



On the Annonaceae of Sungai Menyala Forest Reserve, Port Dickson, Negeri Sembilan

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ABSTRACT. A preliminary report of Annonaceae in Sungai Menyala Forest Reserve, Port Dickson, Negeri Sembilan, Peninsular Malaysia, is given. Based on the collections in the herbarium and in the field, a total of 17 genera and 24 species were listed. In the recent survey during the scientific expedition in October 2022, a total of 13 taxa were recorded, viz. *Alphonsea elliptica*, *A. maingayi*, *Artabotrys suaveolens*, *Dendrokingstonia nervosa*, *Desmos dasymaschalus*, *Goniothalamus macrophyllus*, *Mezzettia parviflora*, *Monocarpia euneura*, *Phaeanthus ophthalmicus*, *Polyalthia rumphii*, *Trivalvaria macrophylla*, *Xylopia ferruginea* and *X. malayana*. Only one endemic species to Peninsular Malaysia was listed, namely *Drepananthus pruniferus* and only one species, *Monocarpia euneura*, bears both flowers and fruits during the recent survey. Another species, *Phaeanthus ophthalmicus*, only bears flowers. These results contributed some additional information about the flowering plants in Sungai Menyala Forest Reserve.

Keywords: *Annonaceae*, *Endemic*, *Lowland dipterocarp forest*, *Sungai Menyala Forest Reserve*.

INTRODUCTION

Annonaceae is a largely concentrated family in tropical regions, with only a few species found in temperate regions. A total of 110 genera from 2,430 species divided into four subfamilies was recorded (Stevens 2001 onwards). Annonaceae is one of the largest families of flowering plants in Peninsular Malaysia, with 38 genera and 198 species recorded (Kochummen, 1972). Most species of this family are found in lowlands and hill dipterocarp forests and are rarely found in the mountains. According to Appanah et al. (1993), Annonaceae was at the top of the species diversity among liana species in the Malaysian rainforests. Taxonomic revisions of Annonaceae in Peninsular Malaysia have been carried out since the early 1900s by Ridley (1922) and continued by other researchers such as Corner (1940), Sinclair (1955), and Kochummen (1972).

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However, studies on the species composition of Annonaceae in certain specific forests in Peninsular Malaysia are still lacking. The early study was conducted by Mat-Salleh and Imam (2005) at Gunung Stong State Park, Kelantan.

They had reported 16 species found around the area. Further, Ahmad Fitri et al. (2014) have reported 20 genera and 38 species at Gunung Tebu Forest Reserve, Terengganu. Seven endemic species were recorded in this study, namely *Cyathocalyx pahangensis*, *C. pruniferus*, *Goniothalamus fulvus*, *Monoon cupulare*, *Popowia fusca*, *Xylophia elliptica* and *X. magna*. Then, Ahmad Fitri et al. (2017) listed 16 genera and 33 species in Gunung Basor Forest Reserve, Kelantan. Twelve species were considered new records for Kelantan, viz. *Enicosanthum congregatum*, *E. fuscum*, *E. macranthum*, *Fissistigma rubiginosum*, *Goniothalamus giganteus*, *G. ridleyi*, *Neo-Uvaria acuminatissima*, *Phaeanthus crassipetalus*, *Polyalthia clavigera*, *Pyramidanthe prismatica*, *Stelechocarpus cauliflorus* and *Uvaria leptopoda*.

Latiff (2013) has listed 80 species from 32 genera of Annonaceae from Taman Negara in Peninsular Malaysia, which covers the areas of Taman Negara (Kuala Tahan, Pahang), Taman Negara (Merapoh, Pahang) and Taman Negara (Kuala Koh, Kelantan). This record is among the intensive studies of Annonaceae in a particular area of Peninsular Malaysia, with a lot of collections since the late 1800s.

