

Contribution to the bryophyte flora of India: the Parambikulam Tiger Reserve in the Western Ghats

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Abstract: A checklist of the bryophyte flora of the Parambikulam Tiger Reserve in the Western Ghats is presented here. It consists of 58 taxa (39 mosses, one Hornwort and 18 liverworts), of which *Grimmia funalis* and *Thuidium subdelicatulum* has reported as new record for India (Manju & Rajesh, communicated), *Leucophanes glaucum* (Schwägr.) Mitt. is newly reported for the mainland of India, 10 species are newly reported for Peninsular India and another four are new for the Kerala State.

Key words: Bryophytes flora, Parambikulam Tiger Reserve, Western Ghats, India.

Parambikulam Tiger Reserve lies in the valley between the Anamalai ranges of Tamil Nadu and the Nelliampathy ranges of Kerala on the majestic Western Ghats. Earlier it is protected as a Wild life Sanctuary and it is raised to the rank of Tiger Reserve recently in February 2010. Parambikulam Tiger Reserve is the most protected ecological piece of Anamalai sub unit of Western Ghats, surrounded on all sides by protected areas and sanctuaries of Kerala and Tamil Nadu. The Palakkad gap in the District is the corridor connecting Malabar Coast to the Deccan plateau. Sanctuary is endowed with a peninsular flora and fauna which are excellently conserved due to total protection and minimal human interferences. The Sanctuary being a major ecological continuum from Peechi to Eravikulam through Anamalai aids the large viable populations of wildlife. It is the home ground for different races of indigenous people who are as well an integral part of the prevailing harmonious ecosystem. The Western Ghats is one of the world's 34 biodiversity hotspots. While considering the abundance of wildlife and the adorable beauty of Nature, Parambikulam Tiger Reserve is perhaps the most attractive piece of wilderness in the entire stretch of the Western Ghats. Thus it is popularly revered as 'Nature's own abode'.

Parambikulam Tiger Reserve is the third largest Protected Area in Kerala with an area of 272 km². It lies between 76°35' and 76°50' E longitude and between 10°20' and 10°32' N latitude in the Palakkad Revenue District of Kerala [Fig. 1]. The Sanctuary is well known because of its diverse flora and fauna. Owing to the geographical location, in the immediate south of Palakkad gap, the Sanctuary experiences a mix of the hot and dry climate of Deccan plateau and wet humid climate of Malabar coast. The Sanctuary

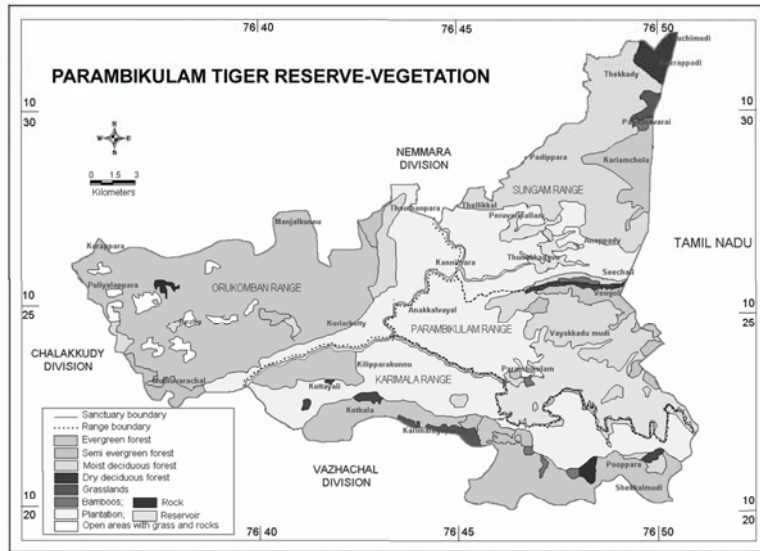
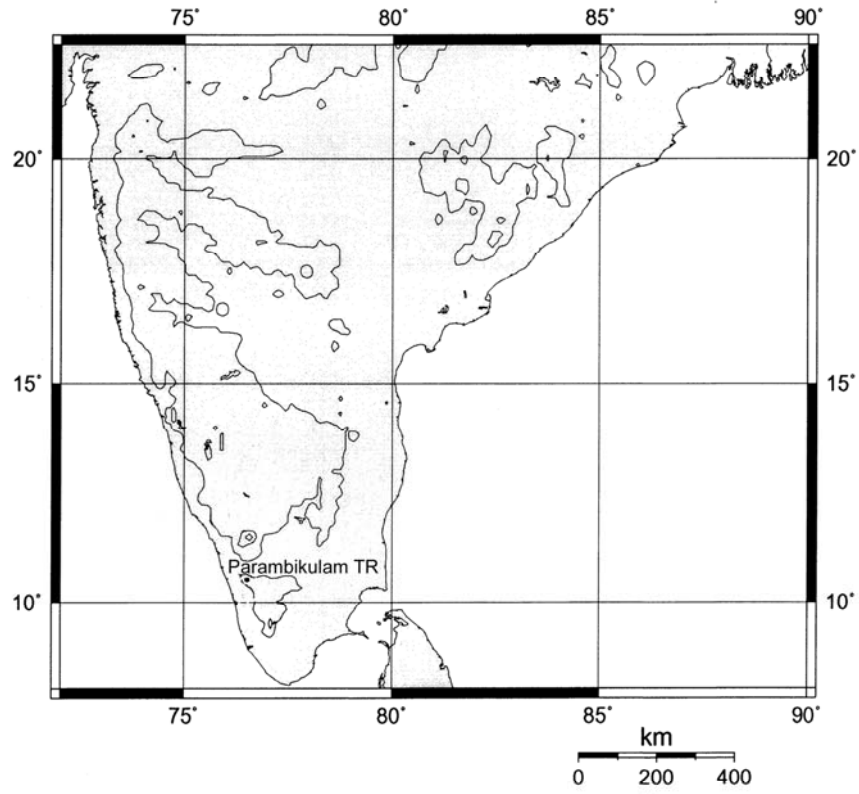


