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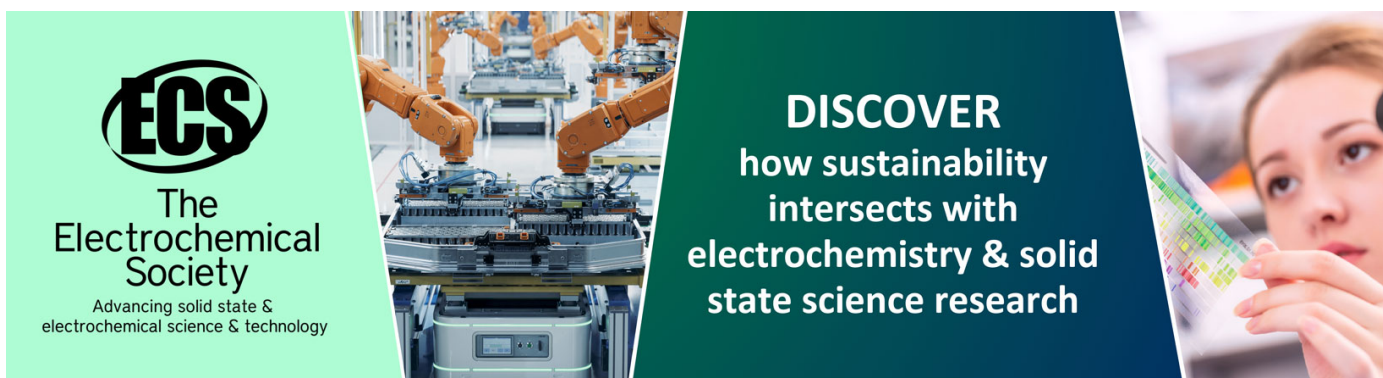
Notes on Annonaceae from Kuala Keniam and surrounding areas at Taman Negara (Pahang), Peninsular Malaysia

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Notes on Annonaceae from Kuala Keniam and surrounding areas at Taman Negara (Pahang), Peninsular Malaysia

Ahmad Fitri Z^{1*}, Nik Hazlan N H², S N Sarmin², Engku Azlin Rahayu Engku Ariff^{2,3}, T T M Z Hashim², N Basiron⁴, S Sahalan⁵, Syarifah Haniera S K⁶, Nazip S^{3,6}, Nik Norafida N A⁷, Nizam M S^{1,8} and Latiff A¹

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

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

³Institute for Biodiversity and Sustainable Development, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia.

⁴Faculty of Art, Computing & Creative Industry, Universiti Pendidikan Sultan Idris 35900 Tanjung Malim, Perak, Malaysia.

⁵Department of Creative Photomedia, Faculty of Art & Design, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia.

⁶Faculty of Applied Sciences, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia.

⁷Climate Change and Forestry Programme, Forest Biodiversity Division, Forest Research Institute Malaysia, 52109, Kepong, Selangor, Malaysia.

⁸Institute of Climate Change, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia.

*ahmadfitri@ukm.edu.my.

Abstract. A brief report on the survey of Annonaceae in Kuala Keniam and surrounding areas of Taman Negara (Pahang), Peninsular Malaysia is given. Based on the collections in the herbarium and in the field a total of 29 genera dan 63 species is listed. In the recent survey in September 2020, a total of 14 taxa was recorded, viz. *Alphonsea elliptica*, *Artabotrys suaveolens*, *Desmos cochinchinensis*, *Enicosanthum fuscum*, *Goniothalamus macrophyllus*, *Monocarpia euneura*, *Orophea enterocarpa*, *Polyalthia cauliflora* var. *beccarii*, *P. obliqua*, *Maasia sumatrana*, *Popowia pisocarpa*, *P. tomentosa*, *Trivalvaria macrophylla* and *Xylopia magna*. Only two taxa, viz. *Polyalthia cauliflora* var. *beccarii* bears fruits and flowers while *Orophea enterocarpa* only bears fruits. These results contributed some additional information of the Annonaceae in Kuala Keniam and surrounding areas of Taman Negara (Pahang).

Keywords: Annonaceae, notes, primary forest, Taman Negara Pahang, tree



1. Introduction

Annonaceae is one of the largest families of flowering plants in Peninsular Malaysia with 38 genera and 198 species recorded [1]. Most species of this family are found in lowlands and hill dipterocarp forests and are rarely found on the mountains. Appanah [2] found that Annonaceae ranked first in the species diversity among lianas of Malaysian forests. There are several new species that have been documented since 2010 such as *Alphonsea rugosa* [3], *Meiogyne kanthanensis* [4], *Monoon malayanum* [5], *Polyalthia pakdin* [6], *Xylopi erythrodactyla*, *X. platycarpa*, *X. sumatrana* and *X. ngii* [7]. Taxonomic revisions of Annonaceae in Peninsular Malaysia have been carried out since the early 1900's by Ridley [8] and continued by other researchers such as Corner [9], Sinclair [10] and Kochummen [1].

Based on evidences from molecular studies, there are some changes on the classification of certain genera being proposed. For instance, the genus *Polyalthia* has been divided into four different genera, namely *Huberantha*, *Maasia*, *Monoon* and *Polyalthia* s.s. [6]. Besides, all seven species of *Enicosanthum* found in Peninsular Malaysia have also transferred to genus *Monoon* [11]. However, studies on the species composition of Annonaceae in certain forests in Peninsular Malaysia are still lacking. One of the previous studies was done by Mat-Salleh and Imam [12] at Gunung Stong State Park, Kelantan where they reported 16 species found around the area. Ahmad Fitri [13] 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*, *Xylopi elliptica* and *X. magna*. Then, Ahmad Fitri [14] have listed 16 genera and 33 species in Gunung Basor Forest Reserve, Kelantan. Twelve species were considered as new record for Kelantan state 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 [15] has listed 80 species from 32 genera of Annonaceae from Taman Negara in Peninsular Malaysia which covers the area of Taman Negara (Kuala Tahan, Pahang), Taman Negara (Merapoh, Pahang) and Taman Negara (Kuala Koh, Kelantan). In an effort to provide some information on the diversity of Annonaceae in Peninsular Malaysia, this study was conducted in Kuala Keniam and surrounding areas at Taman Negara (Pahang). This account can provide additional information on the diversity of Annonaceae in the area.

