

THE PTERIDOPHYTE FLORA OF PULAU TIOMAN, PENINSULAR MALAYSIA

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ABSTRACT. - A total of 154 species of ferns and fern-allies belonging to 73 genera and 26 families were recorded from Tioman Island. The largest genus is *Asplenium* with 14 species, followed by *Selaginella* with 8 species and *Cyathea* and *Pteris* each has 6 species. Species-wise the number of the pteridophytes of the island represents 23.5% of the total in Peninsular Malaysia.

KEY WORDS. - Pteridophytes, Pulau Tioman; checklist.

INTRODUCTION

Pulau Tioman is situated in between 02° 43' to 02° 54'N latitude and 104° 07' to 104° 3.5'E longitude in South China Sea and about 32 km southeast of peninsula coast. Historically, Pulau Tioman was used as the trade route between Middle East and China since 1475 (Mohd. Mokhtar, 1987). The flora of Pulau Tioman had been explored by British botanist, H. N. Ridley in 1889 who had collected some specimens at Teluk Nipah on the west coast of Pulau Tioman. Since then, various collectors came to observe and collect the plants on the various parts of the island; Tanjung Duata (Robinson & Burkill, 1915), Teluk Juara (Robinson & Burkill, 1915; Kloss, 1916, Stone et al., 1974), Gunung Kajang (Henderson, 1927; Kadim & Noor, 1962; Samsuri, 1973; Soepadmo & Lee, 1974); Pulau Tulai and Tanjung Ruit (Corner, 1935), Gunung Lalang (Kadim & Noor, 1962); Sungai Ayer Besar (Kadim & Noor, 1962, Stone et al., 1974); Bukit Penak (Samsuri, 1972). From the above collection trips they managed to collect about 112 species, 62 genera and 23 families of ferns and fern-allies from various parts of the island (Lee et al., 1977). The first collection by staff and students of Universiti Kebangsaan Malaysia was made in August and September 1989 along Kampung Paya to the summit of Gunung Kajang, Tekek-Juara Trail and Air Batang Centre to Salang Bay by one us, Razali Jaman and a student, Zulkifli Mohamad. They collected about 149 specimens of ferns and fern-allies which consist of 95 species from 24 families and 59 genera which include 39 species as new records for Pulau Tioman (Zulkifli et al., 1996).

A few additional surveys were made by one of the authors (Razali Jaman) in 1992-1995 accompanied by students and PERHILITAN (Wildlife Department) Staff to cover the areas of southeast of Pulau Tioman. The surveyed area include Sungai Benuang, Sungai Elin and Sungai Asah Valleys (GPS 02° 44' 39" N and 104° 12' 52" E to 02° 43' 51" N and 104° 11' 52" E).

The geology of the Tioman area is dominated by granitoid boulder-beds which give the rocky structures such as exposed granite rocks and thin layer of soil. Exposed boulders are found near on the coast at Kampung Paya, Batu Sirau (747 m), Nenek Si Mukut (695 m) and at several other places along the trail to the summit of Gunung Kajang. The highest peak is Gunung Kajang (1030 m).

VEGETATION TYPES AND PTERIDOPHYTE DISTRIBUTION

Generally, the vegetation of Pulau Tioman could be divided into four types namely coastal vegetation, mangrove swamp forest, lowland dipterocarp forest and hill dipterocarp forest.

Coastal Vegetation

The eastern sides of the island were covered by rocky coast and Teluk Juara, the only sandy beach, occurs on the eastern part of the island. However the western coast has many beautiful sandy beaches which attract tourists and they have facilities such as chalets, hotel, air strip, dispensary, shops, schools etc. Closer to the beach, *Psilotum nudum* (Psilotaceae) apparently present on the stems of coconut whereas *Lygodium flexuosum* could be easily seen scrambling over the bushes nearby. Associated with the sheltered habitats with high humidity *Adiantum stenochlamys* (Adiantaceae), *Helminthostachys zeylanica* (Ophioglossaceae), *Selaginella willdenowii* (Selaginellaceae) and *Stenochlaena palustris* (Blechnaceae) were encountered. The rock-loving ferns present on boulders include species such as *Tectaria zeilanica* (Dryopteridaceae), *Nephrolepis auriculata* (Nephrolepidaceae), *Pyrrosia anceolata* (Polypodiaceae), *Pteris ensiformis* (Pteridaceae), *Asplenium nidus* and *Asplenium macrophyllum* (Aspleniaceae).

Mangrove swamp forest

The mangrove swamp forests are observed behind most estuaries especially on the southern and western part of the island. Fern species such as *Acrostichum aureum* and *Acrostichum speciosum* are observed.

Lowland Dipterocarp Forest

The type of the lowland forest of the island include the alluvial up to 300 m above sea-level, usually dominated by non-dipterocarp trees such as fagaceous members (*Castanopsis* sp., *Quercus* sp. and *Lithocarpus* sp.), *Memecylon megacarpa* (Melastomataceae), *Ixonanthes icosandra* (Linaceae), etc. Most lowland ferns grow on the forest floor similar to that of the lowland ferns in similar habitat in the mainland. The forest floor is dominated by *Selaginella wallichii*, *Selaginella willdenowii* (Selaginellaceae) and *Colysis pedunculata* among others. *Pleocnemia conjugata* (Dryopteridaceae), *Nephrolepis hirsutula* (Nephrolepidaceae) and *Microlepia speluncae* var. *villosissima* (Dennstaedtiaceae) were also observed on the forest floor.

In the riverine vegetation in the lowland several ferns are also observed including, *Colysis pedunculata* (Polypodiaceae), *Bolbitis heteroclita*, *Bolbitis appendiculata* ssp. *appendiculata* and *Bolbitis sinuata*, (Lomariopsidaceae), *Cephalomanes javanicum* and *Vandenboschia auriculata* (Hymenophyllaceae) are commonly found especially on the river-bed rocks and boulders of Sungai Paya, Sungai Nipah, Sungai Keliling, Sungai Benuang, Sungai Asah and other streams. Holtum (1968) reported that *Leptochilus minor* was collected once in Tioman by Ridley in 1889 but hadn't been seen since then.

Hills Dipterocarp Forests

This vegetation covers from the elevation of 300 m up to 750 m, mostly dominated by seraya, *Shorea curtisii* and keruing bulu, *Dipterocarpus crinitus*. *Blechnum finlaysonianum* (Blechnaceae), *Cyathea hymenodes*, *Cyathea eriophora* (Cyatheaceae), *Asplenium normale*, *A. sublaserpitiifolium* and *A. unilaterale* (Aspleniaceae) were observed in sheltered or semi-sheltered habitats. Epiphytic *Asplenium* (Aspleniaceae) dominated the boulders and also on tree branches. The species include *A. affine*, *A. robustum*, *A. scolopendrioides*, *A. salignum* and *A. nidus* var. *nidus* and *A. phyllitidis* spp. *malesicum*.

This vegetation covers almost the higher peaks in the island in range of the altitude between 750-1200 m such as Gunung Kajang (1030 m), Gunung Seperok (944 m) and an unnamed peak (946 m) etc. Amongst the commonest ferns and fern-allies found on the higher elevation of the island are *Dipteris conjugata* (Dipteridaceae), *Cyathea hymenodes* (Cyatheaceae), *Humata repens* (Davalliaceae), *Huperzia phlegmaria* (Lycopodiaceae) and *Ctenopteris blechnoides* (Grammitidaceae). Near the summit, the endemic ferns of Peninsular Malaysia such as *Taenitis dimorpha* (Adiantaceae), *Cheiropleuria bicuspis* (Cheiropleuriaceae) and *Histiopteris incisa* (Dennstaedtiaceae) occur on Gunung Kajang. The resam (Gleicheniaceae) members were found growing in several places. Two species of *Dicranopteris* (*D. curranii* and *D. linearis* var. *montana*) and *Diplopterygium longissimum*, *Gleichenia microphylla* and *Sticherus truncatus* were found in this area but not found elsewhere at the lower altitude. *Lindsaea parasitica*, *Tapeinidium luzonicum* var. *luzonicum* and *Tapeinidium pinnatum* (Dennstaedtiaceae). *Diplazium simplicivenium* a new record for Pulau Tioman which is commonly encountered on the south eastern part of Pulau Tioman especially on Gunung Seperok and Peak's height 370 m (Upper Sungai Benuang).

CHECKLIST OF FERNS AND FERN-ALLIES

All voucher specimens were lodged at the Herbarium, Universiti Kebangsaan Malaysia (UKMB). A few living specimens were introduced and planted in the University Ferns Garden. The current enumeration is the updated version of the earlier checklist (Lee et al., 1977; Zulkifli et al., 1996) and the nomenclature followed Parris and Latiff (1997).

I. FERN-ALLIES

1. LYCOPODIACEAE

- 1 *Huperzia* Bernh.
- 1 *Huperzia phlegmaria* (L.) Rothmn.
Syn. *Lycopodium phlegmaria* L.
Epiphyte. Gunung Kajang: trail to summit; elevation ca. 300 m, D. W. Lee, KLU 19728 & 19738 (KLU), Anon., 503615 (SING); elevation ca. 1000 m, R. Jaman & Zulkifli, RJ 2921 (UKMB); Summit of Gunung Kajang: elevation ca. 1030 m, R. Jaman & Zulkifli, RJ 2936 (UKMB).
- 1.2 *Lycopodiella* Holub.
- 1.2.1 *Lycopodiella cernua* (L.) Pic. Serm.
syn. *Lycopodium cernuum* L.
Terrestrial, Gunung Kajang: summit trail; elevation ca. 950 m, R. Jaman & Zulkifli, RJ 2888 (UKMB); elevation ca. 1000 m, R. Jaman & Zulkifli, RJ 2939 (UKMB); D. W. Lee, KLU 19792 (KLU).

