

## SHORT COMMUNICATION

### Contribution to the Pteridophyte Flora of Langkawi Archipelago, Peninsular Malaysia

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**Abstrak:** Flora paku pakis di Kepulauan Langkawi mengandungi 130 spesies, 1 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, 8 spesies dalam 2 genus dan 2 famili terdiri dari likofit sementara baki 135 takson dalam 66 genus dan 25 famili terdiri dari monilofit atau paku pakis.

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

**Abstract:** The pteridophyte flora of Langkawi Archipelago consists of 130 species, 1 subspecies and 12 varieties in 68 genera and 27 families. This value represents 22.1% of the 647 taxa at the species level and below reported for Peninsular Malaysia. Of the 143 recorded taxa of pteridophytes at the species level and below, 8 species in 2 genera and 2 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 the Langkawi archipelago were observed a long time ago by many botanists and plant collectors leading to many collections being made from various parts of the islands. Among the important fern collectors of the 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 the ferns of Langkawi appeared in Ridley (1908), who reported several species. This was followed by the observations of Henderson (1939) and Holttum (1968).

Chin (1977) studied the fern flora of the limestone hills of Peninsular Malaysia including those located on the 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 the species level and below from this group of islands. The present report is focused on collections made during a scientific expedition in 2003 and data from several herbaria.

During the expedition organised by the Universiti Kebangsaan Malaysia (UKM), 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, including Dayang Bunting Island,

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Tuba Island, Singa Besar Island and Langgun Island. Habitats of pteridophyte along the trails and its vicinities were surveyed to obtain as many specimens and species as possible. Areas in the vicinity of a stream were carefully examined as these shady and very moist environments are suitable for the growth of ferns. All specimens collected by the authors during the expedition were 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 an oven (50°C). The dried specimens were then identified by following the identification keys to species by Holttum (1968) and Parris *et al.* (2010, 2013). The identified species were then deposited at the UKM herbarium (UKMB). Specimens that have been previously collected and deposited in herbaria of several institutions, such as UKM (UKMB), Universiti Malaya (KLU), Kew Botanical Garden (K) and Singapore (SING), were also examined in this study.

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

The lycophytes in this archipelago are represented by only two families: Lycopodiaceae (one species) and Selaginellaceae (seven species). The other 135 taxa are ferns belonging to 65 genera and 23 families. The largest family that occurs 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, namely *Adiantum philippense*, *Aglaomorpha coronans*, *Bolbitis malaccensis*, *Drynaria bonii*, *Platynerium holttumii*, *Selaginella griffithii*, and *Tectaria brachiata*, are found in the Langkawi islands. *A. philippense*, *D. bonii*, *P. holttumii* and *T. brachiata* are restricted to the northern part of Malaya (Holttum 1968; Bidin 1987). Meanwhile, *A. coronans*, which are mainly distributed in the Asian mainland, is known only from Langkawi in Peninsular Malaysia (Bidin 1987). The rare *B. malaccensis*, which is known only from one collection in Thailand, has been found only in the Langkawi and Tioman islands. Furthermore *S. griffithii* has been reported in Thailand and in Langkawi (Wong 1982).

There are some differences between the results of the previous study (Bidin 1987) and the present one. In this paper, the authors added additional species of lycophytes (eight species) which were not reported in the previous study. The compiled list presented here is based on the currently accepted names as given in the latest monographic works. This means that the previous list contains 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 to a synonym under *Platynerium coronarium*. The same trend occurred in the Davalliaceae. Bidin (1987) listed *Humata repens* and *Humata vestita* as distinct species, but Nootboom (2013) lumped these two species and recognised them as *Davallia repens*.

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

## ACKNOWLEDGEMENT

The authors wish to thank the curators of the following herbarium: KLU, K, UKMB, National Herbarium of Malaysia (KEP) and SING for giving permission to access and study the herbarium specimens. This study was carried out with funding from UKM through UKM-GUP-2011-174 for which the authors are very grateful.

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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

#### ASPLENIACEAE

*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.) Copel.

*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.

*Platyserium coronarium* (J. König) Desv.

*Platyserium holtumii* 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 stigmosa* (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 stenochylamys* 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