

Contribution to the Pteridophyte Flora of Langkawi Archipelago, Peninsular Malaysia

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Abstrak: Flora paku pakis di Kepulauan Langkawi mengandungi 130 spesies, satu subspecies dan 12 varieti dalam 68 genus dan 27 famili. Nilai ini merangkumi 22.1% dari 647 takson di peringkat spesies dan ke bawah yang dilaporkan di Semenanjung Malaysia. Daripada 143 takson paku pakis di peringkat spesies dan ke bawah yang dilaporkan, lapan spesies dalam dua genus dan dua famili terdiri dari likofit sementara baki 135 takson dalam 66 genus dan 25 famili adalah terdiri dari monilofit atau pakis pakis.

Kata kunci: Paku Pakis, Flora, Kepulauan Langkawi, Monilofit, Likofit

Abstract: The pteridophyte flora of Langkawi Archipelago consists of 130 species, one subspecies and 12 varieties in 68 genera and 27 families. This figure represents 22.1% of the 647 taxa at species level and below reported for Peninsular Malaysia. Out of the 143 taxa of pteridophytes at species level and below recorded, eight species in two genera and two families are lycophytes and the other 135 taxa in 66 genera and 25 families are monilophytes or ferns.

Keywords: Ferns, Flora, Langkawi archipelago, Monilophyte, Lycophyte

The richness and uniqueness of the pteridophytes (ferns and lycophytes) of Langkawi archipelago were realized a long time ago by many botanists and plant collectors and many collections were made from various parts of the islands. Among the important fern collectors of Langkawi islands are Md. Haniff, Md. Nur, H.C. Robinson, M.R. Henderson, H.N. Ridley, R.E. Holttum, S.C. Chin, A. Bidin, R. Jaman and

recently the authors. The first account of ferns of Langkawi appears in Ridley (1908), who reported several species. This is followed by Henderson (1939) and Holttum (1968).

Chin (1977) studied the fern flora of limestone hills of Peninsular Malaysia including those located on Langkawi islands. He reported the presence of three species of calcicolous ferns from Langkawi. Ten years later, Bidin (1987) reported a total of 145 taxa of ferns at species level and below from this group of islands. The present report is mainly based on collections made during a scientific expedition in 2003 and also data from several herbaria.

During the expedition organized by Universiti Kebangsaan Malaysia, pteridophyte specimens were collected along various jungle trails on the main island (e.g. Gunung Raya trail, Gunung Machinchang, Telaga Tujuh and Kisap Forest) and several surrounding islands viz. Dayang Bunting Island, Tuba Island, Singa Besar Island and Langgun Island. Habitats of pteridophyte along the trails and its vicinities were surveyed in order to obtain as many specimens and species as possible. Areas in the vicinity of stream were carefully examined as the shady and very moist environments are suitable for the growth of ferns. All specimens collected by the authors during the expedition are wrapped in newspaper, wetted with alcohol and stored in a plastic bag. Evaporation from the newspaper keeps the plants cool and moist. To prepare a herbarium specimen, material from the plastic bag was transferred to a standard plant press and pressed flat and dried in oven (50⁰C). The dried specimens than identified following identification keys to species in Holttum (1968) and Parris et al. (2010, 2013). The identified species then deposited at Universiti Kebangsaan Malaysia herbarium (UKMB). Specimens that have been previously collected and deposited in herbaria of several institutions such as Universiti Kebangsaan Malaysia (UKMB), Universiti Malaya (KLU), Kew Botanical Garden (K) and Singapore (SING) were also examined in this study.

Pteridophyte of Langkawi archipelago comprises 143 taxa at species level and below in 68 genera and 27 families (appendix 1). These represents 22.1% of the 647 taxa at species level and below reported for Peninsular Malaysia (Parris & Latiff 1997). The occurrence of various vegetation types in the islands such as limestone, mangrove, lowland, beach strand vegetation and heath forest support and made the flora of pteridophytes here very diverse and unique.

The lycophytes in this archipelago are represented by only two families viz Lycopodiaceae (one species) and Selaginellaceae (seven species). The other 135 taxa are ferns belonging to 65 genera and 23 families. The largest family which occur in Langkawi archipelago are Pteridaceae with 27 species followed by Polypodiaceae (22 species), Thelypteridaceae (13 species), Hymenophyllaceae (9 species) and Aspleniaceae, Dryopteridaceae and Selaginellaceae with 8 species each.