2. Materials and Methods

All of the data collection and field observation were conducted in Kuala Keniam at Taman Negara (Pahang). The specimens were later brought to Universiti Kebangsaan Malaysia. After being processed, pressed the samples were dried in an oven for a week in 60°C. The dried materials were processed as herbarium specimens and kept in the herbarium of Universiti Kebangsaan Malaysia (UKMB). Specimen identification was done at the Herbarium of Universiti Kebangsaan Malaysia. Furthermore, identification of the specimens was done using keys provided by Sinclair [10], Kochummen [1] and Corner [9]. The present data were compiled with the previous herbarium collection in the local and international herbaria such as herbarium of Forest Research Institute Malaysia (KEP), herbarium of Universiti Kebangsaan Malaysia (UKMB), herbarium of Universiti of Malaya (KLU) and herbarium of Singapore Botanic Gardens (SING).

3. Results and Discussion

3.1 Floristic composition

A total of 63 species belonging to 29 genera is recorded in the lowland dipterocarp and limestone forest in Kuala Keniam and surrounding areas at Taman Negara (Pahang). The biggest genera are *Goniothalamus* and *Polyalthia* with seven species each. In the recent survey in September 2020, a total 14 taxa was recorded, viz. *Alphonsea 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 *Xylopiya magna*. Only one taxon, *Polyalthia cauliflora* var. *beccarii* bears both fruits and flowers (Figure 1). Another species, *Orophea enterocarpa* only bears fruits. The largest trees that have been recorded are *Alphonsea elliptica* with DBH of 39.6 cm followed by *Xylopiya magna* (38.0 cm) and *Maasia sumatrana* (21.3 cm). These results contribute to the additional information of the Annonaceae in Pahang and Peninsular Malaysia. List of all the species of Annonaceae found in Kuala Keniam and surrounding areas at Taman Negara (Pahang) is listed followed with pictures of certain species from the herbarium specimens are illustrated in Figures 2 and 3.

Compared with the previous study by Latiff [15] at Taman Negara, there are two additional species recorded which are *Desmos cochinchinensis* and *Xylopiya magna*. The endemic rare species of *Orophea malayana* is among the unique species in Taman Negara at Kuala Tahan. The specimen type was collected at Gua Luas by Dr. F.S.P. Ng in 1977 and this species was also collected once in Taman Negara (Merapoh). This species was also reported on limestone hills in Ipoh, Perak and Gua Musang, Kelantan.

3.2 *Alphonsea*

3.2.1 *Alphonsea elliptica* Hook.f. & Thomson

Habit: Shrub to 2 m tall.

Habitat: Lowland and hill forests.

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

Specimens examined: s. loc., B. Everett, FRI 14378, 9 July 1970, (KEP), Ulu Sungai Sat, M. Shah & M. Noor, MS 1849, 12 July 1970, (SING); Road to Lata Berkoh, Rahim, 177, 29 April 1974, (UKMB), Keniam, Ahmad Fitri et al., September 2020, voucher specimen.

3.3 *Anaxagorea*

3.3.1 *Anaxagorea javanica* Blume

Habit: Shrub or small tree.

Habitat: Lowland and hill forests.

Distribution in Peninsular Malaysia: Common throughout Peninsular Malaysia except for Pulau Pinang and Perlis.

Specimens examined: Sungai Tahan, Ridley's collector, BGS 004211, 23 September 1893, (SING); Kuala Tembeling, Holtum, 20529, 20 August 1928, (SING); Ulu Sungai Sat, M. Shah & M. Noor, MS 1776, 9 July 1970, (SING); Ulu Sungai Sepia, M. Shah & M. Noor, MS 1901, 16 July 1970, (SING); Sungai Atok, Hassan, HB 61, 23 June 1979, (UKMB).

3.4 *Artabotrys*

3.4.1 *Artabotrys grandifolius* King

Habit: Liana to 20 m long.

Habitat: Lowland forest.

Distribution in Peninsular Malaysia: Only recorded in Kedah, Perak and Pahang; endemic.

Specimens examined: Tembeling, Henderson, 21811, 12 July 1929, (SING).

3.4.2 *Artabotrys suaveolens* (Blume) Blume

Habit: Climber up to 15 m long.

Habitat: Lowland and hill forests.

Distribution in Peninsular Malaysia: In all states except Kelantan, Perlis and Terengganu.

Specimen examined: Road to Juram, Zainudin, 5343, 12 December 1994, (UKMB), Keniam, Ahmad Fitri et al., voucher specimen, September 2020.

3.4.3 *Artabotrys venustus* King

Habit: Liana to 20 m long.

Habitat: Lowland to lower montane forests.

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

Specimens examined: Sungai Tahan, Heaslett, s.n., 25 August 1970, (SING); Ulu Sepia, Whitmore, FRI 15324, 17 July 1970, (KEP); Ulu Sungai Sepia, M. Shah & M. Noor, MS 2002, 19 July 1970, (SING).

3.5 *Cananga*

3.5.1 *Cananga odorata* (Lam.) Hook.f. & Thomson

Habit: Tree to 20 m tall without buttress.

Habitat: Forest margin in lowland and hill forests.

Distribution in Peninsular Malaysia: NS northwards.

Specimen examined: Kuala Terenggan, Millard, FRI 324, 8 May 1958, (KEP).

3.6 *Cyathocalyx*

3.6.1 *Cyathocalyx pruniferus* (Maingay ex Hook.f. & Thomson) J. Sinclair

Habit: Tree to 25 m tall.

Habitat: Lowland to lower montane forests.

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

Specimens examined : Tahan Woods, Whitmore, FRI 4828, 22 February 1968, (KEP); Ulu Sungai Sat, M. Shah & M. Noor, MS 1786, 10 July 1970, (SING); Sungai Riul, Everett, FRI 14459, 14 July 1970,(KEP); Ulu Sungai Sepia, Whitmore, FRI 15325, 17 July 1970, (KEP).

3.6.2 *Cyathocalyx ramuliflorus* (Maingay ex Hook.f. & Thomson) Scheff.

Habit: Tree to 20 m tall.

Habitat: Lowland forest

Distribution in Peninsular Malaysia: Melaka and Pahang.

Specimen examined: Sungai Teku, M. Shah, MS 1368, 21.2.1968, (SING).

3.6.3 *Cyathocalyx scortechinii* (King) J. Sinclair

Habit: Tree to 20 m tall.

