

## XI. A PRELIMINARY SURVEY OF THE FERN FLORA OF PENANG HILL

M. BECKER

Herongerstr. 2, D-47638 Straelen, Germany

## SUMMARY

List of fern species collected on Penang Hill, West Malaysia, between mid January / late February 1992. 105 species in 54 genera, 18 families, with brief notes on habitats and ecology.

## INTRODUCTION

The fern flora of Penang Hill has been the focus of interest of botanists from all over the world for a considerable time. Over 100 years ago, in November 1892, CHARLES CURTIS, founder of the botanical gardens in Penang, published a list of all species that had been found on the whole of Penang Island. It comprises 158 species collected by several botanists at various places on the island. Of these at least 110 species are either explicitly recorded to have been collected on Penang Hill or are very likely to have occurred there. Many specimens found were mentioned by HOLTUM (1966), but no recent checklist of Penang Hill's fern species seems to have been published.

This list is the result of approximately 14 days of fieldwork. I collected 152 plants belonging to 105 fern species in 54 genera. The specimens are lodged in the herbarium at the Universiti Sains Malaysia in Georgetown on Penang Island (USM).

The short period of fieldwork was not sufficient to cover the whole area. Twenty additional species not collected by me but found by previous workers on Penang Hill (Holtum, 1966) can still be expected to occur in low abundances. They are not listed here. Synonyms used by Holtum (1966) or Piggott (1988) are added if they differ from the names used here.

The sites where the specimens were taken are depicted on maps. These maps are not included in the present paper. Readers interested in further information on the exact locations may contact the herbarium at the Universiti Sains Malaysia.

## LIST

- Collecting numbers are indicated in brackets, all are preceded by 'Mal' = Malaysia.
- The taxonomic arrangement follows Kramer & Green (1990).

## MARATTIACEAE

*Angiopteris evecta* (G. Forst.) Hoffm. — 'Waterfall Track'; at roadside; fairly exposed; at c. 450 m; (1111).

*Angiopteris angustifolia* C. Presl — Upper tunnel road; close to walk way; exposed; only one specimen found on Penang Hill; at 690 m; (1121).

## SCHIZAEACEAE

*Schizaea digitata* (L.) Sw. — Crest of hill north-east of botanical garden; secondary forest; shady; on Penang Hill found in two locations only; at c. 210 m; (2111).

- Schizaea dichotoma* (L.) J. Sm. — Upper tunnel road; growing on water tank; exposed, but roots dripping wet; at c. 700 m; only two specimens found on Penang Hill; (2121).
- Lygodium microphyllum* (Cav.) R. Br. — *Lygodium scandens* Sw. — Road linking Bukit Bendera with Bukit Fern; close to Bukit Fern; fronds climbing on shrubs; exposed; at c. 720 m; not very common on Penang Hill; (2211).
- Lygodium longifolium* (Willd.) Sw. — *Lygodium digitatum* C. Presl — Bukit Bendera; close to Moniot road; fairly exposed; at 480 m; (2221).
- Lygodium salicifolium* C. Presl — *Lygodium flexuosum* (L.) Sw. — Botanical garden; fronds climbing on Ixora shrub; exposed; common in exposed situations; at 10 m; (2231).

## GLEICHENIACEAE

- Sticherus truncatus* (Willd.) Nakai — *Gleichenia truncata* (Willd.) Spreng. — *Gleichenia laevigata* (Willd.) Hook. — 'Waterfall Track'; 10 m off the road at foot of road embankment; scrambling on bare, heavily eroded soil; at c. 150 m; locally abundant; common on Penang Hill; (3111).
- Diplazium norrisii* (Mett.) Nakai — *Gleichenia norrisii* Mett. — 'Waterfall Track'; on road embankment; exposed; at c. 360 m; forming thickets; common on Penang Hill; (3211).
- Dicranopteris linearis* (Burm. f.) Underw. var. *subpectinata* (C. Chr.) Holttum — *Gleichenia linearis* (Burm. f.) var. *alternans* (Mett.) Holttum — Close to 'The Waterfalls'; in clearing; exposed; at c. 120 m; common on Penang Hill; (3312).
- Dicranopteris curanii* Copel. — *Gleichenia linearis* (Burm. f.) var. *malayana* v. A. v. R. — Close to 'Waterfall Track', above quarry; on heavily eroded, bare soil; exposed; at 40 m; very common in exposed situations on Penang Hill; (3321).
- Dicranopteris speciosa* (C. Presl) Holttum — *Gleichenia opposita* v. A. v. R. — Close to botanical garden; in clearing; fronds climbing; at 20 m; (3331).