Recently, Ahmad Fitri et al. (2022) reported a total of 63 species belonging to 29 genera based on herbarium collection and survey in the lowland dipterocarp and limestone hill forests in Kuala Keniam and surrounding areas at Taman Negara (Pahang). The biggest genera are *Goniothalamus* and *Polyalthia*, with seven species each. They also reported that during the survey in September 2021, a total of 14 taxa were recorded, viz. *Alphnosea elliptica*, *Artabotrys suaveolens*, *Desmos cochinchinensis*, *Enicosanthum fuscum*, *Goniothalamus macrophyllus*, *Monocarpia marginalis*, *Polyalthia cauliflora* var. *beccarii*, *P. obliqua*, *Maasia sumatrana*, *Orophea enterocarpa*, *Popowia pisocarpa*, *P. tomentosa*, *Trivalvaria macrophylla* and *Xylophia magna*. Only one taxon, *Polyalthia cauliflora* var. *beccarii* bears both fruits and flowers and another species, *Orophea enterocarpa*, only bears fruits.

In an effort to provide some information on the diversity of Annonaceae in Peninsular Malaysia, this study was conducted in Sungai Menyala Forest Reserve, Port Dickson, Negeri Sembilan. This account provides additional information on the diversity of flowering plants in the area.

METHODOLOGY

All the data collection and field observation were conducted in Sungai Menyala Forest Reserve. The specimens were later brought to Universiti Kebangsaan Malaysia for curation. After being processed and pressed, the samples were dried in an oven at 60°C for a week. The dried materials were processed as herbarium specimens and kept in the herbarium at Universiti Kebangsaan Malaysia (UKMB). Specimen identification was done at the Herbarium, Universiti Kebangsaan Malaysia. Furthermore, the identification of the specimens was done using keys provided by Sinclair (1955), Kochummen (1972) and Corner (1988). The present data were compiled with the previous herbarium

collection in the local herbaria, such as the herbarium of the Forest Research Institute Malaysia (KEP).

RESULTS AND DISCUSSION

A total of 24 species belonging to 17 genera are recorded in the coastal lowland dipterocarp forest in Sungai Menyala Forest Reserve. The biggest genus is *Xylopia* with three species. Only one endemic species to Peninsular Malaysia was listed in this study, namely *Drepananthus pruniferus*. This species is distributed in Kelantan, Terengganu, Pahang, Perak, Selangor, Melaka and Johor. In the recent survey during the scientific expedition in October 2022, a total of 13 taxa were recorded, viz. *Alphonsea elliptica*, *A. maingayi*, *Artabotrys suaveolens*, *Dendrokingstonia nervosa*, *Desmos dasymaschalus*, *Goniothalamus macrophyllus*, *Mezzettia parviflora*, *Monocarpia euneura*, *Phaeanthus ophthalmicus*, *Polyalthia rumphii*, *Trivalvaria macrophylla*, *Xylopia ferruginea* and *X. malayana*. Only one species, *Monocarpia euneura* bears both flowers and fruits during the recent survey (Figure 1) and another species, *Phaeanthus ophthalmicus* only bears flowers (Figure 1). The largest tree that has been recorded in the study plots is *Monocarpia euneura*, with a DBH of 46.2 cm in the permanent ecological plot of 102. These results contribute to the additional information on the Annonaceae in Negeri Sembilan and Peninsular Malaysia in general. A list of all the species of Annonaceae found in Sungai Menyala is given below.

1.0. *Alphonsea*

1.1. *Alphonsea elliptica* Hook.f. & Thomson

Habit: Shrub to 2 m tall.

Habitat: Lowland and hill dipterocarp forests.

Distribution in Peninsular Malaysia: Terengganu, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimens examined: 17 June 1947, J. Wyatt-Smith, KEP 64798, (KEP); Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.

1.2 *Alphonsea maingayi* Hook.f. & Thomson

Habit: Tree

Habitat: Lowland dipterocarp forest.

Distribution in Peninsular Malaysia: Perak, Selangor, Negeri Sembilan, Melaka and Johor.

