TAXONOMY

According to Holttum (Willis,1966), ferns and their allies are placed in Division Pteridophyta. Filicopsida is the class of ferns; other classes, Psilotopsida, Lycopsida and Spenopsida are their allies. In this study, 19 family, 29 genera, 52 species and 1 variety are recorded. Among 52 species, only two species are fern allies, they are : Lycopodium phlegmaria Linn., Selaginella delicatula (Desv.)Alst.

Descriptions of all taxonomic categories concerns are provided in details below.

Major Taxa of ferns and fern allies in the Sakaerat Area

DIVISION : Pteridophyta
CLASS : Filicopsida
ORDER : Marattiales
FAMILY : Marattiaceae Hollt.

DIVISION : Pteridophyta
CLASS : Filicopsida
ORDER : Filicales
FAMILY : Schizaeaceae Hollt., Hymenophyllaceae Holtt., Cyatheaceae Holtt.

Dennstaedtiaceae M.Tag.&K.Iwats.

Lindsaeaceae M.Tag.&K.Iwats.

Davalliaceae M.Tag.&K.Iwats.

Oleandraceae M.Tag.&K.Iwats.

Pteridaceae M.Tag.&K.Iwats.

Aspleniaceae M.Tag.&K.Iwats.

Lomariopsidaceae M.Tag.&K.Iwats.

Peranemaceae M.Tag.&K.Iwats.

Adiantaceae Holtt.

Vittariaceae M.Tag.&K.Iwats.

Thelypteridaceae Holtt.

Polypodiaceae Holtt.

DIVISION : Pteridophyta

CLASS : Filicopsida

ORDER : Marsileales

FAMILY : Marsileaceae Holtt.

DIVISION : Pteridophyta

CLASS : Lycopsida

ORDER : Lycopodiales

FAMILY : Lycopodiaceae

DIVISION : Pteridophyta

CLASS : Lycopsida

ORDER : Selaginellales

FAMILY : Selaginellaceae

MARATTIACEAE

Rhizome short, erect or creeping. Stipes fleshy, swollen at base, and also with pair of stipules. Fronds compound, 1-2 pinnate; Veins free or reticulate. Sori linear, sporangia opening by a pore at the apex or a slit down one side.

One genus found in the studied area Angiopteris Hoffm.

Angiopteris Hoffm.

Rhizome terrestrial, short, broad; forming a fleshy stock, bearing brown scales; Roots large. Stipes fleshy green, swollen and with a pair of stipule at base. Fronds bipinnate, pinnae attached to the main rachis, pinnules with short swollen stalks; Veins free. Sori linear, dehiscing along the slit.

One species found in the studied area

Angiopteris evecta (Forst.)Hoffm., Bedd. Handb. F.B.I.Suppl.460.1969;Holtt.Rev.Fl.Malaya II, 44.1954

Rhizome short,broad,light brown in color,bearing brown scales;Roots large about 1-1.7 cm.in diameter. Stipes commonly 73-137 cm.long,green with scattered whitish streaks(Pl.I a.);Rachises grooved,green.Fronds bipinnate about 160-250 cm. by 100-110 cm.;pinnae 4-7 pairs,costae swollen;pinnules 14 cm.by 2 cm.,serrate, ovate-lanceolate,base cuneate or unequal , apex attenuate, glabrous and thin in texture;Veins free or forked near the costules.Sori oval,near margin on free veins, sporangia closed together(Pl. I b.),about 10-18 sporangia per corus , sporangia dehised by longitudinal slit.

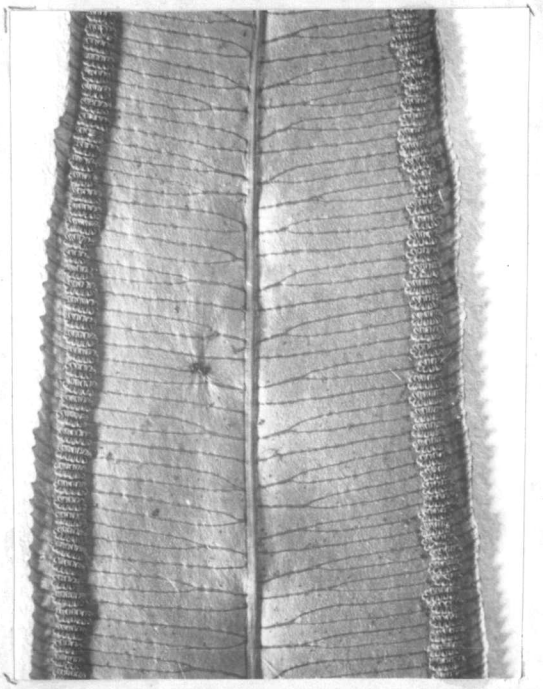
Distribution Japan,Thailand,India,Malaysia to Tropical Australia

Ecology Terrestrial ferns,common along the streams, in dense dry-evergreen forests

Specimens examined : T.Boonkerd No. 190-194

PLATE I

a.



b.

SCHIZAEACEAE

Rhizome creeping or erect, below the ground surface, hairs and scales covered throughout. Fronds closely placed and of various structure. Sporangia confined to very narrow fertile lobe of the leaflets, originated from margin, sessile or short stalks, with or without indusium.

Lygodium Swartz is only one genus found in the studied area.

Lygodium Swartz

Rhizome creeping, below ground surface, covered with densed short black-brown hairs, lower surface with numerous roots. Stipes closed to each other, covered with hairs at base, round or nearly so. Rachises branched; primary rachis-branches always short or hardly developed usually ending with hairy apices; secondary rachis-branches, twining, slender elongate, glabrous or hairy, round or grooved. Fronds of young plants with palmately lobed leaflets, dichotomously branched; Sterile leaflets, crenate-serrate, texture coriaceous; Fertile leaflets usually shorter than the sterile; Veins free, forked 1-2 times, veins glabrous or hairy. Sori protruding from the margin at the ends of the veins (sorophores) (Pl.II c, Pl.III b., c.), each sporangium indusiate; Indusia glabrous or hairy.

Key to the species

Leaflets lobed or more divided .... 1. L flexuosum

Leaflets without lobed or any branches .....
..... 2. L salicifolium

Lygodium flexuosum(L.) Sw.,Bedd.Handb.F.B.I. Suppl.457. 1969;Holtt.Rev. Fl.Malaya II, 57. 1954,Fl.Malesiana Ser II,53. 1959; Tard. &C. Chr. in Lecomte,Fl. Gén.7(2):38-39. 1939

Rhizome short creeping underground, about 10-12 cm. in depth; bearing black-brown hairs throughout, hairs uniseriate.Stipes 12-30 cm. long, hairy at base, grooved, about 0.1-0.3 cm. apart from each other. Main rachises grooved,primary rachis-branches not thick, secondary rachis-branches hairy.Leaflets arranged on secondary rachis,often lobed or more divided or with auricle at the base of each leaflet (Pl. II b.),all stalked (except apical leaflets); coriaceous in texture. Sorophores about 0.1-0.5 cm. long (Pl. II c.);Indusia hairy.

Distribution Southern China,Indo-China,Thailand, India,Ceylon,the Malay Peninsula,Philippines,North Australia and Tropical Africa

Ecology Climbing on Ya phek (Arundinaria pusilla) in farely open places, in dry dipterocarp forests.

Specimens examined : T.Boonkerd No. 31-35, 181-182, 324-325, 327

PLATE II

a.

b.

PLATE II

c.

Lygodium salicifolium Presl.,Holtt,Fl.Malesiana Ser II,51. 1959;Tard.&C. Chr. in Lecomte, Fl. Gén. 7(2):41-42. 1939

Rhizome creeping,slightly branched,densed covered with short black-brown hairs. Stipes about 25-72 cm. long,round,closed together on the upper surface, hairy at base. Primary rachises short,covered with brown hairs;secondary rachis-branches grooved,hairy. Leaflets all stalked, oblong in outlines,without auricle (Pl. III a.);mostly longer and wider than Lygodium flexuosum (L.)Sw. Sorophores mostly 0.5 cm. or more (Pl.III c.);Indusia glabrous or hairy.

Distribution Southern China,Indo-China,Thailand, Assan,Malaysia, New Guinea, Sumatra

Ecology Scattered in dry-evergreen forests and dry-dipterocarp forests.

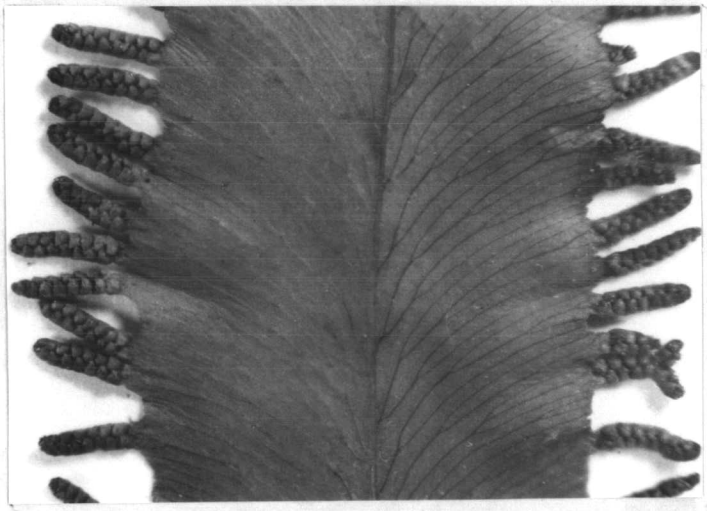
Specimens examined : T.Boonkerd No. 18, 21, 24, 54, 120-122, 425-427

PLATE III

a.

b.

PLATE III



c.

HYMENOPHYLLACEAE

Rhizome, short, erect or long creeping, epiphytic, very often on rock, rarely terrestrial; rooting or rootless; bearing fronds apart from each other. Fronds various sizes and shapes, the ultimate segment small, veins in segment single; Laminae one cell in thickness except for veins; Veins dichotomous or pinnate. Sori terminal, at the tip of ultimate segment (at the tip of one vein) or marginal at the vein ending on leaflets with many veins, receptacle which are extramarginal extension of veins; Indusia tubular or conical at base, the apical part of the indusia more or less dilated, often more or less deeply divided in two lips.

Two genera found in the studied area.

Key to the genera

1. Segments of frond bearing submarginal false vein.....
.....1. Crepidomanes

1. segments of frond without false vein.....
.....2. Gonocormus

Crepidomanes Presl

Rhizome creeping, branched, clothed withdark brown hairs. Fronds tripinnatifid; Stipes and Rachises winged; Veins free, branched, with false vein. Sori indusiate; Indusia usually two-lipped, cup-shaped.

Only one species found in the studied area.

Crepidomanes bipunctatum (Poir.)Copel.,Holtt.Rev. Fl.Malaya II, 99. 1954; Trichomanes bipunctatum Poir., Tard.&C.Chr. in Lecomte,Fl.Gén. 7(2): 63. 1939; Bedd. Handb. F.B.I. Suppl. 41. 1969

Rhizome slender, creeping upto 30 cm. long, always branched, clothed with dark brown hairs, bearing fronds upon 2-3 cm. apart. Stipes short, about 0.7-2.3 cm., upper portion winged; Rachises as stipes. Fronds 3-pinnate-pinnatifid 1.5-6.7 cm. by 1.7-3.5 cm. deltoid-ovate in outlines; Veins free, branched with submarginal false veins. Sori indusiate; Indusia cup-shaped,two-lipped about 0.7 mm. by 2.5 mm.,usually on the acroscopic side of upper pinnae(PL. IV a.&b.)

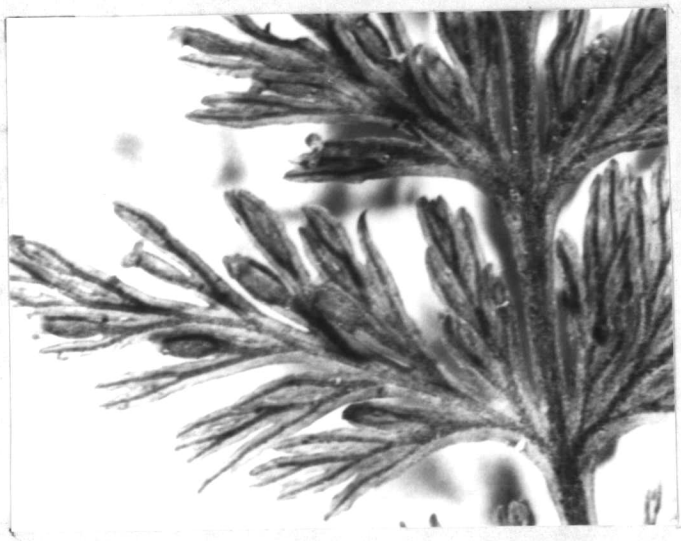
Distribution Southern China, Indo-China, Thailand, India, Tropical Asia and Africa

Ecology Common on rock by stream, in dry-evergreen forests

Specimens examined : T.Boonkerd No. 77-91, 236-238, 244-245

PLATE IV

a.



b.

Gonocormus van den Bosch

Rhizome creeping, often branched, bearing dark hairs throughout. Fronds 2-pinnate or more divided, primary frond (fronds borne by the rhizome) may produce second frond from a bud near it base and the second fronds may produce a third; Veins free, branched, without false vein. Sori sunk in the apices of the ultimate segment, usually at the end of veins.

Only one species found in the studied area.

Gonocormus prolifer (Bl.)Prantl,Holtt.Rev.Fl. Malaya II,97. 1954; Trichomanes proliferum Bl., Bedd. Handb.F.B.I. Suppl. 39, 1939.

Rhizome very slender, long creeping, branched, clothed with dark brown hairs, bearing fronds upon about 0.4-1.1 cm. apart. Stipes very short, 0.4-0.8 cm. long, not winged, hairy. Fronds more pinnate(Only primary-fronds found), about 1.3-2.4 cm. by 0.8-1.0 cm.; Rachises winged; ultimate leaflets less than 0.5 mm. wide; Veins free,branched, without false vein. Sori indusiate; Indusia tubular, about 1 mm. long and 0.7 mm. wide, sunk in the apices of the ultimate segments,at the end of veins.

Distribution Southern China, Thailand, India, The Malay Peninsula, Indonesia and Philippines Islands

Ecology Common on rock by stream, in dry-evergreen forests

Specimens examined : T.Boonkerd No. 92-98, 239-243

PLATE V

a.

b.

CYATHEACEAE

Plant terrestrail, stock erect, unbranched, forming a large trunk, bearing rosette of fronds at apex, usually when old covered with a thick mat of brown-black roots, trunk and bases of stipes covered densely with scales. Fronds large, pinnately compound, mostly bipinnate, bearing both scales and hairs; Veins pinnately nerved, simple or forked. Sori round, on veinlets, never on terminal, with or without cup-shaped indusia.

Cyathea Smith is only one genus found in the studied area.

Cyathea Smith

Stocks short or tall, erect unbranched, forming a trunk which bears a rosette of fronds at the apex; apex of trunk and base of stipes covered with scales. Stipes persistent or caducous leaving scar on the trunk, hairs always present on upper surface. Fronds elliptical, lower pinnae smaller than the middle ones, pinnate-bi-pinnatifid rarely simple; Pinnule symmetrical at base, Veins simple or branched or pinnate. Sori usually at the fork of vein or on the simple vein; Indusium cup-shaped, opening by valve or by rupture.

Cyathea gigantea(Wall. ex. Hook.), Holtt. Rev.Fl. Malaya II,128. 1954; Alsophila glabra (Hook.), Bedd. Handb.F.B.I. Suppl.14. 1969

Stock 150 cm. or more height.(Pl. VI a.). Stipes purplish-brown or black-brown in color,165 cm. or more long, grooved; bearing black-brown scales at the base, scales1.0-1.7 cm.long; Rachises as stipes,grooved,hairy. Fronds bipinnate 260 cm.by 85cm.; pinnae 8-13 pairs; pinnules 9.5 by 1.7 cm., lower one stalked,upper one sessile,apex attenuate, base cuneate or slightly unequal, margin lobed,(Pl. VI b.);Veins simple, mostly 5 pairs in each lobe (Pl. VI c.);costae and costules bearing scales. Sori exindusiate, round,on each vein within the lobes,forming groups of inverted V-shaped (Pl. VI c.)

Distribution Southern China, Thailand, Burma, India, Ceylon, the Malay Peninsula.

Ecology Common along the streams, in dense dry-evergreen forests.

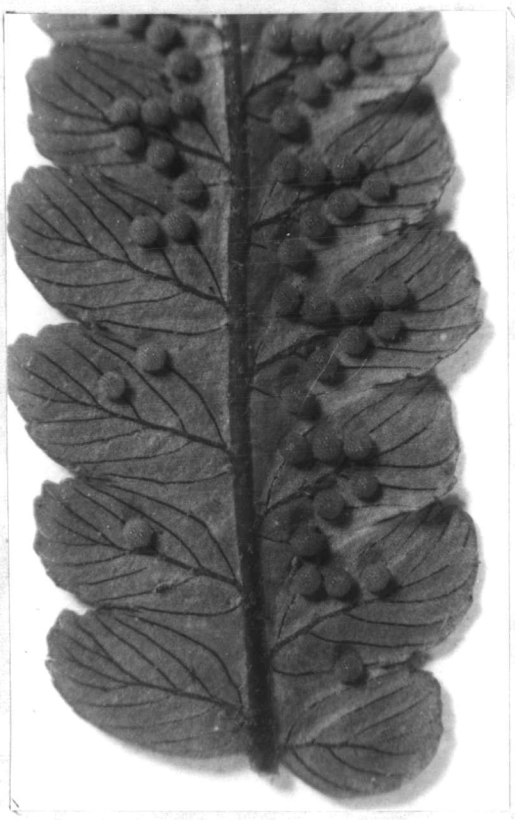
Specimens examined : T.Boonkerd No. 201-205, 391-394

PLATE VI

a.

b.

PLATE VI



c.

