalappuzha, Orakkuzhi, Shankaranpuzha, Pannikkode, and low land local areas.

Malappuram: Nilambur-Nadukani, Adayanpara, Orakkuzhi, Kanolly plot, Nedumkayam, Vazhayur, and low land local areas.

Palakkad: Silent Valley NP., Shenduruni, Nelliampathy, Malampuzha, Parambikulam Tiger Researve, and low land local areas.

OBJECTIVES

1. A comprehensive field study on the bryophyte (mosses, liverworts & hornworts) flora of the Western Ghats of northern parts of Kerala, in different seasons.
2. Studies on the ecological and economic aspects.
3. To assess the problems and prospects of conservation of bryophytes of the area

MATERIALS AND METHODS

Systematic collection of Bryophyte specimens were undertaken during the last three years in different seasons in different localities of the study area. The steps involved in bryophyte taxonomy are collection, preservation, investigation, identification and publication. Every steps are equally important to make the study complete.

a. Collection

This is the most important step in the study of bryophytes. Systematic collection of bryophytes was done from November 2010-October 2013 for morphologic and taxonomic studies. Field trips were undertaken with all necessary items required in the field such as field book, Bryophyte Herbarium packets, specimen bottles, hand lens, sharp edged knife, scalpel, news paper, pen/pencil, slip pad, collection bag and altimeter. Some bryophytes are very delicate and attached to the substratum very firmly, hence collected by scraping out from the substratum with the sharp edged knife. In terrestrial species soil particles were removed by leaving a thin film attached. Epiphytic species were collected by climbing up the trees as far as possible. High canopy species were collected from the fallen leaves and branches. Corticolous and lithophytic species were collected along with the substratum. Two or more species usually grow together and hence were collected by giving the same field number. They were separated later by giving sub numbers after careful examination. Dry specimens were put directly into the paper packets, others were dried by keeping in news paper folders. Field data including date, locality, habitat, altitude, etc. were noted down in the field book. The specimens kept in paper packets usually remain fresh and alive for some days and so that it can be examined them alive; which later dried and stored in the herbarium. Identification of specimens was done later after careful examination using literatures.

b. Preservation

Taxonomic study depends largely upon the type, quality and condition of the preserved specimens in the herbarium. For the preservation of mosses no extra ordinary techniques are required. But the specimens should be dried properly and kept in suitable herbarium packets for their further taxonomic studies.

As the life cycle of mosses consist of 2 distinct phases, the gametophyte and

sporophyte, a complete herbarium needs both these phases for identification. Dried specimens were preserved in paper packets. They regain their original shape and size, and to some extent colour also, when wet. Moss herbarium packets are made by folding thick paper of standard quality in to 5" x 4" sized paper packets. The field data such as collection number, date, locality, altitude, habitat and collectors name were copied on to the herbarium label. The binomial and family name were also added to the labels. These labels were affixed to the upper flap of herbarium packets. These packets were then placed in folders inside the almirah according to the classification system of Shaw and Goffinet (2000). Properly labelled packets were deposited in the Malabar Botanical Garden (MBG).

C. Investigation and Identification

Fresh materials were subjected to study whenever possible for identification. External morphological features were studied under a stereo dissection microscope and internal features by a compound microscope. Size of leaves, capsules and cells were measured using micrometry. Identification of the specimens was done by referring authentic literatures and also in consultation with experts. The specimens were also compared with the herbarium specimens at Calicut University herbarium (CALI). Photographic documentation of the species and their microhabitat were also done with a digital camera Genoptic Progress C5 Camera.

d. Description and Publications

Descriptions were given for each family, genus and species wherever it is needed. Authors of plant names are abbreviated based on Brummit and Powell (1992) and titles of journals were based on taxonomic literature (Staflew and Cowan, 1976-1986). The taxa are arranged according to the classification of Shaw and Goffinet (2000).

Photographs of habit and habitat of each species were also provided as far as possible. Microscopic photographs were taken using Genoptic C5 Progress Camera.

RESULTS

Key to the Classes of Bryophyta

- 1a. Rhizoids septate; capsule mouth, operculum and peristome usually present; elaters absent..... **Bryophyta**
- 1b. Rhizoids aseptate; capsule mouth, operculum and peristome teeth absent; elaters present.....2
- 2a. Thallus with internal tissue differentiation; margin crumpled; cells with numerous chloroplasts, pyrenoids absent; elaters true type..... **Marchantiophyta**
- 2b. Thallus without internal tissue differentiation; margin not crumpled; cells with single chloroplasts, pyrenoid present, elaters pseudo type.....**Anthocerotophyta**

MARCHANTIOPHYTA (LIVERWORTS)

Plants thallose to foliose, prostrate, dorsiventral, branches usually dichotomous, when foliose distinctly 2 or 3 ranked, underleaves when present smaller, lamina cells larger, rounded or elongate; rhizoids aseptate; capsule rounded to cylindrical, seta elongated, mouth, operculum and peristome absent; elaters free or an elaterophore.

The estimated diversity of liverworts is about 6000 to 8000 species, of which atleast 85% are leafy jungermannioids (Schuster, 1984a). Eventhough there is heterogeneity in gametophyte structure of its members, liverworts have been recognized to comprise a single natural unit.

Order **MARCHANTIALES** Limpr.

AYTONIACEAE

Asterella khasiana (Griff.) Grolle, *Ergebn. Forsch. Unter. Nepal Himalaya* 1(4): 267. 1966.

Habitat: On earth cuttings in shady regions of semi evergreen and shola forests.

Distribution: *Asterella khasiana* is a common species in high altitude areas. It has earlier recorded from South India (Kerala), North-east India (Himalaya, Darjeeling), Nepal and China.

Asterella leptophylla (Mont.) Grolle, *Feddes Repertorium* 87: 246. 1976.

Habitat: On land cuttings.

Distribution: India (Kerala, Meghalya).

Reboulia hemisphaerica (L.) Raddi., Opusc. Scient. di Bologna 2: 357. 1818.

Habitat: Seen as patches on earth cuttings along with *Philonotis mollis* and *Targionia hypophylla* in semi evergreen and evergreen forests.

Distribution: It is distributed in South India (Tamil Nadu: Nilgiri hills, Madras, Palni hills, Tirunelvely hills, Kerala), Central India (Mt. Abu), North-east India (Mussoorie, Simla, Kulu, Kashmir, Darjeeling, Pachmahri, Khasi hills), China, Japan, Korea, Nepal, Afganistan, Pakistan, Java, Bonin, New Zealand, Australia, North & South America, Tahiti, Europe and Africa.

MARCHANTIACEAE

Dumortiera hirsuta (Sw.) Nees, Martius Fl. Ras. 1: 307. 1833.

Habitat: Mostly seen in shady wet areas of forests, on rocks near water courses, on submerged rocks, on exposed roots of higher plants, etc. in semi evergreen, evergreen and shola forests.

Distribution: This species is widely distributed in the high altitude areas. It has wide distribution in South India (Madras, Kotagiri, Kerala), North India (Simla, Mussoorie, Kumaon, Pachmahri), Nepal, Japan, Brazil, Mexico, Jamaica, North & South America, Europe, New Zealand, Hawaii and Africa.

Marchantia linearis Lehm. & Lindenb. in Lehm., Nov. Stirp. Pug. 4: 8. 1832.

Habitat: On soil cuttings near water courses in homestead areas of semi-shaded marshy area.

Distribution: It is distributed in India (Kerala; Wayanad, Palakkad; North-east India - Darjeeling, Bengal, Assam, Sikkim, Khasi hills), Sri Lanka, Nepal and Malacca.

Marchantia paleacea Bertol. Opuscoli scientifici d'una Società di professori della Pontifical Università di Bologna 1: 242. 1817.

Habitat: On rocky patch

Distribution: India (Kerala, Assam), Brazil, China and Japan

Marchantia polymorpha L., Species Plantarum 1137. 1753.

Habitat: On land cuttings and on rocky patch.

Distribution: India (Kerala, Tamil Nadu, North-east India) Brazil, China, Japan, Russia, America.

Lunularia cruciata (L.) Dumort. ex Lindb., Not. Sällsk. Fauna Fl. Fenn. Förh., 9: 298. 1868.

Habitat On rocky patch.

Distribution: A widely distributed species in high altitude areas.

EXORMOTHECACEAE

Exormotheca ceylonensis Meijer., J. Hattori Bot. Lab. 16:72. 1956.

Habitat: On moist rocky patch.

Distribution: India (Kerala, Tamil Nadu), Sri Lanka, India.

TARGIONIACEAE Dumort.

Cyathodium cavernarum Kunze in Lehm., Nov. Stirp. Pug. 6: 18. 1834.

Habitat: Occurs in moist areas of both forest and non-forest areas of the study area; on soil, wet rocks, walls and termite mount in the moist deciduous, semi-evergreen and evergreen forest and as well as in the pots and walls in the non-forested areas and homesteads.

Distribution: *Cyathodium cavernarum* is a widely distributed species usually growing in low altitude areas, in places of human habitation or in shady places of disturbed areas.

Cyathodium tuberculatum Udar & D.K.Singh, The Bryologist 79: 235. f. 1-18. 1976.

Habitat: Epiphytic

Distribution: This is an endemic species distributed in Kerala and Assam.

Targionia hypophylla L., Sp. Pl. 1136. 1753; Steph., Sp. Hepat. 1: 61. 1900.

Habitat: Seen as patches on soil cuttings alongwith *Philonotis mollis* and *Reboulia hemisphaerica* in the moist and shady regions in tea estates, semi-evergreen and evergreen forests.

Distribution: This species is distributed in South India (Kerala; Tamil Nadu: Madras; Karnataka: Mysore), Central India (Mt. Abu), North-east India (Western Himalayas, Mussoorie, Pachmahri, Simla, Sikkim, Chirapunji, Khasi hills), Japan, Chile, Korea, Taiwan, China, Hawaii, Peru, Europe, N. & S. America and Australia.

Targionia indica Udar & Gupta, Geophytology 13: 83. f. 1-69. 1983.

Habitat: On rocky patch and crevices of rocks.

Distribution: This is an Indian endemic species.

RICCIACEAE

Riccia billardieri Mont. & Nees ex Gottsche, Lindenb. & Nees, Synopsis Hepaticarum 602. 1846.

Habitat: On land cuttings.

Distribution: India (Kerala, Tamil Nadu).

Riccia crystallina L., Species Plantarum 1138. 1753.

Habitat: On land cuttings.

Distribution: India (Kerala, Tamil Nadu), China.

Riccia discolor Lehm. & Lindenb. , Novarum et Minus Cognitarum Stirpium Pugillus 4: 1. 1832.

Habitat: : On land cuttings.

Distribution: India (Kerala, Tamil Nadu).

Riccia stricta (Gottsche, Lindenb. & Nees) Perold, Bothalia 20: 197. 1990.

Habitat: Aquatic and on marshy land.

Distribution: India (Kerala, Tamil Nadu, Madhya Pradesh, Uttar Pradesh (Pachmarhi).

Riccia frostii Austin, Torrey Bull. Bot. Club 6: 17. 1875.

Habitat: In marshy areas of moist deciduous forest.

Distribution: The species has wide distribution in Peninsular India (Tamil Nadu: Coimbatore, Gujarath; Kerala), North-east India (Kashmir, Sikkim, Gauhati, West Bengal, Lucknow, Allahabad, Manipur, Bihar), Bangladesh, Pakistan, North and South America, Africa, Europe and Turkey.

Ricciocarpos natans (L.) Corda, Naturalient. 12: 651. 1829.

Habitat: Free floating in small ponds in the moist deciduous forests.

Distribution: Distributed in India (Kerala- Wayanad, Parambikulam TR; Kashmir, Nainital, Gauhati, Manipur), New Zealand, Australia, North & South America.

FOSSOMBRONIACEAE

Fossombronia foveolata Lindb. var. *cristula* (Austin) R.M.Schust., Hepat. & Anthocerot. N. America 5: 383. 1992.

Habitat: On moist soil cuttings or rocks alongwith grasses and other mosses in semi-evergreen and evergreen forests.

Distribution: It is distributed in South



Riccia stricta collected from different localities of Kerala

India (Kerala; Tamil Nadu: Kodaikanal, Palni hills, Ootacamund), Japan, Massachusetts, New York, North America and West Virginia.

Fossombronina indica Steph., Sp. Hepat. 6: 73. 1917.

Habitat: On soil cuttings and on small rocks in grasslands.

Distribution: This rare Peninsular Indian endemic species could be collected from Chembra hills of Wayanad. It was Stephani in 1917 described this species from Mangalore of Karnataka State. Srivastava and Sharma (2000) reported this species from Silent Valley National Park of Kerala. It is also distributed in Maharashtra.

PALLAVICINIACEAE

Pallavicinia himalayensis Schiffn., Kais. Alad. Wien LXVII p. 183.

Habitat: On land cuttings and rocky patches in moist areas.

Distribution: in India this species is distributed in Kerala (Kakkavayal Reserve Forest), Meghalaya and Tamil Nadu. (The present collection is a new record for Kerala)

Pallavicinia lyellii (Hook.) S.Gray., Nat. Arr. Brit. Pl. 1: 775. 1821.

Habitat: On soil cuttings and rocky patches where water drips regularly in moist deciduous, semi-evergreen and evergreen forests.

Distribution: It is distributed in South India (Kerala; Karnataka: Kanara, Agumbe), North-east India (Assam, Gauhati, Shillong, Pachmahri), Sri Lanka, Europe, Jamaica, Cuba, Brazil, Java, Singapore, Philippines, Ryukyu, Japan, Moluccas, New Zealand, Africa and America.

Pallavicinia ambigua (Mitt.) Steph., Mémoires de l'Herbier Boissier 11: 7. 1900.

Habitat: On rocky patch in evergreen forests.

Distribution: India (Kerala), Meghalaya, Assam.

Pallavicinia indica Schiffner,

Habitat: On land cuttings.

Distributed: It is distributed in South India (Kerala), Eastern Himalayas (Meghalaya, Khasi), Nepal, Java, Sumatra and Tahiti.

METZGERIACEAE

Metzgeria crassipilus (Lindb.) A.Evans, Rhodora 11: 188. 1909.

Habitat: Epiphytic.

Distribution: It was known from India as *M. caledonica* Steph. collected from India-

orientalis (So, 2003) without any precise locality. After a long gap the present authors could collect this species from the Western Ghats of Parambikulam Tiger Reserve. It is also distributed in Eastern North America (U.S.A., Canada), South America (Colombia), Mexico and Japan.

ANEURACEAE

Riccardia levieri Schiffn., Osterr. Bot. Zeitschr. 49: 130. 1899.

Habitat: Plants grow in mats on moist and shady rocks and stones near streams above 800 m altitude in moist deciduous, semi-evergreen, evergreen and shola forests.

Distribution: It has a wide distribution in South India (Kerala, Tamil Nadu, Karnataka), Central and North India.

Riccardia multifida (L.) S.Gray, Nat. Arr. Brit. Pl. 1: 684. 1821.

Habitat: Growing in moist and shady places on rocks and on exposed roots of higher plants.

Distribution: This is a very common species of *Riccardia* and widely distributed.

Riccardia tenuicostata Schiffn., Denkschr. Math. Nat. Cl. Kais. Akad. Wiss. Wien. 67: 166. 1898.

Habitat: On moist rocks and on exposed roots of higher plants and in fern rhizome in semi-shaded areas of moist deciduous and semi-evergreen forests.

Distribution: It is distributed in South India (Kerala; Tamil Nadu: Kodaikanal), North India (Darjeeling, Western Himalayas), Singapore and Java.

Riccardia villosa (Steph.) Pande et Srivastava, Biological Memoirs 1: 129. 1976.

Habitat: On rocky patch.

Distribution: South India (Kerala, Tamil Nadu) and North India (Eastern Himalayas, West Khasi Hills).

TRICHOCOLEACEAE

Trichocolea tomentella (Ehrh.) Dumort., Syll. Jungerm. Europ. 67. 1831.

Habitat: Plants form extensive, pale whitish-green patches on very damp, shaded rocks in riverine areas of evergreen and shola forests.

Distribution: This is a high altitude species South India (Kerala, Tamil Nadu), Northern India (Western Himalaya) and China.

GEOCALYCACEAE

Chiloscyphus muricatus (Lehm.) J.J.Engel & R.M.Schust., Nova Hedwigia 39: 419. 1984[1985].

Ecology: On land cuttings near stream.

Distribution: In India this species is found distributed only in Tamil Nadu and Kerala; China, Brazil, United states.

Chiloscyphus polyanthus (L.) Corda in Sturm. D. Crypt. 19, p.35 in Stephani, Spec. Hepat., 3: 259 (1908).

Habitat: Plants grow on soil, soil covered rocks, on rocks in pure population or in association with *Folioceros assamicus*, *Jungermannia* sp. and *Scapania* sp., at 1300m altitude.

Distribution: Eastern Himalayas, Meghalaya, East Khasi Hills; Kerala (Idukki).

Heteroscyphus argutus (Nees) Schiffn., Osterr. Bot. Zeitschr. 60: 172. 1910.

Habitat: On rotten logs, rocky patches, soil and roots of higher plants along stream banks in semi-evergreen and evergreen forests.

Distribution: In India this is common in South India (Kerala, Karnataka, Palni hills), North-east India (Kerala, Darjeeling, West Himalaya, Pachmahri, Assam, Sikkim, Manipur, Meghalaya). Its distribution extends to Borneo, Brazil, Myanmar, China, Java, Japan, New Guinea, New Zealand, the Philippines, Sumatra and Taiwan.

Heteroscyphus bescherellei (Steph.) S.Hatt., Bot. Mag. (Tokyo) 58: 39. 1944.

Habitat: on rocky patch in high altitude areas.

Distribution: India (Kerala), China.

Heteroscyphus coalitus (Hook.) Schiffn., Oesterr. Bot. Zeitschr. 60: 172. 1910.

Habitat: Occurring on rotten logs and moist soil often associated with other liverworts in semi-evergreen and evergreen forests.

Distribution: It is distributed in North-east India (Himalayas, Sikkim, Khasi hills), Andaman Islands, Myanmar, Bhutan, China, Java, Sumatra, Borneo, Japan, New Guinea, Philippines and Australia.

Heteroscyphus hyalinus (Steph.) Srivast. et Srivast., Indian Geocalycaceae (Hepaticae): A Taxonomic Study 118. 2002.

Habitat: On rocky patch and on land cuttings in evergreen forests.

Distribution: India (Himalayas and Kerala).

Heteroscyphus perfoliatus (Montin) Schiffn., Oesterr. Bot. Zeitschr. 60: 171. 1910.

Habitat: Epiphytic on shola trees.

Distribution: South India (Kerala, Tamil Nadu: Nilgiri hills) and North-east India (Sikkim).

Heteroscyphus splendens (Lehm. & Lindenb.) Grolle., Acta Botanica Fennica 125: 68. 1984.

Habitat: On land cuttings in riverine area.

Distribution: India (Kerala), China.

Lophocolea minor Nees, Naturg. Eur. Leberm. 2: 330. 1836.

Habitat: On land cuttings and on rocks.

Distribution: India (Western & Eastern Himalayas, Central India, Kerala: Present collection), Europe, America, Asia, China, Nepal, Japan, Siberia, Korea.

Lophocolea bidentata (L.) Dum. Rec. d'Obs, 17. 1835.

Habitat: Plants grow epiphytically on bark in association with *Porella* sp., *Spruceanthus* sp., *Cheilolejeune imbricata*, *Radula* sp., etc.

Distribution: India (Eastern Himalayas: Meghalaya, East Khasi Hills; Kerala).

LEPIDOZIACEAE

Bazzania tridens (Reinw., Blume et Nees) Trev., Mem. R. Instit. Lombardo ser. 3, 4: 415. 1877.

Habitat: Commonly terrestrial, on humus-enriched soil, cliff, rocks, sometimes epiphytic on tree trunks, frequently associated with other species of *Chiloscyphus*.

Distribution: India (Tamil Nadu, Kerala, Eastern Himalaya, Assam, Meghalaya, Shillong, West-Bengal, Kerala; (Kozhikode; Vellarimala, Thusharagiri, Idukki; Mlappara); Sri Lanka, Bhutan, China, Japan, Borneo, Korea, Java, Myanmar, Philippines, Samoa, Sumatra, Taiwan, Thailand, Vietnam.

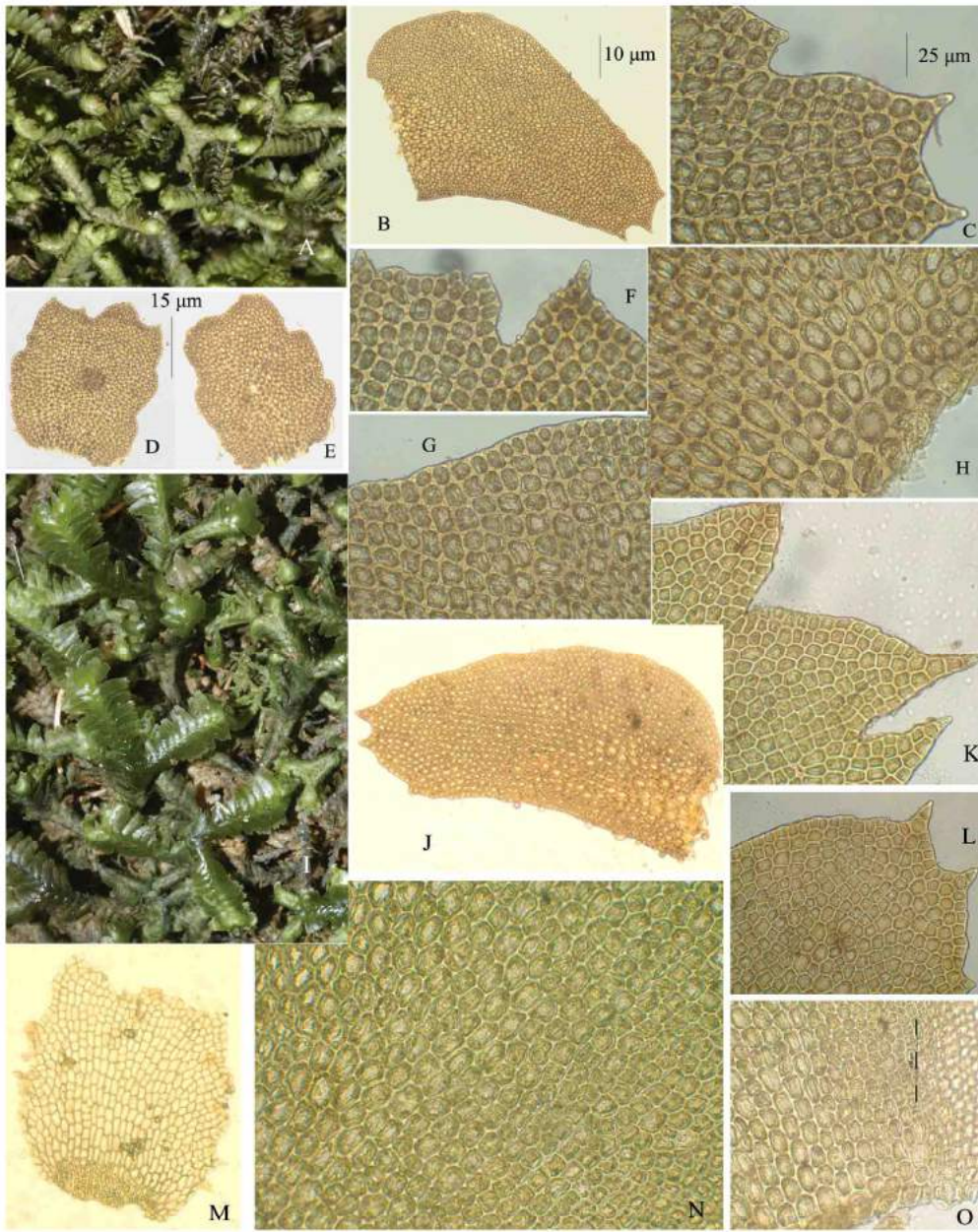
PLAGIOCHILACEAE

Plagiochila arbuscula (Brid. ex Lehm. & Lindenb.) Lindenb., Sp. Hepat. (*Plagiochila* fasc. 1): 23. 1839.

