



Checklist with notes on Rubiaceae of Fraser's Hill, Pahang and Selangor

Ahmad Fitri Zohari¹, Nik Hazlan Nik Hashim^{2*}, Nik Norafida Nik Ali³, Mohd Nizam Mohd Said¹, Nur 'Aqilah Mustafa Bakray¹, Mohammad Khairul Faizi Zulkifli⁴, Ahmad Firdaus Zainuddin⁵, Wan Norilani Wan Ismail¹, Engku Azlin Rahayu Engku Ariff², Mazlin Kusin², Norazlinda Mohamad⁶, Khairunnisaa Abd Rasid⁷, Abdul Latiff Mohamad¹

¹Department of Biological Sciences and Biotechnology, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600, Bangi, Selangor.

²Faculty of Applied Science, Universiti Teknologi MARA Cawangan Pahang, 26400 Bandar Tun Abdul Razak, Jengka, Pahang.

³Es Eco Smart Sdn. Bhd., Level 6, Menara ES, No. 9, Persiaran Industri, Bandar Sri Damansara, 52200, Kuala Lumpur.

⁴Department of Earth Sciences and Environment, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600, Bangi, Selangor.

⁵Natural Forest Programme, Forest Biodiversity Division, Forest Research Institute Malaysia, 52109, Kepong, Selangor.

⁶No. 63A-2 & 65-2, Petaling Utama Avenue, Jalan PJS 1/50, Taman Petaling Utama, 46150 Petaling Jaya, Selangor.

⁷No. 14 Lorong TJI29, Taman Jengka Indah, 26400, Bandar Tun Abdul Razak, Jengka, Pahang.

Received: August 15, 2024, Accepted in revised form: September 5, 2024

Available online: Oct 21, 2024

ABSTRACT. This paper reports the checklist and notes of Rubiaceae in the lower montane forest of Fraser's Hill in Pahang and Selangor. A total of 48 species from 23 genera were recorded, with *Lasianthus* being the most diverse genus with seven species. Thirteen species, viz. *Argostemma yappii*, *Ixora micrantha*, *Lasianthus filiformis* var. *bracteatus*, *L. politus*, *L. pterospermus*, *L. robinsonii*, *Pavetta salicina*, *P. wallichiana*, *Psydrax* sp. 3., *Psydrax* sp. 6, *Tarenna* sp. 6, *Timonius diffusus* and *T. oreophilus* are endemic to Peninsular Malaysia. The research indicated that Rubiaceae exhibits diversity in the lower montane forest of Fraser's Hill, so suggesting the necessity for protection and conservation of the area. Additional research is necessary to further comprehension of this family's diversity.

Key words: Rubiaceae, lower montane forest, Fraser's Hill, Pahang, Selangor

INTRODUCTION

Rubiaceae, or kopi family, is the world's fourth largest flowering plant family, after Compositae, Orchidaceae, and Leguminosae (Mabberley, 1987). This family consists of 13,465 species from 64 tribes and 614 genera (Stevens, 2001). It is the largest family of dicotyledons in Peninsular Malaysia, with 555 species in 149 genera (Wong, 1989). This family is an important component of the lower strata of the tropical rain forest in Peninsular Malaysia, particularly the understory and shrub layers. Only several genera and species are important for timber, such as *Metadina*, *Morinda*, *Nauclea*, *Neonauclea*, *Ochreinauclea*, *Pertusadina*, *Jackiopsis ornata*, *Mussaendopsis beccariana*, *Neolamarckia cadamba*, and *Porterandia anisophyllea*. Several genera also have ornamental potential, such as *Aidia*, *Gardeniopsis*, *Kochummenia*, *Rennellia*, and *Rothmannia* spp. (Wong, 1989). These species produce colourful flowers with a fragrant smell.

*Corresponding author: Tel.: +60 94602410; fax: +60 94602455.

E-mail address: nikhazlan@uitm.edu.my (Nik Hazlan Nik Hashim)

During the Royal Scientific Expedition of Selangor State Park (26 – 30 August 2019), the authors collected several specimens of Rubiaceae from Fraser's Hill area (Figure 1). In the absence of a report on the Rubiaceae checklist, the authors have presented a preliminary assessment of the family observed in this region. The data produced during the expedition were amalgamated with prior collections archived in the Herbarium, Forest Research Institute Malaysia (KEP), and the National Herbarium of the Netherlands (L).