DENNSTAEDTIACEAE

Rhizome usually creeping,mostly covered with hairs (except Orthiopteris with scales);vascular bundle with siphonostele.Fronds pinnate to pinnately decompound, glabrous or hairy;Veins all free;texture thin.Sori terminal on veinlets,marginal or submarginal;Indusia reflexed from the margin of lobes or attached at the bases of sorus,mostly cup-shaped.

Microlepia Presl is only one genus found in the studied area

Microlepia Presl

Rhizome creeping, underground surface, covered on young part with short hairs. Stipes usually closed together, grooved, and also covered with short hairs, vascular strand single and U-shaped;Rachises slightly grooved, hairy. Fronds 2-3 pinnate;pinnae lanceolate to rhomboid-oblong, the acroscopic basal pinnules longer than the basiscopic, pinnules varied in shapes; Veins free, pinnate, hairy, margin crenate or lobed. Sori at the end of veins, usually closed to the base of the sinuses between the lobe of the leaflets; Indusia semi-ovate to cup-shaped, surface hairy.

Three species found in the studied area.

Key to the species

1. Fronds 2-pinnate-pinnatifid
    2. Stipes 45 cm. or more long, pinnae about 20 cm. by 5.5 cm.; more than 4 pairs.....1. M herbacea
    2. Stipes 15-30 cm. or more long, pinnae about 7.5 cm. by 3.7 cm., 2-3 pairs.....3. M strigosa
1. Fronds 3-pinnate-pinnatifid; stipes 50-100 cm. long; pinnae about 38 cm. by 14 cm., 8 pairs or more..... .....2. M speluncae

Microlepia herbacea Ching & C.Chr.,Tard.&C.Chr.
in Leconte, Fl. Gén 7(2): 97. 1939

Rhizome creeping, about 1.2 cm. in circumference, bearing brown hairs throughout, hairs simple. Stipes 45cm. or more long, about 1.5-2.0 cm. apart from each other, 0.15 cm. in diameter, grooved, hairy at bases. Fronds herbaceous, 90 cm. long and 37 cm. wide, 2-pinnate-pinnatifid; Pinnae alternate, basal ones about 20 cm. by 5.5 cm., lanceolate; pinnules lobed, largest pinnules 3.3 cm by 1.0 cm. base oblique; Veins pinnate, the lowest pinnules of each pinna, acroscopic pinnules larger than the basiscopic ones; apices of compound leaves looked like one pinna attached at their apices. Sori at end of veins, one sorus of each lobe, near the sinus of pinnules; Indusia semi-ovate. (Pl. VII b.)

Distribution Southern-China, Thailand

Ecology Terrestrial ferns, in shady places, in dry-evergreen forests

Specimens examined : T.Boonkerd No. 221-230

PLATE VII

a.

b.

Microlepia speluncae (L.)Moore,Bedd.Handb.F.B.I. Suppl. 67-68. 1969; Holtt.Rev.Fl.Malaya II, 314-315. 1954; Tard.& C.Chr. in Lecomte, Fl.Gen. 7(2): 99-100. 1939

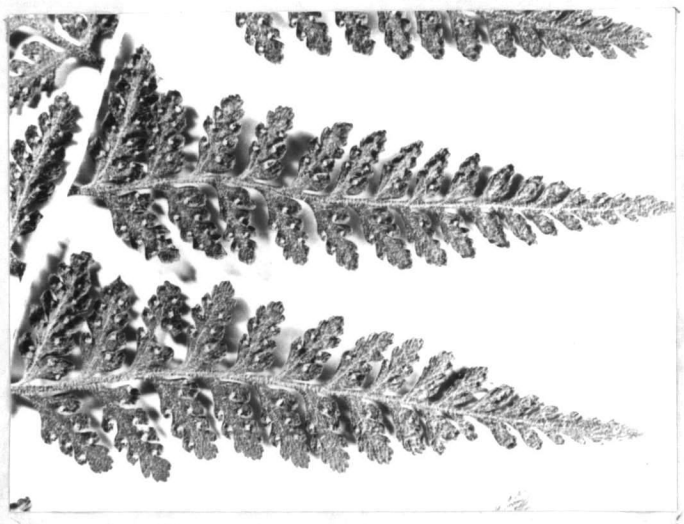
Rhizome creeping, about 10.5 cm. long, 2.5 cm. in circumference, covered with golden-brown hairs; Roots numerous, hairy at their junction to rhizome. Stipes commonly 50 cm. or upto 100cm. long, 1.8-2.2 cm. in circumference, usually closed together, grooved, hairy, light brown when dry; Rachises as stipes. Fronds 3-pinnate -pinnatifid;Pinnae 8 pairs or more, alternate, basal pinnae about 38 cm. by 14 cm., lanceolate, the basal acroscopic pinnules usually largest,about 7.7 cm. by 2.8 cm. lanceolate, apex acuminate, costae bearing short hairs, leaflets of third order about 1.5 X 0.6 cm. (largest), midrib hairy, apex nearly rounded, base oblique, margin lobed, veins single (their branches hardly seen), surface villose. Sori at the sinus of third leaflets, hairy at base (Pl. VIII b.);Indusia cup-shaped.

Distribution Japan, Southern China, Indo-China Thailand, India, The Malay peninsula, Polynesia and Tropical America

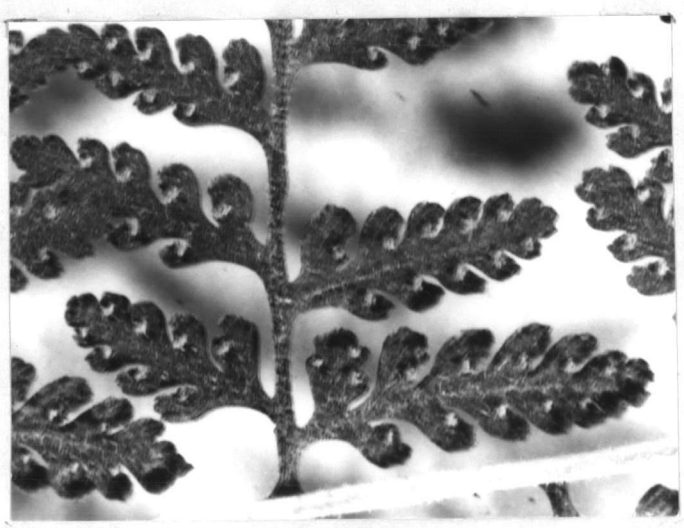
Ecology Terrestrial ferns, rhizome grows in shady place but the stipe show its fronds to bright light

Specimens examined : T.Boonkerd No. 195-196

PLATE VIII



a.



b.

Microlepia strigosa (Thunb.)Presl;Bedd. Handb. F.B.I. Suppl. 67. 1969; Holtt.Rev.Fl.Malaya II, 310. 1954; Tard.&C.Chr. in Lecomte, Fl. Gén. 7(2): 98-99. 1939

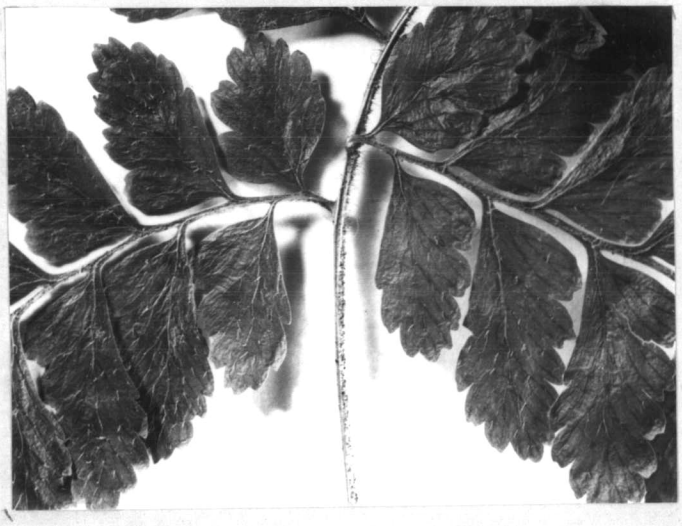
Rhizome creeping, covered with brown hairs through out, 0.8 cm. in circumference, about 7 cm. long, slightly branched. Stipes 15-30 cm. or more long, grooved, bearing pale brown hairs throughout. Fronds 2-pinnate ; Rachises grooved, bearing short hairs; Pinnae 2-3 pairs, apex of compound leaves of young fronds larger than the older ones, lower pinnae about 7.5 cm. by 3.7 cm., lanceolate, midrib hairy, grooved, pinnules alternate, about 20 cm. by 1.0 cm, apices rounded, bases unequal; Veins free, pinnate, hairy, basal pinnules of each pinna stalked, the distal ones sessile, the basal acroscopic pinnules ovate, the others ovate-lanceolate, pinnules lobed (basal); younger pinnules sinuate. Sori at the base of the sinuses between the lobes of the pinnules; Indusia hairy, half cup-shaped.

Distribution Japan, South China, Thailand, South India, Ceylon to Polynesia, Malaysia

Ecology Terrestrial ferns, in dry-evergreen forests

Specimens examined : T.Boonkerd No. 235

PLATE IX



a.

LINDSAEACEAE

Rhizome creeping,mostly terrestrial,rarely climbers, bearing hair or scales or both.Stipes not jointed to the rhizome.Fronds simple or pinnately compound;Veins free or anatomosing without free veinlet in areoles;Rachises grooved.Sori marginal or submarginal,terminal on veins and veinlets or fused into elongated sori;Indusia attached on the basal side of sori and opening outwards to the margin.

o Lindsaya Dryander is only one genus found in the studied area

Lindsaya Dryander

Rhizome slender,creeping and climbing;bearing two rows of fronds so closed or widely spaced.Stipes slender,grooved on one side or quadrangular.Fronds 1-pinnate or 2-pinnate;Rachises grooved on upper surface; Pinnae semi-crescent shape or parallogram shape,no distinct midrib;Veins free and forked or sometimes anatomosing with formation of small areoles.Sori indusiate, submarginal,linear,usually continuous all round the outer edges of unlobed pinnae

Only one species found in the studied area.

Lindsaya ensifolia Sw.,Tagawa & K.Iwats.SEAsian St.5(1):74.1967;Schizoloma ensifolium Sw.,Bedd. Handb.F.B.I.Suppl.80.1969;Holtt.Rev.Fl.Malaya II, 346.1954;Tard. & C.Chr. in Lecomte,Fl.Gen.7(2):129.1939

Rhizome creeping,about 5 cm.long,bearing scales. Stipes about 35 cm. long,light brown in color when dry, slightly quadrangular.Fronds 1-pinnate,30-45 cm.by 20-30 cm.;Rachises grooved,glabrous;pinnae 6-7 pairs,about 6-18 cm. by 0.4-1.7 cm.,short-wing stalks,linear-lanceolate,base cuneate,acuminate apex,margin entire, undulate or slightly toothed, glabrous,texture herbaceous; Veins reticulated without free veins in areoles.Sori indusiate, elongate along the edge of the pinnae (Pl.X. b.)

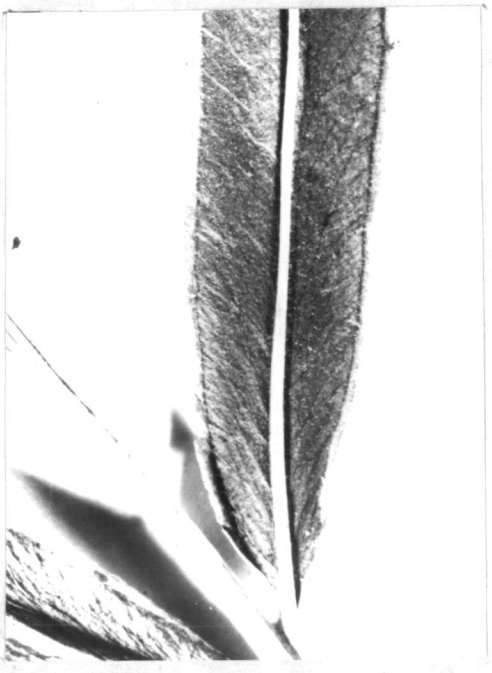
Distribution South-China, Indo-China,Thailand, India, Malaysia, North Australia, Tropical Africa, Polynesia

Ecology Terrestrial ferns, in dry -evergreen forests

Specimens examined : T.Boonkerd No. 40, 116-117

PLATE X

a.



b.

DAVALLIACEAE

Epiphytes or rarely terrestrial ferns ; Rhizome creeping, short or long, fleshy; bearing peltate bases of scales, edges of scales mostly with hairs or teeth. Stipes smooth, arranged in two rows on the dorsal surface of the rhizome, and jointed to it; Rachises more or less winged. Fronds simple to pinnately compound; Veins all free. Sori terminal or rarely dorsal on veins; Indusia cup-shaped, open towards the margin.

Only one genus found in the studied area.

Davallia Smith

Rhizome creeping, long or short, usually epiphytic, sometimes on rock, bearing densed scales; Scales various shapes, the edges usually surrounded with hairs or teeth. Stipes naked, closed together or not; Rachises smooth. Fronds pinnately compound, usually deltoid; Pinnae deltoid, glabrous; Veins free, pinnate; coriaceous in texture. Sori one in each lobe, terminal on the veins, closed to the margin; Indusia attached by the base or by side.

Two species found in the studied area.

Key to the species

1. Climbing ferns; Stipes 10 - 13 cm. long, about 35 cm. apart from each other; Fronds 4-pinnatifid, basal pinnae about 13 by 7.5 cm.....1. *D trichomanoides*

1. Common on rock; stipes 48 cm. or more long, closed together; Fronds 3-pinnate-pinnatifid, basal pinnae about 35 cm. by 21.5 cm.....2. *D divaricata*

Davallia trichomanoides Bl.,Holtt.Rev.Fl. Malaya II, 361.1954 ; Davallia bullata Wall., Bedd. Handb. F.B.I. Supple. 61.1969

Climbing ferns, Rhizome creeping, slender, about 1 cm. in diameter when dry (increased in size after moistening), bearing densed hair - pointed chesnut scales (Pl. XI b.), about 0.6 cm. by 0.1 cm. widest at their peltate base, edges surrounded with short hairs. Stipes 10 - 13 cm. long,glabrous; Rachises with 12 or more pairs of pinnae, the basiscopic basal pinnules longer than acroscopic. Fronds 4-pinnatifid, glabrous , deltoid in outlines (Pl. XI a.); Pinnae about 13 by 7.5 cm., lanceolate-deltoid, texture thin; Veins single or forked 1-2 times, glabrous. Sori half cup-shaped, at the branched veins; Indusia 2 cm. by 1 cm.

Distribution Japan, Thailand, Burma, India, Ceylon, the Malay Peninsula

Ecology Climbing ferns on small tree, near the streams, in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 173-175

PLATE XI

a.

b.

PLATE XI

c.

d.

Davallia divaricata Bl., Bedd. Handb. F.B.I. Suppl. 60.1969; Holtt. Rev. Fl. Malaya II 362.1954; Tard. & C. Chr. in Lecomte, Fl. Gén. 7(2):107. 1939.

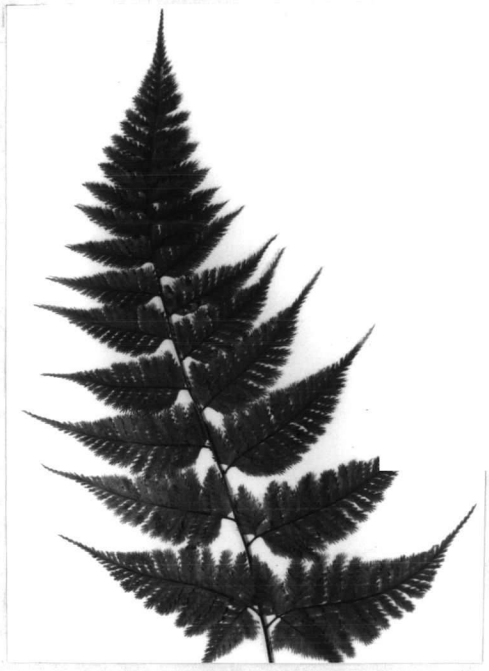
Rhizome creeping, 8 cm. or more long, about 1 cm. in diameter; clothed with long lanceolate-caudate scales, about 1.5cm. long and 0.15 cm. wide, edges surrounded by small septate cells (Pl. XII b.). Stipes 48cm. or more long, closed together, red-brown in color, grooved, smooth; Rachises grooved, smooth. Fronds 3-pinnate-pinnatifid, about 10 pairs of pinnae, laminae 68 cm. or more long, deltoid in outlines (Pl. XII a.); the lower pinnae about 35cm. long and 21.5 cm. wide, deltoid, the basal basiscopic pinnules longer than the acroscopic, about 12.5 by 10cm., deltoid, apex attenuate; the third leaflet sessile, lanceolate, margin lobed; Veins pinnate, forked in each lobes; surface glabrous; texture subcoriaceous to coriaceous; base unequal; apex attenuate. Sori mostly confined in the lobes of the leaflet, at the branched veins or along the protuding veins, half-cup shaped; Indusia about 1.0 by 0.5cm. (Pl. XII c.).

Distribution South China, Thailand, Burma, India, the Malay Peninsula, Indonesia.

Ecology Common on rock, in shady places, in dry-evergreen forests.

Specimens examined : T. Boonkerd No. 231-234, 299

PLATE XII



a.

PLATE XII

c.

OLEANDRACEAE

Rhizome erect or creeping, short or long, bearing peltate scales. Fronds simple to pinnate-bipinnatifid; Stipes not jointed to the rhizome; Pinnae jointed, glabrous or bearing either hairs or scales; Sori round, at the end of veinlets, near margin or elongate near margin ; Indusia round or reniform.

Nephrolepis Schott is only one genus found in the studied area.