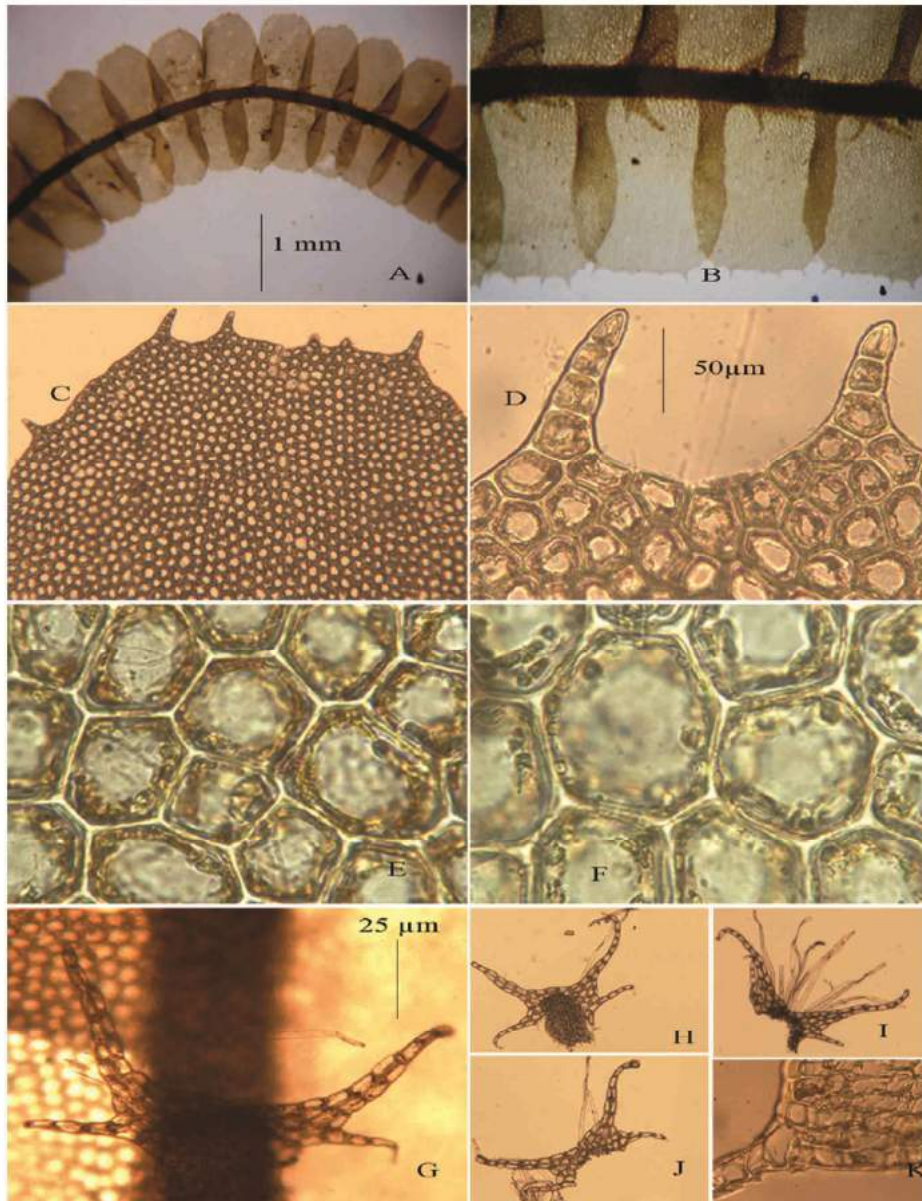
Habitat: Epiphytic.

Distribution: India (Kerala), China, Fiji, Indonesia, Japan, New Caledonia, Papua New Guinea, Samoa, Solomon Islands, Tahiti and Thailand.

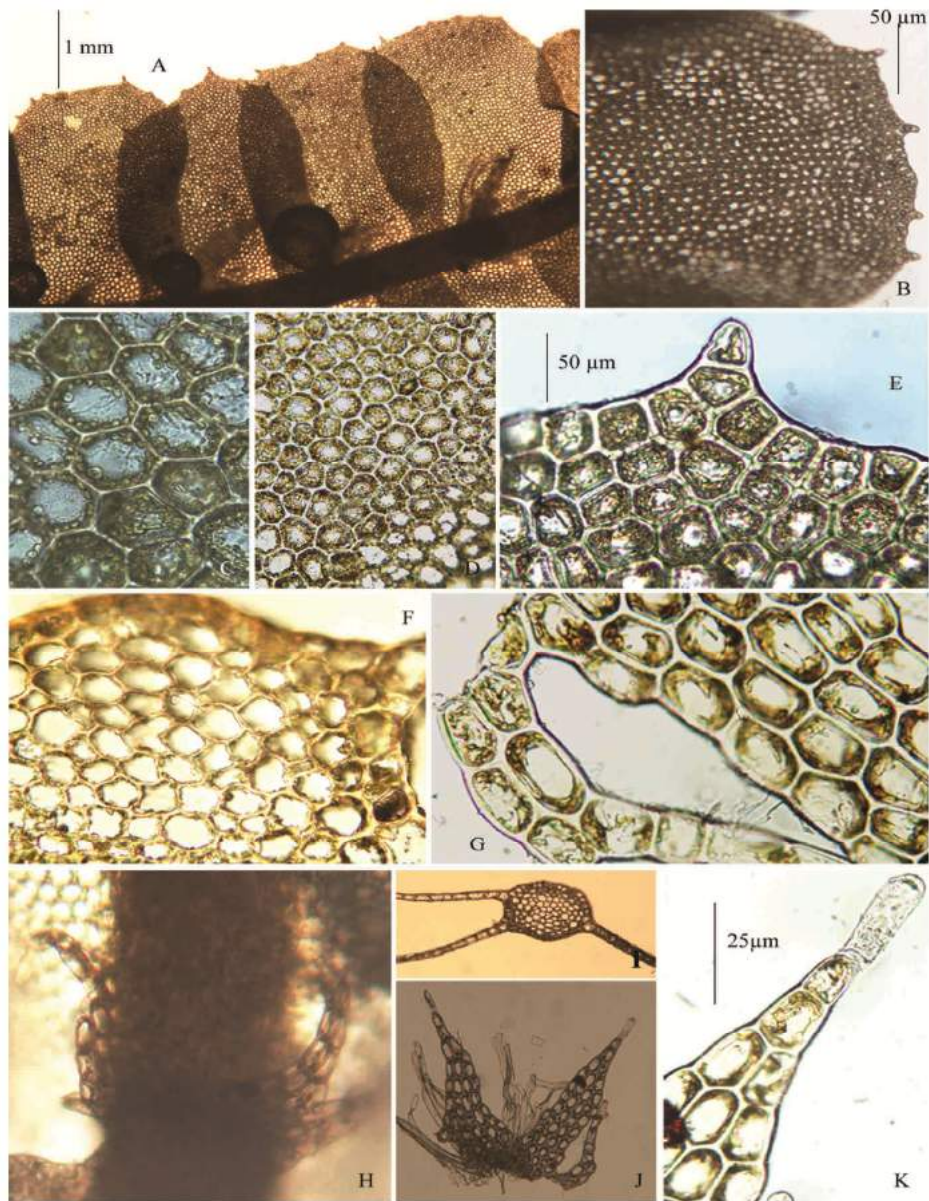
Plagiochila beddomei Steph., Bull. Herb. Boissier, ser. 2, 3: 876. 1903.



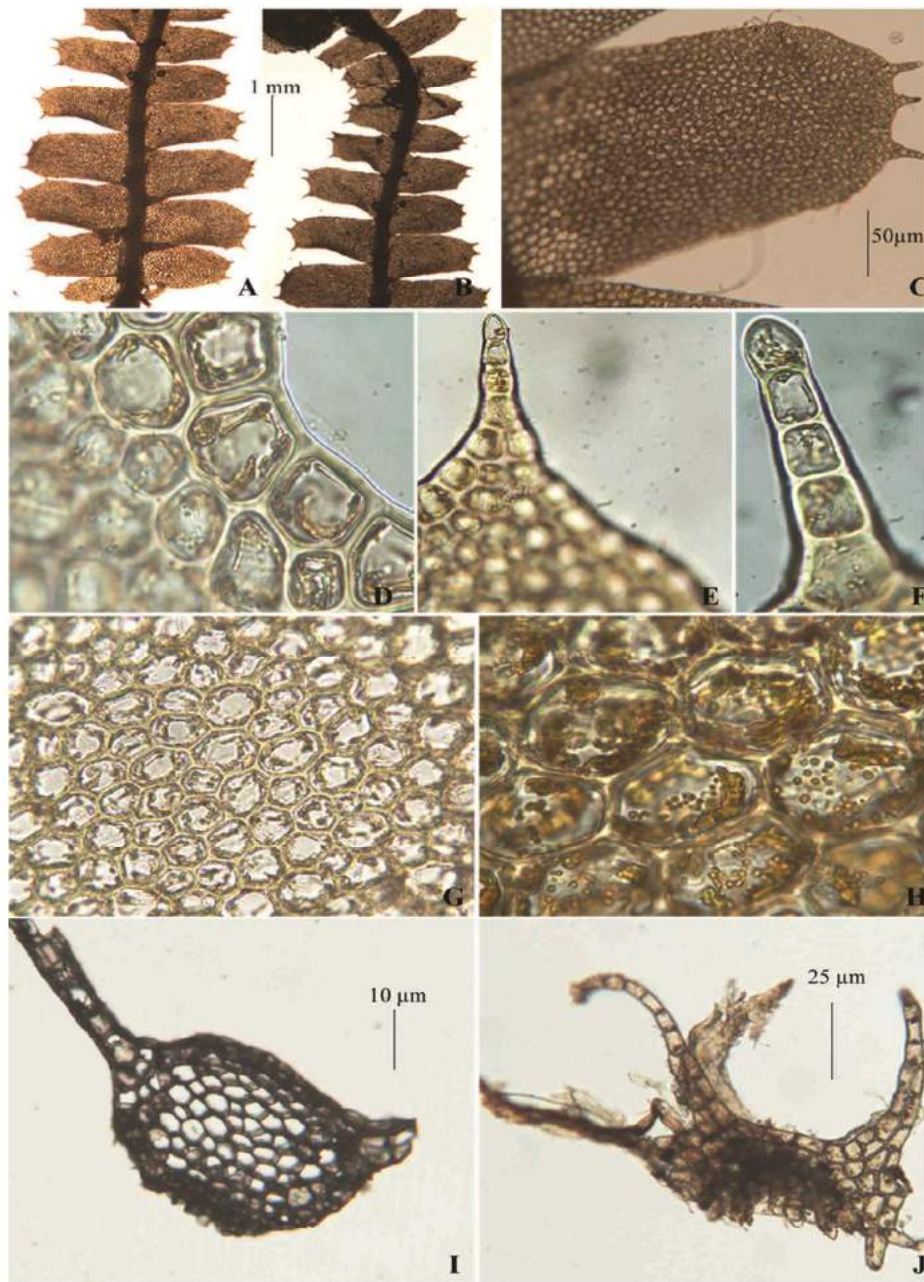
A-H. *Bazzania sumbavensis*, A. Habit, B. Leaf, C. Leaf tip, D&E. Underleaves, F. cells at underleaf, G. Cells at margin of leaf, H. Cells at base of leaf; I-O *Bazzania tridens* I: Habit, J: Leaf, K&L. Leaf tip, M. Underleaf, N. Leaf cells, O. Leaf basal cells; A&I, B&J, D&E same length, all other same length as C



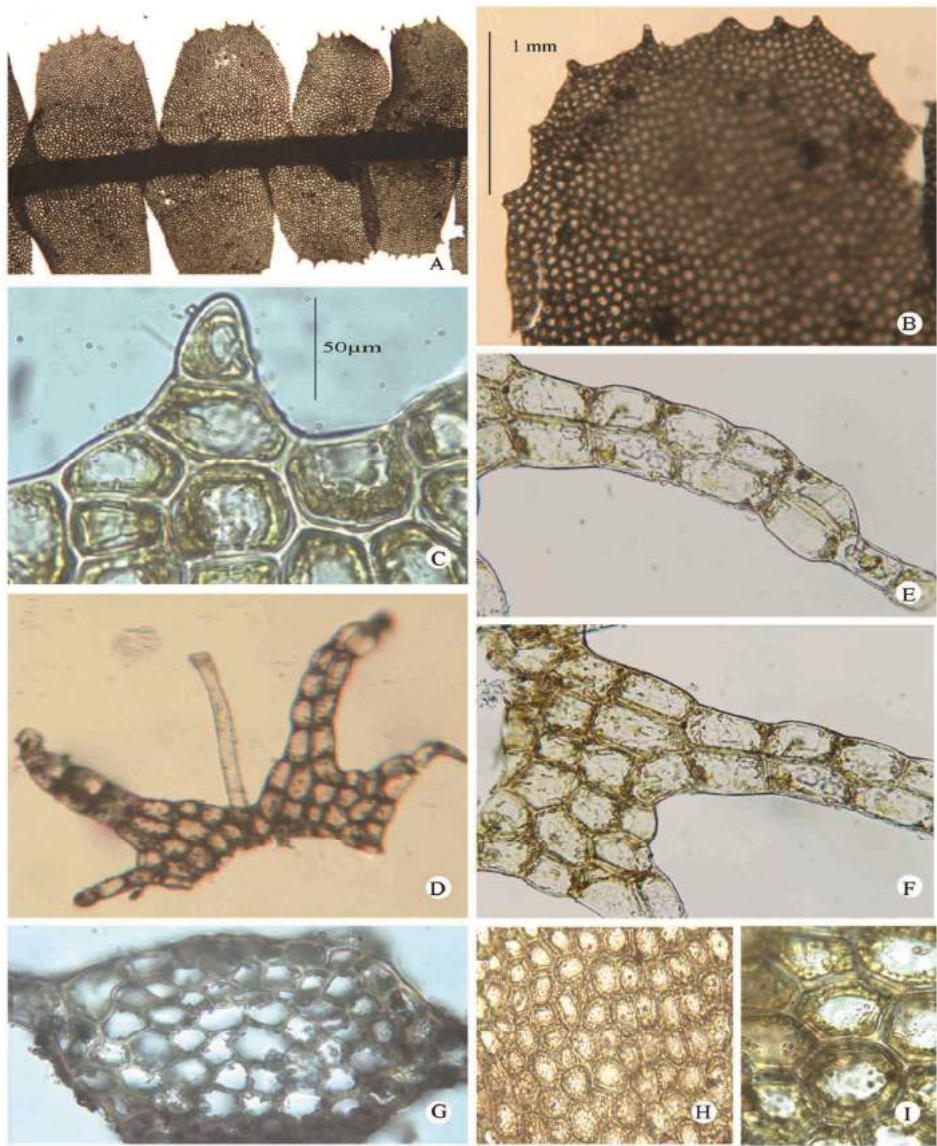
A-K. *Heteroscyphus argutus*, A. Habit dorsal view, B. Ventral view, C. Leaf spine at margin, D. enlarged view, E. Marginal cells, F. Basal cells, G-J. Underleaves, K. C.S. of stem (A-B,C-F,G-K same size)



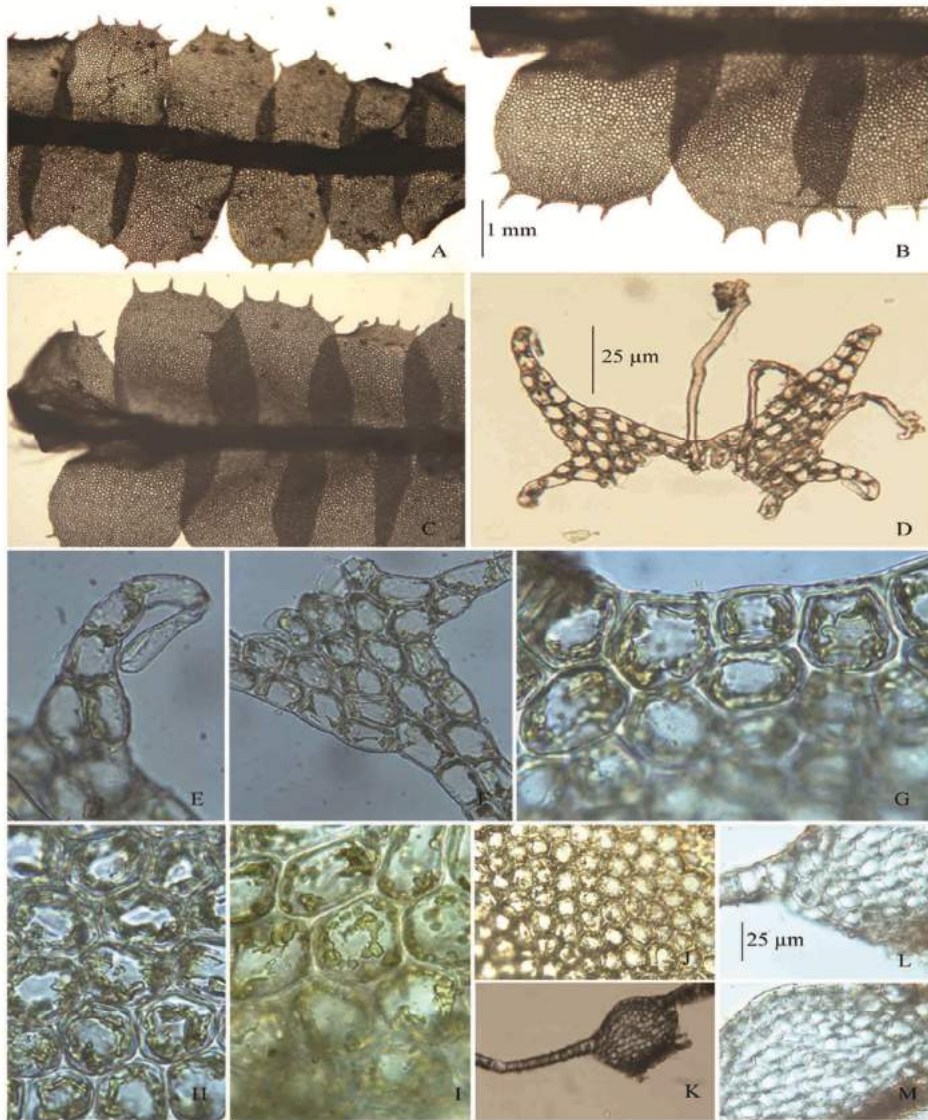
A-K. *Heteroscyphus bescherelei* A. Habit, B. Leaf margin with spines, C. Basal cells, D. Middle cells, E. Marginal cells, F. C.S. of stem, G. Underleaf base, H,J. Underleaves, I. C.S. of stem, K. Underleaf spine (C,F,G,K, same size)



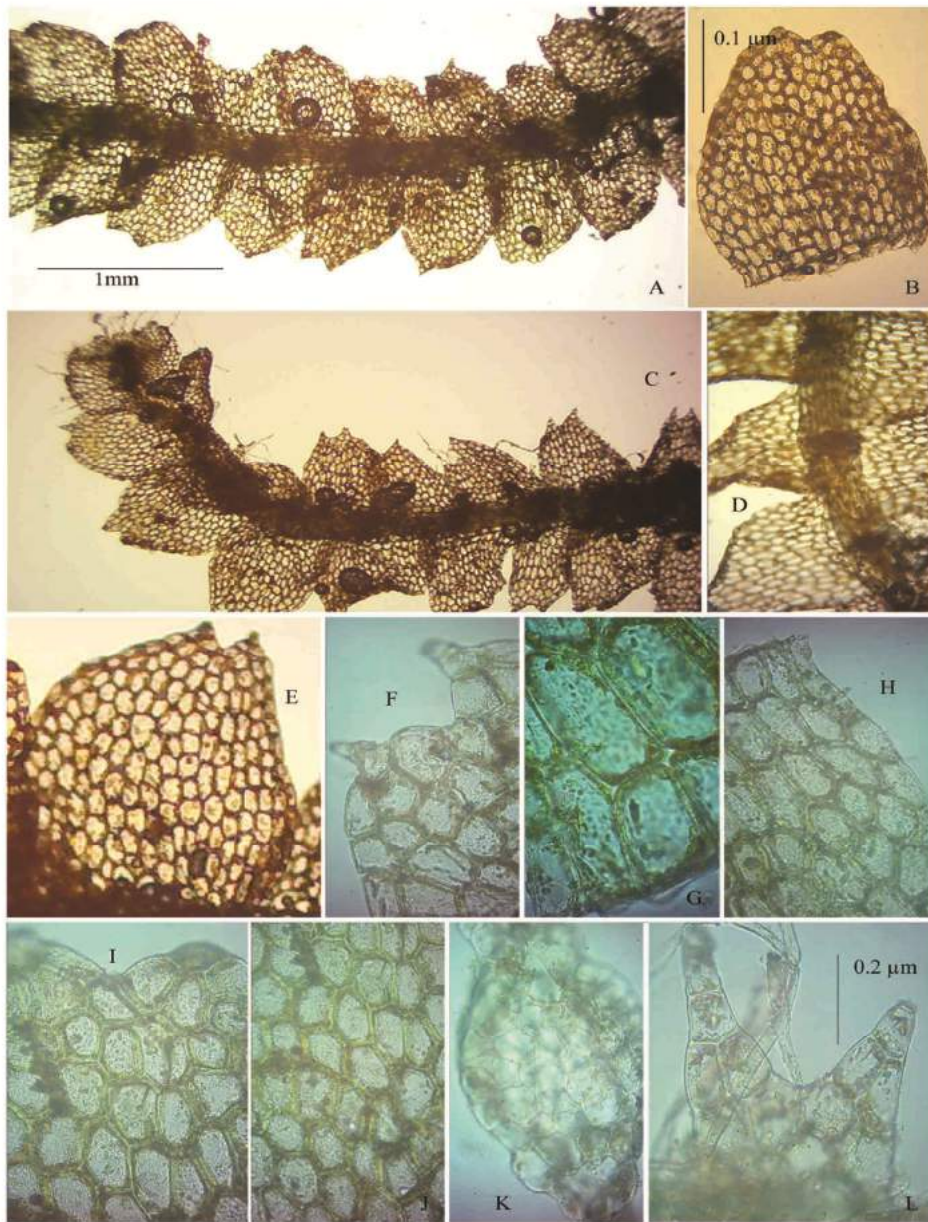
A-J. *Heteroscyphus coalius*, A-B.Habit, C. Leaf, D&G. Marginal cells, E-F. Spine, H. Basal cells, I. C.S. of stem, J. Underleaf (A-B,C-H same size)



A-I. *Heteroscyphus hyalinus*; A. Habit, B. Leaf margin with spines, C. Spine cells, D. Underleaf, E&F. Underleaf spine and base enlarged, G. C.S. of stem, H. Tip cells, I. Basal cells (A-B and C-I same size)



A-M. *Heteroscyphus splendens*, A-C. Habit, D. Underleaf, E-F. Underleaf spine and base, G. Leaf marginal cells, H. Middle cells, I. basal cells, J. Stem cells, K-M. C.S. of stem, (A-C,D-I,J-M same size)



A-L. *Lophocolea bidentata*, A. C-D. Habit, B,E. Leaf, F. Leaf tip cells, G-K. Leaf cells, L. Underleaf (A,C,D;B-E,F-L same size)

Habitat: Epiphytic and on small twigs on shola and evergreen species of *Syzygium wightianum*.

