



6. ภาคผนวก (Appendix)

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

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Lygodium flexuosum (L.) Sw.

Rhizome short-creeping, underground, 5 mm. thick ; bearing fronds close together ; clothed with pale multicellular hairs. Lamina 2-pinnate, dimorphous ; sterile pinnae near the base of stipes, three deeply lobed, edges finely toothed, fertile pinnae on the middle and upper part of frond ; pinnae consists of 2-3 pinnules on each side of the costae ; lowest pinnae largest about 25 cm. long and 14 cm. wide ; terminal pinnule simple, base of pinnules cordate, short stalk attached to the primary-rachis, apex narrowed ; largest pinnules about 9 cm. long and 2 cm. wide, the lower pinnules at the base alternate ; texture thin ; veins free, usually branch off 3 times forked, distinct on both surfaces ; fertile pinnules slightly narrower than sterile one. Sori along the edges of lobe of pinnules, each with a main vein that branches off, each vein bearing a single sporangium, each sporangium has its own indusium so that a sorus consists of a single sporangium, each sorus 2-5 mm. long.

Distribution India, Ceylon, Malaya, Australia, China, Thailand ; this described sample collected from Konthathan Water Fall (Doi Suthep), 558 metres above the sea level.

Ecology common climbing on trees in mixed deciduous forest.

Gleichenia linearis (Burm.) Clarke

Rhizome long-creeping and branches, about 4 mm. thick; bearing well spaced fronds, apex covered with reddish brown multicellular hairs and branches at the base. Stipe slender, erect, about 25-60 cm. long ; rachis long ; rachis long and branches. Lamina 1-pinnate ; main rachis bearing unequal primary rachis branches which developement, apical bud between them covered with a pair of cordate and bluntly lobes stipules, the rachis stops growing, and a pair of lateral pinnae, each primary branch gives off a second branch above with apical bud between them ; the ultimate leaflets with base slightly narrowed, the middle part largest, apex acute and usually bends backwards, leaflets about 13-25 cm. long and 4-7 cm. wide, deeply lobes on edges, about 29 lobes ; texture subcoriaceous ; veins free, twice forked. Sori very small, round, on the first and the third veins or on the first vein only of a series, no indusium.

Distribution Malaya, Thailand, this described sample collected from Doi Pui, about 1475 metres above the sea level.

Ecology mountain ferns in hill evergreen forest.

Hymenophyllum sp.

Rhizome long-creeping, very slender, covered with densely brown multicellular hairs. Stipe slender about 0.5 cm. long, covered with hairs. Lamina simple, about 3-4.5 cm. long and 1-1.5 cm. wide, deeply lobes on edges about 9-11 lobes on each side of costa, each lobe with several segments, rounded at the tip, texture thin and firm ; veins free, each segment with one vein; clothed with brown hairs as of the rhizome, veins distinct on both surfaces. Sori on the terminal vein at the basal acroscopic, indusium triangular, broad base, apex acute, slightly longer than wide about 1 mm. wide, thin, consisting of two lips with entire edges, sporangium about 23 μ long, round, attached on the receptacle.

Distribution this described sample collected from Doi Pui, about 1500 metres above the sea level.

Ecology very small epiphyte ferns or rock ferns, grow with mosses and liverwort.

Plagiogyria communis Ching

Stock short erect, rather stout, apex without hairs or scales ; bearing black roots, and a tuft of stipes close together. Stipe stipe of fertile lamina longer than the sterile one, green, dark at the base ; broad base and flattened with ridge on the back, bearing aerophores on each side of the ridge, the upper surface of stipe flattened with narrow wings on edges, the lower surface broadly rounded, vascular bundle showing U-shaped. Lamina 1-pinnate, dimorphous ; sterile lamina 35-48 cm. long and 15-20 cm. wide, 20-26 pairs of lateral pinnae, middle pinnae largest, lower pinnae with short stalk about 2 mm. long, the upper pinnae sessile ; pinnae 9.5-13 cm. long and 1-1.3 cm. wide, base nearly rounded, apex acuminate, edges with finely toothed throughout ; texture leathery, dark green ; veins free, simple and once forked ; fertile lamina, numerous pinnae, pinnae narrower than sterile one. Sori nearly black, covering the whole lower surface of the fertile pinnae except the midrib, the pinnae roll upwards at maturity ; sporangium 66 μ long.

Distribution Malaya, Burma, Southern China, Sumatra, Philippines Thailand ; this described sample collected from Doi Inthanon National Park, about 2500 metres above the sea level.

Ecology high mountain ferns in hill evergreen forest.

Cyathea gigantea (Wall.) Holtt.

Stock trunk, about 115 cm. long or more ; bearing a tuft of fronds on the apex ; covered with small scales. Stipe 87 cm. long or more, brown to rarely black ; clothed with dark scales ; rachis and stipe grooved, densely hairs on above and hairless on below. Lamina 2-pinnate, about 150-193 cm. long and 80-111 cm. wide, about 12-15 pairs of pinnae, each pinnae about 30-pairs of pinnules, middle pinnae about 43-67 cm. long and 18-22 cm. wide ; pinnules 8-10 cm. long and 2-2.5 cm. wide, sessile, unequal bases, apex acuminate with finely toothed edges, deep lobes on edges about $\frac{2}{3}$ from edges ; lobe about 5 mm. wide, the tip of lobe rounded ; texture thin ; veins free, simple, lobes divided by lateral veins, about 5-6 pairs of veins per each lobe, the upper side of costae and costules clothed with dark brown scales. Sori small, round, on the middle of each vein in a lobe, forming groups of inverted V-shaped, sporangium 46 μ long, no indusium.

Distribution Thai, Southern China, Burma, India, Ceylon, Malaya, Penang, Thailand ; this described sample collected from Astronomical House CMU (Doi Suthep), 753 metres above the sea level. —

Ecology terrestrial ferns near the streamsides, in mixed deciduous forest.

Pyrrosia adnascens (Forst.) Ching

Rhizome long-creeping, 2 mm. thick ; covered with scales; scales less than 1 mm. long, reddish-brown, broad base then narrow towards the apex, pale edges with hairs. Stipe 4-5 cm. long, green. Lamina simple, dimorphous ; sterile lamina about 6-10 cm. long and 1.5-1.8 cm. wide, apex rounded and gradually narrowed to the base, bearing scattered stellate hairs on the upper surface or glabrous when old, the lower surface bearing numerous stellate hairs ; fertile lamina about 9-14 cm. long and 1-1.3 cm. wide, the upper half narrower than the lower half of lamina, apex about 6-8 mm. wide, edges curve backwards ; covered with stellate hairs on both surfaces, lamina longer and narrower than the sterile one ; texture very fleshy ; veins not visible. Sori small, round, close together on the upper half of lamina ; sporangium 39 μ long, brown.

Distribution India, Malaya, South-China, Thailand ; this described sample collected from Mac Klang Water Fall, about 360 metres above the sea level.

Ecology epiphyte ferns, or on rocks near the streamsides.

Pyrrosia mollis Ching

Rhizome short-creeping, 1-2 mm. thick, bearing fronds close together ; covered with scales, scales about 2-4 mm. long, peltate base, apex acute, hairy on edges ; numerous roots on below. Stipe very short, not sharply distinct from base of lamina. Lamina simple, about 10-25 cm. long and 2.5-4 cm. wide, base very cuneate, apex acute, curved edges ; texture rather succulent, the lower surface covered with brown stellate hairs but the upper surface without stellate hairs ; veins not visible, midrib raised on both surfaces. Sori round, 1 mm. wide, almost covering the whole lower surface of lamina, regularly arranged oblique to the midrib, three sori between the lateral veins ; sporangium about 68 μ long with large dark brown annulus.

Distribution Thailand ; this described sample collected from Phadum (Doi Pui), about 1350 metres above the sea level.

Ecology epiphyte ferns in hill evergreen forest.

Pyrrosia longifolia (Burm.) Morton

Rhizome long-creeping, 2-3 mm. thick ; clothed with rounded scales throughout, scales about 1 mm. wide or more, dark brown with pale edges, rather entire. Stipe 2-4 cm. long, purple, not sharply distinct from the lamina ; base covered with the same type of scales as rhizome. Lamina simple, about 10-20 cm. long and 1-2 cm. wide, apical part of fertile lamina usually narrowed about 1 cm. wide or less, base cuneate, linear, edges slightly curved towards the costa ; texture very fleshy the upper surface smoothed and glabrous, the lower surface covered with grey stellate hairs throughout except the costa ; veins not visible, grooved along the costa and raised up on below. Sori round, 1 mm. wide, close together on apical part of lamina, about 4-6 rows of sori distributed between the costa and edges, regularly arranged ; sporangium 39 μ long ; spore elliptic, light yellow, rough surfaces.

Distribution Malaysia, Queensland, Polynesia Thailand ; this described sample collected from Mae Klang Water Fall, about 360 metres above the sea level.

Ecology epiphyte ferns near the streamsides.

