A Preliminary Survey of Ferns and Fern-Allies of Gunung Kajang Area, Pulau Tioman

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Abstract

A total of 149 specimens of ferns and fern-allies were collected during two trips to Gunung Kajang, Pulau Tioman. They were identified to 24 families, 59 genera, 95 species, 1 subspecies and 11 varieties, excluding 2 species whose identity were uncertain. *Asplenium* contributes the largest number among genera, with 9 species, followed by *Selaginella* (6 species) and *Selliguea* (4 species), and 39 species were identified as new records to Pulau Tioman fern flora.

Introduction

Gunung Kajang (1030 m.) which is situated in the south-eastern part of Pulau Tioman is the highest peak of the island (Figure 1). There is a trail from Kampung Paya, inland of Tanjung Pauh on the south-west coast cutting several small streams to the summit of Gunung Kajang. The trail runs upwards along ridges and valleys in a generally west by south-east direction. The small ridge known as Bukit Permatang runs from east to west and one small cave found on the way to the summit at 950 m. elevation is known as Gua Tahi Angin. Another trail to the summit of Gunung Kajang runs from Kampung Juara at Teluk Juara on the other side of the island has been demolished because of the dangerous slopes on the north and south banks.

The geology of the Gunung Kajang area is dominated by granitoid rocks which give the rocky structure such as exposed granite rock and thin layer of soil. Exposed rock is found near the sea at Kampung Paya and at several places along the trail to the summit of Gunung Kajang.

Two trips of survey have been made to collect and identify the ferns and fern-allies from Kampung Paya to the summit of Gunung Kajang and several meters down from the summit to Teluk Juara. Most of the samples were collected in the form of herbarium specimens except several of them were only observed and noted. Voucher specimens were kept in the Herbarium, Universiti Kebangsaan Malaysia (UKMB).

Survey of Pulau Tioman Ferns

Several collections of plants of Pulau Tioman were made by various collectors. In August 1889, Ridley collected a little on the west coast at the place he called Nypa Bay (Henderson, 1930). In June 1915, Burkill and Robinson collected at

Juara Bay and Tanjung Duata (Burkill, 1927) while Henderson (1930) collected mainly on higher altitude especially on Gunung Kajang and Gunung Rokam between May10th and May 29th, 1927. It was until 1977 when Lee and members of Universiti Malaya made a list of ferns and fern-allies of Pulau Tioman. A total of 112 species from 23 families and 62 genera have been recorded from Pulau Tioman and Pulau Tulai from their collections and previous records of herbarium specimens. In this preliminary survey, a total of 149 specimens were collected and classified into 24 families, 59 genera and 95 species which include 39 new records for Pulau Tioman (Table 1).

Table 1 List of ferns and fern-allies collected from Gunung Kajang, including previous records

FAMILY / Species	Zulkifli *et al.*	Lee *et al.*	New Records
LYCOPODIACEAE			
Huperzia phlegmaria	+	+	
Lycopodiella cernua	+	+	
Selaginella alutacia	+	+	
Selaginella delicatula	+		+
Selaginella frondosa		+	
Selaginella intermedia var. *intermedia*	+	+	
Selaginella polystachya		+	
Selaginella selangorensis	+		+
Selaginella wallichi	+	+	
Selaginella willdenovii	+	+	
PSILOTACEAE			
Psilotum complanatum		+	
ADIANTACEAE			
Acrostichum aureum		+	
Acrostichum speciosum		+	
Adiantum caudatum		+	
Adiantum stenochlamys		+	
Pityrogramma calomelanos		+	
Taenitis blechnoides	+		+
Taenitis dimorpha	+		+
ASPLENIACEAE			

FAMILY / Species	Zulkifli *et al.*	Lee *et al.*	New Records
Asplenium affine	+	+	
Asplenium batuense		+	
Asplenium borneense	+	+	
Asplenium macrophyllum	+	+	
Asplenium montanum		+	
Asplenium nidus	+		+
Asplenium nitidum		+	
Asplenium normale	+	+	
Asplenium robustum	+		+
Asplenium salignum		+	
Asplenium scolopendrioides	+	+	
Asplenium sublaserpitiifolium	+		
Asplenium tenerum		+	
Asplenium unilaterale	+	+	
BLECHNACEAE			
Blechnum finlaysonianum	+		+
Blechnum orientale		+	
Stenochleana palustris	+		+
CHEIROPLEURIACEAE			
Cheiropleuria bicuspis	+	+	
CYATHEACEAE			
Cyathea contaminans		+	
Cyathea eriophora	+		+
Cyathea hymenodes	+		+
Cyathea obscura	+		+
Cyathea oosora		+	
Cyathea squamulata		+	
Cyathea tripinnata		+	
DAVALLIACEAE			
Araiostegia hymenophylloides	+	+	
Davallia denticulata		+	
Davallia divaricata	+	+	
Davallia solida		+	

FAMILY / Species	Zulkifli *et al.*	Lee *et al.*	New Records
Humata angustata	+	+	
Humata repens	+	+	
Humata vestita		+	
DENNSTEADTIACEAE			
Histiopteris incisa	+	+	
Lindsaea doryphora	+		+
Lindsaea lucida		+	
Lindsaea parasitica	+	+	
Lindsaea repens var. *pectinata*	+		+
Lindsaea sp.	+		
Microlepia speluncae var. *villosissima*	+	+	
Pteridium aquilinum var. *wightianum*		+	
Pteridium esculentum		+	
Tapeinidium luzonicum var. *luzonicum*	+		+
Tapeinidium pinnatum	+	+	
DIPTERIDACEAE			
Dipteris conjugata	+	+	
DRYOPTERIDACEAE			
Ctenitis subobscura		+	
Cyclopeltis crenata		+	
Didymochlaena truncatula	+	+	
Dryopteris arbuscula		+	
Pleocnemia conjugata	+		+
Pleocnemia irregularis		+	
Polystichum prolificans	+		+
Pteridrys syrmatica	+	+	
Tectaria grandidentata	+		+
Tectaria singaporeana		+	
Tectaria zeilanica		+	
GLEICHENIACEAE			
Dicranopteris curranii	+		+
Dicranopteris linearis var. *linearis*		+	
Dicranopteris linearis var. *montana*	+		+

FAMILY / Species	Zulkifli *et al.*	Lee *et al.*	New Records
Dicranopteris linearis var. *subpectinata*	+		+
Diplopterygium longissimum	+	+	
Gleichenia microphylla var. *semivestita*	+	+	
Sticherus truncatus var. *truncatus*	+	+	
GRAMMITIDACEAE			
Ctenopteris blechnoides	+	+	
Grammitis adspersa	+	+	
Prosaptia celebica	+		+
Prosaptia leysii	+		+
Scleroglossum debile	+	+	
HYMENOPHYLLACEAE			
Cephalomanes javanicum	+	+	
Crepidomanes bipunctatum		+	
Gonocarmus minutus		+	
Mecodium javanicum		+	
Mecodium productum		+	
Meringium acanthoides	+		+
Meringium denticulatum		+	
Meringium holochilum		+	
Meringium meyenianum		+	
Microgonium bimarginatum	+		+
Nesopteris superba		+	
Selenodesmium obscurum	+	+	
Vandenboschia birmanica	+		+
Vandenboschia maxima		+	
LOMARIOPSIDACEAE			
Bobitis sinuata	+	+	
Bolbitis appendiculata ssp. *appendiculata*	+		+
Bolbitis heteroclita	+	+	
Elaphoglossum melanostictum	+		+
Lomagramma perakensis		+	
Lomariopsis lineata		+	
Teratophyllum aculeatum	+	+	