2. PSILOTACEAE

- 2.1 *Psilotum* Swartz
- 2.1.1 *Psilotum complanatum* Sw.
Epiphyte, pendulous. Gunung Kajang: elevation ca. 800 m, D. W. Lee, KLU 19727 (KLU).
- 2.1.2 *Psilotum nudum* (L.) Beauv.
Terrestrial in damp exposed areas. Kampung Paya: elevation ca. 5 m, R. Jaman, s.n. (UKMB).

3. SELAGINELLACEAE

- 3.1. *Selaginella* Beauv.
A total of 7 species recorded for Pulau Tioman and 6 species recorded from the higher elevation mostly in shaded area, especially Gunung Kajang area.
- 3.1.1 *Selaginella alutacia* Spring
Lithophyte. Gunung Kajang: Gua Tahi Angin Trail; elevation ca. 780 m, R. Jaman & Zulkifli, RJ 2899 (UKMB); elevation ca. 940 m, R. Jaman & Zulkifli, RJ 2966 (UKMB); elevation ca. 1000-1030 m, D. W. Lee, KLU 19730 & 19797 (KLU); Henderson, MRH 18279 (SING).
- 3.1.2 *Selaginella delicatula* (Desv.) Alston
Terrestrial. Bukit Permatang: Elevation ca. 780 m, R. Jaman & Zulkifli, RJ 2918 (UKMB).
- 3.1.3 *Selaginella frondosa* Warb.
Terrestrial. Teluk Juara: Burkill, 1138 (SING).
- 3.1.4 *Selaginella intermedia* (Blume) Spring var. *intermedia*
Syn. *S. atroviridis* Spr.
Terrestrial. Gunung Kajang, summit: elevation ca. 1030 m, D. W. Lee, KLU 19732 (KLU); trail to summit; elevation ca. 920 m, R. Jaman & Zulkifli, RJ 2924 (UKMB).

- 3.1.5 *Selaginella polystachya* (Warb.) Hieron.
Terrestrial. Gunung Kajang: Elevation ca. 800 m, D. W. Lee, KLU 19726 (KLU).
- 3.1.6 *Selaginella selangorensis* Bedd. ex Ridl.
Terrestrial. Gunung Kajang: Summit trail; elevation ca. 1000 m, R. Jaman & Zulkifli, RJ 2898 (UKMB); elevation ca. 950 m, R. Jaman & Zulkifli, RJ 2935 (UKMB).
- 3.1.7 *Selaginella wallichii* (Hook. & Grev.) Spring
Terrestrial. Kampung Paya, Gunung Kajang: Sungai Air Pertama Trail, elevation ca. 380 m, R. Jaman & Zulkifli, RJ 2829 (UKMB); elevation ca. 350 m, R. Jaman & Zulkifli, RJ 2832 (UKMB); Gunung Kajang: Summit Trail; elevation ca. 500 m, D. W. Lee, KLU 19729 (KLU); Bukit Permatang.: elevation ca. 880 m, R. Jaman & Zulkifli, RJ 2877 (UKMB).
- 3.1.8 *Selaginella willdenowii* (Desv.) Baker
Terrestrial, forming thicket. Gunung Kajang Kampung Paya: Sungai Air Pertama.: elevation ca. 380 m, R. Jaman & Zulkifli, RJ 2830 (UKMB). Trail to Tekek-Juara Trail: Gunung Kajang Foothill: secondary vegetation, D. W. Lee, KLU 19745 (KLU); Ayer Besar: Henderson, SFN 18753 (SING).

II. FERNS

4. ADIANTACEAE

- 4.1 *Acrostichum* L.
- 4.1.1 *Acrostichum aureum* L.
In coastal mangrove; B. C. Stone, BSC 11933 (KLU); Corner, s.n. (SING).
- 4.1.2 *Acrostichum speciosum* Willd.
Mangrove swamp; D. W. Lee, KLU 19774 (KLU).
- 4.2 *Adiantum* L.
- 4.2.1 *Adiantum caudatum* L.
Terrestrial in shade; Burkill, s.n. (SING); D. W. Lee, KLU 19768; 19779 (KLU).
- 4.2.2 *Adiantum stenochlamys* Baker
Terrestrial in shade; Kampung Sri Tanjung-Kampung Asah Trail: Elevation ca. 10 m, A. Bidin & R. Jaman, s.n. (UKMB); Teluk Juara: Elevation ca. 10 m; Burkill, s.n. (SING).
- 4.3 *Cheilanthes* Sw.
- 4.3.1 *Cheilanthes tenuifolia* (Burm.f.) Sw. subsp. *tenuifolia*
Terrestrial on clear forest in exposed; Batu Sirau: foothill; elevation ca. 50 m, A. Bidin & R. Jaman, s.n. (UKMB)
- 4.4 *Pityrogramma* Link
- 4.4.1 *Pityrogramma calomelanos* (L.) Link
Terrestrial in secondary forest; D. W. Lee, KLU 19772 (KLU); Henderson, MRH 18887 (SING).

- 4.5 *Taenitis* Willd.
This genus has never been recorded from Pulau Tioman. Two species were found in Gunung Kajang area.
- 4.5.1 *Taenitis blechnoides* (Willd.) Sw.
Terrestrial; Gunung Kajang: Summit Trail; elevation ca. 940 m, R. Jaman & Zulkifli, RJ 2969 (UKMB); Summit; elevation ca. 1030 m, R. Jaman & Zulkifli, RJ 2882 (UKMB).
- 4.5.2 *Taenitis dimorpha* Holttum
Terrestrial in semi-shade; Gunung Kajang: Summit; elevation ca. 1020-1030 m, R. Jaman & Zulkifli, RJ 2960 & 2886 (UKMB).

5. ASPLENIACEAE

- 5.1 *Asplenium* L.
This genus contributed the largest number of species among the fern families of Pulau Tioman. A total of fourteen species were identified with two of them, *A. nidus* and *A. robustum* being new records for Pulau Tioman.
- 5.1.1 *Asplenium affine* Sw.
Syn. *A. spathulinum* J. Smith
Epiphyte on rock in semi-shade; Gunung Segadung; elevation ca. 300 m; Henderson, MRH 18763 & 18898 (KLU); Gunung Kajang: Sungai Ayer Orang Puteh; elevation ca. 600 m, R. Jaman & Zulkifli, RJ 2861 (UKMB).
- 5.1.2 *Asplenium batuense* Alderw.
Climbing fern; Teluk Juara; elevation ca. 30 m; Burkill, s.n. (SING).
- 5.1.3 *Asplenium borneense* Hook.
Epiphyte on rock in semi-shaded areas; Gunung Kajang: Sungai Ayer Orang Puteh; elevation ca. 600 m, R. Jaman & Zulkifli, RJ 2856 (UKMB). Sungai Ayer Besar; elevation ca. 250 m, Henderson, MRH 18761 (SING).
- 5.1.4 *Asplenium macrophyllum* Sw.
Epiphyte on boulder in exposed areas; Kampung Paya: sea-coast: R. Jaman & Zulkifli, RJ 2817 (UKMB); Henderson, MRH 18448 (SING); Corner & Burkill, 1033 (SING); D. W. Lee, KLU 19775 (KLU).
- 5.1.5 *Asplenium nidus* L. var. *nidus*
Epiphyte on boulder in exposed areas; Kampung Paya: R. Jaman & Zulkifli, RJ 2818 (UKMB).
- 5.1.6 *Asplenium nitidum* Sw.
Syn. *A. glaucophyllum* Alderw.
Epiphyte on rock in semi-shaded; Tanjung Ruit: Corner, s.n. (SING).
Note: Corner recorded this species as common on rocks in the forest (Holttum, 1968).
- 5.1.7 *Asplenium normale* D. Don var. *normale*
Epiphyte on boulders in shade; Gunung Kajang: Trail to summit; elevation ca. 600-700 m, D. W. Lee, KLU 19770 & 19782 (KLU); R. Jaman & Zulkifli, RJ 2920 (UKMB).
- 5.1.8 *Asplenium robustum* Blume
Epiphyte on boulders in shade; Gunung Kajang: Bukit Permatang; Elevation ca. 850 m, R. Jaman & Zulkifli, RJ 2864 (UKMB).