Distribution: South India (Kerala, Tamil Nadu), China and Thailand.

Plagiochila bischleriana Grolle & M.L.So, Cryptogamie: Bryologie, Lichénologie 18: 191. f. 1. 1997.

Habitat : On bark.

Distribution : India (Kerala), Nepal.

Plagiochila chinensis Steph., Mem. Soc. Sci. Nat. Cherbourg 29: 223. 1894.

Habitat: Epiphytic and on small twigs on shola trees alongwith mosses and other leafy liverworts.

Distribution: South India (Kerala) China, Vietnam, Thailand, Bhutan, Nepal and Pakistan.

Plagiochila devexa Steph., Bull. Herb. Boissier, ser. 2, 3: 340. 1903.

Habitat: Upper part of tree trunks in evergreen forests.

Distribution: South India (Kerala) North-east India (Sikkim, Himalaya), China, Bhutan, Nepal, and Sri Lanka.

Plagiochila durelii Sciffn., Oesterr. Bot. Z.) 49: 131. 1899.

Habitat: Epiphytic.

Distribution: It is distributed in India (Kerala, West Bengal, Sikkim, Meghalaya, Himachal Pradesh), Bhutan, China, Nepal, Thailand and Vietnam.

Plagiochila fruticosa Mitt., J. Proc. Linn. Soc., Bot. 5: 94. 1860.

Habitat: Basal and upper part of tree trunks, on branches and twigs of shola trees and also on rocks.

Distribution: South India (Kerala) North-east India (Assam, Sikkim, Himalaya, Darjeeling, West Bengal), China, Bhutan, Japan, Thailand and Philippines.

Plagiochila parvifolia Lindb., Hedwigia

Habitat: Epiphytic.

Distribution: It is distributed in Southern India (Kerala, Tamil Nadu), North-eastern India (Himalaya, Assam, Sikkim), Bangladesh, Bhutan, China, Japan, Java, Korea, Myanmar, Papua New Guinea, Philippines, Sri Lanka, Thailand and Vietnam.

CEPHALOZIELLACEAE

Cephaloziella kiaerii (Austin) S. Arnell, Bot. Not. 319. 1952.

Habitat: Seen on exposed soil along with *Anoetangium bicolor* in Tea estate.

Distribution: South India (Kerala, Tamil Nadu: Nilgiri, Palni hills, Kodaikanal, Mahabaleswar), Sri Lanka and China.

Cylindrocolea tagawae (Kitag.) Schust., Nova Hedwigia 22: 174. 1971.

Habitat: On soil cutting in semi-evergreen forest.

Distribution: South India (Kerala). It is also distributed in Pachmahri and Madhya Pradesh in India and Thailand.

JUNGERMANNIACEAE

Chandonanthus birmensis Steph., Sp. Hepat. 3: 643. 1909.

Habitat: Upper parts of tree trunk along with other mosses in shola forests.

Distribution: South India (Kerala) North-east India (Sikkim, Darjeeling), China, Nepal, Myanmar, Java, Japan, Ryukyu, Taiwan, Madagascar, Canada, Pacific Islands and Africa.

Jungermannia appressifolia Mitt., J. Proc. Linn. Soc. London 5: 91. 1861.

Habitat: It is seen near watercourses in soil, on small rocks and stones in grasslands along with *Utricularia* sp. and *Pilea microphylla* in semi-evergreen and evergreen forests.

Distribution: South India (Kerala) China and Japan.

Jungermannia macrocarpa Steph., Sp. Hepat. 6: 87. 1917.

Habitat: It is seen as mat in earth cuttings in semi-shaded areas in homestead.

Distribution: This species has been reported to occur in Kerala, Eastern Himalayas, East Nepal and Darjeeling.

Jungermannia obliquifolia (Schiffn.) Váňa, J. Hattori Bot. Lab. 36: 68. 1972.

Habitat: On land cuttings in wet evergreen forests.

Distribution: India (Kerala) Java, Celebes, Sumatra, Philippines and Australia (Váňa, 1975).

Jungermannia rubripunctata (Hatt.) Amakawa, J. Hattori Bot. Lab. 22: 38. 1960.

Habitat: On marshy area.

Distribution: India (Kerala, Assam, Meghalaya).

Jungermannia shinii Amakawa, J. Hattori Bot. Lab. 33: 153-160. 1970.

Habitat: On marshy grass land.

Distribution: India (Assam, Meghalaya, Kerala).

Jungermannia tetragona Lindenb., Botanische Zeitung (Berlin) 6: 462. 1848.

Habitat: On land cuttings

Distribution: India (Kerala) China, Japan.

Jungermannia truncata Nees, Enumeratio Plantarum Cryptogamicarum Javae 29. 1830.

Habitat: On land cuttings and on rocky patch.

Distribution: India (China, Japan).

Notoscyphus paroicus Schiffn., Denkschriften der Kaiserlichen Akademie der Wissenschaften. Mathematisch-naturwissenschaftliche Klasse 67: 192. 1898.

Habitat: On rocky patch.

Distribution: India (Himalayas, Kerala) (**Present collection is a new record for Peninsular India**)

Notoscyphus pandei Udar & Kumar, Journal of the Hattori Botanical Laboratory 49: 256. f. 41-68. 1981.

Habitat: On rocky patch.

Distribution: India (Himalayas, Kerala).

Odontoschisma denudatum (Nees) Dumort., Recueil Observ. Jungerm. 19. 1835.

Habitat: On moist rocky patch.

Distribution: India (Meghalaya, Assam, Kerala) (**New record for Peninsular India and new genus record for Kerala**)

PORELLACEAE

Porella acutifolia (Lehm. & Lindenb.) Trevis., Mem. Reale Ist. Lombardo Sci. ser. 3, 4: 408. 1877.

Habitat: Epiphytic on evergreen and shola trees.

Distribution: In India it is known from South India only (Kerala, Tamil Nadu: Madras, Nilgiri hills, Anamalai hills). The species extends to Malay Archipelago including New Guinea and tropical regions of Continental Asia, northward to Ryukyu Islands of Japan.

Porella campylophylla (Lehm. & Lindenb.) Trevis., Mem. Real. Ist. Lombardo Sci. ser. 3,4: 408. 1877.

Habitat: Corticolous and on rocks in semi-evergreen, evergreen and shola

forests.

Distribution: South India (Kerala- Vellarimala, Thirunelli, Chembra; Tamil Nadu), North-east India (Darjeeling, Kumaon, Assam, Sikkim), Nepal, Myanmar and Vietnam.

JUBULACEAE

Frullania acutiloba Mitt., J. Proc. Linn. Soc. 5: 120. 1861.

Habitat: Upper part of tree trunk and on branches associated with *Cheilolejeunea* sp. in moist deciduous forests.

Distribution: South India (Kerala-Aralam WLS, Wayanad WLS; Tamil Nadu; Eastern India- Khasi hills, Assam), Sri Lanka, China, Java and Japan.

Frullania calcarata Aongstr., Oepl. Vet.-Akad. Forh. Stockholm 30(5): 137. 1873.

Habitat: On small branches of *Terminalia bellerica* and on logs in moist deciduous forests.

Distribution: It is distributed in South India (Kerala), North India (Pachmahri), Tahiti and New Guinea.

Frullania muscicola Steph., Hedwigia, 146. 1894.

Habitat: On logs and branches in moist deciduous forests.

Distribution: The species is widely distributed in South India (Kerala), North-east India (Mussorie, Garhwal), China, Japan, Korea, Manchuria, Mongolia and Nepal.

Frullania squarrosa (Reinw. et. al.) Nees in Gottsche et al., Syn. Hep. 416. 1845.

Habitat: On bark of trees and on logs alongwith foliose lichens in moist deciduous and semi-evergreen forests.

Distribution: South India (Kerala, Tamil Nadu) Western Himalayas.

Frullania tamarisci (L.) Dumort., Rec. Obs. Jungerm. Tournay 13. 1835.

Habitat: Epiphytic on a variety of trees.

Distribution: This South Indian endemic species is known to occur in Kerala and Tamil Nadu.

LEJEUNEACEAE

Archilejeunea minutilobula Udar & U.S.Awasthi, Geophytology 11: 77. f. 18-38. 1981.

Habitat: On bark.

Distribution: India (Maharashtra, Tamil Nadu, Kerala). **Western Ghats endemic. The present collection is a new record for Kerala.**

Caudalejeunea reniloba (Gott.) Steph., Species Hepaticarum 5: 16. 1912.

Habitat: Epiphytic.

Distribution: Widespread from India to the Pacific Islands.

Cheilolejeunea giraldiana (Massari) Mizut., J. Hattori Bot. Lab. 27: 141. 1964.

Habitat: Corticolous in semi-evergreen forests.

Distribution: The species is distributed in South India (Kerala, Tamil Nadu), North-east India (Darjeeling, Sikkim), China, Japan, Nepal and Philippines.

Cheilolejeunea intertexta (Lindenb.) Steph., Bull. Herb. Boiss 5: 79. 1897.

Habitat: On rocky patches in semi-evergreen forests.

Distribution: South India (Kerala, Tamil Nadu), Andaman & Nicobar Islands, Sri Lanka, Java, Japan, Malaya, Philippines, Samoa, Sumatra and Tahiti.

Cheilolejeunea krakammae (Lindenb.) R.M.Schust., Beih. Nova Hedwigia 9: 112. 1963.

Habitat: On bark.

Distribution: Widespread in tropical Africa, Asia and Oceania. In India it is distributed in Kerala (Wayanad), North Eastern region.

Cheilolejeunea serpentina (Mitt.) Mizut., J. Hattori Bot. Lab. 26: 171. 1963.

Habitat: Epiphyllous in evergreen forests.

Distribution: The species is rare in the area. It is distributed in South India (Kerala; Tamil Nadu: Western Ghats of Kanyakumari, Madras), North India (Pachmahri), Andaman & Nicobar Islands, Sri Lanka, Cameroon, Caroline Islands, Java, Madagascar, Malacca, Philippines, Singapore, Sumatra, Seychelles and Thailand.

Cheilolejeunea subopaca (Mitt.) Mizut., J. Hattori Bot. Lab. 26: 183. 1963.

Habitat: Epiphyllous on *Leptochilus* sp.

Distribution: India (Kerala, Sikkim, Assam, West Bengal), Nepal, Bhutan. **Endemic to the Indian subcontinent.**

Cololejeunea appressa (A.Evans) Benedix, Feddes Repert. Spec. Nov. Regni Veg. Beih. 134: 31. 1953[1953].

Habitat: Epiphytic.

Distribution: In India this species is distributed in Kerala, Karnataka, Meghalaya, Tamil Nadu, Andaman and West Bengal; **the present collection is a new record for Kerala. A Pantropical species.**

Cololejeunea foliicola Srivastava & Srivastava, Proc. Indian Acad. Sci., Pl. Sci. 99: 86. f. 21--49. 1989.

Habitat: Foliicolous on *Mallotus* sp.

Distribution: Earlier this species was known only from Karnataka, **the present report extends its distribution range to Kerala also. (Endemic to South India)**

Cololejeunea furcilibulata (Berrie & E.W.Jones) R.M.Schust., Beih. Nova Hedwigia 9: 178. 1963.

Habitat: Ramicolous

Distribution: Scattered over tropical Africa and India (Karnataka & Kerala)

Cololejeunea hasskarliana (Lehm. & Lindenb.) Steph., Hedwigia 29: 72. 1890.

Habitat: On the leaf of *Leptochilus* sp.

Distribution: India (Kerala, Tamil Nadu, Karnataka), in Africa only Réunion and Seychelles, Widespread in tropical and subtropical Asia, Australia and Oceania.

Cololejeunea kashyapii Udar & Srivastava, Geophytology 15: 64. f. 1--22. 1985.

Habitat: Corticolous.

Distribution: Earlier this species was known only from Karnataka, **the present report extends its distribution range to Kerala also. (Endemic to South India).**

Cololejeunea lanciloba Steph., Hedwigia 34: 250. 1895.

Habitat: On leaf of *Mangifera indica*.

Distribution: In India: Kerala, Andaman & Nicobar Islands, Meghalaya, Eastern Hiamalayas and Mysore. A widespread Palaeotropic species distributed from tropical Africa and Asia, Australasia and Oceania.

Cololejeunea latilobula (Herzog) Tixier, Bryophyt. Biblioth. 27: 156. 1985.

Habitat: On leaves of *Mangifera indica*.

Distribution: Palaeotropic species distributed from Africa to China and Vietnam and Fiji Islands, widespread in India.

Cololejeunea longifolia (Mitt.) Benedix, Feddes Repert. Spec. Nov. Regni Veg. Beih.134: 15. 1953.

Habitat: On bark.

Distribution: India (Kerala, Sikkim, Arunachal Pradesh), Japan, Korea, Formosa, China, Malay Peninsula, Bangladesh, Thailand, Sri Lanka, Bhutan, New Caledonia, New Guinea and Fiji Islands.



A. *Cheilolejeunea giraldiana*, B. *Cheilolejeunea serpentina*, C. *Cololejeunea hasskarliana*, D. *Cololejeunea foliicola*, E. *Cololejeunea madothecoides*, F. *Cololejeunea lanciloba*, G. *Cololejeunea latilobula*, H. *Cololejeunea nilgiriensis*



A. *Lejeunea helenae*, B. *Lejeunea stevensiana*, C. *Lejeunea tuberculosa*, D. *Lejeunea flava*,
E. *Schiffneriolejeunea polycarpa*, F. *Schiffneriolejeunea pulopenangensis*

Cololejeunea madothecoides (Steph.) Benedix, Feddes Repert. Spec. Nov. Regni Veg. Beih. 134: 81. 1953.

Habitat: Epiphyllous.

Distribution: India (Kerala, Assam, Tamil Nadu), from Indochina to Japan and Borneo.

Cololejeunea mizutaniana Udar & Srivastava, Misc. Bryol. Lichenol. 9: 138. f. 1. 1983.

Habitat: Corticolous.

Distribution: Earlier this species was known only from Karnataka, **the present report extends its distribution range to Kerala also. (Endemic to South India)**

Cololejeunea nilgiriensis Asthana & Srivastava, Bryophyt. Biblioth. 60: 27. 2003.

Habitat: On bark.

Distribution: Earlier this species was known only from Tamil Nadu, **the present report extends its distribution range to Kerala also. (Endemic to South India)**

Cololejeunea planissima (Mitt.) Abeyw., Ceylon J. Sci., Biol. Sci. 2: 73. 1959.

Habitat: On bark.

Distribution: In India this species is distributed in Kerala, Tamil Nadu, Eastern Himalayas and Meghalaya. A palaeotropic species distributed from East Africa through tropical and subtropical Asia to Australasia and Micronesia.

Cololejeunea raduliloba Steph., Hedwigia 34: 251. 1895.

Habitat: Epiphyllous on *Trichomanes proliferum*.

Distribution: India (Assam, Kerala), Nepal. From the East African islands through China, Japan, Vietnam, Taiwan, to Australia, New Caledonia and Fiji Islands.

Cololejeunea udarii G. Asthana & S.C. Srivast., Bryophytorum Bibliotheca 60: 40. 2003.

Habitat: On the fronds of *Angiopteris indica*.

Distribution: This Indian endemic species is distributed in Kerala, Karnataka, Tamil Nadu, Arunachal Pradesh and Assam. **The present collection is a new record for Kerala. (Endemic to India).**

Lejeunea cocoes Mitt., J. Proc. Linn. Soc. Bot. 5: 114. 1861.

Habitat: On bark and on small branches.

Distribution: India (Kerala, Eastern Himalayas: Khasi hills, Cherrapunji), Diego Garcia, Chagos, Sri Lanka, China incl. Taiwan, Java, Sarawak and Fiji Islands.

This collection forms new record for Peninsular India.

Lejeunea discreta Lindenb., Syn. Hepat. 361. 1845.

Habitat: Corticolous on riparian vegetation in moist deciduous forest.

Distribution: South India (Kerala, Tamil Nadu), North-east India (West Bengal, Himalayas, Sikkim), Sri Lanka, Bhutan, Borneo, Cambodia, Japan, Java, Kampuchea, Moluccas, Nepal, New Caledonia, Papua New Guinea, Philippines and Sumatra.

Lejeunea exilis (Reinw. et al.) Grolle, J. Hattori Bot. Lab. 46: 353. 1979.

Habitat: Epiphytic alongwith *Heteroscyphus* sp. and *Cephaloziella kiaerii* in shola forests.

Distribution: India (Kerala), China, Borneo, Carolines, Japan, Java, New Guinea and Philippines.

Lejeunea flava (Sw.) Nees, Naturgesch. Eur. Leberm. 3: 277. 1838.

Habitat: Epiphytic.

Distribution: Widespread Pantropical species.

Lejeunea helenae (Pears.) Pearson, Forh. Vidensk.-Selsk. Krist. 1886(3): 6. 1886.

Habitat: On logs alongwith *Leucophanes octoblepharoides* in homestead.

Distribution: The known distribution of *L. helenae* is from India (Kerala) Uganda and Malawi in Africa.

Lejeunea obfusca Mitt., J. Proc. Linn. Soc. London 5: 114. 1861.

Habitat: Base of tree trunk on *Mangifera indica* in homestead area.

Distribution: South India (Kerala), North India (Pachmahri) and Sri Lanka.

Lejeunea pallide-virens S.Hatt., J. Hattori Bot. Lab. 12: 80. 1954.

Habitat: Epiphytic.

Distribution: Distributed in India (Kerala), China and Japan.

Lejeunea princeps (Steph.) Mizut., J. Hattori Bot. Lab. 34: 454. 1971.

Habitat: On small branches.

Distribution: Endemic to the Indian subcontinent: India (Kerala, West Bengal, Assam, Sikkim) and Nepal.

Lejeunea stevensiana (Steph.) Mizut., J. Hattori Bot. Lab. 34: 452. 1971.

Habitat: On rocks.

Distribution: India (Sikkim, Himalayas, Khasi hills, Kerala), China, Bhutan and Nepal.

Lejeunea subacuta Mitt., J.Proc. Linn. Soc. Bot. 5: 113. 1861

Habitat: Foliicolous on *Liparis viridiflora*.

Distribution: China, India (Sikkim, Kerala), Nepal, Sri Lanka.

Lejeunea tuberculosa Steph., Sp. Hepat. 5: 790. 1915.

Habitat: This species form large, loose patches on rocks, sometimes on tree trunks and logs in semi-evergreen forests.

Distribution: It is distributed in South India (Kerala), Eastern India (Assam, Mussoorie hills, Sikkim), Bhutan, Nepal and Philippines.

Leptolejeunea balansae Steph., Hedwigia 35: 105. 1896.

Habitat: Epiphyllous.

Distribution: Widespread in Andaman Islands, Malaysia, Indonesia, China to Vietnam and India (Kerala).

Leptolejeunea foliicola Steph. Hedwigia 106. 1896.

Habitat: Foliicolous.

Distribution: In India it is distributed in Kerala and Tamil Nadu. Also distributed in Japan, Java and Philippines.

Lopholejeunea nigricans (Lindenb.) Schiffn., Consp. Hepat. Arch. Ind. 293. 1898.

Habitat : On small branches.

Distribution: A widespread pantropical species distributed in Southern India (Kerala, Tamil Nadu), North-east India (Himalayas, Assam), Japan, China, Papua New Guinea, Brazil, Bolivia, Kenya and Africa.

Lopholejeunea subfusca (Nees) Steph., Hedwigia 29: 16. 1890.

Habitat: Base of tree trunk of *Tectona grandis* and *Terminalia bellerica* in semi-evergreen forests.

Distribution: South India (Kerala, Karnataka, Tamil Nadu), North-east India (West Bengal, Meghalaya, Sikkim), Andaman Islands, Sri Lanka, Borneo, Carolina Islands, China, Taiwan, Ryukyu Island, Japan, Java, Madagascar, Malaya, Marshal Island, New Guinea, New Caledonia, Philippines, Sumatra, Tahiti and Thailand.

Mastigolejeunea auriculata (Wilson & Hook.) Schiffn., Hepat. (Engl.-Prantl) 129. 1893.

Habitat: On bark and branches of *Plumeria alba*.

Distribution: A widely distributed pan tropical species.

Mastigolejeunea humilis (Gott.) Schiffn., in Engl. & Prantl, Nat. Pfl.-fam.1,3: 129. 1895.

Habitat: On bark.

Distribution: A widely distributed species in India (Kerala, Meghalaya), Nepal, Japan, Java, Formosa and Ryukyu.

Mastigolejeunea indica Steph., Sp. Hepat. 4: 776. 1912.

Habitat: On bark.

Distribution: A species known from Kerala, Andaman & Nicobar Islands and Thailand through Southern China to the Philippines and Australia.

Mastigolejeunea ligulata (Lehm. & Lindenb.) Schiffn., Consp. Hepat. Arch. Ind. 299. 1898.

Habitat: Epiphytic.

Distribution: Widespread in the Indo Pacific region, from India to New Guinea and to Australia.

Microlejeunea punctiformis (Taylor) Steph. Hedwigia 29:90. 1890.

Habitat: On rocks and on bark.

Distribution: Sri Lanka, India (Kerala), Nepal, Bhutan, China incl. Taiwan, Thailand and Vietnam (Zhu and So 2001).

Otolejeunea semperiana (Gottsche et Steph.) Grolle, Haussknechtia 2: 53. 1985.

Habitat: Epiphyllous.

Distribution: **New record for India.** Indomalayan species known from Southern China, Indonesia, Malaysia, the Philippines and from Papua New Guinea.

Schiffneriolejeunea polycarpa (Nees) Gradst., J. Hattori Bot. Lab. 38: 335. 1974.

Habitat: Epiphytic.

Distribution: India (Tamil Nadu, Kerala). A Pantropical species distributed from tropical America through Africa to Sri Lanka and southern India.

Schiffneriolejeunea pulopenangensis (Gottsche) Gradst., J. Hattori Bot. Lab. 38: 335. 1974.

Habitat: On bark of *Polyalthia longifolia*.

Distribution: India (Kerala, Tamil Nadu, Karnataka), Sri Lanka, Malaysia, North Borneo, Moluccas and Japan.

Spruceanthus semirepandus (Nees) Verd., Ann. Bryol. Suppl. 4: 153. 1934.

Habitat: Epiphytic on shola trees as well as on rocky patches alongwith

Hypopterigium tenellum, *Plagiochila fruticosa* and *Lejeunea* sp.

Distribution: It is widely distributed on the shola trees. This species was earlier reported from South India (Kerala; Malabar WLS, Wayanad WLS, Vellarimala, Silent Valley; Karnataka; Tamil Nadu), Northeast India (Western Himalaya, Sikkim, Khasi hills, Meghalaya, Darjeeling), Sri Lanka, Japan, China, Java, Borneo, Philippines and Taiwan.

Tuyamaella angulistipa (Steph.) Schust. & Kachroo, J. Linn. Soc., Bot., 56: 508. 1961.

Habitat: On bark.

Distribution: India (Kerala), Known from Malaysia (Pahang, Sabah), Vietnam and Java; **New to India (not reported)**

RADULACEAE

Radula japonica Gottsche ex Steph. Hedwigia 23: 152. 1884.

