

## Mosses of Ayer Hitam Forest Reserve, Selangor, Peninsular Malaysia

AHMAD DAMANHURI and HAJA MAIDEEN

*School of Environmental and Natural Resource Sciences*

*Faculty of Science and Technology, Universiti Kebangsaan Malaysia*

*43600 Bangi, Selangor, Malaysia*

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### ABSTRAK

Sejumlah 43 spesies dan 1 varieti lumut sejati dalam 22 genus dan 9 famili telah diperhatikan di Hutan Simpan Ayer Hitam, Selangor. Ini mewakili 9.1% daripada 481 takson lumut sejati yang telah dilaporkan bagi Semenanjung Malaysia dan Singapura. Tujuh spesies iaitu *Fissidens papillosum*, *Syrrophodon fimbriatulus*, *Pyrrhobryum latifolium*, *Acroporium lamprophyllum*, *Papillidiopsis malayana*, *Radulina hamata* dan *Trichosteleum mammosum* dilaporkan buat pertama kali bagi negeri Selangor dan *Fissidens guangdongensis* merupakan catatan baru bagi Semenanjung Malaysia. *Calymperaceae* merupakan famili terbesar dengan 5 genus dan 18 spesies, diikuti oleh *Sematophyllaceae* (8 genus, 10 spesies), *Hypnaceae* (3 genus, 5 spesies) dan *Fissidentaceae* (1 genus, 5 spesies).

### ABSTRACT

A total of 43 species and 1 variety of mosses in 22 genera and 9 families were observed in the Ayer Hitam Forest Reserve, Selangor. This represents 9.1% of the 481 taxa of mosses reported for Peninsular Malaysia and Singapore. Seven species viz. *Fissidens papillosum*, *Syrrophodon fimbriatulus*, *Pyrrhobryum latifolium*, *Acroporium lamprophyllum*, *Papillidiopsis malayana*, *Radulina hamata* and *Trichosteleum mammosum* are reported for the first time for the state of Selangor and *Fissidens guangdongensis* is a new record for Peninsular Malaysia. *Calymperaceae* is the largest family with 5 genera and 18 species, followed by *Sematophyllaceae* (8 genera, 10 species), *Hypnaceae* (3 genera, 5 species) and *Fissidentaceae* (1 genus, 5 species).

### INTRODUCTION

The first account of mosses from the state of Selangor was that of Dixon (1926), in which he listed a total of 60 species in 37 genera and 14 families. These early collections of mosses were made mainly by H. N. Ridley and I. H. Burkill from the Singapore Botanic Gardens. The latest and most comprehensive listing of mosses of Selangor was given by Mohamed and Tan (1988) in their checklist of mosses of Peninsular Malaysia and Singapore. They reported the presence of 136 species of mosses in 58 genera and 22 families, an addition of 76 species over 42 years. Recently, a couple of studies on the floristic composition of mosses have been carried out in the Langat Basin in Selangor. Mohamad and Gidiman (1990) enumerated a total of 36 species and 1 variety of mosses in 18 genera and 9 families from Bangi Forest Reserve and a total of 74 species and 1 variety of mosses in 37 genera

and 22 families occur in the lowland dipterocarp forests in the Langat Basin (Damanhuri and Ajamain 1999).

Bangi Forest Reserve, Ayer Hitam Forest Reserve and Bukit Tunggul Forest Reserve were once contiguous, but as new townships and highways were developed in the area, these forests became fragmented and isolated. Historically, these forests were logged several times in the last 60 years. Bangi FR and Ayer Hitam FR are twice-logged over forests. Although Ayer Hitam Forest Reserve is not situated in the Langat Basin, it is adjacent to it and situated about 25 km from Bangi Forest Reserve.

### MATERIALS AND METHODS

During the Ayer Hitam Forest Reserve Scientific Expedition organised by the Faculty of Forestry, Universiti Putra Malaysia from 2-5 May 2000, moss specimens were collected from various parts

of the area. Various microhabitats of mosses such as exposed tree roots, tree-buttresses, tree trunks, rotten logs, soil, surfaces and crevices of rocks and boulders etc. were carefully surveyed in order to obtain as many specimens and species as possible. Special attention was given to areas along the main river in the area, Sungai Rasau which flows through the middle of the Forest Reserve and the smaller streams because the moist and shady environment there are very conducive for the growth of bryophytes.