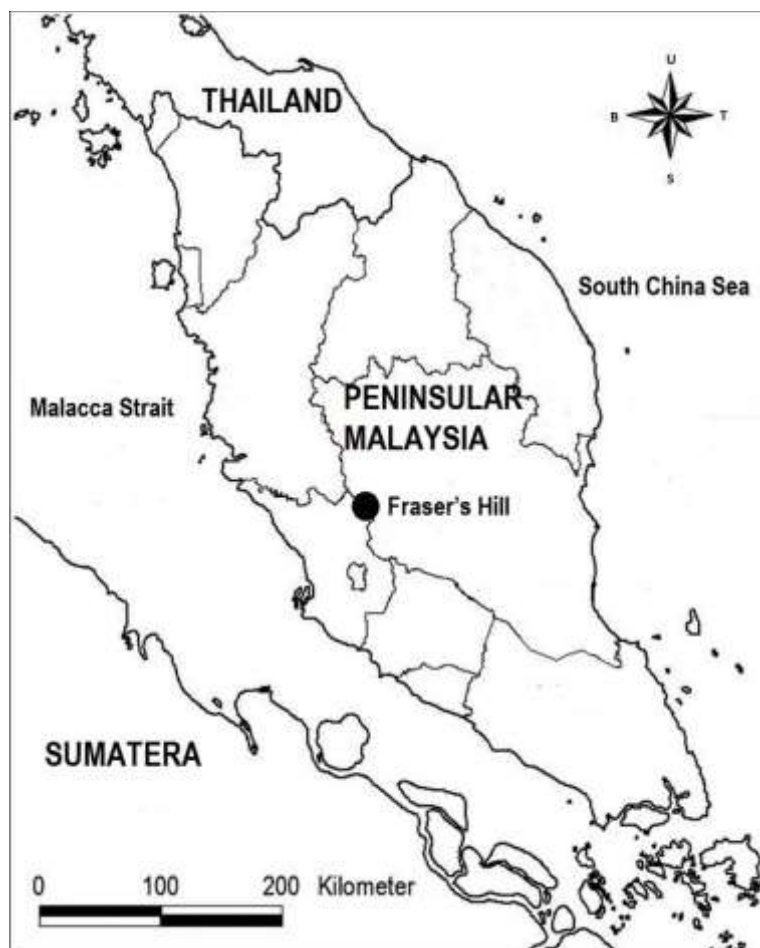


Figure 1. Location of Fraser's Hill, Selangor

METHODOLOGY

Specimens of Rubiaceae were gathered during the research excursion in Fraser's Hill Forest Reserve from August 26 to August 30, 2019. All specimens bearing flowers or fruits were identified in situ, while those lacking such features were preserved as vouchers for subsequent identification in the herbarium. Locations (longitude and altitude) were taken. The specimens were later brought to Universiti Kebangsaan Malaysia and dried at 60 °C for about one week. The desiccated materials were prepared into herbarium specimens and preserved in the Herbarium of Universiti Kebangsaan Malaysia (UKMB). Specimen identification was done at the Herbarium UKMB and Herbarium, Forest Research Institute Malaysia (KEP). Furthermore, identification of the specimens was done using keys provided by Wong (1989). The herbarium specimens housed in KEP and the National Herbarium of the Netherlands (L) were also analyzed. Supplementary data from the herbarium labels, including behaviors and overall morphology, was also

obtained.

RESULTS AND DISCUSSION

A total of 48 taxa from 23 genera of Rubiaceae have been documented on Fraser's Hill in Pahang and Selangor. *Lasianthus* is the most diverse genus, with seven taxa, followed by *Argostemma* with five taxa and *Pavetta* with four taxa. Ten genera were represented by a single species each, namely *Aidia*, *Brachytome*, *Canthium*, *Chassalia*, *Gaertnera*, *Gardeniopsis*, *Hedyotis*, *Porterandia*, *Prismatomeris*, and *Wendlandia*. Thirteen taxa, viz. *Argostemma yappii*, *Ixora micrantha*, *Lasianthus filiformis* var. *bracteatus*, *L. politus*, *L. pterospermus*, *L. robinsonii*, *Pavetta salicina*, *P. wallichiana*, *Psydrax* sp. 3., *Psydrax* sp. 6, *Tarenna* sp. 6, *Timonius diffusus* and *T. oreophilus* are endemic to Peninsular Malaysia (Turner, 1995). A complete checklist of Rubiaceae taxa found on Fraser's Hill is provided below:

1. *Aidia densiflora* (Wall.) Masam.