FAMILY / Species	Zulkifli *et al.*	Lee *et al.*	New Records
MARATTIACEAE			
Angiopteris angustifolia		+	
Angiopteris evecta	+	+	
NEPHROLEPIDACEAE			
Nephrolepis auriculata	+	+	
Nephrolepis davallioides	+	+	
Nephrolepis falcata		+	
Nephrolepis hirsutula	+		+
OLEANDRACEAE			
Oleandra pistillaris	+		+
OPHIOGLOSSACEAE			
Helminthostachys zeylanica	+	+	
POLYPODIACEAE			
Colysis macrophylla	+	+	
Colysis pedunculata	+	+	
Colysis pteropus		+	
Drynaria sparsisora	+		+
Goniophlebium korthalsii	+		+
Goniophlebium sp.	+		
Loxogramme avenia	+	+	
Loxogramme subecostata		+	
Microsorum heterocarpum	+		+
Phymatosorus nigrescens	+		+
Pyrrosia lanceolata	+	+	
Pyrrosia rasamalae		+	
Selliguea enervis	+	+	
Selliguea heterocarpa	+	+	
Selliguea taeniata var. *palmata*	+	+	
Selliguea triloba	+	+	
PTERIDACEAE			
Pteris ensiformis	+	+	
Pteris grevilleana		+	

FAMILY / Species	Zulkifli *et al.*	Lee *et al.*	New Records
Pteris mertensioides		+	
Pteris oppositipinna	+		+
Pteris tripartita		+	
Pteris vittata		+	
SCHIZAEACEAE			
Lygodium circinatum		+	
Lygodium flexuosum	+	+	
Lygodium microphyllum		+	
Schizaea dichotoma		+	
Schizaea digitata	+	+	
THELYPTERIDACEAE			
Amphineuron interruptum		+	
Christella arida		+	
Christella parasitica		+	
Pronephrium repandum	+	+	
Pronephrium rubicundum	+	+	
Sphaerostephanos heterocarpus	+		+
VITTARIACEAE			
Antrophyum callifolium	+	+	
Monogramma dareicarpa		+	
Vaginularia trichoidea	+		+
Vittaria angustifolia	+		+
Vittaria elongata		+	
Vittaria scolopendrina	+		+
WOODSIACEAE			
Diplazium sorzogonense	+		+
Diplazium tomentosum	+		+
Total number of species	**95**	**112**	**39**

On the coastal area at Kampung Paya in Tanjung Pauh, *Nephrolepis auriculata*, *Stenochlaena palustris* and *Pteris ensiformis* dominate the rocks in open places. There are several others like *Asplenium nidus*, *A. macrophyllum* and *Pyrrosia*

lanceolata which were found on rocks by the beach, whereas *Lygodium flexuosum* can be easily seen scrambling over the bushes nearby. A single individual of *Helminthostachys zeylanica* was observed in open ground.

The trail from Kampung Paya runs across several small streams under primary forest of Gunung Kajang foothill. One small stream known as Sungai Ayer Pertama is dominated with a species, *Bolbitis sinuata*, on rock and terrestrial in flood area of the stream. Along streams, *Bolbitis appendiculata* ssp. *appendiculata* grows in similar habitat with the above species. Other rock ferns such as *Cephalomanes javanicum* grow on expose rock surface in the stream.

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 wallichi*, *Selaginella wildenovii* and *Colysis pedunculata* among others. Another small stream called Ayer Suring shows the same fern flora but no *Bolbitis sinuata* found. *Microsorum heterocarpum* grows on rock in shady area. Holttum (1968) recorded that this species has the south limit not further than the Main Range. Riparian ferns such as *Pleocnemia conjugata* and *Pteridrys syrmatica* are found along streams but not in large groups, were new records for Pulau Tioman. Holttum (1968), noted that *Pleocnemia conjugata* was less common in Peninsular Malaysia, probably correlated with its lowland habitat and preference for lightly shaded places which do not occur in normal fully shaded primitive forest.

Another notable place called Ayer Orang Puteh was furnished with naked surface of rocks with a small stream that flows underneath, giving a wet and moist habitat which is a suitable place for rock-loving ferns especially members of Hymenophyllaceae such as *Cephalomanes javanicum*, *Meringium acanthoides*, *Microgonium bimarginatum* and *Selenodesmium obscurum*. Other lithophytic ferns found were *Asplenium affine*, *A. borneense*, *A. scolopendrioides*, *Antrophyum callifolium*, *Colysis macrophylla* and *Loxogramme avenia*. Ayer Orang Puteh at the altitude of 650 m also the lowest limit of Cyatheaceae found in Gunung Kajang area; *Cyathea eriophora* was found on the bank near rocky part of Ayer Orang Puteh.

The area upwards of Air Orang Puteh shows more diversity in fern flora. Out of 95 species of ferns and fern-allies collected from Gunung Kajang area, 49 species (52 %) were collected in the very limited area above 700 m. Bukit Permatang (850 m.) was familiar with ferns of Cyatheaceae and Dennsteadtiaceae. Two species of *Cyathea* i.e. *Cyathea hymenodes* and *Cyathea obscura* were new records to Pulau Tioman. *Histiopteris incisa* grows on rock with a thin layer of humus. *Asplenium robustum* which grows on high branches of trees in Main Range, especially at Cameron Highlands, was found growing on rock at Bukit Permatang. This species is now rare (Piggot, 1988).

Along the trail reaching the summit, ferns of Gleicheniaceae were found growing in several places. Two species of *Dicranopteris* and one species each from *Diplopterygium*, *Gleichenia* and *Sticherus* were found in this area but not found elsewhere at the lower altitude. The summit of Gunung Kajang (1030 m.) is characterised with the present of *Cheiropleuria bicuspis* which only grows in lower montane

forest. Holttum (1968), noted that specimen from Pulau Tioman has a special form with four-lobed sterile fronds, while our collection showed the form with two-lobed sterile fronds which is the common form of this species. Ferns of family Grammitidaceae which grow on mossy branch of trees and rocks also characterised the summit of Gunung Kajang. Among them were *Prosaptia celebica* and *Prosaptia leysii* which were new records of Pulau Tioman ferns. Another notable fern species at the summit was *Histiopteris incisa* which colonised the landslide area on the north banks of the summit.

Checklist of Ferns and Fern-Allies of the Gunung Kajang Area

FERN-ALLIES

1. LYCOPODIACEAE

1.1 ***Huperzia*** Bernh.

One species found in Gunung Kajang area.

1.1.1 ***Huperzia phlegmaria*** (L.) Rothm.
Lycopodium phlegmaria L.

Epiphyte. Lower montane forest. Elevation: 1000-1030 m.

Material: SUMMIT TRAIL: Elevation 1000 m, *Zulkifli & R. Jaman*, RJ 2921 (UKMB); SUMMIT: Elevation 1030 m, *Zulkifli & R. Jaman*, RJ 2936 (UKMB).

1.2 ***Lycopodiella*** Holub

One species found in Gunung Kajang area, restricted mostly near the summit of the hill.

1.2.1 ***Lycopodiella cernua*** (L.) Pic. Serm.
Lycopodium cernuum Linn.

Terrestrial. Upper hill dipterocarp to lower montane forest. Elevation: 950-1000 m.

Material: SUMMIT TRAIL: Elevation ca. 950 m, *Zulkifli & R. Jaman*, RJ 2888 (UKMB); ca.1000 m elevation, RJ 2939 (UKMB).

2. SELAGINELLACEAE

2.1. ***Selaginella*** Beauv.

A total of 8 species recorded for Pulau Tioman and 6 from the Gunung Kajang area, mostly in shaded area.