### RESULTS AND DISCUSSION

A total of 138 specimens of mosses were collected and these are deposited in the Bryophyte Herbarium, Universiti Kebangsaan Malaysia, Bangi (UKMB). The mosses enumerated in this paper were based on the above collections.

The moss flora of Ayer Hitam Forest Reserve comprises 43 species and 1 variety in 22 genera and 9 families (Appendix 1). This represents 9.1% of the 481 species, 17.7% of the 124 genera and 26.5% of the 34 families of mosses reported for Peninsular Malaysia and Singapore, and about 32.4% of the 136 species, 37.9% of the 58 genera and 40.9% of the 22 families recorded for the state of Selangor (Mohamed and Tan 1988). Out of the 44 taxa of mosses recorded, 7 species in 7 genera and 3 families are reported for the first time for Selangor viz. *Fissidens papillosus*, *Syrhropodon fimbriatulus*, *Pyrrhobryum latifolium*, *Acroporium lamprophyllum*, *Papillidiopsis malayana*, *Radulina hamata* and *Trichosteleum mammosum*. Another species, *Fissidens guangdongensis* is a new record for Peninsular Malaysia. The occurrence of *F. guangdongensis* in Peninsular Malaysia was pointed out to us by Prof. Benito Tan of the National University of Singapore based on a specimen collected from Gunung Kajang, Pulau Tioman (A. Damanhuri 1065, UKMB). This species which prefers to grow on termite or ant nests in shady places seem to be quite common in Peninsular Malaysia. To date, we have seen and collected specimens from Hulu Langat (Selangor), Sungkai (Perak) and Taman Negara (Pahang). *Fissidens guangdongensis* is known to be distributed from southern China to Japan and the Philippines.

In terms of moss family, Calymperaceae is the largest with 5 genera and 18 species, followed by Sematophyllaceae (8 genera, 5 species), Hypnaceae (3 genera, 5 species) and Fissidentaceae (1 genus, 5 species). The family

Calymperaceae is also very well represented in other lowland rain forests in Peninsular Malaysia (Damanhuri 1999, 2000; Damanhuri and Ajamain 1999; Mohamed and Mohamad 1987).

The number of moss species found in the Ayer Hitam Forest Reserve (1248 ha) is found to be higher than that reported for Bangi Forest Reserve (138 ha), a small isolated forest in the Langit Basin, Selangor (Table 1). This could be due to the larger land area of Ayer Hitam Forest Reserve and also the presence of several small rivers and streams in the area compared to Bangi Forest Reserve, which is devoid of streams. The number of mosses in Ayer Hitam Forest Reserve is about 58.7% of the 75 taxa found in the lowland rain forests (Hulu Langat Forest Reserve, Sungai Lalang Forest Reserve and Sungai Jeloh Forest Reserve) in the Langat Basin (30923 ha) (Table 1).

### CONCLUSION

For a small patch of isolated lowland forest in the midst of the Klang Valley which is less than 1300 ha in size, this Forest Reserve supports quite an interesting moss flora worthy of further scientific study and conservation. The high level of species occurrence is important for the long-term monitoring study of an isolated forest such as this. Seven of the species found here are new additions to the bryoflora of the state of Selangor and the presence of *Fissidens guangdongensis*, a new record for Peninsular Malaysia, shows that our knowledge about these tiny plants in this pocket of logged-over lowland forest is still far from satisfactory and complete. This is more reason why we should strive to propose for the conservation of some small green lungs in the midst of bustling developing areas.

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### REFERENCES

- CROSBY, M.R. and R.E. MAGILL. 1978. *A Dictionary of Mosses*. 2nd. printing. Missouri Botanical Garden. St. Louis.
- DAMANHURI, A. 1999. The moss flora of Merapoh, Taman Negara, Pahang, Malaysia. In

TABLE 1

Summary of moss taxa and numbers reported from Ayer Hitam Forest Reserve, Bangi Forest Reserve (Mohamad & Gidiman 1990) and Langat Basin, Selangor (Damanhuri & Ajamain 1999).

