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Research Article

Bryophyte flora of Mount Tebu Forest Reserve, Terengganu, Peninsular Malaysia

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Abstract

A checklist of the bryophyte flora of Mount Tebu Forest Reserve in Terengganu, Peninsular Malaysia, is presented. A total of 189 taxa in 71 genera and 26 families were enumerated. This figure represents 63% of the 298 bryophyte species recorded so far for the State of Terengganu. Out of 189 taxa of bryophytes, 26 liverworts are new additions to the bryoflora of Terengganu. The most prominent liverwort family is represented by Lejeuneaceae, with 54 species from 17 genera, while the moss family is the Sematophyllaceae, with 34 taxa in 13 genera. The majority of the species are epiphytes, either corticolous or ramicolous. Almost half of the bryophyte species have wider elevational ranges and occur from the lowlands to the summit of Mount Tebu.

Key words: Biodiversity, bryophytes, checklist, Malaysia, Marchantiophyta, taxonomy

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Introduction

Mount Tebu (1039 m) is the second-highest mountain after Mount Lawit (1519 m) in the northernmost part of Terengganu (Fig. 1). It is located within one of the primary mountain ranges of Peninsular Malaysia, known as the Timur Range (Banjaran Timur). The mountain comprises undulating lowlands, hill and upper hill dipterocarp forest. It has been gazetted as one of the state forest reserves, including the lowlands of Lata Belatan Recreational Forest at the base of Mount Tebu. Geologically, Mount Tebu is composed of unconsolidated alluvium, metasedimentary and igneous rocks in the lowlands to the summit of the mountain (Mohamed and Ali 2014). The unique landscape feature provides ample habitat for a diverse flora and fauna community with high conservation value (see Abdul Rahim et al. (2014) for several extensive floristic and ecological studies). It also offers a variety of vegetation and habitats favourable to the growth and diversity of bryophytes. The history of bryophyte

exploration in Terengganu has been reviewed by Lee et al. (2019). The early investigation was conducted by British and Japanese bryologists and yielded only a few bryophyte species, nine being mosses and two were liverworts (Dixon 1926; Yamada 1979; Inoue 1984). Subsequently, more recent collections of bryophytes from this region have been carried out, of which 11 species of bryophyte have been reported for the first time in Peninsular Malaysia and 77 taxa are new records to Terengganu (Lee et al. 2018, 2022; Pesiu et al. 2021; Sarimi et al. 2021).

Study area

Mount Tebu Forest Reserve is located at latitude 5.5914°N and longitude 102.6122°E in the Besut District, the northern part of Terengganu. The highest peak reaches 1039 m above sea level, including Lata Belatan Recreational Forest at its base, an entering point to the forest reserve. The foot of this mountain is often shaded by riparian forests where bryophytes are easily found within this area, ranging from 40–100 m a.s.l. with medium canopy cover. The closest rivers are Sungai Besut, Sungai Keluang Besar and Sungai Setiu. Most trees are

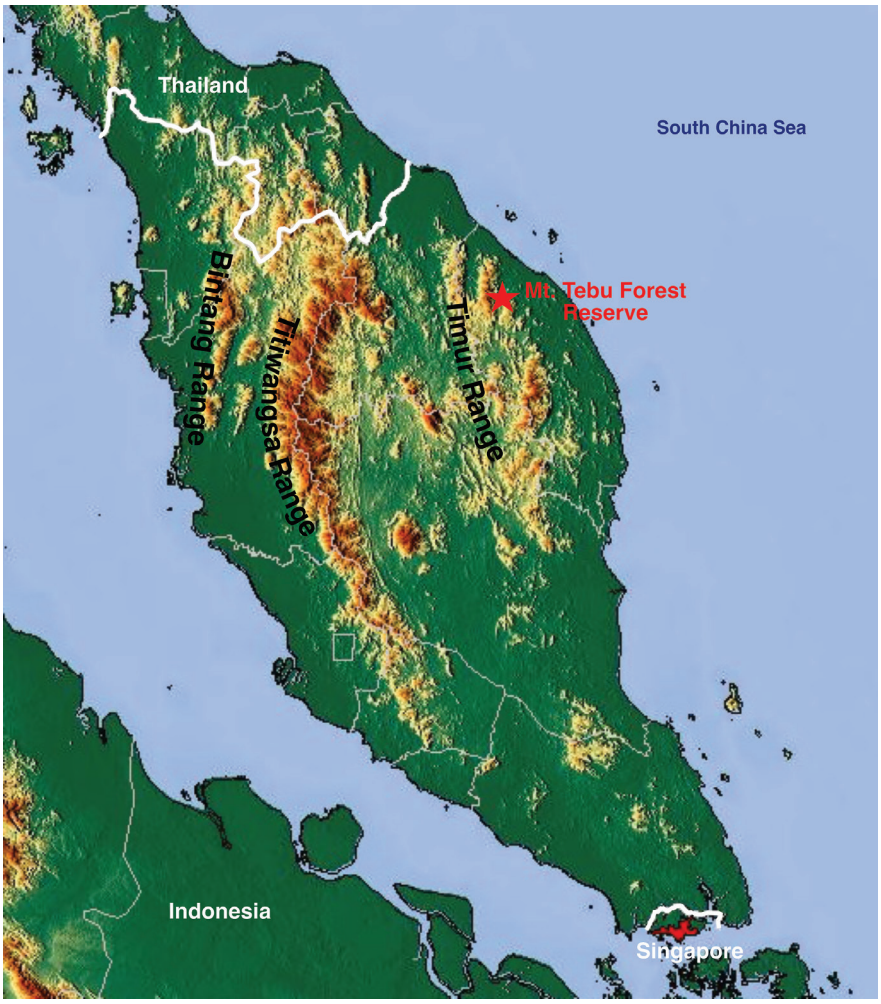

Figure 1. The map of Peninsular Malaysia shows the study area, Mt. Tebu Forest Reserve. Map modified from Dr Blofeld - http://www.maps-for-free.com, CC BY 3.0.

from the families Dipterocarpaceae, Euphorbiaceae, Annonaceae, Lauraceae and Myrtaceae. They grow on both sides of a valley and throughout the trails. Streams are moderate to fast water currents, often creating a few natural pools on the granite surfaces.