Habitat: Lowland to lower montane forests.

Distribution in Peninsular Malaysia: Perak and Pahang; endemic.

Specimen examined: Kuala Tahan, Seimund, 912, February 1921, (SING).

3.6.4 *Cyathocalyx sumatranus* Scheff.

Habit: Tree to 20 m tall.

Habitat: Lowland forest.

Distribution in Peninsular Malaysia: Kedah, Pulau Pinang, Perak, Kelantan, Pahang and Negeri Sembilan; endemic.

Specimen examined: Tembeling, M.R. Henderson, SFN 24533, 27 May 1931, (SING).

3.7 *Cyathostemma*

3.7.1 *Cyathostemma argenteum* (Blume) J. Sinclair

Habit: Woody climber.

Habitat: Lowland forest.

Distribution in Peninsular Malaysia: Pahang and Selangor.

Specimen examined: Road to Kuala Kenyam (limestone cave), Y.C.Chan, 29 April 1975, (KEP).

3.7.2 *Cyathostemma micranthum* (A. DC.) J. Sinclair

Habit: Woody climber.

Habitat: Lowland forest.

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

Specimen examined: Kuala Tembeling, Burkill & Haniff, SFN 15840, 24 November 1924, (SING).

3.7.3 *Cyathostemma wrayi* King

Habit: Woody climber.

Habitat: Lowland forest.

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

Specimen examined: Tembeling, Mat, BGS 001799, 1893, (SING); Kuala Tembeling, Henderson, s.n., July 1929, (SING).

3.8 *Dasymaschalon*

3.8.1 *Dasymaschalon dasymaschalum* (Blume) I.M.Turner

Habit: Shrub.

Habitat: Lowland and hill forests.

Distribution in Peninsular Malaysia: Common throughout all states.

Specimens examined: Sungai Sat, Henderson, SFN 21993, 20 July 1929, (SING); Ulu Sungai Sat, M. Shah & M. Noor, MS 1844, 12 July 1970, (SING); Ulu Sungai Sepia, M. Shah & M. Noor, MS 1924, 16 July 1970, (SING); Lubuk Simpon, Latiff & Hamid, 13615, 14 October 1982, (UKMB).

3.9 *Desmos*

3.9.1 *Desmos cochinchinensis* Lour.

Habit: Climber.

Habitat: Lowland forest.

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

Specimen examined: Keniam, Ahmad Fitri et al., voucher specimen, September 2020.

3.10 *Fissistigma*

3.10.1 *Fissistigma kingii* (Boerl.) Burkill

Habit: Woody climber.

Habitat: Lowland forest.

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

Specimen examined: Tembeling, Henderson, SFN 21802, 12 July 1929, (SING).

3.10.2 *Fissistigma lanuginosum* (Hook.f. & Thomson) Merr.

Habit: Woody climber.

Habitat: Lowland forest.

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

Specimen examined: Lata Berkoh, S.K.Yap, FRI 023427, 17 May 1980, (KEP).

3.11 *Friesodielsia*

3.11.1 *Friesodielsia affinis* (Hook.f. & Thomson) D. Das

Habit: Woody climber.

Habitat: Lowland forest.

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

Specimen examined: Trail to Juram, Zainudin, 5325, 11 December 1994, (UKMB).

3.11.2 *Friesodielsia biglandulosa* (Blume) Steenis

Habit: Liana to 30 m long.

Habitat: Lowland forest.

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

Specimen examined: Trail to Juram, Zainudin et al., 5331, 12 December 1994, (UKMB); Trail to Juram, Zainudin et al., AZ 5458, 20 January 1995, (UKMB).

3.11.3 *Friesodielsia latifolia* (Hook.f. & Thomson) Steenis

Habit: Liana to 20 m long.

Habitat: Lowland and hill forests.

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

Specimen examined: Kuala Terenggan, R. Jaman, 238 RJ, 30 April 1975, (UKMB).

3.12 *Goniiothalamus*

3.12.1 *Goniiothalamus curtisii* King

Habit: Small tree to 10 m tall.

Habitat: Lowland to lower montane forests

Distribution in Peninsular Malaysia: Kelantan, Perak, Pahang, Selangor; endemic.

Specimens examined: Trail to Gua Telinga, Zainudin, AZ 3522, 17 May 1991, (UKMB); Trail to Juram, Zainudin, 5333, 12 December 1994, (UKMB).

3.12.2 *Goniiothalamus giganteus* Hook.f. & Thomson

Habit: Tree to 20 m tall.

Habitat: Lowland and hill forests.

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

Specimen examined: Taman Negara, Everett, FRI 14399, 11 July 1970, (KEP).

3.12.3 *Goniiothalamus macrophyllus* (Blume) Hook.f. & Thomson

Habit: Shrub.

Habitat: Lowland forest.

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

Specimens examined: Sungai Tahan, Mat, BGS 0055664, 23 September 1893, (SING); Tembeling, Henderson, s.n., 14 July 1929, (SING); Permatang Tersek, Whitmore, FRI 4732, 16 February 1968, (KEP); Bukit Terom, M. Shah, MS 1578, 5 March 1968, (SING); Ulu Sungai Sat, M. Shah & M. Noor, MS 1755, MS 1765, 9 July 1970, (SING); Bukit Tersek, Stone, 10909B, 4 August 1972, (KLU) & (KEP), Keniam, Ahmad Fitri et al., voucher specimen, September 2020.

3.12.4 *Goniiothalamus scortechinii* King

Habit: Small tree to 5 m tall.

Habitat: Lowland and hill forests.

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

Specimens examined: Ulu Kenyam, M. Shah, MS 1526, 3 March 1968, (SING); Kuala Tahan, M. Shah & Shukur, MS 2718, 17 August 1972, (SING), B.C. Stone & S.C. Chin, 13845, Kuala Tahan-Gua Telinga track, (KLU).

3.12.5 *Goniiothalamus tenuifolius* King

Habit: Small tree to 5 m tall.

Habitat: Lowland to lower montane forests.

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

Specimens examined: Tembeling, Henderson, SFN 24543, 21 May 1931, (SING); Sungai Teku, M. Shah, MS 1374, 21 February 1968, (SING); Ulu Sungai Sat, M. Shah & M. Noor, MS 1862, 13 July 1970, (SING), Kuala Juram, L.S.L. Chua, D. Mustapa & K. Apok, FRI 40665, 9 May 1997, (KEP).