## HYMENOPHYLLACEAE

- Meringium holochilum* (Bosch) Copel. — *Hymenophyllum holochilum* (Bosch) C. Chr. — Government Hill; on boulder in stream bed; shady; at c. 500 m; (4112).
- Meringium penangianum* (Matt. & C. Chr.) Copel. — *Hymenophyllum penangianum* Matt. & C. Chr. — Government Hill; epiphytic on tree trunk close to stream; shady; at c. 600 m; rare on Penang Hill; (4121).
- Meringium johorensis* (Holttum) Copel. — *Hymenophyllum johorensis* Holttum — Government Hill; on mossy boulder; shady; at c. 630 m; rare on Penang Hill; (4131).
- Meringium* (?) *acanthoides* (Bosch) Copel. — *Hymenophyllum acanthoides* (Bosch) Rosenst. — Government Hill; on boulder in stream bed, in forest; shady; at c. 630 m; rare on Penang Hill; specimen may be *Meringium denticulatum* (Sw.) Copel.; (4141).
- Meringium* (?) *denticulatum* (Sw.) Copel. — *Hymenophyllum denticulatum* Sw. — Government Hill; on mossy boulder; shady; identification uncertain; at c. 600 m; (4151).
- Mecodium polyanthos* (Sw.) Copel. — *Hymenophyllum polyanthos* Sw. — Government Hill; on tree trunk; shady; at c. 630 m; (4211).
- Mecodium productum* (Kunze) Copel. — *Hymenophyllum productum* Kunze — Government Hill; on boulder near stream; damp; shady; at c. 660 m; rare on Penang Hill; (4221).

- Mecodium badium* (Hook. & Grev.) Copel. — *Hymenophyllum badium* Hook. & Grev. — Government Hill; on boulder in stream bed; very shady and damp; at c. 630 m; rare on Penang Hill; (4231).
- Selenodesmium obscurum* (Bl.) Copel. — *Trichomanes obscurum* Bl. — Government Hill; on boulder, near stream; shady, moist; at c. 650 m; (4311).
- Crepidomanes christii* (Copel.) Copel. — *Trichomanes christii* Copel. — Close to lower tunnel road; on mossy boulder near stream; very shady and damp; at c. 550 m; (4411).
- Microgonium bimarginatum* Bosch — *Trichomanes bimarginatum* Bosch — On boulder near stream; shady; damp; found in various scattered locations on mossy boulders on Penang Hill (especially Western Hill); at c. 650 m; (4511).
- Cephalomanes javanicum* (Bl.) Bosch — *Trichomanes javanicum* Bl. — 'Waterfall Track'; 20 m next to road, on rock in stream bed; damp, shady situation (forest); common on Penang Hill; at c. 150 m; (4611).

## CYATHEACEAE

- Cyathea squamulata* (Bl.) Copel. — Tiger Hill; at margin of natural gap in primary forest; at c. 700 m; (5111).
- Cyathea contaminans* (Hook.) Copel. — Bukit Bendera; at roadside; fairly exposed; abundant on top of Bukit Bendera; at c. 700 m; (5122).
- Cyathea alternans* (Wall.) C. Presl — Lower tunnel road; at the side of the road; fairly exposed; at c. 600 m; (5132).
- Cyathea latebrosa* (Wall.) Copel. — Government Hill; near walk; fairly exposed; at c. 600 m; (5141).
- Cyathea moluccana* R. Br. — *Cyathea brunonis* Wall. ex Hook. — 'Waterfall Track'; 20 m next to road in forest; fairly shady; common on Penang Hill; at c. 150 m; (5151).
- Cyathea gigantea* (Wall.) Holttum — Government Hill; on boulder at stream; exposed; at c. 450 m; (5161).