Materials and methods

This study is based on the authors' intensive bryophyte explorations from April 2019–November 2021 in Terengganu and a re-examination of previous moss collections of A. Damanhuri was made during the Mount Tebu scientific expedition in 2012. All the bryophyte samples were collected from various microhabitats along the trails within the study area, including tree trunks and branches, rocks, soils, fallen logs, rotten wood and leaves. Liverwort specimens were deposited in the Herbarium of Universiti Malaysia Terengganu (**UMTP**) and moss specimens were deposited in the Herbarium of Universiti Kebangsaan Malaysia (**UKMB**). About 1000 samples of bryophytes were collected from the study area and were examined by light microscopy. The drawing of the specimen was produced using an Olympus BX43 microscope, equipped with a drawing tube.

Results and discussion

A total of 189 taxa in 71 genera and 26 families were found in the Mount Tebu Forest Reserve, of which 109 are mosses and 80 are liverworts (Figs 2–4). This represents 63% of the 298 bryophyte species recorded so far for the State of Terengganu (Pócs and Lee 2016; Pesiu et al. 2021; Sarimi et al. 2021; Lee et al. 2022). Out of 80 species of liverworts, 26 are reported for the first time for Terengganu. The largest liverwort family found is the Lejeuneaceae, with 54 species, followed by Lepidoziaceae (eight species) and Radulaceae (seven species). The largest moss family is the Sematophyllaceae, with 34 taxa, followed by Calymperaceae (32 taxa) and Hypnaceae (seven taxa). The smallest liverwort and moss families were represented by only one species, for example, liverworts: Calypogeiaceae, Pallaviciniaceae, Plagiochilaceae, Solenostomataceae and Schistochilaceae and mosses: Diphysciaceae, Myuriaceae, Neckeraceae and Thuidiaceae. As expected, the distinct dominance of species is from the family Lejeuneaceae and mosses Sematophyllaceae and Calymperaceae, representing about 60% of all the bryophyte species found in Mount Tebu. They are the most common bryophyte families in the lowland tropical rainforests with high light intensity, dense canopy, high temperatures and many evergreen tree species.

Our study found that the diversity of moss species was higher than that of liverworts, a scenario similar to all the states in Peninsular Malaysia (Fig. 5). Reasons may be lower liverwort collecting, difficulty identifying liverwort species and lack of comprehensive field guides and local bryologists dealing with liverwort. The moss flora of Peninsular Malaysia has been well-studied taxonomically, in which exploration and species inventory of mosses have been more intensive and detailed. Thus far, 524 moss species have been reported from Peninsular Malaysia and all but Perlis and Malacca are well-represented

Figure 2. Mosses and their habit **A** *Diphyscium mucronifolium* Mitt **B** *Leucobryum sanctum* (Schwägr.) Hampe **C** *Fissidens ceylonensis* Dozy & Molk **D** *Pyrrhobryum latifolium* (Bosch & Sande Lac.) Mitt **E** *Arthrocormus schimperi* (Dozy & Molk.) Dozy & Molk **F** *Octoblepharum albidum* Hedw **G** *Mitthyridium fasciculatum* (Hook. & Grev.) H. Rob **H** *Ectropothecium buitenzorgii* (Bél.) Mitt. **I** *Syrrhopodon muelleri* (Dozy & Molk.) Sande Lac.

with above 100 species (Yong et al. 2013; Ellis et al. 2019a, b). In comparison, only 491 taxa of liverworts are known from Peninsular Malaysia, suggesting that several States, particularly the northern regions, such as Perlis, Kedah and the east coast (Kelantan), have been under-collected and understudied (Lee and Gradstein 2021; Lee et al. 2022). The State of Pahang seems to be the centre of bryophyte diversity in Peninsular Malaysia (Fig. 5). The presence of major highlands and montane forests in Pahang often provides more favourable and more varied microhabitats for a rich bryophyte flora.