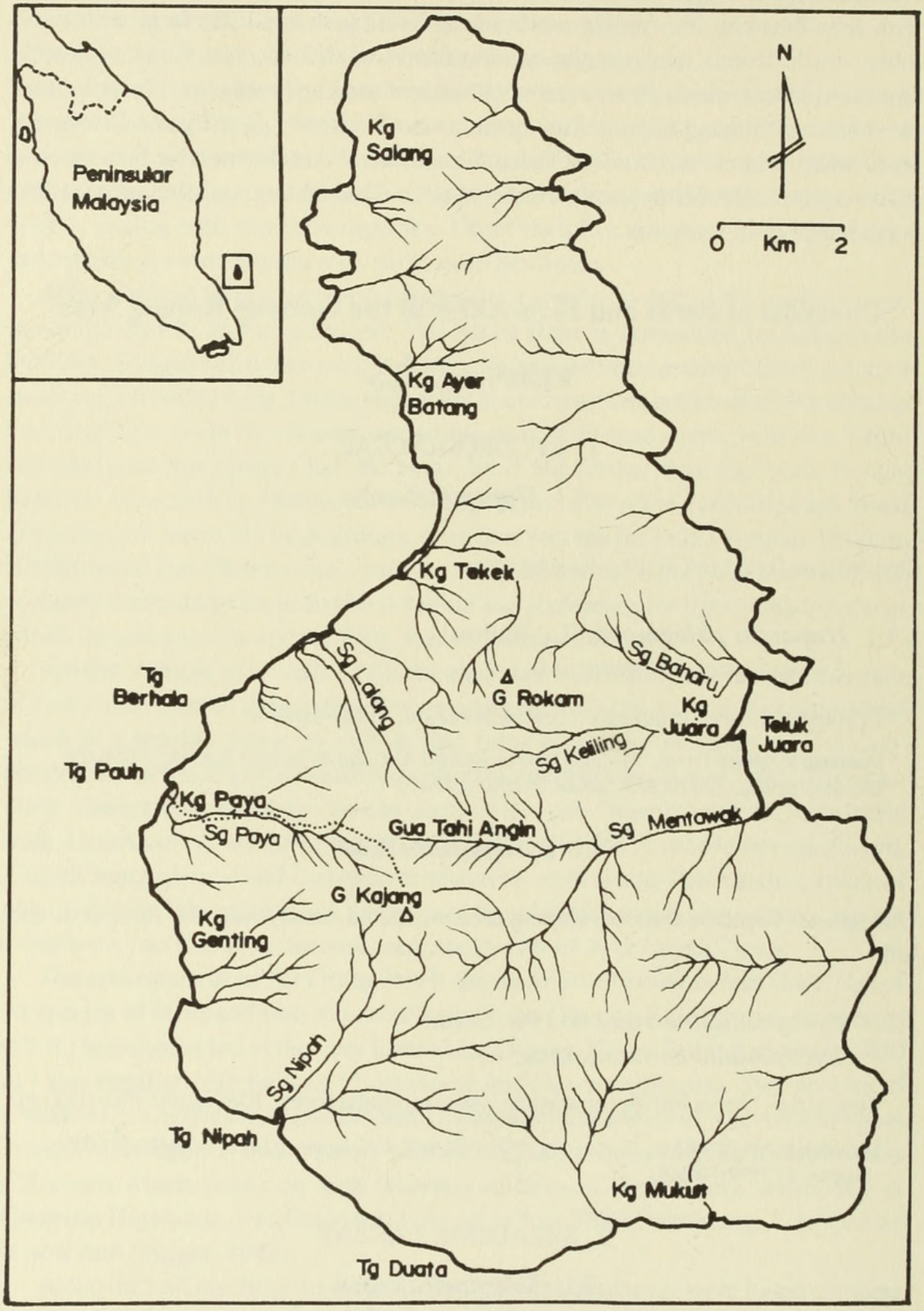

Figure 1. Map of Pulau Tioman, showing collection trail (....) to the summit of Gunung Kajang and several previous collecting localities

2.1.1 ***Selaginella alutacia*** Spring

Lithophyte. Upper hill dipterocarp forest. Elevation: 780-940 m.

Material: GUA TAHI ANGIN TRAIL: Elevation ca. 780 m, *Zulkifli & R. Jaman*, RJ 2899 (UKMB); Elevation ca. 940 m, *Zulkifli & R. Jaman*, RJ 2966 (UKMB).

2.1.2 ***Selaginella delicatula*** (Desv.) Alston

Terrestrial. Upper hill dipterocarp forest.

Material: BUKIT PERMATANG: Elevation ca. 780 m, *Zulkifli & R. Jaman*, RJ 2918 (UKMB).

2.1.3 ***Selaginella intermedia*** (Bl.) Spring var. ***intermedia***
Selaginella atroviridis Spring

Terrestrial. Upper hill dipterocarp forest.

Material: SUMMIT TRAIL: Elevation ca. 920 m, *Zulkifli & R. Jaman*, RJ 2924 (UKMB).

2.1.4 ***Selaginella selangorensis*** Bedd. ex Ridl.

Terrestrial. Upper hill dipterocarp forest to lower montane forest. Elevation 950-1000 m.

Material: SUMMIT TRAIL: Elevation ca. 1000 m, *Zulkifli & R. Jaman*, RJ 2898 (UKMB); Elevation ca. 950 m, *Zulkifli & R. Jaman*, RJ 2935 (UKMB).

2.1.5 ***Selaginella wallichii*** (Hook. & Grev.) Spring

Terrestrial. Hill dipterocarp forest. Elevation 350-880 m.

Material:SUNGAI AIR PERTAMA TRAIL: Elevation ca. 380 m, *Zulkifli & R. Jaman*, RJ 2829 (UKMB); Elevation ca. 350 m, *Zulkifli & R. Jaman*, RJ 2832 (UKMB); BUKIT PERMATANG: Elevation ca. 880 m, *Zulkifli & R. Jaman*, RJ 2877 (UKMB).

2.1.6 ***Selaginella willdenovii*** (Desv.) Baker

Terrestrial, forming thicket. Hill dipterocarp forest.

Material: SUNGAI AIR PERTAMA TRAIL: Elevation ca. 380 m, *Zulkifli & R. Jaman*, RJ 2830 (UKMB).

FERNS

3. ADIANTACEAE

3.1 ***Taenitis*** Willd

This genus has never been recorded from Pulau Tioman before. Two species were found in Gunung Kajang area.

3.1.1 ***Taenitis blechnoides*** (Willd.) Sw.

Terrestrial. Upper hill dipterocarp forest to lower montane forest. Elevation: 940- 1030 m.

Material: SUMMIT TRAIL: Elevation ca. 940 m, *Zulkifli & R. Jaman*, RJ 2969 (UKMB); SUMMIT: Elevation ca. 1030 m, *Zulkifli & R. Jaman*, RJ 2882 (UKMB).

3.1.2 ***Taenitis dimorpha*** Holttum

Terrestrial in semi-shade. Lower montane forest. Elevation: 1020-1030 m.

Material: SUMMIT: Elevation ca. 1030 m, *Zulkifli & R. Jaman*, RJ 2886 (UKMB); Elevation ca. 1020 m, *Zulkifli & R. Jaman*, RJ 2960 (UKMB).

4. ASPLENIACEAE

4.1 ***Asplenium*** L.

This genus contributed the largest number of species among the fern families of Gunung Kajang. A total of nine species were identified with two of them, *A. nidus* and *A. robustum* being new records for Pulau Tioman.

4.1.1 ***Asplenium affine*** Sw.
Asplenium spathulinum J. Sm.

On semi-shaded rock. Hill dipterocarp forest.

Material: AYER ORANG PUTEH: Elevation ca. 600 m, *Zulkifli & R. Jaman*, RJ 2861 (UKMB).

4.1.2 ***Asplenium borneense*** Hook.

On semi-shaded rock. Hill dipterocarp forest.