## DIPTERIDACEAE

- Dipteris conjugata* Reinw. — 'Waterfall Track'; on road embankment; exposed; locally abundant; forming thickets; at 500 m; (6211).

## POLYPODIACEAE

- Phymatosorus scolopendria* (Burm.) Pic.-Serm. — *Phymatodes scolopendria* (Burm.) Ching — Botanical garden; on rock; exposed; common; at 10 m; (6111).
- Phymatosorus nigrescens* (Bl.) Pic.-Serm. — *Phymatodes nigrescens* (Bl.) J. Sm. — Botanical garden; on rock; near stream; fairly exposed; at 10 m; common; (6122).
- Crypsinus taeniatus* (Sw.) Copel. — Government Hill; fairly shady; damp; growing amongst mosses and filmy ferns; at c. 650 m; in low abundances at various locations on Penang Hill; (6311).
- Selliguea heterocarpa* (Bl.) Bl. — Close to 'The Waterfalls'; on rock; fairly shady; growing next to *Drynaria* spec.; at c. 200 m; (6412).
- Colysis acuminata* (Baker) Holttum — Close to botanical garden; on rocks at stream; at c. 50 m; (6511).

- Belvisia mucronata* (Fée) Copel. — Close to 'The Waterfalls'; on rock at stream; fairly exposed; at c. 200 m; (7111).
- Belvisia callifolia* (C. Chr.) Copel. — Government Hill; on boulder, near stream; fairly shady; at c. 450 m; less common than *B. mucronata* on Penang Hill; (7121).
- Drynaria sparsisora* (Desv.) T. Moore — Botanical garden; epiphytic on *Oncosperma tigillarum*; exposed; not uncommon on Penang Hill; at 10 m; (8111).
- Drynaria quercifolia* (L.) J. Sm. — Bukit Bendera; on rock; exposed; at c. 600 m; not uncommon on Penang Hill; (8121).
- Drynaria rigidula* (Sw.) Bedd. — On tree on left side of the entrance to the cable-car station on Bukit Bendera; well-grown plant; exposed; only one specimen found on Penang Hill; at 700 m; (8131).
- Platyterium coronarium* (Koenig) Desv. — 'Moongate Walk'; epiphytic on branch above stream bed; exposed; well-grown plants could only be found in places out of reach of collectors; at c. 200 m; (9111).
- Pyrrosia lanceolata* (L.) Farw. — *Pyrrosia adnascens* (G. Forst.) Ching — Close to botanical garden; epiphytic on branch; in forest; exposed; at c. 45 m; (9212).
- Pyrrosia angustata* (Sw.) Ching — Bukit Bendera; epiphytic on tree trunk next to road; very exposed; at 750 m; (9221).
- Pyrrosia piloselloides* (L.) Price — *Drymoglossum piloselloides* (L.) C. Presl — Close to 'The Waterfalls'; epiphytic on branch in canopy; exposed; not uncommon; at c. 200 m; (9231).
- Loxogramme forbesii* Copel. — Government Hill; on boulder; shady; at c. 650 m; (10111).
- Loxogramme avenia* (Bl.) C. Presl — Government Hill; near lower tunnel road; on mossy boulder by stream; very shady and damp; fronds form nest; at c. 550 m; (10121).

## GRAMMITIDACEAE

- Ctenopteris blechnoides* (Grev.) W.H. Wagner & Grether — *Ctenopteris moultoni* (Copel.) Holttum — Tiger Hill; in forest; on rock; at c. 60 m; common on Penang Hill; (10211).
- Acrosorus triangularis* (Scort.) Copel. — Government Hill; on mossy tree trunk; in forest; shady; at c. 650 m; (10311).