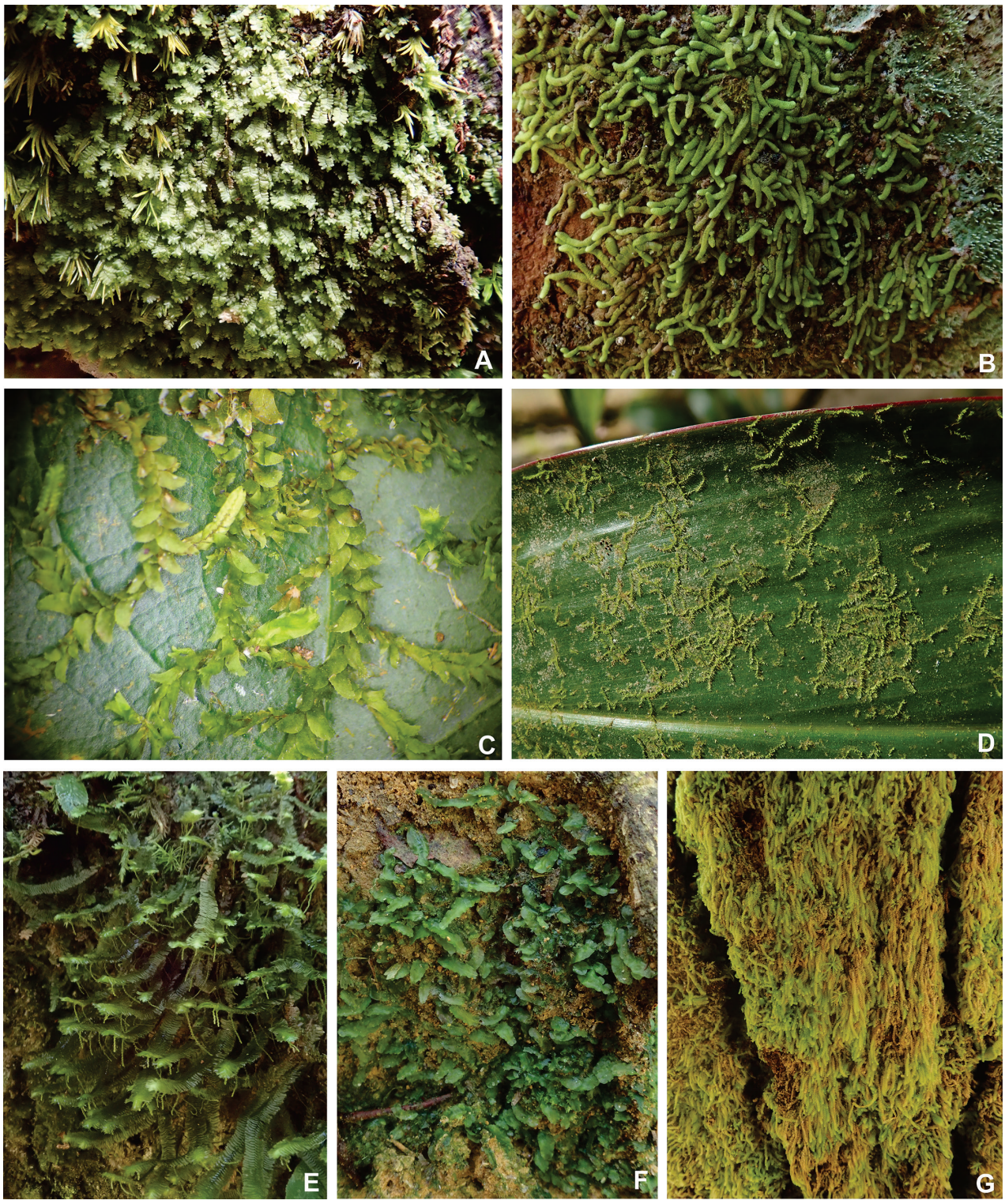

Figure 3. Liverworts and their habit **A** *Bazzania uncigera* (Reinw., Blume & Nees) Trevis **B** *Pycnolejeunea grandiocellata* Steph **C** *Caudalejeunea reniloba* (Gottsche) Steph **D** *Leptolejeunea epiphylla* (Mitt.) Steph **E** *Bazzania densa* (Sande Lac.) Schiffn **F** *Pallavicinia lyellii* (Hook.) Gray **G** *Drepanolejeunea pentadactyla* (Mont.) Steph.

Most of the bryophyte species in Mount Tebu are epiphytic, growing on the bark of tree trunks, on branches or tree stumps and the base of trees (Fig. 6). About half (49%) of ca. 1000 specimens examined were collected on trees

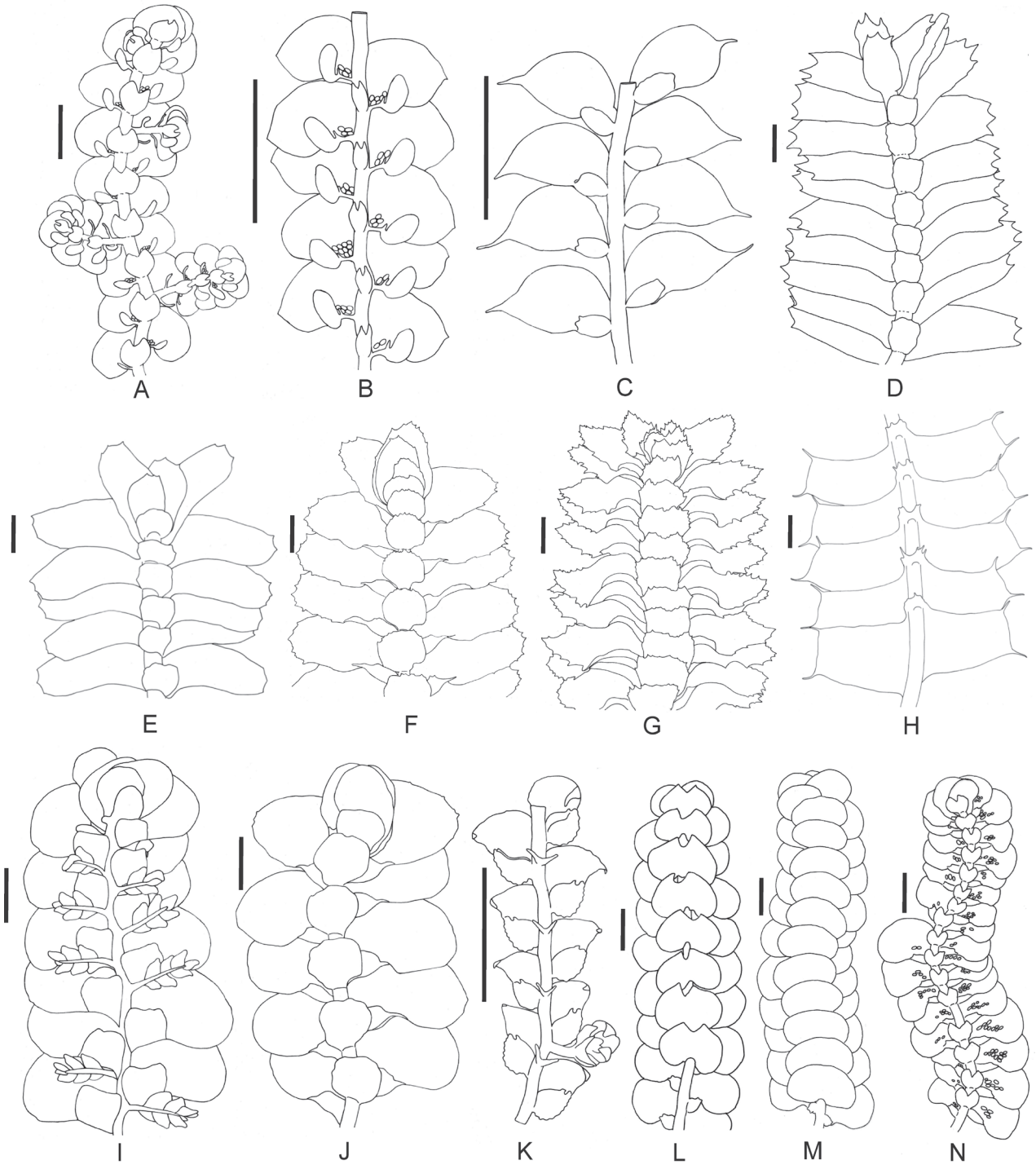

Figure 4. Liverworts from Mount Tebu Forest Reserve, all in ventral view **A** *Frullania gracilis* (Reinw. et al.) Nees **B** *Frullania trichodes* Mitt **C.** *Cololejeunea wightii* Steph **D** *Bazzania longicaulis* (Sande Lac.) Schiffn **E** *Bazzania albifolia* Horik **F** *Ptychanthus striatus* (Lehm. & Lindenb.) Nees **G** *Thysananthus spathulistipus* (Reinw. et al.) Lindenb **H** *Heteroscyphus coalitus* (Hook.) Schiffn **I** *Radula formosa* (Spreng.) Nees **J** *Spruceanthus polymorphus* (Sande Lac.) Verd **K** *Drepanolejeunea vesiculosa* (Mitt.) Steph **L** *Lejeunea sordida* (Nees) Nees **M** *Lepidolejeunea integristipula* (J.B. Jack & Steph.) R.M. Schust **N** *Pycnolejeunea grandiocellata* Steph. (Scale = 0.5 mm).