Material: AYER ORANG PUTEH: Elevation ca. 600 m, *Zulkifli & R. Jaman*, RJ 2856 (UKMB).

4.1.3 ***Asplenium macrophyllum*** Sw.

On exposed rock. Coastal vegetation.

Material: KAMPONG PAYA: Elevation ca. 1 m, *Zulkifli & R. Jaman*, RJ 2817 (UKMB).

4.1.4 ***Asplenium nidus*** L.

On exposed rock. Coastal vegetation.

Material: KAMPONG PAYA: Elevation ca.1 m, *Zulkifli & R. Jaman*, RJ 2818 (UKMB).

4.1.5 ***Asplenium normale*** D. Don

On shaded rock. Hill dipterocarp forest.

Material: SUMMIT TRAIL: Elevation ca. 700 m, *Zulkifli & R. Jaman*, RJ 2920 (UKMB).

4.1.6 ***Asplenium robustum*** Bl.

On shaded rock. Upper hill dipterocarp forest.

Material: BUKIT PERMATANG: Elevation ca. 850 m, *Zulkifli & R. Jaman*, RJ 2864 (UKMB).

Note: Piggot (1988), noted that this species was commonly observed as epiphytes on higher branches of trees in Cameron Highlands but is now difficult to find.

4.1.7 ***Asplenium scolopendrioides*** J. Sm. ex Hook.

On semi-shaded rock. Hill dipterocarp forest. Elevation: 460-600 m.

Material: AYER SURING TRAIL: Elevation ca. 460 m, *Zulkifli & R. Jaman*, RJ 2834 (UKMB); AYER SURING: Elevation ca. 480 m, *Zulkifli & R. Jaman*, RJ 2839 (UKMB); AYER ORANG PUTEH: Elevation ca. 600 m, *Zulkifli & R. Jaman*, RJ 2857 (UKMB).

4.1.8 ***Asplenium sublaserpitiifolium*** Ching

On semi-shaded rock. Hill dipterocarp forest. Elevation: 520 m.

Material: AYER ORANG PUTEH TRAIL: Elevation ca. 520 m, *Zulkifli & R. Jaman*, RJ 2845 (UKMB).

Note: This species probably is 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 occurence of the species on Pulau Tioman is thus an interesting extension of range as the species described by Ching were collected from the neighbouring parts of Southern China.

4.1.9 ***Asplenium unilaterale*** Lam.

On semi-shaded rock. Hill dipterocarp forest.

Material: AYER SURING: Elevation ca. 480 m, *Zulkifli & R. Jaman*, RJ 2848 (UKMB); *Zulkifli & R. Jaman*, RJ 2852 (UKMB).

5. BLECHNACEAE

5.1 ***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.

5.1.1 ***Blechnum finlaysonianum*** Hook. & Grev.

Terrestrial in shade. Hill dipterocarp forest.

Material: SUNGAI AYER PERTAMA TRAIL: Elevation ca. 350 m, *Zulkifli & R. Jaman*, RJ 2914 (UKMB).

5.2 ***Stenochlaena*** J. Sm.

A genus with only one species recorded from Malaysia and has not been recorded before from Pulau Tioman.

5.2.1 ***Stenochlaena palustris*** (Burm. f.) Bedd.

Climber in open situations. Coastal vegetation.

Material: KAMPONG PAYA: Elevation ca.1 m, *Zulkifli & R. Jaman*, RJ 2821 (UKMB).

6. CHEIROPLEURIACEAE

6.1 ***Cheiropleuria*** C. Presl

The only species in the genus recorded in Malaysia. It is a species found near the summit of Gunung Kajang.

6.1.1 ***Cheiropleuria bicuspis*** (Bl.) C. Presl

Terrestrial in shade. Lower montane forest.

Material: SUMMIT TRAIL: Elevation ca. 1020 m, *Zulkifli & R. Jaman*, RJ 2961 (UKMB).

7. CYATHEACEAE

7.1 ***Cyathea*** Sm.

A total of 7 species recorded for Pulau Tioman, 3 were new records, found in Gunung Kajang area.

7.1.1 ***Cyathea eriophora*** Holttum

Terrestrial in semi-shade. Hill dipterocarp forest.

Material: AYER ORANG PUTEH: Elevation ca. 650 m, *Zulkifli & R. Jaman*, RJ 2879 (UKMB).

7.1.2 ***Cyathea hymenodes*** Mett.
Cyathea latebrosa (Wall.)Copel. var. *indusiata* Holttum

Terrestrial in light shade. Upper hill dipterocarp forest. Elevation: 850-950 m.

Material: BUKIT PERMATANG: Elevation ca. 850 m, *Zulkifli & R. Jaman*, RJ 2946 (UKMB), Elevation ca. 880 m, *Zulkifli & R. Jaman*, RJ 2872 (UKMB); SUMMIT TRAIL TO TELUK JUARA: Elevation ca. 950 m, *Zulkifli & R. Jaman*, RJ 2933 (UKMB).

7.1.3 ***Cyathea obscura*** (Scort.) Copel.

Terrestrial in open situations. Upper hill dipterocarp forest to lower montane forest. Elevation: 850-1020 m.

Material: BUKIT PERMATANG: Elevation ca. 850 m, *Zulkifli & R. Jaman*, RJ 2927 (UKMB); SUMMIT TRAIL: Elevation ca. 1020 m, *Zulkifli & R. Jaman*, RJ 2959 (UKMB).

8. DAVALLIACEAE

8.1 *Araiostegia* Copel.

Only one species recorded from Malaysia. On Pulau Tioman this species was found at Bukit Permatang.

8.1.1 *Araiostegia hymenophylloides* (Bl.) Copel.

On rock in semi-shade. Upper hill dipterocarp forest.

Material: BUKIT PERMATANG: Elevation ca. 800 m, *Zulkifli & R. Jaman*, RJ 2863 (UKMB).

8.2 *Davallia* Sm.

One species found from three species recorded from Pulau Tioman.

8.2.1 *Davallia divaricata* Bl.

On rock in light shade. Upper hill dipterocarp forest.

Material: BUKIT PERMATANG: Elevation ca.850 m, *Zulkifli & R. Jaman*, RJ 2865 (UKMB).

8.3 *Humata* Cav.

Two species were found in Gunung Kajang area.

8.3.1 *Humata angustata* (Wall. ex Hook. & Grev.) J. Sm.

Terrestrial and climber, lithophyte and on old stump in semi-shade. Upper hill dipterocarp forest to lower montane forest. Elevation: 780-1020 m.

Material: SUMMIT TRAIL: Elevation ca. 1000 m, *Zulkifli & R. Jaman*, RJ 2887 (UKMB), Elevation 1000 m, RJ 2890 (UKMB), Elevation ca. 1020 m, *Zulkifli & R. Jaman*, RJ 2963 (UKMB); BUKIT PERMATANG TRAIL: Elevation ca. 780 m, *Zulkifli & R. Jaman*, RJ 2919 (UKMB).

8.3.2 *Humata repens* (L. f.) Diels

Epiphyte in light expose. Upper hill dipterocarp forest to lower montane forest. Elevation: 820-1030 m.

Material: BUKIT PERMATANG: Elevation ca. 820 m, *Zulkifli & R. Jaman*, RJ 2868 (UKMB); SUMMIT TRAIL: Elevation ca. 1000 m, *Zulkifli & R. Jaman*, RJ 2889 (UKMB); SUMMIT: Elevation ca.1030 m, *Zulkifli & R. Jaman*, RJ 2929 (UKMB).

9 DENNSTEADTIACEAE

9.1 *Microlepia* C. Presl

One species found in Gunung Kajang area.

9.1.1 ***Microlepia speluncae*** (L.) T. Moore var. ***villosissima*** C. Chr.