- 5.1.9 *Asplenium salignum* Blume
Epiphyte on boulder in semi-shade; Tekek-Juara Trail: elevation ca. 150 m, A. Bidin & R. Jaman, s.n. (UKMB); Teluk Elin: elevation ca. 100 m, R. Jaman (observed).; Gunung Kajang: Trail to summit: elevation ca. 300 m, D. W. Lee, KLU 19760 (KLU).
Note: Razali Jaman observed a plant with simply pinnate frond at Teluk Elin.
- 5.1.10 *Asplenium scolopendrioides* J. Sm. ex Hook.
Epiphyte on boulders in semi-shaded areas; Gunung Kajang: Ayer Suring Trail: elevation ca. 460 m, R. Jaman & Zulkifli, RJ 2834 (UKMB); Ayer Suring: Elevation ca. 480 m, R. Jaman & Zulkifli, RJ 2839 (UKMB); Ayer Orang Puteh: Elevation ca. 600-700 m, R. Jaman & Zulkifli, RJ 2857 (UKMB); Stone, BCS 11892 (KLU); D. W. Lee, KLU 19720 (KLU); Henderson, MRH 21658 (SING).
- 5.1.11 *Asplenium sublaserpitiifolium* Ching
Epiphyte on boulders semi-shaded areas. Teluk Juara: Kuala Sungai Tawa; Low elevation, Burkill, s.n.: Gunung Kajang: Sungai Ayer Orang Puteh: elevation ca. 520 m; R. Jaman & Zulkifli, RJ 2845 (UKMB).
Note: Our collection probably represents the second collection in Malaysia after a single specimen collected by Burkill in June 1915 from Teluk Juara, Pulau Tioman, which was described in Holttum (1968). The occurrence of the species on Pulau Tioman is thus an interesting extension of range as the species described by Ching from parts of Southern China.
- 5.1.12 *Asplenium subnormale* Copel.
Terrestrial, Pulau Tioman (as in Holttum, 1968): at sea-level and ca. 330 m, Anon.
- 5.1.13 *Asplenium tenerum* G. Forst.
Epiphyte. Gunung Kajang: Trail to summit; elevation ca. 300 m; D. W. Lee, KLU 19739 & 19750 (KLU).
- 5.1.14 *Asplenium unilaterale* Lam
On boulders in semi-shaded areas; Teluk Juara: lower elevation; Burkill, s.n. (SING); Stone, BCS 11909; Kampung Paya: Gunung Kajang Trail: D. W. Lee, KLU 19741 (KLU); Gunung Kajang: Sungai Ayer Suring; elevation ca. 480 m, R. Jaman & Zulkifli, RJ 2848 & 2852 (UKMB).

6. BLECHNACEAE

- 6.1 *Blechnum* L.
A genus of six species in Peninsular Malaysia. This genus was not previously recorded from Pulau Tioman. The shade loving-fern, *Blechnum finlaysonianum* was found on forest floor in hill dipterocarp forest.
- 6.1.1 *Blechnum finlaysonianum* Hook. & Grev.
Terrestrial in shade; Gunung Kajang: Sungai Ayer Pertama Trail; elevation ca. 350 m, R. Jaman & Zulkifli, RJ 2914 (UKMB).
- 6.1.2 *Blechnum orientale* L.
Terrestrial in exposed; Kampung Paya: Gunung Kajang Trail: D. W. Lee, KLU 19758 (KLU).
- 6.2 *Stenochlaena* J. Sm.
A genus with only one species recorded from Malaysia and has not been recorded before from Pulau Tioman.

- 6.2.1 *Stenochlaena palustris* (Burm f.) Bedd.
Climber in open habitats; Kampung Paya: sea-coast; R. Jaman & Zulkifli, RJ 3821 (UKMB).

7. CHEIROPLEURACEAE

- 7.1 *Cheiropleuria* C. Presl
- 7.1.1 *Cheiropleuria bicuspis* (Blume) C. Presl
Terrestrial in shade. Gunung Kajang: summit; elevation ca. 1030 m, R. Jaman & Zulkifli, RJ 2961 (UKMB); trail to summit elevation ca. 800 m; Henderson, MRH 18911 (SING).

8. CYATHEACEAE

- 8.1 *Cyathea* Smith
A total of six species recorded for Pulau Tioman, three were new records.
- 8.1.1 *Cyathea contaminans* (Wall. ex Hook.) Copel.
Terrestrial in exposed or light shaded forests. Tekek-Juara Trail: Sungai Baharu, elevation ca. 250 m, R. Jaman & Zulkifli, s.n. (UKMB); no loc., elevation ca. 300 m, Henderson, MRH 18871 & 21711 (SING); Burkill, s.n. (SING); Upper Sungai Benuang: elevation ca. 500 m, R. Jaman (observed).
- 8.1.2 *Cyathea eriophora* Holttum
Terrestrial in semi-shade. Gunung Kajang: Ayer Orang Puteh, elevation ca. 650 m, R. Jaman & Zulkifli, RJ 2879 (UKMB).
- 8.1.3 *Cyathea hymenodes* Mett.
Terrestrial in light shade. Gunung Kajang: Bukit Permatang, elevation ca. 850-880 m, R. Jaman & Zulkifli, RJ 2872 & 2946 (UKMB); Summit to Juara Trail: elevation ca. 950 m, R. Jaman & Zulkifli, RJ 2933 (UKMB).
- 8.1.4 *Cyathea obscura* (Scort.) Bedd.
Terrestrial in open habitats; Gunung Kajang: Bukit Permatang; elevation ca. 850 m, R. Jaman & Zulkifli, RJ 2927 (UKMB); Summit Trail: elevation ca. 1020, R. Jaman & Zulkifli, RJ 2959 (UKMB).
- 8.1.5 *Cyathea oosora* Holttum
Terrestrial. Gunung Kajang: Trail to summit, elevation ca. 1015 m, D. W. Lee, KLU 19795 (KLU).
Note: Type specimen was from Mt. Kinabalu at 2200-3000 m, in ridge forest. Also found in North Celebes at 1500-2000 m. The Pulau Tioman specimen represents the third locality for this species.
- 8.1.6 *Cyathea tripinnata* Copel.
Terrestrial. Gunung Segadang: Bukit Talang, elevation ca. 250 m, Henderson, MRH 18504 & 18617 (SING).

9. DAVALLIACEAE

- 9.1 *Araiostegia* Copel.
Only one species recorded from Malaysia and on Pulau Tioman this species was found at Bukit Permatang.
- 9.1.1 *Araiostegia hymenophylloides* (Blume) Copel.
On boulders in semi-shade. Upper hill dipterocarp forest. Gunung Kajang: Bukit Permatang; Elevation ca. 800 m, R. Jaman & Zulkifli, RJ 2863 (UKMB); D. W. Lee, KLU 19725 & 19798 (KLU).
- 9.2 *Davallia* Smith
Three species recorded from Pulau Tioman.
- 9.2.1. *Davallia denticulata* (Burm f.) Mett.
Epiphyte on boulder. Coastal. Coastal area.; Henderson, MRH 18418 (SING).
- 9.2.2 *Davallia divaricata* Blume;
On boulders in light shade. Coastal to upper hill dipterocarp forest. D. W. Lee, KLU 19771 (KLU); Gunung Kajang: elevation ca. 850 m, R. Jaman & Zulkifli, RJ 2865 (UKMB); Upper Sungai Kelayak: elevation ca. 540 m; R. Jaman & Zulkifli. (observed).
- 9.2.3 *Davallia solida* (G. Forst.) Sw.
On boulders in light shade. Coastal area: Corner, s.n. (SING).
- 9.3 *Humata* Cav.
Three species were found on the island.
- 9.3.1 *Humata angustata* (Wall. ex Hook. & Grev.) J. Sm.
Lithophyte and creeper on old stump in semi-shade area. Upper hill dipterocarp forest to lower montane forest. Elevation:780-1020 m. Gunung Kajang: Bukit Permatang Trail, elevation ca. 780 m, R. Jaman & Zulkifli, RJ 2919 (UKMB); Gunung Kajang: Elevation ca. 1000-1020 m, Zulkifli & R. Jaman, & Zulkifli, RJ 2887. (UKMB), Elevation 1000 m, RJ 2890 & 2963 (UKMB);, Elevation ca. 1020 m, R. Jaman & Zulkifli. RJ 2963 (UKMB); Henderson, MRH 18256 & 18943 (SING); Soepadmo. ES 1371 (KLU); D. W. Lee. KLU 19737 (KLU).
- 9.3.2 *Humata repens* (L. f.) Diels
Epiphyte in light exposed area. Upper hill dipterocarp forest to lower montane forest. Elcvation: 820-1030 m. Gunung Kajang: Bukit Permatang: Elevation ca. 820 m, R. Jaman & Zulkifli, RJ 2868 (UKMB); Gunung Kajang: Summit Trail, trail to summit: elevation ca. 1000 m, R. Jaman & Zulkifli, RJ 2889 (UKMB); Gunung Kajang: summit.: Elevation ca.1030 m, R. Jaman & Zulkifli, RJ 2929 (UKMB). Gunung Rokam: elevation ca. 850 m; Henderson, MRH 18795 (SING).
- 9.3.3 *Humata vestita* (Blume) T. Moore
Epiphyte in light exposed area. Gunung Kajang: Montane forest. elevation ca.1030 m, D. W. Lee, DWL KLU 19737 (KLU).