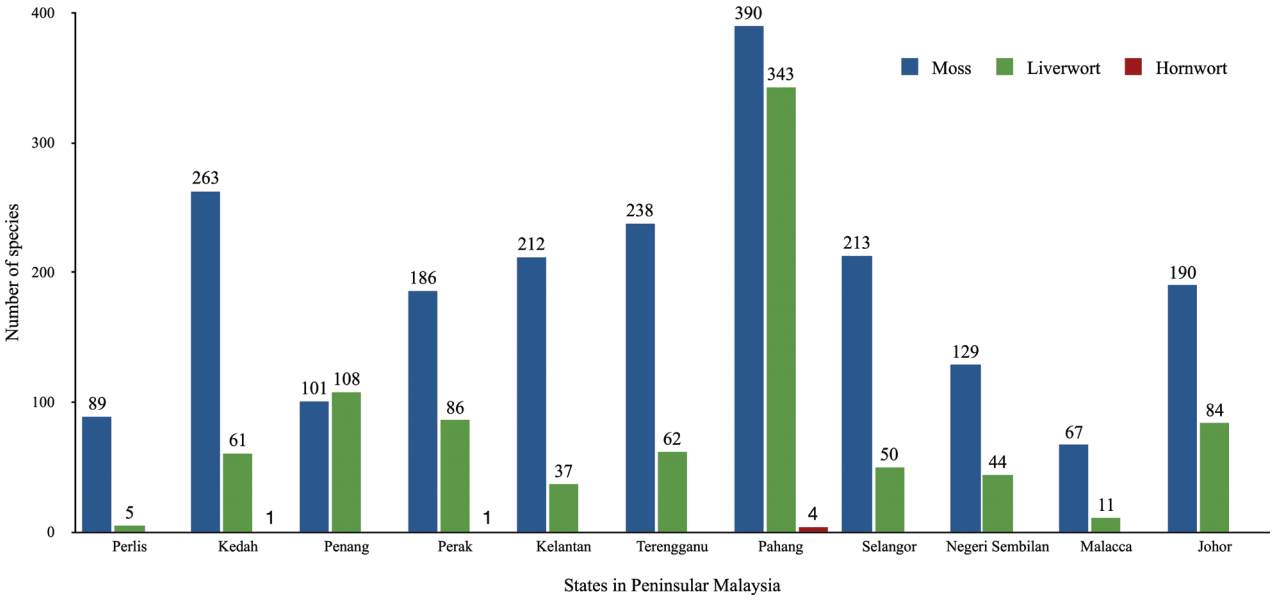

Figure 5. The number of bryophyte species reported from the States of Peninsular Malaysia.

(trunks, branches, twigs), while 22% were from leaves, 14% from rocks, 9% from soil or humus and 6% from rotten logs. About 18 species had broad substrate preferences and occurred on bark and branches of trees, leaves, soils and decaying logs. Others had more narrow preferences and occurred on only one substrate type, for example, *Pallavicinia lyellii* and *Solenostoma comatum* were always found on soil, *Ephemeropsis tjibodensis* and *Leptolejeunea epiphylla* occurred exclusively on leaves and *Diphyscium mucronifolium* grew only on rock (Appendix 1).

The distribution of the bryophyte species in Mount Tebu shows a distinct elevational differentiation from sea level to the mountain's summit (Fig. 7). About half of the moss species have wide elevational ranges and occur from the lowlands to the summit of Mount Tebu. The remaining half of the species have more narrow elevational ranges and are restricted to a lower range, below 500 m. Liverwort species have wider elevational ranges and occur in all elevation belts. However, both groups show a similar trend where most of the species are elevational generalist species, occurring in most rainforest belts and lowland specialists, being found only below 500 m. Of 189 taxa, only 29 species are restricted to the submontane rainforest and occur exclusively at 700–1000 m a.s.l. For example, *Acroporium condensatum* and *Mastopoma uncinifolium* are obligate highland species known only from Cameron Highlands, Mount Jerai and Mount Tebu (this study) (Tixier 1980; Yong et al. 2006). Other moss species typical of high elevations found in Mount Tebu are *Campylopus exasperatus*, *Leucoloma molle*, *Pogonatum cirratum* subsp. *macrophyllum*, *Acroporium stramineum* and *Trichosteleum saproxylophilum* and liverworts are *Frullania gracilis*, *F. trichodes*, *Cheilolejeunea ceylanica*, *C. trifaria*, *Cololejeunea aequabilis*, *C. appressa*, *C. equialbi*, *C. falcata*, *C. inflectens*, *C. metzgeriopsis*, *C. obliqua*, *C. ocelloides*, *C. sigmoidea*, *C. stephanii*, *Drepanolejeunea dactylophora*, *Ptychanthus striatus*, *Schistochila aligera*, *Spruceanthus polymorphus* and *Tuyamaella molischii*.