Terrestrial in light shade. Hill dipterocarp forest.

Material: SUNGAI AYER PERTAMA TRAIL: Elevation ca. 350 m, *Zulkifli & R. Jaman*, RJ 2833 (UKMB).

9.2 ***Histiopteris*** (Agardh) J. Sm.

One species found from two different habitats, i.e. terrestrial and rock.

9.2.1 ***Histiopteris incisa*** (Thunb.) J. Sm.

Terrestrial and lithophyte in open situations. Upper hill dipterocarp forest to lower montane forest. Elevation: 840-1030 m.

Material: SUMMIT: Elevation ca. 1030 m, *Zulkifli & R. Jaman*, RJ 2883 (UKMB); BUKIT PERMATANG: Elevation ca. 840 m, *Zulkifli & R. Jaman*, RJ 2956 (UKMB).

9.3 ***Lindsaea*** Dryander

Three species were found in Gunung Kajang area from five species recorded for Pulau Tioman. One sterile specimen cannot be identified.

9.3.1 ***Lindsaea doryphora*** Kramer
Lindsaea scandens Hooker var. *terrestris* Holttum

Terrestrial in light shade. Hill dipterocarp forest to upper hill dipterocarp forest. Elevation: 580-880 m.

Material: AYER ORANG PUTEH TRAIL: Elevation ca. 580 m, *Zulkifli & R. Jaman*, RJ 2847 (UKMB); BUKIT PERMATANG: Elevation ca. 820 m, *Zulkifli & R. Jaman*, RJ 2875 (UKMB), Elevation ca. 880 m, *Zulkifli & R. Jaman*, RJ 2878 (UKMB).

9.3.2 ***Lindsaea parasitica*** (Roxb. ex Griff.) Hieron.
Lindsaea scandens Hooker

Climber in shade. Upper hill dipterocarp forest. Elevation: 750-850 m.

Material: BUKIT PERMATANG TRAIL: Elevation ca. 750 m, *Zulkifli & R. Jaman*, RJ 2869 (UKMB); BUKIT PERMATANG: Elevation ca. 850 m, *Zulkifli & R. Jaman*, RJ 2876 (UKMB).

9.3.3 ***Lindsaea repens*** (Bory) Thwaites var. ***pectinata*** (Bl.) Mett. ex Kuhn

Epiphyte in semi-shade. Lower montane forest.

Material: SUMMIT TRAIL: Elevation ca. 1000 m, *Zulkifli & R. Jaman*, RJ 2942 (UKMB).

9.3.4 ***Lindsaea*** sp.

On rock and scrambling over small bushes in shade. Hill dipterocarp forest. Sterile.

Material: AYER ORANG PUTEH TRAIL: Elevation ca. 550 m, *Zulkifli & R. Jaman*, RJ 2851 (UKMB).

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

Two species are identified and *T. luzonicum* var. *luzonicum* is a new record for Pulau Tioman.

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

Terrestrial in shade. Upper hill dipterocarp forest.

Material: SUMMIT TRAIL: Elevation ca. 960 m, *Zulkifli & R. Jaman*, RJ 2964 (UKMB).

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

Terrestrial in shade. Upper hill dipterocarp forest.

Material: BUKIT PERMATANG: Elevation ca. 880 m, *Zulkifli & R. Jaman*, RJ 2874 (UKMB).

10. DIPTERIDACEAE

10.1 ***Dipteris*** Reinw.

One species found on summit of Gunung Kajang.

10.1.1 ***Dipteris conjugata*** Reinw.

Terrestrial in open situations. Lower montane forest.

Material: SUMMIT: Elevation ca.1030 m, *Zulkifli & R. Jaman*, RJ 2885 (UKMB).

11. DRYOPTERIDACEAE

11.1 ***Didymochlaena*** Desv.

Only one species occurs in Gunung Kajang area.

11.1.1 ***Didymochlaena truncatula*** (Sw.) Sw.

Terrestrial in shade. Hill dipterocarp forest.

Material: AYER ORANG PUTEH TRAIL: Elevation ca. 520 m, *Zulkifli & R. Jaman*, RJ 2842 (UKMB).

11.2 ***Pleocnemia*** C. Presl

One species is identified from Gunung Kajang area and is a new record for Pulau Tioman.

11.2.1 ***Pleocnemia conjugata*** (Bl.) C. Presl

Terrestrial in semi-shade. Lowland dipterocarp forest to hill dipterocarp forest. Elevation: 210-560 m.

Material: SUNGAI AYER PERTAMA TRAIL: Elevation ca. 210 m, *Zulkifli & R. Jaman*, RJ 2827 (UKMB); AYER SURING TRAIL: Elevation ca. 560 m, *Zulkifli & R. Jaman*, RJ 2906 (UKMB).

Note: Holttum (1968), noted that this species was collected twice in Peninsular Malaysia, once near Melaka and once at Baling, Kedah.

11.3 ***Polystichum*** Roth.

This genus has never been recorded previously from Pulau Tioman.

11.3.1 ***Polystichum prolificans*** Alderw.

Terrestrial and lithophyte in light shade. Upper hill dipterocarp forest. Elevation: 800-880 m.

Material: BUKIT PERMATANG: Elevation ca. 800 m, *Zulkifli & R. Jaman*, RJ 2862 (UKMB); SUMMIT TRAIL: Elevation ca. 880 m, *Zulkifli & R. Jaman*, RJ 2871(UKMB).

11.4 ***Pteridrys*** C. Chr & Ching

One species found in Gunung Kajang area.

11.4.1 ***Pteridrys syrmatica*** (Willd.) C. Chr. & Ching

Terrestrial and lithophyte in light shade. Lowland dipterocarp forest. Elevation: 160-300 m.

Material: SUNGAI AYER PERTAMA TRAIL: Elevation ca. 160 m, *Zulkifli & R. Jaman*, RJ 2833 (UKMB); Elevation ca. 210 m, *Zulkifli & R. Jaman*, RJ 2826 (UKMB); SUNGAI AYER PERTAMA: Elevation ca. 300 m, *Zulkifli & R. Jaman*, RJ 2909 (UKMB).

11.5 ***Tectaria*** Cav.

One species found out of two species recorded on Pulau Tioman.

11.5.1 ***Tectaria grandidentata*** (Cesati) Holttum

Terrestrial in shade. Hill dipterocarp forest.

Material: AYER ORANG PUTEH TRAIL: Elevation ca. 550 m, *Zulkifli & R. Jaman*, RJ 2846 (UKMB).

12. GLEICHENIACEAE

12.1 ***Dicranopteris*** Bernh.

Two species were found in Gunung Kajang. *Dicranopteris curranii* is a new record for Pulau Tioman.

12.1.1 ***Dicranopteris curranii*** Copel.

Terrestrial and scrambling in exposed lower montane forest.

Material: SUMMIT: Elevation ca. 1030 m, *Zulkifli & R. Jaman*, RJ 2912 (UKMB).

12.1.2 ***Dicranopteris linearis*** (Burm. f.) Underw. var. ***montana*** Holttum

Terrestrial and scrambling in light-shaded lower montane forest.

Material: SUMMIT TRAIL: Elevation ca. 1000 m, *Zulkifli & R. Jaman*, RJ 2934 (UKMB).

12.1.3 ***Dicranopteris linearis*** (Burm. f.) Underw. var. ***subpectinata*** (H. Christ) Holttum

Terrestrial in expose. Upper hill dipterocarp forest to lower montane forest. Elevation: 950-1000 m.

Material: SUMMIT TRAIL: Elevation ca. 950 m, *Zulkifli & R. Jaman*, RJ 2931 (UKMB); Elevation ca.1000 m, *Zulkifli & R. Jaman*, RJ 2940 (UKMB).