## THELYPTERIDACEAE

- Amphineuron opulentum* (Kaulf.) Holttum — *Cyclosorus extensus* (Bl.) Ching — Botanical garden; stream bed; fairly exposed; at 10 m; common; (10111).
- Macrothelypteris torresiana* (Gaud.) Ching — *Thelypteris uliginosa* (Kunze) Ching — Lower tunnel road; near asphalt on earth bank; exposed; at c. 570 m; (11211).
- Pronephrium salicifolium* (Wall.) Holttum — *Abacopteris salicifolia* (Wall.) Holttum — Close to 'The Waterfalls'; on rock; at c. 200 m; (11311).
- Pronephrium asperum* (C. Presl) Holttum — *Abacopteris multilineata* (Wall. ex Hook.) Ching var. *malayensis* Holttum — 'Waterfall Track'; 20 m near road, in forest; shady; terrestrial; close to stream; damp; at c. 150 m; (11321).
- Sphaerostephanus penniger* (Hook.) Holttum — *Cyclosorus megaphyllus* (Mett.) Ching — Lower tunnel road; next to road; fairly exposed; not common on Penang Hill; at c. 500 m; (11411).
- Christella parasitica* (L.) Liv. — *Cyclosorus parasiticus* (L.) Kuntze — Close to Bukit Fern; terrestrial on road embankment; exposed; at 700 m; common; (11611).

*Mesophlebion motleyanum* (Hook.) Holttum — *Thelypteris motleyana* (Hook.) Holttum — Government Hill; shady; at 600 m; (11711).

## DENNSTAEDTIACEAE

*Microlepia speluncae* (L.) T. Moore var. *villosissima* C. Chr. — 80 m Northeast of botanical garden; in clearing; near stream; exposed; at 30 m; (12112).

*Pteridium aquilinum* (L.) Kuhn var. *wightianum* (Agardh) Tryon — Bukit Bendera; upper tunnel road; on road embankment; exposed; at 700 m; (12211).

*Pteridium caudatum* (L.) Maxon var. *yarrabense* (Domin) Parris — *Pteridium esculentum* (G. Forst.) Nakai — Bukit Bendera; upper tunnel road; near road; exposed; forming thicket; at c. 700 m; (12222).

*Lindsaea parallelogramma* Alderw. — *Lindsaya parallelogramma* v. A. v. R. — Government Hill; terrestrial; in forest; at 600 m; (13111).

*Lindsaea doryphora* Kramer — *Lindsaya scandens* Hook. var. *terrestris* Holttum — Government Hill; terrestrial in primary forest; shady; at c. 700 m; (13121).

*Lindsaea parasitica* (Roxb.) Hieron. — *Lindsaya scandens* Hook. — Close to Bukit Bendera; in forest; shady; rhizome climbing on young tree trunk; at 600 m; (13131).

*Lindsaea integra* Holttum — *Lindsaya nitida* auct. non Copel. — In forest; terrestrial on ridge; soil mossy; shady; at c. 250 m; (13141).

*Lindsaea napaea* v. A. v. R. — *Lindsaya napaea* auct. v. A. v. R. — Government Hill; primary forest; terrestrial; at c. 650 m; (13151).

*Lindsaea orbiculata* (Lamk.) Mett. ex Kuhn — *Schizoloma orbiculatum* (Lamk.) Kuhn — Bukit Bendera; upper tunnel road; on wall; fairly shady; at 700 m; (13161).

*Lindsaea ensifolia* Sw. — *Schizoloma ensifolium* (Sw.) J. Sm. — Close to Bukit Bendera; in forest; terrestrial; shady; at c. 600 m; only 3 specimens found; (13171).

*Lindsaea divergens* Hook. & Grev. — *Isoloma divergens* (Hook. & Grev.) J. Sm. — Government Hill; terrestrial; primary forest; shady; at c. 700 m; (13181).

*Tapeinidium pinnatum* (Cav.) C. Chr. — 'Moongate Walk'; on slope at side of walk; fairly shady; not uncommon at sides of footpaths on Penang Hill; at c. 450 m; (13211).