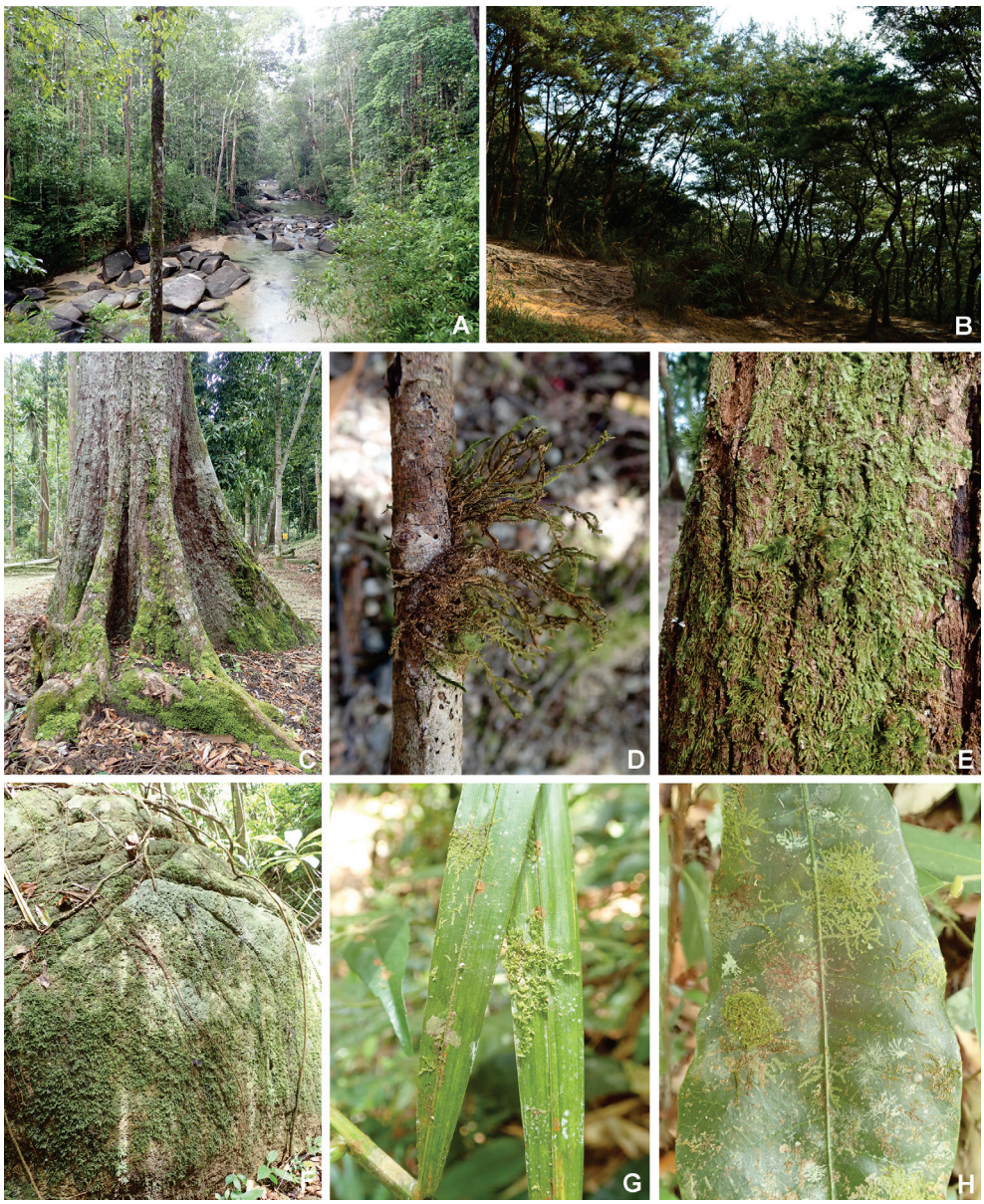

Figure 6. Habitats of bryophyte species of Mount Tebu Forest Reserve **A** lowland dipterocarp forest **B** area around the summit **C–E** bryophytes on tree bases, branches, trunks **F** on rocks **G, H** on leaves.

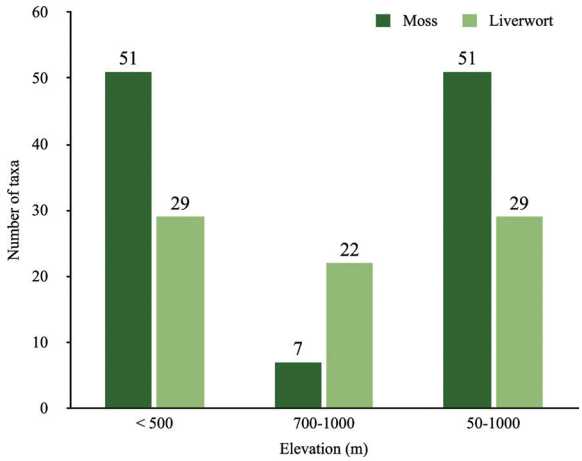

Figure 7. The elevational distribution of bryophyte taxa found in Mount Tebu Forest Reserve.

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Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

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Author contributions

Conceptualization: GEL. Data curation: NN, MSS, NSA, NS, CWK, GEL, NAS, EP. Investigation: NN, GEL. Methodology: MSS, NS, EP, GEL, NN. Supervision: GEL. Writing - original draft: GEL. Writing - review and editing: EP, NAS, NN, CWK, NSA, MSS, NS.

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Data availability

All of the data that support the findings of this study are available in the main text.

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Appendix 1

Table A1. Substrate preferences and elevational distributions of bryophyte taxa in Mount Tebu. Corti: Corticolous (tree trunk), Epi: Epiphyllous (leaf), Ligni: Lignicolous (rotten log), Rami: Ramicolous (tree branch), Saxi: Saxicolous (rock), Terri: Terricolous (soil). An asterisk indicates new additions to the State of Terengganu (*).