Habitat: On branches as well as on soil and rocky patches alongwith *Plagiochila* sp. and *Cololejeunea* sp. in evergreen and shola forests.

Distribution: South India (Kerala), North India (Himalayas), China, Japan and Korea.

Radula javanica Gottsche in Gottsche *et al.*, Syn. Hepat. 257. 1845.

Habitat: Corticolous on trees of semi-evergreen and evergreen forests.

Distribution: It is a common species in the semi evergreen forests. It is widely distributed in the Asian and Pacific tropics and was earlier reported from South India (Kerala, Karnataka), North-east India (Assam, Khasi hills), Sri Lanka, Thailand, Vietnam, Sumatra, Java, Borneo, New Guinea, Philippines, Taiwan, China, Samoa, Japan and New Caledonia.

Radula kurzii Steph., Hedwigia 23: 153. 1884.

Habitat: Corticolous, on rocky patches or on leaf litter alongwith *Spruceanthus semirepandus*, *Plagiochila fruticosa* and *Lejeunea* sp. in evergreen and shola forests.

Distribution: This species is widely distributed in shola forests. Distributed in Kerala, Andaman Islands, Sri Lanka, China, Caledonia and Australia.

Radula meyeri Stephani, Hedwigia 27: 62. 1888.

Habitat: On bark.

Distribution: India (Kerala, Assam, Meghalaya) (**New record for Kerala**).

Radula obscura Mitt., J. Proc. Linn. Soc., Bot. 5: 107. 1861.

Habitat: On bark and branches.

Distribution: India (Kerala, Tamil Nadu, Western Himalayas) and China. **(New record for Kerala).**

ANTHOCEROTOPHYTA (Hornworts)

Plants thallose, dorsiventral, lobed, without internal differentiation of tissues, oil bodies present, rhizoids smooth, sporogonium without seta, with bulbous foot and intercalary meristem, capsule cylindrical to elongate.

Classification system of Hyvonen & Pippo (1993)

Order Anthocerotales Limpr. in Cohn

Family **Anthocerotaceae** Dumort.

Anthoceros (P.Micheli.) L., *Folioceros* D.C.Bhardwaj, *Leiosporoceros* Hassel de Men., *Mesoceros* Piippo, *Phaeoceros* Prosk., *Sphaerosporoceros* Hassel

Family **Dendrocerotaceae** (Milde) Hassel de Men.

Dendroceros Nees, *Megaceros* Campbell

Family **Notothyladaceae** (Milde) Muell.

Notothylas Sull.

ANTHOCEROTACEAE Dumort.

Anthoceros angustus St., Spec. Hep. 5: 1001. 1916.

Habitat: On land cuttings where water drips regularly.

Distribution: The species is distributed in India (Kerala, Sikkim, Western Himalayas, Eastern Himalayas) and Japan.

Anthoceros crispulus (Montin) Douin, Rev. Bryol. 32: 25. 1905.

Habitat: In earth cuttings in semi-evergreen forests.

Distribution: The species is distributed in the Western Himalayas, Eastern Himalayas, South India (Kerala (Wayanad, Kozhikode, Palakkad); Tamil Nadu), Sri Lanka, Japan, Korea, Malaysia, Europe and United States of America.

Phaeoceros laevis (L.) Prosk. subsp. *laevis* Prosk., Rapp & Comm. VIII. Congr. Intern. Bot., Paris 14-16: 69. 1954.

Habitat: On earth cuttings usually alongwith *Riccardia levieri* and on moist

rocks in semi-evergreen forests and grassland.

Distribution: It is a widely distributed species in South India (Tamil Nadu, Kerala, Karnataka) and Northern India (Eastern & Western Himalayas).

NOTOTHYLADACEAE Prosk.

Notothylas levieri Schiffn. ex Steph., Sp. Hep. 5: 1021. 1917.

Habitat: Grows in shady rocky patches of semi-evergreen and evergreen forests where water drips regularly along with *Riccardia multifida*, *Utricularia* and *Pilea microphylla*.

Distribution: The species has wide distribution in northern and central India (Western Himalaya, Central Himalaya, Mussorie, Simla). From South India the species was first described from Palakkad of Kerala State by Madhusoodanan and Nair (2003).

BRYOPHYTA (Moss)

Plants foliose, leaves usually many ranked, spirally arranged, rarely distichous, costate or ecostate, laminar cells isodiametric to linearly elongated; seta short or long; capsules vary in shape, with mouth, operculum and peristome teeth.

Mosses are the most speciose group among bryophytes, comprising approximately 10,000 or more species. They differ from liverworts and hornworts in several characters such as gametophyte composed of stems with undivided and often costate leaves, and a sporophyte terminated by a capsule that is elevated by the elongation of seta prior to maturity.

POLYTRICHACEAE Schwaegr.

Atrichum longifolium Cardot & Dixon ex Gangulee, Mosses E. India 1: 81. f. 33. 1969.

Habitat: On land cuttings

Distribution: India (Kerala, Eastern Hiamalaya, Assam) China.

Atrichum pallidum Renauld & Cardot, Bull. Soc. Roy. Bot. Belgique, 34(2): 63. 1895[1896].

Habitat: On land cuttings.

Distribution: India (Kerala, Tamil Nadu, Assam).

Pogonatum aloides (Hedw.) P. Beauv., Prodr. Aethéogam., 84. 1805.

Habitat: On land cuttings.

Distribution: India (Kerala, Tamil Nadu, Assam, Himalayas), Burma, China, Germany, Kenya, Spain

Pogonatum leucopogon Renaud & Cardot, Bull. Soc. Roy. Bot. Belgique, 34(2): 64. 1896.

Habitat: On land cuttings.

Distribution: A widely distributed species in tropics and sub tropics.

Pogonatum microstomum (Schwaegr.) Brid., Bryol. Univ. 2: 745. 1827.

Habitat: Along soil cuttings in grasslands, some times mixed with other mosses in semi-evergreen, evergreen forests and grassland area.

Distribution: This is a South-east Asiatic species reported from South India (Kerala; Chembra, Silent Valley, Parambikulam, New Amarambalam; Tamil Nadu), North-east India (Darjeeling, Western Himalaya, Meghalaya, Sikkim), Sri Lanka, Bhutan, Taiwan, Nepal, Philippines, Szechwan, Tonkin and Yunnan.

Diphysciaceae

Diphyscium mucronifolium Mitt., Bryol. Jav. 1: 35. pl. 26. 1855.

Habitat: On moist rocks.

Distribution: India (Kerala, Tamil Nadu), United states of America.

Diphyscium involutum Mitt., J. Proc. Linn. Soc., Bot., Suppl. 2: 149. 1859.

Habitat: On rocky patch.

Distribution: India (Kerala, Khasia Hills, Palni Hills) Sri Lanka and the Philippines.

DITRICHACEAE Limpr.

Ditrichum darjeelingense Renaud & Cardot, Bull. Soc. Bot. Belgium 41(1): 51. 1905.

Habitat: On soil cuttings in moist deciduous forests.

Distribution: This Indian endemic species was known from Darjeeling only. Recently It was collected from the green lands of Madayippara in Kannur district and from Tholpetty of Wayanad.

Garckeia flexuosa (Griff.) Margad. & Nork., J. Bryol. 7: 440. 1973.

Habitat: On the edges of earth cuttings and on brick walls in semi-shaded areas of homesteads, semi-evergreen, evergreen forests and in grasslands.

Distribution: It is widely distributed in South India (Kerala, Tamil Nadu,

Karnataka), North-east India (West Bengal, Darjeeling, Khasi hills, Tripura), Andaman Islands, Sri Lanka, Bhutan, Myanmar, Indochina, Japan, Java, Madagascar, Malaysia, Nepal, New Guinea, Philippines, Sumatra, Thailand, Australia, Oceania and Central America.

DICRANACEAE Schimp.

Campylopodium khasianum (Griff.) Paris, Index Bryol. Suppl. 237.1894.

Habitat: On soil cuttings in semi-evergreen and evergreen forests.

Distribution: This is an Indo Sri Lankan species earlier reported from South India (Kerala), North-east India (Darjeeling, Khasi hills) and Sri Lanka.

Campylopus ericoides (Griff.) A.Jaeger, Ber. Senckenberg. Naturf. Ges. 1870-71: 424. 1872.

Habitat: On rocky patches along with *Bryum* sp. and also on soil cuttings in grassland.

Distribution: It is a South-east Asiatic species distributed in South India (Kerala: Chembra, Aralam WLS, Silent Valley; Western Ghats of Thirunelveli, Agasthyamala), North-east India (Darjeeling, Khasi hills, Manipur, Meghalaya, West Bengal), Sri Lanka, Nepal, Myanmar, Thailand, Vietnam, Java and Philippines.

Campylopus flexuosus (Hedw.) Brid., Mant. Musc. 4: 71. 1819.

Habitat: On rocks and soil in grasslands.

Distribution: This is a cosmopolitan species mostly occurring in high altitude areas. It has been reported from South India (Kerala: Vellarimala, New Amarambalam), North India (Western Himalaya), China, East Nepal, Algeria, Abyssinia, Madagascar, New Zealand, Oceania and Siberia.

Campylopus involutus (C.Mueller) A.Jaeger., (Ber. Thätigk. St. Gallischen Naturwiss. Ges.) 1870-71: 418 (Gen. Sp. Musc. 1: 122). 1872.

Habitat: On rocky patches.

Distribution: An Indo-Malesian species distributed in North India (Darjeeling), Southern India (Tamil Nadu: Nilgiri hills; Kerala: Aralam WLS- present collection).

Campylopus pilifer Brid., Musc. Rec. Suppl. 4: 72. 1819 [1818].

Habitat: On soil cuttings in grasslands.

Distribution: India (Kerala), Ireland, Mexico, Guatemala, Costa Rica, Nicaragua and South Africa.

Campylopus richardii Brid., Muscol. Recent. Suppl., 4: 73. 1819[1818].

Habitat: On rocky patch in high altitude areas.

Distribution: A widely distributed species.

Campylopus subulatus Schimp. ex J.Milde., Bot. Zeitung (Berlin). 20: 460. 1862.

Habitat: On rocky patch and on land cuttings.

Distribution: India (Kerala), China, Mangolia, United states of America.

Leucoloma amoene-virens Mitt., Musc. Ind. Orient. 13. 1859.

Habitat: Base of tree trunks and on logs in evergreen and shola forests.

Distribution: It is an Indo-Sri Lankan species distributed in South India (Kerala- Widely distributed in high altitudes, Tamil Nadu), East India (Khasi hills) and Sri Lanka.

Trematodon longicollis Michx., Flora Bor. Amer. 2: 289. 1803.

Habitat: On soil cuttings in evergreen forests.

Distribution: It is a cosmopolitan species distributed in South India (Kerala: Chinnar WLS, Tamil nadu: Palni hills, Karnataka: Coorg), North-east India (Darjeeling, Bengal, Assam, Manipur, West Bengal, Western Himalaya), Sri Lanka, China, Japan, Ryukyu, Korea, Myanmar, Philippines, New Guinea, Taiwan, Siberia, South Africa, Europe and New Zealand.

LEUCOBRYACEAE Schimp.

Leucobryum bowringii Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 26. 1859.

Habitat: Epiphytic and also on logs.

Distribution: India (Kerala, Tamil Nadu, Himalayas) China, Japan, Java, Malaysia, New Guinea, Philippines, Sri Lanka, Thailand, Vietnam

Leucobryum juniperoideum (Brid.) C.Muell., Linnaea 18: 689. 1845.

Habitat: Corticolous or on logs in moist deciduous, semi-evergreen, evergreen and shola forests.

Distribution: It was recorded earlier from South India (Kerala- Wayanad WLS, Chembra, Silent Valley, Tamil Nadu), East India (Khasi hills) and Japan.

Leucobryum mittenii Besch., J. Bot. (Morot) 12: 287. 1898.

Habitat: On logs.

Distribution : It is distributed in India (Khasia Hills, Kerala) and Japan.

Leucobryum nilghiriense C.Muell., J. Proc. Linn. Soc., Bot., Suppl. 1: 26. 1859.

Habitat: On tree trunk.

Distribution: It is distributed in India (Darjeeling, Tamil Nadu, Kerala), East Nepal, Bhutan, Khasia Hills, Sri Lanka, Myanmar, Thailand, Vietnam, Sumatra, Java, Borneo, Celebes, Philippines, China, Korea, Japan and Fiji.

Leucophanes octoblepharoides Brid., Bryol. Univ. 1: 763. 1826.

Habitat: On logs along with *Lejeunea helenae* in homestead.

Distribution: It is an Indo-Pacific species distributed in South India (Kerala), North-east India (Assam, Bengal), Sri Lanka, Bangladesh, Myanmar, Java, New Guinea, Nepal, Philippines, Sumatra, Tahiti, Admiral Island and Pacific Islands.

Leucophanes albescens C.Muell., Bot. Zeit., 22: 347. 1864.

Habitat: on logs.

Distribution; it is an Indo-pacific species distributed in South India (Kerala, Nicobar Islands), North east India, Thailand, Borneo and Philippines.

Leucophanes glaucum (Schwägr.) Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 25. 1859.

Habitat: On logs.

Distribution : It is distributed in Indonesia, China, Japan, Thailand, Vietnam, Malaysia, Philippines, Papua New Guinea, Australia, Thailand and Nicobar Islands as *L. albescence*. **The present collection is thus a new record for the mainland of India.**

Leucoloma amoene-virens Mitt., J. Proc. Linn. Soc., Bot., Suppl. 1: 13. 1859

Habitat: On logs.

Distribution: India (Kerala, Tamil Nadu).

Octoblepharum albidum Hedw., Sp. Musc. 50. 1801.

Habitat: It is a widely distributed species seen in a variety of habitats such as on exposed roots, branches, logs, on soil and rocks in scattered colonies, from lower to medium altitude (up to 900 m) mostly in all type of vegetations.

Distribution: It is a common species found in low altitude to higher altitudes and it has earlier reported from South India (Kerala, Karnataka, Tamil Nadu) North-east India (Kumaon, Sikkim), Sri Lanka, Java, New Guinea, China, Bolivia, Columbia, Indo-Malayan region, Madagascar, Myanmar, Nepal, Peru, Philippines and Venezuela.

FISSIDENTACEAE Schimp.

Fissidens anomalus Mont., Ann. Sci. Nat. Bot., sér. 2, 17: 252. 1842.

Habitat: Epiphytic and on small branches.

Distribution: It is a widely distributed species in the high altitude *Shola* forests of Kerala. It is also distributed in Tamil Nadu, Himachal Pradesh, Darjeeling in India; East Nepal, Sri Lanka, Thailand, Java and the Philippines

Fissidens asperisetus Sande-Lac., Naturk. Verh. Holl. Maatsch. Wetensch. Haarlem 11: 2. 1872.

Habitat: On soil cuttings and also on concrete walls in homestead areas, semi-evergreen and evergreen forests.

Distribution: This is a south-east Asiatic species earlier reported from South India (Tamil Nadu, Kerala), Andaman Islands, Sri Lanka, Celebes, Java and Philippines.

Fissidens bryoides Hedw., Sp. Musc. Frond. 153. 1801.

Habitat: On land cuttings.

Distribution: A widely distributed species.

Fissidens ceylonensis Dozy & Molk., Ann. Sci. Nat. Bot. ser. 3(2): 304. 1844.

Habitat: This species is common in laterite soil with sand or clay, rocks and stones, brick walls and on exposed roots of trees mostly on coconut trees in moist-deciduous forests and in homestead areas. It is a common species of Termite mounts.

Distribution: It is a widely distributed species common in South India (Kerala, Tamil Nadu), North-east India (Darjeeling, Himalaya, Sikkim, Uttar Pradesh, West Bengal), Sri Lanka, Borneo, Iran, Java, Malaysia, Moluccas, Nepal, New Zealand, Philippines, Sumatra, Thailand, Vietnam and Yunnan.

Fissidens crenulatus Mitt., Musc. Ind. Orient. 140. 1859.

Habitat: On soil cuttings and on Termite mounts in baboo breaks in moist deciduous forest.

Distribution: An Indo-Pacific species distributed in South India (Kerala, Tamil Nadu), North-east India (Orissa), Myanmar and East Nepal.

Fissidens crispulus Brid., Musc. Rec. Suppl. 4: 187. 1819 [1818].

Habitat: This species is very common and is frequently occur as dense mats on soil, rocks and bases of tree trunks in semi-evergreen forests.

Distribution: This species was earlier reported from India (Kerala, Himalayas), China, Malaysia, Madagascar, Reunion and Cameroon.

Fissidens crispulus Brid. var. *robinsonii* (Broth.) B.C.Tan & Choy, J. Bryol. 24: 47. 2002.

Habitat: On soil cuttings in plantations and moist deciduous forests.

Distribution: It was earlier reported from India (Kerala, Himalaya), China and Philippines.

Fissidens diversifolius Mitt., Musc. Ind. Or. 140. 1859.

Habitat: Common in soil with sand or clay, rocks and stones.

Distribution: It was earlier recorded from Peninsular India (Kerala- Kakkavayal RF, Karnataka, Tamil Nadu: Palni hills, Nilgiri hills), Central India (Madhya Pradesh, Orissa), and North east India (Assam, Arunachal Pradesh, Bengal, Bihar, Chhotanagpur).

Fissidens flaccidus Mitt., Trans. Linn. Soc. Lond. 23: 56. 1860.

Habitat: On soil, concrete walls and bricks in homesteads and in partially shady areas of moist deciduous forests.

Distribution: This species was reported earlier from South India (Kerala, Tamil Nadu), Central India (Maharashtra, Madhya Pradesh), North-east India (Bengal, Haryana, Khandala, Western Himalaya), Sri Lanka, China, Indonesia, Borneo, Brazil, Myanmar, Taiwan, Japan, Java, Nepal, Mexico, New Guinea, Philippines and Ryukyus.

Fissidens intromarginatus Bartr., Rev. Bryol. Lichen, 23: 242. 1954.

Habitat: On moist soil and rocks.

Distribution: South India (Kerala, Tamil Nadu, Karnataka), North East India (Darjeeling, Orissa), Nepal, Western Himalaya and Myanmar.

Fissidens kammadensis Manju, K.P.Rajesh & Madhus., Acta Biol. Hung. 50: 160. 2008.

Habitat: On roots of higher plants, on land cuttings and on rocks.

Distribution: Kerala (Kasaragod-Kammadam kavu). **Endemic to Kerala.**

Fissidens polysetulus C.Mueller, Gen. Musc. Fr.: 63. 1900.

Habitat: On soil and land cuttings.

Distribution: South India (Kerala, Tamil Nadu), North East India (Darjeeling, Sikkim), Nepal and Thailand.

Fissidens semperfalcatus Dixon, J. Siam Soc. Nat. Hist. Suppl. 10:2 (1935).

Habitat: On land cuttings and on rocky patch.

Distribution: India (Kerala), China.

Fissidens serratus Müll.Hal., Bot. Zeitung (Berlin) 5: 804. 1847.

Habitat: Epiphytic.

Distribution: India (Kerala), Brazil Chile, Fiji, Java, Philippines, Australia.

Fissidens subbryoides Gangulee, Nova Hedwigia 8: 141. 1964.

Habitat: On wet land cuttings along with *Selaginella ciliaris* and *Asterella khasiana* in semi shaded road cuttings in semi-evergreen forests.

Distribution: It was earlier reported from South India (Kerala, Tamil Nadu), North-east India (Assam), Andaman Islands and East Nepal.

Fissidens virens Thwait. ex Mitt., J. Linn. Soc. Bot. 13: 324. 1873.

Habitat: On land cuttings in evergreen and semi-evergreen forests.

Distribution: This species was earlier reported from North-east India (Kerala, West Bengal, Assam), Sri Lanka, China, Malaysia and Vietnam.

Fissidens zollingeri Montin, Ann. Sci. Nat. Bot. ser. 3, 4: 114. 1845.

Habitat: Terrestrial along with *Fossombronia foveolata* var. *crustula* on road cutting soil and also on logs in semi shaded areas of moist deciduous and semi-evergreen forests.

Distribution: It was earlier recorded from South India (Kerala, Tamil Nadu, Karnataka), Sri Lanka, Bolivia, Myanmar, Fiji, Java, Malaysia, New Guinea, Peru, Philippines, Samoa, Sumatra, Tahiti and North & Central Vietnam.

CALYMPERACEAE Kindb.

Calymperes andamense Besch., Ann. Sci. Nat. Bot. Ser. 8,1: 272. 276. 1895.

Habitat: Epiphytic, found on dried twig.

Distribution: South India (Kerala), Andaman Islands.

Calymperes afzelii Sw., Jahrb. Gewachsk. 1: 3. 1818.

Habitat: Commonly occurs on shaded tree trunks and logs including rotting stumps and fern rhizomes in moist deciduous forests.

Distribution: This species is distributed in South India (Goa, Kerala, Tamil Nadu), Sri Lanka and China.

Calymperes erosum C.Muell., Linnaea 21: 182. 1848.

Habitat: Epiphytic along with *Octoblepharum albidum* and *Lejeunea* sp. and also on logs and as epiphylls in homestead.

Distribution: It is a common species distributed in South India (Goa, Kerala, Tamil Nadu), Sri Lanka, Myanmar, China, Africa and America.

Calymperes hampei Dozy & Molk., Bryol. Jav., 1: 48. 1856.

Habitat: Occurs on tree trunks and logs.

Distribution: It is distributed in South India (Kerala), Myanmar, Sumatra, Java, Borneo, Timor, etc. It is an Indo-Malesian species.

Calymperes lonchophyllum Schwaegr., Sp. Musc. Frond., Suppl. 2: 333. 1816.

Habitat: Epiphytic.

Distribution: A widely distributed pantropical species.

Calymperes tenerum Müll.Hal., Linnaea 37: 174. 1872.

Habitat: Prefers a wide range of habitat such as bark, rocks and on land cuttings.

Distribution: A widely distributed species.

Calymperes mangaloreense Dixon & P. de la Varde, Arch. Bot. Bull. Mens. 1(8-9): 164. 1927.

Habitat : Bark of cultivated trees near homestead.

Distribution: Distributed in India (Kerala- Kozhikode low land areas, Karnataka) and Burma.

Syrrhopodon gardneri (Hook.) Schwaegr. in Hedw., Sp. Musc. Suppl. 2(1): 110. 131. 1824.

Habitat: Upper part of tree trunk in semi-evergreen forests.

Distribution: India (Kerala, North-western Himalayas, West Bengal, Khasi hills), Sri Lanka, Bhutan, Borneo, Indonesia, Nepal, Philippines, Sumatra and Vietnam.

POTTIACEAE Schimp.

Anoetangium aestivum (Hedw.) Mitt., J. Linn. Soc. Bot. 12: 175. 1869.

Habitat: On rocks and on land cuttings.

Distribution: Distributed in India (Kerala) China, Japan, Philippines, New Zealand, Europe and North and South America.

Anoetangium bicolor Renauld & Cardot, Bull. Soc. Bot. Belgium 14(1): 19. 1905.

Habitat: On soil and on rocky patches in Tea estates.

Distribution: India (Kerala, Western Himalayas)

Barbula indica (Hook.) Spreng., Syst. Veg. 2: 72. 1824.

Habitat: It is found almost everywhere, on roadsides, soil cuttings, rock crevices,

moist bricks, rotten logs and on concrete walls in moist deciduous forests.

Distribution: It was earlier recorded from India (Kerala), China, Japan, Korea, Myanmar, Malaysia, Papua New Guinea, Philippines, Colombia, Mexico, Africa and America.

Barbula tenuirostris Brid., Bryol. Univ. 1: 826. 1827.

Habitat: On land cuttings.