3.12.6 *Goniothalamus tortilipetalus* M.R. Hend.

Habit: Small tree to 5 m tall.

Habitat: Lowland and hill forests.

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

Specimens examined: Tembeling, Henderson, MS 1526, 3 March 1968, (SING), Sg. Cheruai, Gua Gajah, Trail to Gua Gajah, L.S.L. Chua, D. Mustapa & K. Apok, FRI 40619, 9 May 1997, (KEP).

3.12.7 *Goniothalamus uvarioides* King

Habit: Small tree to 5 m tall.

Habitat: Lowland and hill forests.

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

Specimen examined: Sungai Tahan, Ng, FRI 1403, 11 August 1966, (KEP).

3.13 *Huberantha*

3.13.1 *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 forests.

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

Specimens examined: Bukit Terom, Whitmore, FRI 8534, 5 March 1968, (KEP); Trail to Bukit Terisik, Razali, 198R, 21 April 1975, (UKMB); Trail to Gunung Tahan, Y. C. Chan, FRI 021798, 21 April 1975, (KEP); Lata Berkoh, K. C. Ang, FRI 023409, 29 April 1975 (KEP).

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

Syn. *Polyalthia rumphii* (Blume) Merr.

Habit: Tree to 12 m tall.

Habitat: Lowland and hill forests.

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

Specimens examined: Bukit Terom near Kuala Keniyam, T.C. Whitmore, FRI 8534, 5 March, 1982 (KEP), Sungai Trenggan, K. M. Wong & Khairuddin, FRI 326151, 18 August 1982, (KEP); Trail to Gua Luas, A. Latiff, TPD 54, 17 October 1982, (UKMB).

3.14 *Maasia*

3.14.1 *Maasia glauca* (Hassk.) Mols, Kessler & Rogstad

Syn. *Polyalthia glauca* (Hassk.) F. Muell.

Habit: Tree to 30 m tall.

Habitat: Swampy lowland forest.

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

Specimens examined: Sungai Riul, Everett, FRI 14438 12 July 1970, (KEP); Trail to Juram, Zainnuddin, 5324A, 11 December 1994, (UKMB); Trail to Juram, Zainudin, Zulkifli, Bedul, AZ 5391, 15 January 1995, (UKMB).

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

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

Habit: Tree to 25 m tall.

Habitat: Lowland and peat swamp forests.

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

Specimen examined: Ulu Sungai Sepia, M. Shah & M. Noor, MS 2008, 19 July 1970, (SING).

3.14.3 *Maasia sumatrana* (Miq.) Mols, Kessler & Rogstad

Syn. *Polyalthia sumatrana* (Miq.) Kurz

Habit: Tree to 20 m tall.

Habitat: Lowland and hill forest.

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

Specimens examined: Bukit Terom, Whitmore, FRI 8538, FRI 8551, 5 March 1968, (KEP); Ulu Sepia, M. Shah & M. Noor, MS 1904, 16 July 1970, (SING); Sungai Tembeling, K. M. Wong & Khairuddin, FRI 32632, 19 August 1982, (KEP); Trail to Bumbun Height, A. Latiff et al., PTD 260, 19 March 1983, (UKMB); Trail to Bumbun Height, A. Latiff, A. Zainudin, S. Hamid, 13621, 19 March 1983, (UKMB); Keniam, Ahmad Fitri et al., voucher specimen, September 2020.

3.15 *Meiogyne*

3.15.1 *Meiogyne monosperma* (Hook.f. & Thomson) Heusden

Habit: Tree to 15 m tall.

Habitat: Lowland and hill forests.

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

Specimen examined: Tahan Woods, Whitmore, FRI 4774, 21 February 1968, (KEP).

3.16 *Melodorum*

3.16.1 *Melodorum aberrans* (Maingay ex Hook.f. & Thomson) J. Sinclair

Habit: Climber.

Habitat: Lowland forest.

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

Specimen examined: Tembeling, Henderson, SFN 24541, 27 May 1931, (SING).

3.17 *Mezzettia*

3.17.1 *Mezzettia parviflora* Becc.

Habit: Tree to 30 m tall.

Habitat: Lowland and hill forests.

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

Specimens examined: Trail to Kuala Kenyam limestone cave, Y. C. Chan, FRI 023837, 29 April 1975, (KEP); Belau Hide, F. S. P. Ng, FRI 27061, 5 July 1977, (KEP).

3.18 *Miliusa*

3.18.1 *Miliusa longipes* King

Habit: Small tree to 10 m tall.

Habitat: Lowland and hill forests.

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

Specimen examined: Tanjung Bungkal, M. Shah & M. Noor, MS 2031, 21 July 1970, (SING).

3.19 *Monocarpia*

3.19.1 *Monocarpia euneura* Miq.

Habit: Tree to 15 m tall.

Habitat: Lowland and hill forests.

Distribution in Peninsular Malaysia: All states except for Perlis.

Specimens examined: Tembeling, Henderson, SFN 24540, 27 May 1931, (SING); Sungai Riul, Everett, FRI 14447, 14 July 1970, (KEP), Keniam, Ahmad Fitri et al., voucher specimen, September 2020.

3.20 *Monoon*

3.20.1 *Monoon fuscum* (King) B. Xue & R.M.K.Saunders

Syn. *Enicosanthum fuscum* (King) Airy Shaw

Habit: Tree to 20 m tall.

Habitat: Lowland to lower montane forests.

Distribution in Peninsular Malaysia: Perak, Pahang and Selangor; endemic.

Specimens examined: Tembeling, T. Suppiah, FRI 14767, 18 February 1971, (KEP), Keniam, Ahmad Fitri et al., voucher specimen, September 2020.

3.20.2 *Monoon membranifolium* (J.Sinclair) B.Xue & R.M.K.Saunders

Syn. *Enicosanthum membranifolium* J. Sinclair

Habit: Tree to 10 m tall.

Habitat: Lowland forest.

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

Specimen examined: Kuala Tahan, Kochummen, FRI 84966, 24 February 1958, (KEP).

3.21 *Orophea*

3.21.1 *Orophea enterocarpa* Maingay ex Hook.f. & Thomson

Habit: Small tree to 7 m tall.

Habitat: Lowland and hill forests.