No.	Taxon	Substrate preference	Elevation (m)
Bryophyta (Mosses)			
I.	**Calymperaceae** Kindb.		
1	*Arthrocormus schimperi* (Dozy & Molk.) Dozy & Molk.	Corti, Saxi	60–110
2	*Calymperes afzelii* Sw.	Corti	50–130
3	*Calymperes boulayi* Besch.	Corti	60 –110
4	*Calymperes erosum* Müll. Hal.	Corti, Saxi	50–1005
5	*Calymperes fasciculatum* Dozy & Molk.	Corti, Rami	50–1005
6	*Calymperes graeffeanum* Müll. Hall.	Corti	60–110
7	*Calymperes lonchophyllum* Schwägr.	Corti, Ligni	50–970
8	*Calymperes lonchophyllum* Schwägr. subsp. *beccari* (Hampe) M.Menzel	Ligni	110–940
9	*Calymperes mollucense* Schwägr.	Corti, Rami, Saxi, Ligni	50–130
10	*Calymperes porrectum* Mitt.	Corti	60–110
11	*Exostratum blumii* (Hampe) L.T.Ellis	Corti, Saxi, Ligni	60–110
12	*Leucophanes augustifolium* Renauld & Cardot	Corti, Saxi, Terri	50–1005
13	*Leucophanes glaucum* (Schwägr.) Mitt.	Corti	50–130
14	*Leucophanes octoblepharioides* Brid.	Corti, Rami, Saxi	50–970
15	*Mitthyridium constrictum* (Sull.) H.Rob	Corti, Epi, Rami	60–110
16	*Mitthyridium fasciculatum* subsp. *cardotii* (M.Fleisch.) B.C.Tan & L.T.Ellis	Corti	50–130
17	*Mitthyridium fasciculatum* (Hook. & Grev.) H.Rob.	Corti, Rami	50–1005
18	*Mitthyridium flavum* (Müll. Hal.) H.Rob.	Corti	50–130
19	*Mitthyridium junquilianum* (Mitt.) H.Rob.	Corti, Rami	50–130
20	*Mitthyridium repens* (Harv.) H.Rob.	Corti	50–970
21	*Mitthyridium undulatum* (Dozy & Molk.) H.Rob.	Corti, Rami	50–970
22	*Octoblepharum albidum* Hedw.	Corti	50–130
23	*Syrrhopodon albo-vaginatus* Schwägr.	Ligni	50–130
24	*Syrrhopodon aristifolius* Mitt.	Corti	50–1005
25	*Syrrhopodon confertus* Sande Lac.	Corti	50–1005
26	*Syrrhopodon croceus* Mitt.	Corti, Saxi	50–1005
27	*Syrrhopodon muelleri* (Dozy & Molk.) Sande Lac.	Corti	50–970
28	*Syrrhopodon prolifer* Schwägr.	Corti, Ligni	110–940
29	*Syrrhopodon spiculosus* Hook. & Grev.	Corti, Ligni	50–970
30	*Syrrhopodon stoneae* W.D.Reese	Corti	50–130
31	*Syrrhopodon trachyphyllus* Mont.	Corti	50–940
32	*Syrrhopodon tristichus* Schwägr.	Corti	60–940
II.	**Daltoniaceae** Schimp.		
33	*Distichophyllum cuspidatum* (Dozy & Molk.) Dozy & Molk.	Corti	110–940
34	*Distichophyllum nigricaule* var. *cirratum* (Renauld & Cardot) M.Fleisch	Corti, Saxi	110–940
35	*Ephemeropsis tjibodensis* K.I.Goebel	Epi	60–110
III.	**Dicranaceae** Schimp.		
36	*Campylopus ericoides* (Griff.) A.Jaeger	Saxi	100–1005
37	*Campylopus exasperatus* (Nees & Blume) Brid.	Saxi	940–1005
38	*Dicranella coarctata* (Müll. Hal.) Bosch & Sande Lac.	Terri	110–940
39	*Leucoloma amoene-virens* Mitt.	Saxi	50–130
10	*Leucoloma molle* (Müll. Hal.) Mitt.	Corti	940–1005

No.	Taxon	Substrate preference	Elevation (m)
IV.	**Diphysciaceae** M.Fleisch		
41	*Diphyscium mucronifolium* Mitt.	Saxi	60–970
V.	**Fissidentaceae** Schimp.		
42	*Fissidens ceylonensis* Dozy & Molk.	Saxi	60–110
43	*Fissidens crassinervis* Sande Lac.	Terri	50–970
44	*Fissidens hollianus* Dozy & Molk.	Corti	60–110
45	*Fissidens javanicus* Dozy & Molk.	Saxi	60–110
46	*Fissidens oblongifolius* Hook. f. & Wilson	Corti	70–80
47	*Fissidens pellucidus* Hornsch.	Terri	70–80
VI.	**Hypnaceae** Schimp.		
48	*Ectropothecium buitenzorgii* (Bél.) Mitt.	Corti, Ligni, Saxi, Terri	50–970
49	*Ectropothecium ichnotocladum* (Müll. Hal.) A.Jaeger	Corti, Saxi	50–940
50	*Isopterygium albescens* (Hook. in Schwägr.) A.Jaeger	Corti	50–130
51	*Pseudotaxiphyllum pohliaecarpum* (Sull. & Lesq.) Z.Iwats.	Terri	110–940
52	*Vesicularia dubyana* (Müll. Hal.) Broth.	Corti, Saxi, Terri	50–130
53	*Vesicularia miquelii* (Sande Lac.) M.Fleisch.	Corti	60–110
54	*Vesicularia reticulata* (Dozy & Molk.) Broth.	Saxi	70–80
VII.	**Hypnodendraceae** Broth.		
55	*Hypnodendron dendroides* (Brid.) Touw	Saxi	110–940
56	*Hypnodendron subspininervium* (Müll. Hal.) A.Jaeger subsp. *arborescens* (Mitt.) Touw	Corti	110–940
VIII.	**Leucobryaceae** Schimp.		
57	*Leucobryum aduncum* Dozy & Molk.	Corti, Ligni, Saxi, Terri	50–970
58	*Leucobryum aduncum* var. *scalare* (M.Fleisch.) A.Eddy	Corti	50–970
59	*Leucobryum bowringii* Mitt.	Corti, Saxi	50–970
60	*Leucobryum candidum* (P.Beauv.) Wilson	Corti, Saxi	50–970
61	*Leucobryum chlorophyllosum* Müll. Hal.	Corti	50–970
62	*Leucobryum javense* (Brit.) Mitt.	Corti, Terri	100–1005
63	*Leucobryum microleucophanoides* A.Johnson	Corti	100–970
64	*Leucobryum sanctum* (Schwägr.) Hampe	Corti, Saxi, Terri	50–970
IX.	**Meteoriaceae** Kindb.		
65	*Aerobryidium crispifolium* (Broth. & Geh.) M.Fleisch.	Corti, Rami	60–110
66	*Aerobryopsis longissima* (Dozy & Molk.) M.Fleisch.	Corti	50–130
X.	**Myuriaceae** M.Fleisch.		
67	*Oedicladium pseudorufescens* (Hampe) B.C.Tan & Mohamed	Corti, Saxi	50–970
XI.	**Neckeraceae** Schimp.		
68	*Himantocladium plumula* (Nees in Brid.) M.Fleisch.	Corti	60–110
XII.	**Polytrichaceae** Schwägr.		
69	*Pogonatum cirratum* subsp. *fuscatum* (Mitt.) Hyvönen	Terri	110–940
70	*Pogonatum cirratum* subsp. *macrophyllum* (Dozy & Molk.) Hyvönen	Saxi	940–1005
XIII.	**Pottiaceae** Hampe		
71	*Barbula consanguinea* (Thwaites & Mitt.) A.Jaeger	Saxi	60–110
72	*Hyophila involuta* (Hook.) A.Jaeger	Saxi, Terri	50–130
XIV.	**Rhizogoniaceae** Broth.		
73	*Pyrrhobryum latifolium* (Bosch & Sande Lac.) Mitt.	Corti	50–130
74	*Pyrrhobryum medium* (Besch.) Manuel	Corti	60–110
XV.	**Sematophyllaceae** Broth.		
75	*Acanthorrhynchium papillatum* (Harv.) M.Fleisch.	Corti, Ligni	50–130
76	*Acroporium adspersum* (Hampe) Broth.	Corti	60–110
77	*Acroporium condensatum* E.B.Bartram	Saxi	940–1005