12.2 ***Diplopterygium*** (Diels) Nakai

12.2.1 ***Diplopterygium longissimum*** (Bl.) Nakai
Gleichenia longissima Bl.

Scrambling in expose. Lower montane forest.

Material: SUMMIT TRAIL: Elevation ca.1000 m, Zulkifli & R. Jaman, RJ 2881 (UKMB).

12.3 ***Gleichenia*** Sm.

One species was identified from Gunung Kajang.

12.3.1 ***Gleichenia microphylla*** R. Br. var. ***semivestita*** (Labill.) v.A.v.R.

Terrestrial in open situationse. Lower montane forest.

Material: SUMMIT TRAIL: Elevation ca. 1000 m, *Zulkifli & R. Jaman*, RJ 2932 (UKMB).

12.4 ***Sticherus*** Presl

12.4.1 ***Sticherus truncatus*** (Willd.) Nakai var. ***truncatus***
Gleichenia truncata (Willd.) Spring var. *truncata; Gleichenia laevigata* (Willd.) Hk.

Terrestrial in light-shaded lower montane forest.

Material: SUMMIT: Elevation ca.1030 m, *Zulkifli & R. Jaman*, RJ 2938 (UKMB).

13. GRAMMITIDACEAE

13.1 *Ctenopteris* Bl. ex Kunze

One species was identified from Gunung Kajang.

13.1.1 ***Ctenopteris blechnoides*** (Grev.) W.H. Wagner & Grether
Ctenopteris moultonii (Copel.) C. Chr. & Tard.

Epiphyte and lithophyte in light shade. Upper hill dipterocarp forest to lower montane forest. Elevation: 820-1030 m.

Material: SUMMIT TRAIL: Elevation ca. 820 m, *Zulkifli & R. Jaman*,RJ 2867 (UKMB); Elevation ca. 1000 m, *Zulkifli & R. Jaman*, RJ 2896 (UKMB); SUMMIT: Elevation ca. 1030 m, *Zulkifli & R. Jaman*, RJ 2930 (UKMB); BUKIT PERMATANG: Elevation ca. 860 m.(Trail to Gunung Kajang), *Zulkifli & R. Jaman*, RJ 2953 (UKMB).

13.2 *Grammitis* Sw.

A single species of *Grammitis* was found in Gunung Kajang area.

13.2.1 ***Grammitis adspersa*** Bl.

Epiphyte and lithophyte in shade. Hill dipterocarp forest to lower montane forest. Elevation: 580-1030 m.

Material: SUMMIT: Elevation ca. 1030 m, *Zulkifli & R. Jaman*, RJ 2893 (UKMB); AYER ORANG PUTEH: Elevation ca. 580 m, *Zulkifli & R. Jaman*,RJ 2943 (UKMB).

13.3 *Prosaptia* Presl

Two species are found in Gunung Kajang and Prosaptia leysii is a new record for Pulau Tioman.

13.3.1 ***Prosaptia celebica*** (Bl.) Tagawa & K. Iwatsuki
Ctenopteris celebica (Bl.) Copel.

Epiphyte in semi-shade. Lower montane forest.

Material: SUMMIT: Elevation ca. 1030 m, *Zulkifli & R. Jaman*, RJ 2892 (UKMB).

Note: Holttum (1968), stated that this species has been found twice in mainland Peninsular Malaysia (once on Gunung Tahan (1830 m) and the other at an unrecorded place in Perak.)

13.3.2 ***Prosaptia leysii*** (Baker) Ching
Ctenopteris leysii (Bak.) Holtt.

Epiphyte in semi-shade. Upper hill dipterocarp forest to lower montane forest. Elevation: 860-1000 m.

Material: SUMMIT TRAIL: Elevation ca. 1000 m, *Zulkifli & R. Jaman*, RJ 2901 (UKMB); BUKIT PERMATANG: Elevation ca. 860 m, *Zulkifli & R. Jaman*, RJ 2952 (UKMB).

Note: Holttum (1968), noted that the southern limit of distribution of this species in Peninsular Malaysia is Gunung Ledang (Mount Ophir) at elevations varying from 150 m to 760 m.

13.4 ***Scleroglossum*** v.A.v.R.

Only one species occurs in Gunung Kajang area.

13.4.1 ***Scleroglossum debile*** (Kuhn) Alderw.

Epiphyte in shade. Upper hill dipterocarp forest.

Material: SUMMIT TRAIL: Elevation ca. 900 m, *Zulkifli & R. Jaman*, RJ 2894 (UKMB).

14. HYMENOPHYLLACEAE

14.1 ***Cephalomanes*** C. Presl

14.1.1 ***Cephalomanes javanicum*** (Bl.) Bosch
Trichomanes javanicum Blume

On semi-exposed rock. Lowland dipterocarp forest to lower montane forest. Elevation: 200-1030 m.

Material: SUNGAI AYER PERTAMA TRAIL: Elevation ca. 200 m, *Zulkifli & R. Jaman*, RJ 2825 (UKMB); AYER SURING: Elevation ca. 480 m, *Zulkifli & R. Jaman*, RJ 2840 (UKMB); AYER ORANG PUTEH: Elevation ca. 600 m, *Zulkifli & R. Jaman*, RJ 2858 (UKMB); SUMMIT: Elevation ca. 1030 m, *Zulkifli & R. Jaman*, RJ 2937 (UKMB).

14.2 ***Meringium*** C. Presl

14.2.1 ***Meringium acanthoides*** (Bosch) Copel.
Hymenophyllum acanthoides Bosch

On shaded rock. Hill dipterocarp forest.

Material: AYER ORANG PUTEH: Elevation ca. 600 m, *Zulkifli & R. Jaman*, RJ 2970 (UKMB).

14.3 ***Microgonium*** C. Presl

14.3.1 ***Microgonium bimarginatum*** Bosch
Trichomanes bimarginatum Bosch

On shaded rock. Hill dipterocarp forest. Elevation: 650 m.

Material: AYER ORANG PUTEH: Elevation ca. 650 m, *Zulkifli & R. Jaman*, RJ 2970 (UKMB).

14.4 ***Selenodesmium*** (Prantl) Copel.

14.4.1 ***Selenodesmium obscurum*** (Bl.) Copel.
Trichomanes obscurum Bl.

Terrestrial and lithophytic in shade. Hill dipterocarp forest to upper hill dipterocarp forest. Elevation: 600 - 780 m.

Material: GUA TAHI ANGIN TRAIL: Elevation ca. 780 m, *Zulkifli & R. Jaman*, RJ 2900 (UKMB); AYER ORANG PUTEH: Elevation ca. 600 m, *Zulkifli & R. Jaman*, RJ2900A (UKMB).

14.5 ***Vandenboschia*** Copel.

14.5.1 ***Vandenboschia birmanica*** (Bedd.) Ching
Trichomanes radicans Sw. auct.

On shaded rock. Hill dipterocarp forest.

Material: AYER SURING: Elevation ca. 489 m, *Zulkifli & R. Jaman*, RJ 2836 (UKMB).

Note: Holttum (1968), recorded that only one small specimen has been collected at Cameron Highland and postulated that this highland is the southern limit of this species in South-east Asia.

15. LOMARIOPSIDACEAE

15.1 ***Bolbitis*** Schott

Three species are found in Gunung Kajang and *B. appendiculata* ssp. *appendiculata* is a new record for Pulau Tioman.

15.1.1 ***Bolbitis appendiculata*** (Willd.) K. Iwatsuki ssp. ***appendiculata***
Egenolfia appendiculata (Willd.) J. Sm. ssp. *appendiculata*

On shaded rock. Lowland dipterocarp forest.

Material: SUNGAI AYER PERTAMA TRAIL: Elevation ca. 200 m, *Zulkifli & R. Jaman*, RJ 2835 (UKMB).