Habit: Sapling.

Habitat and distribution: Lowland to montane forests throughout Peninsular Malaysia.

Specimen examined: Selangor, Fraser's Hill, Pelawan Trail, 28 August 2019, Z. Ahmad Fitri, AFZ s.n.

2. *Argostemma elatostemma* Hook.f.

Habit: Herb.

Habitat and distribution: Hill and montane forest and has been recorded in Pulau Pinang, Perak and Pahang.

Specimen examined: Pahang, Fraser's Hill, 8 March 1987, R.D. Worthington, 12557.

3. *Argostemma hookeri* King

Habit: Herb.

Habitat and distribution: Hill and montane forests and has been recorded in Pulau Pinang, Pahang, Selangor and Johor.

Specimen examined: Selangor, Fraser's Hill, Pelawan Trail, 28 August 2019, Z. Ahmad Fitri, AFZ s.n.

4. *Argostemma parvifolium* var. *involucratum* (Hemsl.) Bakh.

Habit: Creeping herb.

Habitat and distribution: Hill and montane forest and has been recorded in Pulau Pinang, Perak, Pahang, Selangor and Melaka.

Specimens examined: Pahang, Fraser's Hill, 25 September 1959, Md. Shah & Noor, MS 635, 8 March 1987, R.D. Worthington, 12530.

5. *Argostemma yappii* King

Habit: Herb.

Habitat and distribution: Endemic to Peninsular Malaysia, montane forest and has been recorded in Perak, Pahang

and Selangor.

Specimens examined: Pahang, Fraser's Hill, 14 November 1937, C.F. Symington, KEP 45026; 17 January 1954, Van Steenis 18520.

6. *Argostemma* sp.

Habit: Herb.

Specimen examined: Selangor, Fraser's Hill, Trail to Gap and Pelawan Trail; 27 & 28 August 2019, Z. Ahmad Fitri, AFZ s.n.

Note: Yet to be identified to species.

7. *Brachytome scortechinii* King & Gamble

Habit: Shrub.

Habitat and distribution: Montane forest above 900 m a.s.l. and has been recorded in Kedah, Perak and Pahang.

Specimens examined: Pahang, Fraser's Hill, 30 August 1923, Md. Nur, SF 11178, Selangor, Fraser's Hill, Trail to Gap, 27 August 2019, Z. Ahmad Fitri, AFZ s.n.

8. *Canthium glabrum* Blume

Habit: Tree.

Habitat and distribution: Lowland to montane forests and widespread in Peninsular Malaysia.

Specimens examined: Pahang, Fraser's Hill, 3 February 1927, E.J. Strugnell, KEP 12656; Selangor, Fraser's Hill, Trail to Gunung Gap and Pelawan Trail, 27 & 28 August 2019, Z. Ahmad Fitri, AFZ s.n.

9. *Chassalia chartacea* Craib (Figure 2).

Habit: Shrub.

Habitat and distribution: Lowland to lower montane forests and widespread in Peninsular Malaysia.

Specimens examined: Pahang, Fraser's Hill, 15 May 1926, E. Cubitt, KEP 11140, Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ 2876.



Figure 2. *Chassalia chartacea*

10. *Gaertnera diversifolia* Ridl.

Habit: Shrub.

Habitat and distribution: Hill and montane forest to 1500 m and has been recorded in Pahang, Selangor and Negeri Sembilan.

Specimen examined: Pahang, Fraser's Hill, 21 May 1998, Malcomber, Simon T., SM 3018.

11. *Gardeniopsis longifolia* Miq.

Habit: Shrub.

Habitat and distribution: Lowland to montane forests throughout Peninsular Malaysia.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap. In situ observation, 27 August 2019.

12. *Hedyotis* sp.

Habit: Herb.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ s.n.

Note: Yet to be identified to species.

13. *Ixora lobbii* King & Gamble var. *lobbii*

Habit: Shrub.

Habitat and distribution: Lowland to montane forests at 1200 m a.s.l. throughout Peninsular Malaysia.

Specimens examined: Pahang, Fraser's Hill, 26 June 1987, K.M. Wong, FRI 32044. Selangor, Fraser's Hill, Trail to Gunung Gap and other trails, 27 & 28 August 2019, A. Latiff & Z. Ahmad Fitri, AFZ 2941.