Nephrolepis Schott

Stock short,erect,bearing numerous roots,and slender lateral runners which can develop into new plants. Stipes tufted,usually closed together;Stock and stipes bearing hairy peltate based scales.Fronds 1-pinnate,long and narrow,with many pinnae,the lowest ones usually reduced;Pinnae sessile,articulate;Veins all free,veinlet forked.Sori terminal on veins;Indusia round-reniform with a sinus.

Only one species found in the studied area

Nephrolepis falcata (Cav.) C.Chr.,Holtt.Rev. Fl.Malaya II,381.1954;Tard.& C.Chr.in Lecomte, Fl.Gen.7(2):289.1941

Rhizome short erect,covered with peltate scales; Scales about 2 mm. long;Roots numerous glossy light brown.Stipes about 13 cm.long,spirally arranged,bearing scales usually at the base,grooved, glossy light brown when dry;Rachises grooved,sometimes with scales.Fertile fronds about 130 cm.by 16 cm.or more,lower pinnae small, pinnae falcate,fertile pinnae more slender than sterile, largest fertile pinnae about 11 by 1.3 cm.,largest sterile pinnae about 6.3 by 1.2 cm.,all pinnae sessile;Veins all free,veinlets forked 1-2times,ending near margin,terminal veinlets with spot(hydathods),apex acuminate-attenuate, base truncate and unequal,margin crenate,surface glabrous, midrib slightly hairy.Sori at the end of veinlets,near margin;Indusia round.(Pl.XIII b.)

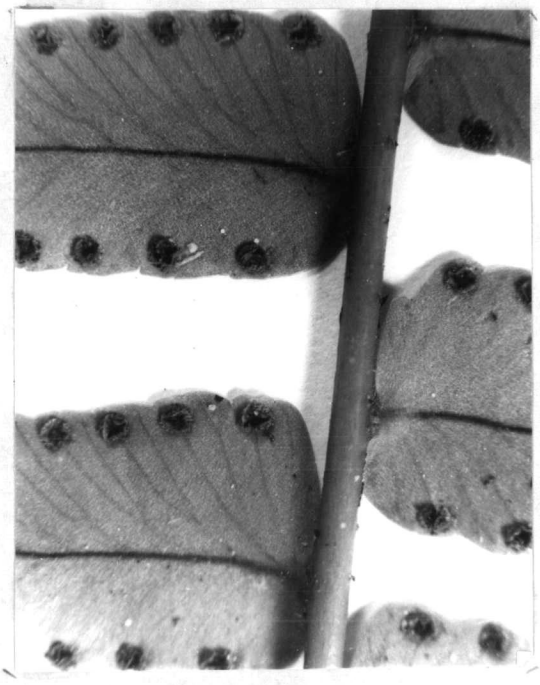
Distribution South-China,Indo-China,Thailand, Malaysia

Ecology Usually on rock or on the Bird nest ferns' rhizome,in dry-evergreen forest.

Specimens examined : T.Boonkerd No. 3, 11, 12, 266-268

PLATE XIII

a.



b.

ADIANTACEAE

Rhizome short or long, erect or creeping, hairs and scales present. Fronds simple or pinnately decompound; Veins free or reticulated forming areoles without included veinlets; Laminae glabrous or hairy. Sori at the end of veins, otherwise elongated along the veins; Indusia reflexed from lobes of the lamina or form the margin.

Three genera and one species of each found in the studied area.

Key to the genera

1. Aquatic ferns; rhizome erect; fronds dimorphous, 2-pinnate, succulent.....1. *Ceratopteris*

1. Terrestrial ferns

    2. Fronds 1-pinnate, rhizome erect.....
    .....2. *Adiantum*

    2. Fronds simple, deeply lobed, rhizome creeping
    .....3. *Doryopteris*

Ceratopteris Brongn.

Aquatic plants, having stock instead of rhizome, stock short erect, with leaves (fronds) arranged in rosette. Stipes fleshy round and ribbed on one side, smooth on the other, or somewhat smooth all over in young plants. Fronds dimorphous; Sterile fronds bi-pinnatifid with broad lobes; the venation reticulate with no free included veinlets; Fertile fronds more deeply dissected with narrow lobes, and their edges reflexed to cover the lower surface; Veins longitudinal. Sporangia scattered along the veins, large and stalked.

The genus consider monotypic Ceratopteris thallictroides

Ceratopteris thallictroides (L.) Brongn., Bedd. Handb. F.B.I. Suppl. 123. 1969;Holtt. Rev. Fl. Malaya II,578-579. 1954; Tard.&C. Chr. in Leconte, Fl. Gén. 7(2):194-196. 1940

Stock short, erect bearing a rosette of leaves (Pl. XIV a.),light green in color.Stipes 25-30 cm.long round, fleshy light green, smooth on one sides,ribbed on the other; Rachises aliked. Fronds dimorphous; Sterile fronds bipinnate pinnatifid 30 by 20 cm. or more, pinnae ovate in outline about 4 by 2 cm.; Veins reticulate without free vein in areoles; Fertile fronds bipinnate about 30 by 20 cm. in size, pinnae 11.7 by 5 cm. or more, glabrous, succulent, Veins reticulate, rarely longitudinal.Sporangia solitary scattered along the veins, with short stalks,and also covered by the reflexed margin of the frond.

Distribution Indo-China, Thailand,Malaysia, India,Ceylon.

Ecology This aquatic fern is found in common in ditch, and other shallow water in opened places or even as a common weed of rice fields. It may be the submerge, immersed or very often floating. The submerged and the floating are mainly young plants which bear only the sterile fronds, while most fertile fronds only as well-grown immersed plant.

Specimens examined : T.Boonkerd No. 293-298

PLATE XIV

a.

Adiantum Linn.

Rhizome short, erect or creeping, scaly; Scales narrow, not peltate at base, usually bear hairs when young. Stipes round, slender, brittle, black-brown, or reddish brown, glossy or sometimes hairy;Rachises as stipes usually grooved on the upper surface,sometimes rooting at tip. Fronds 1-pinnate to 3-pinnate;Pinnae and pinnules fan shaped,or parallogram-shaped,entire or deeply lobed, toother when sterile;Veins all free and forked. Sori on the under surface of the small reflexed margin.

The genus Adiantum quite a number of species widely distributed in the tropic and the adjacent. Many of them contain a horticulture value or known as Maidenhair fern.

One species found in the studied area.

Adiantum caudatum Linn.,Bedd.Handb.F.B.I.Suppl. 83. 1969;Holtt.Rev.Fl.Malaya II,599. 1954; Tard. & C. Chr. in Leconte,Fl.Gen.7(2): 180. 1940

Rhizome short erect, covered with scales; Scales about 4 mm. long, brown in color. Stipes bearing scales at base and bearing hairs throughout, tufted, reddish brown and glossy about 8.5 cm. long, nearly round(except in young frond slightly grooved on the upper surface);Rachises as stipes, usually elongated and rooting at the tip(Pl. XV a.). Fronds 1-pinnate; pinnae numerous, alternate; frond about 33 by 2.5 cm.; largest pinnae about 1.3x0.6 cm.,paralleogram-shaped, stalks short, villose,coriaceous;Veins prominent on the upper surface, free, fork 1-2 times.Sori round or nearly so, on the apices of the lobes and under the reflexed marginal flaps.(Pl. XV b.).

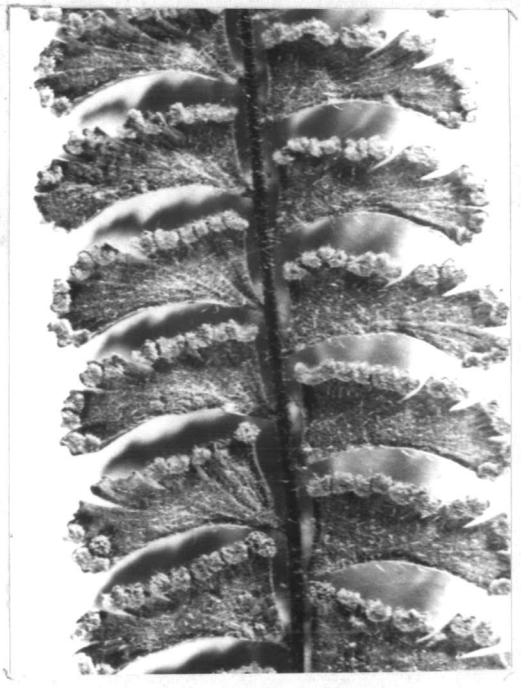
Distribution In the old World Tropics,from Africa to the Pacific.

Ecology Common on rock in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 25-30, 322-323

PLATE XV

a.



b.

Doryopteris J.Sm.

Rhizone creeping, clothed with small scales; Scales not peltate. Stipes nearly black or dark brown, polished. Fronds well spaced, dimorphous, simple or palmatifid, basiscopically produced, more or less leathery; Veins reticulate throughout the fronds. Sori submarginal and continuous along the vein's ending and covered by the reflexed margin of the lamina.

Only one species found in the studied area.

Doryopteris ludens(Wall.)J.Sm.,Bedd.Handb. F.B.I.Suppl. 120. 1969; Holtt. Rev.Fl.Malaya I I, 594. 1954; Tard.& C.Chr. in Leconte,Fl.Gen. 7(2):176. 1940

Rhizome creeping, slender, about 2 mm. in diameter, bearing scales; Scales lanceolate with acuminate apices, edges paler.Stipes about 28.5 cm. long;well-spaced, about 0.2-1.7 cm. apart ;dark brown in color, scaly at base (upper portion smooth,round).Fronds dimorphous,simple, deeply lobed,deltoid in outlines; Fertile fronds more lobed than the sterile (Pl.XVI c.) and the young fronds (Pl. XVI a.), lamina variable, mostly more than 14 by 12.5 cm., with truncate base, glabrous,coriaceous;Veins palmately nerved and prominent in lobes, areoles without veinlets,reticulated veins hardly seen. Sori elongate and under the reflexed marginal flaps.

Distribution South China, Laos, Cambodia, Thailand, Malaysia.

Ecology Terrestrial ferns, very common in dry-evergreen forests.

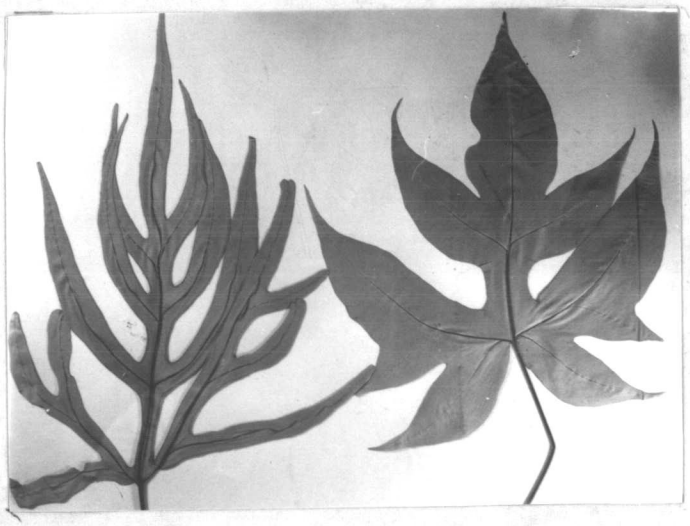
Specimens examined : T.Boonkerd No. 22-23, 269-272, 304-307, 428-432

PLATE XVI

a.

b.

PLATE XVI



c.

VITTARIACEAE

Rhizome epiphytic creeping and clothed with clathrate scales. Stipes usually closed; Fronds simple, entire, glabrous, usually thick and fleshy; Veins reticulated or free in very narrow fronds. Sori exindusiate, innersed in groove along veins or margin; paraphyses numerous.

Two genera found in the studied area.

Key to the genera

1. Veins simple; sori sunk in marginal groove.....
.....2. Vittaria

1. Veins anatomosing; sori in the shallow groove, elongate along the veins, usually surrounding areoles.....1. Antrophyum

Antrophyum Kaulf.

Rhizone short, creeping and fleshy, always with clathrate scales; Scales with long slender hair-pointed apex, and entire or toothed edges; Roots numerous with brown root hairs. Stipes short, fleshy. Fronds fleshy, pendulous, simple, entire, midrib never prominent; Veins forming many small areoles throughout the frond, areoles without free included veinlets. Sori spreading along the vein, broken line or branched, usually sunk in groove; paraphyses numerous.

One species found in the studied area.

Antrophyum callifolium Bl.; Holtt. Rev. Fl.Malaya II, 605. 1954; Tard. & C.Chr. in lecomte, Fl.Gen. 7(2): 204. 1940

Rhizone short creeping; Scales lanceolate, clathrate, edges toothed, about 4 mm. long, mostly at apex; Roots numerous, densely covered with brown root hairs. Stipes short, with narrow wing, green in color, well-spaced about 0.1-0.2 mm. apart. Fronds simple, fleshy, linear-lanceolate, glabrous, apices and bases attenuate, margin entire-undulate;(Pl. XVII a.); Veins reticulate , prominent on the upper surface, shallowly grooved on the lower surfaces. Sori exindusiate, elongated along side of veins (Pl. XVII a.), sometimes around areoles; paraphyses brown, numerous , hair-liked.

Distribution South-East tropical Asia

Ecology Common on rock, in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 4, 251-254

PLATE XVII

a.

b.

Vittaria Smith

Rhizome creeping, short or long, somewhat slender; permanent covered with clathrate scales; Roots present prominently covered with brown hairs. Fronds simple narrow, entire, fleshy, stipitate or not, the stipe if present usually winged; Laminae coriaceous; Venation consisting a midrib and lateral veins that join to form the submarginal veins. Sori linear, all along the submarginal vein, usually deeply immersed in a groove.

A genus of not so many species, usually confine to high altitude, one species found in the studied area.

Vittaria elongata Sw.,Bedd.Handb.F.B.I.Suppl. 404. 1969; Holtt. Rev. Fl. Malaya II, 614. 1954; Tard. & C.Chr. in Leconte, Fl.Gén. 7(2):197.1940

Rhizome creeping, about 3.5 cm. long; Scales clathrate, mostly at apex, about 0.2 cm. long, edges sometimes toothed. Stipes short, 0.2-0.3 cm. apart from each other; Fronds simple about 36 cm. or more long and 0.7 cm. wide, linear, glabrous and margin entire (Pl. XVIII a.), apex and base long attenuate, thin but firm in texture, midrib distinct on the upper surface; Veins simple, hardly seen. Sori sunk in the marginal groove, elongated along the whole length of fronds.

Distribution South China, Indo- China, Thailand , India, the Malay Peninsula, Polynesia, Tropical Africa

Ecology Common epiphyte or on rock, in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 255-256

PLATE XVIII

a.

PTERIDACEAE

Rhizome erect or creeping, covered with hairs or scales. Fronds of various sizes and forms; Veins free or anatomosing, to form areoles, without included free veins. Sori so closed to the margin of each pinna; Indusia reflexed from margin of lobes or sporangia scattered under surface of the fertile pinnae.

Among genera of Pteridaceae, only one genus Pteris Linn. found in the studied area.

Pteris Linnaeus

Rhizome erect or creeping;bearing tuft of fronds upon;Scales mostly at apex;margin of scales paler,sometimes hairy. Stipes grooved,scaly at base.Fronds 1-2 pinnate, basal pair of pinnae often branched, branches smaller, the apex of fronds and pinnae similar; Rachises grooved; costae of pinnae grooved;Veins free,forked 1-2 times. Sori elongated along margin;Indusia reflexed from margin of the laminae.

Four species found in the studied area.

Key to the species

1. Rhizome creeping; widest pinnae not more than 1 cm.; pinnae 3-5 pairs; all pinnae often branched.....
.....1. P ensiformis

1. Rhizome erect; widest pinnae usually more than 1 cm.

2. Rachises about 2 cm. long; pinnae 2 pairs; margin mostly toothed in sterile pinnae.....
.....3. P scabripes

2. Rachises about 15 cm. or more long; pinnae 4-6 pairs, margin entire

3. Pinnae branched, mostly basiscopic side, bases of upper pinnae fused with rachises...
.....2. P heteromorpha

3. Pinnae not branched; scales at rhizome and base of stipes hairy.....4. P venusta

Pteris ensiformis Burm.,Bedd.Handb.Ferns Brit. Ind.Suppl. 107. 1969;Holtt.Rev.Fl.Malaya II , 399. 1954; Tard.&C. Chr.in Lecomte,Fl.Gén. 7 (2); 149-150. 1940.

Rhizome creeping,about 2.5-10.5 cm. long;Scales at-apex about 0.25 cm. long.Stipes 26-31 cm. long in sterile stipes,more long in fertile stipes,quadrangular,grooved, each about 0.7-1.1 cm. apart;Rachises as stipes.Fronds dimorphous;the sterile fronds about 28-53 cm. long and 6.5-8.5 cm.,pinnae lobes about 0.7-0.9 cm.; the fertile fronds about 41-69 cm. by 14-16 cm.,pinnae lobes about 0.4-0.6 cm.; deltoid in outlines;Lower pinnae more or less 2-pinnate,basiscopic lobes longer than the acroscopic (Pl.XIX a.);Veins free,forked 1-2times in sterile fronds,one time in fertile usually near costae (Pl.XIX b.,c.);Laminae serrate,glabrous,subcorioceous. Sori elongated from base of pinnae to about 2 cm.far from the apex(Pl.XIX b.,c.);Indusia reflexed from the margin,about 0.5 mm.wide

Distribution South China,Indo-China,Thailand,the Malay Peninsula,Ceylon,India,Australia and Polynesia

Ecology Terrestrial ferns,semi-shade in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 45-47, 119

114

PLATE XIX

a.

b.

PLATE XIX

c.