Pyrrosia stigmosa (Sw.) Ching

Rhizome short-creeping, 4-5 mm. thick ; bearing numerous roots below ; covered with dark brown scales, scales about 5 mm. long, base narrowed, apex acuminate with very slender tip, edges toothed. Stipe about 15-21 cm. long ; covered with densely stellate hairs when young. Lamina simple, 11-21 cm. long and 3.5-4 cm. wide, base cuneate, apex narrowed acute, the middle part widest ; texture leathery, upper surface not bearing stellate hairs, green, hydathodes appear as small white spots on edges, the lower surface covered with densely bright brown stellate hairs ; veins anastomosing, costae grooved on above, lateral veins oblique about 45° to the costae. Sori small, round, $\frac{3}{4}$ mm. wide, brown, irregularly arranged within the areoles ; sorus consisting of 4-6 sporangium which arranged in ring shaped on the whole lower surface of lamina and covered with densely light brown stellate hairs ; sporangium 51 μ long.

Distribution North-India, Indo-China, Sumatra, New Guinea, Malaya, Thailand ; this described sample collected from Mae Klang Water Fall, about 360 metres above the sea level.

Ecology Rock ferns, near the streamsides.

Pyrrosia eberhardtii (Christ) Ching

Rhizome long-creeping, 1.5 mm. thick, clothed with scales, scales about 7 mm. long and 1 mm. wide, dark brown peltate base, apex acute, entire, cell wall pale in colour. Stipe about 9-15 cm. long, covered with stellate hairs, grooved on above with raised edges. Lamina simple, about 9-12 cm. long and 2-2.5 cm. wide, lanceolate, base cuneate, apex acuminate, entire ; texture leathery, upper surface bright green, not stellate hairs, hydathodes a small white spots on edges and well-spaced, the lower surface covered with light brown of stellate hairs ; veins not visible, midrib and lateral veins distinct on both surfaces, grooved on above of midrib. Sori round, small about 1 mm. wide, irregularly arranged almost the whole lower surface of lamina, sporangium 55 μ long with rather large annulus ; spore round or elliptic, yellow and rather rough surfaces.

Distribution Thailand, this described sample collected from Doi Pui, 1530 metres above the sea level.

Ecology epiphyte ferns in hill evergreen forest.

Pyrrosia mannii (Gies) Ching

Rhizome slender, long-creeping, about 2-3 mm. thick ; covered with scales, dark brown peltate base, apex acute, entire edges, not clathrate. Stipe about 2-5 cm. long, stipe of sterile lamina shorter than fertile one, covered with stellate hairs throughout. Lamina simple, about 8-9 cm. long and 2.8-3 cm. wide, sterile and fertile lamina similar in shape, lanceolate, slightly broad base, apex acute, entire edges ; texture leathery, the lower surface light brown with numerous stellate hairs, the upper surface green and hydathodes on edges ; veins, midrib distinct, lateral veins oblique to the midrib ; other veins not distinct, as covered by stellate hairs. Sori round, on the whole lower surface, arranged close together in several rows, oblique on each side of the midrib, three rows of sori arranged between the lateral veins.

Thailand

Distribution ; ^this described sample collected from Doi Pui, 1530 metres above the sea level.

Ecology epiphyte ferns in hill evergreen forest.

Drymoglossum piloselloides (Linn.) Pr.

Rhizome creeping, branched, 1 mm. thick ; bearing black roots ; covered with scales throughout, scales dark brown, pale edges with long hairs, base rather peltate in shape. Stipe, sterile frond sessile, fertile frond 5-7 mm. long, glabrous. Lamina simple, dimorphous ; sterile lamina more or less circular or elliptic, 2.5-3 cm. long and 1-1.3 cm. wide, apex broadly round, gradually narrowed at the base ; texture leathery, succulent surface bearing stellate hairs ; veins anastomosing, midrib distinct in basal half only, other veins not visible ; fertile lamina oblong, narrower and longer than the sterile one, about 4-5 cm. long and 5-7 mm. wide, apex rounded, gradually narrowed to the base, upper surface grooved which opposite to the sori band, midrib visible throughout. Sori long band on edges of lamina, sori about 2-3 mm. wide ; sporangium 31 μ long, brown, spore with short spines on surface.

Distribution North-east India, Sumatra, New Guinea, Thailand ; the described sample collected from Phadum (Doi Pui), about 1350 metres above the sea level.

Ecology very small epiphyte ferns in hill evergreen forest.

Lepisorus longifolius (Bl.) Holtt.

Rhizome short-creeping, 3 mm. thick, green; covered with brown scales, scales about 2 mm. long, broad base, apex acute, cell wall forming network, edges with finely toothed. Stipe about 2-3 cm. long, green, purplish when dry, not sharply distinct from the narrow base of the lamina. Lamina simple, about 20-25 cm. long and 1.5-1.8 cm. wide, linear, base very narrow cuneate, apex acuminate, entire; texture leathery; veins no vein visible on the surfaces but visible by transmitted light, midrib raised on lower surface. Sori round, light brown, about 3-4 mm. long and 1-1.5 mm. wide, one row on each side of the costae, usually in the upper part of lamina about $\frac{2}{3}$, sunk in surface, 58 μ mm. long, densely umbella-sporangiums.

Distribution North-east India, Burma, Malaya, Philippines, Thailand; this described sample collected from Doi Pui, also found in Ruesee Cave area, about 982-1550 metres above the sea level.

Ecology epiphyte ferns in hill evergreen forest.

Crypsinus rhynchophyllus (Hook) Copel.

Rhizome long-creeping, 1-1.5 mm. thick ; covered with brown scales, scales about 2 mm. long, narrow, peltate base, teeth on edges, not clathrate ; bearing dense brown roots on below. stipe green, stipe of fertile lamina longer than the sterile one. Lamina simple, dimorphous ; sterile lamina about 3 cm. long and 1.5 cm. wide, broad base, apex round and broad, edges thickened usually notched ; texture leathery, dark green surfaces ; veins mostly hidden, anastomosing forming irregular areoles with free veinlets, costae and lateral veins dark in colour ; fertile lamina narrower than sterile 6-12 cm. long and 1-1.5 cm. wide, base cuneate and widest at the middle part, the upper part of lamina very narrow, about 5-8 mm. wide at the tip. Sori round, 1-2 mm. wide, a single row on each side of costae, slightly sunk in cavity which appear prominent on the upper surface, sori present on the narrow part of lamina, no indusium ; protected by umbella-paraphyses when young ; sporangium 46 μ long, elliptic.

Distribution Malaya, Polynesia, Thailand ; this described sample collected from Doi Pui, 1530 metres above the sea level.

Ecology small epiphyte ferns in hill evergreen forest, associated with mosses and liverwort.

Loxogramme subecostata (Hook.) C.Ch.

Rhizome long-creeping, about 2.5 mm. thick ; bearing a series of fronds close together ; apex covered with brown scales, about 2-3 mm. long, scale with broad base, apex acuminate, short tooth on edges, cell wall very dark and distinct. Stipe very short and not sharply distinct from the lamina. Lamina about 8-13 cm. long and 0.8-1.5 cm. wide, linear, base cuneate, apex acute, entire edges ; texture fleshy ; veins not visible but transparent to light, anastomosing a series of irregular areoles with few free veinlets, the midrib raised on both surfaces with higher ridge on above. Sori long, about 3-7 mm. long and 1-1.5 mm. wide, brown, in deep groove, oblique to the midrib or nearly parallel to the edges, usually nearer edge than the midrib, appearing prominent on the upper surface ; sporangium 47 μ long, pale in colour, annulus rather large, spherical spores.

Distribution Malaya, Sumatra, Borneo, Thailand ; this described sample collected from Ruesee Cave area (Doi Suthep), 982 metres above the sea level.

Ecology epiphyte ferns or on rocks near the water fall, associated with mosses and filmy fern, in hill evergreen forest.

Drynaria quercifolia (L.) J.Sm.

Rhizome long-creeping, 2 cm. thick or more ; bearing short roots ; apex covered with reddish brown scales, scales 1 cm. long, base broadly rounded, apex very narrowed, pale edges and finely toothed. Lamina sterile lamina (nest-leaves) sessile, simple, about 14-17 cm. long and 11-15 cm. wide, base rounded, apex acute, several lobes on edges, lobe nearly rounded, green for a short time then dry on stem throughout, these nest-leaves closed together and collected the other dry leaves for a long period of time providing minerals for the plants ; fertile lamina, stipe 10-15 cm. long, green on the upper surface, purple on the lower surface ; lamina simple about 32-40 cm. long and 25-28 cm. wide, edges deeply lobes about 1-2 mm. from the costae, lobes oblique, each lobe about 11-14 cm. long and 2-2.2 cm. wide, apex acute, edges serrate throughout ; texture leathery ; veins anastomosing, containing few free veinlets within areoles. Sori round, 2 mm. wide, regular rows on each side of the costae, the largest sori at the base of the costules, rather elongate, raised on the upper surface opposite the sori ; sporangium 39 μ long, annulus translucent, no indusium.

Distribution India, Malaya, Australia, South China, Thailand ; this described sample collected from Phadum at (Doi Pui), also found at Doi Pui ; about 1300-1685 metres above the sea level.

Ecology epiphyte ferns in hill evergreen forest.