No.	Taxon	Substrate preference	Elevation (m)
78	*Acroporium diminutum* (Brid.) M.Fleisch.	Corti	60–1005
79	*Acroporium joannis-winkleri* Broth.	Corti, Ligni, Terri	60–1005
80	*Acroporium lamprophyllum* Mitt.	Corti	50–130
81	*Acroporium rigens* (Dixon) Dixon	Saxi, Terri	50–1005
82	*Acroporium stramineum* (Reinw. & Hornsch.) M.Fleisch.	Terri	940–1005
83	*Acroporium strepsiphyllum* (Mont.) B.C.Tan	Corti, Saxi	60–1005
84	*Clastobryophilum bogoricum* (Bosch & Sande Lac.) M.Fleisch.	Corti	50–130
85	*Clastobryum caudatum* (Sande Lac.) M.Fleisch.	Corti	70–80
86	*Clastobryum cuculligerum* (Sande Lac.) Tixier	Corti	60–110
87	*Clastobryum epiphyllum* (Renauld & Cardot) B.C.Tan & Touw	Corti, Rami	60–110
88	*Gammiella tonkinensis* (Broth. & Paris) B.C.Tan	Rami	100–970
89	*Isocladiella surcularis* (Dixon) B.C.Tan & Mohamed	Corti	60–110
90	*Mastopoma uncinifolium* (Broth.) Broth.	Rami	940–1005
91	*Meiothecium microcarpum* (Harv.) Mitt.	Corti	50–130
92	*Papillidiopsis bruchii* (Dozy & Molk.) W.R.Buck & B.C.Tan	Corti	60–110
93	*Papillidiopsis complanata* (Dixon) W.R.Buck & B.C.Tan	Corti, Ligni	50–1005
94	*Papillidiopsis luxurians* (Dozy & Molk.) W.R.Buck & B.C.Tan	Corti, Ligni, Saxi	50–940
95	*Papillidiopsis malesiana* W.R.Buck & B.C.Tan	Corti	50–130
96	*Rhaphidostichum bunodicarpum* (Müll. Hal.) M.Fleisch.	Corti, Saxi	50–130
97	*Rhaphidostichum piliferum* (Broth.) Broth.	Corti	60–110
98	*Taxithelium instratum* (Brid.) Broth.	Corti	50–130
99	*Taxithelium isocladium* (Bosch & Sande Lac.) Renauld & Cardot	Corti, Epi, Rami	50–130
100	*Taxithelium kerianum* (Broth.) Broth.	Corti, Rami	60–940
101	*Taxithelium lindbergii* (A.Jaeger) Renauld & Cardot	Epi, Rami	110–1005
102	*Taxithelium nepalense* (Schwägr.) Broth.	Corti	60–110
103	*Trichosteleum boschii* (Dozy & Molk.) A.Jaeger	Corti, Ligni, Rami, Saxi	50–1005
104	*Trichosteleum saproxylophilum* (Müll. Hal.) B.C.Tan *et al*.	Terri	940–1005
105	*Trichosteleum singapurense* M.Fleisch.	Corti	70-80
106	*Trichosteleum stigmosum* Mitt.	Corti, Ligni, Rami	50–130
107	*Trismegistia lancifolia* (Harv.) Broth.	Corti, Saxi	50–970
108	*Trismegistia lancifolia* var. *pseudoplicata* (Harv.) Broth.	Corti, Ligni	60–940
XVI.	**Thuidiaceae** Schimp.		
109	*Thuidium pristocalyx* (Müll. Hal.) A.Jaeger	Saxi	50–940
	Marchantiophyta (Liverworts)		
I.	**Calypogeiaceae** Arnell		
1	**Asperifolia arguta* (Nees & Mont.) A.V.Troitsky et al.	Terri	63–340
II.	**Frullaniaceae** Lorch		
2	*Frullania apiculata* (Reinw. *et al*.) Nees	Epi	850–1000
3	**Frullania gracilis* (Reinw. *et al*.) Nees	Corti	980
4	**Frullania trichodes* Mitt.	Epi	800
III.	**Lejeuneaceae** Cavers		
5	*Caudalejeunea reniloba* (Gottsche) Steph.	Corti, Epi, Rami	40–1039
6	*Ceratolejeunea minor* Mizut.	Epi	100
7	*Ceratolejeunea singapurensis* (Lindenb.) Schiffn.	Epi	100
8	*Cheilolejeunea ceylanica* (Gottsche) R.M.Schust. & Kachroo	Corti, Epi	900–1000
9	*Cheilolejeunea trapezia* (Nees) Kachroo & R.M.Schust.	Corti, Epi, Rami	80–1000
10	*Cheilolejeunea trifaria* (Reinw. *et al*.) Mizut.	Epi	1006
11	*Cololejeunea aequabilis* (Sande Lac.) Schiffn.	Epi	900–1000
12	*Cololejeunea appressa* (A.Evans) Benedix	Epi	600–1000
13	*Cololejeunea equialbi* Tixier	Epi	880–1000