Distribution: A widely distributed species in India (Kerala, Western Himalaya, Plains of Uttarpradesh, Madhya Pradesh, Bihar, West-Bengal Plains, Darjeeling, Arunachal Pradesh, Tamil Nadu), East Nepal, Sri Lanka, Myanmar, China, Japan, Thailand, Vietnam, Malaysia, Java, Singapore, New Guinea, Philippines, Taiwan. **(New record for Kerala)**

Gymnostomum calcareum Nees & Hornsch., Bryologia Germanica 1: 153. pl. 10 f. 15. 1823.

Habitat: On rocks

Distribution: It is distributed in India (Eastern Himalaya, Western Himalaya), Western Tibet, Europe, Caucasus, Siberia, Tajikistan, China, Japan, N.&S. Africa, Australia, New Zealand, N.&S. America and Oceania. **The present collection is a new record for Peninsular India.**

Hymenostomum edentulum (Mitt.) Besch., Bull. Soc. Bot. Fr. 34: 95. 1887.

Habitat: On soil cuttings in grasslands.

Distribution: This is an Indo-Pacific species found distributed in South India (Kerala, Tamil Nadu), Andaman & Nicobar Islands, Sri Lanka, China, North Vietnam, Taiwan, Java, Philippines and New Caledonia.

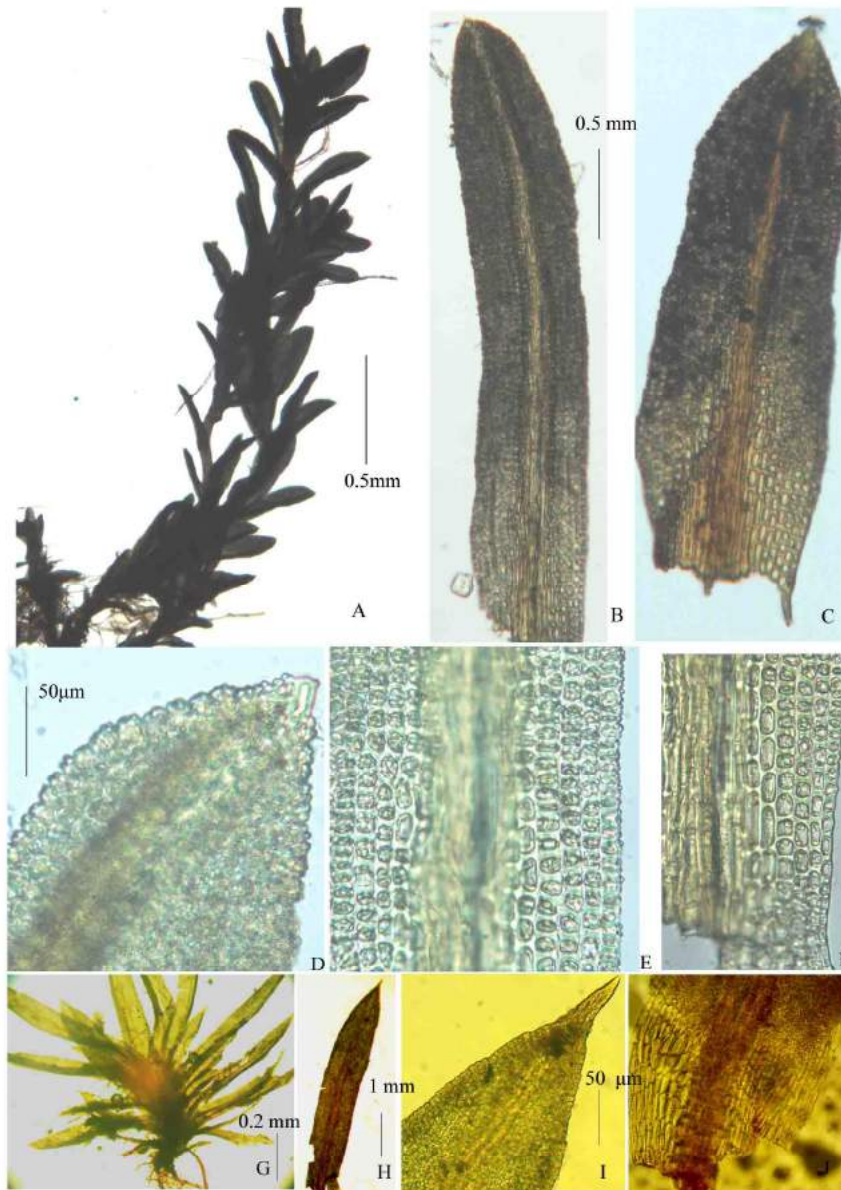
Hymenostylium recurvirostre (Hedw.) Dixon, Rev. Bryol. Lichenol. 6: 96. 1933.

Habitat: On rocky patches in semi-evergreen forests.

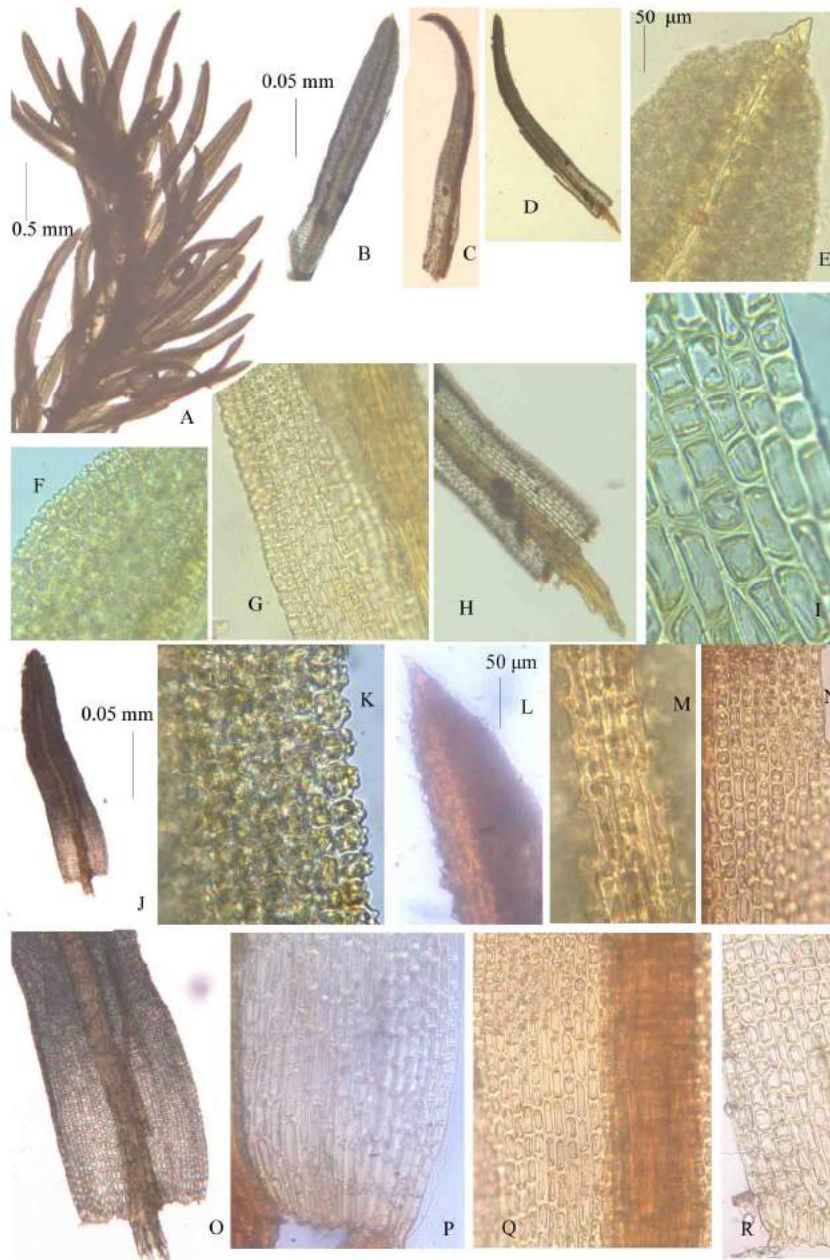
Distribution: It was earlier reported from South India (Kerala) North-east India (Western Himalaya, Kashmir, Kumaon, Khasi hills, Kangra, Ladakh, Mussoorie, Sikkim), Afghanistan, China, Japan, Korea, Myanmar, Caucasus, New Zealand, New Guinea, Philippines, Pakistan and Western Tibet.

Hyophila involuta (Hook.) A.Jaeger, Ber. Senckenberg. Naturf. Ges. 1871-72: 356. 1873.

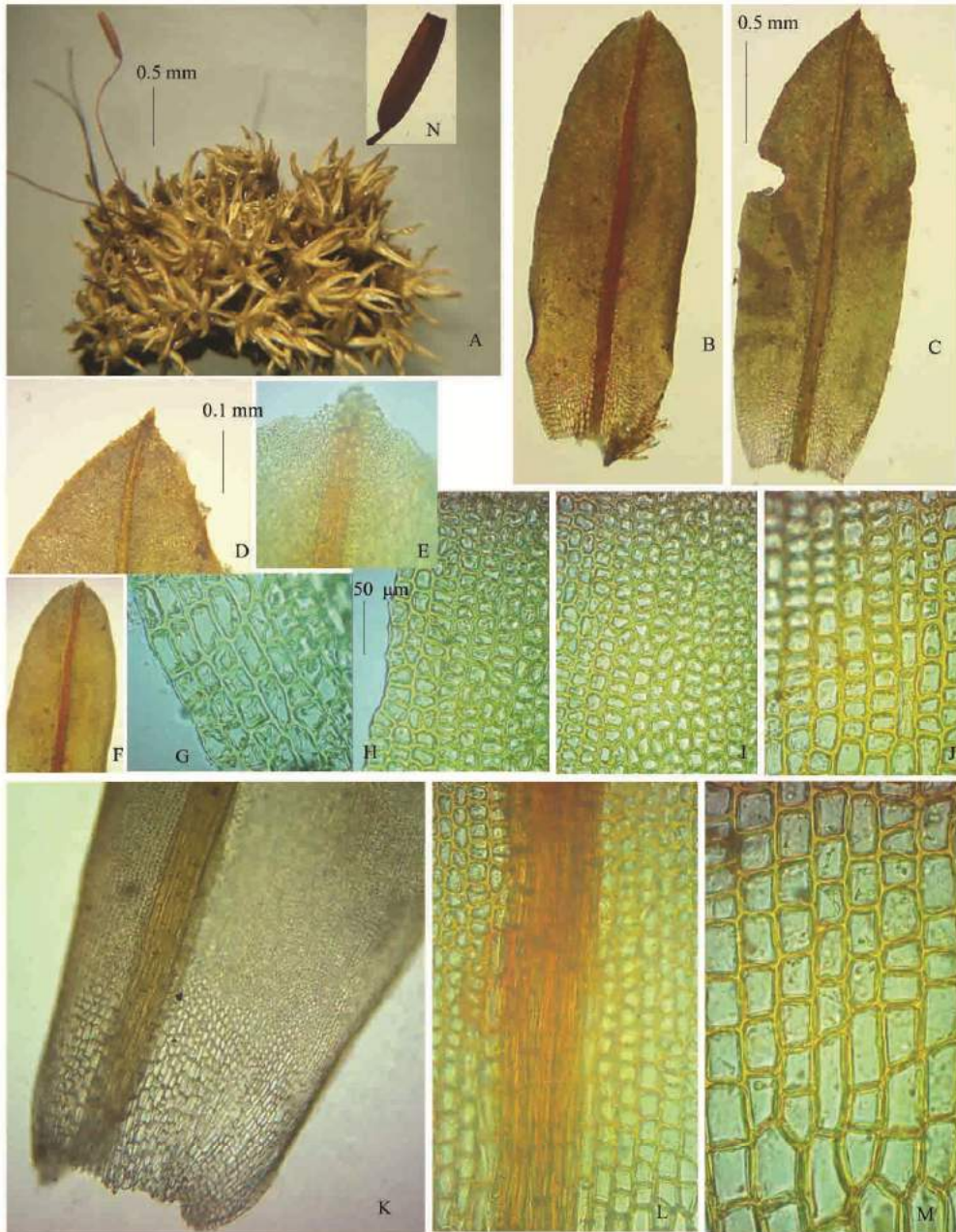
Habitat: It is seen in a variety of habitats such as on soil, rocks, logs, crevices of



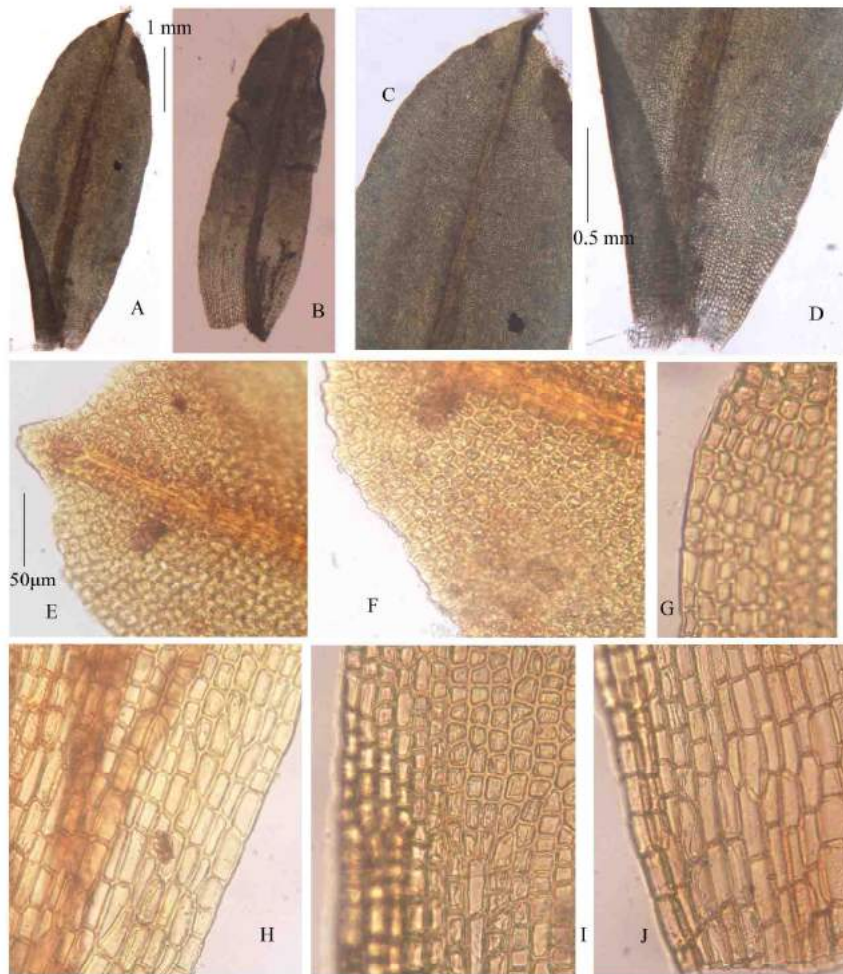
A-F. *Anoectangium aestivum* A. Dry habit, B&C. Leaf, D. Leaf tip cells, E. Leaf middle cells, F. Leaf basal cells; G-J. *Anoectangium bicolor*, G. Habit, H. Leaf, I. Leaf tip, J. Leaf base (B&C, D&F, I&J same size)



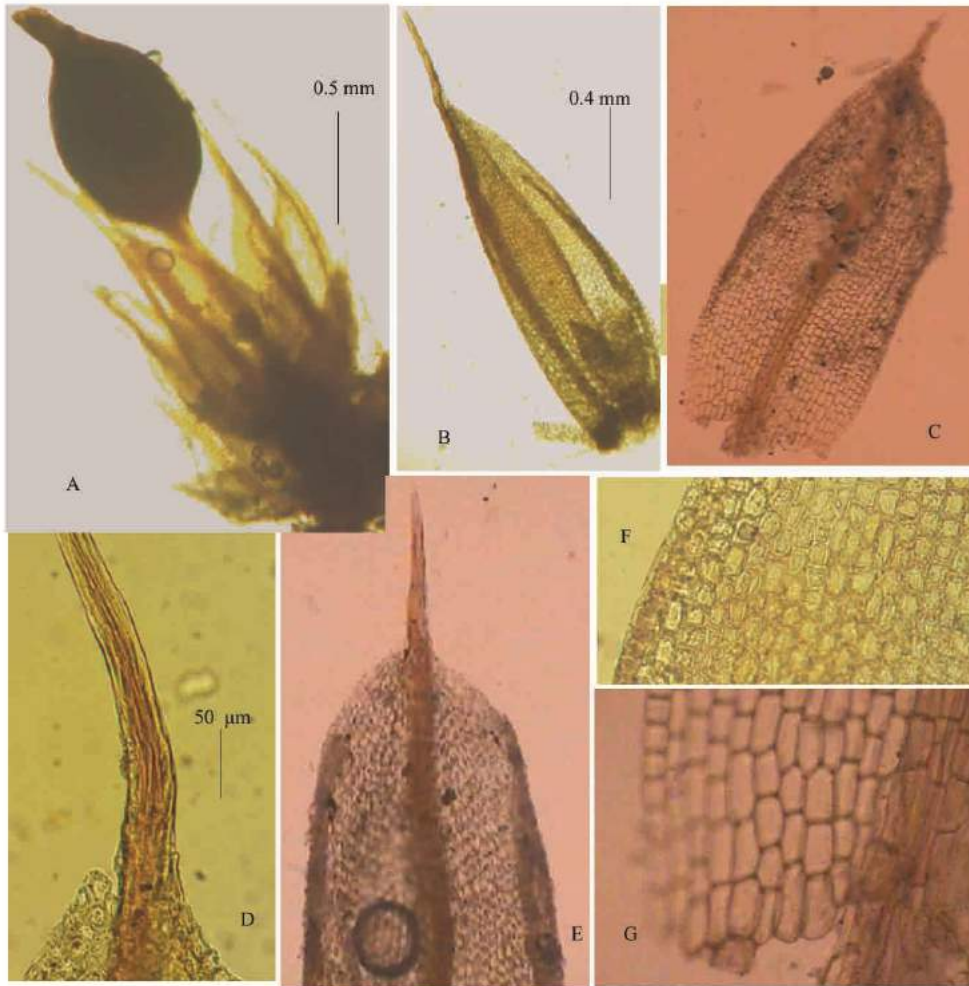
A-I. *Barbula indica*, A. Habit, B-D. Leaf, E. Leaf tip, F. Leaf tip marginal cells, G. Leaf middle cells, H. Leaf base, I. Leaf basal cells; J-R. *Barbula tenuirostris*, J. Leaf, K. Leaf tip marginal cells, L. Leaf tip, M. Costa, N. middle marginal cells, O-Leaf base, P-R. Basal cells (B-D, E-I, K-R same size)



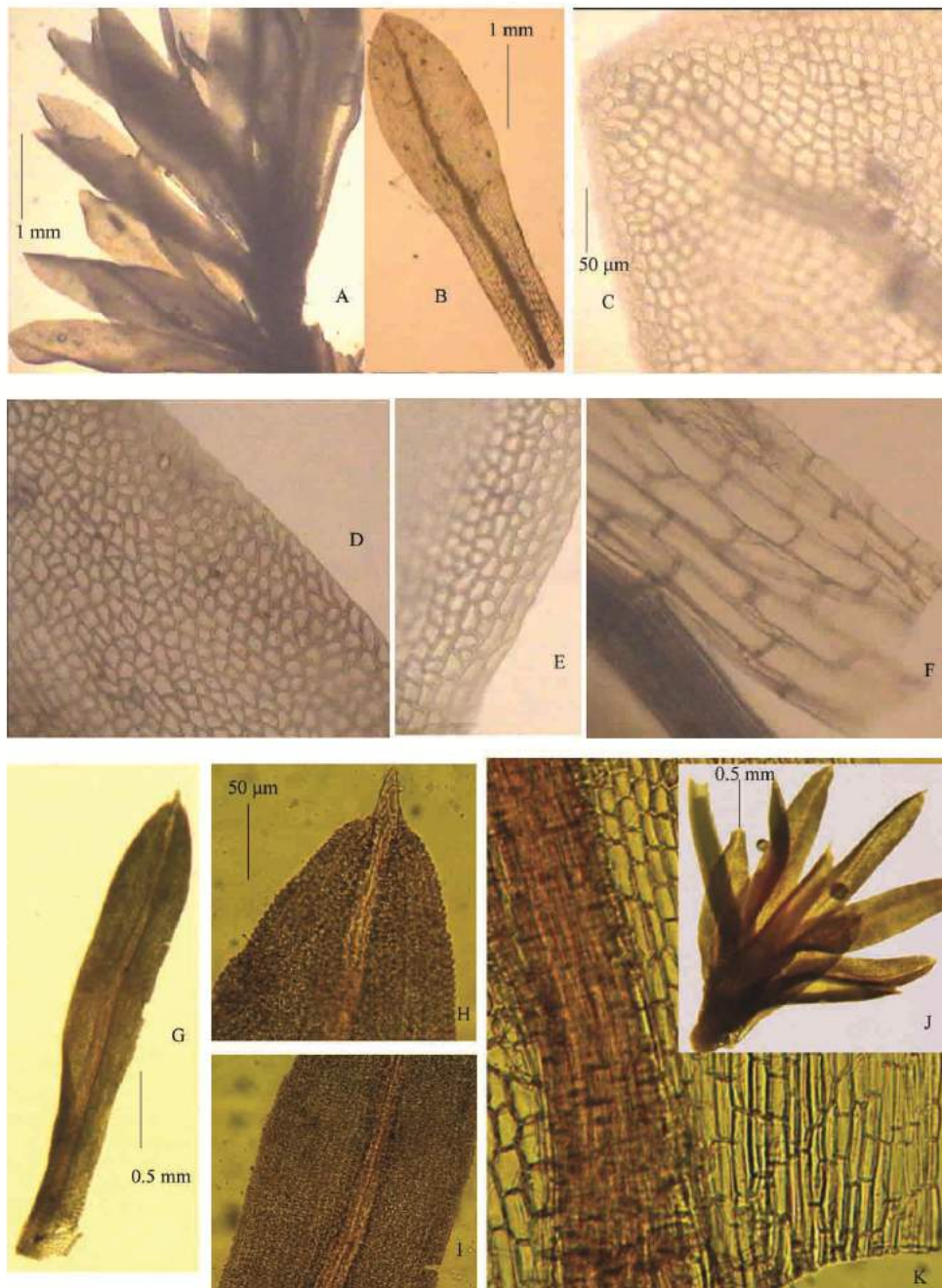
A-N. *Hyophila involuta*, A. Dry habit, B&C. Leaf, D-F. Leaf tip, G&H. Marginal cells, I. Leaf tip cells, J. Above basal cells, K. Basal region, L. Cells near costa, M. Basal cells, N. Capsule (B-C, D-F, G-M same size)



A-J. *Hyophila nymaniana*, A7B. Leaf, C. Leaf tip, D. Leaf base, E&F. Leaf tip cells, G. Middle marginal cells, H-J. Basal marginal cells (A-D & E-J same size)



A-G. *Pottia bryoides*, A. Habit with capsule, B& C. Leaves, D. Excurent Costa, E. Leaf tip, F. marginal cells, G. Basal cells (D-G same size)



A-F. *Scopelophila ligulata*, A. Habit, B. Leaf, C. Leaf tip, D. Leaf marginal cells at tip, E. Leaf margin above base, F. Leaf basal cells; G-K. *Tortella tortuosa*, G. Leaf, H. Leaf tip, I. Leaf middle cells, J. Habit, K. Leaf basal cells (C-F, H-I, K same size)





A-I. *Tortula muralis*, A. Habit, B. Capsule, C. Dry habit, D. Spores, E. Leaf, F. Leaf tip with long costa, G. Leaf tip cells, H. Leaf base, I Leaf basal cells; J-M. *Tortula schmidtii*, J. Leaf, K. Marginal cells, L. Leaf tip cells, M. Leaf basal cells (A-C, E-F, G-I, J-M same size)

rocks, walls, etc. from low to high altitudes. It is also found on Termite mount.