Drynaria bonii Christ

Rhizome long-creeping, fleshy, 1.5 cm. thick ; apex covered with brown scales, scales about 1 mm. long, dark brown peltate base, pale edges with fringed hairs, apex very narrow and long. Lamina the sterile nest-leaves sessile, covered the upper surface of rhizome, overlapping each other, about 6-8 cm. long and 4.5-6 cm. wide, ovate, margin with round lobes ; veins prominent on both surfaces, anastomosing with free veinlets in areoles ; the foliage leaves with short wing stipe ; lamina about 54-60 cm. long and 22-30 cm. wide, deeply lobes on edges nearly to the midrib ; lobe well-spaced about 5-7 pairs, each about 14-16 cm. long and 3.5-4 cm. wide, sinus 5 cm. wide at the base, apex acute ; texture leathery, dark green ; veins anastomosing forming small areoles, distinct on both surfaces and raised on the lower surface. Sori round, small, irregularly arranged on the area between the lateral veins, sporangium 39 μ long.

Distribution South China, Indo-China, Thailand ; this described sample collected from Konthathan Water Fall (Doi Suthep), 595 metres above the sea level.

Ecology epiphyte ferns or on rocks in mixed deciduous forest.

Drynaria rigidula (Sw.) Bedd.

Rhizome very long, twining on tree trunk, about 1.2 cm. thick ; covered with reddish brown scales, scales 8 mm. long, dark brown peltate base then gradually narrowed towards the apex, apex acuminate, unicellular hairs on edges. Lamina, sterile lamina (nest-leaves) simple, 20-25 cm. long and 6-9 cm. wide, brown, deeply lobes on edges about a half from edges, lobe about 6-9 mm. long, apex acute, sessile ; veins anastomosing, distinct on both surfaces, lower surface covered with whitish stellate hairs ; fertile lamina with stipe about 13-18 cm. long, purple, clothed with stellate hairs ; lamina 1-pinnate 55-75 cm. long or more and 35-41 cm. wide, middle pinnae largest about 20 cm. long and 7 mm. wide, linear, base cuneate with short wings of the stalk, apex acute, toothed edges throughout ; texture leathery ; veins anastomosing forming rather large areoles, one row on each side of the costae, costae raised on both surfaces. Sori round, about 1-1.5 mm. wide, one row on each side of the costae, one sorus in the middle of each areole, upper surface of pinnae raised up opposite to the sori, sporangium 27 μ long.

Distribution Sumatra, Polynesia, Australia, Malaya, Thailand ; this described sample collected from Konthathan Water Fall (Doi-Suthep), 558 metres above the sea level.

Ecology epiphyte ferns in mixed deciduous forest.

Phymatodes longissima (Bl.) J.Sm.

Rhizome long-creeping, green ; bearing widely spaced fronds ; covered with densely dark brown scales, scales 4-5 mm. long and 2 mm. wide at the base. Stipe 42-60 cm. long, green but purple when old, prominent base about 0.5 cm. long. Lamina simple, 78-95 cm. long and 21-27 cm. wide, deep lobes on edges nearly to the midrib ; sterile pinna about 37-44 cm. long and 18-21 cm. wide, 11-pairs of lobes, lobes wider than fertile lobes ; fertile pinna about 15-18 pairs of lobes, each lobe 10-13 cm. long and almost 2 cm. wide, apex acute, edges slightly reflexed, entire ; texture thin, bright green ; veins anastomosing with large areoles on each side of costa. Sori round, large about 3 mm. wide, pale brown, regular rows on each side of the costa, sori sometimes interrupted arrange, sunk in cavity of the large areoles, sporangium 51 μ long.

Distribution Aussum, Indo-China, Malaya, Thailand ; this described sample collected from Mae Klang Water Fall, about 360 metres above the sea level.

Ecology creeping on rocks near the streamsides.

Aglaomorpha heraclea (Kze) Copland

Rhizome epiphyte, very large using around other trees ; about 5-6 cm. thick ; bearing densely hair-like dark brown roots, and densely brown scales ; scales about 1.5-2 cm. long and 0.5 cm. wide, slightly broad base, narrowed towards the upper half with pale hairs on edges. Lamina simple, sessile ; 80-110 cm. long and 25-37 cm. wide, base cordate about 15 cm. wide;consisting of 15-17 lobes, middle lobes largest and oblique to the costae, apex of lobes narrow and acute, edges slightly reflexed and untoothed ; texture leathery ; veins anastomosing forming areoles, costa raised on both surfaces, all veins raised. Sori small, elongate, regularly arranged between lateral veins ; sporangium pale brown 35 μ long.

Distribution Sumatra, New Guinea, Thailand ; this described sample collected from Phadum(Doi Pui), also found in Kog-Ma Watershed, about 1200-1350 metres above the sea level.

Ecology epiphyte ferns in hill evergreen forest.

Thelypteris sp.

Stock short erect, bearing a tuft of stipes ; numerous brown roots, young part with scales. Stipe 5-11 cm. long, dark colour at the base only ; covered with densely unicellular hairs throughout, scaly at the base. Lamina about 8-15 cm. long and 4-5 cm. wide, 1-pinnate ; simple apical pinna with deeply lobes, apex acuminate ; about 9-11 pairs of lateral pinnae, nearly equal in size, pinnae oblong, lowest pinnae slightly reduced ; pinnae about 3-3.5 cm. long and 7-10 mm. wide, all sessile, edges with lobes to about a half from edges ; texture thin ; veins free, pinnate, about 3-5 pairs of veins in each lobe, distinct on both surfaces, both basal veins running to the margin above the sinus ; rachis covered with unicellular hairs. Sori small, elongate, about 1 mm. wide, black, situated on the first and second pairs of veins in lobe ; indusium peltate with dense hairs ; sporangium 47 μ long.

Distribution this described sample collected from Astronomical House CMU (Doi Pui), 753 metres above the sea level.

Ecology rock ferns in the streams.

Cyclosorus subpubescens (Bl.) Ching

Stock short-creeping and branches, bearing a tuft of fronds ; apex covered with very short hairs about 6 mm. long and dark brown scales, scales with short hairs on edges, cordate base, apex acuminate. Stip 6-18 cm. long, green more or less purple, grooved on above, scaly at the base, bearing short unicellular hairs. Lamina 1-pinnate, 45-70 cm. long and 17-25 cm. wide, about 22 pairs of pinnae, 3-4 pairs at the base very reduced, apical pinna simple, all sessile, the lowest pinnae 3-4 cm. long ; middle pinnae largest about 12 cm. long and 2 cm. wide, apex acuminate untoothed, edges deeply lobes to about a half from edges ; the upper side of costae and rachis bearing densely pale short curved hairs, short hairs on upper surface of lamina, veins cloth, with short hairs ; texture thin ; veins free, 5-7 pairs of veins in each lobe, the basal veins of two lobes joining to form an excurrent vein to the base of sinus, the next veins running to the base of sinus membrane. Sori round, seating on the middle veins, paralleled to the costules ; indusium large, dense hairs on surface, brown ; sporangium 27 μ long.

Distribution Celon, Malaya, Queensland, Thailand ; this described sample collected from Mae Klang Water Fall and also found in the campus area, about 360 metres above the sea level.

Ecology common terrestrial ferns near the streamsides.

Cyclosorus sp.

Rhizome short-creeping, 8 mm. thick ; covered with dark brown scales, scales about 6 mm. long, broad base, apex acute, entire. Stipe about 48-80 cm. long, olive, scaly at the base, grooved on above, densely hairs in the groove and base of stipe, two vascular bundles at the base ; rachis covered with short hairs denser on above than below. Lamina 50-68 cm. long and 35-56 cm. wide, 1-pinnate ; consisting of 13-15 pairs of well spaced lateral pinnae, 2-3 pairs of lower pinnae very reduced ; the middle pinnae largest about 19 cm. long and 2.5 cm. wide, lobes on edges about $\frac{1}{3}$ from the edges, apex acuminate, sessile, rachis with dense hairs on both surfaces, the upper surface of costules clothed with hairs shorter than the costae ; texture thin, dark green, the lower surface of pinnae clothed with short hairs but glabrous on the upper surface ; veins free, pinnate, veins clothed with erect short hairs ; about 8-10 pairs of lateral veins in each lobe, the lowest pairs join and form long excurrent vein meeting the next veins, the next 2- pairs of veins ending to the side of sinus membrane. Sori round, brown to nearly black, on the vein near the costules than the sinus membrane ; sporangium 35 μ long.

Distribution this described sample collected from Doi Pui, 1398 metres above the sea level.

Ecology terrestrial ferns in hill evergreen forest.

Microlepia spluncae (L.) Moore

Rhizome short-creeping, 7 mm. thick ; bearing fronds close together ; apex covered with light brown hairs about 2 mm. long. Stipe 50-65 cm. long, green or purplish brown ; clothed with hairs throughout ; rachis the same as stipe but with denser hairs in appearance. Lamina tripinnate-quadripinnatifid at the base, about 87-110 cm. long and 60-90 cm. wide, about 8-9 pairs of lateral pinnae, middle pinnae largest, the upper pinnae gradually reduced ; largest pinnae 43 cm. long and 8 cm. wide ; largest pinules at the base 7 cm. long and 2 cm. wide, deeply lobes on edges ; lobes alternate, apex acute, the upper edge deeply lobes and broad, crenate towards the base ; texture thin ; veins free, darker than the surface of lamina, clothed with densely hairs on above and below sometimes also on the lamina. Sori small, round, near the base of the sinuses ; indusium club-shaped with numerous hairs ; sporangium 39 μ long, covering the indusium completely at maturity.