15.1.2 ***Bolbitis heteroclita*** (C. Presl) Ching

Terrestrial in shade. Hill dipterocarp forest.

Material: AYER SURING: Elevation ca. 480 m, *Zulkifli & R. Jaman*, RJ 2837 (UKMB).

15.1.3 ***Bolbitis sinuata*** (C. Presl) Hennipman
Bolbitis malaccensis (C. Chr.) Ching

On shaded rock. Lowland dipterocarp forest.

Material: KAMPONG PAYA: Elevation ca. 50 m, *Zulkifli & R. Jaman*, RJ 2910 (UKMB).

15.2 ***Elaphoglossum*** Schott

A genus of six species recorded from Peninsular Malaysia, but only one species occurs in Gunung Kajang area.

15.2.1 ***Elaphoglossum melanostictum*** (Bl.) T. Moore

On shaded rock. Hill dipterocarp forest to upper hill dipterocarp forest. Elevation: 580-880 m.

Material: BUKIT PERMATANG: Elevation ca. 880 m, *Zulkifli & R. Jaman*, RJ 2891 (UKMB); AYER ORANG PUTEH TRAIL: Elevation ca. 580 m, *Zulkifli & R. Jaman*, RJ 2904 (UKMB); SUMMIT TRAIL: Elevation ca. 840 m, *Zulkifli & R. Jaman*, RJ 2947 (UKMB).

Note: Holttum (1968) noted that this species was found in Penang, but nowhere else in Peninsular Malaysia.

15.3 ***Teratophyllum*** Mett. ex Kuhn

One species found in Gunung Kajang area.

15.3.1 ***Teratophyllum aculeatum*** (Bl.) Mett. var. ***montanum*** Holttum

Climber in light shade. Hill dipterocarp forest to upper hill dipterocarp forest. Elevation: 550-920 m.

Material: SUMMIT-TELUK JUARA TRAIL: Elevation ca. 920 m, *Zulkifli & R. Jaman*, RJ 2965 (UKMB); AYER ORANG PUTEH TRAIL: Elevation ca. 550 m, *Zulkifli & R. Jaman*, RJ 2851 (UKMB).

16. MARATTIACEAE

16.1 ***Angiopteris*** Hoffm.

Only one species occurs in Gunung Kajang.

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

Terrestrial. Hill dipterocarp forest.

Material: AYER ORANG PUTEH: Elevation ca. 610 m, *Zulkifli & R. Jaman*, RJ 2917 (UKMB).

17. NEPHROLEPIDACEAE

17.1 ***Nephrolepis*** Schott

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

17.1.1 ***Nephrolepis auriculata*** (L.) Trimen
Nephrolepis biserrata (Sw.) Schott

Terrestrial and climbing, and lithophyte in shade and expose. Coastal vegetation to upper hill dipterocarp forest. Elevation: 1-950 m.

Material: KAMPONG PAYA: Elevation ca. 1 m, *Zulkifli & R. Jaman*, RJ 2816 (UKMB); AYER SURING: Elevation ca. 210 m, *Zulkifli & R. Jaman*, RJ 2843 (UKMB); BUKIT PERMATANG: Elevation ca. 820 m, *Zulkifli & R. Jaman*, RJ 2922 (UKMB); SUMMIT-TELUK JUARA TRAIL: Elevation ca. 950 m, *Zulkifli & R. Jaman*, RJ 2968 (UKMB).

17.1.2 ***Nephrolepis davallioides*** (Sw.) Kunze
Nephrolepis acuminata (Houtt.) Kuhn

Terrestrial and epiphyte in light shade. Lower montane forest.

Material: SUMMIT: Elevation ca. 1030 m, *Zulkifli & R. Jaman*, RJ 2884 (UKMB).

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

Terrestrial in expose. Lowland dipterocarp forest. Elevation: 70 m.

Material: AYER SURING TRAIL: Elevation ca. 70 m, *Zulkifli & R. Jaman*, RJ 2911 (UKMB).

18. OLEANDRACEAE

18.1 ***Oleandra*** Cav.

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

18.1.1 ***Oleandra pistillaris*** (Sw.) Cav.

Terrestrial in light shade. Lower montane forest.

Material: Gunung Kajang, near summit. Observed.

19. OPHIOGLOSSACEAE

19.1 ***Helminthostachys*** Kaulf.

Only one individual was observed during the survey.

19.1.1 ***Helminthostachys zeylanica*** (L.) Hook.

Terrestrial. Alluvial vegetation.

Material: KAMPONG PAYA: Elevation ca. 2 m. Observed.

20. POLYPODIACEAE

20.1 ***Colysis*** C. Presl

Two species are found from the Gunung Kajang area.

20.1.1 ***Colysis macrophylla*** (Bl.) C. Presl

On rock in semi-shade. Hill dipterocarp forest.

Material: AYER ORANG PUTEH: Elevation ca. 600 m, *Zulkifli & R. Jaman*, RJ 2859 (UKMB).

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

On rock in shade. Lowland dipterocarp forest to upper hill dipterocarp forest. Elevation: 180-850 m.

Material: SUNGAI AYER PERTAMA TRAIL: Elevation ca. 180 m, *Zulkifli & R. Jaman*, RJ 2824 (UKMB); AYER SURING: Elevation ca. 480 m, *Zulkifli & R. Jaman*, RJ 2841 (UKMB); Elevation ca. 480 m, *Zulkifli & R. Jaman*, RJ 2853 (UKMB); BUKIT PERMATANG: Elevation ca. 850 m, *Zulkifli & R. Jaman*, RJ 2895 (UKMB).

20.2 ***Drynaria*** J. Sm.

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

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

Epiphyte in semi-shade. Hill dipterocarp forest.

Material: SUNGAI AYER PERTAMA: Elevation ca. 460 m, *Zulkifli & R. Jaman*, RJ 2908 (UKMB).

20.3 ***Goniophlebium*** (Bl.) 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*.

20.3.1 ***Goniophlebium korthalsii*** (Mett.) Bedd.

Epiphyte in light shade. Upper hill dipterocarp forest.

Material: SUMMIT TRAIL FROM TELUK JUARA: Elevation ca. 950 m, *Zulkifli & R. Jaman*, 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.

20.3.2 ***Goniophlebium*** sp.

Terrestrial in semi-shade. Lowland dipterocarp forest. Sterile.

Material: AYER SURING TRAIL: Elevation ca. 210 m, *Zulkifli & R. Jaman*, RJ 2843. (UKMB).

20.4 ***Loxogramme*** C. Presl

Only one species found in Gunung Kajang area from two species recorded for Pulau Tioman.

20.4.1 ***Loxogramme avenia*** (Bl.) C. Presl

On exposed rock. Hill dipterocarp forest.

Material: AYER ORANG PUTEH: Elevation ca. 600 m, *Zulkifli & R. Jaman*, RJ 2860 (UKMB).

20.5 ***Microsorum*** Link.

One species was identified from Gunung Kajang area and is a new record for Pulau Tioman.

20.5.1 ***Microsorum heterocarpum*** (Bl.) Ching

On shaded rock. Hill dipterocarp forest to upper hill dipterocarp forest. Elevation: 480-800 m.

Material: AYER SURING: Elevation ca. 480 m, *Zulkifli & R. Jaman*, RJ 2838 (UKMB); SUMMIT TRAIL: Elevation ca. 800 m, *Zulkifli & R. Jaman*, RJ 2926 (UKMB).

20.6 ***Phymatosorus*** Pic. Serm.

20.6.1 ***Phymatosorus nigrescens*** (Blume) Pic. Serm.
Phymatodes nigrescens (Bl.) J. Sm.

On shaded rock. Hill dipterocarp forest.