The pteridophyte flora of the islands is more luxuriant due to the influence of Thailand climatic elements and limestone outcrops (Latiff 1994). Some interesting species viz. *Adiantum philippense*, *Aglaomorpha coronans*, *Bolbitis malaccensis*, *Drynaria bonii*, *Platynerium holttumii*, *Selaginella griffithii*, and *Tectaria brachiata*, are found in Langkawi islands. *Adiantum philippense*, *D. bonii*, *P. holttumii* and *T. brachiata* are restricted to the northern part of Malaya (Holttum 1968, Bidin 1987). Meanwhile *Aglaomorpha coronans* which are mainly distributed in Asian mainland is known only from Langkawi in Peninsular Malaysia (Bidin 1987). The rare *Bolbitis malaccensis* which is known only from one collection in Thailand has been found only in Langkawi and Tioman islands. Furthermore *Selaginella griffithii* has been reported in Thailand and in Langkawi (Wong 1982).

There are some differences between result of the previous study (Bidin 1987) and the present one. In this paper the authors managed to add additional species of lycophytes (eight species) which were not reported in the previous study. The compiled list presented here is base on current accepted names as given in latest monographic works. This means that the previous list contain names that are not in use or synonyms. For example Bidin and Jaman (1986) described *P. platylobum* as a novel species, which is found in Langkawi, but in the latest revision of the Polypodiaceae (Hovenkamp 2013), it was reduced as synonym under *Platynerium coronarium*. The same trend happens in the Davalliaceae. Bidin (1987) listed *Humata repens* and *Humata vestita* as distinct species but Nootboom (2013) lumped these two spesies and recognized them as *Davallia repens*.

Pteridophytes in Langkawi archipelago are more diverse compare to pteridophytes in other offshore islands due to the large size of the main island and also the occurrence of various vegetation types in the islands such as limestone hill, mangrove, lowland, beach strand vegetations and heath forest.

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Appendix 1

Checklist of pteridophytes. The current enumeration is the updated version of the flora based on Parris (2010). All new records are marked with an asterisk (*).

Lycophytes

LYCOPODIACEAE

**Lycopodiella cernua* (L.) Pic. Serm.

SELAGINELLACEAE

**Selaginella argentea* (Wall. ex Hook. & Grev.) Spring

**Selaginella delicatula* (Desv. ex Poir) Alston

**Selaginella griffithii* Spring

**Selaginella intermedia* (Blume) Spring

**Selaginella minutifolia* Spring

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

**Selaginella willdenowii* (Desv.) Baker

Monilophytes

ASPENIACEAE

Asplenium macrophyllum Sw.

Asplenium nidus L. var. *nidus*

Asplenium paradoxum Bl.

Asplenium pellucidum Lam.

Asplenium phyllitidis D. Don

Asplenium salignum Bl.

Asplenium tenerum G. Forster

BLECHNACEAE

Blechnum orientale L.

Stenochlaena palustris (Burm. f.) Bedd.

CIBOTIACEAE

Cibotium barometz (L.) J. Sm.

CYATHEACEAE

Cyathea borneensis Copel.

Cyathea contaminans (Wall. ex Hook.) Copel.

Cyathea glabra (Bl.) Copel.

DAVALLIACEAE

Davallia denticulata (Burm.f.) Mett.

Davallia divaricata Bl.

Davallia trichomanoides Bl. var. *lorrainei* (Hance) Holtt.

Davallia trichomanoides Bl. var. *trichomanoides*

Davallia repens (L.fil.) Diels

Davallia pectinata (Sm.) Desv.

DENNSTAEDTIACEAE

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

Microlepia strigosa (Thunb.) C.Presl

DRYOPTERIDACEAE

Bolbitis appendiculata (Willd.) K. Iwatsuki

Bolbitis heteroclita (C. Presl.) Ching

Bolbitis malaccensis (C.Chr.) Ching

Bolbitis virens (Hook. & Grev.) Hennisman var. *compacta* Hennisman

Ctenitis subobscura (H. Christ) Holttum

Elaphoglossum callifolium (Bl.) T. Moore

Polystichum prolificans Alderw.

GLEICHENIACEAE

Dicranopteris linearis (Burm.f.) Underw.

Dicranopteris speciosa (C. Presl) Holtt.

HYMENOPHYLLACEAE

Cephalomanes javanicum (Blume) Bosch

Crepidomanes bipunctatum (Poir.) Copel.

Crepidomanes kurzii (Bedd.) Tagawa & K. Iwat.

Gonocormus minutus (Blume) Bosch

Meringium denticulatum (Sw.) Copel.

Microtrichomanes digitatum (Sw.) Copel.

Pleuromanens pallidum (Blume) C. Presl

Selenodesmium obscurum (Blume) Copel.

Vandenboschia maxima (Blume) Copel.

LINDSAEACEAE

Lindsaea ensifolia Sw.

Lindsaea heterophylla Dryand.

Lindsaea lucida Blume

Lindsaea parasitica (Roxburgh ex Griffith) Hieron

Lindsaea repens (Bory) Thwaites

Tapeinidium pinnatum (Cav.) C.Chr.

LOMARIOPSIDACEAE

Cyclopeltis crenata (Fée) C. Chr .