Specimens examined: 10 June 1947, L. Sow, KEP 64560, (KEP); 17 June 1949, J. Wyatt-Smith, KEP 64058, (KEP); 21 August 1961, F.C. Yong, KEP 99858, (KEP); Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.

2.0 *Artabotrys*

2.1 *Artabotrys suaveolens* (Blume) Blume

Habit: Liana.

Habitat: Lowland and hill dipterocarp forests.

Distribution in Peninsular Malaysia: Kedah, Pulau Pinang, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimen examined: Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.

3.0 *Dendrokingstonia*

3.1 *Dendrokingstonia nervosa* (Hook.f. & Thomson) Rauschert

Habit: Tree

Habitat: Lowland dipterocarp forest.

Distribution in Peninsular Malaysia: Perak, Pahang, Selangor, Negeri Sembilan and Melaka.

Specimens examined: 17 June 1949, J. Wyatt-Smith, KEP 64773, (KEP); 9 July 1947, L. Sow, KEP 64475, (KEP);

Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.

4.0 *Desmos*

4.1 *Desmos dasymaschalus* (Blume) Safford

Habit: Shrub

Habitat: Lowland dipterocarp forest.

Distribution in Peninsular Malaysia: All states.

Specimen examined: Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.

5.0 *Drepananthus*

5.1 *Drepananthus pruniferus* Maingay ex Hook.f. & Thomson

Habit: Tree to 25 m tall.

Habitat: Lowland dipterocarp to lower montane forests.

Distribution in Peninsular Malaysia: Kelantan, Terengganu, Pahang, Perak, Selangor, Melaka and Johor; endemic.

Specimen examined: 9 July 1947, J. Wyatt-Smith, KEP 64489, (KEP).

5.2 *Drepananthus ramuliflorus* Maingay ex Hook.f. & Thomson

Habit: Tree to 20 m tall.

Habitat: Lowland dipterocarp forest.

Distribution in Peninsular Malaysia: Melaka and Pahang.

Specimen examined: 17 June 1955, K.M. Kochummen, KEP 76606, (KEP).

6.0 *Fissistigma*

6.1 *Fissistigma manubriatum* (Hook.f. & Thomson) Merr.

Habit: Liana.

Habitat: Lowland and hill dipterocarp forest.

Distribution in Peninsular Malaysia: Kedah, Pulau Pinang, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimen examined: 23 February 1978, K.M. Kochummen, FRI 26553, (KEP).

7.0 *Friesodielsia*

7.1 *Friesodielsia glauca* (Hook.f. & Thomson) Steenis

Habit: Liana

Habitat: lowland and hill dipterocarp forest.

Distribution in Peninsular Malaysia: Kedah, Pulau Pinang, Kelantan, Perak, Pahang, Melaka and Johor.

Specimen examined: 11 June 1947, J. Wyatt-Smith, KEP 64687, (KEP).

8.0 *Goniothalamus*

8.1 *Goniothalamus macrophyllus* (Blume) Hook.f. & Thomson

Habit: Shrub.

Habitat: Lowland dipterocarp forest.

Distribution in Peninsular Malaysia: Throughout Peninsular Malaysia except for Perlis.

Specimens examined: 13 January 1954, J. Wyatt-Smith, KEP 76181, (KEP); 23 April 1975, K.M. Kochummen, FRI 23102, (KEP); Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.

9.0 *Huberantha*

9.1 *Huberantha jenkinsii* (Hook.f. & Thomson) Chaowasku

Syn. *Polyalthia jenkinsii* (Hook.f. & Thomson) Hook.f. & Thomson

Habit: Tree to 18 m tall.

Habitat: Lowland and hill dipterocarp forests.

Distribution in Peninsular Malaysia: Kedah, Pulau Pinang, Perak, Pahang and Melaka.

Specimen examined: 17 June 1949, J. Wyatt-Smith, KEP 64097, (KEP).