Locality	Ayer Hitam FR		Bangi FR		Langat Basin	
	Genus	Species	Genus	Species	Genus	Species
1. Bartramiaceae	-	-	1	1	-	-
2. Bryaceae	1	1	2	3	1	1
3. Calymperaceae	5	18	3	13	6	33
4. Dicranaceae	-	-	1	1	1	1
5. Diphysciaceae	-	-	-	-	1	1
6. Ephemeropsaceae	-	-	-	-	1	1
7. Fissidentaceae	1	4 + 1 var.	1	3 + 1 var.	1	6 + 1 var.
8. Hookeriaceae	1	1	-	-	2	2
9. Hypnaceae	3	5	2	6	1	2
10. Hypnodendraceae	-	-	-	-	1	1
11. Leucobryaceae	1	1	3	4	1	2
12. Meteoraceae	-	-	-	-	1	1
13. Myuriaceae	1	1	-	-	1	1
14. Neckeraceae	-	-	-	-	4	5
15. Octoblepharaceae	-	-	-	-	1	1
16. Orthotrichaceae	-	-	-	-	2	2
17. Phylloprepariaceae	-	-	-	-	1	1
18. Plagiotheciaceae	-	-	-	-	1	1
19. Polytrichaceae	-	-	-	-	1	1
20. Pottiaceae	-	-	2	2	1	1
21. Pterobryaceae	-	-	-	-	1	1
22. Rhizogoniaceae	1	2	-	-	1	1
23. Sematophyllaceae	8	10	3	3	4	5
24. Thuidiaceae	-	-	-	-	2	3
Total No.	22	43 + 1 var.	18	36 + 1 var.	37	74 + 1 var.

*Interdisciplinary Approaches in Natural Product Sciences*, ed. Z. Zakaria, N.I. Yusoff, I.M. Said & L.B. Din. p. 211-221. Malaysia Natural Products Society.

DAMANHURI, A. 2000. Mosses of Belum Forest Reserve, Perak, Peninsular Malaysia. *Malay. Nat. J.* **54**(3): 211-221.

DAMANHURI, A. and N. H. AJAMAIN. 1999. Flora lumut sejati di Lembangan Langat, Selangor, Malaysia. In *Prosiding Seminar IRPA-UKM 1999*, ed. I. Sahid. Jilid 3. p. 407-410. Pusat Pengurusan Penyelidikan, UKM, Bangi.

DIXON, H.N. 1926. A list of mosses of the Malay Peninsula. *Gard. Bull. Straits Settlements*. **4**: 1-46.

MOHAMAD, A. D. and J. B. GIDIMAN. 1990. Flora lumut sejati (Bryophytine) Hutan Simpan Bangi dan kawasan sekitarnya. In *Ekologi dan Biologi Hutan Simpan Bangi*, ed. A. Latiff. Kumpulan Kertas Kerja 14. p.147-151. Penerbit UKM, Bangi.

MOHAMED, H. and A.D. MOHAMAD. 1987. The moss flora of Ulu Endau, Johor, Malaysia. *Malay. Nat. J.* **41**: 183-189.

Mohamed, H. and B.C. Tan. 1988. A checklist of mosses of Peninsular Malaya and Singapore. *Bryologist* **91**(1): 24-44.

## Appendix 1

Checklist of mosses in Ayer Hitam Forest Reserve, Selangor.

The arrangement of families follows that of Crosby and Magill (1978) with slight modifications. The habitat and distribution within Peninsular Malaysia are given. Species reported for the first time for Selangor are marked with '\*' and '\*\*' indicates new records for Peninsular Malaysia.

## 1. FISSIDENTACEAE

1.1 *Fissidens ceylonensis* Dozy & Molk.

A. Damanhuri 2000-173. On thin soil over surface of rock, in partial shade. All states.

1.2 *F. crassinervis* Sande Lac. var. *crassinervis*

A. Damanhuri 2000-262, 2000-238 and 2000-239. On soil in partial shade to open sites. All states.

1.3 *F. crassinervis* var. *laxus* (Sull. & Lesq.) A. Eddy

A. Damanhuri 2000-218, 2000-240, 2000-241, 2000-260 and 2000-263. On soil in partial shade to open sites. All states.

1.4 \*\**F. guangdongensis* Z. Iwats. & Z. H. Li

A. Damanhuri 2000-287. On ant nest in full shade.

1.5 \**F. papillosus* Sande Lac.

A. Damanhuri 2000-237. On termite nest in full shade. Pahang

## 2. LEUCOBRYACEAE

2.1 *Leucobryum sanctum* (Brid.) Hampe

A. Damanhuri 2000-252 and 2000-267. On rotten log and on surface of boulder in partial shade. All states.

## 3. CALYMPERACEAE

3.1 *Arthrocormus schimperi* (Dozy & Molk.) Dozy & Molk.