Material: AYER ORANG PUTEH: Elevation ca. 580 m, *Zulkifli & R. Jaman*, RJ 2950 (UKMB).

20.7 ***Pyrrosia*** Mirbel

Only one species found during the survey.

20.7.1 ***Pyrrosia lanceolata*** (Linn.) Farwell
Pyrrosia adnascens (Sw.) Ching

On exposed rock. Coastal vegetation.

Material: KAMPUNG PAYA: Elevation ca. 1 m, *Zulkifli & R. Jaman*, RJ 2819 (UKMB).

20.8 ***Selliguea*** Bory

Four species found in Gunung Kajang area.

20.8.1 ***Selliguea enervis*** (Cav.) Ching
Cypsinus enervis (Cav.) Copel.

Epiphyte in light shade. Upper hill dipterocarp forest.

Material: SUMMIT TRAIL: Elevation ca. 950 m, *Zulkifli & R. Jaman*, RJ 2887 (UKMB).

20.8.2 ***Selligua heterocarpa*** (Bl.) Bl.

On rock in light shade. Upper hill dipterocarp forest.

Material: SUMMIT TRAIL: Elevation ca. 750 m, *Zulkifli & R. Jaman*, RJ 2925 (UKMB).

20.8.3 ***Selliguea taeniata*** (Sw.) Parris
Crypsinus taeniatus (Sw.) Copel..

On exposed rock. Upper hill dipterocarp forest.

Material: BUKIT PERMATANG: Elevation ca. 820 m, *Zulkifli & R. Jaman*, RJ 2866 (UKMB).

20.7.4 ***Selliguea triloba*** (Houtt.) M.G. Price
Crypsinus trilobus (Houtt.) Copel.

Epiphyte in light-shade. Lower montane forest.

Material: SUMMIT: Elevation ca. 1030 m, *Zulkifli & R. Jaman*, RJ 2903, RJ 2905 (UKMB).

21. PTERIDACEAE

21.1 ***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.

21.1.1 ***Pteris ensiformis*** Burm. f.

Terrestrial in open situations. Coastal vegetation.

Material: KAMPONG PAYA: Elevation ca. 3 m, *Zulkifli & R. Jaman*, RJ 2822 (UKMB).

21.1.2 ***Pteris oppositipinna*** Fée
Pteris asperula J. Sm. ex Hieron.

Terrestrial in light-shade. Upper hill dipterocarp forest.

Material: BUKIT PERMATANG: Elevation ca. 840 m, *Zulkifli & R. Jaman*, RJ 2928 (UKMB).

Note: Holttum (1968), noted that this species was only recorded in Selangor, Pulau Pinang and Negeri Sembilan.

22. SCHIZAEACEAE

22.1 ***Lygodium*** Sw.

Three species are recorded from Pulau Tioman but only one species found during the survey in Gunung Kajang and surrounding area.

22.1.1 ***Lygodium flexuosum*** (L.) Sw.

Terrestrial and scrambling over bushes. Coastal vegetation.

Material: KAMPONG PAYA: Elevation ca. 1 m, *Zulkifli & R. Jaman*, RJ 2820 (UKMB).

22.2 ***Schizaea*** Smith

Only one species found, mostly near summit of Gunung Kajang.

22.2.1 ***Schizaea digitata*** (Linn.) Sw.

Terrestrial. Upper hill dipterocarp to lower montane forest. Elevation 950-1020 m.

Material: SUMMIT TRAIL: Elevation ca. 1000 m, *Zulkifli & R. Jaman*, RJ 2897 (UKMB); Elevation ca. 950 m, *Zulkifli & R. Jaman*, RJ 2941 (UKMB); Elevation ca. 1020 m, *Zulkifli & R. Jaman*, RJ 2962 (UKMB).

23. THELYPTERIDACEAE

23.1 ***Pronephrium*** C. Presl

Two species are found in Gunung Kajang area and *P. repandum* is a new record for Pulau Tioman.

23.1.1 ***Pronephrium repandum*** (Fée) Holttum

Terrestrial in light shade. Hill dipterocarp forest. Elevation: 380-580 m.

Material: SUNGAI AYER PERTAMA TRAIL: Elevation ca. 380 m, *Zulkifli & R. Jaman*, RJ 2828 (UKMB); AYER ORANG PUTEH: Elevation ca. 580 m, *Zulkifli & R. Jaman*, RJ 2850 (UKMB).

23.1.2 ***Pronephrium rubicundum*** (Alderw.) Holttum

Terrestrial in shade. Hill dipterocarp forest. Elevation: 510-750 m.

Material: AYER ORANG PUTEH TRAIL: Elevation ca. 510 m, *Zulkifli & R. Jaman*, RJ 2844 (UKMB); Elevation ca. 510 m, *Zulkifli & R. Jaman*, RJ 2849 (UKMB); BUKIT PERMATANG TRAIL: Elevation 750 m, *Zulkifli & R. Jaman*, RJ 2870 (UKMB).

23.2 ***Sphaerostephanos*** J. Smith

One species found and is a new record for Pulau Tioman.

23.2.1 ***Sphaerostephanos heterocarpus*** (Bl.) Holttum
Cyclosorus heterocarpus (Bl.) Ching

Terrestrial in light shade. Hill dipterocarp forest. Elevation: 360-550 m.

Material: AYER SURING TRAIL: Elevation ca. 360 m, *Zulkifli & R. Jaman*, RJ 2831 (UKMB); Elevation ca.550 m, *Zulkifli & R. Jaman*, RJ 2907 (UKMB).

24. VITTARIACEAE

24.1 ***Antrophyum*** Kaulf.

Only one species found in Gunung Kajang area.

24.1.1 ***Antrophyum callifolium*** Bl.

On shaded rock. Hill dipterocarp forest.

Material: AYER ORANG PUTEH: Elevation ca. 600 m, *Zulkifli & R. Jaman*, RJ 2855 (UKMB).

24.2 ***Vaginularia*** Fée

24.2.1 ***Vaginularia trichoidea*** Fée
Monogramma trichoidea J. Sm.

Epiphyte in shade. Lower montane forest.

Material: SUMMIT: Elevation ca. 1030 m, *Zulkifli & R. Jaman*, RJ 2948 (UKMB).

24.3 ***Vittaria*** Sm.

Two species are found in the Gunung Kajang area.

24.2.1 ***Vittaria angustifolia*** Bl.

On shaded rock. Upper hill dipterocarp forest. Elevation: 840-850 m.

Material: BUKIT PERMATANG: Elevation ca. 850 m, *Zulkifli & R. Jaman*, RJ 2902 (UKMB); Elevation ca. 840 m, *Zulkifli & R. Jaman*, RJ 2951 (UKMB).

24.3.2 ***Vittaria scolopendrina*** (Bory) Thw.

On shaded rock. Upper hill dipterocarp forest.

Material: BUKIT PERMATANG: Elevation ca. 900 m, *Zulkifli & R. Jaman*, RJ 2902 (UKMB).

25. WOODSIACEAE

25.1 ***Diplazium*** Sw.

This genus was never recorded previously from Pulau Tioman. Two species are found in Gunung Kajang area.

25.1.1 ***Diplazium sorzogonense*** (C. Presl) C. Presl
Athyrium sorzogonense (C. Presl) Milde

Terrestrial in open situations. Upper hill dipterocarp forest.

Material: BUKIT PERMATANG TRAIL: Elevation ca. 780 m, *Zulkifli & R. Jaman*, RJ 2873 (UKMB).

25.1.2 ***Diplazium tomentosum*** Bl.

On shaded rock. Upper hill dipterocarp forest.

Material: GUA TAHI ANGIN: Elevation ca. 950 m, *Zulkifli & R. Jaman*, RJ 2923 (UKMB).

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