10. DENNSTEADTIACEAE

- 10.1 *Histiopteris* (Agardh) J. Sm.
- 10.1.1 *Histiopteris incisa* (Thunb.) J. Sm.
Terrestrial and lithophyte in open areas; hill dipterocarp forest to lower montane forest. Elevation: 840-1030 m. Gunung Kajang: Bukit Permatang and summit, elevation ca. 840 m and 1030 m, R. Jaman & Zulkifli, RJ 2883 & 2956 (UKMB); summit of Gunung Kajang: elevation ca. 1030 m, R. Jaman & Zulkifli, RJ 2883 (UKMB); Kadim & Noor K 626 (SING).
- 10.2 *Microlepia* C. Presl
One species found in Gunung Kajang area.
- 10.2.1 *Microlepia speluncae* (L.) T. Moore var. *villosissima* C. Chr.
Terrestrial in light shade area. Hill dipterocarp forest. Elevation ca. 350-500 m. Gunung Kajang: Sungai Air Pertama Trail: Elevation ca. 350-500 m, R. Jaman & Zulkifli, RJ 2833 (UKMB); D. W. Lee, KLU 19719 & 19778 (KLU); Henderson, MRH 18873 (SING).
- 10.3 *Pteridium* Scopoli
- 10.3.1 *Pteridium aquilinum* (L.) Kuhn var. *wightianum* (Agardh) Tryon
Terrestrial, in open places. Pulau Tulai: Henderson, MRH 18252 (SING).
- 10.3.2 *Pteridium esculentum* (G. Forst.) Cockayne
Terrestrial in open places. Tioman Island: Stone, BCS 11971 (KLU).
- 10.3 *Lindsaea* Dryander
Three species were found in Gunung Kajang area from five species recorded for Pulau Tioman. One sterile specimen is yet to be identified.
- 10.3.1 *Lindsaea doryphora* Kramer
Terrestrial in light shade. Hill dipterocarp forest to upper hill dipterocarp forest. Elevation: 580-880 m. Gunung Kajang: Air Orang Puteh Trail, elevation ca. 580 m, R. Jaman & Zulkifli, RJ 2847 (UKMB); Gunung Kajang: Bukit Permatang, elevation ca. 820-880 m, R. Jaman & Zulkifli, RJ 2875 (UKMB), elevation ca. 880 m, R. Jaman & Zulkifli, RJ 2878 (UKMB).
- 10.3.2 *Lindsaea lucida* Blume subsp. *lucida*
Terrestrial in shade. Hill dipterocarp forest. Forest below 500 m, Henderson, MRH 18587 (SING); D. W. Lee, DWL KLU 19740 (KLU).
- 10.3.3 *Lindsaea parasitica* (Roxb. ex Griff.) Hieron
Climber in shade. Upper hill dipterocarp forest. Elevation: 750-850 m. Gunung Kajang: Bukit Permatang Trail, elevation ca. 750-850 m, R. Jaman & Zulkifli, RJ 2869 (UKMB); Henderson, MRH 18817 (SING); Kadim & Noor, K 573 (SING); D. W. Lee, KLU 19731 (KLU); Gunung Kajang: Bukit Permatang: elevation ca. 850 m, R. Jaman & Zulkifli, RJ 2876 (UKMB).
- 10.3.4 *Lindsaea repens* (Bory) Thwaites var. *pectinata* (Blume) Mett. ex Kuhn
Epiphyte in semi-shade. Lower montane forest. Gunung Kajang: Summit Trail, elevation ca. 1000 m, R. Jaman & Zulkifli, RJ 2942 (UKMB).
- 10.3.5 *Lindsaea* sp.
On rock and scrambling over small bushes in shade, sterile. Hill dipterocarp forest. Gunung Kajang: Ayer Orang Puteh Trail, elevation ca. 550 m, R. Jaman & Zulkifli, RJ 2851 (UKMB). Sterile.

10.4 *Tapeinidium* (C. Presl) C. Chr.

10.4.1 *Tapeinidium luzonicum* (Hook.) Kramer var. *luzonicum*

Terrestrial in shade. Upper hill dipterocarp forest. Gunung Kajang: Summit-Juara Trail, elevation ca. 960 m, R. Jaman & Zulkifli, RJ 2964 (UKMB).

10.4.2 *Tapeinidium pinnatum* (Cav.) C. Chr.

Terrestrial in shade. Upper hill dipterocarp forest. Gunung Kajang: Bukit Permatang, elevation ca. 800-880 m.; D. W. Lee, KLU 19786 (KLU); Henderson, MRH 18929 & 21661 (SING); elevation ca. 880 m, R. Jaman & Zulkifli, RJ 2874 (UKMB).

11. DIPTERIDACEAE

11.1 *Dipteris* Reinw.

11.1.1 *Dipteris conjugata* Reinw.

Terrestrial in open situations. Lower montane forest. Gunung Kajang: Summit, elevation ca. 1030 m, R. Jaman & Zulkifli, RJ 2885 (UKMB); elevation ca. 1039 m; D. W. Lee, KLU 19791 (KLU); Henderson, MRH 18928 (SING).

12. DRYOPTERIDACEAE

12.1 *Ctenitis* C. Chr.

12.1.1 *Ctenitis subobscura* (Christ) Holttum

Syn. *Ctenitis manii* auct.; non Hope

On boulder in the forest, elevation ca. 1100 m, Henderson, MRH 18593 & 19762 (SING); D. W. Lee, KLU 19784 (KLU).

12.2 *Didymochlaena* Desv.

12.2.1 *Didymochlaena truncatula* (Sw.) Sw.

Terrestrial in shade. Hill dipterocarp forest. Elevation 520-800 m. Gunung Kajang: Ayer Orang Puteh Trail, elevation ca. 520 m, Zulkifli & R. Jaman & Zulkifli, RJ 2842 (UKMB); Gunung Rokam: elevation ca. 800 m; Henderson, MRH 18818 (SING).

12.3 *Pleocnemia* C. Presl

Two species was identified from Gunung Kajang area.

12.3.1 *Pleocnemia conjugata* (Blume) C. Presl

Terrestrial in semi-shade. Gunung Kajang: Sungai Ayer Pertama Trail, Lowland dipterocarp forest to hill dipterocarp forest. Elevation: 210-560 m. R. Jaman & Zulkifli, RJ 2827 (UKMB); Gunung Kajang: Ayer Suring Trail: elevation ca. 560 m, R. Jaman & Zulkifli, RJ 2906 (UKMB). Note: Holttum (1968) noted that this species was collected twice in Peninsular Malaysia, once near Melaka and once at Baling, Kedah. According to Holttum (1991) this species apparently found in areas with a short regular dry season and in rather open forest.

12.3.2 *Pleocnemia irregularis* (C. Presl) Holttum

Syn. *Arcypteris irregularis* (Presl) Ching

Terrestrial on secondary forest in semi-shade. Secondary forest. Gunung Kajang: trail to summit: elevation ca. 100 m; D. W. Lee, KLU 19763 (KLU).

12.4 *Polystichum* Roth.

- 12.4.1 *Polystichum prolificans* Alderw.
Terrestrial and lithophyte in light shade. Upper hill dipterocarp forest. Elevation: 800-880 m. Gunung Kajang: Bukit Permatang: elevation ca. 800-880 m, R. Jaman & Zulkifli, RJ 2862 & 2871 (UKMB). Elevation ca. 880 m, R. Jaman & Zulkifli, RJ 2871 (UKMB).
- 12.5 *Pteridrys* C. Chr. & Ching
One species found in Gunung Kajang area.
- 12.5.1 *Pteridrys symatica* (Willd.) C. Chr. & Ching
Terrestrial and lithophyte in light shade. Lowland dipterocarp forest. Elevation: 160-300 m. Gunung Kajang: Sungai Ayer Pertama Trail, elevation ca. 160-300 m, R. Jaman & Zulkifli, & R. Jaman, RJ 2826, 2833 & 2909 (UKMB); Gunung Segadung: elevation ca. 300 m, Henderson, MRH 18844 (SING); Elevation ca. 210 m, R. Jaman & Zulkifli, RJ 2826 (UKMB); Elevation ca. 300 m, R. Jaman & Zulkifli, RJ 2909 (UKMB).
- 12.6 *Tectaria* Cav.
One species found out of two species recorded on Pulau Tioman.
- 12.6.1 *Tectaria grandidentata* (Cesati) Holttum
Terrestrial in shade. Gunung Kajang: Ayer Orang Puteh Trail, Hill dipterocarp forest. Elevation ca. 550 m. R. Jaman & Zulkifli, RJ 2846 (UKMB).
- 12.6.2 *Tectaria singaporiensis* (Wall. ex Hook. & Grev.) Copel.
Gunung Lalang: elevation ca. 800 m, Kadim & Noor K 622 (SING).
- 12.6.3 *Tectaria zeilanica* (Houtt.) Slegde
Syn. *Quercifilix zeilanica* (Houtt.) Copel.
In shade. South Cape: Burkill 1034 (SING); Tekek: Tanjung Pak Seman, R. Go 110 & 115 (UKMB).