Lomariopsis lineata (C. Presl.) Holttum

LYGODIACEAE

Lygodium circinnatum (Burm.f.) Sw.

Lygodium flexuosum (L). Sw.

Lygodium microphyllum (Cav.) R. Brown

Lygodium polystachyum Wall. ex T. Moore

Lygodium salicifolium C. Presl

MARATTIACEAE

Angiopteris evecta (Forst.) Hoffm.

MARSILEACEAE

Marsilea crenata C. Presl.

NEPHROLEPIDACEAE

Nephrolepis auriculata (L.) Trimen

Nephrolepis hirsutula (G. Forst.) C. Presl

OLEANDRACEAE

Oleandra neriiformis Cav.

OPHIOGLOSSACEAE

Helminthostachys zeylanica (L.) Hook.

Ophioglossum reticulatum L.

PARKERIACEAE

Acrostichum aureum L.

Acrostichum speciosum Willd.

POLYPODIACEAE

Aglaomorpha coronans (Mett.) Copel.

Belvisia mucronata (Fée) Copel.

Drynaria sparsisora (Desv.) T. Moore

Drynaria rigidula (Sw.) Beddome

Drynaria bonii Chr.

Goniophlebium persicifolium (Desv.) Bedd.

Lecanopteris sinuosa (Wall. ex Hook.) Cope1.

Leptochilus macrophyllus (Blume) Noot. var. *macrophyllus*

Leptochilus macrophyllus (Blume) Noot. var. *pedunculatus* (Hook. & Grev.) Noot.

Loxogramme avenia (Bl.) C. Presl

Microsorium heterocarpum (Bl.) Ching

Microsorium nigrescens (Bl.) Pic.Serm.

Microsorium punctatum (L.) Copel.

Microsorium scolopendria (Burm.f.) Pic. Serm.

Platycerium coronarium (J. König) Desv.

Platycerium holttumii de Jonch. & Hennipm.

Pyrrosia lanceolata (L.) Farw.

Pyrrosia longifolia (Burm. f.) C.V. Morton

Pyrrosia penangiana (Hook.) Holtt.

Pyrrosia piloselloides (L.) M. G. Price

Pyrrosia stigmata (Sw.) Ching

PTERIDACEAE

Adiantum caudatum L.

Adiantum capillus-veneris L.

Adiantum latifolium Lam

Adiantum mathewsianum Hook.

Adiantum peruvianum Kl.

Adiantum philippense L.

Adiantum polyphyllum Willd.

Adiantum steno-chylamys Bak.

Adiantum tenerum Swartz.

Adiantum trapeziforme L.

Antrophyum callifolium Bl.

Ceratopteris thalictroides (L.) Brongn.

Cheilanthes tenuifolia (Burm.f.) Sw.

Doryopteris ludens (Wall. ex Hook) J. Sm.

Haplopteris angustifolia Bl.

Haplopteris ensiformis Sw. var. *ensiformis*

Haplopteris ensiformis Sw. var. *latifolia* Holttum.

Hemionitis arifolia (Burm.f) T. Moore

Pityrogramma calomelanos (L.) Link

Pteris biaurita L.

Pteris ensiformis Burm.f.

Pteris longipinnula Wall. ex J. Agardh.

Pteris mertensioides Willd. subsp. *mertensioides*

Pteris scabripes Wall. ex J. Agardh.

Pteris venulosa Bl.

Pteris vittata L.

Taenitis blechnoides (Willd.) Sw.

SALVINIACEAE

Azolla pinnata R. Br. var. *imbricata* (Roxb.) Bonap.

SCHIZAEACEAE

Actinostachys digitata (L.) Wall. ex Reed

Schizaea dichotoma (L.) J.E. Smith

TECTARIACEAE

Pleocnemia irregularis (C. Presl) Holtt.

Tectaria brachiata (Zoll. & Mor.) C.V. Morton

Tectaria semipinnata (Roxb.) C.V. Morton

Tectaria angulata (Willd.) Copel.

Tectaria fissa (Kunze) Holttum

THELYPTERIDACEAE

Amphineuron immersum (Bl.) Holttum

Amphineuron opulentum (Kaulf.) Holttum

Amphineuron terminans (Hook.) Holttum

Christella dentata (Forssk.) Brownsey & Jermy

Christella parasitica (L.) Lev.

Christella papilio (C. Hope) Holttum

Christella subpubescens (Bl.) Holttum

Cyclosorus interruptus (Willd.) H. Ito

Mesophlebion chlamydophorum (C. Chr.) Holttum

Pronephrium asperum (C. Presl.) Holttum

Pronephrium repandum (Fée) Holttum

Sphaerostephanos heterocarpus (Bl.) Holttum

Sphaerostephanos penniger (Hook.) Holttum var. *penniger*

WOODSIACEAE

Diplazium bantamense Bl.

Diplazium esculentum (Retz) Sw.

Diplazium malaccense C. Presl