Fig. 1. Study area

abodes all the major vegetation types of the Western Ghats, except the Montane Sholas and Grasslands. However, low altitude shola and grassland formations are found at Karimalagapuram and Pandaravarai. The Parambikulam valley is well known for its valuable teak. One of the world's largest teak trees, 'Kannimara Teak', is in the Sanctuary. In the past, large-scale clearing of the teak bearing moist deciduous forests had been carried out for extracting timber. These clear-felled forest areas were planted with teak, which occupies about 87 km² area of the Sanctuary.

The altitude ranges from 440 m a.s.l. from Chalakkudy river basin to 1438 m a.s.l. at Karimalagapuram. It is the third largest Protected Area in Kerala and is well known for the faunal diversity and population. The Sanctuary is bordered by Vazhachal Forest Division on the south, Chalakkudy Forest Division on the west, Nelliampathi Ghats continuous to the Palakkad gap on the north and Indira Gandhi Wildlife Sanctuary of Tamil Nadu on the east. Compared to other Protected Areas in Kerala, this Sanctuary is bordered by natural forests of Kerala and Tamil Nadu and acting as a connecting link and animal corridor from Nelliampathy to Chinnar and forests of Idukki district through the Anamalai Wildlife Sanctuary.

The floristic studies by Sujanalpal (2006) reported 1521 taxa of vascular plants under 801 genera belonging to 170 families. Among the 1521 taxa 384 are Peninsular Indian endemics and 301 of them are restricted to the Western Ghats. This reveals the high floristic richness of the Sanctuary when compared to the other Protected Areas in Kerala. Among the 1521 taxa, 1438 (95%) are angiosperms, pteridophytes form 81 taxa and Gymnosperms are represented by two taxa.

Physiographical features of the Sanctuary strongly influence the local climate. Major part of the Sanctuary is along the windward region and receives high rainfall. The area gets both the southwest and northeast monsoon, of which southwest being the most active. The maximum temperature was recorded during February and April and fluctuates between 24⁰C and 35⁰C. The minimum temperature varies between 18⁰C and 23⁰C during November and December. In the hills it is still lower during night.

The Sanctuary congregates different vegetation types along the leeward and windward side of the Western Ghats. According to Chandrasekharan (1962a,b,c,d,) and Champion and Seth (1968) the natural vegetation of the Sanctuary can be broadly classified into West coast tropical evergreen forests, West coast tropical semi-evergreen forests, Southern moist mixed deciduous forests, Southern dry mixed deciduous forests. Apart from these vegetation types, certain edaphic types such as Reed brakes, Cane brakes, Secondary evergreen forest, Moist bamboo brakes, Montane grasslands (Pseudo wet temperate grasslands), Montane forests (Pseudoshola) and Low altitude marshy grasslands (Vayals) are also present.