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

Specimens examined: Kuala Tahan, Kochummen, KEP 84960, 24 February 1958, (KEP); Kuala Tahan, Trail Sungai Tahan, van Balgooy, 2427, 17 April 1975, (BO), Gua Luas, M. Shah, MS 1546, 4 March 1968, (SING); Ulu Sungai Sat, M. Shah & M. Noor, MS 1789, 10 July 1970, (SING); Tanjung Bungkal, M. Shah & M. Noor, MS 2035, 21 July 1970, (SING); Tanjung Bungkal, Whitmore, FRI 15376, 21 July 1970, (KEP); s. loc. , K. C. Ang, FRI 023302, 15 April 1975, (KEP); Sungai Tahan, Razali, 146R, 19 April 1975, (UKMB); Sungai Tahan, F. S. P. Ng, FRI 27036, 2 March 1977, (KEP); Sungai Atok, Hassan, HB 60, 23 June 1979, (UKMB); Batu Kumbang, R. Kiew, RK 1438, 5 October 1984, (UPM); Trail to Bukit Indah, Zainudin, AZ 3493, 16 May 1991, (UKMB); Trail to Gua Telinga, Zainudin, AZ 3524, 17 May 1991, (UKMB), Trail to Gua Telinga, L.E. Teo & G.Pachiappan, KL 3382, 1 March 1983, (KLU).

3.21.2 *Orophea hastata* King

Habit: Small tree to 10 m tall.

Habitat: Lowland to lower montane forests.

Distribution in Peninsular Malaysia: Kelantan, Perak, Pahang and Selangor.

Specimens examined: Kuala Kenyam, Whitmore, FRI 8576, 6 March 1968, (SING); Trail to Bukit Teresek, L.E. Teo & G. Pachiappan, 555, 29 April 1975, (SING).

3.21.3 *Orophea hirsuta* King

Habit: Small tree to 4 m tall.

Habitat: Limestone hill forest.

Distribution in Peninsular Malaysia: Perlis, Kedah, Perak and Pahang.

Specimens examined: Foothill of Gua Luas, Razali, 233R, 29 April 1975, (UKMB); Trail to Kuala Kenyam (limestone), Y. C. Chan, FRI 023831, 29 April 1975, (KEP).

3.21.4 *Orophea maculata* Scort. ex King

Habit: Small tree to 10 m tall.

Habitat: Limestone hill forest.

Distribution in Peninsular Malaysia: Perak, Pahang and Selangor; endemic.

Specimens examined: Trail to Bukit Tersik, A. Latiff & S. Hamid, TPD 40, 16 October 1982, (UKMB); Trail to Gua Telinga, A. Zainudin & D. Jones, AZ 1054, 22 September 1983, (UKMB).

3.21.5 *Orophea malayana* P.J.A. Kessler

Habit: Small tree to 5 m tall.

Habitat: Limestone hill forest.

Distribution in Peninsular Malaysia: Kelantan, Perak and Pahang; endemic.

Specimens examined: Gua Luas, F.S.P. Ng, FRI 27058, 4 March 1977, (KEP), Trail to Gua Luas, M. Shah & Shukur, MS 2684, 15 August 1972, (SING).

3.21.6 *Orophea polycarpa* A. DC.

Habit: Small tree to 10 m tall.

Habitat: Limestone hill forest.

Distribution in Peninsular Malaysia: Perlis, Kelantan, Perak and Pahang.

Specimen examined: Tanjung Bungkal, M. Shah & M. Noor, MS 2018, MS 2020, 21 July 1970, (SING);

3.22 *Phaeanthus*

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

Habit: Shrub.

Habitat: Lowland and hill forests.

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

Specimens examined: Sungai Sat, Henderson, s. n., July 1929, (SING); Kuala Sepia, M. Shah & M. Noor, MS 1936, 15 July 1970, (SING); Trail to Terengganu, Y. C. Chan, FRI 023842, 30 April 1975, (KEP).

3.23 *Polyalthia*

3.23.1 *Polyalthia brunneifolia* J. Sinclair

Habit: Shrub to 4 m tall.

Habitat: Lowland and hill forests, sometimes in limestone hill forest.

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

Specimen examined: Sungai Tahan, Mat, BGS 002917, 1893, (SING).

3.23.2 *Polyalthia cauliflora* Hook.f. & Thomson

Habit: Small tree to 5 m tall.

Habitat: Lowland and hill forests.

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

Specimens examined: Sungai Tahan, Ridley, BGS 002849, 8. 1891, (SING); Tahan River Wood, Ridley, BGS 002852, 8. 1891, (SING); Sungai Tahan, Mat, BGS 002853, 1893, (SING); s. l. , L.E. Teo & G. Pachiappan, 556, 3156, 29 April 1975, (SING); Road to Bukit Indah, A. Zainudin, AZ 3495, 16 May 1991, (UKMB).

3.23.3 *Polyalthia cauliflora* Hook.f. & Thomson var. *beccarii* (King) J. Sinclair

Habit: Small tree to 5 m tall.

Habitat: Lowland and hill forests.

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

Specimens examined: s. loc., K.C. Ang, FRI 23339, 20 April 1975, (KEP), Sungai Tahan, K. M. Kochummen, KEP 84981, 1 March 1958, (KEP); Bukit Belar, M. Shah, MS 1636, 7 March 1968, (SING); Ulu Sungai Sat, M. Shah & M. Noor, MS 1753, 9 July 1970, (SING); Trail to Bukit Teresek, Y. C. Chan, FRI 023802, 21 April 1975, (KEP), Keniam, Ahmad Fitri et al., voucher specimen, September 2020.

3.23.4 *Polyalthia cauliflora* Hook.f. & Thomson var. *desmantha* (Hook.f. & Thomson) J. Sinclair

Habit: Small tree to 5 m tall.

Habitat: Lowland and hill forests.

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

Specimens examined: Sungai Teku, Kiah, SFN 31771, 23 July 1936, (SING); Sungai Teku, M. Shah, MS 1357, 21 February 1968, (SING).

3.23.5 *Polyalthia chrysotricha* Ridl.

Habit: Small tree to 10 m tall.

Habitat: Lowland and lower montane forests.

Distribution in Peninsular Malaysia: Rare, only recorded in Pahang and Selangor; endemic.

Specimen examined: Sungai Tahan, Mat, BGS 002922, 23 September 1893, (SING).