*Odontosoria chinensis* (L.) J. Sm. — *Sphenomeris chinensis* (L.) Maxon var. *divaricata* (C. Chr.) Kramer — *Sphenomeris chusana* (L.) Copel. var. *tenuifolia* (Sw.) C. Chr. — Bukit Bendera; road embankment; exposed; next to *Cyathea contaminans*; common and locally abundant only at higher elevations on Penang Hill; at 700 m; (13311).

## DAVALLIACEAE

*Davallia denticulata* (Burm. f.) Mett. — 'Moongate Walk'; rhizome creeping on rock; exposed; at c. 400 m; (14112).

*Davallia divaricata* Bl. — Government Hill; on rock; fairly exposed; rhizome creeping and hanging down; at c. 400 m; (14121).

*Humata angustata* (Wall.) J. Sm. — On rock in stream bed; exposed; in many different locations and situations on boulders on Penang Hill; at 30 m; (14211).

*Humata repens* (L. f.) Diels — Close to 'The Waterfalls'; on rock; fairly exposed; at c. 200 m; (14221).

## NEPHROLEPIDACEAE

- Nephrolepis hirsutula* (G. Forst.) C. Presl — At roadside in residential area near botanical garden; epiphyte on persistent leaf bases of palm; exposed; at 10 m; common; (15111).  
*Nephrolepis falcata* (Cav.) C. Chr. — Close to Bukit Bendera; on rock; exposed; at c. 600 m; (15121).  
*Nephrolepis biserrata* (Sw.) Schott — Western Hill; exposed; locally abundant; at c. 600 m; (15131).

## PTERIDACEAE

- Adiantum latifolium* Lamk. — Botanical garden, near entrance; at margin of forest; fairly shady; in various locations on Penang Hill; naturalized, from tropical America; at 10 m; (16111).  
*Adiantum stenochlamys* Baker — Government Hill; near road; on mossy rock; fairly shady; at c. 600 m; (16121).  
*Taenitis blechnoides* (Willd.) Sw. — 'Waterfall Track'; close to road; in shady crevice on bare soil; at c. 30 m; common on Penang Hill; (16211).  
*Pityrogramma calomelanos* (L.) Link — Close to 'The Waterfalls'; on bare soil on roots of fallen tree trunk; exposed; naturalized; at c. 60 m; (16311).  
*Pteris biaurita* L. — Bukit Bendera; upper tunnel road; at roadside; exposed; common on Penang Hill; at 700 m; (17111).  
*Pteris vittata* L. — 'Waterfall Track'; on road embankment; on slope; gravel; fairly exposed; not uncommon on Penang Hill; at 130 m; (17121).  
*Pteris ensiformis* Burm. f. — On top of Bukit Bendera near police station on lawn; exposed; at 720 m; (17131).

## VITTARIACEAE

- Vittaria ensiformis* Sw. — Near Bukit Bendera in residential area; on mossy rock; fairly shady; dry; at c. 600 m; (18111).

## ASPLENIACEAE

- Asplenium nidus* L. — Close to 'The Waterfalls'; on rock; fairly exposed; at c. 200 m; (19111).  
*Asplenium longissimum* Bl. — Government Hill; at margin of secondary forest; fairly exposed; locally abundant on Penang Hill at a few sites only; at c. 600 m; (19121).  
*Asplenium macrophyllum* Sw. — Close to Bukit Bendera; on mossy rock; fairly shady; dry; at c. 600 m; not uncommon on Penang Hill; (19131).  
*Asplenium tenerum* G. Forst. var. *retusum* C. Chr. — Government Hill; in forest; epiphyte on branch; very shady; at c. 630 m; (19141).  
*Asplenium pellucidum* Lamk. — Government Hill; terrestrial; exposed; at c. 630 m; (19151).

## LOMARIOPSIDACEAE

- Bolbitis appendiculata* (Willd.) Iwatsuki – *Egenolfia appendiculata* (Willd.) Iwatsuki — Close to lower tunnel road; on mossy boulder near stream; damp; shady; locally abundant on boulders in stream beds on Penang Hill; at c. 550 m; (20111).
- Bolbitis heteroclita* (C. Presl) Ching — On mossy rock near stream; growing 0.1 m above surface of water; very shady; at 45 m; (20121).
- Elaphoglossum norrisii* (Hook.) Bedd. – *Elaphoglossum melanostictum* [non (Bl.) T. Moore] Holttum. — Government Hill; next to walkway; on mossy boulder; shady; at c. 650 m; only one specimen found; (21111).