Pteris heteromorpha Fée,Tard. & C.Chr.in Lecomte, Fl.Gén.7(2):147.1940;Pteris cretica var. heteromorpha Hook.,Bedd.Handb.Ferns Brit.Ind. Suppl.106.1969

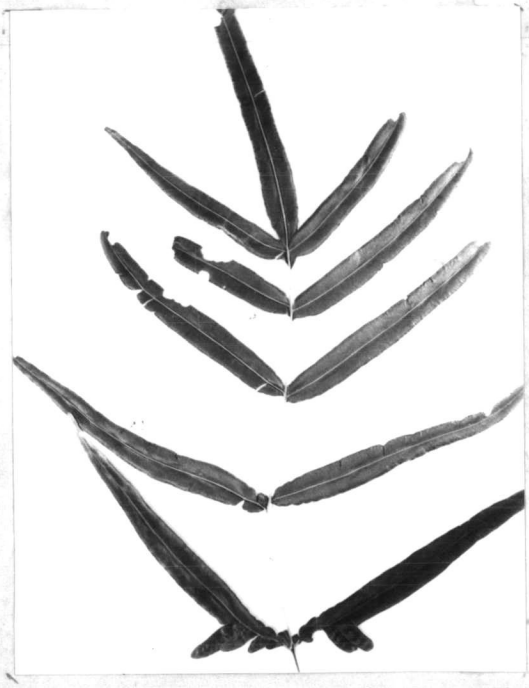
Rhizome erect.Stipes about 15-50 cm.long,yellow in color,glossy,naked or scaly at base,nearly round, slightly grooved;Rachises as stipes.Fronds 1-pinnate about 30-60 cm.by 20-30 cm.wide;Pinnae 4-6 pairs,sessile or subsessile,lateral pinnae opposite or alternate, terminal pinnae similar to the lateral;the lowest pinnae branched or deeply lobed forming pinnules;basiscopic branches(pinnules)usually longer than acroscopic;the second pair of pinnae from the base usually with basiscopic branches(pinnules)only,mostly seen in alternated pinnae; Pinnae about 14-25 cm.long and 1.6 cm.wide,linear or linear-lanceolate,margin entire in upper pinnae,deeply lobed to form pinnule in lower pinnae;Veins free,once-forked,nearly parallel veins,surface glabrous,texture subcoriaceous.Sori linear,elongate along margin from base of pinnae to 2-5 cm.far from apex(Pl.XX b.);Indusia reflexed from the margin,nearly 1 mm.wide,and membranous.

Distribution Indo-China,Thailand,Luzon,Célébes

Ecology Terrsetrial ferns in semi-shade dry-evergreen forests.

Specimens examined : T.Boonkerd No. 41, 42, 48

PLATE XX



a.

b.

Pteris scabripes Wall. ex Hook. , Holtt. Rev. Fl. Malaya II, 399. 1954

Rhizome short, erect; bearing few scales and numerous roots. Stipes about 30 - 35 cm. long, somewhat longer in fertile fronds, purple in color, naked, shallow grooved; Rachises as stipes about 2 cm. long. Fronds 1-pinnate, 2 pairs, subopposite, terminal pinnae similar to the lateral, the lowest branched, closed to the base, the branches smaller, all pinnae sessile or subsessile; Sterile pinnae about 10-12 cm. by 2.0-2.7 cm., elliptic in outlines (Pl. XXI a. right), base usually oblique, apex acuminate, margin serrate-serrulate with large tooth near apex, surface glabrous, texture coriaceous; Veins free, forked 1-time, hardly seen, midrib on the upper surface shallow grooved; Fertile pinnae about 13-19 cm. by 0.9-1.1 cm., margin entire but serrate about 3 cm. far from apex (Pl. XXI b.), other character similar. Sori elongate along margin from base to 3 cm. far from apex (Pl. XXI b.) ; Indusia about 0.5 mm. wide.

Distribution Thailand, Malaysia

Ecology Terrestrial ferns, in semi-shade, dry-evergreen forests.

Specimens examined : T.Boonkerd No. 73-74, 118

PLATE XXI

a.

b

Pteris venusta Kunze, Tard.&C. Chr. in Lecomte, Fl. Gen. 7(2): 145. 1940.

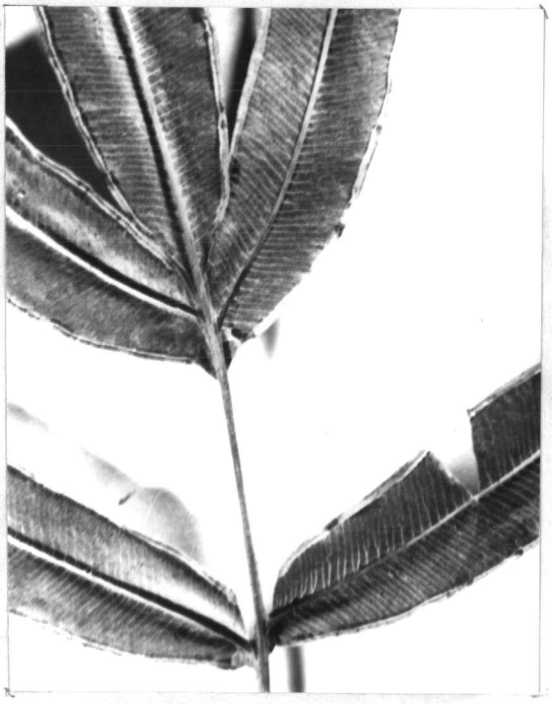
Rhizome short erect, bearing numerous roots, clothed with golden-brown root hairs. Stipes 40-50 cm. long, scaly at base; Hairy scales dark brown in color, edges paler, scales caducous; grooved, yellow to reddish brown. Fronds 1-pinnate about 75-110 cm. by 25-47 cm.; Rachises grooved, about 15 cm. long, naked, reddish brown on lower side, the upper pale yellow; Pinnae 5-6 pairs, subopposite, about 15-24 cm. by 1.3-1.6 cm., sessile or nearly so; the terminal pinnae usually longest, and closed to the adjacent pairs, base cuneate or oblique, apex usually attenuate, margin entire, surface glabrous, texture coriaceous; Veins free, once forked nearly - parallel(Pl. XXII a.). Sori elongate from base to 4.5 cm. far from apex; Indusia membraneous, nearly 1.0 cm. wide.

Distribution South China, Indo-China, Thailand, Malaysia.

Ecology Terrestrial ferns, in semi-shade dry-ever green forests.

Specimens examined : T.Boonkerd No. 114-115

PLATE XXII



a.

ASPLENIACEAE

Rhizome erect or creeping,terrestrial,climbing, epiphyte or on rock;Scales clathrate,edges entire or branches.Stipes containing two vascular strands at base, which meeting upper portion into a single 4 arms,seen in X-section.Fronds simple to pinnately compound;Veins free or united with longitudinal veins,forming areoles without included veinlets.Sori linear,oblong,elongate along veins or on veins;Indusia similar shape to sori,attached along veins.

This is newly splitting family by using subfamily Asplenioideae to family,using Asplenium as a type(Tagawa & Iwatsuki,1972).Only one genus,Asplenium(L.)found in the studied area.

Asplenium Linnaeus

Rhizome erect or creeping, terrestrial, climbing, epiphytic, very often on rock; Clathrate scales. Stipes short or long, with two vascular strands at base, which unite upper forming a single 4-armed strand. Fronds various forms, simple, pinnate or more divided; Rachises grooved; Veins mostly free, rarely anatomosing. Sori linear or oblong, usually along and on one side of the veins; Indusia opening toward the costa.

Four species found in the studied area.

Key to the species

1. Fronds simple
   2. Laminae about 8-16 cm. or more wide, pale green in color; Scales dark brown to black; Sori along both branches of veins.....3. *A nidus*
   2. Laminae usually not more than 9 cm. wide, deep green in color; Scales light brown; Sori along acroscopic branch of veins only.....4. *A phyllitidis*
1. Fronds pinnately compound
   2. Fronds 1-pinnate; Stipes and rachises covered with small scales; 6-14 sori per pinna.....2. *A crinicaule*
   2. Fronds 2-3 pinnate, varied in size, fertile fronds various forms; 2-3 Sori in each lobe of pinnule.....1. *A confusum*

Asplenium confusum Tard.&Ching, Tard.&C.Chr. in Lecomte, Fl. Gen. 7(2):240. 1940 .

Rhizome erect,covered throughout with scales; Scales clathrate,lanceolate,base notched;tulf of fronds upon;Roots numerous,clothed by numerous golden brown root-hairs. (Pl.XXIII.a.). Stipes varied in length,usually 20-45 cm. long,grooved,color variable;Rachises grooved,on upper surface, naked.Fronds mostly 3-pinnate,varied in size,the large one about 90cm. long and 34cm. wide;Pinnae 10-15 pairs, opposite, sub-opposite or alternate , lanceolate-ovate in outlines, varied in size, upper surface costa grooved; Pinnules ovate in outlines, more or less lobed , stalk short; the third series of pinnae deltoid in outlines, sessile , apex more or less lobed, lobes narrow; Veins free,forked 1-4times,surface glabrous. Sori elongated along free veins, 2-3sori in each lobe of pinnules,2-5 mm. long (Pl.XXIII b.); Indusia membranous.

This species varied in size, some smaller fertile fronds about 6cm. long and 1.2 cm. wide. Fronds 1-2pinnate, stipes and rachises usually covered with scales.

Distribution South China, Indo-China, Thailand

Ecology Common on rock , in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 133-139, 147-149

PLATE XXIII

a.

b.

Asplenium crinicaule Hance,Bedd.Handb.F.B.I.Suppl. 150.1969;Tard. & C.Chr. in Leconte,Fl.Gen. 7(2): 227-228.1940

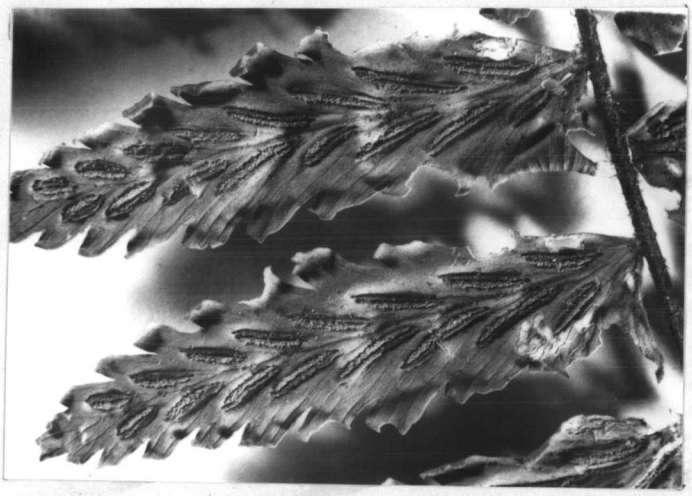
Rhizome erect,clothed with scales;Scales clathrate, branched, 6-11 mm. long,lanceolate;tulf of fronds upon. Stipes 12-24 cm. long,grooved,black-brown in color,covered with scales throughout,scales similar to those rhizomes but smaller and thinner;Rachises as stipes. Fronds 1-pinnate, 75-80 cm. long, largest at the middle about 10 - 11 cm. wide, elliptic in outlines; Pinnae numerous,alternate,sessile, basal and apical pinnae small,largest pinnae about 5.5 cm. long, widest at base about 1.5 cm.,lanceolate in outlines, costae grooved on upper surface,base oblique,surface glabrous coriaceous in texture,margin deeply incised;Veins free, forked. Sori linear,along pinnate veins, 4-6 mm. long, 6-14 sori per pinna (Pl.XXIV a);Indusia membranous.

Distribution Indo-China,Thailand,India,Australia.

Ecology Scattered on rock,in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 257-259, 287-289

PLATE XXIV



a.

Asplenium nidus Linn.,Holtt.Rev.Fl.Malaya II,419. 1954;Tard.& C.Chr.in Lecomte,Fl.Gén.7(2):219.1940; Thamnopteris nidus Presl;Bedd.Handb.Fern.Brit. Ind.137.1969

Rhizome short,erect,covered with scales at apex; Scales clathrate about 2 cm.long,edging with black hairs; rosette of fronds at apex,and many spreading roots below, bearing wooly root hairs,so as to become a water holding structure and also rooting media of other plants,as well as ant's inhabiting place.Stipes short,3-5 cm.long, brilliant black,naked.Fronds simple,forming a basket on the rhizome,65-125 cm.long and 8-16 cm.wide,oblong-lanceolate,base attenuate,apex acuminate,margin entire-undulate,glabrous,coriaceous in texture;veins forked1-2 time,the first forking near the midrib.Sori linear,mostly on every branched veins;all indusiated(Pl.XXV b.)

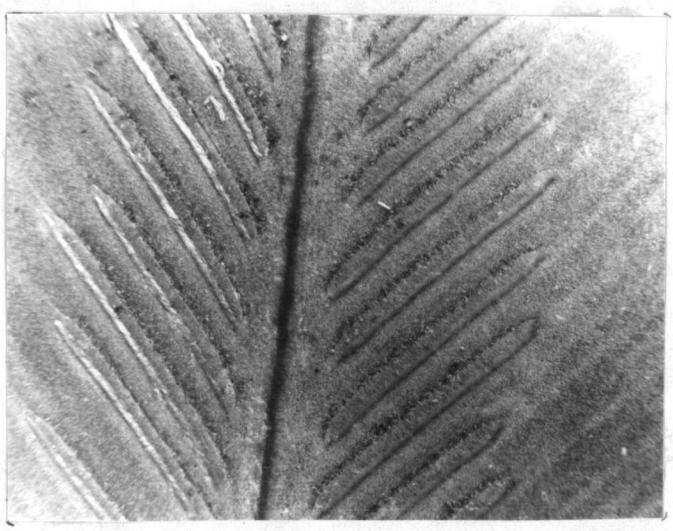
Distribution Laos,North Vietnam,Thailand,the Malay Peninsula,North India,Ceylon

Ecology Epiphyte or common on rock,in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 1, 2, 75-76, 319-320

PLATE XXV

a.



b.

Asplenium phyllitidis Don.,Holtt.Rev.Fl.Malaya II, 420.1954

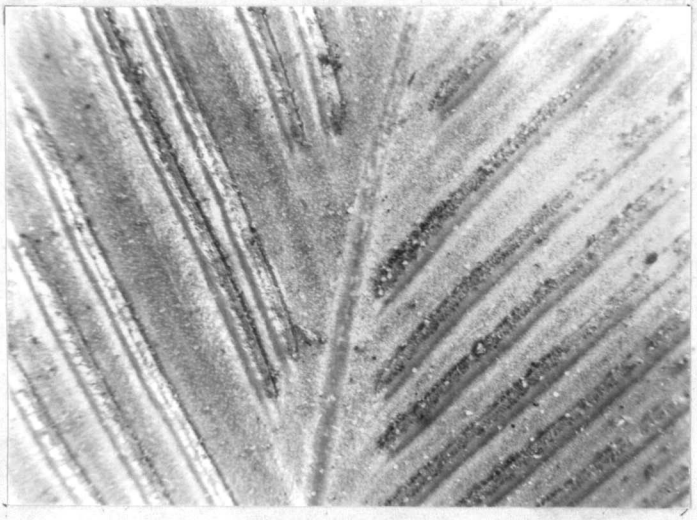
Rhizome erect,covered with scales;Scales clathrate, light brown in color,about 1.2by 0.2 cm.,lanceolate,base notched;basket of fronds upon.Stipes short,brilliant black,naked.Fronds simple,deep green in color,50-72 cm. long and 5.5-9.0 cm. wide,elliptic-oblong,apex acuminate, base attenuate;midrib raised on lower surface,basal portion black,upper portion green;surface glabrous,margin entire, texture coriaceous when living;Veins once or twice forked, the first fork near midrib;veinlet jointed with longitudinal veins near margin forming anatomosing veins.Sori linear along veinlets,usually along the acroscopic branch of veins only,forming sori apart from each other;Indusia membranous,arising from veinlets,open to apical part of fronds.(PL. XXVI a.).

Distribution Thailand,South-East Asia,Malaysia

Ecology Epiphyte or common on rock,in semi-shade dry-evergreen forests.

Specimens examined : T.Boonkerd No. 56, 59, 321, 326, 328

PLATE XXVI



a.

LOMARIOPSIDACEAE

Rhizome terrestrial or epiphytic, every often on rock, creeping or high climbing; Roots developed in row on ventral side; young part of rhizome covered with brown scales. Fronds of mature plants or pinnate, dimorphous; Veins free or anatomosing; fertile pinnae usually very narrow; sporangia covering the whole lower surface or only at two narrow sides of the midrib, very rarely on both surfaces.

Two genera found in the studied area.

Key to the genera

1. Rhizome creeping on rock; Scales covered throughout, clathrate; sterile pinnae to 10 cm. long.....
.....1. Bolbitis

1. Rhizome climbing on tree trunk; Scaly at apex, not clathrate; sterile pinnae to 20 cm. long.....
.....2. Lomariopsis

Key to the species

1. Sterile pinnae about 2.2-4.5 cm. long, oblong, base unequal, acroscopic sides wider than basiscopic sides; veins free, 2-3 time forked. .....
.....1. B. appendiculata

1. Sterile pinnae about 5.5-10.0 cm. long, elliptic-oblong, base acute, veins anatomosing.....
.....2. B. copelandii

Bolbitis Schott

Rhizome short creeping on rock, or on other plants; covered with clathrate scales; Fronds dimorphous, simple or 1-pinnate; Stipes and rachises grooved scaly; Pinnae sessile or nearly so, entire-undulate to crenate-sinuate margin; Veins free or anatomosing, with included free veinlets in areoles; fertile pinnae with sporangia covering on both surface or at two narrow sides of the midrib.

Two species found in the studied area.

Bolbitis appendiculata (Willd.) K. Iwats., Hennipman, Blumea 18:147. 1970; Tagawa & K.Iwats. SE. Asian St. 5:90. 1967. Egenolfia appendiculata (Willd.), Holtt. Rev.Fl. Malaya II, 459.1954.