Distribution Malaya, Thailand.

Ecology terrestrial ferns in hill evergreen forest.

Microlepia spluncae. Var villosissima C.Chr.

This variety differs from the specific type in having dense short or long hairs on the lower surface of pinnules ; veins on the upper surface also covered with hairs, lobes close together; indusium smaller, always hidden by the sporangium when mature.

Distribution Malaya, Penang ; this described sample collected from Kog-Ma Watershed (Doi Suthep), about 1200 metres above the sea level.

Ecology terrestrial ferns in hill evergreen forest.

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่

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Sphenomeris chusana (L.) Copel.

Rhizome short-creeping, bearing fronds close together; covered with dark brown scales, scales less than 1 mm. long, hair-like, narrow, base of scale composed of 2-3 cells. Stipe 7-29 cm. long, green, brown at the base, grooved on above, scaly at the base; rachis deeply grooved. Lamina 3-pinnate, 15-53 cm. long and 11-18 cm. wide, the lowest pinnae reduced; pinnules oblique; each pinnule consisting of three lobes, base cuneate, edges straight, the tip of each lobe of pinnule wider than sori; texture thin; veins free, distinct on the upper surface. Sori on the tip of ultimate lobe; indusium thin, nearly as long as the tip of lobe, edges of both indusium and lobe finely toothed, the lower side of indusium contacted with the lamina, opening on the upper side; sporangium 46 μ long with translucent annulus; spore rough, brown.

Distribution Malaya, Japan, Polynesia, Madagasca, Thai the described sample collected from Phadum (Doi Pui) and also found in Kog-Ma Watershed, about 1200-1350 metres above the sea level.

Ecology terrestrial ferns in hill evergreen forest.

Var. tenuifolia (Sw.) C. Chr.

frond usually larger, ultimate lobes longer and narrower the apex of each lobe with 1-2 veins only.

Lindsaya ensifolia Sw.

Rhizome short-creeping, 3 mm. thick ; covered with brown scales about less than 1 mm. long. Stipe 10-48 cm. long, dark green, brown when dry, grooved on above, quadrangular, rachis grooved. Lamina 1-pinnate, about 15-30 cm. long and 17-24 cm. wide ; consisting of long simple apical pinna and 4-7 pairs of lateral pinnae sometimes less ; pinnae 9-15 cm. long and 1.5-2 cm. wide, linear-lanceolate, base cuneate, apex acuminate, entire edges, pinnae with short wings stalk ; texture firm and thin, dark green ; veins anastomosing forming areoles and not free veinlets within, distinct when dry. Sori continuous along the edges of pinnae ; indusium thin opening towards the edges, sporangium about 31 μ long.

Distribution South-China, Indo-China, Thailand, India, Malaya, North Australia, Africa ; this described sample collected from Konthathan Water Fall, 558 metres above the sea level.

Ecology terrestrial ferns in mixed deciduous forest, near the streamsides.

Leucostegia immersa (Wall.) Presl

Rhizome long-creeping, 7 mm. thick, young parts covered with light brown scales, scales not peltate base, mostly covered with densely red-brown hairs. Stipe about 22-35 cm. long, pale, slightly red when dry, grooved on above ; scaly at the base, scales about 3-4 mm. long and 1 mm. wide, apex acute, entire. Lamina 3-pinnate at the base, 2-pinnate on the upper part, lamina deltoid about 32-40 cm. long and 23-35 cm. wide ; pinnules light green rhomboid, apex acute, rounded teeth edges, largest pinnule about 1 cm. long and 0.5 cm. wide ; texture rather thin ; veins free, several times forked, each tooth with a single vein. Sori large, about 2 mm. wide, each sorus on the acroscopic vein ; indusium not reaching to the edges of lamina.

Distribution Southern India, Thailand ; this described sample collected from Phadum (Doi Pui), about 1350 metres above the sea level.

Ecology terrestrial ferns in hill evergreen forest.

Davallia trichomanoides Bl.

Rhizome long climbing on trees, 3-5 mm. thick ; densely covered with chesnut-brown scales, scales 6-7 mm. long and 1 mm. wide, peltate base, very narrow apex, short pale hairs on edges. Stipe olive, 10-19 cm. long, glabrous, slightly grooved on above ; rachis grooved with raised edges and decurrent. Lamina tripinnate-quadrripinnatifid at the base, rather deltoids in outline about 18-32 cm. long and 15-28 cm. wide ; consisting of 10-12 pairs of pinnae or more, the lowest pinnae largest about 14 cm. long and 8 cm. wide, lanceolate and gradually reduced towards the upper pinnae, pinnules about 1.5-2.2 cm. long and 0.5-0.7 cm. wide ; texture thin, ultimate division of pinnules with unequal bilobes ; veins free, forked , one vein on each lobe, glabrous. Sori elongate, on the vein-tip in each segment, indusium about 2 mm. long and less than 1 mm. wide, sporangium 47 μ long.

Distribution Japan, Thailand, Burma, India, Ceylon ; this described sample collected from Phadum (Doi Pui), about 1350 metres above the sea level.

Ecology epiphyte ferns in hill evergreen forest.

Humata repens (L.fil.) Diels

Rhizome long-creeping, 2-3 mm. thick, bearing well-spaced fronds; covered with brown scales throughout, scales dark brown peltate base with pale edges, narrowed to the apex, about 5-6 mm. long and 1 mm. wide. Stipe slender 1.5-3 cm. long, grooved on the upper surface with scattered scales. Lamina simple, about 4-5 cm. long and 3.5-4 cm. wide, triangular, falcate unequal base, apex short acute, deeply lobes nearly to the midrib, the lower lobes deeper than the upper lobes, the lowest lobe largest, sinus linear, lobe oblong giving off smaller lobes ; sterile lobes round and smooth, fertile lobes finely toothed, each tooth with one sorus ; texture leathery, dark green on the upper surface ; veins free, once forked, veins distinct and broad on the lower surface. Sori small, less than 1 mm. wide, at the tip of vein near the edges ; indusium semi-circular, base attached to the vein only, slightly raised on the upper surface ; sporangium 47 μ long.

Distribution North India, Japan, Australia, Thailand ; this described sample collected from Kog-Ma Watershed (Doi Suthep), 1200 metres above the sea level.

Ecology epiphyte ferns in hill evergreen forest.

Nephrolepis cordifolia (L.) Pr.

Stock short erect ; bearing a tuft of stipes, slender roots and numerous, runners sometimes with tuber ; covered with light brown scales, scales about 5-6 mm. long, apex acute, entire. Stipe 19-27 cm. long, olive-brown ; covered with scales similar to the stock ; rachis appear the same. Lamina 1-pinnate, about 45-70 cm. long and 4.5-5.5 cm. wide ; consisting of numerous pinnae, broad base attaches to rachis ; sterile pinnae 2-2.5 cm. long and 0.6-0.8 cm. wide, the upper edge of the base cordate with auricles, the lower base nearly round, no auricles, apex rather acute ; texture thin ; veins free, once forked, ending with hydathodes throughout, veins within auricle pinnate, costae nearly black, other veins not visible ; fertile pinnae similar in shape as sterile one but apex bluntly narrowed. Sori near the edges, one row on each side of costae ; indusium reiniform, one attached with the surface, broad base curved circular that forming a small sinus oblique to the costae, the other free edges opening towards the apex ; sporangium 27 μ long.

Distribution Malaya, Thailand, Japan, New Zealand ; this described sample collected from Phadum (Doi Pui) also found in lowlands, about 1350 metres above the sea level.

Ecology mountain ferns in hill evergreen forest.

Nephrolepis hirsutula (Forst.) Pr.

Stock short-erect ; bearing a tuft of fronds close together ; many slender roots on below, runners ; covered with dark brown scales, scales 2-4 mm. long, apex acuminate, pale edges with short hairs. Stipe 15-62 cm. long, brown to nearly black ; densely clothed throughout with similar scales to the stock when young and also small pale scales with hairy edges, the base of scale become dark brown when old. Lamina 1-pinnate, 60-113 cm. long and 18-24 cm. wide ; pinnae close together, sessile, broad base attached to the rachis ; the middle pinnae largest, the upper and the lowest pinnae very reduced, the upper base of pinnae truncate with auricle, the lower base broadly rounded ; sterile pinnae 6-7.5 cm. long and 1-1.4 cm. wide, the upper base truncate and bearing a short triangular auricle, the lower base broadly rounded, edges crenate, hydathodes along the edges ; fertile pinnae narrower than sterile one, about 1 cm. wide, apex with serrate ; texture thin ; veins not visible, the midrib distinct. Sori near the edges, one row on each side of the costae ; indusium reiniform, thin, attached to the surface of lamina and opening towards the apex ; sporangium 31 μ long, brown.

Distribution Malaya, Thailand ; this described sample collected from behind Biology Building.

Ecology terrestrial ferns on lowlands.