Distribution: It was earlier recorded from Peninsular India (Kerala; Widely distributed in all districts; Karnataka: Mysore; Tamil Nadu: Palni hills, Nilgiri hills; Gujarat), Central India (Madhya Pradesh, Orissa), North-east India (Assam, Arunachal Pradesh, Bengal, Bihar, Chhotanagpur, Darjeeling, Khasi hills, Western Himalayas), Sri Lanka, Nepal, China, Japan, Java, Korea, Borneo, Myanmar, Celebes, Manchuria, New Guinea, Oceania, Philippines, Sumatra, Taiwan, North & South Vietnam, North, Central & South America and Europe.

Hyophila nymaniana (M.Fleisch.) Menzel, Willdenowia 22: 198. 1992.

Habitat: On earth cuttings and on cement walls in moist deciduous forests and in homestead areas.

Distribution: This is an Indo-Pacific species distributed in Peninsular India (Kerala: Wayanad WLS, Chinnar WLS, Tamil Nadu: Palni hills, Gujarat), North-east India (Western Himalaya, Orissa) and Philippines.

Oxystegus cylindricus (Bruch ex Brid.) Hilp., Beih. Bot. Centralbl. 50: 620. 1933.

Habitat: On small rocky patches in semi-evergreen forests and grasslands.

Distribution: It is distributed in India (Kerala, Darjeeling, Naga hills, Khasi hills, Sikkim), Nepal.

Pottia bryoidea (Dicks.) Mitt., Ann. Mag. Nat. Hist., ser. 2, 8: 311. 1851.

Habitat: On land cuttings.

Distribution: India (Kerala); Kazakhstan, United States (Arizona, Colorado).

(New record for India)

Semibarbula orientalis (F.Weber) Wilk & Margad., Taxon 8(2): 75. 1959.

Habitat: Upper part of tree trunk along with *Pinnatella culcutensis* and on rocky patches in moist deciduous forests.

Distribution: Earlier recorded from South India (Kerala), North-east India (Darjeeling, Arunachal Pradesh, Bengal, Orissa), Sri Lanka, China, Nepal, New Guinea, Pakistan, Celebes, Taiwan, Madagascar, Malaysia, Siam and Central and Southern Africa.

Scopelophila cataractae (Mitt.) Broth., Engl. & Prantl, Nat. Pflanzenfam 1(3): 436. 1902.

Habitat: Seen in sandy soil near riverine areas, mostly in mineral rich areas in semi-evergreen forests.

Distribution: It is widely distributed in all continents. In India, it is distributed in North India (Nainital, Kumaon Himalaya), North, Central & South America, Africa, Kerala (Wayanad) Asia through to China.

Syntrichia fragilis (Tayl.) Ochyra., *Fragm. Florist. Geobot.* 37: 212. 1992.

Habitat : On rocky patch.

Distribution: In India this species was known as *Tortula fragilis* (Zander, 1993). It is distributed in China, Bolivia, Chile, Columbia and Argentina. **The present collection is a new record for Peninsular India.**

Trichostomum crispulum Bruch., *Flora* 12: 395. 4. 1829.

Habitat: On land cuttings.

Distribution: It is distributed in India (Kerala) China, Japan, Mexico, Canada, United states, Russia, Poland, Ireland, Columbia, Papua New Guinea, America and Africa.

Trichostomum wayanadense Manju, Rajesh & Madhus. *Bryo. Wayanad. W. Ghats.* 119-2005.

Habitat: On logs in moist deciduous forest.

Distribution: India (Kerala) **Endemic to Kerala.**

Tortula muralis Hedw., *Sp. Musc. Frond.* 123. 1801.

Habitat: On rocks.

Distribution: It is distributed in North-east India (Sikkim, Garhwal, Kulu), Central Asia, Caucasus, Europe and North America. **The present collection is a new record for Peninsular India.**

Tortula schmidtii (C.Mueller) Borth., *Nat. Pflanzenfam.* 1(3): 434. 1902.

Habitat: On rocks.

Distribution: India (Western Himalayas, Tamil Nadu, Kerala), China, Central and Western Asia, Europe and North America.

Tortella tortuosa (Hedw.) Limpr., *Laubm. Deutschl.*, 1: 604. 1888.

Habitat: On tree trunk.

Distribution : India (Kerala, Tami Nadu, Kashmir, Uttarakhand), East Nepal, China, Japan, North America, Central Europe, Caucasus, Algeria, Morocco, Iran.

GRIMMIACEAE

Grimmia funalis (Schwägr.) Bruch & Schimp., Bryol. Europ. 3: 119, fig. 247. 1845.

Habitat: On rocky patches in grassland.

Distribution: It is distributed in India (Kerala) Nepal, China, Japan, Europe, North Africa, North America and Australia.

FUNARIACEAE

Entosthodon wichurae M.Fteisch., Die Musci Fl. Buitenz. 2: 481. 1904.

Habitat: On wet soil of stream banks of shola forests and on grasslands.

Distribution: It is distributed in South India (Kerala: Chembra hills, ENP; Tamil Nadu: Western Ghats of Kanyakumari), North-east India (Meghalaya, Uttar Pradesh), Sri Lanka, Indonesia and Myanmar.

Funaria hygrometrica Hedw., Sp. Musc. 172. 1801.

Habitat: Grow on moist soil, rocks and brick walls in large patches associated with other mosses in homestead areas.

Distribution: A cosmopolitan species distributed in South India (Kerala: Chinnar WLS, Tamil Nadu: Nilgiri hills, Palni hills), North-east India (Himalayas, Kashmir, Manipur, Naga hills, Orissa), Sri Lanka, China, Japan, Korea, Myanmar, New Zealand, Siberia, Taiwan, Thailand, Tibet, Europe, North & South America, Africa, Australia and Oceania.

SPLACHNACEAE

Gymnostomiella vernicosa (Hook.) M.Fleisch. var. *tenerum* (C.Muell. ex Dusen) Arts, J. Bryol. 20(2): 424. 1998.

Habitat: Seen along the concrete brick walls and painted walls in homestead areas.

Distribution: This variety is distributed in low altitude areas of the study area in concrete walls. This variety of *Gymnostomiella vernicosa* was reported from Kerala, Saudi Arabia, Yemen, Oman, United Arab Emirates, Kuwait, Socotra, Qatar and Bahrain.

Splachnobryum obtusum (Brid.) C.Muell., Verh. Zool. Bot. Ges. Wien 19: 503. 1869.

Habitat: Terrestrial in moist deciduous forests.

Distribution: Earlier recorded from Western Ghats of Tamil Nadu, Kerala; North India (Delhi, Western Himalaya), Myanmar, Java and Philippines.

Tayloria subglabra (Griff.) Mitt., Musci. Ind. Or. 57: 1856.

Habitat: On land cuttings.

Distribution: It is distributed in North east India (Darjeeling, Naga hills, Meghalaya), Southern India (Kerala, Tamil Nadu), Nepal, China, Japan, Bhutan, Sri Lanka, Vietnam, Thailand, Java, Philippines, Taiwan and Korea. **The present collection is a new record for Kerala.**

BRYACEAE

Anomobryum auratum (Mitt.) A.Jaeger, Bericht. St. Gall. Naturw. Ges. 1873-74: 142. 1875.

Habitat: Plants grow on moist exposed rocks and moist soil in semi-evergreen and evergreen forests.

Distribution: It is distributed in South India (Kerala: Chembra, Thirunelli, Vellarimala, Silent Valley, ENP; Karnataka: Mahabaleswar; Tamil Nadu), North-east India (Darjeeling, Western Himalayas, Kashmir, Meghalaya, Naga hills, Sikkim), Sri Lanka, China, Bhutan, Nepal, Korea, Japan, Philippines, Tanzania, Kenya and Madagascar.

Anomobryum filiforme var. *concinatum* (Spruce) Loeske, Rev. Bryol. Lichénol. 5: 200. 1933.

Habitat: On rocky patch.

Distribution: India (Kerala), Japan, Mexico.

Brachymenium exile (Dozy & Molk.) Bosch & Sande-Lac., Bryol. Jav. 1: 139. 1860.

Habitat: This species is seen in a wide range of microhabitat such as on small stones, rocky patches, logs, soil, along with *Bryum argenteum*, *Hyophila involuta* etc. and also on muddy walls in moist deciduous, semi-evergreen and evergreen forests.

Distribution: A South and East Asiatic Pacific species distributed in South India (Kerala, Tamil Nadu), North-east India (Darjeeling, Western Himalayas, Naga hills), Sri Lanka, East Nepal, Japan, Korea, Java, Tonkin, Bolivia, Columbia and Peru.

Brachymenium nepalense Hook. in Schwaegr., Sp. Musc. Suppl. 2(1): 131. 1824.

Habitat: Epiphytic on trunks of *Tectona grandis* in moist deciduous forests.

Distribution: *B. nepalense* is an Afro-Asiatic species distributed in South India (Kerala; Soochippa, Vellarimala, New Amarambalam; Karnataka, Tamil Nadu), North-east India (Simla, Kumaon, Garhwal), Sri Lanka, Thailand, Sumatra, Java, Borneo, Celebes, New Guinea, Myanmar, China, Taiwan, Indonesia, Japan, Philippines and Africa.

Bryum apalodictyoides Müll.Hal., Bot. Zeitung (Berlin). 11: 21. 1853.

Habitat: On rocky patch.

Distribution: India (Kerala, Eastern Hiamalayas).

Bryum apiculatum Schwägr., Sp. Musc. Frond., Suppl. 1, (2): 102-103, pl. 72 [top].
1816.

Habitat: Terrestrial.

Distribution : India (Kerala, Himalayas), African countries.

Bryum argenteum Hedw., Sp. Musc. 181. 1801; Broth., Rec. Bot. Surv. India 1(12): 320.
1899.

Habitat: On moist soil and on exposed rocks alongwith *Brachymenium exile* and *Hyophila involuta* in moist deciduous, semi-evergreen, evergreen forests and grasslands.

Distribution: It has earlier reported from South India (Kerala: Wayanad, Kozhikode, Palakkad; Tamil Nadu: Nilgiri, Palni hills), China, Japan, Malaysia, Papua New Guinea, Philippines, Taiwan, Thailand, Vietnam, Madagascar, America, Africa and Europe.

Bryum capillare Hedw., Sp. Musc. 182. 1801.

Habitat: On damp soil or on small rocks in semishaded areas of semi-evergreen forests.

Distribution: It is a cosmopolitan species found distributed in South India (Kerala, Tamil Nadu), North India (Western Himalaya, Kashmir), China, Thailand, Vietnam, Taiwan, Korea, Japan, Siberia, Central Asia, Europe, North & Central Africa, North & South America, Australia and New Zealand.

Bryum cellulare Hook., Sp. Musc. Suppl. 3(1): 214a. 1827.

Habitat: On soil cuttings along with other mosses in semi-evergreen forests.

Distribution: A wide spread species distributed in India (Kerala, Western Himalayas), Myanmar, China, Japan, Sumatra, Java, Philippines, Taiwan, Europe, North & Central Africa and Australia.

Bryum coronatum Schwaegr., Sp. Musc. Suppl. 7(2): 103. 1816.

Habitat: On calcareous soils or walls and also on rocks alongwith *Funaria hygrometrica* and *Hyophila involuta* in homesteads and in semi-evergreen forests.

Distribution: It is common throughout the study area, mostly in the mid

altitudinal range from 500-800 m. It is widely distributed in India, China, Borneo, Philippines, Thailand, Brazil, Bolivia, Peru and Mexico.

Bryum dichotomum Dicks., Sp. Musc. Frond., 183, pl. 42, f. 8-12. 1801.

Habitat: On land cuttings.

Distribution: India (Kerala, Himalayas) Australia, Columbia, New Zealand, South Africa

Bryum paradoxum Schwägr., Sp. Musc. Frond., Suppl. 3, 1(1): 224: a. 1827.

Habitat: On rocky patch.

Distribution: India (Kerala, Assam, meghalaya) China, Japan, Brazil, Madagascar, Philippines

Bryum plumosum Dozy. & Molk., Ann. Sci. Nat. Bot. Ser. 3, 3(2): 301. 1844.

Habitat: On earth cuttings in moist deciduous forests.

Distribution: Recorded from India (Kerala, Assam, Calcutta, Orissa, Western Himalaya), Sri Lanka, China, Japan, Sumatra, Java, Celebes, Borneo, Philippines, Taiwan, Australia and New Caledonia.

Bryum tuberosum Mohamed & Damanhuri, *Bryologist* 93(3): 288. 1990.

Habitat: On rocky patch.

Distribution: India (Kerala, Karnataka), Malaysia.

Bryum wightii Mitt., J. Linn. Soc. Bot. Suppl. 1: 74. 1859.

Habitat: Grows moderately at high altitude regions, near wet areas such as waterfalls, often on moist rocky substratum, mostly associated with *Utricularia* sp. and *Campylopus* sp. in semi-evergreen, evergreen, shola forests and in grasslands.

Distribution: This Indo-Sri Lankan species is common in the study area at higher altitudes. It has reported from South India (Kerala, Tamil Nadu, Karnataka, Maharashtra).

Ptychostomum pseudotriquetrum (Hedw.) J.R. Spence & H.P. Ramsay ex Holyoak & N. Pedersen, J. Bryol. 29(2): 120. 2007.

Habitat: Seen in a variety of habitats such as on soil in grasslands, on rocky patches, bark of *Cycas circinalis* and on other trees in semi-evergreen, shola forests and in plantations.

Distribution: A cosmopolitan species distributed in India (Kerala, Tamil Nadu, Kumaon Himalaya, Sikkim, Kashmir), Nepal, Korea, Columbia, Ecuador,

Siberia, Venezuela; Europe, Australia, Africa and Antarctica.

Rhodobryum giganteum (Schwaegr.) Paris, Index Bryol. Suppl. 1116. 1898.

Habitat: Seen at high altitude areas mostly on wet rocks, humus rich soils and logs near streams in shola forests.

Distribution: It is wide spread in the tropical and sub tropical region and was earlier reported from South India (Kerala, Tamil Nadu), North-east India (Darjeeling, Khasi hills, Arunachal Pradesh, Manipur, Sikkim), Sri Lanka, China, Japan, Nepal, Madagascar, Sumatra, Java, Myanmar, Thailand and Oceanic Islands.

Rhodobryum ontariense (Kindb.) Paris, Eur. N. Amer. Bryin. (Mosses) 2: 346. 1897.

Habitat: On roots of higher plants near stream.

Distribution: India (Kerala).

MNIACEAE

Plagiomnium rostratum (Schrad.) T.J.Kop., Ann. Bot. Fenn. 5(2): 147. 1968.

Habitat: On wet rocks, earth cuttings and base of trees near streams in evergreen and shola forests.

Distribution: Almost a cosmopolitan species distributed in South India (Kerala, Tamil Nadu), North-east India (Arunachal Pradesh, Assam, Himalaya, Manipur, Meghalaya, Nagaland), Sri Lanka, China, Japan, Java, Korea, Myanmar, Nepal, New Guinea, New Zealand, Pakistan, Philippines, Taiwan and Tibet.

RHIZOGONIACEAE

Pyrrhobryum spiniforme (L. ex Hedw.) Mitt., J. Linn. Soc. Bot. 10: 174. 1868.

Habitat: On rocky patches and base of tree trunks in evergreen and shola forests.

Distribution: It is distributed in South India (Kerala, Tamil Nadu), North-east India (Darjeeling, Sikkim, Khasi hills, Assam, Arunachal Pradesh), Sri Lanka, Japan, China, Korea, New Guinea, Java, Borneo, Vietnam, New Caledonia and Philippines.

BARTRAMIACEAE

Philonotis angusta Mitt., J. Proc. Linn. Soc. 1: 61. 1859.

Habitat: Land cuttings.

Distribution: *P. angusta* is less distributed species earlier recorded from India. (Kerala, Western Himalaya, Darjeeling, Assam, Arunachal, Manipur), Sri Lanka and Thailand.

Philonotis falcata (Hook.) Mitt., Musci Ind. Or. 62. 1859.

Habitat: On land cuttings.

Distribution: It is a widely distributed species earlier recorded from South India (Kerala, Nilgiri hills, Kodaikanal, North-east India (Western Himalaya, Darjeeling, Khasia hills, Midnapur), Bhutan, China, Korea, Japan, Tonkin, Java, Philippines, Taiwan, South Africa, Europe, North America and Hawaii.

Philonotis fontana (Hedw.) Brid., Bryol. Univ. 2: 18. 1827.

Habitat: On soil cutting in semi-evergreen forests.

Distribution: Earlier it was recorded from South India (Kerala, Tamil Nadu), North India (Kumaon Himalaya), China, Japan, Korea, Iran, Tibet, Taiwan, Philippines, Europe, Central & South Africa, Central & South America and New Zealand.

Philonotis hastata (Duby) Wijk & Marg., Taxon 8: 74.1959.

Habitat: On soil and rocky patches in homestead, moist deciduous, semi-evergreen and evergreen forests.

Distribution: It is a common species of shady garden soil and flower pots from the low altitudes to higher altitudes in the shaded forest floor. A pantropical species earlier reported from South India (Kerala, Tamil Nadu), North-east India (Calcutta, Assam, Sikkim), Sri Lanka, Borneo, Bolivia, Java, Thailand, Celebes, Philippines, Japan, Taiwan, Chile, Oceanic Island, Peru, Venezuela, Africa, South America and Australia.

Philonotis mollis (Dozy & Molk.) Mitt., Musc. Ind. Orient. 60. 1859.

Habitat: On moist rocks covered with soil or on moist soil associated with *Bryum wightii*, *Utricularia* sp. and grasses in moist deciduous, semi-evergreen and evergreen forests.

Distribution: *P. mollis* was reported earlier from South India (Kerala, Karnataka), Central India (Rajasthan), Andaman Islands, Sri Lanka, Borneo, Java, Indonesia, Japan, Madagascar, Philippines, Sumatra and Tonkin.

Philonotis seriata Mitt., J. Proc. Linn. Soc. 1: 63. 1859.

Habitat: Land cuttings

Distribution: *P. seriata* is a north hemispheric species distributed in India (Kerala, North western Himalaya and Kashmir) Nepal, Korea, Japan, Caucasus, Central Asia, Mongolia, Europe, North Africa, Greenland, Alaska, Canada, California, North Carolina.

Philonotis secunda (Dozy & Molk.) Bosch & Sande-Lac., Bryol. Jav. 1: 156. 1861.

Habitat: On rocky patches in homesteads and in evergreen forests.

Distribution: This species was earlier recorded from South India (Kerala, Tamil Nadu), Sri Lanka and Indonesia.

Philonotis thwaitesii Mitt., Musc. Ind. Orient. 60. 1859.

Habitat: Seen on soil cuttings and moist rocks in semi-evergreen, evergreen and shola forests.

Distribution: Earlier it was reported from South India (Kerala, Tamil Nadu), North India (Western Himalaya), Sri Lanka, China, Borneo, Bolivia, Colombia, Japan, Korea, New Guinea and Taiwan.

ORTHOTRICHACEAE

Macrocoma tenuis subsp. *tenuis* (Hook. & Grev.) Vitt, Revue Bryologique et Lichénologique 39: 217. 1973.

Habitat: Base of tree trunk.

Distribution: India (Kerala), Australia, Brazil, New Zealand.

Macromitrium moorcroftii (Hook. & Grev.) Schwaegr., Sp. Musc. Suppl. 2(2): 67. 1826.

Habitat: Corticolous in evergreen and shola forests.

Distribution: It was earlier reported from South India (Kerala, Karnataka), North-east India (Western Himalaya, Khasi hills, Sikkim, Darjeeling), Andaman and Nicobar Islands, China, Nepal, Myanmar, Bhutan and Bangladesh.

Macromitrium nepalense (Hook. & Grev.) Schwaegr., Sp. Musc. Suppl. 2(2): 134. 1827.

Habitat: Base of tree trunk on *Mangifera indica* on marshy areas in moist deciduous forests.

Distribution: A Southeast Asiatic species earlier reported from South India (Kerala, Tamil Nadu), North-east India (Darjeeling, Arunachal Pradesh, Assam, Khasi hills, Naga hills), Myanmar, Thailand, North Vietnam, Yunnan, Hongkong and Philippines.

Macromitrium sulcatum (Hook.) Brid., Bryol. Univ. 1: 319. 1826.

Habitat: This is a common species in evergreen and shola forests as corticolous along with other leafy liverworts, sometimes on rocks.

Distribution: *M. sulcatum* is common in the high altitude evergreen and shola forests. This species is widely distributed in South India (Kerala; high altitude areas of all districts, Western Ghats of Maharashtra; Tamil Nadu: Nilgiri hills, Chennai; Karnataka: Coorg), Sri Lanka, Nepal, Borneo, Kampuchea, Madagascar, Malaysia, Myanmar, Philippines, Thailand and Vietnam.

Macromitrium tenerum Kurz, Flora 13: 373. 1830.

Habitat: On logs in semi-evergreen and evergreen forests.

Distribution: This species has earlier recorded from India (Kerala) China, Japan and Sri Lanka.

Macromitrium turgidum Dixon, J. Siam Soc., Nat. Hist. Suppl., 9: 22. 1932.

Habitat: On bark.

Distribution : It is distributed in India (Kerala, Naga Hills, Arunachal) and Thailand.

MYURACEAE

Myurium rufescens (Reinw. et Hornsch.) Fleisch., Musci Buitenzorg, 3: 672. 1908.

Habitat: On bark.

Distribution: It is distributed in India (Kerala, Darjeeling, Khasia Hills), Sri Lanka, Myanmar, Thailand, Sumatra, Java, Malacca, Celebes, Borneo, New Guinea, Philippines, China, Japan, Australia and New Caledonia.

RACOPILACEAE

Racopilum cuspidigerum (Schwaegr.) Angstr., Ofvers. Foerh. Kongl. Svenska Vetensk.-Akad. 29: 10. 1872.

Habitat: On sandy soil and rocks in moist deciduous, semi-evergreen, evergreen and shola forests.

Distribution: It was earlier recorded from South India (Kerala, Tamil Nadu), Myanmar, Thailand, Philippines, Vietnam, Borneo, Indonesia, Malaysia and Papua New Guinea.

Racopilum orthocarpum Wils. & Mitt., J. Linn. Soc. Bot. Suppl. 1: 136. 1859.

Habitat: On a wide variety of habitats such as bark of trees, logs, bare rocks and soil in moist deciduous, semi-evergreen and evergreen forests.

Distribution: A South East Asiatic continental species earlier reported from South India (Kerala; Vellarimala, Wayanad WLS, Aralam WLS, Silent Valley; Tamil Nadu:

Kodaikanal), North-east India (Western Himalaya, Khasi hills, Sikkim), Sri Lanka, Nepal, Vietnam and Myanmar.

CRYPHAEACEAE

Schoenobryum concavifolium (Griff.) Gangulee, Moss. E. India 2(5): 1209. 1976.

Habitat: On twigs and on logs in moist deciduous forests.

Distribution: Earlier it was recorded from South India (Kerala, Karnataka), East India (Manipur), Sri Lanka, Bangladesh, Myanmar, Thailand, Vietnam, Celebes, New Guinea, Philippines, Columbia, Bolivia and Ecuador.