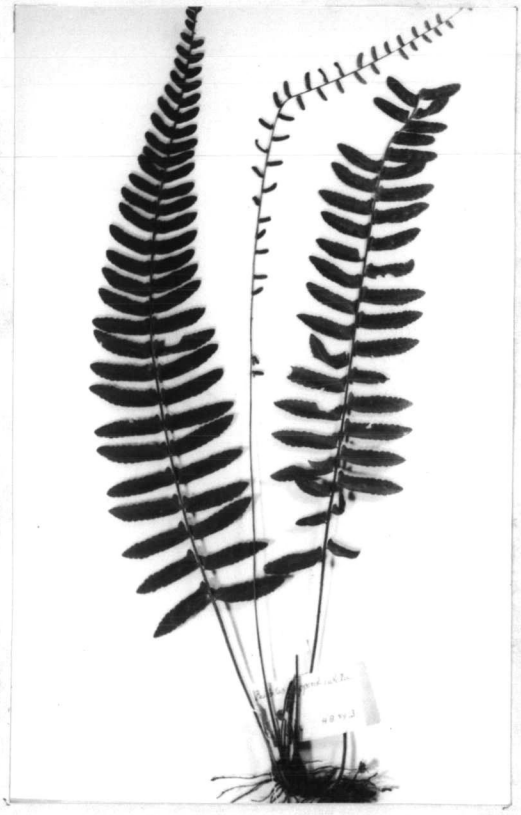
Rhizome creeping, 4-5 cm. long; and scaly; Scales clathrate, dark brown in color, about 2-5 mm. by 0.5 mm.; Fronds dimorphous(Pl. XXVII a.); Stipes scaly, grooved, in sterile fronds about 5-10 cm. long, the fertile about 12-21 cm.; Fronds 1-pinnate, sterile fronds about 18-45 cm. long and 4.5-8.2 cm. wide, elliptic in outlines, fertile fronds rather longer but narrower, and elliptic-oblong; Laminae of fertile fronds about 14-28 pairs of pinnae, sterile fronds lesser, pinnae alternate or subopposite, sessile; Sterile pinnae about 2.2-4.5 cm.long and 0.7-1.1 cm.wide, oblong, base unequal, small auricle at acroscopic side of base, margin crenate, surface glabrous, apex acut- obtuse veins in the basal auricle pinnate, all ending in sinus connecting with teeth; Fertile pinnae about 0.4-3.2 cm. and 0.15-0.6 cm. wide, oblong, base unequal, edge slightly crenate, with short teeth in the sinus. Sporangia covering the whole; exindusiate(Pl. XXVII b.).

Distribution Ceylon, North India, Western and Northern Malaysia, South China to South Japan.

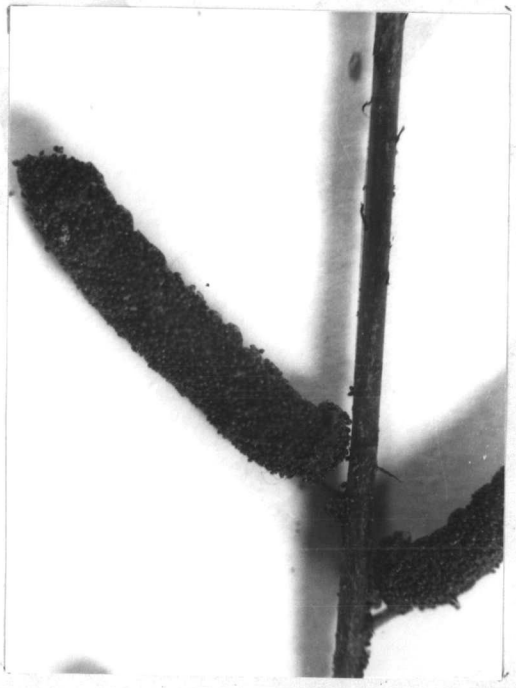
Ecology Common on rock in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 52-53, 55, 57,

-PLATE XXVII



a.



b.

Bolbitis copelandii Ching, Tard.C. Chr.
in Leconte, Fl. Gen.7(2):434. 1941.

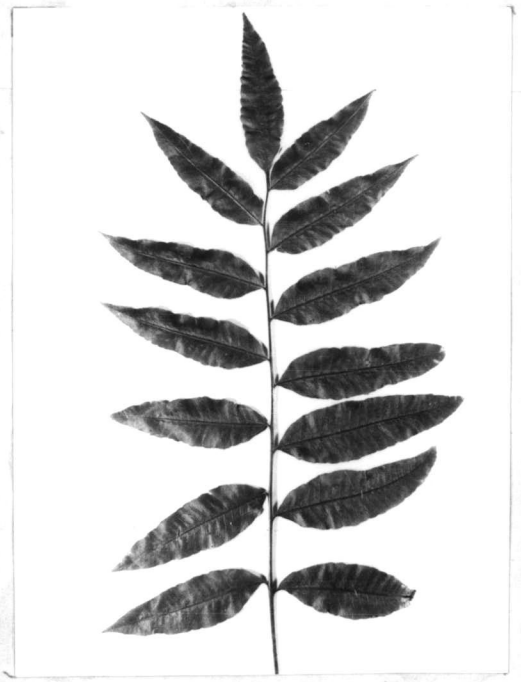
Rhizome creeping on rock, 6.5-10.5 cm. long, and scaly; Scales clathrate, dark brown to black in color, about 5 mm. long. Fronds dinorphous;Stipes closed together, grooved,scaly; Rachises grooved and rarely scaly;Shorter stipes always observed in sterile frond comparing to the fertile frond; Fronds 1-pinnate, sterile fronds about 25-51 cm. long and 10-16 cm. wide (Pl. XXVIII a.), fertile fronds about 28-58 cm. long and 4.7-7.5 cm. wide (Pl. XXVIII b.); Pinnae sessile or short stalks,subopposite or alternate, 4-6 pairs; sterile pinnae 5.5-10.0 cm. long and 2.0-2.3 cm. wide, the apical simple,similar to lateral pinnae, lateral pinnae elliptic-oblong, apex acuminate, base acute,margin undulate-sinuate,glabrous,veins anatomosing,with included veinlets in areoles; Laminae green when living,red-brown when dry;fertile pinnae about 3.2-5.5 cm. long and 0.6-1.1 cm. wide, elliptic-lanceolate,acuminate apex, base acute, margin sinuate, Sporangia entirely covered lower surface except midrib; Indusia absent.(Pl. XXVIII c.)

Distribution Laos, Cambodia, Thailand.

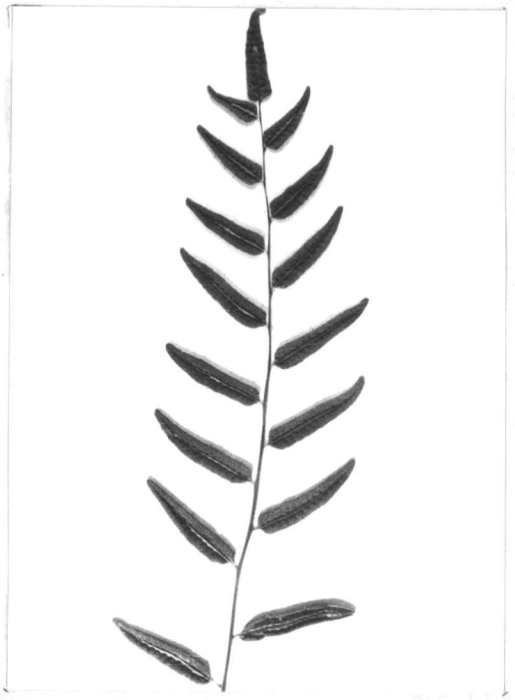
Ecology Lithosere in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 8-10, 64-66, 101-103, 433-436

PLATE XXVIII



a.



b.

PLATE XXVIII

c.

Lomariopsis Fée

Rhizome large,high climbing,rooting ventrally, the apical part covered with broad brown scales. Fronds many arranged in rows on rhizome, dimorphous, 1-pinnate, Stipes and rachises grooved, rarely scaly; Pinnae jointed to the rachis; except the terminal one which is not jointed; Veins simple free or forked. Those of fertile fronds much narrower than of sterile fronds.

A more common species is also found in the studied area: Lomariopsis cochin-chinensis Fee.

Lomariopsis cochinchinensis Fée, Holtt. Rev.Fl. Malaya II, 476. 1954; Tard. & C.Chr. in Lecomte, Fl.Gén. 7(2):428. 1941.

Large plant bearing roots, is grown in the ground; Rhizome climbing on tree trunk, large to about 3.8 cm. in circumference; clothed with scales at apex; Scales red-brown in color, about 1.2 cm. by 0.3 cm. lanceolate. Stipes and rachises grooved, rarely scaly. Fronds many, 1-pinnate; the sterile arranged on all part of rhizome, about 116 cm. long and 40 cm. wide, lateral pinnae about 20 pairs, alternate, sessile or nearly so; largest pinnae about 20.5 cm. by 3.5 cm., oblong, apex acuminate, base acute or unequal, margin entire, glabrous, texture coriaceous; Veins free, once forked; fertile fronds, 1-pinnate usually at apex of rhizome about 81 cm. by 42 cm.; pinnae to 20 pairs, alternate; with short stalks, about 0.2-0.5 cm. long, largest pinnae about 23 cm. by 0.4 cm., linear in outlines; Sporangia entirely covered on both surface of pinnae; exindusiate(Pl. XXIX b.)

Distribution South China, Indo-China, Thailand, the Malay Peninsula

Ecology Climbing ferns on Trees, usually near the streams in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 206-209

PLATE XXIX

a.

b.

PERANEMACEAE

Sub Family Tectarioideae

Terrestrial plants; Stocks, bearing tuft of fronds at the apex, apex of stock and base of stipes scaly, scales narrow, not clathrate. Fronds various forms, simple to pinnately compound; Veins free or various anatomosing. Sori round or nearly so; Indusia round or reniform, sometimes absent.

Two genera found in the studied area.

Key to the genera

1. Stocks about 30 cm. tall; fronds to 160 cm. or more long; sinus with a tooth.....1. Arcypteris

1. Rhizome suberect or creeping; fronds rarely exerted to 160 cm. long; sinus without tooth.....2. Tectaria

Arcypteris Underwood

Stock terrestrial, erect and scaly; Scales on the stock narrow, long shinning brown and toothed. Stipes with similar scales of stock at bases. Fronds 1-pinnate-bipinnatifid or 2-pinnate, the basal basiscopic pinnule of the basal pinnae longer than the other; a tooth at the base of each sinus between two lobes of lamina; Veins anatomosing, forming many small areoles, with few free included veinlets; glandular hairs red, spherical usually on lower surface of veins and costae. Sori with or without reniform indusia.

One species found in the studied area.

Arcypteris irregularis (Presl.) Holtt: Rev. Fl. Malaya II,538. 1954.

Stock erect, about 30 cm. or more tall, bearing scales at the apex; Scales about 5 mm. long, dark brown; tuft of frond upon. Stipes 75 cm. or more , nearly 3 cm. in diameter at base, grooved, the base covered with scales; green when alive, turning black brown at base and light brown at top when dry; Rachises grooved, naked. Fronds 1-pinnate-pinnatifid or 2 pinnate in basal pairs of pinnae , about 160 cm. by 60cm. ;Pinnae 10 or more pairs, all with short stalks about 0.2-0.6 mm. long, alternately arranged on rachis, lowest pairs of pinnae largest, forming pinnules at base; the basal basiscopic pinnules about20 cm. by4 cm. ,sessile , and deeply lobed; the basal acroscopic pinnule much shorter and narrower, midrib of these pinnules grooved on upper surface, usually to the joint costae, clothed at the jointly costae with short brown hairs; the middle pairs of pinnae, subopposite , about 36-40 cm. by9.0-10.5 cm., glabrous, deeply lobed at the apical and middle part, basal pinnules equal in size or slightly longer in basiscopic pinnules about 4-6 cm. long (Pl. XXX a.), sinus about 1 cm. wide, with branched tooth at base;

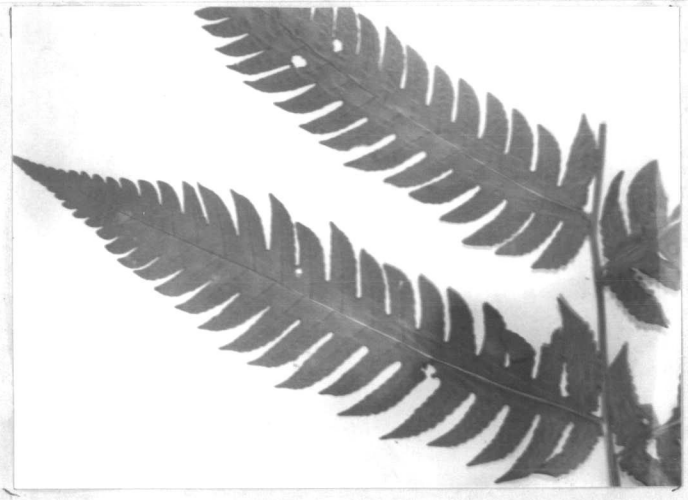
Vein anatomosing with included free vein in areoles along either sides of costae between two costules. Sori numerous 1cm. in diameter, round, on the veinlets junction; exindusiate (Pl. XXX b.)

Distribution Thailand, Malaysia.

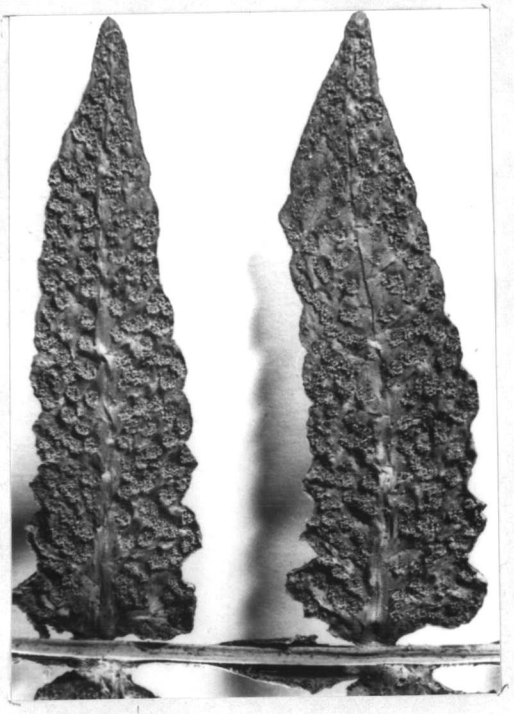
Ecology Terrestrial ferns, in densed dry-evergreen forests.

Specimens examined : T. Boonkerd No. 187-189

PLATE XXX

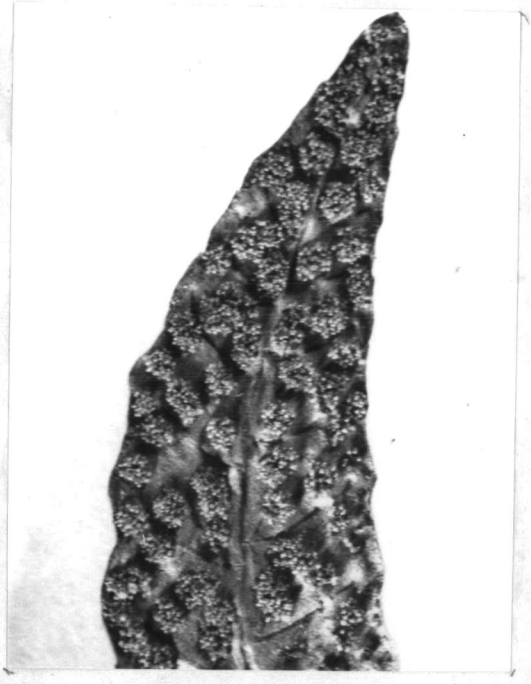


a.



b.

PLATE XXX



c.

Tectaria Cavanilles

Rhizome suberect or creeping, short or long; covered with scales mostly at apex. Fronds various forms, simple to tripinnatifid; Veins anatomosing with free veinlets in the areoles. Sori round or nearly so, usually at the end of free vein in an areole or on the veins junction; Indusia orbicular or reniform or sometimes absent.

Two species found in the studied area.

Key to the species

1. Pinnae mostly lobed, bearing both basiscopic branches and acroscopic; Rachises usually upto 40 cm. long.....
.....1. T. variolosa

1. Pinnae entire-undulate, bearing basiscopic branches only; usually very short.....2. T herpetocaulos

Tectaria variolosa (Wall.)C.Chr., Holtt. Rev.Fl. Malaya II, 506. 1954; Tard. & C. Chr. in Lecomte Fl. Gen.7(2):412. 1941;Aspidium variolosum Wall., Bedd. Handb.F.B.I. Suppl.216. 1969

Rhizome suberect or creeping, to 7.5 cm. or more long; bearing scales throughout, usually at apex of rhizome and base of stipes; Scales brown about 5 mm. by 0.5 mm., edges with multicellular hairs, brown in color. Fronds dimorphous;Stipes grooved,usually closed to each other;Rachises shallow grooved,clothed with short multicellular brown hairs;fronds bipinnate-pinnatifid. Sterile fronds(Pl.XXXI a.) about 65 cm.by 35 cm.;Laminae deltoid in outlines;Pinnae 4 pairs,opposite or subopposite; the basal pinnae largest,about 21.5 cm.by 18.5 cm.;with 2 pairs of pinnules;the basal basiscopic pinnules largest,about 11 cm.by 3 cm.,lanceolate,stalks short about 3 mm.long,margin deeply lobed,sometimes extremely lobed forming basal branched;the middle part of basal pinnae deeply lobed,the distal part lobed to undulate margin,apex acuminate;subbasal pinnae with 1 pair of pinnule;upper pinnae without pinnules,margin deeply lobed; pinnae all short stalks about 1.5 cm.long,stalks of pinnae and pinnules clothed with short multicellular hairs; lower surface of laminae glabrous,costae and costule on upper surface hairy;Veins anatomosing with included free

veins in areoles, areoles 4-6 side; margin of pinnae and lobes with minute tooth. Fertile fronds (Pl. XXXI b.) about 75 cm. long and 20 cm. wide; the basal pinnae largest, shapes of pinnae and pinnules similar to the sterile but more slender; Venation similar but more simple (Pl. XXXI c.). Sori round or nearly so about 1.5 mm. in diameter, on the free vein in the areole (Pl.XXXI c.), free veins projected to all direction, forming irregularly scattered; Indusia round or reniform

Distribution China, Indo-China, Malaysia, India

Ecology Terrestrial ferns, moderate shade, in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 49-51, 109-113, 126-129, 313-317

PLATE XXXI

a.

b.