13. GLEICHENIACEAE

- 13.1 *Dicranopteris* Bernh.
Two species were found in Gunung Kajang area. *Dicranopteris curranii* is a new record for Pulau Tioman.
- 13.1.1 *Dicranopteris curranii* Copel.
Terrestrial and scrambling in exposed. lower montane forest. Gunung Kajang: Trail to summit; elevation ca. 880-1030 m; R. Jaman & Zulkifli RJ 2912 (UKMB); secondary forest; D. W. Lee. KLU 19764 (KLU); Peak of 1228 ft.: Elevation ca. 880 m; R. Jaman & Zulkifli (observed); trail to summit: secondary forest; D. W. Lee. KLU 19764 (KLU).
- 13.1.2a *Dicranopteris linearis* (Burm f.) Underw. var. *montana* Holttum
Terrestrial and scrambling in light-shaded lower montane forest. Gunung Kajang: Summit Trail, Elevation ca. 1000 m, R. Jaman & Zulkifli, RJ 2934 (UKMB); Elevation ca. 880 m; R. Jaman & Zulkifli (observed).
- 13.1.2b *Dicranopteris linearis* (Burm f.) Underw. var. *subpectinata* (H. Christ) Holttum;
Terrestrial in exposc. Upper hill dipterocarp forest to lower montane forest. Elevation: 950-1000 m. Gunung Kajang: summit trail, elevation ca. 950-1000 m. R. Jaman & Zulkifli, RJ 2931 & 2940 (UKMB); Elevation ca. 1000 m, R. Jaman & Zulkifli, RJ 2940 (UKMB).
- 13.2 *Diplopterygium* (Diels) Nakai

- 13.2.1 *Diplopterygium longissimum* (Blume) Nakai
Syn. *Gleichenia longissima* Blume
Scrambling in exposed. Gunung Kajang: summit trail, elevation ca. 800-1000 m, Henderson, MRH 18941 (SING); R. Jaman & Zulkifli, RJ 2881 (UKMB); Peak of 1228 ft., elevation ca. 880 m (observed).
- 13.3 *Gleichenia* Smith
- 13.3.1 *Gleichenia microphylla* R. Br.
Terrestrial in open situations. Lower montane forest. Gunung Kajang: summit trail, elevation ca. 1000 m, R. Jaman & Zulkifli, RJ 2932 (UKMB).
- 13.4 *Sticherus* C. Presl
- 13.4.1 *Sticherus truncatus* (Willd.) Nakai var. *truncatus*
Terrestrial in light-shaded. lower montane forest. Gunung Kajang: summit, elevation ca. 1030 m, Zulkifli & R. Jaman & Zulkifli, RJ 2938 (UKMB); Peak of 1228 ft.: elevation ca. 880 m; R. Jaman & Zulkifli (observed).

14. GRAMMITIDACEAE

- 14.1 *Ctenopteris* Blume ex Kunze
- 14.1.1 *Ctenopteris blechnoides* (Grev.) W.H. Wagner & Grether
Syn. *Ctenopteris moultonii* (Copel.) C. Chr. & Tardieu
Epiphyte and lithophyte in light shade. Upper hill dipterocarp forest to lower montane forest. Elevation: 820-1030 m. Gunung Kajang: summit trail and above, elevation ca. 800-1030 m; Henderson, MRH 18933 (SING); R. Jaman & Zulkifli, RJ 2867, 2896, 2930 & 2953 trail to summit: Elevation ca. 820 m, Zulkifli & R. Jaman, RJ 2867 (UKMB); D. W. Lee, KLU 19783, 19794 & 19799 (KLU); Trail to Gunung Kajang: Elevation ca. 860 m, R. Jaman & Zulkifli, RJ 2953 (UKMB); D. W. Lee, KLU 19794 (KLU); Elevation ca. 1000 m, R. Jaman & Zulkifli, RJ 2896 (UKMB); D. W. Lee, KLU 19799 (KLU); summit: Elevation ca. 1030 m. R. Jaman & Zulkifli, RJ 2930 (UKMB); Soepadmo, ES 1370 KLU).
- 14.2 *Grammitis* Sw.
- 14.2.1 *Grammitis adspersa* Blume
Epiphyte and lithophyte in shade. Hill dipterocarp forest to lower montane forest. Elevation: 580-1030 m. Gunung Kajang: Sungai Ayer Orang Putelt; Elevation ca. 580 m, R. Jaman & Zulkifli & R. Jaman, RJ 2943 (UKMB); Gunung Kajang: summit trail and above, trail to summit: Elevation ca. 800-1030 m., Soepadmo, ES 1373 (KLU); Henderson, MRH 18255 & 18944 (SING); summit: Elevation ca. 1030 m, Zulkifli & R. Jaman & Zulkifli, RJ 2893 (UKMB); Henderson, MRH 18944 (SING); D. W. Lee, KLU 19733 (KLU).
- 14.3 *Prosaptia* Presl
Two species were found and *Prosaptia leysii* is a new record for Pulau Tioman.
- 14.3.1 *Prosaptia celebica* (Blume) Tagawa & K. Iwatsuki
Syn. *Ctenopteris celebica* (Blume) Copel.
Epiphyte in semi-shade. Lower montane forest. Gunung Kajang: summit, Elevation ca. 1030 m, R. Jaman & Zulkifli, RJ 2892 (UKMB).
Note: Holttum (1968) stated that this species was found twice on mainland Peninsular Malaysia, once on Gunung Tahan (1830 m) and the other at unrecorded locality in Perak.

- 14.3.2 *Prosaptia leysii* (Baker) Ching
Syn. *Ctenopteris leysii* (Baker) Holttum
Epiphyte in semi-shade. Gunung Kajang: summit trail. Upper hill dipterocarp forest to lower montane forest. Elevation: 860-1000 m. R. Jaman & Zulkifli, RJ 2901 (UKMB); Gunung Kajang: Bukit Permatang: Elevation ca. 860 860 m, R. Jaman & Zulkifli, RJ 2952 (UKMB).
Note: Holttum (1968) noted that the southern limit of distribution of this species in Peninsular Malaysia is Gunung Ledang (Mount Ophir), Johore at elevations varying from 150 m to 760 m.

- 14.4 *Scleroglossum* Alderw.
Only one species occurs in Gunung Kajang area.

- 14.4.1 *Scleroglossum debile* (Kuhn) Alderw.
Epiphyte in shade. Gunung Kajang: summit trail, trail to summit: Elevation ca. 900-1000 m, Henderson, MRH 18275a (SING); R. Jaman & Zulkifli, RJ 2894 (UKMB); Elevation ca. 1000 m; Henderson, MRH 18275a (SING).

15. HYMENOPHYLLACEAE

- 15.1 *Cephalomanes* C. Presl

- 15.1.1 *Cephalomanes javanicum* (Blume) Bosch
Syn. *Trichomanes javanicum* Blume
On semi-exposed rock in forest stream. Tekek-Juara Trail: elevation ca. 250 m; Stone, BCS 11893 (KLU); Lowland dipterocarp forest to lower montane forest. Elevation: 200-1030 m. Gunung Kajang: Sungai Ayer Pertama Trail, elevation ca. 200 m, R. Jaman & Zulkifli, RJ 2825 (UKMB); Elevation ca. 250 m; Stone, BCS 11893 (KLU); Ayer Suring, elevation ca. 480 m, R. Jaman & Zulkifli, RJ 2840 (UKMB); Ayer Orang Puteh, elevation ca. 600 m, R. Jaman & Zulkifli, RJ 2858 (UKMB); D. W. Lee, KLU 19767 (KLU); Gunung Kajang: summit, Elevation ca. 1030 m, R. Jaman & Zulkifli, RJ 2937 (UKMB).

- 15.2 *Crepidomanes* Copel.

- 15.2.1 *Crepidomanes bipunctatum* (Poir.) Copel.
Syn. *Trichomanes bipunctatum* Poir.
Epiphyte in moist shady places. Lowland forest. Sungai Air Besar: Teluk Bahai: elevation ca. 300 m; Henderson, MRH 18702 & 21679 (SING).

- 15.3 *Gonocormus* Bosch

- 15.3.1 *Gonocormus minutus* (Blume) Bosch
Syn. *Trichomanes minutum* Blume; *T. proliferum* Blume
Bukit Rokam: elevation ca. 800 m; Henderson, MRH 18820 (SING).

- 15.4 *Mecodium* Copel.

- 15.4.1 *Mecodium javanicum* (Spreng.) Copel.
Syn. *Hymenophyllum javanicum* Spreng.
Epiphyte in moist places. Gunung Kajang: summit trail, Hill dipterocarp forest. trail to summit: Elevation ca. 1000 m; Henderson, MRH 18605 (SING).
Note: Holttum (1968) cited this species as occurring on montane forest at 1200-1500 m