9.2 *Huberantha rumphii* (Blume ex Hensch.) Chaowasku

Syn. *Polyalthia rumphii* (Blume) Merr.

Habit: Tree to 12 m tall.

Habitat: Lowland and hill dipterocarp forests.

Distribution in Peninsular Malaysia: Kedah, Terengganu, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimens examined: 11 June 1947, J. Wyatt-Smith, KEP 64606, (KEP); 21 August 1961, F.C. Yong, KEP 99870, (KEP); Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.

10.0 *Maasia*

10.1 *Maasia hypoleuca* (Hook.f. & Thomson) Mols, Kessler & Rogstad

Syn. *Polyalthia hypoleuca* Hook.f. & Thomson

Habit: Tree to 25 m tall.

Habitat: Lowland dipterocarp and peat swamp forests.

Distribution in Peninsular Malaysia: Pulau Pinang, Kelantan, Terengganu, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimens examined: 13 June 1947, J. Wyatt-Smith, KEP 64695, (KEP); 17 June 1955, K.M. Kochummen, KEP 76602, (KEP).

11.0 *Mezzettia*

11.1. *Mezzettia parviflora* Becc.

Habit: Tree to 30 m tall.

Habitat: Lowland and hill dipterocarp forests.

Distribution in Peninsular Malaysia: Throughout Peninsular Malaysia except in Perlis and Kelantan.

Specimens examined: 17 June 1947, J. Wyatt-Smith, KEP 64809, (KEP), KEP 64847, (KEP); 17 June 1955, K.M. Kochummen, KEP 76613, (KEP); Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.

12.0 *Monocarpia*

12.1 *Monocarpia euneura* Miq.

Syn. *Cyathocalyx marginalis* Scheff.; *Cyathocalyx maingayi* Hook.f. & Thomson; *Monocarpia marginalis* (Scheff.) J.Sinclair

Habit: Tree to 15 m tall.

Habitat: Lowland and hill dipterocarp forests.

Distribution in Peninsular Malaysia: All states except for Perlis.

Specimens examined: 7 September 1948, J. Wyatt-Smith, KEP 64484, (KEP); 3 December 1951, L. Sow, KEP 66519, (KEP); 20 September 1957, K.M. Kochummen, KEP 78761, (KEP), KEP 78763, (KEP); 15 September 1972, K.M. Kochummen, FRI 16583, (KEP); Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.; Plot 102, 5 October 2022, Z. Ahmad Fitri et al., AFZ s.n.

13.0 *Monoon*

13.1 *Monoon hookerianum* (King) B.Xue & R.M.K. Saunders

Syn. *Polyalthia hookeriana* King

Habit: Tree to 20 m tall.

Habitat: Lowland and hill dipterocarp forest.

Distribution in Peninsular Malaysia: Kedah, Terengganu, Perak, Pahang and Johor.

Specimen examined: 1 August 1951, Motan, KEP 70471, (KEP).

13.2 *Monoon sclerophyllum* (Hook.f & Thomson) B. Xue & R.M.K Saunders

Syn. *Polyalthia sclerophylla* Hook.f. & Thoms.

Habit: Tree to 15 m tall.

Habitat: Lowland and hill dipterocarp forest.

Distribution in Peninsular Malaysia: Perak, Pahang, Negeri Sembilan, Melaka and Johor.

Specimens examined: 11 July 1947, J. Wyatt-Smith, KEP 64725, (KEP); 14 January 1954, J. Wyatt-Smith, KEP 76190, (KEP).

14.0 *Phaeanthus*

14.1 *Phaeanthus ophthalmicus* (Roxb. ex G. Don) J. Sinclair

Habit: Shrub.

Habitat: Lowland and hill dipterocarp forests.

Distribution in Peninsular Malaysia: Kelantan, Perak, Pulau Pinang, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimens examined: Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.; Plot 102, 5 October 2022, Z. Ahmad Fitri et al., AFZ s.n.