PLATE XXXI

c.

Tectaria herpetocaulos Holtt. Dansk Bot.Ark.23(2): 241. 1965

Rhizome long creeping, about 2.5 cm. in circumference, apex of rhizome and base of stipes scaly; Scales brown in color, about 1 cm. long and 0.1 cm. wide. Stipes grooved, dark brown in color, alternatively arranged on rhizome, 1.5 cm. apart from each other, 30-80 cm. long. Young fronds trifoliate, adult fronds pinnate(Pl. XXXII a.); Rachises hairy, grooved, about 4 cm. long; Laminae about 27 cm. or more long and 20 cm. or more wide; lateral pinnae sessile or nearly sessile; basal pinnae with basiscopic branches, branches about 13 cm. by 3 cm., subbasal pinnae smallest; apex of compound fronds similar to lateral pinnae; apex of pinnae mostly attenuate, base unequal, margin entire-undulate; surface glabrous, costae on upper surface hairy; Veins anatomosing, with included free veinlets in areoles. Sori on the free veinlets in the areoles, veinlets pointing to all direction, so sori irregularly arranged, round and about 1 mm. in diameter; exindusiate. (Pl. XXXII b.).

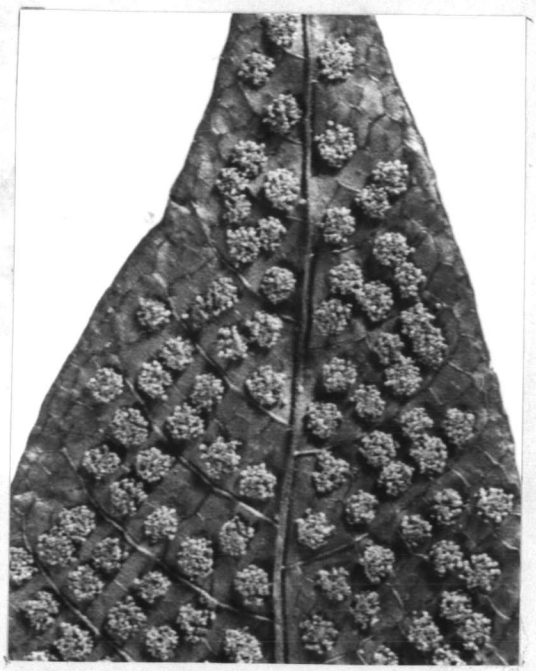
Distribution Indo-China, Thailand, India, Malaysia

Ecology Terrestrial ferns, in shady places dry-evergreen forests.

Specimens examined : T.Boonkerd No. 219-220, 263-265

PLATE XXXII

a.



b.

THELYPTERIDACEAE

Rhizome terrestrial, erect or creeping, scaly; Scales usually with unicellular hairs at the margin or often on the surface. Stipes scaly at base, containing 2-vascular strands which unite high up to form a single U-shaped bundle seen in cross section. Fronds compound, pinnate-bipinnatifid, rarely simple; Veins free or anatomosing (Fig. 4). Sori round, rarely linear; Indusia if present round and glabrous or hairy.

One genus found in the studied area, Thelypteris Schmidel

Thelypteris Schmidel

Rhizome short or long, erect or creeping, covered usually at the apex with various forms of scales and hairs; Scales hairy, usually at the apicies and edges, hairy scales usually falling off from old portion of rhizome. Fronds pinnate-bipinnatifid; Stipes scaly; Rachises, costae and costules, slightly grooved; Laminae pubescent or glabrous; Venation either free, goniopteroid (meniscioid) or pleocnemioid (Fig. 4). Sori round, on the veins and veinlets or sometimes more fused together in meniscioid group; Indusia if present round or reniform.

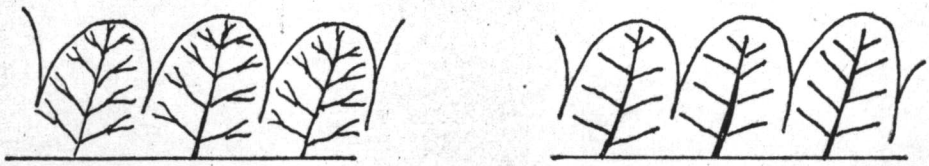
Seven species found in the studied area.

Key to the species

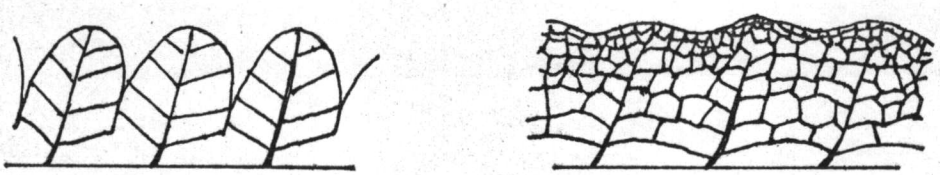
1. Rhizome erect
    2. Acroscopic and basiscopic basal lobes unequal, the former usually longer; Sori on the basal veinlets only.....1. T. dentata
    2. Acroscopic and basiscopic lobes equal; Sori on every veinlet of each lobe
        3. Pinnae 35 cm. or more long.....3. T. immersa
        3. Pinnae not more than 12 cm. long.....2. T. heterocarpa

1. Rhizome creeping
    2. Venation goniopteroid
        3. Lateral pinnae 1 pair.....7. T. triphylla
        3. Lateral pinnae 2-5 pairs.....8. T. triphylla var. parishii
    2. Venation free
        3. Lower pinnae reduced.....5. T. subpubescens
        3. Lower pinnae not reduced
            4. Sori on the pinnate veinlets, restricted to the apical lobes only.....6. T. terminans
            4. Sori on the basal veinlets of each lobes.....4. T. parasitica

a b

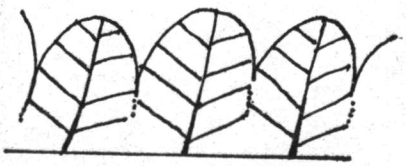


c d



e f

g h



i

Fig. IV

Thelypteris dentata (Forsk.)St.John,K.Iwats.Mem. Coll.Sci.Univ. Kyoto B 31(3): 171.1965

Rhizome short, erect, tuft of fronds upon; Scales covered at the apex, light brown and edges with unicellular hairs, to 4 mm. long. Stipes 20 - 25 cm. long, scaly at base, grooved throughout their length, hairy; Rachises as stipes. Fronds 1-pinnate-pinnatifid, about 45 cm. long and 15 cm. wide; Laminae oblong-lanceolate, apex acute to acuminate, widest near middle; Pinnae 10 - 15 pairs, alternate, sessile; the basal pointed downward (Pl. XXXIII a.), made an angle 45-60 degree to the rachises; lateral pinnae about 8 by 1.2 cm., oblong in outlines, margin deeply lobed, about 2 mm. near costae, lobes round quadrangular or moderately at apex, usually 2-3 mm. broad, margin of lobes with unicellular hairs, apex of pinnae acute-acuminate, base unequal, acroscopic basal lobes of each pinna longer than the basiscopic lobes; both surface hirsute; Venation free with callous sinus, pinnate in each lobe, veinlets 4-5 pairs. Sori on the basal veins of adjacent group which meeting at the sinus between their lobes, 2 sori under each sinus, forming two rows parallel to costae (Pl. XXXIII b.); Indusia round, reniform about 0.5 mm. in diameter, hairy.

Distribution Thailand, Taiwan, Southernmost Japan

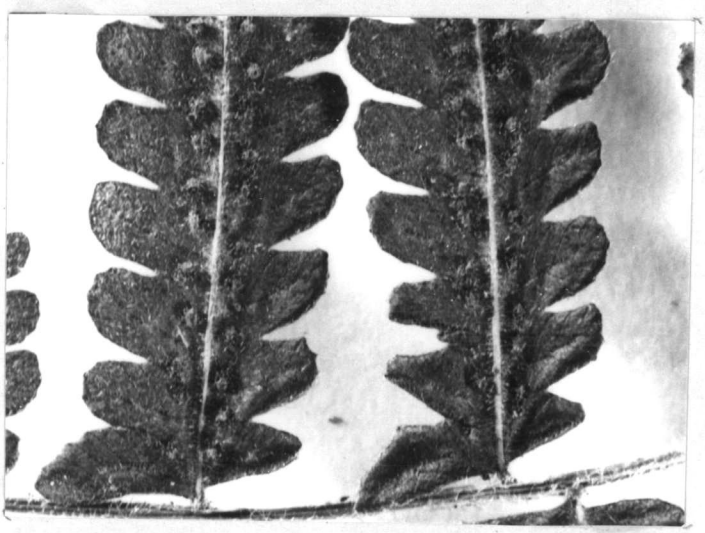
Tropic of the world

Ecology Terrestrial ferns, common along the bank of stream, in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 22-23, 373-375

PLATE - XXXIII

a.



b.

Thelypteris heterocarpa (Bl.)Morton

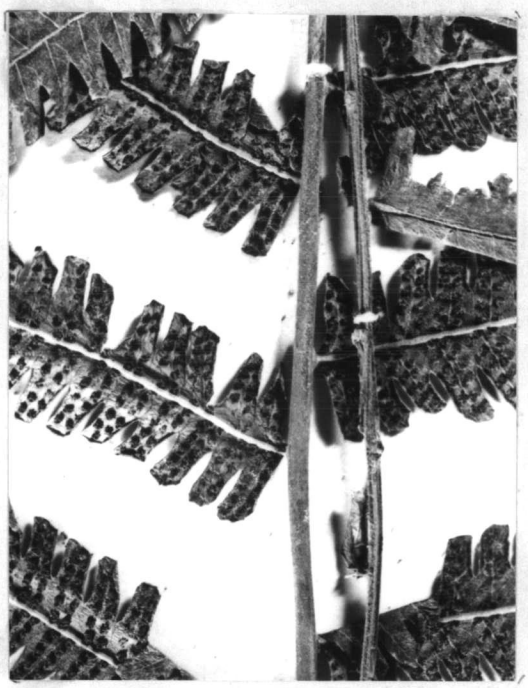
Rhizome erect, bearing numerous roots clothed by golden brown root hairs, tuft of fronds uppon, apex of rhizome scaly; Scales to 7 mm. long, widest at base about 1 mm., edges hairy. Stipes scaly, to 36 cm. long, grooved, naked. Fronds 1-pinnate-pinnatifid, about 76 cm. by 16 cm.; Rachises grooved, hairy, rarely scaly; Laminae lanceolate-oblong, apex acuminate, widest near the base; Pinnae up to 20 pairs, alternate, sessile, 2-3 pairs of basal pinnae reduced, pinnae about 12 cm. by 1.5cm., costae and veins hairy, grooved on lower surfaces, margin lobed about 2.5 mm. apart from costae, lobes nearly round, 2-3 mm. broad, lobes and sinus hairy, lobes all equal, apex acuminate, base truncate; the lower surfaces glabrous, the upper hirsute; Venation free with callous sinus, veinlets pinnate in each lobes, 5 pairs. Sori minute, round, on pinnate veinlets in each lobes (Pl. XXXIV a.); Indusia round or reniform.

Distribution Thailand

Ecology Terrestrial ferns, along the stream, in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 300, 303

PLATE XXXIV



a.

Thelypteris immersa (Bl.)Ching, Holtt. Rev.Fl. Malaya II, 243.1954

Rhizome short, erect; tuft of fronds upon. Fronds 1-pinnate-pinnatifid; Rachises grooved, hairy; Laminae of well grown plants 120 cm. or more long and 60 cm. or more wide, but 1-2 pairs of pinnae reduced; Pinnae numerous, sessile, opposite or subopposite, about 35 cm. long and 2.5 cm. wide, margin deeply lobed near the costae, lobes about 1.1 cm. long and 2-3 mm. broad, lobes and sinus hairy; surface glabrous, grooved, costae and veins hairy on upper surfaces; Venation free, with callous sinus, veins pinnate 13 pairs or more in each lobe. Sori small, round on the pinnate veins, basal pairs of veins sterile (Pl. XXXV a.); Indusia small, glabrous.

Distribution Hainan, Thailand, Malaysia

Ecology Terrestrial ferns, along the streams, in densed dry-evergreen forests.

Specimens examined : T.Boonkerd No. 68-69

PLATE XXXV

a.

Thelypteris parasitica (L.) Fosb.,K. Iwats.Mem. Coll.Sci.Univ. Kyoto B.31(3):172. 1965

Rhizome long creeping, about 20 cm. or more long, 1.5 cm. in circumference,covered with brown scales and hairs throughout;Scales to 1 cm. or more long, wider at base.Stipes on all sides of rhizome,each 1-4 cm. apart,scaly at the base,grooved and hairy throughout their length,to 40 cm. or more long.Fronds 1-pinnate-pinnatifid;Rachises grooved,hairy;Laminae 25-50 cm. or more long and 15-20 cm. or more wide; Pinnae to 20 or more pairs,sessile,opposite,subopposite or alternate, basal pinnae not reduced but some lateral pinnae reduced, about 13.5 by 1.3 cm. long, oblong-lanceolate,base truncate,apex acuminate, margin deeply lobed,about 2 mm.broad and 5 mm. long;acroscopic basal lobes of each pinna longer than basiscopic lobes (Pl. XXXVI b.), margin hairy; both surface densely hirsute;Venation free,with callous sinus,basal veinlets of adjacent lobes meet about 1 mm. from costa and fused together, forming single veinlet, pointed to the sinus,pinnate veins in each lobe about 7 pairs.Sori small,round, on the basal veinlets of each lobe, 1 sorus per basal veinlet, from two rows of sori parallel to both sides of costae (Similar to T dentata(Forsk.) St. John.), sometimes on each pair of veinlets in the lobes

(Pl. XXXVI b.); Indusia round, hairy.

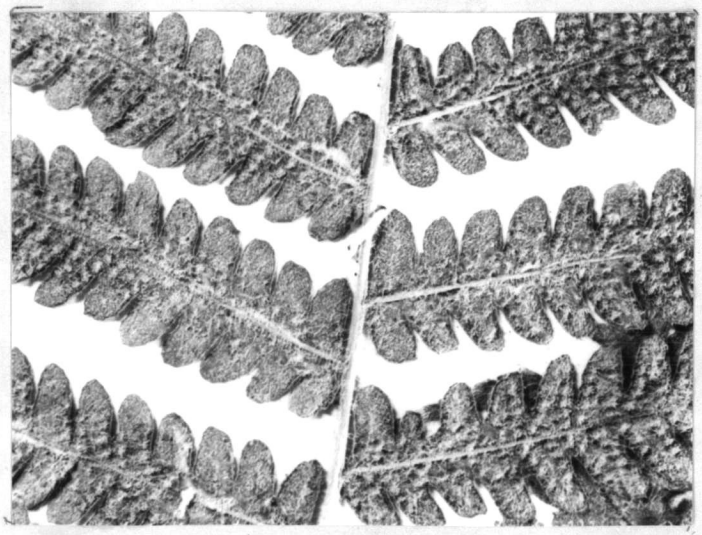
Distribution Tropic of East Asia.

Ecology Terrestrial ferns, along the banks of streams, in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 290-292, 301-302

PLATE XXXVI

a.



b.

Thelypteris subpubescens (Bl.)K.Iwats.Mem.Coll. Sci.Univ.Kyoto B.31(3):173.1965; Cyclosorus subpubescens (Bl.)Ching,Holtt.Rev.Fl.Malaya II, 273.1954

Rhizome creeping, with tuft of fronds upon; Roots numerous, clothed with golden brown root hairs; Scaly and hairy, usually at the base of stipes and apex of rhizome, scales about 9 mm. long, 0.5 mm. wide at base, margin hairy. Stipes to 25 cm. or more long, grooved, covered with very short unicellular brown hairs; Rachises as stipes. Fronds 1-pinnate; Laminae about 110 cm. by 28 cm., wider at the middle; Pinnae 25 pairs or more, sessile, opposite or subopposite, 5-6 pairs of basal pinnae reduced, apical pinnae similar to lateral pinnae (Pl. XXXVII b.), largest pinnae about 15 cm.by 1.5 cm.,base wider, lanceolate, apex attenuate, base acute or nearly so, margin shallowed lobed (Pl. XXXVII a,c), lobes about 2 mm. broad and 2mm. long; acroscopic basal lobes of lower pairs pinnae longer than basiscopic lobes, lobes hairy; Venation free with callous sinus, pinnate veins 4-7 pairs in each lobe , basal veinlets of adjacent lobes meet and fused below the sinus, to form a single veinlet pointed to the sinus, subbasal veinlets similar, the single veinlets of the basal and subbasal veinlets then fused forming a terminal single veinlet ,-pointing and reaching the sinus; lower surface glabrous, except costae hairy; upper surface hairy, hairs

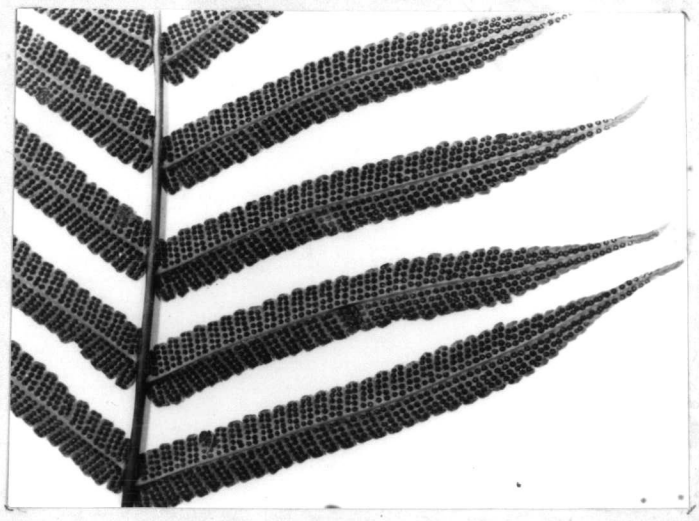
minute. Sori about 1 mm. in diameter, round, on pinnate veins, mostly on every veinlet, except at the apex (Pl. XXXVII c.); Indusia round, glabrous.