TRACHYPODACEAE

Diaphanodon blandus (Harv.) Renauld & Cardot, Bull. Soc. Bot. Belgium 38(1): 23. 1900.

Habitat: On tree trunks along the stream banks and logs in evergreen forests.

Distribution: It was earlier described from South India (Kerala, Karnataka, Tamil Nadu), North-east India (Mussoorie, Simla, Kumaon, West Bengal, Sikkim, Assam, Darjeeling), Sri Lanka, Nepal, Bhutan, Borneo, Ceram, Halmahera, Indonesia, Myanmar, Taiwan, Sumatra and Yunnan.

Duthiella declinata (Mitt.) Zant., Blumea 9(2): 559. 1959.

Habitat: Corticolous in moist deciduous forests.

Distribution: India (Kerala, Mussoorie, Naga hills, Simla), China, Indonesia and Philippines.

Trachypus bicolor Reinw. & Hornsch., Nov. Act. Ac. Leop. Car. 14 (2): 708. 1829.

Habitat: Common on basal and upper part of tree trunks and branches in semi-evergreen, evergreen and shola forests.

Distribution: It was reported earlier from South India (Kerala, Tamil Nadu), North-east India (Western Himalayas, Assam, Sikkim), Sri Lanka, China, Nepal, Barnes, Brazil, Celebes, French Guinea, Guatemala, Indonesia, Japan, Korea, Mexico, Myanmar, Thailand, New Guinea, Philippines and Sumatra.

Trachypodopsis serrulata (P.Beauv.) M.Fleisch., Hedwigia 45: 67. 1905.

Habitat: Basal and upper part of tree trunk on evergreen forests.

Distribution: It was earlier recorded from South India (Kerala, Tamil Nadu), North-east India (Calcutta, Mussoorie, Arunachal Pradesh, Khasi hills, Naga hills, Sikkim, Simla), Andaman Islands, Sri Lanka, Myanmar, Thailand, Laos, Sumatra, Java,

Borneo, Celebes, Taiwan, Central & South Africa and Madagascar.

PTEROBRYACEAE

Garovaglia plicata (Brid.) Bosch & Sande-Lac., Bryol. Jav. 2: 79. 1863.

Habitat: Upper part of tree trunk in evergreen and shola forests.

Distribution: It is an Indo-Malesian species distributed in India (Kerala, Sikkim); Sumatra, Indonesia, Java, Malaya, Borneo, Taiwan, Cera and Philippines.

Pterobryopsis acuminata (Hook.) M.Fleisch., Hedwigia 45: 59. 1905.

Habitat: Upper part of tree trunk on semi-evergreen and evergreen forests.

Distribution: This species is distributed in South India (Kerala, Tamil Nadu), North-east India (Sikkim, Khasi hills), Nepal and Myanmar.

Pterobryopsis orientalis (C.Muell.) M.Fleisch., Hedwigia 59: 217. 1917.

Habitat: Corticolous along with other mosses and leafy liverworts and also on logs in moist deciduous, semi-evergreen and evergreen forests.

Distribution: A South-east Asiatic species found distributed in South India (Kerala, Tamil Nadu), North-east India (Mussoorie, Kumaon, Darjeeling, Sikkim, Naga hills), Myanmar, Thailand, North Vietnam and Yunnan.

Symphysodontella involuta (Thwaites & Mitt.) M. Fleisch., Musci Buitenzorg, 4: 1674. 1923.

Habitat: On bark.

Distribution: It is distributed in India (Kerala, Eastern Hiamalayas, Arunachalpradesh).

Symphysodontella madhusoodananii Manju & Rajesh, *Phytokeys* 18: 39–44. 2012.

Habitat: Hanging from the branches.

Distribution: **Endemic to Kerala** (New Amarambalam RF, Malappuram Dt.).

Described as new species to science.

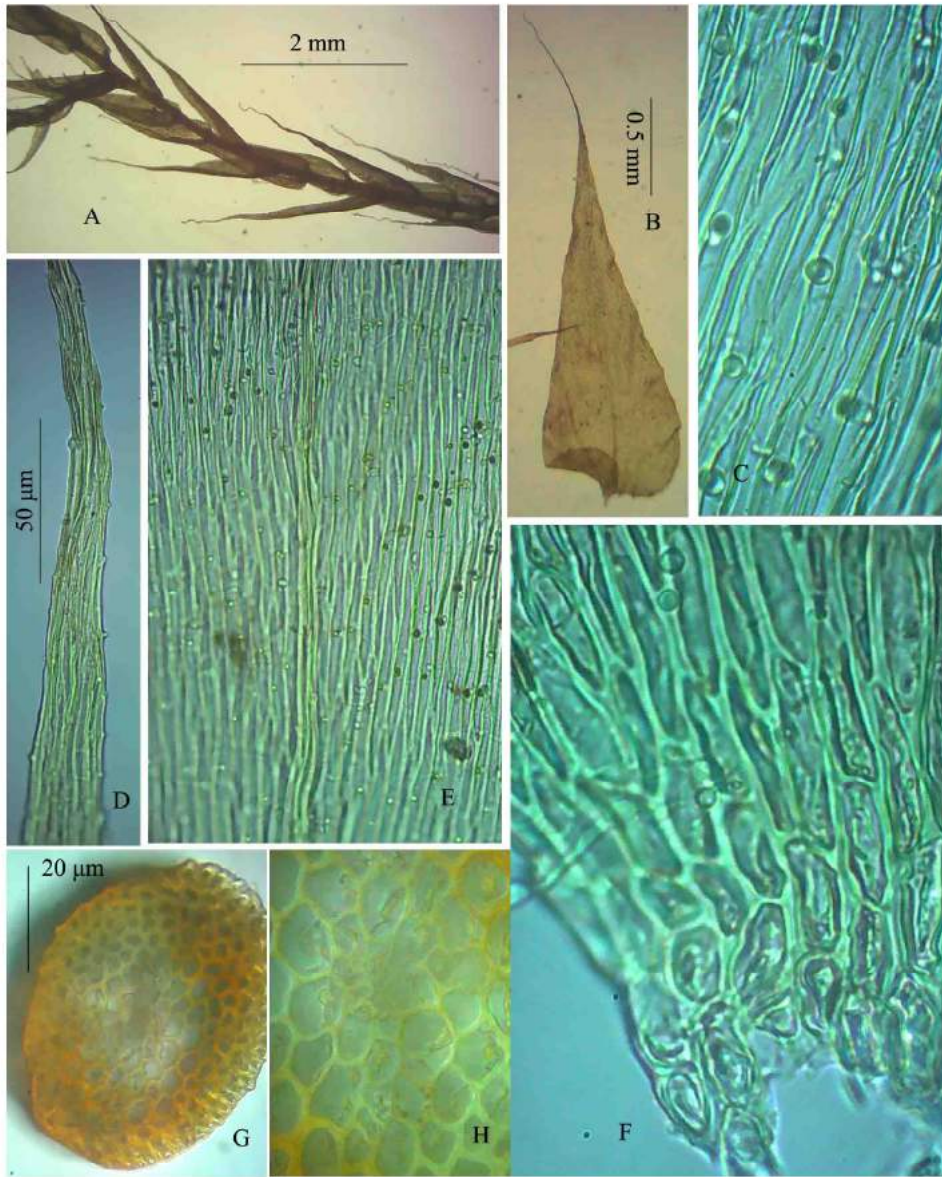
METEORACEAE

Aerobryidium aureonitens (Hook. ex Schwägr.) Broth., Nat. Pflanzenfam., I(3): 820. 1906.

Habitat: Hanging from the branches.

Distribution: It is distributed in India (Kerala, Khasi hills, Darjeeling) and Nepal, China, Sri Lanka, Myanmar, Taiwan and Thailand.

Aerobryopsis longissima (Dozy & Molk.) M.Fleisch., Hedwigia 44: 305. 1905.



Aerobryopsis wallichii; A. Branch, B. Leaf, C. Leaf papilla at leaf centre, D. Leaf tip cells, E. Leaf middle cells, F. Leaf basal cells (C-F same size) G. Stem C.S., H. Middle cortical cells at stem

Habitat: Base of tree trunk in moist deciduous forests.

Distribution: It is distributed in South India (Kerala, Tamil Nadu, Karnataka) East India (Sikkim), Sri Lanka, China, Caroline Islands, Indian Archipelago, Madagascar, Malacca, New Guinea, Philippines, Pacific Ocean Islands, Sumatra, Taiwan, Tonkin, Australia and Yunnan.

Aerobryopsis wallichii (Brid.) A.Fleisch., Musci Fl. Buitenz. 3: 789.1908.

Habitat: Hanging from the branches.

Distribution: India (Kerala), Eastern Nepal, Sri Lanka. **(The present collection is a new record for India).**

Aerobryum speciosum Dozy & Molk., Ned. Kruidk. Arch. 2(4): 280. 1851.

Habitat: Base of tree trunk along with mosses near streams in moist deciduous and semi-evergreen forests, also epiphytic on Coffee tree in Plantations.

Distribution: An east and southeast Asiatic species earlier reported from South India (Kerala, Western Ghats of Tamil Nadu), North-east India (Darjeeling, Arunachal Pradesh, Khasi hills, Manipur, Meghalaya, Sikkim), Sri Lanka, Bhutan, Celebes, China, Taiwan, Indonesia, Japan, Philippines, New Guinea and Tonkin.

Barbella chrysonema (Müll.Hal.) Nog., J. Hattori Bot. Lab. 41: 328. 1976.

Habitat: Terrestrial.

Distribution: India (Kerala, Tamil Nadu) and China.

Barbella convolvens (Mitt.) Broth., Nat. Pflanzenfam., I(3): 824. 1906.

Habitat: On branches of trees.

Distribution: India (Kerala, Eastern Hiamalayas).

Barbella turgida Nog., Flora of Eastern Himalaya 1: 571. f. 38. 1966.

Habitat: On tree trunk.

Distribution: It is distributed in India (Kerala, Western Himalaya, Tamil Nadu), East Nepal.

Cryptopapillaria fuscescens (Hook.) A.Jaeger, Ber. Senckenberg. Naturf. Ges. 1875-'76: 270. 1877.

Habitat: On tree trunks and on logs in moist deciduous, semi-evergreen, evergreen and shola forests.

Distribution: It is widely distributed in South India (Kerala, Goa, Karnataka, Tamil Nadu), North-east India (Kumaon Hiamalaya, West Bengal, Arunachal

Pradesh, Manipur, Meghalaya, Sikkim), Sri Lanka, Bhutan, Indonesia, Indian Archeipelago, Myanmar, Nepal, Philippines, Thailand, Tonkin and Yunnan.

Chrysocladium flammeum (Mitt.) M. Fleisch., Musci Buitenzorg, 3: 830. 1908.

Habitat: On bark.

Distribution: It is distributed in India (Kerala, Assam), Sikkim, Darjeeling, East Nepal.

Floribundaria floribunda (Dozy & Molk.) M.Fleisch., Hedwigia 44: 302. a-i. 1905.

Habitat: Hanging from the branches.

Distribution: It is distributed in India (Kerala, Sikkim, Darjeeling, Bhutan, Arunachal, Assam, Khasia Hills, Manipur) and East Nepal.

Floribundaria sparsa (Mitt.) Broth., Nat. Pflanzenfam. I(3): 822. 1906.

Habitat: Hanging from the branches.

Distribution: It is distributed in India (Kerala, Sikkim, Darjeeling, Khasia Hills), East Nepal, Bhutan, Thailand, Java and Taiwan.

Floribundaria walkerii (Renauld & Cardot) Broth. in Engl. & Prantl, Nat. Pflanzenfam. 1(3): 822. 1906.

Habitat: On rocky patches and as epiphytes along with other leafy liverworts in semi-evergreen, evergreen and shola forests.

Distribution: *Floribundaria walkerii* is an Indian endemic species distributed in Kerala, Eastern Himalayas and West Bengal.

Meteoriopsis ancistrodes (Ren. & Card.) Broth., Nat. Pflanzenfam. I(3): 826. 1906.

Habitat: On branches.

Distribution: A south-east Asiatic species distributed in North-east India (Kerala, Darjeeling, Mussoorie, Garhwal, Kumaon), Nepal, Bhutan, Myanmar, Thailand, Sumatra, Java, Taiwan and Borneo.

Meteoriopsis reclinata (C.Muell.) M.Fleisch. in Broth., Nat. Pflanzenfam. 1(3): 826. 1906.

Habitat: It is a common species seen on the trunks and branches of trees and shrubs in coffee and teak plantations, moist deciduous, semi-evergreen, evergreen and shola forests.

Distribution: It is a widely distributed species in the study area. It was earlier recorded from South India (Kerala, Tamil Nadu, Karnataka), North-east India

(Mussoorie, Kumaon, Bihar, Meghalaya, Sikkim), Sri Lanka, China, Japan, Indonesia, Malacca, Myanmar, Thailand, Laos, Celebes, Nepal, New Guinea, Sumatra and Australia.

Meteoriopsis squarrosa (Hook.) M.Fleisch. in Broth., Nat. Pflanzenfam. 1(3): 826. 1906.

Habitat: Corticolous as well as on small branches of shrubs in moist deciduous semi-evergreen, evergreen and shola forests.

Distribution: It was earlier recorded from South India (Kerala, Tamil Nadu, Karnataka), North-east India (Sikkim, Darjeeling, Himalaya, Arunachal Pradesh, Khasi hills, Manipur), Sri Lanka, Nepal, Bhutan, Myanmar, Thailand, Vietnam, Sumatra, Java, New Guinea, Philippines, Taiwan and Yunnan.

Meteorium buchananii (Brid.) Broth., Nat. Pflanzenfam. I(3): 818. 1906.

Habitat: On bark.

Distribution: India (Kerala, Himalayas) Japan, Papua New Guinea.

Meteorium helminthocladum (Müll.Hal.) M.Fleisch., Musci Buitenzorg, 3: 778. 1908.

Habitat: Epiphytic.

Distribution: India (Kerala) China.

Papillaria crocea (Hamp.) A.Jaeger, Ber. Senckenberg. Naturf. Ges. 1875-'76: 267. 1877.

Habitat: On small branches of trees as well as on logs in moist deciduous forests.

Distribution: It has earlier reported from South India (Kerala, Tamil Nadu), Sri Lanka, China, Japan, New Zealand and Australia.

Papillaria leuconeura (Müll. Hal.) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges., 1875-76: 267 (Gen. Sp. Musc. 2: 171). 1877.

Habitat: Hanging from the branches.

Distribution: It is distributed in India (Kerala, Himalayas), Vietnam, Sumatra, Java, Ceram, Celebes, New Zealand, Philippines, Papua New Guinea and New Caledonia.

Pseudobarbella compressiramea (Ren.& Card.) Nog., Fl. E. Himalaya 1: 574. 1966.

Habitat: On branches.

Distribution: It is recorded from India (Kerala, Sikkim, Darjeeling and Naga Hills) and East Nepal.

NECKERACEAE

Calyptothecium pinnatum Nog.

Habitat: Hanging from bark and branches.

Distribution: An east Asiatic species distributed in Eastern India (Kerala, Sikkim, Darjeeling, Khasia Hills), Eastern Nepal, Taiwan and Myanmar, Taiwan. **(The present collection is a new record for Peninsular India)**

Calyptothecium wightii (Mitt.) M.Fleisch., Hedwigia 45: 62. 1905.

Habitat: Epiphytic and also terrestrial in evergreen and shola forests.

Distribution: An Asiatic species distributed in India (Kerala, Darjeeling), Bangladesh, Sri Lanka, Myanmar, Laos, Thailand, Vietnam, Yunnan and Taiwan.

Himantocladium cyclophyllum (Müll.Hal.) M.Fleisch., Musci Buitenzorg 3: 887. 1908.

Habitat: Epiphytic.

Distribution: India (Kerala, West Bengal, Assam, Arunachal) Africa.

Himantocladium plumula (Nees) M.Fleisch., Die Musci Fl. Buitenz. 3: 889. 1908.

Habitat: Base of tree trunk in evergreen forests.

Distribution: An Indo-Pacific species found distributed in India (Kerala, Arunachal Pradesh, Assam, Khasi hills), Bangladesh, China, Taiwan, Japan, Sumatra, Indonesia, Borneo, Philippines, New Caledonia, New Guinea, Australia and Pacific Ocean Islands.

Homali dendron exiguum (Bosch. & Sande-Lac.) M.Fleisch., Musci Fl. Buitenz. 3: 897. 1908.

Habitat: On rocky patches near streams in moist deciduous forests.

Distribution: It was earlier reported from South India (Kerala; Tamil Nadu), North-east India (Garhwal, Mussoorie, Arunachal Pradesh, Khasi hills), Sri Lanka, Japan, Myanmar, Thailand, Vietnam, Sumatra, Java, Celebes, New Guinea, Philippines, Taiwan, Tahiti, Fiji and Australia.

Homali dendron flabellatum (Sm.) M.Fleisch., Hedwigia 45: 74. 1906.

Habitat: Epiphytic on shady tree trunks and on rocks near stream in shola forests.

Distribution: It was earlier reported from South India (Kerala; Tamil Nadu; Karnataka), North-east India (West Bengal, Sikkim, Darjeeling, Arunachal Pradesh, Meghalay), Sri Lanka, Java, Borneo, Philippines, Japan, Pacific Ocean Islands, Sumatra, Thailand and Australia.

Neckeropsis fimbriata (Harv.) M.Fleisch., Die Musci Fl. Buitenz. 3: 878. 1908.

Habitat: Base of tree trunk in semi-evergreen forests.

Distribution: It is an Indo-Malesian species distributed in India (Kerala, Darjeeling, Sikkim, Khasi hills), Nepal, Bhutan, Myanmar, Thailand, Cambodia, Vietnam, Malaysia and Philippines.

Neckeropsis andamana (Müll.Hal.) M.Fleisch., Musci Buitenzorg 3: 878. 1908.

Habitat: On bark and on rocks.

Distribution: India (Kerala), Andaman Islands, Philippines and Thailand.

Pinnatella calcutensis M.Fleisch., Hedwigia 45: 84. 1906.

Habitat: Basal and upper part of tree trunk in moist deciduous, semi-evergreen and evergreen forests.

Distribution: It is a South-east Asiatic species reported from South India (Kerala, Karnataka), North-east India (West Bengal, Darjeeling, Orissa) and Thailand.

Pinnatella sikkimensis Broth. in Mitteil., Inst. Allg. Bot. Hamburg, 8:404.1931.

Habitat: On rocky patch.

Distribution: India (Kerala, Sikkim).

HOOKERIACEAE

Callicostella papillata (Montin) Mitt., Musc. Ind. Orient. 136. 1859.

Habitat: Epiphytic on base of trunk as well as on logs in homestead areas.

Distribution: It is reported as distributed in South India (Kerala, Tamil Nadu), North India (West Bengal), Andaman Islands, Sri Lanka, Borneo, Fiji, Taiwan, Indonesia, Java, Malaya, Madagascar, New Guinea, New Caledonia, Ryukyus, Samoa, Sumatra, Tahiti, Taiwan, Thailand, Philippines and Vietnam.

Cyathophorum adiantum (Griff.) Mitt., J. Proc. Linn. Soc., Bot., Suppl. 2: 147. 1859.

Habitat: On bark

Distribution: India (Kerala) Thailand.

Distichophyllum schmidtii Broth., Bot. Tidsskr. 24: 122. 1901.

Habitat: On bark and on rocky patch.

Distribution: India (Kerala), Bangladesh and Thailand

Glossadelphus bilobatus (Dix.) Broth., Nat. Pflanzenfam. (ed. 2). 11: 535. 1925.

Habitat: On rocky patch.

Distribution: India (North east, Kerala).

HYPOPTERYGIACEAE

Hypopterygium aristatum Bosch. & Sande-Lac., Bryol. Jav. 2: 12, 141. 1861.

Habitat: On rocky patches near streams in evergreen and shola forests.

Distribution: Earlier recorded from South India (Kerala, Tamil Nadu), Northern India (Himalayas), China, Java, New Guinea and Indo-Malayan region.

Hypopterygium tamarisci (Sw.) Brid. & C.Muell., Syn. Musc. Frond. 2: 8. 1850.

Habitat: In moist shady areas on rocks, logs, over humus or leaf litter; Occasionally on bases of tree trunks and soil in evergreen and shola forests.

Distribution: Earlier reported from South India (Kerala; Tamil Nadu), Sri Lanka, Brazil, Columbia, Ecuador, Java, Madagascar, Malaya, Mexico, New Guinea, Pacific Ocean Islands, Argentina, Bolivia, Borneo, Peru, Philippines, Sumatra and West Indies.

FABRONIACEAE

Fabronia schensiana C.Muell., Nuov. Giorn. Bot. Ital. ser. 4: 262. 1897.

Habitat: On logs in Tea estates.

Distribution: It has earlier reported from India (Kerala, Sikkim) and China.

THUIDIACEAE

Thuidium cymbifolium (Dozy & Molk.) Dozy & Molk., Bryologia Javanica 2: 115. 221. 1865.

Habitat: On rocks.

Distribution: A widely distributed very common species in the tropics at high altitude areas.

Thuidium pristocalyx (C.Muell.) A.Jaeger, Ber. Senckenberg. Naturf. Ges. 1876-77: 257. 1878.

Habitat: On rocks near streams in evergreen and shola forests.

Distribution: It was earlier recorded from India (Kerala) Thailand, Vietnam, Indonesia, Malaysia and Philippines.

Thuidium subdelicatulum (Hampe) Broth., Acta Soc. Sci. Fenn. 19(5): 27. 1891.

Habitat: On rocky patch and on roots of higher plants.

Distribution: India (Kerala) Brazil.

Thuidium tamariscellum (C.Muell.) Bosch. & Sande-Lac., Bryol. Jav. 2: 20. 1865.

Habitat: Occur in wide range of habitats such as rocks, bases of trees and leaf litter in evergreen and shola forests.

Distribution: This is a south and east Asiatic species, earlier reported from South India (Kerala, Tamil Nadu, Karnataka), North-east India (Himalaya, Sikkim), Butan, Nepal, Myanmar, Thailand, Tonkin, Yunnan, Taiwan, Sumatra, Java and Philippines.
Pelekium gratum (P.Beauv.) Touw, J. Hatt. Bot. Lab. 90: 203. 2001.

Habitat: On leaf litter where soil is seen and on logs in semi-evergreen and evergreen forests.

Distribution: It was earlier reported from India (Kerala) Sri Lanka, Indonesia, Malaysia, Papua New Guinea and Philippines.

BRACHYTHECIACEAE

Brachythecium buchananii (Hook.) A.Jaeger, Ber. Senckenberg. Naturf. Ges. 1876-77: 341. 1878.

Habitat: On soil, rocks, also as epiphytic on trunks, or on short branches in evergreen forests.

Distribution: Earlier reported from South India (Kerala, Tamil Nadu), North-east India (Himachal Pradesh, Mussorie, Garhwal, Meghalaya, Naga Hills), Nepal, Bhutan, China, Japan, Korea, Myanmar, Pakistan, Thailand, Vietnam, Laos and Philippines.

Brachythecium rutabulum (Hedw.) Schimp., Bryol. Eur. 6: 15. pl. 543 (fasc. 52-56 Monogr. 11. pl. 9). 1853.

Habitat: On rocky patch.

Distribution: India (Kerala, Eastern Himalayas) China, Japan, Gautemala, New Zealand, papua New Guinea

Bryhnia nepalensis Takaki, Bull. Nat. Sc. Musc. Tok. 9: 374. 1966.

Habitat: Epiphytic on shola trees.