## DRYOPTERIDACEAE

- Polystichum prolificans* v. A. v. R. — Close to lower tunnel road; on mossy rock in stream bed; very shady and damp; at c. 550 m; (22111).
- Diplazium crenatoserratum* (Bl.) T. Moore – *Athyrium crenatoserratum* (Bl.) Milde — Close to botanical garden; in forest but exposed; near stream; at 35 m; (23111).
- Diplazium malaccense* C. Presl – *Athyrium malaccense* (C. Presl) Holttum — Close to lower tunnel road; at natural clearing; exposed; at c. 600 m; (23122).
- Diplazium tomentosum* Bl. – *Athyrium tomentosum* (Bl.) Milde — ‘Waterfall Track’; c. 0.1 km down road from tea station ‘84’; on road embankment; fairly shady; at c. 500 m; (23131).
- Diplazium bantamense* Bl. – *Athyrium bantamense* (Bl.) Milde — Government Hill; in forest; on sandy soil; near stream; found on Penang Hill only in single location; 10–20 specimens growing together; at c. 650 m; (23141).
- Diplazium pinnatum* (Blanco) Copel. – *Athyrium pinnatum* (Blanco) Copel. — Close to ‘Waterfall Track’, near tea station ‘84’; terrestrial; exposed; at c. 500 m; (23151).
- Tectaria singaporeana* (Wall. ex Hook. & Grev.) Copel. — Lower tunnel road; on road embankment, but in forest; shady; only one specimen found on Penang Hill; at c. 500 m; (24111).
- Tectaria brachiata* (Zoll. & Mor.) Morton — Northeast of botanical garden; in forest; naturalized in Malaya; found on Penang Hill and Langkawi; at c. 60 m; (24121).
- Heterogonium sagenioides* (Mett.) Holttum — Lower tunnel road; fairly exposed; rhizome erect (c. 10cm); in crevice on rock; at c. 600 m; (24212).
- Pleocnemia irregularis* (C. Presl) Holttum – *Arcypteris irregularis* (C. Presl) Holttum — 100 m Northeast of botanical garden; on soil between rocks; fairly shady; common on Penang Hill in fairly exposed situations; at 45 m; (24311).

## BLECHNACEAE

- Blechnum orientale* L. — ‘Waterfall Track’; on heavily eroded soil; exposed; on Penang Hill very common in exposed situations; at c. 60 m; (25111).
- Blechnum finlaysonianum* Hook. & Grev. — Close to ‘Waterfall Track’, near Bukit Bendera; in forest; shady; at 600 m; not common on Penang Hill; (25121).
- Stenochlaena palustris* (Burm. f.) Bedd. — Government Hill; climbing on tree trunk; fairly exposed; common on Penang Hill; at c. 600 m; (25211).

## CONCLUSIONS

Generally all *Hymenophyllaceae* have low abundances except for *Cephalomanes javanicum*. *Mecodium productum* and, to a lesser extent, *Meringium holochilum* are locally abundant. Members of the *Gleicheniaceae* are often very abundant in exposed situations, suppressing other plant growth. However *Dicranopteris speciosa* was only found in a few locations.

Filmy ferns, such as the rare *Meringium penangianum* can be found on Penang Hill on the granite boulders in stream beds and in other very shaded situations in the virgin forest. Filmy ferns are among the plants that are most sensitive to exposure and lowered humidity due to human activities. Such human interference favours the light-demanding ferns. Hence whenever clearing occurs members of the *Gleicheniaceae* in particular become locally extremely abundant. Some of the shade-preferring species listed by Curtis as being common at one time on Penang Hill can nowadays be spotted at only a few sites.

Nevertheless Penang Hill still harbours a rich fern flora with some species having been recorded only in two or three other locations in the world.

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