Distribution Thailand, South-East Asia, Malaysia, Queensland, Ceylon

Ecology Terrestrial ferns, along the banks of streams, in densed dry-evergreen forests.

Specimens examined : T.Boonkerd No. 379-382, 395-403

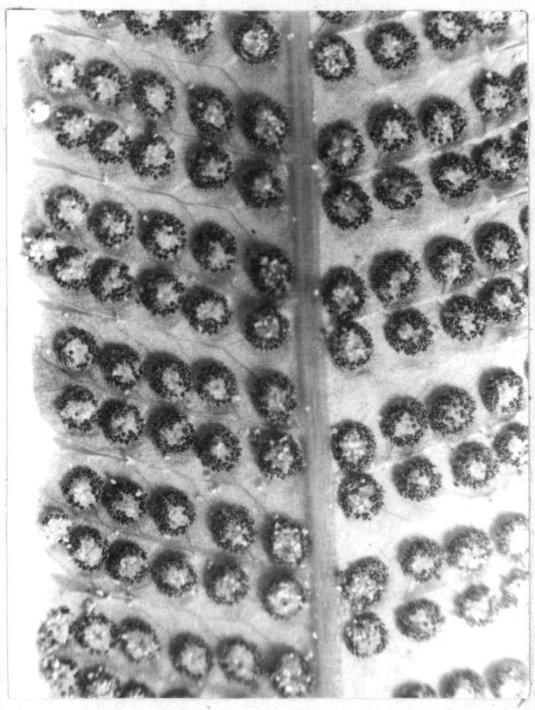
PLATE XXXVII



a.

b.

PLATE XXXVIII



c.

Thelypteris terminans (Hook.)M.

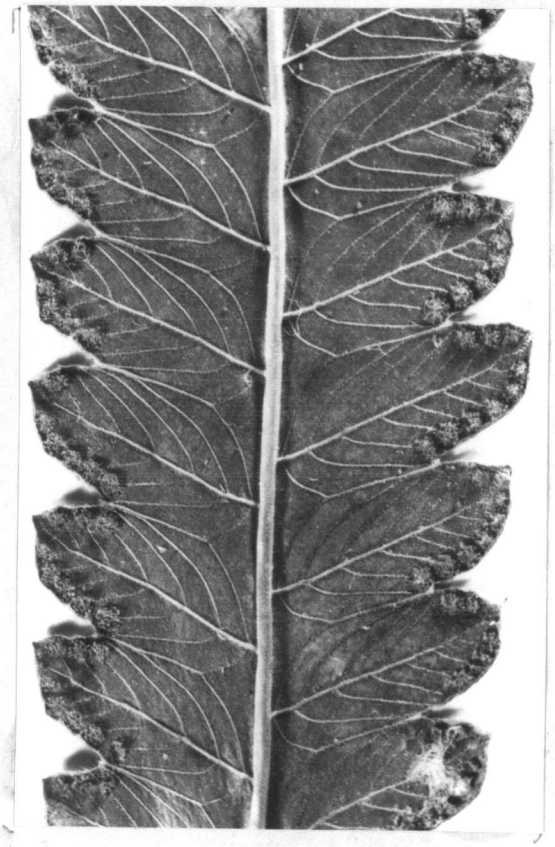
Rhizome short creeping ; scaly throughout, scale brown, about 3 mm. long, margin hairy. Fronds irregularly arranged, 0.3 - 1.2 cm. apart from each other; Stipes scaly at the base and covered with unicellular white hairs upon, to 30 cm. or more long; Rachises grooved, hairy; Laminae about 50 cm. by 28 cm., with apex similar to the lateral pinnae; Pinnae about 10 pairs, sessile or subsessile about 20 cm. by 2.5 cm., apex acuminate, base truncate; margin lobed, lobes acute, about 6 mm. broad and 5 mm. depth, lobes hairy; both surface glabrous, except the costae; Venation free with a callous sinus, basal veinlets of adjacent lobes met and fused about 2 mm. above costae, forming single veinlet running to each sinus (Pl. XXXVIIIa). Sori on the pinnate vein, confined to apical part of lobes, about 5 pairs of total 7 pairs veinlets in each lobes, round, small (Pl. XXXVIII a); Indusia round and glabrous.

Distribution Thailand

Ecology Terrestrial ferns, along the streams in dry evergreen forests.

Specimens examined : T. Boonkerd No. 70-72

PLATE XXXVIII



a.

Thelypteris triphylla (Sw.)K.Iwats.,Mem.Coll.Sci. Univ. Kyoto B 31(3);190-191. 1965; Abacopteris triphylla (Sw.)Ching,Holtt. Rev. Fl. Malaya II, 287. 1954; Meniscium triphyllum Sw., Bedd. Handb. F.B.I. Suppl. 397. 1969

Rhizome long creeping, about 2 mm. in diameter; Scales and hairs covered on all part of rhizome, 0.4 cm. long, edges of scales hairy. Fronds dimorphous, trifoliate (Pl. XXXIX a.); Stipes 0.4-1.0 cm. apart from each other, scaly at base, grooved, hairy throughout, the sterile stipes about 10 cm. long, the fertile longer upto 25 cm.long; Rachises as stipes; terminal pinnae largest about 15 cm. by 3.4 cm.,more slender in the fertile, lanceolate-oblong in outlines, apex acuminate, base truncate, cuneate or round; basal pairs of pinnae opposite, about 5.5 cm. by 2.0 cm. in sterile fronds; surface glabrous and verrucose, costae and veins covered with hooked hairs; Gonioptoroid Venation (Fig. 4 a.). Sori exindusiate, about 2 mm. long on all veinlets which nearly parallel to the costae; Sporangia covered with hooked hairs.

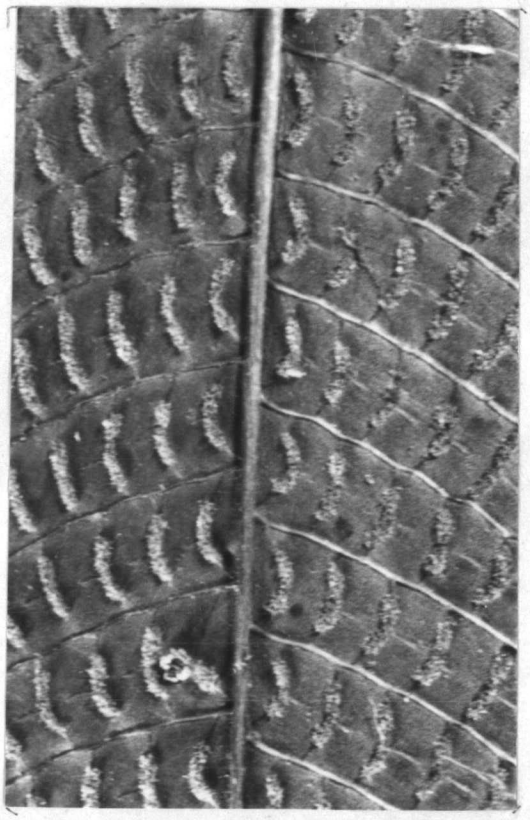
Distribution Tropical Asia and Australia

Ecology Terrestrial ferns, in swamy places or along the streams, semi-shade in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 216-218, 404-411

PLATE XXXIX

a.



b.

Thelypteris triphylla var.parishii (Bedd.)K.Iwats., Mem.Coll.Sci.Univ.Kyoto B.31(3):191.1965; Meniscium triphyllum (Sw.)var.parishii,Bedd.H. 399.1969

The variety differs from the species in having fronds with 2-5 pairs of lateral pinnae.The specimen at Sakaerat;Fronds,bearing 2 pairs of lateral pinnae;upper pairs of lateral pinnae smaller and adnate at base;basal pinnae larger,sessile,subopposite;Stipe also longer very often reach to 70 cm.long.

Distribution Taiwan,Indo-China,Thailand,Burma, Malaya

Ecology Terrestrial ferns in swamy places or on the banks of streams,semi-shade in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 211-215, 377-378

POLYPODIACEAE

Rhizome creeping, usually epiphytic or on rock, containing a ring of small vascular strands; Scales present usually peltate at the base, clathrate or not. Fronds simple, entire, or deeply lobed or pinnate, with stipes jointed to the rhizome; Veins reticulated, with free veinlets in areoles. Sori exindusiate, round, elongated parallel to the main veins or to the margin, or acrostichoid sometimes sunk in cavities in the frond surface.

Polypodiaceae is probably the largest family of Pteridophytes, composing at least more than 1000 species, with 26 genera or more.

Only 5 genera found in the studied area : Platycerium, Drynaria, Pyrrosia, Microsorium, Colysis.

Key to the genera

1. Nest-leaves present
    2. Fertile fronds repeated forked.....
    .....1. Platycerium
    2. Fertile fronds deeply lobed or pinnate.....
    .....4. Drynaria
1. Nest-leaves none
    2. Laminae simple entire
        3. Sori round or nearly so
            4. Surface of laminae covered with stellate hairs.....
            .....2. Pyrrosia
            4. Surface of laminae glabrous..
            .....3 Microsorium
        3. Sori acrostichoid or nearly so.....
        .....5. Colysis
    2. Laminae simple deeply lobed.....
    .....3. Microsorium

Platycerium Desvaux

Rhizome epiphytic, short fleshy, branched, young parts of rhizome covered with broad scales. Fronds without stalks, densely bearing stellate hairs when young, glabrous when old, dimorphous; Sterile nest leaves erect with broad lamina or deeply cordate at base, main veins forked, small veins reticulated, the fertile erect or pendulous, dichotomously branched from the base. The sporangia at part of lower surface or special lobes.

One species found in the studied area.

Platycerium wallichii Hook.,Bedd. Handb. F.B.I. Suppl. 445. 1969; Holtt. Rev.Fl.Malaya II,141. 1954

Rhizome short,creeping,branched and fleshy young parts covered with scales;Scales with pale edge, about 1 cm. long and 1cm. wide. Fronds dimorphous, sessile; Nest-leaves erect , with broad lamina, about 60 cm. long and as wide as long, covering the rhizome, margin lobed, sinus about 4 cm. in depth and as long as wide ; Main veins dichotomously branched , veinlets anatomosing ; Fertile fronds erect or pendulous , repeatedly dichotomous (see Plate XL b.) Veins similar to the sterile fronds but having large areoles with included veinlets ; Surface covered with dense stellate hairs when young glabrous and glossy when dry. Sporangia acrostichoid , spread all over the lower surface , clothed with large stellate hairs .

Distribution Thailand, Malay Peninsula, Tenasserim, Mergui, Singapore, Philippines

Ecology Common on tree trunk, up to 10-15 m. in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 119-120

- PLATE XL

a.

b.

Pyrrosia Mirbel

Rhizome creeping, covered with persistent scales; Scales usually peltate at base (except P stigmosa). Stipes usually short. Fronds simple , various length , usually fleshy; upper surface glabrous , the lower clothed with stellate hairs; margin entire; Vein usually hidden. Sori round, protected when young by stellate hairs, usually spread on apical part of fronds.

Two species found in the studied area.

Key to the species

1. Veins prominent on upper surface , laminae coriaceous.----------1. P stigmosa

1. Veins hardly seen on both surface ,laminae thick and fleshy----------2. P longifolia

Pyrrosia stigmosa (Sw.) Ching, Tard.&C. Chr. in Lecomte, Fl. Gén.7(2) :507. 1941; Holtt. Rev. Fl. Malaya II,148.1954; Niphobolus stigmosus Moore, Bedd. Handb. F.B.I. 328. 1969

Rhizome creeping about 5 cm. long, clothed with scales at apex; Scales about 0.5 by 0.1cm. ; stipes closed to each other. Young stipes clothed with brown stellate hairs, and naked when very old, and black or dark brown in color,usually at base, about 15-20 cm.long.Fronds simple;Laminae about 20-30 cm.long and 2-3 cm.wide,oblong in outline,base acute, apex acuminate;Upper surface glabrous,lower surface clothed with stellate hairs(Pl.XLI b. left);Main veins shallow grooved upper and raised below,about 6-10 mm. apart,all making angle about 60 degree to the midrib, areoles hardly seen(Pl.XLI b.right).Sori small,irregular arrangement and clothed with light brown stellate hairs.

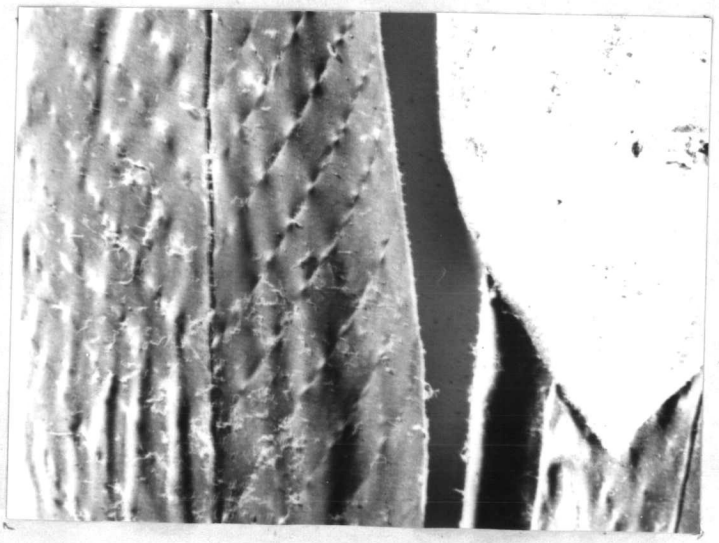
Distribution Indo-China,Thailand,Malaysia,Sumatra to New Guinea,North India

Ecology Epiphyte or on rock along the stream in dry-evergreen forosts.

Specimens examined : T.Boonkerd No. 177-178, 383-385

PLATE XLI

a.



b.

Pyrrosia longifolia (Burm.)Morton,Holtt.Rev. Fl.Malaya II,148. 1954; Niphobolus acrostichoides (Sw.) Bedd. Handb.F.B.I. Suppl. 327. 1969; Pyrrhosia acrostichoides Ching, Tard.&C. Chr. in Lecomte, Fl. Gén. 7(2): 514-515. 1941

Rhizome long creeping, branched, about 0.9 cm. thick, covered with persistent scales; Scales about 2.0 by 1.0 mm., dark brown in color, edges paler. Stipes short about 4.0 cm.long, round or nearly so, black-brown in color. Fronds simple, about 40 cm. or more long and 2.2 cm. wide, linear(Pl.XLII a.),base cuneate, apex acute; apical part of frond usually narrow and then rolled; upper surface glabrous and glossy green, lower surface covered throughout with grey stellate hairs; fleshy and 1.0 mm. thick; midrib grooved upper and strongly raised lower; Veins hardly seen on both surface. Sori round, nearly 1 mm. in diameter, glabrous, usually scattered on apical part of fronds(Pl. XLII a.).

Distribution Southern China, Indo-China , Thailand, Burma, Malaysia to Queensland and Polynesia

Ecology Epiphyte on trees, upto 4-8m., in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 197-198, 309-312

- PLATE XLII

a.

Microsorium Link, emend. Ching

Rhizome creeping or climbing, covered with persistent scales; Scales mostly peltate at base, usually clathrate; Roots numerous. Fronds simple entire or deeply lobed; surface glabrous; texture coriaceous or fleshy when living; Veins anatomosing, visible when dry, with free veinlets in the areoles, veinlets pointing to all direction. Sori naked, round, small, on the veins junction or on the anatomosing veins, mostly irregular arrangement.

Three species found in the study area.

Key to the species

1. Fronds with margin entire

    2. Main veins hardly seen in living frond, fronds fleshy .....1.M punctatum

    2. Main veins distinctly raised on lower surface, fronds coriaceous.....3.M zippelii

1. Fronds with margin deeply lobed ....2.M nigrescens

Microsorium punctatum (Linn.)Copel,Holtt.Rev.Fl. Malaya II,179.1954;Tard. & C.Chr.in Lecomte,Fl.Gen. 7(2):483.1941;Pleopeltis punctata Bedd.Handb. F.B.I. Suppl.357.1969

Rhizome creeping,about 1 cm.in circumference; Roots with many dark brown root hairs;Scales persistent and clathrate,peltate at base about 2 by 1.5 cm.Stipes short,naked;grooved.Fronds simple about 83 cm.or more long and 6 cm.or more wide,apex narrow acuminate and usually narrow to the base,glabrous,entire and fleshy (Pl.XLIII a.)Veins hardly seen when living,so conspicuous on both surface when dry,anatomosing,some areoles with included veinlets,main veins about 1.5-2.5 cm.apart from each other.Sori round about 1.5 mm.in diameter, irregularly arranged on the anatomosing veins.

Distribution Tropical Asia,West Tropical Africa

Ecology Epiphyte or lithosere,common in dry-evergreen forests

Specimens examined : T.Boonkerd No. 123-125, 169-172

PLATE XLIII

a.

Microsorium nigrescens (Bl.)Copel.,Tagawa& K.Iwats. S.E. Asian St.5:54. 1967; Phymatodes nigrescens (Bl.)J.Sm.,Holtt. Rev.Fl. Malaya II,193. 1954; Tard. & C. Chr. in Lecomte.,Fl. Gen. 7(2):473. 1941

Rhizome short creeping, about 0.5-1.0 cm. in diameter, bearing numerous roots and peltate scales. Stipes 30-40 cm. or more long, shallow grooved, naked. Fronds simple; margin deeply lobed near the midrib, about 135 cm. or more long and 55 cm. or more wide; lobes upto 10 pairs, apex of lobes attenuate, margin entire-undulate,the middle lobes about 30 by 4 cm; surface glabrous;Veins prominent on both surface, anatomosing with free veinlets in areoles,tip of veinlets translucent when living. Sori naked, round, sunk in the blade of lobes, usually on the anatomosing veins, forming two rows of sori at both side of the midrib of lobes.