No.	Taxon	Substrate preference	Elevation (m)
14	*Cololejeunea falcata* (Horik.) Benedix	Epi	600–1000
15	*Cololejeunea floccosa* (Lehm. & Lindenb.) Schiffn.	Epi	80–1000
16	*Cololejeunea inflata* Steph.	Epi	80–1000
17	*Cololejeunea inflectens* (Mitt.) Benedix	Epi	900–1000
18	*Cololejeunea lanciloba* Steph.	Epi	80–500
19	*Cololejeunea metzgeriopsis* (K.I.Goebel) Gradst. *et al.*	Epi	780
20	*Cololejeunea obliqua* (Nees & Mont.) Schiffn.	Epi	800–1000
21	*Cololejeunea ocelloides* (Horik.) Mizut.	Epi	900–1000
22	*Cololejeunea planissima* (Mitt.) Abeyw.	Epi	80–1000
23	*Cololejeunea schmidtii* Steph.	Epi	300–1000
24	*Cololejeunea sigmoidea* Jovet-Ast & Tixier	Epi	800–1000
25	*Cololejeunea stephanii* Benedix	Epi	900–1006
26	*Cololejeunea verrucosa* Steph.	Epi	100–900
27	**Cololejeunea wightii* Steph.	Corti	100–900
28	*Colura acroloba* (Prantl) Jovet-Ast	Epi	100–900
29	*Colura ari* (Steph.) Steph.	Epi	100–1000
30	*Colura conica* (Sande Lac.) K.I.Goebel	Corti, Epi	100–900
31	*Colura corynophora* (Nees *et al*.) Trevis.	Corti, Epi	100–1000
32	*Colura inuii* Horik.	Epi	100–1000
33	*Drepanolejeunea dactylophora* (Nees *et al*.) J.B.Jack & Steph.	Epi	850–1006
34	*Drepanolejeunea levicornua* Steph.	Epi	80–1000
35	*Drepanolejeunea longicornua* (Herzog) Mizut.	Epi	100–1000
36	*Drepanolejeunea pentadactyla* (Mont.) Steph.	Epi	100–1000
37	*Drepanolejeunea spicata* (Steph.) Grolle & R.L.Zhu	Corti, Epi, Rami	100–1000
38	*Drepanolejeunea ternatensis* (Gottsche) Schiffn.	Corti, Epi, Rami	100–1000
39	*Drepanolejeunea thwaitesiana* (Mitt.) Steph.	Epi	80–1000
40	**Drepanolejeunea vesiculosa* (Mitt.) Steph.	Epi	60–100
41	*Lejeunea adpressa* Nees	Corti, Epi	90–500
42	*Lejeunea micholitzii* Mizut.	Epi	900–1000
43	**Lejeunea sordida* (Nees) Nees	Corti	89
44	*Lepidolejeunea bidentula* (Steph.) R.M.Schust.	Corti, Epi	63–340
45	**Lepidolejeunea integristipula* (J.B.Jack & Steph.) R.M.Schust.	Corti	63–340
46	*Leptolejeunea amphiophthalma* Zwickel	Epi	80–1000
47	*Leptolejeunea subacuta* A.Evans	Epi	300–1000
48	*Leptolejeunea epiphylla* (Mitt.) Steph.	Epi	80–1000
49	*Leptolejeunea maculata* (Mitt.) Schiffn.	Epi	80–1000
50	*Leptolejeunea vitrea* (Nees) Schiffn.	Epi	80–1000
51	*Lopholejeunea eulopha* (Taylor) Schiffn.	Epi	100–900
52	*Metalejeunea cucullata* (Reinw. *et al*.) Grolle	Epi	900–1000
53	*Microlejeunea punctiformis* (Taylor) Steph.	Corti, Epi	89–940
54	**Ptychanthus striatus* (Lehm. & Lindenb.) Nees	Corti	980
55	**Pycnolejeunea grandiocellata* Steph.	Corti	60–100
56	**Spruceanthus polymorphus* (Sande Lac.) Verd.	Corti	980
57	*Tuyamaella molischii* (Schiffn.) S.Hatt.	Epi	780–1006
58	**Thysananthus spathulistipus* (Reinw. *et al*.) Lindenb.	Rami	48
IV.	**Lepidoziaceae** Limpr.		
59	**Bazzania albifolia* Horik.	Corti	89–700
60	**Bazzania asymmetrica* (Steph.) N.Kitag.	Corti, Rami	100–200
61	**Bazzania calcarata* (Sande Lac.) Schiffn.	Corti	100
62	**Bazzania densa* (Sande Lac.) Schiffn.	Corti	89–700

No.	Taxon	Substrate preference	Elevation (m)
63	**Bazzania longicaulis* (Sande Lac.) Schiffn.	Corti, Terri	89–700
64	**Bazzania uncigera* (Reinw. *et al*.) Trevis.	Corti, Saxi	89–700
65	**Kurzia gonyotricha* (Sande Lac.) Grolle	Terri	89
66	**Lepidozia trichodes* (Reinw. *et al*.) Nees	Terri	89
X.	**Lophocoleaceae** Vanden Berghen		
67	**Heteroscyphus aselliformis* (Reinw. *et al*.) Schiffn.	Corti	89
68	**Heteroscyphus coalitus* (Hook.) Schiffn.	Terri	89
69	**Heteroscyphus succulentus* (Gottsche) Schiffn.	Corti	89
XI.	**Pallaviciniaceae** Mig.		
70	**Pallavicinia lyellii* (Hook.) Gray	Terri	60
XII.	**Plagiochilaceae** Müll.Frib.		
71	*Plagiochila bantamensis* (Reinw. *et al*.) Mont.	Corti,	89
XIII.	**Radulaceae** Müll.Frib.		
72	*Radula acuminata* Steph.	Epi	80–1000
73	*Radula assamica* Steph.	Epi	60–100
74	**Radula formosa* (Spreng.) Nees	Corti	60–100
75	*Radula grandilobula* Promma & Chantanaorr.	Epi	100
76	*Radula javanica* Gottsche	Corti, Epi	60–100
77	*Radula nymannii* Steph.	Epi	60–100
78	*Radula tjibodensis* K.I.Goebel	Epi	80–1000
IX.	**Solenostomaceae** Stotler & Crand.-Stotl.		
79	**Solenostoma comatum* (Nees) C.Gao	Terri	60
X.	**Schistochilaceae** H.Buch		
80	**Schistochila aligera* (Nees & Blume) J.B.Jack & Steph.	Corti	994