A. Damanhuri 2000-162, 2000-170, 2000-184 and 2000-219. On buttresses and at base of trees and palms, in partial to full shade. All states.

3.2 *Calymperes erosum* Müll. Hal.

A. Damanhuri 2000-242 and 2000-244. On thin soil at base of trees, in partial to full shade. Johor, Pahang, Perak, Pulau Langkawi, Pulau Pinang and Selangor.

3.3 *C. lonchophyllum* Schwägr.

A. Damanhuri 2000-168 and 2000-176. On tree trunks in full shade. Johor, Pahang, Perak, Pulau Langkawi, Pulau Pinang and Selangor.

3.4 *C. moluccense* Schwägr.

A. Damanhuri 2000-245. On tree trunk in full shade. Pahang, Perak and Selangor.

3.5 *Leucophanes octoblepharoides* Brid.

A. Damanhuri 2000-167, 2000-172, 2000-179, 2000-188, 2000-182, 2000-190, 2000-266, 2000-272, 2000-273, 2000-276, 2000-279, 2000-280, 2000-281, 2000-285 and 2000-291. On lianas, tree trunks and occasionally on rotten logs in partial to full shade. All states.

3.6 *Mitthyridium constrictum* (Sull.) H. Rob.

A. Damanhuri 2000-164. On fallen branch. Pahang and Selangor.

3.7 *M. fasciculatum* (Hook. & Grev.) H. Rob.

A. Damanhuri 2000-185, 2000-209 and 2000-222. On tree trunks in partial to full shade. Johor, Kedah, Pahang, Perak, Selangor and Terengganu.

3.8 *M. flavum* (Müll. Hal.) H. Rob.

A. Damanhuri 2000-202, 2000-261, 2000-271, 2000-274 and 2000-282. On tree trunks in partial to full shade. Pahang, Perak, Pulau Langkawi and Selangor.

3.9 *M. jungquilianum* (Mitt.) H. Rob.

A. Damanhuri 2000-203, 2000-204, 2000-221, 2000-246, 2000-269, 2000-278 and 2000-292. On tree trunks in full shade. Johor, Pahang, Perak and Selangor.

3.10 *M. repens* (Harv.) H. Rob.

A. Damanhuri 2000-161, 2000-183, 2000-243, 2000-268, 2000-270 and 2000-290. On tree trunks in partial shade. Johor, Melaka, Pahang, Perak, Pulau Pinang and Selangor.

3.11 *M. undulatum* (Dozy & Molk.) H. Rob.

A. Damanhuri 2000-207, 2000-208, 2000-277, 2000-288 and 2000-289. On tree trunks in full shade. Johor, Kedah, Perak and Selangor.

3.12 *Syrrophodon albovaginatus* Schwägr.

A. Damanhuri 2000-160 and 2000-178. On rotten logs in full shade. Pahang, Perak, Pulau Langkawi, Pulau Pinang and Selangor.

3.13 *S. aristifolius* Mitt.

A. Damanhuri 2000-177 and 2000-286. On tree trunks in partial to full shade. Johor, Melaka, Pahang, Perak and Selangor.

3.14 *S. croceus* Mitt.

A. Damanhuri 2000-165. On tree trunk in full shade. Johor, Kedah, Kelantan, Pulau Pinang and Selangor.

3.15 *\*S. fimbriatulus* Müll. Hal.

A. Damanhuri 2000-250. On tree trunk in full shade. Johor and Perak.

3.16 *S. involutus* Schwägr.

A. Damanhuri 2000-284. On tree trunk in partial shade. Johor, Kedah, Melaka, Pahang, Perak, Pulau Pinang and Selangor.

3.17 *S. muelleri* (Dozy & Molk.) Sande Lac.

A. Damanhuri 2000-159, 2000-171, 2000-174, 2000-180, 2000-181, 2000-187 and 2000-191. On tree trunks in full shade. Johor, Kedah, Kelantan, Pahang, Perak, Pulau Langkawi, Pulau Pinang and Selangor.

3.18 *S. spiculosus* Hook. & Grev.

A. Damanhuri 2000-163, 2000-166, 2000-169, 2000-175, 2000-186, 2000-189, 2000-206, 2000-214 and 2000-283. On soil, tree trunks, rotten logs and on vertical walls of boulders, in full shade. Johor, Kedah, Melaka, Pahang, Perak, Pulau Langkawi, Pulau Pinang and Selangor.