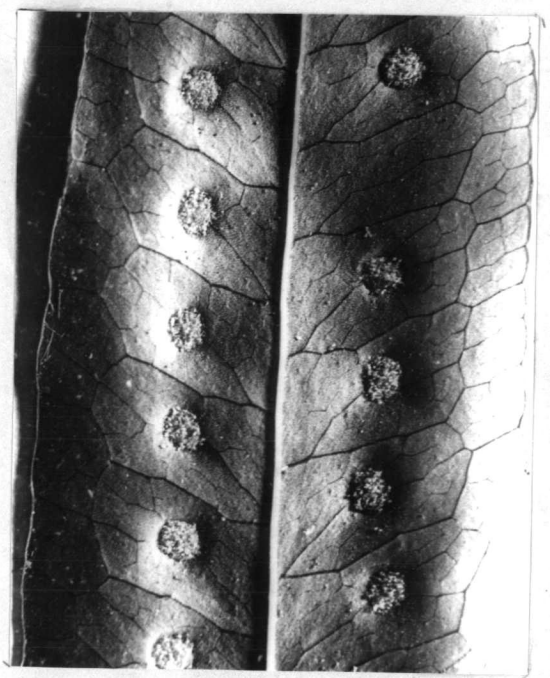
Distribution Tropic of Asia and Australia

Ecology Common on wet rock near the streams in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 5-7, 282-286

PLATE XLIV

a.



b.

Microsorium zippelii (Bl.)Ching,Holtt.Rev.Fl. Malaya II,176.1954;Tard. & C.Chr.in Lecomte,Fl. Gen.7(2):479.1941;Tagawa & K.Iwats.SE.Asian St. 5:52.1967

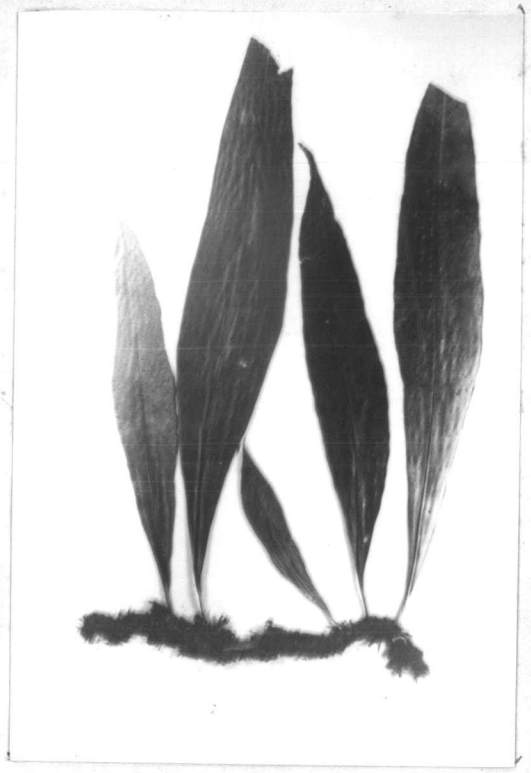
Rhizome long creeping,about 3 mm.in diameter, boaring persistent scales;Scales clathrate,edges toothed about 5 mm.long;Roots numerous.Stipes short, glossy brown when dry,grooved,scaly at base,about 1.5 cm. or more apart.Fronds simple,glabrous,coriaceous,about 55 cm.or more long and 6.5 cm. or more wide, base cuneate,apex acuminate, with undulate margin; Main veins prominent on both surface, about 0.7-1.5 cm. apart (Pl. XLV b.), veins anatomosing with free veinlets in the areoles. Sori round, about 1.5 mm. in diameter, irregularly arranged on the veinlets junction. (Pl. XLV b.).

Distribution South China, Cambodia, Thailand, North India, Malaysia, Sumatra, Philippines.

Ecology Common on moisty rocks, in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 142-146

PLATE XLV



a.

b.

Drynaria J.Smith

Rhizome creeping, thick and fleshy, covered with scales throughout. Fronds dimorphous, simple deeply lobed or pinnate; the sterile nest-leaves short, broad, sessile, turning brown when old; the fertile foliage leaves long and stalked, simple deeply lobed or pinnate, glabrous; Veins anatomosing with free veinlets in areoles. Sori round, small or of moderate size on the veins.

The genus Drynaria is a fern of very distinctive in having fronds of two kinds similar to Platycerium , the stag horn fern, often ant associated.

Key to the species

1. Fertile fronds simple, deeply lobed

    2. Nest-leaves to 20 cm. or more long, lobes 1.5-3.0 cm. deep ..... 3. D quercifolia

    2. Nest-leaves shorter to 7.5 cm. or a little more long, lobes round and shortly incised ..... 1. D bonii

1. Fertile fronds pinnate, apex of nest-leaves acute ..... 2. D rigidula

Drynaria bonii Christ,Tard. & C.Chr.in Lecomte, Fl.Gén.7(2):517.1941

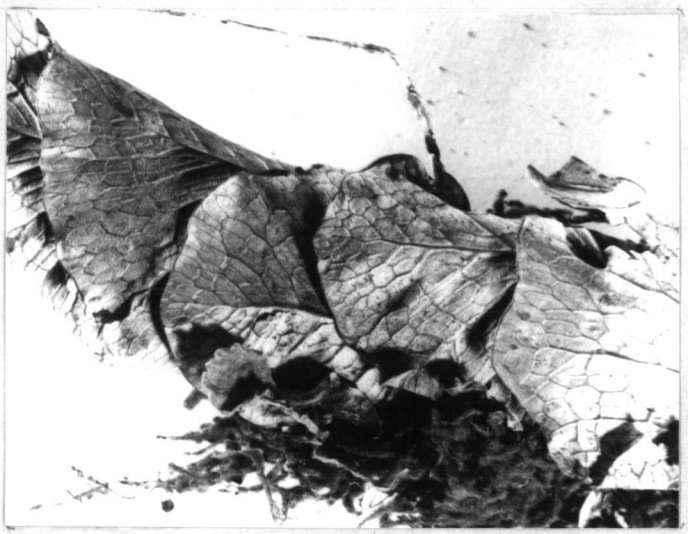
Rhizome long creeping,fleshy,covered with persistent scales;Scales peltate at base and then abruptly long pointed,brown,edges paler;Roots short with brown root hairs.The sterile nest-leaves (Pl.XLVI a.) sessile,covered on upper surface of rhizome,overlapping to each other,about 7.5 cm.long and 5.5 cm.wide,orbiculate or ovate in outlines;margin shallowly lobed,lobes round,surface glabrous;Veins prominent on both surface and anatomosing,also in some areoles with free veinlets; The foliage leaves (Pl.XLVI) simple with short wing stipes;margin deeply lobed,lobes 6 pairs or more about 55-60 cm.long and 20-25 cm.wide,middle lobes about 13 cm. by 3 cm.,apex of lobes acuminate , surface glabrous;Veins anatomosing,with free veinlets in some areoles(Pl.XLVI c.).Sori round,about 1.5 mm.in diameter, irregularly arranged on the veins.(Pl.XLVI c.)

Distribution South China,Indo-China,Thailand

Ecology Common on trees or rock in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 13-17, 420-424

PLATE XLVI



a.

b.

PLATE XLVI

c.

Drynaria rigidula (Sw.),Bedd.Handb.F.B.I.Suppl. 344.1969;Holtt.Rev.Fl.Malaya II,183.1954;Tard.& C.Chr.in Lecomte,Fl.Gén.7(2):521.1941

Rhizome creeping,about 1 cm.in diameter,bearing scales throughout;Scales peltate at base with long points, about 7 mm.long,red-brown in color,edges paler and toothed;Roots numerous.Nest-leaves (Pl.XLVII a,)sessile, erect,imbricate,about 12 cm.long and 7 cm.wide,lanceolate; margin lobed,about 1 cm. deep,lobes and apex acute; surface glabrous;Veins anatomosing,with free veinlets. in some areoles;midrib strongly raised on both surfaces. Foliage leaves 1-pinnate,stipes to 20 cm.long,round or nearly so;stipes and rachises hairy;Laminae 55 by 23 cm. pinnae 14 or more pairs,pinnae sessile,alternate about 14 by 0.9 cm.,base acute,apex acuminate,margin serrulate; surface glabrous;Veins similar to the nest-leaves(Pl. XLVII a.) Sori round, about 1 mm.in diameter,on the veins junction,forming two rows of sori parallel to both sides of costa(PL. XLVII a.).

Distribution Tropical Asia and Australia

Ecology Epiphyte on tree trunk upto 10-12 m.; in dry-evergreen forests and mixed deciduous forests.

Specimens examined : T.Boonkerd No. 19-20, 36-37, 308

PLATE XLVII

a.

b.

Drynaria quercifolia (L.)J.Sm.;Holtt.Rev.Fl. Malaya II,182.1954;Polypodium quercifolium, Bedd.Handb.F.B.I.Suppl.341.1969

Rhizome creeping,young part covered with scales; Scales dark brown,about 6 mm.long and 0.5 mm.wide,edges paler and toothed;Roots numerous,covering the whole part of rhizome.Nest-leaves (Pl.XLVIII b.) sessile,imbricate, about 20 cm.or more long and 16.5 cm.or more wide, orbiculate or ovate in outlines;margin lobed about 1.5-3.0 cm.deep;surface glabrous, glossy brown when dry;Veins anatomosing with free veinlets in areoles.Fertile foliage leaves simple (Pl.XLVIII c.),margin deeply lobed;Stipes nearly round,naked,about 14 cm.long;Laminae about 40 by 26.5 cm.,lobes to 5 or more pairs,middle lobes about 16 by 3.5 cm.,midrib grooved on upper surface;surface and veins similar to the nest-leaves.Sori round,about 2 mm.in diameter,irregularly arranged on the veins. (Pl.XLVIII d.)

Distribution India,Ceylon,Thailand,Malaysia to Polynesia,Tropical Australia

Ecology Epiphyte in deciduous dipterocarp forests (Pl.XLVIII a.)

Specimens examined : T.Boonkerd No. 183-186

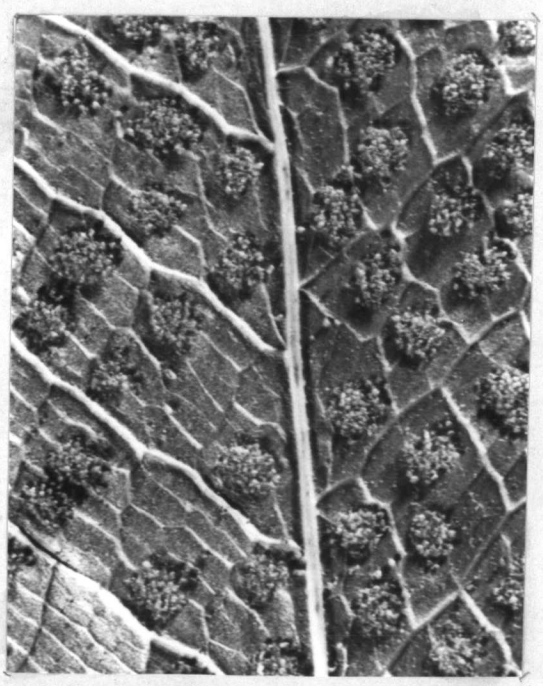
PLATE XLVIII

a.

b.

PLATE XLVIII

c.



d.

Colysis Presl

Rhizome creeping or climbing, stipes jointed to it; Scales clathrate. Stipes often winged nearly to the base. Fronds simple, thin in texture; Veins conspicuous, main veins rather irregular at a broad angle to the midrib and with a few rows of areoles between them. Sori in lines between adjacent main veins.

Only one species found in the studied area.

Colysis pedunculata Ching, Holtt. Rev.Fl.Malaya II, 160. 1954; Tard..& C. Chr. in Lecomte,Fl.Gén. 7(2):492. 1941; Selliguea hamiltoniana Wall.,Bedd. Handb. F.B.I.Supple.390. 1969

Rhizome creeping or climbing, about3 mm. in diameter, bearing clathrate scales about 3 mm, long throughout. Fronds about 3 mm. apart from each other, simple, dimorphous (Pl. XLIX a.); Sterile stipes to 15 cm. long; Fertile stipes upto 36 cm. or more long, scaly at base; Sterile fronds about 28-40 cm. long and 5 cm. or more wide; Fertile fronds about 43-52 cm. long and 1.8-3.4 cm. wide; glabrous; margin undulate; base oblique to cuneate, and apex acuminate; Veins anatomosing, areoles with included free veinlets, main veins 0.8-1.2 cm. apart.Sporangia acrostichoid or in lines between adjacent main veins.(Pl. XLIX b.).

Distribution South China, Indo-China, Thailand, India, the Malay Peninsula.

Ecology Epiphyte on shrub or lithosere uncommon in dry-evergreen forests.

Specimens examined : T.Boonkerd No. 140-141, 380

PLATE XLIX

a.

b.

MARSILEACEAE

Rhizome creeping, submerged or on swamp. Fronds bifoliate, quadrifoliate or absent (Pilularia). Heterospory, microsporangia and megasporangia born in sporocarp; Sporocarp 1 to many, with stalk attached at the axil of stipes or on rhizome near stipes.

Only one genus found in Thailand, Marsilea L.

Marsilea Linnaeus

Rhizome creeping, bearing fronds equally apart on the upper surface; Rooting under surface, opposite each frond. Fronds quadrifoliate; Leaflets obovate, apex round, base cuneate, thin in texture; Veins dichotomously branched, anatomosing to form irregular narrow radiating areoles. Sporangia born in sporocarp, heterospory.

One species found in the studied area.

Marsilea crenata Presl,Holtt.Rev.Fl.Malaya II, 619. 1954

Rhizome slender, long creeping, pale yellow-green in color, bearing fronds about 4-6 cm . apart, glabrous. Stipes about 12 cm. long. Fronds quadrifoliate, leaflets about 1.5 cm. by 1.2 cm., obovate, apex round, base cuneate, surface glabrous, entire. Sporocarps 1 or 2, 3-4 mm. long, oblong in outlines, attached at the axil of stipes, stalks about 0.5 cm. long.

Distribution Thailand, Malaysia, Philippines

Ecology Plants,commonly creeping along the wet area, sometimes in swamps.

Specimens examined : T.Boonkerd No. 176-179

LYCOPODIACEAE

Perennial herbs, terrestrial or epiphyte; Stems erect, prostrate or pendulous, dichotomously branched or pinnate. Leaves rather small (Microphyll), simple, often spirally arranged; Veins single, without ligule; Fertile leaves (Sporophyll) similar to the sterile, usually at the terminal of stems(Sporophyll forming strobilus). Sporangia solitary at the axil of sporophyll, various forms, dehiscent by 2 valves; Spore small, all spore resemble (Homospory).

Lycopodium Linn. is only one genus found in the studied area, characters as described in the family.

Lycopodium phlegmaria Linn.,Alston in Lecomte,Fl. Gén. 7(2): 551-553. 1951

Epiphytic plants; Stems pendulous about 20-50 cm. long, about 3 mm. in diameter, repeated dichotomous 1-4 times. Leaves about 15 mm. by 5 mm. spirally arranged, ovate-lanceolate, apex acute , base round, entire, semi-coriaceous in texture, sessile or nearly so; Midveins raised on lower surface. Sporophyll mostly different from sterile leaves, about 1.5 mm. long, ovate-deltoid in outlines, slightly acuminate at apex, coriaceous in texture. Sporangia orbicular, base cordate, valves equal.

Distribution Tropical Asia and Australia

Ecology Epiphyte, associated with moss,on the tree by the streams in dry-evergreen forests

Specimens examined :

SELAGINELLACEAE

Terrestrial herbs, annual or perennial; Stems erect or prostrate, bearing rhizophore, branching dichotomously or pinnately; Rhizophore geotrophic, dichotomously branched, bearing roots in the ground. Leaves monomorphic or dimorphic arranged in four rows, two ventral larger, two dorsal smaller, adpressed to stems, directed to distal direction. Sporophyll forming strobilus, monophyllous, spirally arranged or heterophyllous arranged in four rows, heterosporous; Sporangia at the axil of sporophyll, dehised by 2 valves, spore of two kinds ,megaspore and microspore.

Selaginella Beauv. is the monotypic genus in this family, characters as described in the family.

Selaginella delicatula (Desv. ex Poir.)Alst,
Alston in Lecomte, Fl.Gén. 7(2): 576-577. 1951

Main stem mostly erect, about 20 cm. high and 1 mm. thick, grooved, pale yellow in color; with lateral branches about 6 cm. long; Leaves well spaced similar shape, oblong in outlines, pinnate 2-3 time; Rhizophores 3.5 cm. long and 0.5 mm. thick, dichotomous near the ground surface, glabraus, grooved. Lateral leaves oblong about 4 mm. by 2.5 mm., higher portion semi-eliptic-oblong, lower portion oblong, acuminate apex, base truncate, without auricle; Axillary leaves ovate-round, over the main stem, ovate-oblong, entire, without auricle over the branches; Median leaves, ovate-oblong, apex acuminate, entire. Strobile solitary, at the terminal of the branches, 4-angles, about 0.5-3.5 cm. long and 1.5-2.0 mm. thick. Sporophylls uniform, subulate-deltoid, entire, acuminate; Megaspores about 350 microns, pale brown, 3-radiate, distal face warty; Microspore 27.5 microns, hyaline, distal face spread with elongate papilae.

Distribution South China, Indo-China, Thailand

Ecology Terrestrial in shady places near the streams in dry-evergreen forests

Specimens examined : T.Boonkerd No. 260-262