Notes on the species from Parambikulam Tiger Reserve

The present study enumerates the bryophyte diversity of the area along with author citation followed by the observations on the substrate/s on which it was found growing in the study area, the locality, altitude, the collector's name (acronyms: *MCN* = Manju, *C.N.*, *SVK* = Sreenivas, *V.K.*, *Remesh, M.* = *RM*, *Sujanapal* = *SP*), collection number, and with comments on the distribution of species. The bryophyte specimens were deposited in the Calicut University Herbarium (CALI).

Marchantiophyta

Asterella leptophylla (Mont.) Grolle- On land cuttings. Parambikulam Tiger Reserve (850 m) *MCN 106804 (CALI)*. In India this species is known only from the Meghalaya of Eastern Hiamalayas as *A. reticulate* A.Evans. Manju *et al.* (2009) reported this species as new record for Peninsular India from Aralam WLS, Kannur district, Kerala.

Bazzania tridens (Reinw., Blume & Nees) Trevis.- On branches. Parambikulam Tiger Reserve (1150 m) *MCN 106814 (CALI)*. Widely distributed in the tropical and temperate regions of Asia; in India it is distributed in Eastern India (Assam, Sikkim) and Southern India (Tamil Nadu, Kerala).

Cheilolejeunea serpentina (Mitt.) Mizut. - On rocks and soil near streams. Parambikulam Tiger Reserve (1150 m) *MCN 106817 (CALI)*. It is distributed in Southern India (Kerala, Tamil Nadu), Northern India (Pachmahri), Andaman & Nicobar Islands, Sri Lanka, Cameroon, Caroline Islands, Java, Madagascar, Malacca, Philippines, Singapore, Sumatra, Seychelles and Thailand.

Dumortiera hirsuta (Sw.) Nees- On rocky patch near streams were water drips regularly. Parambikulam Tiger Reserve (900-1400 m) *SP 106806 (CALI)*. This is widely distributed in the high altitude areas of the Western Ghats. It has wide distribution in Southern India (Tamil Nadu, Kerala, Karnataka), Northern India (Simla, Mussoorie, Kumaon, Pachmahri), Nepal, Japan, Brazil, Mexico, Jamaica, North & South America, Europe, New Zealand, Hawaii and Africa.

Frullania tamarisci (L.) Dumort. subsp. *obscura* (Verd.) S.Hatt.- On bark. Parambikulam Tiger Reserve (1150 m) *MCN 106815 (CALI)*. Nair *et al.* (2006) reported this species from Kerala as *F. tamarisci* subsp. *moniliata* and Nair and Madhusoodanan (2006) and Madhusoodanan *et al.* (2007) reported this as *Frullania tamarisci* (L.) Dumort. not mentioning its subspecies. It is a widely distributed species in Southern India (Kerala, Tamil Nadu), Northern India (Himalaya), Sri Lanka, Malaysia, China, Taiwan, Korea, Japan and Europe.

Heteroscyphus argutus (Nees) Schiffner- On land cuttings. Parambikulam Tiger Reserve (800 m) *SP 106803 (CALI)*. In India common in Southern India (Kerala, Karnataka, Tamil Nadu) and North-eastern India (Darjeeling, West Himalaya, Pachmahri, Assam, Sikkim, Manipur, Meghalaya). Its distribution extends to Borneo, Brazil, Myanmar, China, Java, Japan, New Guinea, New Zealand, Philippines, Sumatra and Taiwan.

Lopholejeunea nigricans (Lindenb.) Schiffner- On small branches. Parambikulam Tiger Reserve (1000-1400 m) *MCN 106819, MCN 106715 (CALI)*. In India this species is known by different names. (as *L. abortiva* var. *doliiformis* U.S. Awasthi, S.C. Srivast. & D. Sharma by Awasthi *et al.* (2000), as *L. javanica* (Nees) Schiffner and *L. sikkimensis* Stephani by Srivastava & Sharma (2000), as *L. javanica* (Nees) Schiffner and *L. sikkimensis* Stephani by Pócs *et al.* (2007); as *Lopholejeunea abortiva* (Mitt.) Stephani by Nair *et al.* (2008). This species is distributed in Southern India (Kerala, Tamil Nadu), North-east India (Himalayas, Assam), Japan, China, Papua New Guinea, Brazil, Bolivia, Kenya and Africa.