Pteridium aquilinum (L.) Kuhn

Rhizome long-creeping, underground, 9 mm. thick ; clothed with brown hairs ; bearing scattering roots on below. Stipe about 35-45 cm. long, green, brown at the base, vascular system of several bundles in a horse-shoe arrangement, grooved on above and densely hairs within but hairless on below ; rachis and midrib deeply grooved, edges decurrent. Lamina 2-pinnate, about 87-100 cm. long and 84-95 cm. wide, 5-7 pairs of lateral pinnae, the lowest pinnae largest and gradually reduced on the upper, triangular shaped ; largest pinnae 50 cm. long and 26 cm. wide ; pinnules about 8-13 cm. long and 2-2.5 cm. wide, deeply lobes on edges nearly to the midrib ; texture subcoriaceous, clothed with densely hairs on the whole lower surface ; veins free, forked, raised on the lower surface, costae more or less hairy on both sides. Sori linear along the edges, except 2 mm. long from the apex ; indusium two, thin ; sporangium 31 μ long, spore light brown.

Distribution Malaya, Thailand ; the sample here collected from Doi Inthanon National Park, also found in Doi Suthep, Doi Pui ; about 900-1675 metres above the sea level.

Ecology mountain ferns, expose places, adapted to sunny and dry area.

Pteris vittata Linn.

Stock short erect ; covered with brown scales, scales about 4 mm. long, narrow, thin, entire. Stip about 17-24 cm. long, green, grooved above ; covered with light brown scales throughout, about 7 mm. long. Lamina 1-pinnate, 52-74 cm. long and 21-28 cm. wide, 20-25 pairs of sessile lateral pinnae, the lower pinnae reduced especially the lowest pinnae ; apical pinna simple and largest, similar shape as the others ; pinnae linear, apex acute, base cordate ; largest pinnae 15 cm. long and 1.1 cm. wide, all pinnae produced spores except the very reduced pinnae at the base ; texture firm, thin ; veins free, once forked near the costae, toothed on the base of costae, raised on the lower surface. Sori continuous along the edges of pinnae, except the base and apex, false indusium ; sporangium 51 μ long, brown.

Distribution Malaya, Africa, Thailand ; the sample here collected from Mae Klang Water Fall, about 360 metres above the sea level, also found in other places.

Ecology terrestrial common ferns on lowland.

Pteris pellucida Presl

Rhizome short-creeping ; apex covered with dark brown scales, scales 2-4 mm. long, base rather broad and gradually narrowed to the apex, entire, cell wall distinct. Stipe about 28-35 cm. long, stipe of fertile lamina longer than sterile one, base covered with scales, grooved on above, base purplish and green rachis. Lamina 1-pinnate, about 25-38 cm. long and 17-22 cm. wide ; consisting of simple apical pinna and 3-4 pairs of lateral pinnae ; rachis with deeply grooved, edges decurrent ; pinnae sessile, lanceolate about 17-24 cm. long and 1-2 cm. wide, apical pinna similar in shape as lateral ones; texture leathery and firm, dark green ; veins free, simple or once forked, distinct raised on both surfaces, costae with grooved and raised edges. Sori continuous along the edges ; false indusium ; sporangium 27 μ long, dark brown, spore triangular with slightly rough surface.

Distribution Thailand, described sample collected from Wachirathan Water Fall (Doi Inthanon) and Konthathan Water Fall (Doi Suthep), about 585-800 metres above the sea level.

Ecology terrestrial ferns near the streamsides.

Pteris ensiformis Burm.

Rhizome short-creeping, about 3-4 mm. thick, fronds close together, numerous roots surrounding the rhizome, scales about 3 mm. long, narrow, apex acute, edges entire. Stipe about 15-30 cm. long, scaly at the base grooved on above, stipe of fertile lamina longer than sterile one. Lamina dimorphous, sterile lamina about 8-20 cm. long and 5-10 cm. wide, shorter than fertile, the lower pinnae pinnate, apical lamina with 2-4 pairs of deeply lobes, 3 pairs of lateral pinnae, the lowest pinnules again lobes, lobe elliptic and finely toothed ; fertile lamina about 15-35 cm. long and 8-15 cm. wide ; consisting of simple apical pinna with 2-lobes, and 3 pairs of lateral pinnae which once branch near the base, lobes narrower and deeper than sterile one, largest pinnae about 12 cm. long and 4-5 cm. wide ; texture thin and firm ; veins 1-2 times forked. Sori continuous along the edges of pinnae ; indusium pale, forming by reflexed edges ; sporangium 23 μ long, dark brown.

Distribution Celon, China, Malaya, Australia, Polynesia, the sample here collected from Rucsee Cave area.

Ecology terrestrial ferns near the streamsides.

Pteris venulosa Bl.

Stock short erect, bearing a tuft of fronds ; apex covered with dark brown scales, scales about 1.5 mm. long, narrow, entire sometime very short toothed on pale edges. Stipe 6-11 cm. long, green or purple at the base, stipe of fertile frond longer than sterile one ; rachis similar to stipe. Lamina 1-pinnate ; sterile lamina consisting of one pair of lateral pinnae and apical pinna about 4-6 cm. long and 8-10 mm. wide, finely toothed on edges ; fertile lamina, apical pinna about 12-16 cm. long and 5-6 mm. wide, and 2-pairs of lateral pinnae, lowest pinnae once branch near the base, sometimes apical pinna branch off again forming 2-lobes ; pinnae linear, untoothed except near the apex rather broad and serrate ; texture thin and firm ; veins usually once forked near the costae and simple veins, costae raised and grooved on the upper surface. Sori continuous along the edges of pinnae, except at sharply toothed apex ; false indusium ; sporangium 39 μ long.

Distribution Western Malaya, Java, Thailand ; this described sample collected from Ruesee Cave area.

Ecology terrestrial ferns near the water fall or wet ground on lowlands.

Pteris heteromorpha Fee'

Rhizome short-creeping, 4-6 mm. thick ; bearing numerous black roots ; clothed with dark brown scales with pale edges and hairs on it. Stipe about 29-43 cm. long, green, scaly at the base. Lamina 1-pinnate, about 30-35 cm. long and 15-20 cm. wide ; consisting of simple apical pinna about 15-19 cm. long, 4-8 pairs of lateral pinnae, lowest pinnae unbranched ; pinnae about 10-13 cm. long and 3-3.5 cm. wide, lanceolate, base narrow, apex acuminate, deeply lobes on edges, lobes close together about 4-7 lobes on each side of the costae and nearly equal, lobe oblong, largest lobe about 1.5 cm. long and 0.5 cm. wide, apex acute, spines at the base of costae ; texture subcoriaceous ; veins free, simple and once forked. Sori continuous along the edges but not extending to the apex, false indusium ; sporangium 27 μ long, dark to blackish brown.

Distribution Malaya, Penang, Thailand ; this described sample collected from Astronomical House CMU, 760 metres above the sea level.

Ecology mountain ferns in mixed deciduous forest.

Pteris asperula J.Sm.

Stock short erect ; covered with dark brown scales, scales about 4 mm. long, pale edges. Stipe 27-57 cm. long, green, more or less purple when old, also for rachis, grooved on above, scaly at the base. Lamina 1-pinnate, 43-58 cm. long and 19-35 cm. wide, about 7-8 pairs of lateral pinnae, simple apical pinna and similar to the others, the middle pinnae largest about 21 cm. long and 3.2 cm. wide, edges, deeply lobes about 1 mm. from the costae, about 44 lobes with rather rounded tips, slightly narrow base, apex acuminate about 3 cm. long ; texture subcoriaceous ; veins free usually once forked, raised on the lower surface, each lobe about 16-18 pairs of veins, spine at the base of costule ; sterile lamina smaller than fertile one. Sori continuous along the edges of lobes, false indusium ; sporangium 43 μ long, dark brown more or less purple.

Distribution Philippines, Penang, Malaya, Thailand ; this described sample collected from Konthathan Water Fall. (Doi Suthep), 585 metres above the sea level.

Ecology terrestrial ferns in mixed deciduous forest.

Pteris biaurita Linn.

Stock short ~~erect~~ ; bearing numerous slender roots on below ; covered with dark brown scales, scales narrow, pale hairy edges. Stipe about 25-37 cm. long, green more or less purplish when old, glabrous, grooved on above ; rachis and costae deeply grooved with minute hairs within ; teeth at the base of costules. Lamina 1-pinnate, 35-42 cm. long and 27-45 cm. wide, slightly dimorphous ; fertile pinnae and lobes narrower than sterile one, about 6-7 pairs of lateral pinnae, the lowest pinnae largest with branch near the base, other pinnae not branch, sessile, base rather broad, apex acuminate about 3-4 cm. long, deeply lobes on edges nearly to the costae ; lobe oblong ; largest pinnae about 18 cm. long and 4 cm. wide, 22 lobes, apical pinna similar to the others ; texture thin ; veins distinct, free usually once forked, raised on both surfaces. Sori continuous along the edges, false indusium ; sporangium 43 μ long, dark brown.

Distribution West-India, Malaya, Thailand ; the sample here collected from Doi Pui, also found in Mae-Klang Water Fall, Wachirathan Water Fall, about 360-1550 metres above the sea level.