14. *Ixora micrantha* Ridl.

Habit: Shrub or small tree.

Habitat and distribution: Endemic to Peninsular Malaysia, distributed in hill and montane forest above 700 m and has been recorded Perak, Pahang and Selangor.

Specimen examined: Pahang, Fraser's Hill, 8 February 1931, Syed Ali, KEP 23394.

15. *Lasianthus filiformis* King & Gamble var. *bracteatus* King & Gamble (Figure 3).

Habit: Shrub, ca. 1.5 m tall.

Habitat and distribution: An endemic variety and is distributed in the lowland and hill forests, including swamps.

This variety has been recorded in Terengganu, Perak, Pahang, Selangor and Negeri Sembilan.

Specimens examined: Selangor, Fraser's Hill, Trail to Gunung Gap and other trails, 27 & 28 August 2019, A. Latiff & Z. Ahmad Fitri, AFZ s.n., AFZ 2881 & AFZ 2943.



Figure 3. *Lasianthus filiformis* var. *bracteatus*

16. *Lasianthus griffithii* Wight

Habit: Shrub.

Habitat and distribution: Lowland and hill forest and has been recorded in Kelantan, Terengganu, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimen examined: Pahang, Fraser's Hill, 22 January 1973, K.M. Kochummen, FRI 16651.

17. *Lasianthus lowianus* King & Gamble (Figure 4)

Habit: Shrub, ca. 1.0 m tall.

Habitat and distribution: This species is distributed in lowland and montane forests up to 1500 m and has been recorded in Kedah, Pulau Pinang, Kelantan, Terengganu, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ 2887, AFZ 2905.



Figure 4. *Lasianthus lowianus*

18. *Lasianthus politus* Ridl. (Figure 5)

Habit: Shrub, ca. 1.5 m tall.

Habitat and distribution: An endemic species which is distributed in hill and lower montane forests up to ca. 1100 m and has been recorded in Pahang, Selangor and Negeri Sembilan.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ 2896.



Figure 5. *Lasianthus politus*

19. *Lasianthus pterospermus* Wight

Habit: Shrub.

Habitat and distribution: This endemic species is distributed in lowland and hill forests up to ca. 1200 m and has been recorded in Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ s.n.

20. *Lasianthus rhinocerotis* Blume

Habit: Shrub, ca. 1.0 m tall.

Habitat and distribution: This species is found in montane forest and has been recorded in Perak, Pahang and Selangor.

Specimen examined: Selangor, Fraser's Hill, Pelawan Trail, 27 August 2019, Z. Ahmad Fitri, AFZ 2897.

21. *Lasianthus robinsonii* Ridl.

Habit: Shrub.

Habitat and distribution: This endemic species is distributed in montane forest at about 1200 m and has been recorded in Perak, Pahang and Selangor.

Specimen examined: Pahang, Fraser's Hill, 15 January 1981, K.M. Wong, FRI 32032.

22. *Morinda rigida* Miq.

Habit: Liana.

Habitat and distribution: This species is distributed in lowland to montane forest; widespread and common in Peninsular Malaysia.

Specimen examined: Pahang, Fraser's Hill, 4 September 1969, K.M. Kochummen, FRI 2752.

23. *Morinda umbellata* L.

Habit: Climber.

Habitat and distribution: This species is distributed from sea shores to mountains; widespread in Peninsular Malaysia.

Specimen examined: Pahang, Fraser's Hill, 11 November 1979, K.M. Kochummen, FRI 11465.

24. *Mussaenda angustisepala* Ridl.

Habit: Climber

Habitat and distribution: This species is distributed in forest margin from lowland to hill forest and has been recorded mostly in northern part of Peninsular Malaysia.

Specimen examined: Pahang, Fraser's Hill, 20 June 1987, R.D., Worthington, 12902.

25. *Mussaenda mutabilis* Hook.f.

Habit: Shrub.

Habitat and distribution: This species is distributed in lowland to montane forest; widespread in Peninsular Malaysia.

Specimens examined: Pahang, Fraser's Hill, 23 September 1922, H.M. Burkill, 4/7/1987, RD, Worthington, 12980.

26. *Nauclea officinalis* (Pierre ex Pit.) Merr. & Chun.

Habit: Sapling.