Lunularia cruciata (L.) Dumort. ex Lindb.- On land cuttings. Parambikulam Tiger Reserve (1100 m) *MCN 106827 (CALI)*. A widely distributed species in high altitude areas.

Metzgeria crassipilus (Lindb.) A.Evans- Epiphytic. Parambikulam Tiger Reserve (1400 m) *MCN 106716 (CALI)*. 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.

Pallavicinia indica Schiffner- On land cuttings. Parambikulam Tiger Reserve (850 m) *MCN 106805a (CALI)*. It is distributed in Eastern Himalayas (Meghalaya, Khasi), Nepal, Java, Sumatra and Tahiti. The present collection is a new record for Peninsular India.

Plagiochila durelii Sciffn.- Epiphytic. Parambikulam Tiger Reserve (1100 m) *MCN 106808 (CALI)*. It is distributed in India (Kerala, West Bengal, Sikkim, Meghalaya, Himachal Pradesh), Bhutan, China, Nepal, Thailand and Vietnam.

Plagiochila parvifolia Lindb.- Epiphytic. Parambikulam Tiger Reserve (1000 m) *MCN 106802 (CALI)*. 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.

Porella acutifolia (Lehm. & Lindenb.) Trevis.- Epiphytic. Parambikulam Tiger Reserve (1350 m) *MCN 106728 CALI*. The species has wide distribution in India (Kerala, Tamil Nadu and Eastern Himalayas) Sri Lanka and Java.

Porella campylophylla (Lehm. & Lindenb.) Trevis.- Epiphytic. Parambikulam (1400 m) Palakkad, *MCN 106718 (CALI)*. This species is widespread from India to Vietnam.

Radula japonica Gottsche ex Steph.- On rocks. Parambikulam Tiger Reserve (1100 m) *MCN 106813 (CALI)*. It is distributed in the high altitude evergreen and shola forests of Kerala State. It was earlier reported from the Northern India (Himalayas), Southern India (Kerala) China, Japan and Korea.

Riccardia tenuicostata Schiffner- On moist rocks. Parambikulam Tiger Reserve (1100 m) *MCN 106801 (CALI)*. A widely distributed species.

Schiffneriolejeunea polycarpa (Nees) Gradst.- Epiphytic. Parambikulam (1450 m) *MCN 106717 (CALI)*. It is distributed in Southern India (Nilgiri hills, Naduvattam), Sri Lanka, Tropical Africa, South Africa, Tropical America and Brazil,. The present collection is a new record for Kerala State.

Targionia hypophylla L.-On land cuttings. Parambikulam Tiger Reserve (1000 m) *MCN 106807 (CALI)*. A widely distributed species in Southern India (Kerala, Tamil Nadu, Karnataka), Central India (Mt. Abu), North-eastern India (Western Himalayas, Mussoorie, Pachmahri, Simla, Sikkim, Chirapunji, Khasi hills), Japan, Chile, Korea, Taiwan, China, Hawaii, Peru, Europe, N. & S. America and Australia.

Anthocerotophyta (Hornworts)

Notothylas levieri Schiffner ex Steph.- Grows in shady rocky patches of semi-evergreen and evergreen forests where water drips regularly along with other mosses. Parambikulam Tiger Reserve (700 m) *SVK 106399 (CALI)*. From Southern India the species was first described from Dhoni hills of Palakkad district by Madhusoodanan and Nair (2003). It is common in the high altitudes of Kerala. The species has wide distribution in northern and central India (Western Himalaya, Central Himalaya, Mussorie, Simla).

Bryophyta (Mosses)

Aerobryidium aureonitens (Hook. ex Schwägr.) Broth.- Hanging from the branches. Parambikulam Tiger Reserve (1400 m) *MCN 106724 (CALI)*. Gangulee (1970) treated this species as synonym of *A. filamentosum* (Hook.) M. Fleisch.. However Noguchi (1976) treat it as a separate species. It is distributed in North-east India (Khasi hills, Darjeeling) and Nepal, China, Sri Lanka, Myanmar, Taiwan and Thailand. The present collection is a new record for Peninsular India.

Anomobryum auratum (Mitt.) A.Jaeger- On rocks. Parambikulam Tiger Reserve (1100 m) *MCN 106824 (CALI)*. It is distributed in Southern India (Kerala, Karnataka, 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.