- 15.4.2 *Mecodium productum* (Kunze) Copel.
Syn. *Hymenophyllum productum* Kunze
Epiphyte in moist places. Gunung Kajang: summit trail, elevation ca. 1000 m, Henderson, MRH 18004 (SING).
- 15.5 *Meringium* C. Presl
Four species occur on high elevation.
- 15.5.1 *Meringium acanthoides* (Bosch) Copel.
Syn. *Hymenophyllum acanthoides* Bosch
On shaded rock. Gunung Kajang: Ayer Orang Puteh, elevation ca. 600 m, R. Jaman & Zulkifli, RJ 2970 (UKMB).
- 15.5.2 *Meringium denticulatum* Holttum (Sw.) Copel.
Syn. *Hymenophyllum denticulatum* Sw.
Epiphyte in moist places. Gunung Kajang: summit, Elevation ca. 1039 m; Henderson, MRH 18270 & 21671 (SING).
- 15.5.3 *Meringium holochilum* (Bosch) Copel.
Syn. *Hymenophyllum holochilum* (Bosch) C. Chr.
Epiphyte in moist places. Gunung Kajang: summit trail, Elevation ca. 1000 m; Henderson, MRH 18275 (SING). Bukit Seperok: elevation ca. 880 m; R. Jaman & Zulkifli (observed).
- 15.5.4 *Meringium meyenianum* C. Presl
Syn. *Hymenophyllum meyenianum* (C. Presl) Copel.
Epiphyte in moist places. Upper hill dipterocarp forest. Bukit Rokam: summit, Elevation ca. 850 m; Henderson, MRH 18198 (SING).
- 15.6 *Microgonium* C. Presl
- 15.6.1 *Microgonium bimarginatum* Bosch
Syn. *Trichomanes bimarginatum* (Bosch) Bosch
On shaded rock. Gunung Kajang: Sungai Ayer Orang Puteh, Hill dipterocarp forest. Elevation: 650 m. R. Jaman & Zulkifli, RJ 2970 (UKMB).
- 15.7 *Nesopteris* Copel.
- 15.7.1 *Nesopteris superba* (Backh. ex T. Moore) Copel.
Syn. *Trichomanes superba* Backh. ex T. Moore
Epiphyte in moist places. Gunung Kajang: summit trail, elevation ca. 1000 m; Soepadmo, ES 1368 (KLU).
- 15.8 *Selenodesmium* (Prantl) Copel.
- 15.8.1 *Selenodesmium obscurum* (Blume) Copel.
Syn. *Trichomanes obscurum* Blume
Terrestrial and lithophytic in shade. Hill dipterocarp forest to upper hill dipterocarp forest. Elevation: 600 - 780 m. Durian Sabok: elevation ca. 100 m; Henderson, MRH 21672 (SING); Gunung Kajang: Sungai Ayer Orang Puteh, elevation ca. 600 m, R. Jaman & Zulkifli, RJ2900a (UKMB); Gua Tahi Angin Trail: elevation ca. 780 m, R. Jaman & Zulkifli, RJ 2900 (UKMB) elevation ca. 600 m, Zulkifli & R. Jaman, RJ2900a (UKMB); Gunung Kajang: summit trail, elevation ca. 1000 m; D. W. Lee, KLU 19734 (KLU); Henderson, MRH 18825 (SING).
- 15.5 *Vandenboschia* Copel.

- 15.5.1 *Vandenboschia birmanica* (Bedd.) Ching
Syn. *Trichomanes radicans sensu* Holttum
On shaded rock. Gunung Kajang: Ayer Suring, elevation ca. 489 m, R. Jaman & Zulkifli, RJ 2836 (UKMB).
Note: Holttum (1968) recorded that only one small specimen had been collected at Cameron Highland, Pahang and postulated that this highland on Pulau Tioman is the southern limit of this species in South-east Asia.
- 15.5.2 *Vandenboschia maxima* (Blume) Copel.
Syn. *Trichomanes maxima* Blume
On shaded rock. Hill dipterocarp forest. elevation ca. 300 m: Burkill, s.n. (SING); Gunung Kajang: summit trail, elevation ca. 300 m; Burkill, s.n. (SING); D. W. Lee, KLU 19759 (KLU); Henderson. MRH 18592 (SING).

16. LOMARIOPSIDACEAE

- 16.1 *Bolbitis* Schott
Three species were found from Gunung Kajang area and *B. appendiculata* ssp. *appendiculata* is a new record for Pulau Tioman.
- 16.1.1 *Bolbitis appendiculata* (Willd.) K. Iwatsuki ssp. *appendiculata*
On shaded rock. Gunung Kajang: Lowland dipterocarp forest. Sungai Ayer Pertama Trail, elevation ca. 200 m, R. Jaman & Zulkifli, RJ 2835 (UKMB).
- 16.1.2 *Bolbitis heteroclita* (C. Presl) Ching
Terrestrial in shade. Gunung Kajang: Ayer Suring Trail, forest stream, elevation ca. 300-480 m, D. W. Lee, KLU 19800 (KLU); R. Jaman & Zulkifli, RJ 2837 (UKMB).
- 16.1.3 *Bolbitis sinuata* (C. Presl) Hennisman
Syn. *B. malaccensis* (C. Chr.) Ching
On shaded rock. Tekek-Juara Trail: Forest stream; Stone, BCS 11904 (KLU); Lowland dipterocarp forest. Kampung Paya: Gunung Kajang Trail, elevation ca. 50 m, R. Jaman & Zulkifli, RJ 2910 (UKMB). Tekek-juara: Forest stream; Stone, BCS 11904 (KLU).
- 16.2 *Elaphoglossum* Schott
- 16.2.1 *Elaphoglossum melanostictum* (Blume) T. Moore
Syn. *E. peninsulare* Holttum
On boulders in shade. Gunung Kajang: Ayer Orang Puteh Trail, elevation ca. 580 m, R. Jaman & Zulkifli, RJ 2904 (UKMB); Bukit Permatang. Hill dipterocarp forest; Elevation ca. 840-880 m, R. Jaman & Zulkifli, RJ 2891 & 2947 (UKMB)
Note: Holttum (1968) noted that this species was found in Penang, but nowhere else in Peninsular Malaysia.
- 16.3 *Teratophyllum* Mett. ex Kuhn
One species found in Gunung Kajang area.
- 16.3.1 *Teratophyllum aculeatum* (Blume) Mett. var. *montanum* Holttum
Climber in light shade. Gunung Kajang: Hill dipterocarp forest to upper hill dipterocarp forest. Elevation: 550-920 m. D. W. Lee, KLU 19776 (KLU); Henderson, MRH 18861 (SING); Burkill, s.n. (SING); Gunung Kajang: Ayer Orang Puteh. Elevation ca. 550 m, R. Jaman & Zulkifli, RJ 2851 (UKMB); Gunung Kajang-Tekek Trail: Elevation ca. 920 m. R. Jaman & Zulkifli, RJ 2965 (UKMB).

17. MARATTIACEAE

17.1 *Angiopteris* Hoffm.

17.1.1 *Angiopteris evecta* (G. Forst.) Hoffm.

Terrestrial. Gunung Kajang: Ayer Orang Puteh, Elevation ca. 610 m, R. Jaman & Zulkifli, RJ 2917 (UKMB).

17.1.2 *Angiopteris elliptica* Alderw.

Terrestrial. Hill dipterocarp forest. Upper Sungai Benuang: elevation ca. 640 m, R. Jaman (observed).

18. NEPHROLEPIDACEAE

18.1 *Nephrolepis* Schott

Three species were identified from Gunung Kajang area and *N. hirsutula* is a new record for Pulau Tioman.

18.1.1 *Nephrolepis auriculata* (L.) Trimen

Syn. *N. biserrata* (Sw.) Schott

Terrestrial and climbing, and lithophyte in shade and exposed areas. Coastal vegetation to upper hill dipterocarp forest. Tekek-Juara Trail: Corner, 29807 (KLU); Elevation: 1-950 m. Kampung Paya, sea level, R. Jaman & Zulkifli, RJ 2816 (UKMB); Gunung Kajang: Ayer Suring., Elevation ca. 210 m, R. Jaman & Zulkifli, RJ 2843 (UKMB); Bukit Permatang, elevation ca. 820 m, R. Jaman & Zulkifli, RJ 2922 (UKMB); Gunung Kajang-Juara Trail elevation ca. 950 m, R. Jaman & Zulkifli, RJ 2968 (UKMB); Corner, 29807 (KLU).

18.1.2 *Nephrolepis falcata* (Cav.) C. Chr.

Terrestrial or climbing in semi-exposed habitats. Secondary forest: D. W. Lee, KLU 19749 & 19742 (KLU); Upper Sungai Benuang: elevation ca. 520 m, R. Jaman (observed).

18.1.3 *Nephrolepis davallioides* (Sw.) Kunze

Terrestrial and epiphyte in light shade. Gunung Kajang: summit, Lower montane forest.; Elevation ca. 1030 m, Kadim & Noor, K 629 (SING); D. W. Lee, KLU 19790 (KLU); R. Jaman & Zulkifli, RJ 2884 (UKMB); Elevation ca. 1039 m; Kadim & Noor, K629 (SING); D. W. Lee, KLU 19790 (KLU).

18.1.4 *Nephrolepis hirsutula* (G. Forst.) C. Presl

Terrestrial in exposed areas. Gunung Kajang: Ayer Suring Trail, Lowland dipterocarp forest. Elevation: 70 m. R. Jaman & Zulkifli, RJ 2911 (UKMB).

19. OLEANDRACEAE

19.1 *Oleandra* Cav.

Only one species found from two species recorded from Peninsular Malaysia.

19.1.1 *Oleandra pistillaris* (Sw.) Cav.

Terrestrial in light shaded areas. Gunung Kajang: Lower montane forest. R. Jaman (Observed).

20. OPHIOGLOSSACEAE

20.1 *Helminthostachys* Kaulf.

20.1.1 *Helminthostachys zeylanica* (L.) Hook.

Terrestrial, Teluk Juara: low elevation; Burkill, s.n. (SING); Kampung Paya: R. Jaman (observed).

20.2 *Ophioglossum* L.

20.2.1 *Ophioglossum pendulum* L. forma *pendulum*

Epiphytic on higher tree, always associated with *Asplenium nidus*. Upper Sungai Kelayak:, Elevation ca. 620 m, R. Jaman (observed).

21. POLYPODIACEAE

21.1 *Colysis* C. Presl

Three species were found from Pulau Tioman area.