Distribution: This species was earlier recorded from India (Kerala) and east Nepal.

Eurhynchium swartzii (Thurn.) Curnow., Bryotheca Europaea 12: 593. 1862.

Habitat: On rocky patch.

Distribution: It is distributed in India (Kerala, Eastern Himalayas), East Nepal, Darjeeling, Sri Lanka, China, Japan, Siberia, Kurdistan, Caucasus, Europe, Azores, Algeria, Central and South Africa, Canada and United States of America.

Eurhynchium vagans (A.Jaeger) E.B.Bartram, Bishop Mus. Bull. 101. 213. 1933.

Habitat: Epiphytic near riverine areas in moist deciduous forests.

Distribution: Earlier recorded from South India (Kerala, Karnataka, Tamil Nadu), North-east India (Darjeeling, Dehradun, Garhwal), Sri Lanka, Myanmar, Thailand, Laos, Java, Borneo, Philippines, Taiwan, Japan and Hawaii.

Rhynchostegium herbaceum (Mitt.) A.Jaeger, Ber S. Gall Naturw. Ges. 1876-77: 368. 1878.

Habitat: On rocky patches and on short branches in evergreen and shola forests.

Distribution: An Indo-Sri Lankan species earlier reported from South India (Kerala, Karnataka), North-east India (Darjeeling, Sikkim, Khasi hills, Arunachal Pradesh, Dehradun, Mussoorie hills) and Sri Lanka.

ENTODONTACEAE

Entodon flavescens (Hook.) A.Jaeger, Ber. Senckenberg. Naturf. Ges. 1876-77: 293. 1879.

Habitat: On rocks and rotten logs in moist deciduous, semi-evergreen and evergreen forests.

Distribution: This east Asiatic species is distributed in South India (Kerala), North-east India (Darjeeling, Mussoorie, Assam, Khasi hills, Sikkim), Nepal, Bhutan, Korea, Japan, Philippines, Yunnan and Eastern Siberia.

Entodon plicatus C.Muell., Linnaea 18: 706. 1845; Gangulee, 3(8): 1791. 1980.

Habitat: Corticolous in moist deciduous forests.

Distribution: A Southeast Asiatic species distributed in India (Kerala, Tamil Nadu, Karnataka, Kumaon Himalaya), Sri Lanka, China, Myanmar, Thailand, Celebes, Philippines.

Erythrodontium julaceum (Hook. ex Schwaegr.) Paris, Index Bryol. Suppl. 436, 1896.

Habitat: On logs and on moist soil in Teak plantations and in moist deciduous forests.

Distribution: It was earlier reported from South India (Kerala, Karnataka, Tamil Nadu), North-east India (Assam, Dehradun, Khasi hills, Mussoorie, Sikkim), Sri Lanka, Celebes, Java, Nepal, Philippines, Myanmar, Tonkin, Sumatra, Yunnan and South and Central Africa.

SEMATOPHYLLACEAE

Brotherella amblystegia (Mitt.) Broth., Nat. Pflanzenfam. 11: 425. 1925.

Habitat: On bark.

Distribution: It is distributed in India (Kerala, Darjeeling, Arunachal Pradesh, Naga Hills).

Chionostomum rostratum (Griff.) C. Muell., Linnaea 36: 21. 1869.

Habitat: On bark.

Distribution : It is distributed in India (Kerala; Aralam WLS, Darjeeling, Khasia Hills, Coorg), Sri Lanka, Thailand, North & South Vietnam, Philippines and Taiwan.

Clastobryopsis muelleri (Dix.) Tix. in Rev. Bryol. Lichenol, 43: 413. 1977.

Habitat: Epiphytic, found on tree bark.

Distribution: India (Kerala, Tamil Nadu), North East India (Darjeeling, Assam), Nepal, Philippines.

Entodontopsis nitens (Mitt.) W.R. Buck & Ireland, Nova Hedwigia 41: 104. 1985.

Habitat: On rocky patch.

Distribution: A widely distributed species.

Eurhynchium swartzii (Turn.) Curnow., Bryotheca Europaea 12: 593. 1862.

Habitat: On rocky patch and on roots of higher plants.

Distribution: India (Eastern Himalayas, Kerala).

Foreauella orthothecia (Schwaegr.) Dixon. & P.Varde., J. Bot. 75: 129. 1937.

Habitat: On logs, roots and bark, strongly attached to the substratum in the plantations, moist deciduous, semi evergreen and evergreen forests.

Distribution: This Indo-Malesian species was earlier recorded from South India (Kerala, Tamil Nadu), North-east India (Darjeeling, Assam, Khasi hills, Orissa), Nepal, Thailand, Philippines and the Pacific Ocean Islands.

Glossadelphus bilobatus (Dix.) Broth., Nat. Pflanzenfam. (ed. 2) 11: 535. 1925.

Habitat: On wet rocks.

Distribution: It is distributed in India (Kerala, Naga Hills), Sri Lanka and Moluccas.

Meiothecium microcarpum (Hook.) Mitt., J. Linn. Soc. Bot. 10:185. 1868.

Habitat: On bark.

Distribution: India (Kerala), Japan, Philippines, Thailand.

Rhaphidorrhynchium confertissimum (Mitt.) Broth., Nat. Pfl. ed. 2, 11: 428, 1925.

Habitat: On rocky patch.

Distribution: India (Kerala), China.

Sematophyllum subhumile (Müll.Hal.) M.Fleisch., Musci Buitenzorg 4: 1264. 1923.

Habitat: On rocky patch near streams.

Distribution: India (Kerala) China, Japan, Australia.

Sematophyllum subpinnatum (Brid.) E.G.Britton, Bryologist 21: 28. 1918.

Habitat: Base of tree trunk and also on logs of *Tectona grandis* in plantations.

Distribution: It has been reported earlier from South India (Kerala, Tamil Nadu), North-east India (Darjeeling, Assam, Khasi hills), Sri Lanka, Japan, Sumatra, Java, Philippines, Australia, Central & South Africa, Madagascar and America.

Sematophyllum phoeniceum (C.Muell.) M.Fleisch., Musci Buitenzorg, 3: 1266. 1923.

Habitat: On logs.

Distribution: It is distributed in India (Kerala, Tamil Nadu), Andaman Islands, Thailand, Vietnam, South China and Bangladesh.

Stereophyllum anceps (Bosch. & Sande Lac.) Broth., Nat. Pflanzenfam. I(3): 898. 1907.

Habitat: On rocky patch and on roots of higher plants.

Distribution: India (Kerala, Tamil Nadu, Assam, Himachal Pradesh, Punjab

Taxithelium nepalense (Schwaegr.) Broth., Monsunia 1: 51. 1899.

Habitat: On rocky patch.

Distribution: India (Kerala), China, Philippines, Thailand.

Trachyphyllum inflexum (Harv.) Gepp in Hiern., Cat. Welw. Afr. Pl. 2(2): 299. 1901.

Habitat: On logs in plantations and moist deciduous forests.

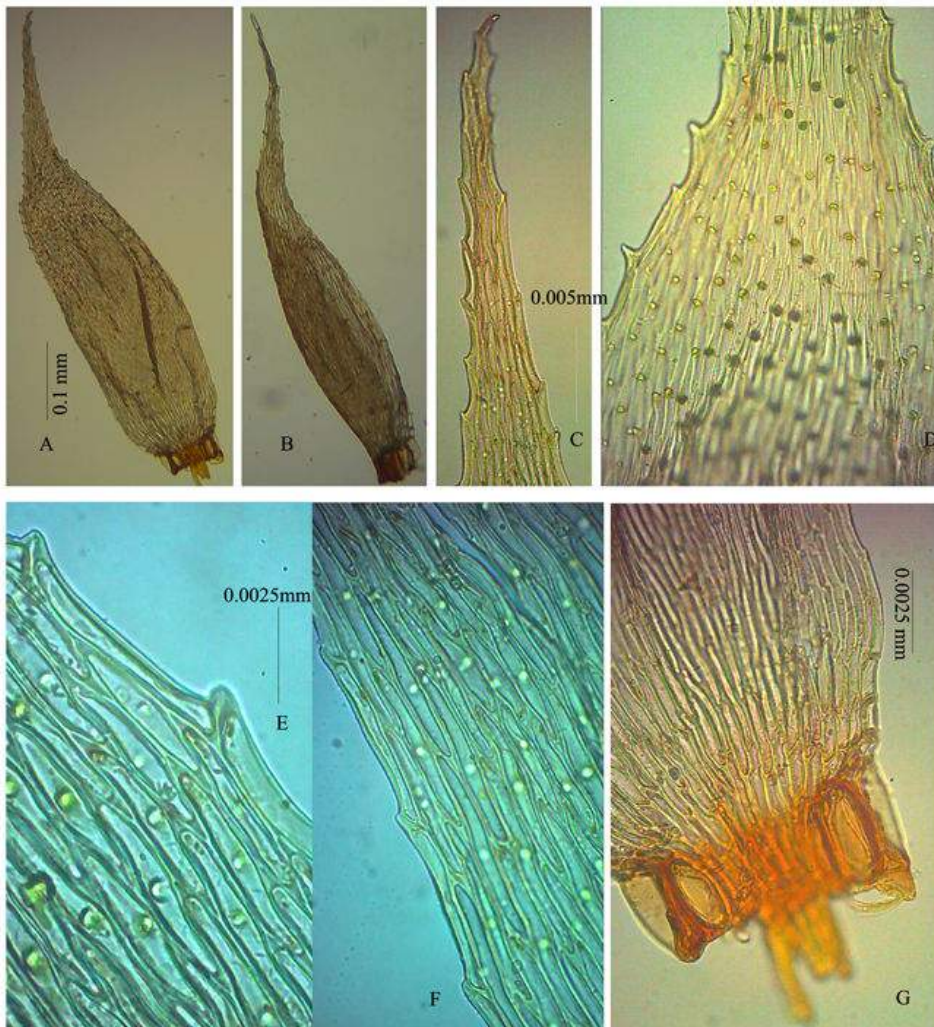
Distribution: This species was earlier reported from South India (Kerala, Karnataka), Central India (Madhya Pradesh), North-east India (Sikkim, Darjeeling, Orissa), China, Nepal, Bangladesh, Myanmar, Thailand, Cambodia, Java, Moluccas, Philippines, Australia, New Caledonia and Madagascar.

Trichosteleum boschii (Dozy & Molk.) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1876-77: 421 (Gen. Sp. Musc. 2: 487). 1878.

Habitat: On rocky patch.

Distribution: India (Kerala, Assam), Nepal, Malaysia, Sumatra, Borneo, Fiji, China, Philippines and Thailand.

Trichosteleum stigmatum Mitt., J. Linn. Soc., Bot. J. Linn. Soc., Bot. 10: 181. 1868.



Trichosteleum stigosum; A&B. Leaves, C&D. Leaf tip cells, E&F. Leaf marginal cells , G. Alar cells

Habitat: Epiphytic.

Distribution: India (Kerala), China (Hainan, Guangdong, Guangxi), Borneo, Philippines, Papua New Guinea, Oceania, Samoa and Fiji).

Wijkia deflexifolia (Mitt. ex Renauld & Cardot) H.A. Crum., The Bryologist 74: 171. 1971.

Habitat: On bark.

Distribution : It is distributed in India (Kerala, Darjeeling) and Bhutan.

HYPNACEAE

Ctenidium lychnites (Mitt.) Broth. in Engl. & Prantl, Nat. Pflanzenfam. 1(3): 1048. 1909.

Habitat: Terrestrial in evergreen forests.

Distribution: It is an Indo-Philippine species distributed in India (Kerala; Wayanad WLS, Tamil Nadu: Nilgiri hills, Palni hills, Khasi hills), Sri Lanka and Philippines.

Ectropothecium compressifolium (Mitt.) A.Jaeger, Ber. S. Gall. Naturw. Ges. 1877-78: 290. 1880.

Habitat: On soil cuttings in evergreen forests.

Distribution: It was earlier recorded from India (Kerala, Assam, Khasi hills) and Myanmar.

Ectropothecium sikkimense (Renauld & Cardot) Renauld & Cardot, Bull. Soc. Bot. Belgium 41(1): 109. 1905.

Habitat: Terrestrial in moist deciduous, semi-evergreen and evergreen forests.

Distribution: It has earlier reported from India (Kerala, Darjeeling, Sikkim), Bhutan and Thailand.

Ectropothecium rostellatum (Mitt.) Jaeg., Ber. S. Gall. Naturw. Ges., 1877-78: 258.1859.

Habitat: On rocky patch.

Distribution: India (Kerala, Himalayas).

Hypnum macrogynum Besch., Ann. Sci. Nat., Bot., sér. 7, 7, 15: 91. 1892.

Habitat: On rocky patch and on roots of higher plants.

Distribution: It is distributed in India (Himalayas, Kerala), East Nepal, Myanmar, South China and Taiwan.

Hypnum flaccens Besch., Ann. Sci. Nat., Bot., sér. 7, 15: 92. 1892.

Habitat: On roots of higher plants.

Distribution: It is distributed in India (Kerala, Sikkim), East Nepal, Bhutan. **(New record for Peninsular India)**

Isopterygium albescens (Hook.) A.Jaeger, Ber. S. Gall. Naturw. Ges. 1877-78: 433. 1878.

Habitat: On bark, rotten logs and on the surface of polypores in shola forests.

Distribution: It was earlier recorded from South India (Kerala, Tamil Nadu), North-east India (Khasi hills), Sri Lanka, Myanmar, Thailand, Vietnam, Singapore, Sumatra, Java, Borneo, Celebes, Philippines, Japan and New Zealand.

Isopterygium lignicola (Mitt.) A.Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges., 1876-77: 432 (Gen. Sp. Musc. 2: 498). 1878.

Habitat: On roots of higher plants.

Distribution: India (Kerala, Nilgiri hills, Sikkim, Khasia hills), Sri Lanka, Burma

Isopterygium minutirameum (C.Mueller) Jaeger, Ber. S. Gall. Naturw. Ges. 1876-77: 434. 1878.

Habitat: On bark of trees.

Distribution: India (Kerala, Tamil Nadu), Thailand, Sri Lanka and Myanmar.

Taxiphyllum taxirameum (Mitt.) M.Fleisch., Die Musci Fl. Buitenz. 4: 1435. 1923.

Habitat: Commonly found in shaded sites, on rocks or soil banks, on logs; often near riparian habitat in Teak plantations, moist deciduous, semi-evergreen and evergreen forests.

Distribution: This is widely distributed in the tropics and earlier reported from South India (Kerala, Tamil Nadu, Karnataka), North-east India (Mussoorie, Simla, Nainital, Almora), Sri Lanka, Myanmar, Sumatra, Java, New Guinea, Philippines, Taiwan, Yunnan, Korea, Japan, Siberia, Oceania and Australia.

Vesicularia levieri Cardot, J. Indian Bot. 2: 187. 10. 1921.

Habitat: On land cuttings and on rocky patch near stream.

Distribution: India (Kerala, Andaman Islands) Singapore and Malaysia.

Vesicularia vesicularis (Schwaegr.) Broth., Nat. Pflanzenfam. 1(3): 1094. 1908.

Habitat: On rocks near riparian habitat in semi-evergreen and evergreen forests.

Distribution: This south & east Asiatic-Pacific species distributed in India (Kerala, Western Himalaya, West Bengal, Arunachal Pradesh), China, Thailand,

Vietnam, Sumatra, Java, Borneo, Philippines, Australia and Oceania.

Vesicularia reticulata (Dozy & Molk.) Broth., Die Natürlichen Pflanzenfamilien I(3): 1094. 1908.

Habitat: On rocks.

Distribution: Distributed in India (Sikkim, Arunachal, Assam, Naga hills, Kerala) Sumatra, Java, Celebes, Philippines, Japan, Oceania and New Zealand.

HYLOCOMIACEAE

Macrothamnium macrocarpum (Reinw. & Hornsch.) M.Fleisch., Hedwigia 44: 308, 1905.

Habitat: Basal and upper part of tree trunk in evergreen and shola forests.

Distribution: A widespread Indo-Pacific species distributed in South India (Kerala, Tamil Nadu), North-east India (Abor, Khasi, Kumaon, Sikkim), Sri Lanka, Java, Thailand, Borneo, Yunnan, Japan, Hawaii, Myanmar, Pacific Ocean Islands, Taiwan, Philippines and Siam.

SUMMARY

Eventhough the bryophytes are the second largest group of land plants, next to Angiosperms the information on this group is meagre. It is evident from the fact that, there are no good manuals or monographs on the bryophytes of India. The main reason for this is, probably the limited number of researchers in bryology compared to the enormous diversity of the group. It is nearly impossible to bring out the bryophyte flora of India single handily, considering the vast extent of our country and geographical diversity.

The scenario in Kerala is not different. It is more pathetic when compared to the other South Indian states such as Tamil Nadu bryophytic studies. The reason behind is the low number of active researchers and research centres engaged in the bryophytic studies in India. The review of literature on South Indian bryology reveals that during the last ten years the bryophyte studies have began and it is moving in a good pace in Kerala compared to the sporadic collections of earlier reports.

The regional approaches of studying the smaller areas with deeper intensity is probably the best method in developing a national database. The present work is significant in this aspect. The present study is aimed mainly to document the bryophyte diversity of a biodiversity rich area in the Northern parts of Kerala. This study, reported 333 species of bryophytes including many new distributional records and novelties. This report is an addition to the biodiversity of the bryophytes of Kerala. Earlier Manju et al. (2008) reported 465 species from whole of Kerala. This report is thus significant that only the Northern part of Kerala holds 333 species. Among these 91 species are addition with regard to earlier report. The present study is also important with regard to the collection of plant specimens from various localities of Northern Westren Ghats in Kerala. Now Malabar Botanical Garden Herbarium holds more than 2000 specimens of collections from various localities.

The present study reports 333 species belonging to 154 genera and 53 families. Of these, mosses comprise 209 species belonging to 108 genera and 31 families. Liverworts comprise 121 species, belonging to 43 genera and 19 families and

hornworts comprise four species belonging to three genera and two families. Meteoriaceae is the largest family with 20 species followed by Pottiaceae and Sematophyllaceae with 19 and 18 species each among mosses and Lejeuneaceae with 45 species is the largest Liverwort family. Of these one species viz., *Symphysodontella madhusoodananii* Manju & Rajesh is reported as new to science. Six species viz., *Archilejeunea abbreviata*, *Otolejeunea semperiana*, *Tuyamaella angulistipa* (not reported), *Trichosteleum stigmatosum*, *Pottia bryoides* and *Aerobryopsis wallichii* are new records to India, *Leucophanes glaucum* is a new record for the mainland of India, Seven species viz., *Lejeunea cocoes*, *Notoscyphus paroicus*, *Odontoschisma denudatum*, *Gymnostomum calcareum*, *Tortula muralis*, *Calyptothecium pinnatum*, and *Hypnum flaccens* are new records to Peninsular India and Eight species viz., *Archilejeunea minutilobula*, *Radula meyeri*, *R. obscura*, *Cololejeunea appressa*, *Cololejeunea udarii*, *Barbula tenuirostris*, *Syntrichia fragilis* and *Tayloria subglabra* are new records to Kerala; *Odontoschisma* and *Tuyamaella* are two new genus record for Kerala (Listed below). Among these *Symphysodontella madhusoodananii* is described as new species to science. Some taxa collected as *Trachypodopsis* sp., *Fissidens* sp., *Pterobryopsis* sp. and *Riccardia* sp. may turn to be new to science or become new distributional records. All these show richness of the bryo-diversity of the area.

In the present study area the evergreen forests shows the richest species diversity followed by semi-evergreen forests eventhough the area is less in extent compared to the moist deciduous forests. This is mainly due to the availability of more suitable microhabitats, which support a variety of bryophytes. The diversity in semi-evergreen forests is high due to the mixing up of species from evergreen and moist deciduous forests. In homesteads, plantations and in the grasslands the diversity is very less due to the unavailability of suitable microhabitat and more disturbance. The grassland area supports minimum number of species. This is because of the dryness, exposure to wind, lack of shade and occurrence of fire. The soil moisture which play the key role in the sustenance of the bryophytes is lesser in grasslands, compared to other vegetation types. These areas are more prone to stress due to lack of shade and exposure to sun and wind. Moreover, the species present in grasslands such as *Pogonatum microstomum*, *Campylopus* spp., *Entosthodon wichurae*, etc. are adapted to grassland life with their subterranean rhizoids and high

regenerating capacity. Only those species which can withstand the extreme conditions of grassland could survive here. The maximum diversity of species is seen in the medium altitude. This may be due to the mixing of low and high altitude species in the mid altitude zone.

Endemic species iredcorded from the Northern Western Ghats in Kerala

New observations:

New species to science	New record for India	New record for Mainland of India	New record for Peninsular India	New record for Kerala	New genus record for Kerala
<i>Symphysodontella madhusoodananii</i> sp. nov.	<i>Archilejeunea abbreviata</i> , <i>Otolejeunea semperiana</i> , <i>Trichosteleum stigmosum</i> , <i>Pottia bryoides</i> , <i>Aerobryopsis wallichi</i> , <i>Tuyamaella angulistipa</i> (not reported)	<i>Leucophanes glaucum</i>	<i>Lejeunea cocoes</i> , <i>Gymnostomum calcareum</i> , <i>Tortula muralis</i> , <i>Notoscyphus paroicus</i> , <i>Calyptothecium pinnatum</i> , <i>Odontoschisma denudatum</i> , <i>Hypnum flaccens</i> ,	<i>Archilejeunea minutilobula</i> , <i>Radula meyeri</i> , <i>R. obscura</i> , <i>Cololejeunea appressa</i> , <i>Cololejeunea udarii</i> , <i>Barbula tenuirostris</i> , <i>Syntrichia fragilis</i> , <i>Tayloria subglabra</i>	<i>Odontoschisma</i> , <i>Tuyamaella</i>

Endemic to Kerala	Endemic to Western Ghats	Endemic to South India	Endemic to Indian subcontinent	Endemic to India
<i>Fissidens kammadensis</i> , <i>Trichostomum wayanadense</i> , <i>Symphysodontella madhusoodananii</i>	<i>Archilejeunea minutilobula</i>	<i>Cololejeunea foliicola</i> , <i>Cololejeunea kashyapii</i> , <i>Cololejeunea mizutaniiana</i> , , <i>Cololejeunea nilgiriensis</i>	<i>Cheilolejeunea subopaca</i>	<i>Cololejeunea udarii</i>

CONSERVATION

Generally, the conservation strategy is meant for higher group of organisms only. In the case of lower groups, the conservationists and policy makers give no significance. This neglect is the main reason for the lack of proper information base on the lower group of plants in the country.

The protected areas in Kerala state, is protected by law and hence experience less threat. There are many areas of rich and unique biodiversity other than the protected area, which deserve better conservation status. Reserved forest areas in the study area hold a good vegetation of evergreen, semi evergreen and shola forests, which abode a good number of rare and threatened species. Now these areas are subjected to indiscriminate anthropogenic interference by tourists. If the present situation is continued, the area with its rich biodiversity will be degraded in the near future itself. *Ex-situ* conservation, by introducing into gardens may also be attempted.

SCOPE OF THE FUTURE WORK

The present study in a less explored area of the Western Ghats, one among the hotspots of biodiversity, reveals its bryological potentials. It opens new vistas for more studies related to the development on pharmacological and other relevant medicinal aspects of bryophytes. The lack of an easy to use identification manual is the main reason that made most of the teachers and students as bryophobic. The present study may fill this gap to certain extent and could ignite more bryological studies.

The ecological adaptability and the occurrence of rare and threatened species in the area call for conservation of the species as a whole and thereby in the conservation of area.

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