Atrichum longifolium Cardot & Dixon ex Gangulee- On land cuttings. Parambikulam Tiger Reserve (1200 m) *MCN 106825 (CALI)*. It is distributed in North-east India (Darjeeling), Southern India (Kerala) and China.

Bryum cellulare Hook.- On rocky patches. Parambikulam Tiger Reserve (1100 m) *MCN 106823 (CALI)*. A wide spread species distributed in Northern India (Western Himalayas), Southern India (Kerala), Nicobar Islands, Nepal, Myanmar, China, Japan, Sumatra, Java, Philippines, Taiwan, Europe, North & Central Africa and Australia.

Bryum wightii Mitt.- On rocky patches along with other mosses. Parambikulam Tiger Reserve (1050 m) *RM 106287 (CALI)*. Distributed in Southern India (Maharashtra, Tamil Nadu, Kerala), Sri Lanka and Nepal.

Calypothecium sp. Hanging from small branches. Parambikulam Tiger Reserve (1000-1100 m) *MCN 106818, 106829 (CALI)*. It is not matching with any of the species of *Calypothecium* known from India. Further studies are required to fix the identity.

Cryptolepton pluvinii (Brid.) Broth.- Hanging from the branches of trees. Parambikulam Tiger Reserve (1100 m) *RM 99697 CALI*. It is distributed in India (Sikkim, Garhwal, Mussoorie, Simla), Bhutan, Nepal, Pakistan and Central Africa. Manju (2008) reported this species as new to Southern India from Parambikulam Tiger Reserve.

Ecroptothecium sikkimense (Renauld & Cardot) Renauld & Cardot- On bark. Parambikulam Tiger Reserve (1000 m) *MCN 106820 (CALI)*. It is distributed in Southern India (Kerala) North-east India (Darjeeling, Sikkim), Andaman & Nicobar Islands, Nepal, Bangladesh, Bhutan and Thailand.

Entodon rubicundus (Mitt.) A. Jaeger- On rocky patches and on basal part of tree trunks near riparian habitat. Parambikulam Tiger Reserve (700 m) *SVK 106394 (CALI)*. Widely distributed in the tropics and subtropics.

Fissidens anomalus Mont.- On bark. Parambikulam Tiger Reserve (1250 m) *MCN 106822a (CALI)*. It is a widely distributed species in the high altitude Shola forests of Southern India (Kerala, Tamil Nadu), North-east India (Himachal Pradesh, Darjeeling), Nepal, Sri Lanka, Thailand, Java and the Philippines.

Fissidens crispulus Brid.- On land cuttings along with *Pallavicinia indica*. Parambikulam Tiger Reserve (850 m) *MCN 106805b (CALI)*. It is a common species in Kerala and is distributed in North-east India, Southern India (Kerala, Tamil Nadu), Andaman & Nicobar Islands, China, Malaysia, Madagascar, Reunion and Cameroon.

Fissidens kurzii Müll. Hal.- On small branches. Parambikulam Tiger Reserve (700 m) *SVK 106398b (CALI)*. It is distributed in India (North Bengal), Andaman & Nicobar Islands, Nepal, Myanmar and Bhutan. The present collection is a new record for Peninsular India.

Foreauella orthothecia (Schwaegr.) Dixon. & P.Varde.- On bark. Parambikulam Tiger Reserve (500 m) *MCN 106909 (CALI)*. This Indo-Malesian species is distributed in Southern India (Kerala, Tamil Nadu, Karnataka), North-east India (Darjeeling, Assam, Khasi hills, Orissa), Nepal, Thailand, Philippines and the Pacific Ocean Islands.

Garckea flexuosa (Griff.) Margad. & Nork.- On rocks and on earth cuttings. Parambikulam Tiger Reserve (750 m) *MCN 106812 (CALI)*. It is a common species widely distributed in Southern India (Kerala, Tamil Nadu, Karnataka), North-eastern India (West Bengal, Darjeeling, Khasi hills, Tripura), Andaman Islands, Sri Lanka, Nepal, Bhutan, Myanmar, Indochina, Japan, Java,

Madagascar, Malaysia, New Guinea, Philippines, Sumatra, Thailand, Australia, Oceania and Central America.