3.23.6 *Polyalthia cinnamomea* Hook.f. & Thomson

Habit: Tree to 15 m tall.

Habitat: Lowland and hill forests.

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

Specimen examined: s. loc., B. Everett, FRI 14382, 9 July 1970, (KEP).

3.23.7 *Polyalthia lateritia* J. Sinclair

Habit: Small tree to 10 m tall.

Habitat: Lowland and lower montane forests.

Distribution in Peninsular Malaysia: Rare and only recorded in Kelantan, Perak, Pahang and Melaka; endemic.

Specimens examined: Sungai Tahan, Mat, BGS 002766, 29 March 1893, (SING); Trail to Bukit Terisik, Razali, 199R, 21 April 1975, (UKMB).

3.23.8 *Polyalthia obliqua* Hook.f. & Thomson

Habit: Small tree to 7 m tall.

Habitat: Lowland and hill forests, also on limestone hill forest.

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

Specimens examined: s. loc., B. Everett, FRI 14344, 9 July 1970, (KEP); Tembeling, Henderson, SFN 21799, 13 July 1929, (SING); Tembeling, Holtum, SFN 24706, 23 April 1931, (SING); Tembeling, Henderson, SFN 24809, 29 May 1931, (SING); Kuala Tahan, Kochummen, FRI 83428, 26 February 1958, (KEP); Sungai Redap, M. Shah, MS 1597, 6 March 1968, (SING); Sungai Tahan, M. Shah & M. Shukor, MS 2663, 14 August 1972, (SING); Trail to Gunung Tahan, Y. C. Chan, FRI 021777, 15 April 1975, (KEP), FRI 021795, 21 April 1975; Sungai Tahan, Razali, 159 R, 15 April 1975, (UKMB); Trail to Lata Berkoh, Razali, 128R, 19 April 1975, (UKMB); Trail along SungaiTahan, van Balgooy, 2417, 16 April 1975, (BO), Trail to Bukit Terisik, Razali, 195R, 21 April 1975, (UKMB); Trail to Gunung Tahan, Y. C. Chan, FRI 021795, 21 April 1975, (KEP); Trail to Bukit Terisik, Latiff, TPD 42, 16 October 1982, (UKMB); Trail to Gua Telinga, Zainudin, AZ 3512, AZ 3523, 17 May 1991, (UKMB), Keniam, Ahmad Fitri et al., voucher specimen, September 2020.

3.23.9 *Polyalthia stenopetala* (Hook.f. & Thomson) Ridl.

Habit: Small tree 5-10 m tall;

Habitat: Lowland and hill forests.

Distribution in Peninsular Malaysia: All states except for Perlis dan Pulau Pinang; common in Pahang, Perak and Selangor.

Specimens examined: Sungai Teku, Seimund, 493, February 1921, (SING); Sungai Teku, Seimund, 494, February 1921, (SING); Tembeling, Henderson, SFN 21844, 13 July 1929, (SING); Ulu Sepia, Whitmore, FRI 15282, 16 July 1970, (KEP).

3.24 *Popowia*

3.24.1. *Popowia fusca* King

Habit: Small tree to 10 m tall.

Habitat: Lowland and hill forests.

Distribution in Peninsular Malaysia: Perak, Pahang and Kelantan.

Specimens examined: Sungai Teku, Kiah, SFN 31923, 29 July 1936, (SING); Ulu Kenyam, M. Shah, MS 1528, 3 March 1968, (SING); Ulu Sungai Sat, M. Shah & M. Noor, MS 1770, 9 July 1970, (SING).

3.24.2. *Popowia pisocarpa* (Blume) Endl.

Habit: Small tree to 7 m tall.

Habitat: Lowland and hill forests.

Distribution in Peninsular Malaysia: Common throughout all states.

Specimens examined: Gua Luas, M. Shah, MS 1548, 4 March 1968, (SING); Ulu Sepia, Whitmore, FRI 15309, 16 July 1970, (KEP); Kuala Tahan, L.E. Teo & G. Pachiappan, 795, 4 March 1983, (SING); Keniam, Ahmad Fitri et al., voucher specimen, September 2020.

3.24.3. *Popowia tomentosa* Maingay ex Hook.f. & Thomson

Habit: Small tree to 7 m tall.

Habitat: Lowland and hill forests.

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

Specimens examined: Jeram Panjang, M. Shah, MS 1512, 1 March 1968, (SING); Ulu Sungai Sepia, M. Shah & M. Noor, MS 1908, 16 July 1970, (SING); Ulu Sungai Sepia, M. Shah & M. Noor, MS 2005, 19 July 1970, (SING); Keniam, Ahmad Fitri et al., voucher specimen, September 2020.

3.25 *Pseuduvaria*

3.25.1 *Pseuduvaria macrophylla* (Oliv.) Merr.

Habit: Small tree to 7 m tall.

Habitat: Lowland and hill forests.

Distribution in Peninsular Malaysia: All states except for Perlis and Johor.

Specimens examined: Sungai Tahan, Ridley, BGS 005130, August 1891, (SING); Sungai Tahan, Mat, BGS 005131, 1893, (SING); Trail to Gua Luas, Whitmore, FRI 8524, 4 March 1968, (KEP); Sungai Tahan, Razali, 162 RJ, 17 April 1975, (UKMB); Sungai Tahan, Razali, 175 RJ, 18 April 1975, (UKMB); s. loc., K. C. Ang, FRI 023325, 19 April 1975, (KEP); Trail to Gua Luas, A. Zainudin, AZ 1017, 21 September 1983, (UKMB).

3.26 *Stelechocarpus*

3.26.1 *Stelechocarpus cauliflorus* (Scheff.) R.E. Fr.

Habit: Small tree to 10 m tall.

Habitat: Lowland and hill forests.

Distribution in Peninsular Malaysia: Perlis, Pulau Pinang, Perak, Pahang, Selangor and Johor.

Specimens examined: Tembeling, Holttum, SFN 24707, 23 April 1931, (SING); Tembeling, Henderson, SFN 21859, 13 July 1929, (SING); Tanjung Bungkal, Whitmore, FRI 15377, 21 July 1970, (KEP); Tanjung Bungkal, M. Shah & M. Noor, MS 2036, 21 July 1970, (SING).

3.27 *Trivalvaria*

3.27.1 *Trivalvaria macrophylla* (Blume) Miq.