21.1.1 *Colysis macrophylla* (Blume) C. Presl

On boulders in semi-shaded areas. Gunung Sedagang: Hill dipterocarp forest. Elevation ca. 300 m; Henderson, MRH 18895 (SING); Gunung Kajang: Ayer Orang Puteh; Elevation ca. 600 m, R. Jaman & Zulkifli, RJ 2859 (UKMB). Upper Sungai Benuang:: Elevation ca. 540 m, R. Jaman (observed).

21.1.2 *Colysis pedunculata* (Hook. & Grev.) Ching

On boulders in shaded areas. Gunung Kajang: Sungai Ayer Pertama Trail, Lowland dipterocarp forest to upper hill dipterocarp forest. Elevation: 180-850 m. R. Jaman & Zulkifli, RJ 2824 (UKMB); Buluh Telang: elevation ca. 250 m; Henderson, MRH 18586 (SING); Gunung Kajang: Ayer Suring, elevation ca. 480 m, R. Jaman & Zulkifli, RJ 2841 & 2853 (UKMB); Elevation ca. 480 m, R. Jaman & Zulkifli, RJ 2853 (UKMB); Bukit Permatang: elevation ca. 850 m, R. Jaman & Zulkifli, RJ 2895 (UKMB). Upper Sungai Benuang: elevation ca. 520 m. R. Jaman (observed).

21.1.3 *Colysis pteropus* (Blume) Bosman

Syn. *Microsorium pteropus* (Blume) Ching

On boulders in shade. Lowland forest stream; Stone, BCS 11896 (KLU).

21.2 *Drynaria* J. Sm.

This genus was never recorded from Pulau Tioman before this survey. One species occurs in the island area.

21.2.1 *Drynaria sparsisora* (Desv.) T. Moore

Epiphyte in semi-shade. Gunung Kajang: Sungai Ayer Pertama, Hill dipterocarp forest.: Elevation ca. 460 m, R. Jaman & Zulkifli, RJ 2908 (UKMB).

21.3 *Goniophlebium* (Blume) C. Presl

Two specimens were collected from Gunung Kajang area. One sterile specimen needs further determination. Four other species occur in Peninsular Malaysia, viz. *G. percussum*, *G. persicifolium*, *G. prainii* and *G. subauriculatum*

- 21.3.1 *Goniophlebium korthalsii* (Mett.) Bedd.
Epiphyte in light shade. Upper hill dipterocarp forest. Gunung Kajang-Juara Trail: elevation ca. 950 m, R. Jaman & Zulkifli, RJ 2967 (UKMB).
Note: Holttum (1968) noted that this species was only once collected in Peninsular Malaysia by H. Kunstler (King's Collector) in Larut, Perak.
- 21.3.2 *Goniophlebium percussum* (Cav.) Wagner & Grether
Terrestrial in semi-shade. Gunung Kajang: Ayer Suring Trail, Lowland dipterocarp forest. elevation ca. 210 m, R. Jaman & Zulkifli, RJ 2843 . (UKMB).
- 21.4 *Leptochilus* Kaulfuss
Only one species was encountered and disappeared since then (as noted by Holttum, 1968). It is believed that this species is virtually extinct in Pulau Tioman.
- 21.4.1 *Leptochilus minor* Fee
On boulders in stream-bed in shade. Ridley (K?)
- 21.5 *Loxogramme* C. Presl
- 21.5.1 *Loxogramme avenia* (Blume) C. Presl
On exposed rock. Hill dipterocarp forest. Gunung Kajang: Ayer Orang Puteh Trail, Elevation ca. 600 m, Kadim & Noor, K 612 (SING).
- 21.5.2 *Loxogramme subecostata* (Hook.) C.Chr.
On boulders in shade. Gunung Sedagang. elevation ca. 300 m; Henderson, MRH 18896 (SING); Gunung Kajang, Ayer Suring, Henderson, MRH 21696 (SING); Tekek-Juara trail, elevation ca. 320 m, A. Bidin & R. Jaman, AB 3623 (UKMB)
- 21.6 *Microsorium* Link.
One species was identified from Gunung Kajang area and is a new record for Pulau Tioman.
- 21.6.1 *Microsorium heterocarpum* (Blume) Ching
On boulders in shade. Hill dipterocarp forest. Gunung Kajang: Ayer Suring, elevation ca. 480 m, R. Jaman & Zulkifli, RJ 2838 (UKMB); Gunung Kajang: Summit Trail, elevation ca. 800 m, R. Jaman & Zulkifli, RJ 2926 (UKMB).
- 21.7 *Phymatosorus* Pic. Serm
Only one species occurs on the island.
- 21.7.1 *Phymatosorus nigrescens* (Blume) Pic Serm.
On boulders in shade. Hill dipterocarp forest, Gunung Kajang; Ayer Orang Puteh, elevation ca. 580 m, R. Jaman & Zulkifli, RJ 2950 (UKMB).
- 21.8 *Pyrrosia* Mirbel
Two species found during the survey.
- 21.8.1 *Pyrrosia lanceolata* (L.) Farwell
Syn. *P. adnascens* (G. Forst.) Ching, *P. varia* (Kaulf.) Farw.
Epiphyte on exposed rock. Coastal vegetation. : Kampung Paya, elevation ca. 1 m, R. Jaman & Zulkifli, RJ 2819 (UKMB); Coastal area: Soepadmo, ES 1464 (KLU); D. W. Lee, KLU 19780 (KLU); Henderson, MRH 18472 (SING).
- 21.8.2 *Pyrrosia rasamalai* (Racib.) Ching
Syn. *P. floccigera sensu* Holttum
Epiphyte. Hill dipterocarp forest; Gunung Kajang; Ayer Suring, elevation ca. 600 m; Henderson, MRH 21697 (SING).

- 21.9 *Selliguea* Bory
Four species found in Gunung Kajang area.
- 21.9.1 *Selliguea enervis* (Cav.) Ching
Syn. *Crypsinus enervis* (Cav.) Copel.
Epiphyte in light shade. Upper hill dipterocarp forest.; Gunung Rokam; Henderson, MRH 18798 (SING); Gunung Kajang: Trail to summit: elevation ca. 800-950 m; D. W. Lee, KLU 20426 (KLU); Elevation ca. 950 m, R. Jaman & Zulkifli, RJ 2887 (UKMB).
- 21.9.2 *Selliguea heterocarpa* (Blume) Blume
On boulders in light shade. Upper hill dipterocarp forest. Gunung Kajang; Trail to summit: elevation ca. 750-1000 m, R. Jaman & Zulkifli, RJ 2925 (UKMB); Elevation ca. 1000 m; Sidek Kiah, 458 (SING).
- 21.9.3 *Selliguea taeniata* (Sw.) Parris var. *palmata* (Blume) Parris
Syn. *Crypsinus taeniatus* (Sw.) Copel. var. *palmatus* (Blume) C. Chr.
On exposed rock. Upper hill dipterocarp forest. Gunung Rokam: elevation ca. 800 m.; Henderson, MRH 18788 (SING); Bukit Permatang: elevation ca. 820 m, R. Jaman & Zulkifli, RJ 2866 (UKMB).
- 21.9.4 *Selliguea triloba* (Houtt.) M. G. Price
Syn. *Crypsinus triloba* (Houtt.) Copel.
Epiphyte in light-shade. Lower montane forest. Gunung Kajang, summit.; elevation ca. 1030 m. R. Jaman & Zulkifli, RJ 2903 & RJ 2905 (UKMB); Elevation ca. 1039 m; D. W. Lee, DWL KLU 19790 (KLU).

22. PTERIDACEAE

- 22.1 *Pteris* L.
Six species are recorded from Pulau Tioman. Two species are found in Gunung Kajang area, including *P. oppositipinna* which is a new record for Pulau Tioman.
- 22.1.1 *Pteris ensiformis* Burm f.
Terrestrial in open areas especially in coastal vegetation. Kampung Paya, Elevation ca. 3 m, R. Jaman & Zulkifli, RJ 2822 (UKMB). Coastal and secondary forest: low elevation; Burkill, s.n (SING); Corner, s.n (SING); Stone, BCS 11885 (KLU); D. W. Lee, KLU 19721 (KLU).
- 22.1.2 *Pteris grevilleana* Wall. ex J. Agardh
Terrestrial. Lowland dipterocarp forest. Gunung Sedangang, Elevation ca. 250 m; Henderson, MRH 18598, 19717, 19753 & 19754 (SING).
- 22.1.3 *Pteris mertensioides* Willd. subsp. *mertensioides*
Terrestrial. Hill dipterocarp forest: elevation ca. 600 m; Henderson, MRH 18872 (SING).
- 22.1.4 *Pteris oppositipinna* Fée
Terrestrial in light-shade. Gunung Kajang; Bukit Permatang, elevation ca. 840 m. R. Jaman & Zulkifli, RJ 2928 (UKMB).
Note: Holttum (1968) noted that this species was only recorded in Selangor, Pulau Pinang and Negeri Sembilan.
- 22.1.5 *Pteris tripartita* Sw.
Terrestrial. Lowland dipterocarp forest. elevation ca. p to 300 m; D. W. Lee, KLU 19777 (KLU).

- 22.1.6 *Pteris vittata* L.
Terrestrial in open. Lowland forest. D. W. Lee, KLU 19722 (KLU).