Grimmia funalis (Schwägr.) Bruch & Schimp.- On rocky patches in grassland. Parambikulam Tiger Reserve (1400 m) *MCN 106826 (CALI)*. It is distributed in Nepal, China, Japan, Europe, North Africa, North America and Australia. Gangulee (1969) reported it from Eastern Nepal not from Indian region. Manju & Rajesh (in press) reported this species as new record for India.

Hypnum imponens (Hedw.) Boulay- On rocks. Parambikulam Tiger Reserve (700 m) *SVK 106402 (CALI)*. A cosmopolitan species distributed in North east India (Sikkim, Khasi hills, Kashmir, Western Himalayas), Southern India (Tamil Nadu: Palni hills, Madras), China, Japan, Caucasus, Siberia, Central Asia, Europe and Africa. The present collection is a new record for Kerala.

Hypnum subimponens subsp. *ulophyllum* (Müll. Hal.) Ando- On rocky patches. Parambikulam Tiger Reserve (1800 m) *RM 99699 (CALI)*. An East Asiatic species distributed in India (Naga hills, Andaman & Nicobar Islands), China, Japan, Nepal, Bhutan, Bangladesh, Taiwan and Korea. The present collection is a new record for Kerala.

Leucophanes glaucum (Schwägr.) Mitt. On logs. Parambikulam Tiger Reserve (900 m) *MCN 106810 CALI*. It is distributed in Indonesia, China, Japan, Thailand, Vietnam, Malaya, 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.

Macromitrium nepalense (Hook. & Grev.) Schwägr.- Epiphytic and on rocky patches. Parambikulam Tiger Reserve (750 m) *SVK 106396 (CALI)*. It is distributed in India (Assam, Andaman & Nicobar Islands, Kerala, Tamil Nadu), Nepal, Bhutan, Bangladesh and Philippines.

Macromitrium sulcatum (Hook.) Brid.- Corticolous as well as on small branches. This species is widely distributed in India (Kerala, Western Ghats of Maharashtra, Tamil Nadu, Assam), Sri Lanka, Nepal, Borneo, Kampuchea, Madagascar, Malaysia, Myanmar, Philippines, Thailand and Vietnam.

Meteoriopsis ancistrodes (Ren. & Card.) Broth.- On branches. Parambikulam Tiger Reserve (1100 m) *MCN 106828 (CALI)*. A south-east Asiatic species distributed in North-east India (Darjeeling, Mussoorie, Garhwal, Kumaon), Nepal, Bhutan, Myanmar, Thailand, Sumatra, Java, Taiwan and Borneo. The present collection is a new record for Peninsular India.

Meteorium helminthocladum (Müll. Hal.) M.Fleisch.- On small branches. Parambikulam Tiger Reserve (700 m) *SVK 106403 (CALI)*. A south-east Asiatic species distributed in North-east India (Darjeeling, Khasia), Nepal, Bhutan, Sri Lanka, China, Japan, Vietnam and Taiwan. The present collection is a new record for Peninsular India.

Neckeropsis fimbriata (Harv.) M.Fleisch.- Base of tree trunks in semi-evergreen forests. Parambikulam Tiger Reserve (700 m) *SVK 106395 (CALI)*. It is an Indo-Malesian species distributed in Southern India (Kerala), North-east India (Darjeeling, Sikkim, Khasi hills), Nepal, Bhutan, Myanmar, Thailand, Cambodia, Vietnam, Malaysia and Philippines.

Octoblepharum albidum Hedw.- On logs. Parambikulam Tiger Reserve (750 m) *MCN 106811 (CALI)*. A widely distributed species.

Palamocladium leskeoides (Hook.) E.Britton- On rocks. Parambikulam (1400 m) *MCN 106723 (CALI)*. In India this species was known as *Homalothecium nilgheriense* (Mont.) H. Rob. (Hofmann, 1997). It is distributed in North-east India (Western Hiamalayas, Sikkim, Assam), Southern India (Kodaikanal, Valparai, Nilgiri & Palni hills; Kerala: Travancore (without precise locality); Sri Lanka, China, Japan, Sumatra and Madagascar.

Papillaria leuconeura (Müll. Hal.) A.Jaeger- Hanging from the branches. Parambikulam (1400 m), *MCN 106725 (CALI)*. It is distributed in India (Himalayas), Vietnam, Sumatra, Java, Ceram, Celebes, New Zealand, Philippines, Papua New Guinea and New Caledonia. The present collection is a new record for Peninsular India.