Ecology terrestrial ferns, on common lowland and mountain, in hill evergreen forest.

Pteris tripartita Sw.

Stock short erect, stout ; covered with dull scales, scales 1.2 cm. long and 0.6 cm. wide, entire ; apex of young fronds clothed with pale hairs. Stipe 100-137 cm. long, green, purple when old, scaly at the base, densely hairs on the stipe and rachis, grooved above ; rachis purple. Lamina 2-pinnate ; the end of rachis with three branches ; middle branch consisting of pinnae with deeply lobes ; lateral branches as long as the middle one, and branch off smaller branch near the base ; middle branch about 71-88 cm. long and 44-51 cm. wide, about 20 pairs of pinnae, apical pinna slightly gradually reduced, middle pinnae largest about 26 cm. long and 4-5 cm. wide, deeply lobes about 2 mm. long from the costae, basal one free especially at the lower half of pinnae, apex acuminate, lobe oblique with sinus 4-5 mm. wide, slightly bluntly point at the tip ; texture thin ; veins free, raised on both surfaces, distinct ; toothed on the base of costules. Sori continuous along the edges of lobes except at the tip and the apex of sinus ; false indusium ; many paraphyses ; sporangium 35 μ long, dark brown, spore triangular.

Distribution Australia, Polynesia, Thailand ; this described sample collected from Doi Pui, about 1545 metres above the sea level.

Ecology terrestrial ferns in hill evergreen forest.

Asplenium ensiforme Wall. ex Hook & Crev.

Stock short erect, about 5 mm. thick ; bearing stipes at several intervals ; apex covered with scales, scales 6 mm. long, ovate-lanceolate, clathrate. Stipe about 3-5 cm. long, green, dark green base or nearly black when dry, grooved on above ; covered with scales similar to the stock. Lamina simple, about 20-37 cm. long and 1.5-2 cm. wide, linear, apex acuminate, base very cuneate, entire edges ; texture leathery and firm, dark green ; veins oblique usually once forked near the midrib, midrib prominent on both surfaces, the lower side covered with few scales. Sori long, along the upper branch of once-forked vein, paralleled to each other, sorus about 2-2.8 cm. long and 1-2.5 mm. wide, or about $\frac{2}{3}$ of each vein, light brown ; indusium rolled backwards at maturity ; sporangium 47 μ long with small translucent annulus, spore dark.

Distribution Thailand ; the described sample collected from Doi Inthanon National Park, 2685 metres above the sea level.

Ecology epiphyte ferns on high mountain, hill evergreen forest, grow together with mosses.

Asplenium aruottii Bak

Rhizome long-creeping and branches, underground ; covered with small dull scales, cell wall latticed. Stipe 25-40 cm. long, dark to nearly black, grooved on above, two vascular bundles ; rachis olive to black when dry. Lamina bipinnate-tripinnatifid, about 31-40 cm. long and 21-39 cm. wide ; consisting of 14 pairs of pinnae, lowest pinnae largest about 20 cm. long and 15 cm. wide, the upper pinnae gradually reduced, each pinnae with 10-15 pairs of leaflets ; leaflets short apex acute, lateral sides paralleled, reduce towards the apex, deeply lobes on edges down to nearly the midrib ; each lobe with a secondary lobes, about $\frac{1}{2}$ from the edges, the upper lobes and apex with toothed edges ; texture thin and firm, dark green on sufaces ; veins free, the costules grooved above with raised edges to which the edge of the costae. Sori long, along the one side of the vein about 2 mm. long ; protected by thin indusium, one base attached along the veins and other edges opening towards the costules ; sporangium 39 μ long, spore covered with perispore.

Distribution Thailand ; this described sample collected from Doi Inthanon National Park, about 2685 metres above the sea level.

Ecology mountain ferns in hill evergreen forest.

Asplenium sp.

Rhizome short erect ; covered with clathrate scales, scales about 5 mm. long and 1 mm. wide, lanceolate, round base with small sinus, apex acute ; fronds close together ; dense brown roots. Stipe about 4-6 cm. long, green, grooved on above ; both stipe and rachis clothed with brown scales. Lamina 1-pinnate, about 10-15 cm. long and 2.5-3.5 cm. wide, consisting of 12-15 pairs of pinnae ; pinnae close together, ovate, various sizes, about 1.5-2 cm. long and .5-.8 cm. wide, lobes on edges ; texture thin and firm ; veins free, usually 1-3 forked, glabrous, grooved on above of veins. Sori elongate along the free veins, 1-2 sori on each lobe especially at the basal lobe with 2 sori face to face, sori about 3-5 mm. long and 1 mm. wide, indusium opening towards the costae ; sporangium 43 μ long with small pale annulus.

Distribution this described sample collected from Ruessé Cave area, also found in Kog-Ma Watershed, about 982-1200 metres above the sea level.

Ecology rock ferns along the streamsides, grow with mosses and filmy ferns.

Brainea insignis (Hk.) J.Sm.

Stock erect, stout, 50 cm. height or more, bearing several rosettes of stipes ; apex covered with long narrow light brown scales, scales about 2-4 cm. long and 1 mm. wide, with dark brown central band of scales and paler edges, narrow throughout. Stipe 20-28 cm. long, dense scales at the base. Lamina 1-pinnate, sterile lamina 65-80 cm. long and 23-30 cm. wide ; consisting of numerous pinnae, close together, lowest pinnae reduced, the middle pinnae largest ; rachis and costae clothed with hair-like brown scales ; largest pinnae about 19 cm. long and 1.3 cm. wide, cordate base, apex acuminate, finely toothed on edges ; texture subcoriaceous, dark green ; veins free, once forked and united to a single areole, costae with grooved and raised edges and rounded below ; fertile lamina about 42-51 cm. long and 8-23 cm. wide ; consisting of numerous pinnae, all sessile, pinnae about 10-14 cm. long and 6-8 mm. wide, pinnae narrower than sterile one. Sori arranged along the vein except the costae ; sporangium 43 μ long with small annulus, no indusium, spore spherical and perispore.

Distribution Southern China, Thailand, Malaya ; this described sample collected from Phadum (Doi Pui), also found in Kog-Ma Watershed, about 1200-1350 metres above the sea level.

Ecology mountain ferns in hill evergreen forest.

Bolbitis heteroclita (Pr.) Ching

Rhizome short-creeping, 3-4 mm. thick, green ; bearing two rows of stipes ; apex covered with narrowed lanceolate scales, scales about 4 mm. long, dark brown with pale edges, clathrate. Stipe, green, stipe of fertile lamina about 10-17 cm. long and of sterile one 8-14 cm. long. Lamina 1-pinnate, terminal pinna simple and one pair of lateral pinnae, all sessile ; sterile terminal pinna, lanceolate, with extended very long tip ending to form meristematic tissues capable of forming a plantlet, about 20-26 cm. long and 0.6-0.8 cm. wide at the tip ; lateral pinnae 10-13 cm. long and 3-4 cm. wide, sessile or very short stalk, base cuneate, apex acuminate, edges undulate ; texture thin ; veins anastomosing forming irregular areoles, raised on both surfaces of pinnae ; fertile terminal pinna similar in shape but smaller, the tip of pinnae shorter than sterile one. Sori covering the whole lower surface of pinnae, except the midrib ; sporangium 43 μ long, black.

Distribution Thailand, South China, Malaya, New Guinea; this described sample collected from Ruesee Cave area (Doi Suthep).

Ecology terrestrial ferns near the water fall.

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Bolbitis sp.

Rhizome short-creeping, bearing two rows of stipes ; apex clothed with clathrate scales, scales about 6 mm. long, broad base and narrow towards the apex, entire edges. Stipe stipe of fertile lamina 21-37 cm. long and stipe of sterile lamina 15-20 cm. long, green, scaly at the base. Lamina 1-pinnate, sterile lamina about 30-49 cm. long and 27-33 cm. wide, consisting of 2-3 pairs of lateral pinnae and simple apical pinna about 26-30 cm. long and 3-5 cm. wide, similar in shaped, all sessile, edges crisped ; texture leathery ; veins anastomosing forming regular areoles, fertile lamina about 46-51 cm. long and 10-15 cm. wide, consisting of 6-pairs of lateral pinnae and simple apical pinna, pinnae oblong about 6-7 cm. long and 6 mm. wide. Sori covered the whole lower surface of pinnae included the midrib ; sporangium 52 μ long with rather large annulus ; spores spherical, smooth, perispores.

Distribution the described sample collected from Konthathan Water Fall (Doi Suthep), 558 metres above the sea level.

Ecology rock ferns near the streamsides in mixed deciduous forest.

Dryopteris hirtipes (Bl.) O.KTZE

Stock short erect ; apex clothed with brown scales, scales about 2 mm. long, broad base, apex acute, edges entire. Stipe 30-48 cm. long, purple on lower side of stipe and rachis, scaly at the base ; rachis with scattered scales, scales long narrow, dark, 2 mm. long, and covered with dark scales about 1.3 cm. long. Lamina 1-pinnate, about 64-81 cm. long and 26-37 cm. wide ; consisting of 18-21 pairs of pinnae, well-spaced, lowest pinnae largest, apical pinna simple with lobes on edges about a half from edges, apex acuminate and serrate ; largest pinnae about 20 cm. long and 2 cm. wide, linear, base slightly narrow, apex acuminate, lobes on edges about $\frac{1}{4}$ from edges, pinnae with short wings stalk ; texture thin, firm ; veins free, about 4-pairs of veins on each lobe, costae raised on both surfaces. Sori round, 1 mm. wide, light brown, seating on the first and second pairs of veins in lobe ; indusium peltate, dark brown, sporangium 39 μ long, rough surface spores.