Habit: Small tree to 10 m tall.

Habitat: Lowland and hill forests.

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

Specimens examined: Ulu Sungai Sat, M. Shah & M. Noor, MS 1779, 10 July 1970, (SING); Kuala Tahan, Whitmore, FRI 20133, 10 June 1971, (KEP); Sungai Tahan, Razali, 171 RJ, 18 April 1975, (UKMB); Sungai Tahan, Stone, B.C. & Chin, S.C., 13901, 19 July 1978, (KLU); Trail to Terengan Hide, Y. C. Chan, FRI 023849, 30 April 1975, (KEP); Trail to Bumbun Height, A. Latiff et al., 13617, 19 March 1983, (UKMB); Trail to Gua Telinga, A. Zainudin, AZ 1052, 22 September 1983, (UKMB); Lata Berkoh, A. Zainudin, AZ 1304, 27 March 1984, (UKMB); Trail to Gua Telinga, Zainudin, AZ 3510, 17 May 1991, (UKMB); Trail to Bukit Indah, A. Zainudin, AZ 3497, 16 May 1991, (UKMB); Trail Sungai Tembeling to Bukit Tersek, van Balgooy, 2454A, 19 April 1975, (BO); Sg. Cheruai, Gua Gajah, Trail to Gua Gajah, L.S.L. Chua, D. Mustapa & K. Apok, FRI 40615, 6 May 1997, (KEP); Keniam, Ahmad Fitri et al., voucher specimen, September 2020.

3.28 *Uvaria*

3.28.1 *Uvaria lobbiana* Hook.f. & Thomson

Habit: Large climber reaching 50 m long

Habitat: Lowland forest.

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

Specimens examined: Trail to Bukit Tersik, Rahim, 128, 19 April 1975, (UKMB); Trail to Gua Luas, Razali, 225R, 27 April 1975, (UKMB); Gua Luas, Van Balgooy, 2554, 27 April 1975, (UKMB); Trail to Gua Telinga, Zainudin, AZ 1046, 22 September 1983, (UKMB).

3.29 *Xylopia*

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

Habit: Tree to 18 m tall.

Habitat: Lowland forest.

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

Specimens examined: Tahan Woods, Whitmore, FRI 4743, 20 February 1968, (KEP); Sungai Kenyam, Whitmore, FRI 4933, 2 March 1968, (KEP).

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

Habit: Tree to 15 m tall.

Habitat: Lowland and hill forests.

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

Specimen examined: Keniam, Ahmad Fitri et al., voucher specimen, September 2020.

3.29.3 *Xylopia malayana* Hook.f. & Thomson

Habit: Tree to 18 m tall.

Habitat: Lowland and hill forests.

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

Specimens examined: South Tembeling, Sungai Riul, B. Everett, FRI 14445, 12 July 1970, (KEP); Ulu Sepia, T.C. Whitmore, FRI 15335, 18 February 1970, (KEP), FRI 15347, 18 February 1970, (KEP); Kuala Juram, L.S.L. Chua, D. Mustapa & K. Apok, FRI 40666, 9 May 1997, (KEP).



Figure 1. *Polyalthia cauliflora* var. *beccarii*. A. The stem that bears fruits. B. The stem with both flowers and fruits.

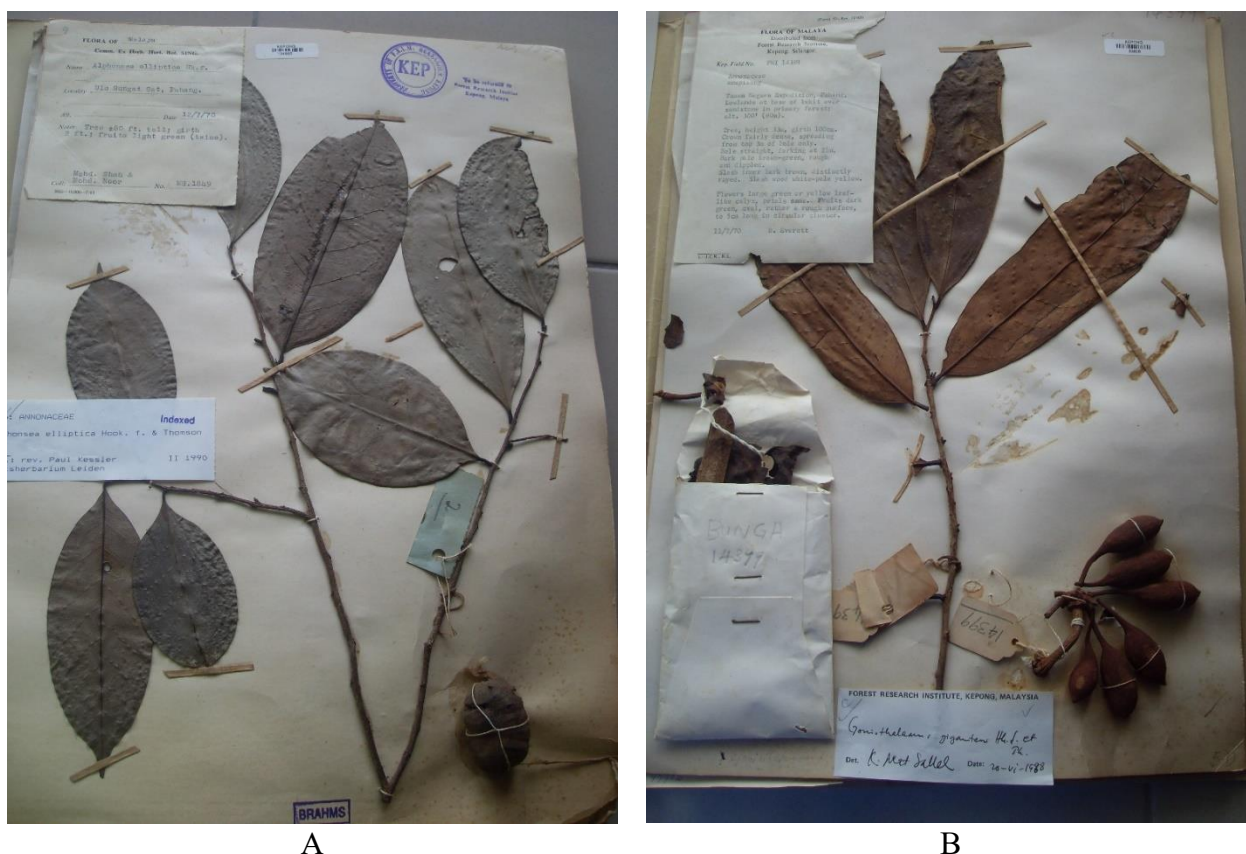
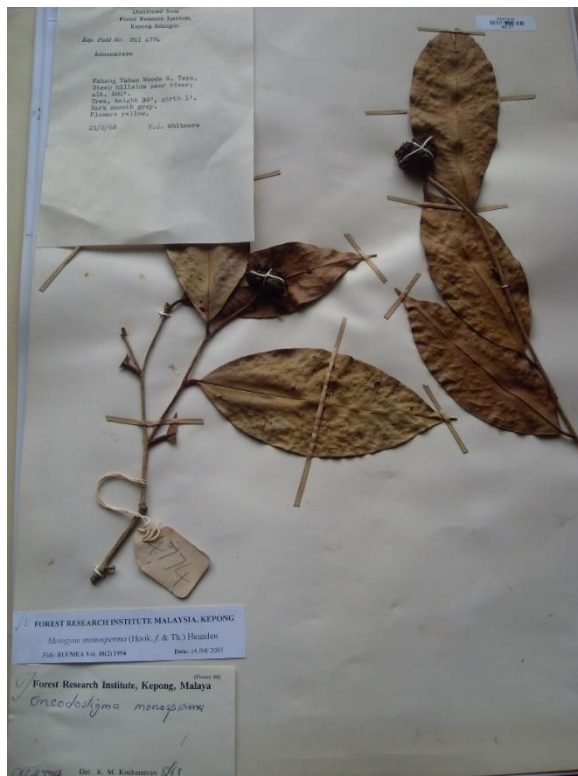