4. BRYACEAE

4.1 *Orthodontium infractum* Dozy & Molk.

A. Damanhuri 2000-195 and 2000-295. On moist soil in partial shade. Pahang and Selangor.

5. RHIZOGONIACEAE

5.1 *\*Pyrrhobryum latifolium* (Bosch & Sande Lac.) Mitt.

A. Damanhuri 2000-192 and 2000-254. On tree trunks in full shade. Johor, Negeri Sembilan, Pahang, Perak and Pulau Pinang.

5.2 *P. spiniforme* (Hedw.) Mitt.

A. Damanhuri 2000-253. On vertical wall of boulder in full shade. All states.

6. HOOKERIAEAE

6.1 *Callicostella papillata* (Mont.) Mitt.

A. Damanhuri 2000-210. On thin soil over rotting cloth in full shade. Johor, Pahang, Perak, Pulau Pinang and Selangor.

7. MYURIAEAE

7.1 *Oedycladium pseudorufescens* (Hampe) B. C. Tan & Mohamed

A. Damanhuri 2000-213. On tree trunk in partial shade. Johor, Kelantan, Melaka, Perak, Pulau Pinang and Selangor.

8. SEMATOPHYLLACEAE

8.1 *Acanthorrhynchium papillatum* (Harv.) M. Fleisch.

A. Damanhuri 2000-212, 2000-216, 2000-217, 2000-255, 2000-293 and 2000-294. On rotten logs and tree trunks in partial to full shade. All states.

8.2 *Acroporium joannis-winkleri* Broth.

A. Damanhuri 2000-224. On rotten log in full shade. Pahang and Selangor.

8.3 *\*A. lamprophyllum* Mitt.

A. Damanhuri 2000-198. On tree trunk in full shade. Kedah, Kelantan, Melaka and Pahang.

8.4 *Clastobryophilum bogoricum* (Bosch & Sande Lac.) M. Fleisch.

A. Damanhuri 2000-220 and 2000-251. On tree trunks in full shade. Pahang, Perak and Selangor.

8.5 *\*Papillidiopsis malayana* (Dixon) B. C. Tan

A. Damanhuri 2000-24 and 2000-249. On tree trunks in full shade. Kedah, Melaka, Pahang, Pulau Langkawi and Pulau Pinang.

8.6 *\*Radulina hamata* (Dozy & Molk.) A. Jaeger

A. Damanhuri 2000-233. On rotten log in full shade. Pahang, Perak and Pulau Pinang.

8.7 *Taxithelium isocladum* (Bosch & Sande Lac.) Renaud & Cardot

A. Damanhuri 2000-205 and 2000-259. On liana and trunk of a small tree, in full shade. All states.

8.8 *Trichosteleum boschii* (Dozy & Molke.) A. Jaeger  
 A. Damanhuri 2000-196, 2000-197, 2000-201, 2000-228, 2000-230, 2000-231 and 2000-256. On liana, tree trunks, exposed roots and rotten logs, in partial shade. All states.

8.9 \**T. mammosum* (Müll. Hal.) A. Jaeger  
 A. Damanhuri 2000-226. On burnt wood in partial shade. Johor and Pulau Pinang.

8.10 *Trismegistia calderensis* (Sull.) Broth.  
 A. Damanhuri 2000-232 and 2000-234. On surfaces of boulders in partial shade. Pahang and Selangor.

9. HYPNACEAE

9.1 *Ectropothecium buitenzorgii* (Bél.) Mitt.  
 A. Damanhuri 2000-235. On thin soil over surface of boulder in full shade. All states.

9.2 *Isopterygium albescens* (Hook. in Schwägr.) A. Jaeger  
 A. Damanhuri 2000-257. On small tree in full shade. Johor, Pahang, Perak and Selangor.

9.3 *I. minutirameum* (Müll. Hal.) A. Jaeger  
 A. Damanhuri 2000-296. On rotten log. Johor, Kelantan, Pahang, Perak, Selangor and Terengganu.

9.4 *Vesicularia miquelii* (Sande Lac.) M. Fleisch.  
 A. Damanhuri 2000-215, 2000-225, 2000-229 and 2000-248. On rotten logs in full shade. All states.

9.5 *V. reticulata* (Dozy & Molke.) Broth.  
 A. Damanhuri 2000-247. On thin soil over rotting cloth in full shade. Johor, Perak, Perlis, Pulau Pinang and Selangor.