Habitat and distribution: This species is found in lowland and hill forests throughout Peninsular Malaysia.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ s.n.

27. *Nauclea subdita* (Korth.) Steud.

Habit: Sapling.

Habitat and distribution: This species is found in lowland and hill forests throughout Peninsular Malaysia.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, AFZ 2912.

28. *Pavetta graciliflora* Wall. ex Ridl.

Habit: Shrub.

Habitat and distribution: This species is distributed in lowland and hill forests and widespread in Peninsular Malaysia.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap and Pelawan Trail, 27 & 28 August 2019, Z. Ahmad Fitri, AFZ 2904.

29. *Pavetta napieri* (Ridl.) Bremek.

Habit: Shrub.

Habitat and distribution: This species is distributed in lowland and hill forests and widespread in Peninsular Malaysia.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ s.n.

30. *Pavetta salicina* (Ridl.) Bremek.

Habit: Shrub.

Habitat and distribution: This endemic species is distributed in hill and lower montane forests, especially on the Main Range.

Specimens examined: Pahang, Fraser's Hill, 20 February 1967, F.S.P. Ng, FRI 1934; Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ s.n.

31. *Pavetta wallichiana* Steud.

Habit: Shrub.

Habitat and distribution: This endemic species is distributed in lowland forest; throughout Peninsular Malaysia.

Specimen examined: Pahang, Fraser's Hill, 15 October 1966, K.M. Kochummen, FRI 2159.

32. *Porterandia anisophyllea* (Jack ex Roxb.) Ridl.

Habit: Sapling and tree.

Habitat and distribution: This species is distributed in lowland and hill forests. This species has been recorded in

Kedah, Terengganu, Pulau Pinang, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimens examined: Pahang: Fraser's Hill, 15 January 1981, K.M. Wong, FRI 32023; Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, in situ observation.

33. *Prismatomeris glabra* (Korth.) Valetton.

Habit: Sapling.

Habitat and distribution: This species is distributed in lowland to montane forests throughout Peninsular Malaysia.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ s.n.

34. *Psychotria malayana* Jack (Figure 6)

Habit: Shrub, 1.5-2.0 m tall.

Habitat and distribution: This species is distributed in lowland to hill forests throughout Peninsular Malaysia.

Specimens examined: Pahang: Fraser's Hill, 3 March 1967, T.C. Whitmore, FRI 3148; Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ 2877 & AFZ 2882.



Figure 6. *Psychotria malayana*

35. *Psychotria rostrata* Blume (Figure 7)

Habit: Shrub, ca. 1.0 m tall.

Habitat and distribution: This species is distributed in lowland and hill forests and has been recorded in Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimens examined: Pahang: Fraser's Hill, 8 August 1987 K.M. Wong, FRI 32039; Selangor, Fraser's Hill, Trail to Gunung Gap and Pelawan Trail, 27 & 28 August 2019, Z. Ahmad Fitri, AFZ 2875, AFZ 2890 & AFZ 2898.



Figure 7. *Psychotria rostrata*

36. *Psydrax* sp. 3. (Figure 8)

Wong, Tree Fl. Malay. 4 (1989) 400.

Habit: Small tree.

Habitat and distribution: This endemic species is distributed in montane forest at 1100-1300 m a.s.l. and has been recorded in Main Range in Peninsular Malaysia.

Specimen examined: Pahang: Fraser's Hill, September 1923, Mohd Nur, KEP 11280.



Figure 8. *Psydrax* sp. 3.

37. *Psydrax* sp. 6.

Wong, Tree Fl. Malay. 4 (1989) 400.

Habit: Small tree.

Habitat and distribution: This endemic species is distributed in montane forest and has been recorded in Pahang and Selangor.

Specimen examined: Pahang: Fraser's Hill, 8 March 1968, K. Ogata, KEP 110332.

38. *Tarenna mollis* (Wall. ex Hook.f.) B.L. Rob.

Habit: Shrub or small tree.

Habitat and distribution: This species is distributed in lowland to lower montane forest and has been recorded in Pulau Pinang, Terengganu, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimen examined: Pahang: Fraser's Hill, 8 May 1987, K.M. Kochummen, FRI 18480.

39. *Tarenna stellulata* (Hook. f.) Ridl.

Habit: Shrub.

Habitat and distribution: This species is distributed from lowland to montane forests at ca. 1200 m. This species has been recorded in Kelantan, Terengganu, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimens examined: Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ 2870 & AFZ 2893.