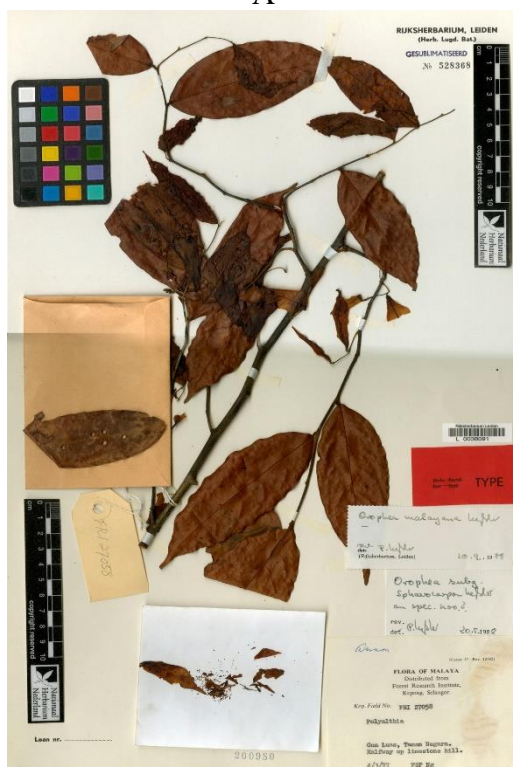
Figure 2. Herbarium specimens. A. *Alphonsea elliptica*. B. *Goniiothalamus giganteus*



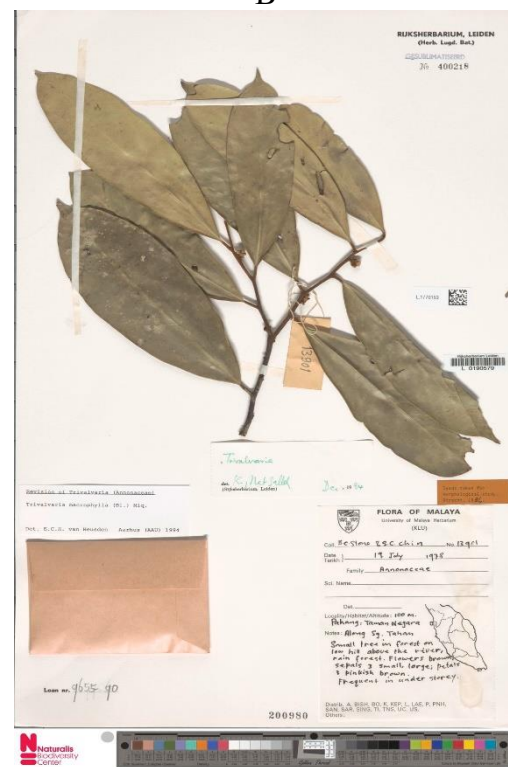
A



B



C



D

Figure 3. Herbarium specimens. A. *Meigogyne monosperma*; B. *Mezzettia parviflora*; C. Isotype of *Orophea malayana*. D. *Trivalvaria macrophylla*.

3.30 Phenology

Based on our observation in the field and also the reference collections in the herbaria, the time of flowering and fruiting for certain taxa are as follow, viz. *Alphonsea elliptica* fruiting in July, *Huberantha jenkesii* fruiting in April, *H. rumphii* flowering in March, *Orophea enterocarpa* fruiting in April and July, *O. hirsuta* flowering in April, *O. malayana* bears fruits in August and October, *Polyalthia cauliflora* flowering in April, *P. obliqua* flowering and fruiting in April, *P. stenopetala* bears fruits in July, *Popowia pisocarpa* flowering in March and fruiting in July, *Pseuduvaria macrophylla* flowering in March, *Stelechocarpus cauliflorus* fruiting in July, *Trivalvaria macrophylla* flowering in May, fruiting in April, June and July, *Xylophia ferruginea* fruiting in March and *X. malayana* fruiting in July.

4. Conclusion

A total of 63 species from 29 genera of Annonaceae was recorded in the lowland dipterocarp, hill forest and limestone hill forests around Kuala Keniam and surrounding areas at Taman Negara (Pahang). There are two additional species recorded in the recent study namely *Desmos cochinchinensis* and *Xylophia magna*. On the other hand, *Orophea malayana* is among the the endemic and rare species found in Taman Negara. This study showed that the pristine forest at Kuala Keniam and the surrounding area of Taman Negara should be extensively studied to demonstrate the rich diversity of Annonaceae in particular and the flowering plants in general.

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