Pinnatella calcutensis M.Fleisch.- Parambikulam Tiger Reserve (750 m) *SVK 106397 (CALI)*. A south-east Asiatic species distributed in Southern India (Kerala, Karnataka), North-east India (West Bengal, Darjeeling, Orissa) and Thailand.

Pogonatum leucopogon Renauld & Cardot. On land cuttings. Parambikulam Tiger Reserve (1000 m) *MCN 106809 (CALI)*. A widely distributed species in tropics and sub tropics.

Pterobryopsis orientalis (Müll. Hal.) M. Fleisch.- Epiphytic. Palakkad, Parambikulam Tiger Reserve (1250-1300 m) *RM 106278, RM 106285, MCN 106822b (CALI)*. A south-east Asiatic mainland species distributed in North-east India (Sikkim, Darjeeling, Naga hills, Mussoorie, Kumaon) Southern India (Kerala, Tamil Nadu), China, Myanmar, Thailand, North Vietnam and Yunnan.

Pterobryopsis auriculata Dixon- Epiphytic. Palakkad, Parambikulam Tiger Reserve (1000 m) *RM 106289 (CALI)*. It is distributed in China and India (Kerala).

Regmatodon orthostegius Mont.- On rocky patches. Parambikulam (1400 m) *MCN 106727 (CALI)*. It is distributed in North-east India (Western Himalayas, Sikkim, Darjeeling, Khasi hills, Kumaon, Assam), Southern India (Tamil Nadu: Palni hills, Nilgiri hills), Sri Lanka, Nepal, Pakistan and Yunnan. The present collection is a new record for Kerala.

Rhodobryum giganteum On rocky patches near streams. Parambikulam Tiger Reserve (1400 m) *MCN 106821 CALI*. Widely distributed species in the high altitude regions of Southern India (Tamil Nadu, Kerala, Karnataka), North-east India (Darjeeling, Khasi hills, Arunachal Pradesh, Manipur, Sikkim), Sri Lanka, China, Japan, Nepal, Madagascar, Sumatra, Java, Myanmar, Thailand and Oceanic Islands.

Syntrichia fragilis (Taylor) Ochyra- On rocky patch. Parambikulam (1400 m) *MCN 106726 (CALI)*. 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.

Tayloria subglabra (Griff.) Mitt.- On land cuttings. Parambikulam (1400 m) *MCN 106720 (CALI)*. It is distributed in North east India (Darjeeling, Naga hills, Meghalaya), Southern India (Tamil Nadu: Palni hills), Nepal, China, Japan, Bhutan, Sri Lanka, Vietnam, Thailand, Java, Philippines, Taiwan and Korea. The present collection is a new record for Kerala.

Thuidium subdelicatulum (Hampe) Broth.- On roots of higher plants. Parambikulam (1400 m) *MCN 106721 (CALI)*. This species is earlier recorded from Brazil only. Manju & Rajesh (in press) reported this species as new record for India.

Tortula muralis Hedw.- On rocks. Parambikulam (1400 m) *MCN 106722 (CALI)*. 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.

Trachyphyllum inflexum (Harv.) Gepp- On logs. Parambikulam Tiger Reserve (750 m) *SVK 106408 (CALI)*. It is distributed in Southern India (Karnataka, Kerala), Central India (Madhya Pradesh), North-east India (Sikkim, Darjeeling, Orissa), China, Nepal, Bangladesh, Myanmar, Thailand, Cambodia, Java, Moluccas, Philippines, Australia, New Caledonia and Madagascar.

Trachypodopsis serrulata var. *crispatula* (Hook.) Zanten- Epiphytic. Parambikulam Tiger Reserve (1800 m) *MCN 99698 CALI*. A widely distributed species.

Trichostomum crispulum Bruch.- On land cuttings. Parambikulam (1400 m) *MCN 106719 (CALI)*. It is distributed in India (without precise locality) China, Japan, Mexico, Canada, United states, Russia, Poland, Ireland, Columbia, Papua New Guinea, America and Africa.

Discussion

Sporadic study resulted in recording of 58 bryophytes, which indicate the need for thorough explorations for framing better conservation measures. This is the first report of bryophytes of Parambikulam Tiger Reserve. This sanctuary with 272 km² area support 58 taxa in its preliminary exploration.

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