Distribution Thailand ; this described sample collected from Doi Pui, 1552 metres above the sea level.

Ecology terrestrial ferns in hill evergreen forest.

Dryopteris sp.

Stipe short erect, stout ; apex covered with brown scales, scales long, narrow, about 8 mm. long, broad base narrowing towards the apex, apex acute, entire. Stipe 34-58 cm. long, clothed with densely brown scales at the base, rough surface caused by the fallen scales ; several bundles at the base. Lamina tripinnate-quadrupinnatifid, about 50-95 cm. long or more and 32-40 cm. wide ; consisting of 12-16 pairs of lateral pinna, the lowest pinna largest and gradually reduced towards the upper pinna ; largest pinnae 21 cm. long and 12 cm. wide, apex acute, each pinna consisting of 12-pairs of pinnae but 2-pinnate near the apex of pinna ; pinnae about 5-7 cm. long and 2-2.5 cm. wide, all in similar shape, each pinnae consisting of 12-14 pairs of pinnules ; pinnules about 1 cm. long and 0.5 cm. wide, apex rather rounded, deeply lobes on edges, linear lobe ; texture thin ; veins free, one vein per each lobe except the basal lobe with pinnate veins, distinct on both surfaces ; grooved on above of costae and costules. Sori small, round, on the terminal vein of each lobe, indusiate, hidden by sporangia at maturity ; sporangium 39 μ long, pale.

Distribution this described sample collected from Doi Inthanon National Park, about 2500 metres above the sea level.

Ecology mountain ferns in hill evergreen forest.

Polystichum sp.

Rhizome short-creeping, bearing stipes close together; covered with light brown scales, scales about 7 mm. long and 2 mm. wide at the base, broad base, apex acute ; with roots around the rhizome. Stipe 40-65 cm. long, rough ; scaly at the base, scales smaller than that of rhizome, grooved above ; rachis deeply grooved. Lamina 50-71 cm. long and 45-70 cm. wide, quadripinnate at the base, lowest pinnae largest about 40 cm. long and 35 cm. wide ; consisting of 7-9 pairs of pinnae ; pinnules about 1 cm. long and 0.5 cm. wide, edges deeply lobes with sharp teeth, base unequal, teeth on edges of pinnules, costae grooved above ; texture thin and firm ; veins free, once or twice forked, distinct on both surfaces. Sori round, on the vein-tip of the first branch near the midrib, one sorus on each lobe, brown, indusium peltate, sporangium small about 27 μ long.

Distribution this described sample collected from Phadum (Doi Pui), about 1350 metres above the sea level.

Ecology terrestrial ferns in hill evergreen forest.

Tectaria variolosa (Wall.) C.Chr.

Rhizome short-creeping ; apex clothed with brown scales, scales about 8 mm. long and 1 mm. wide, pale edges. Stipe about 38-50 cm. long, dark brown, base with scales as in rhizome, upper part with groove and numerous hairs ; rachis and costae clothed with short hairs, glabrous on below. Lamina 1-pinnate but the lowest pinnae 2-pinnate ; sterile lamina about 21-25 cm. long and 25-28 cm. wide, consisting of 3 pairs of lateral pinnae and apical pinna ; pinnules at the base of the lowest pinnae about 8-12 cm. long and 3-3.5 cm. wide, rounded base, apex acuminate, deeply lobes on edges, one pair of lateral pinnules ; the upper pinnae with short stalked, deeply lobes on edges, the basal lobe of the largest pinnae falcate ; veins anastomosing forming small regular areoles, no veinlet within ; fertile lamina about 28 cm. long and 18 cm. wide ; consisting of 4 pairs of lateral pinnae, lowest lateral pinnae largest, all lobe almost rounded ; texture subcoriaceous ; veins more simpler than in sterile lamina, single areoles. Sori large, one sorus is on each areole ; indusium large, dark brown, rather reiniform, sporangium 35 μ long, spore pale.

Distribution South-west China, Southern-Java, Thailand; this described sample collected from Konthathan Water Fall (Doi Suthep), 558 metres above the sea level.

Ecology terrestrial ferns, capable of adapting to seasonal climate.

Athyrium sp.

Stock erect, stout, bearing a tuft of fronds close together ; apex covered with scales, scales 4-6 mm. long and 1-1.5 mm. wide, base rather peltate, edges toothed, teeth bilobed and composed of 2 cells which separate at the tip. Stipe about 15-35 cm. long, bearing papillae throughout, two vascular strands at the base and uniting upwards into a single U-shaped strand, rachis papillate in the grooved ; costae grooved above with thin raised edges. Lamina 1-pinnate, about 50-75 cm. long and 24-35 cm. wide, 14-16 pairs of pinnae, pinnae 10-15 cm. long and 2-3 cm. wide, base truncate and broadly round, apex acute, pinnae oblong, sessile, deeply lobes on edges about $\frac{1}{4}$, apex of lobes serrate, apical pinna deeply lobes on edges at the base ; texture thin ; veins free, pinnate but veins in group fusing on lateral sides, 10 pairs of veins per lobe, 3-4 pairs of adjacent groups anastomosing forming excurrent vein towards a sinus between adjacent lobes. Sori long, almost whole length of the veins, sporangium 35 μ long, indusium light brown.

Distribution this described sample collected from behind the Sarathum of Chiang Mai University.

Ecology terrestrial ferns near the pools, or wet ground.

Ceratopteris thalictroides (L.) Brongn.

Stock short erect, bearing a rosette of fronds; apex covered with brown scales, scales elliptic, dark lateral walls, edges entire. Stipe about 16-21 cm. long, green, fleshy, flattened and smooth on the upper side, rounded and ribbed on the lower side, many air-channels and small peripheral bundles, rachis as stipe. Lamina compound, dimorphous ; sterile lamina about 16-20 cm. long and 8-9 cm. wide, deeply lobes on edges of pinnae ; shorter than the fertile one ; fertile lamina about 25-60 cm. long and 19-28 cm. wide, 7-10 pairs of pinnae, 2-pinnate ; pinnules divided into linear lobes, ultimate lobes about 2-3 cm. long and 1.5 mm. wide, edges thin and translucent, colourless, reflex backwards to meet below close to the midrib ; pinnules about 6 cm. long and 6 cm. wide, with 5 deep lobes, the lowest pinnules with lobe branch off again, about 3-lobes ; veins 5-longitudinal veins, raised. Sporangium along the veins except the midrib, sporangium 78 μ long with large annulus, spore rough.

Distribution Malaya, Thailand ; this described sample collected from Huey-Kaew Arboretum.

Ecology water ferns on lowland pools.

Antrophyum parvulum Bl.

Rhizome short-creeping, fleshy ; apex covered with scales, scales about 5 mm. long, clathrate, apex narrow and long, hair-like, toothed edges ; bearing numerous brown roots. Stipe very short, not sharply distinct from the lamina, two vascular strands on above the base. Lamina simple, dimorphous, stipe usually not distinct ; the smaller ones with obovate-shaped, rounded at the apex ; the larger ones wider at the middle part and gradually narrow to the apex, base cuneate, one side nearly straight, another side curved towards the base and apex ; veins and midrib not visible but distinct when dry, anastomosing forming narrow areoles and long ; texture fleshy, dark green on the upper surface. Sori long and anastomosing along the veinlet, in deep grooves ; sporangium 7 μ long, annulus small and dark brown ; paraphyses numerous, club-shaped, reddish-brown.

Distribution Penang, Malaya, Thailand ; this described sample collected from Ruesee Cave area (Doi Suthep), 982 metres above the sea level.

Ecology rock ferns, near the water fall, usually grow together with mosses in hill evergreen forest.

Adiantum philippense Linn.

Stock short erect or suberect ; bearing a tuft of fronds; covered with scales, scales about 3 mm. long, narrow, dark, entire, base cordate. Stipe 6-20 cm. long, purple to nearly black, grooved on above, glabrous ; rachis similar to stipe. Lamina 1-pinnate, about 18-20 cm. long and 9-12 cm. wide, 7-8 pairs of pinnae, terminal pinna irregular shape ; leaflets with black stalked about 1 cm. long, the lowest stalk longest about 1.2-1.5 cm. long with leaflet nearly crescent-shaped, the lower edge and inner edge joining to stalk almost in a straight line, lower edge recurved, the upper and outer edge continue to form a curved ; largest pinnae about 4.5 cm. long and 1.5 cm. wide, the upper edge with lobes about $\frac{1}{4}$ deep from edges, rounded tips ; texture thin ; veins free, several times forked. Sori long along the edges of lobes about 2 mm. long and 1 mm. wide ; indusium originated from reflexed flap.