15.0 *Polyalthia*

15.1 *Polyalthia cauliflora* Hook.f. & Thomson

Habit: Small tree to 5 m tall.

Habitat: Lowland and hill dipterocarp forests.

Distribution in Peninsular Malaysia: Pahang, Perak, Melaka and Johor.

Specimens examined: 1 August 1951, Motan, KEP 70470, (KEP); 17 June 1955, K.M. Kochummen, KEP 76610, (KEP).

15.2 *Polyalthia cinnamomea* Hook.f. & Thomson

Habit: Tree to 15 m tall.

Habitat: Lowland and hill dipterocarp forests.

Distribution in Peninsular Malaysia: Perlis, Kedah, Pulau Pinang, Kelantan, Terengganu, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimen examined: 19 October 1977, N.S. Mat Asri, FRI 25746, (KEP).

16.0 *Trivalvaria*

27.1 *Trivalvaria macrophylla* (Blume) Miq.

Habit: Small tree to 10 m tall.

Habitat: Lowland and hill dipterocarp forests.

Distribution in Peninsular Malaysia: Kedah, Pulau Pinang, Kelantan, Perak, Pahang, Selangor and Melaka.

Specimen examined: Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.

17.0 *Xylopia*

17.1 *Xylopia ferruginea* (Hook.f. & Thomson) Hook.f. & Thomson

Habit: Tree to 18 m tall.

Habitat: Lowland dipterocarp forest.

Distribution in Peninsular Malaysia: Kedah, Kelantan, Terengganu, Perak, Pahang, Selangor, Negeri Sembilan, Melaka and Johor.

Specimens examined: 11 June 1947, J. Wyatt-Smith, KEP 64603, (KEP); 14 April 1954 J. Wyatt-Smith, KEP 76191, (KEP); Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.

17.2 *Xylopia magna* Maingay ex Hook.f. & Thomson

Habit: Tree to 15 m tall.

Habitat: Lowland and hill dipterocarp forests.

Distribution in Peninsular Malaysia: Kedah, Kelantan, Terengganu, Perak, Pahang, Selangor, Negeri Sembilan and Melaka.

Specimen examined: 16 July 1947, J. Wyatt-Smith, KEP 64728, (KEP); 16 June 1955, K.M. Kochummen, KEP 72481, (KEP).

17.3 *Xylopia malayana* Hook.f. & Thomson

Habit: Tree to 18 m tall.

Habitat: Lowland and hill dipterocarp forests.

Distribution in Peninsular Malaysia: Terengganu, Perak, Pahang, Selangor, Melaka and Johor.

Specimens examined: 5 December 1951, J. Wyatt-Smith, KEP 70339, (KEP); Warisan Trail, 3 October 2022, Z. Ahmad Fitri et al., AFZ s.n.



A



B

Figure 1. A: The fallen fruit of *Monocarpia euneura* in plot 102, B: The shrubby species of *Phaeanthus ophthalmicus* bear flower around the Trail of Warisan.

CONCLUSION

More than 20 species of Annonaceae were recorded in the coastal lowland dipterocarp forest of Sungai Menyala Forest Reserve, Port Dickson, Negeri Sembilan. Almost all species found are commonly found in the lowland and hill dipterocarp forests of Peninsular Malaysia. Only one endemic species to Peninsular Malaysia was listed, namely

Drepananthus pruniferus. This study showed that the pristine forest at Sungai Menyala Forest Reserve should be extensively studied to demonstrate the rich diversity of Annonaceae in particular and the flowering plants in general.

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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; Formal analysis: Mohammad Khairul Faizi Zulkifli, Mohd Nizam Mohd Said; Writing review & editing: Noraini Talip, Norazlinda Mohamad; Project administration: Abdul Latiff;

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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.

COMPLIANCE WITH ETHICAL STANDARDS

Not applicable.

SUPPLEMENTARY MATERIAL

Not applicable.

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