23. SCHIZAEACEAE

- 23.1 *Lygodium* Sw.
- 23.1.1 *Lygodium flexuosum* (L.) Sw.
Terrestrial and scrambling over bushes. Coastal vegetation. Kampung Paya: elevation ca. 1 m, R. Jaman & Zulkifli, RJ 2820 Zulkifli & R. Jaman, RJ 2820 (UKMB); Pulau Sepoi; Corner, s.n.
- 23.1.2 *Lygodium microphyllum* (Cav.) R. Br.
Scrambling and terrestrial. Secondary forest, D. W. Lee, KLU 19723 (KLU).
- 23.2 *Schizaea* Smith
- 23.2.1 *Schizaea dichotoma* (L.) Sm.
Terrestrial on slope in shade. D. W. Lee, KLU 19723 (KLU); Peak 1228 ft.: elevation ca. 780 m, R. Jaman & Zulkifli, s.n. (UKMB).
- 23.2.2 *Schizaea digitata* (L.) Sw.
Terrestrial. Gunung Kajang: Summit Trail, elevation 900-1020 m; Henderson, MRH 18936 (SING); R. Jaman & Zulkifli, RJ 2897, 2941 & 2962 (UKMB); Upper Sungai Benuang: On the slope of 1228 hill, elevation ca. 780 m, R. Jaman (observed).

24. THELYPTERIDACEAE

- 24.1 *Amphineuron* Holttum
- 24.1.1 *Amphineuron terminans* (Hook.) Holttum
Terrestrial in shade. Secondary forest, D. W. Lee, KLU 19748 (KLU).
- 24.2 *Christella* Leveille
- 24.2.1 *Christella arida* (D. Don) Holttum
Terrestrial in shade. Secondary forest, D. W. Lee, KLU 19724 (KLU).
- 24.2.2 *Christella parasitica* (L.) L.
Terrestrial in open. Gunung Kajang: Secondary forest; D. W. Lee, KLU 19746 & 19747 (KLU); Burkill, s.n (SING); Stone, BCS 11886 (KLU).
- 24.3 *Mesophlebion* Holttum
Only a single species occurs on the island.
- 24.3.1 *Mesophlebion chlamydophorum* (C. Chr.) Holttum
Terrestrial under shelter. Upper Sungai Benuang: elevation ca. 630 m, R. Jaman (observed). Upper Sungai Asah: elevation ca. 530 m, R. Jaman (observed).
- 24.4 *Pronophrum* C. Presl
Two species were found in Gunung Kajang area and *P. repandum* is a new record for Pulau Tioman.

- 24.4.1 *Pronephrium repandum* Holttum
Terrestrial in light shade. Gunung Kajang: Sungai Air Pertama Trail, elevation ca. 580 m, R. Jaman & Zulkifli, RJ 2850 (UKMB).
- 24.4.2 *Pronephrium rubicundum* (Alderw.) Holttum
Terrestrial in shade. Gunung Kajang: Summit Trail, elevation 510-750 m, R. Jaman, RJ 2844 & 2849 (UKMB); elevation ca. 600 m; D. W. Lee, KLU 19788 (KLU); Gunung Kajang: Bukit Permatang Trail, elevation 750 m, R. Jaman & Zulkifli, RJ 2870 (UKMB). Upper Sungai Benuang: elevation ca. 720 m, R. Jaman (observed).
- 24.5 *Sphaerostephanos* J. Smith
One species was found and is a new record for Pulau Tioman.
- 24.5.1 *Sphaerostephanos heterocarpus* (Blume) Holttum
Terrestrial in light shade. Air Suring Trail: elevation ca. 360-550 m, R. Jaman & Zulkifli, RJ 2831 & 2907 (UKMB); Upper Sungai Elin: elevation ca. 720 m, R. Jaman (observed).

25. VITTARIACEAE

- 25.1 *Antrophyum* Kaulf.
- 25.1.1 *Antrophyum callifolium* Blume
On boulders in shade; on palm stem. Primary forest, elevation ca. 300 m, Henderson, MRH 18756 (SING); Burkill, s.n (SING); D. W. Lee, KLU 19765 (KLU); Ayer Orang Puteh: elevation ca. 600 m, R. Jaman & Zulkifli, RJ 2855 (UKMB). Upper Sungai Benuang: elevation ca. 700 m, R. Jaman & Zulkifli, RJ 4321 (UKMB). Upper Sungai Elin: elevation ca. 720 m, R. Jaman (observed).
- 25.1.2 *Antrophyum latifolium* Blume
On boulders in shade. Upper Sungai Benuang: elevation ca. 630 m, R. Jaman & Zulkifli, s.n. (UKMB).
Note: New record for Pulau Tioman. Introduced and planted in Universiti Kebangsaan Malaysia Fern Garden.
- 25.2 *Monogramma* Schkuhr
- 25.2.1 *Monogramma dareicarpa* Hook.
Epiphyte on rock. elevation ca. 300 m, D. W. Lee, KLU 19766 (KLU).
- 25.3 *Vaginularia* Fee
- 25.3.1 *Vaginularia trichoidea* Fee
Syn. *Monogramma trichoidea* (Fee) Hook. & Baker
Epiphyte in shade. Gunung Kajang; summit, elevation ca. 1030 m, R. Jaman & Zulkifli, RJ 2948 (UKMB). Upper Sungai Benuang: elevation ca. 630 m, R. Jaman & Zulkifli, RJ 4322 (UKMB).
- 25.4 *Vittaria* Smith
- 25.4.1 *Vittaria angustifolia* Blume
On boulders in shade. Gunung Kajang; summit trail, elevation 840-850 m, R. Jaman & Zulkifli, RJ 2902 & 2951 (UKMB).

- 25.4.2 *Vittaria elongata* Sw.
Epiphyte. Kampung Tekek: Stone, BCS 11934 (KLU).
- 25.4.3 *Vittaria scolopendrina* (Bory) Thw.
Epiphyte on boulders in shade. Gunung Kajang: Bukit Permatang, elevation ca. 900 m, R. Jaman & Zulkifli, RJ 2902 (UKMB). Upper Sungai Benuang: elevation ca. 780 m, R. Jaman (observed).

26. WOODSIACEAE

- 26.1 *Diplazium* Swartz
- 26.1.1 *Diplazium pallidum* Blume
Terrestrial in shade. Buluh Talang: elevation ca. 800 m; Henderson, MRH 18583 (SING); Upper Sungai Benuang. Near summit of Hill of 2183 ft., elevation ca. 800 m, R. Jaman (observed).
- 26.1.2 *Diplazium simplicivenium* Holttum
Terrestrial in various habitats. Upper Sungai Benuang and Upper Sungai Asah: elevation ca. from 200m-830 m, R. Jaman (observed).
- 26.1.3 *Diplazium sorzogonense* (C. Presl) C. Presl
Terrestrial in open situations. Gunung Kajang: Bukit Permatang Trail, elevation ca. 780 m, R. Jaman & Zulkifli. RJ 2873 (UKMB).
- 26.1.4 *Diplazium tomentosum* Blume
On boulders in shade. Gunung Kajang: Gua Tahi Angin, elevation ca. 950 m, R. Jaman & Zulkifli. RJ 2923 (UKMB); Upper Sungai Benuang: elevation ca. 830 m, R. Jaman (observed).

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LITERATURE CITED

- Burkill, I. H., 1927. Botanical collectors, collections and collecting places in the Malay Peninsula. *Gard. Bull. Sing.*, **4**: 113-203.
- Henderson, M. R., 1930. Notes on the Flora of Pulau Tioman and the neighbouring islands. *Gard. Bull. Sing.*, **5** (3-6): 80-98.
- Holttum, R. E., 1963. Cyatheaceae. *Flora Malesiana. Series 2*, **1**(2) : 65-176.
- Holttum, R. E., 1968. *Revised Flora of Malaya. Vol. 2 Ferns*, 2nd ed. Government Printing Office, Singapore. 653 pp.
- Holttum, R. E., 1981. Thelypteridaceae. *Flora Malesiana. Series 2*, **1**(5): 331-599.
- Lee, D. W., B. C. Stone, M. Ratnasabapathy & K. T. Tiang, 1977. *Natural History of Pulau Tioman*. Merlin Samudra Sdn. Bhd., Pulau Tioman. 69 pp.

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- Mohammad Mokhtar, A. B., 1987. Penemuan Barang-barang Purba di Kampung Juara. Pulau Tioman. *Pahang Dalam Sejarah*. **2**: 35-39. Lembaga Muzium Negeri Pahang. Pekan. (Monograf).
- Parris, B. S., 1985. Grammitidaceae of Peninsular Malaysia and Singapore. *Kew Bull.*, **41**(3): 491-517.
- Parris, B. S., R. S. Beaman & J. H. Beaman, 1992. *The plants of Mount Kinabalu I. Ferns and fern-allies*. Royal Botanic Gardens, Kew. 165 pp.
- Parris, B. S. & A. Latiff, 1997. Towards a Pteridophyte Flora of Malaysia: A Provisional Checklist of Taxa. *Mal. Nat. J.*, **50**: 235-280.
- Piggot, A. G., 1988. *Ferns of Malaysia in colour*. Tropical Press Sdn.Bhd., Kuala Lumpur. 458 pp.
- Zulkifli, M., A. Latiff, A. A. Bidin & R. Jaman, 1996. A preliminary survey of ferns and fern-allies of Gunung Kajang, Pulau Tioman. *Gards. Bull. Sing.*, **48** : 159-188