Distribution Malaya, Java, Africa, Thailand ; this described sample collected from Ruesee Cave area (Doi Suthep), 982 metres above the sea level.

Ecology rock ferns, near the streamsides in hill evergreen forest.

Adiantum caudatum Linn.

Stock short erect, bearing a tuft of fronds ; covered with densely dark brown scales, scales about 4-5 mm. long, narrow, apex acute, pale edges. Stipe 4-10 cm. long, dark brown to nearly black ; clothed with multicellular hairs throughout, the upper side of rachis clothed with hairs longer and denser than the lower side. Lamina 1-pinnate, 8-27 cm. long and 3-3.5 cm. wide, 8-31 pairs of pinnae, all very short stalks or sessile, apical part of lamina leafless and rooting at the tip ; largest pinnae about 1.8 cm. long and 0.7 cm. wide, parallelogram-shaped, lower edge nearly straight, upper edge nearly parallel to the lower edge, upper edge and outer edge with deep lobes to about half of the pinnae, edges of lobe crenate ; texture thin, upper surface of pinnae clothed with densely long hairs but the lower surface clothed with both short and long hairs ; veins free, forked, raised on the upper surface. Sori long; on the tip of lobes protected by elongate reflexed flaps, hairy and dark brown, sporangium 35 μ long.

Distribution Malaya, Africa ; this described sample collected from Mae Klang Water Fall, about 360 metres above the sea level, also found in other lowlands.

Ecology terrestrial common ferns, usually on rocks near the streamsides.

Pityrogramma calomelanos (L.) Link

Rhizome short erect, bearing a tuft of fronds close together ; covered with light brown scales, scales narrow, less than 1 mm. long. Stipe 16-30 cm. long, dark brown to nearly black, scaly at the base ; grooved on above ; covered with white waxy powder when young ; rachis deeply grooved on above ; grooved with narrow wings, green ; dark purple underside. Lamina 2-pinnate, 30-45 cm. long and 22-29 cm. wide, pinnae about 13-17 cm. long and 3-4 cm. wide ; pinnules oblique to the midribs, largest pinnule about 2 cm. long and 0.6 cm. wide, elliptic, apex acute, edges toothed, the lower surface of pinnules covered with white waxy powder ; texture thin, dark green ; veins free, distinct. Sporangium seated along the veins, covering the whole lower surface of pinnules when mature ; sporangium 47 μ long, dark or black

Distribution, Malaya, Thailand ; this described sample collected from Phadum (Doi Pui), about 1300 metres above the sea level.

Ecology terrestrial ferns in hill evergreen forest.

Marsilea crenata Presl

Rhizome creeping, about 1 mm. thick ; well-spaced fronds, green ; clothed with light brown multicellular hairs. Stipe about 9-18 cm. long, bearing pale hairs, but dense at the base. Lamina compound with 4 leaflets, each about 1.3-1.7 cm. long and 1.2-1.6 cm. wide, very cuneate base, apex broadly rounded. edges entire ; texture thin and firm ; veins anastomosing, raised on the upper surface. Sporocarps stalked about 2-4 mm. long, attached at the base of a stipe, bearing 1-3 sporocarps, per stalk; sporocarp about 4-5 mm. long and 3-3.5 mm. wide, green, almost black when old, oblong or ovoid, the end rounded, the other end attached to the stalk, the apex end in two small teeth, covered with pale hairs on the surfaces, many small pores on surfaces also; each sporocarp containing both megasporangium and microsporangium, opening when mature (11).

Distribution Penang, Malaya, Sumatra, Philippines, Thailand ; this described sample collected from the front of Post Office of Chiang Mai University, also found in other places.

Ecology common water ferns, grow in lowland.

Salvinia cucullata Roxb.

Rhizome slender in Water ; clothed with dark brown multicellular hairs, narrow, apex acuminate ; rootless ; bearing leaves close together. Lamina simple, leaves in whorls of 3, two of each whorl being green, floating on the upper surface, the third submerged, numerous and root-like ; leaflets about 1 cm. long and 1-4 cm. wide, wider than long, edges entire, lateral sides curved upwards so that the edges meet, upper surface clothed with minute papillae, lower surface bearing short brown hairs ; texture thin and firm ; veins reticulate, not distinct on both surfaces. Sori each enclosed by an indusium, at the base of the third leaves, not found in the collected specimens, some sori bearing only megasporangium, some only microsporangium (11).

Distribution India, Western Australia, Malaya, Thailand; the described sample collected from Hua Kasw Arboretum.

Ecology water ferns, grow together with Azolla and water-lilies.

Azolla pinnata R.Br.

Stem very slender, alternately branch to left and right ; bearing leaves in two alternate rows, numerous roots growing downwards about 4 cm. long. Plant whole plant about 1.2-1.5 cm. long and 0.5-0.6 cm. wide ; simple, very small size, less than 1 mm., leave biloped, one floating, green, purplish when old, slightly curved edges with colony of Anabaena azollae, present within, the other lobe submerged and colourless. Sori enclosed by indusium, between the base of branch stem and submerged lobe, each sorus bearing either megasporangium or microsporangium, not found in the collected specimens (11).

Distribution Africa, Asia, Australia, Malaya, Thailand; this described sample collected from Huey-Kaew Arboretum.

Ecology water ferns, usually grow with Lemna, salvinia, water-lilies ; rapidly wide spreading on the whole surface of water, expose places.

คำที่ใช้ในการบรรยาย

1. รูปร่างลักษณะของใบ (4)

elliptic	=	ใบมน ลักษณะหัวท้ายมน ตรงกลางป่อง
obovate	=	ใบรูปไข่กลับ ส่วนกว้างที่สุดของใบอยู่ทางค้ำปลายใบ
ovate	=	ใบรูปไข่ ส่วนกว้างที่สุดของใบอยู่ทางคานก้านใบ
lanceolate	=	ใบรูปหอก ลักษณะใบยาวแล้วค่อย ๆ แคบไปทางปลายใบ
linear	=	ใบแคบยาวตลอด
oblong	=	ใบรูปขนาน ส่วนใหญ่ของใบสองข้างอยู่ในแนวขนาน กัน โคนและปลายใบมน

2. ลักษณะของยอดใบ (4)

acute	=	ปลายใบทู่ คือปลายใบที่ค่อย ๆ เรียวเข้ามาบรรจบกัน
acuminate	=	ปลายใบแหลม คือปลายใบที่สอบเข้าหากันจนเป็นทาง ยาวออกไป

3. ลักษณะของโคนใบหรือฐานใบ (4)

cordate	=	โคนใบรูปหัวใจ
auricle	=	โคนใบรูปติ่งหู
truncate	=	โคนใบตัด คือโคนใบที่เสมอกันเป็นเส้นเดียวกันเมื่อถูกตัด
cuneate	=	โคนใบสอบ เป็นรูปลิ้น
falcate	=	โคนใบยื่นออกทั้งสองข้าง

4. ลักษณะของขอบใบ (4)

entire	=	ขอบเรียบ
crenate	=	ขอบใบหยักมน โฉงเป็นลูกคลื่น
serrate	=	ขอบใบหยักเป็นฟันเลื่อย
tooth	=	ขอบใบหยักเป็นซี่ฟัน
notch	=	ขอบใบหนา และเว้าเป็นแอ่งเล็ก ๆ ตลอด

5. โครงสร้างของใบ หรือเนื้อใบ (4)

thin	=	เนื้อใบบาง
coriaceous	=	เนื้อใบหนาเป็นแผ่นหนัง
subcoriaceous	=	เนื้อใบค่อนข้างหนาเป็นแผ่นหนัง

6. เส้นใบ (15)

acrosopic veins	=	เส้นแขนงใบที่อยู่ไปทางค้ำปลายใบ
basisopic veins	=	เส้นแขนงใบที่อยู่ไปทางค้ำโคนใบ

7. อับสปอร์ และสิ่งที่ป้องกันอันตรายให้กับกลุ่มอับสปอร์ (15)

sporocarp	=	เป็นโครงสร้างรูปไข่ หรือรูปขอบขนานที่มีกลุ่มอับสปอร์ อยู่ภายใน
annulus	=	เป็นเขตแถวเกลียวของอับสปอร์ ผนังเขตหนา 3 ชั้น
stellate hairs	=	ขนรูปดาว มีลักษณะจุดตรงกลางกลมสีน้ำตาลเข้ม แล้ว มีแขน (arms) ยื่นออกมาโดยรอบสี่ข้าง

- paraphyses = เป็นขน หรือสเกลที่เปลี่ยนแปลงไปเป็นเส้นยาวแทรกอยู่
ระหว่างอับสปอร์เพื่อป้องกันอันตราย
- false indusium = เยื่อหุ้มกลุ่มอับสปอร์ที่เกิดจากขอบใบบาง ม้วนมาหุ้ม
กลุ่มอับสปอร์ไว้
- homosporous = แต่ละกลุ่มอับสปอร์มีสปอร์ชนิดเดียว คือมี microspore
หรือ megaspore อย่างใดอย่างหนึ่ง
- heterosporous = แต่ละกลุ่มอับสปอร์มีสปอร์สองชนิดคือมีทั้ง microspore
และ megaspore อยู่ในกลุ่มอับสปอร์เดียวกัน