40. *Tarenna* sp. 6.

Wong, Tree Fl. Malay. 4 (1989) 411.

Habit: Shrub.

Habitat and distribution: This endemic species is distributed in montane forest and only recorded in Fraser's Hill, Pahang.

Specimen examined: Pahang: Fraser's Hill, 18 January 1967, K.M. Kochummen, FRI 2216.

41. *Timonius diffusus* Ridl.

Habit: Small tree.

Habitat and distribution: This endemic species is distributed in montane forest and only recorded in Pahang and Selangor.

Specimens examined: Pahang: Fraser's Hill, 26 August 1981, K.M. Wong, FRI 32247, Selangor, Fraser's Hill, Pelawan Trail, 28 August 2019, Z. Ahmad Fitri AFZ s.n.

42. *Timonius oreophilus* Ridl.

Habit: Shrub.

Habitat and distribution: This endemic species is distributed in hill and montane forest above 700 m a.s.l. has been

recorded in Pahang and Selangor.

Specimen examined: Pahang: Fraser's Hill, 29 March 1967, F.S.P. Ng, FRI 5010.

43. *Uncaria cordata* (Lour.) Merr.

Habit: Climber.

Habitat and distribution: This species is distributed in lowland and hill forest; widespread in Peninsular Malaysia.

Specimen examined: Pahang: Fraser's Hill, 3 November 1981, K.M. Kochummen, FRI 26590.

44. *Uncaria longiflora* (Poir.) Merr. var. *pteropoda* (Miq.) Ridsdale

Habit: Climber.

Habitat and distribution: This variety is distributed in lowland and hill forest margins and widespread in Peninsular Malaysia.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ s.n.

45. *Urophyllum griffithianum* (Wight) Hook. f.

Habit: Shrub.

Habitat and distribution: This species is found in lowland and hill forests and has been recorded in Pulau Pinang, Terengganu, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap, 27 August 2019, Z. Ahmad Fitri, AFZ s.n.

46. *Urophyllum streptopodium* Wall. ex Hook. f.

Habit: Shrub.

Habitat and distribution: This species is distributed from lowland to lower montane forests and has been recorded in Pulau Pinang, Kelantan, Terengganu, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap 27 August 2019. AFZ s.n.

47. *Urophyllum* sp. 9.

Wong, Tree Fl. Malay. 4 (1989) 423.

Habit: Shrub, ca. 2.5 m tall.

Habitat and distribution: This species is distributed from lowland to lower montane forests at 1300 m and has been recorded in Pahang (Pulau Tioman) and Selangor.

Specimen examined: Selangor, Fraser's Hill, Trail to Gunung Gap and Pelawan Trail, 27 & 28 August 2019, Z. Ahmad Fitri, AFZ 2872.

48. *Wendlandia burkillii* Cowan

Habit: Tree.

Habitat and distribution: This species is distributed montane forest above 1500 m and has recorded in Main Range, Peninsular Malaysia.

Specimens examined: Pahang, Fraser's Hill, 20 April 1968, T.C. Whitmore, FRI 8632; 4 December 1991, R. Kiew and S. Anthonyamy, RK 3432.

CONCLUSION

The research indicated that Rubiaceae exhibits diversity in the lower montane forest of Fraser's Hill, with 48 species documented. A total of 13 endemic species have been reported in this area, indicating the necessity for protection and conservation efforts.

ACKNOWLEDGMENTS

The authors expressed their gratitude to the Forestry Department of Selangor and Prof. Dr. Rusea Go, Universiti Putra Malaysia, for their invitation and hospitality throughout this scientific expedition.

AUTHOR CONTRIBUTIONS

Writing original draft: Ahmad Fitri Zohari, Nik Hazlan Nik Hashim; Data curation: Nik Norafida Nik Ali, Nur 'Aqilah Mustafa Bakery, Wan Norilani Wan Ismail, Mazlin Kusin; Formal analysis: Mohammad Khairul Faizi Zulkifli, Mohd Nizam Mohd Said, Ahmad Firdaus Zainuddin; Writing review & editing: Khairunnisaa Abd Rasid, Norazlinda Mohamad, Engku Azlin Rahayu Engku Ariff; Project administration: Abdul Latiff.

FUNDINGS

Not applicable.

COMPETING INTEREST

The authors declare that they have known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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