The Tree-ferns of Malaya

by

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AND

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Introduction (R.E.H.)

Preparation of the account of the tree-fern family (Cyatheaceae) in *Flora Malesiana* (Series II, Vol. 1, part 2, 1963) involved a study of all the species which have been named throughout the Malayan region, some 350 names in all. This led to the discovery that a good many species had been re-named, sometimes more than once, by different authors; in such cases, the earliest name has to be used. For this reason, the names of some species described in *Ferns of Malaya* (1954) have to be changed. An example is *Cyathea kingii*, named in 1883 from a Malayan specimen, which is found to be indistinguishable from *Cyathea lurida*, originally described from a Java specimen in 1828. Two more names were later given to specimens from Sumatra, but they are not distinct from *C. kingii*, the variability of which is shown by more ample collections made in Malaya. Besides changes made for this reason, two more are due to the discovery that names used in *Ferns of Malaya* were mis-applied; and three species have to be added to the list. The changes are as follows.

Ferns of Malaya		Flora Malesiana	
Cyathea brunonis	p. 117 =	*C. moluccana* R. Br.	p. 143
C. latebrosa var *indusiata*	p 121 =	*C. hymenodes* Mett.	p. 89
C. obtusata	p. 121 =	*C. borneensis* Copel.	p. 110
C. burbidgei	p. 124 =	*C. trichodesma* (Scort.) Copel.	p. 150
C. ampla	p. 125 =	*C. polypoda* Bak.	p 151
C. kingii	p. 126 =	*C. lurida* (Bl.) Copel.	p. 121.

Misapplications. The true *C. burbidgei* (Bak.) Copel. and the true *C. ampla* Copel. are both species of Sarawak which do not occur in Malaya, and the names were wrongly applied to Malayan ferns in *Ferns of Malaya*. The Malayan specimens misnamed *C. burbidgei* were found to be identical with the type-specimen of *C. trichodesma* at the British Museum (Natural History); this species had been overlooked when *Ferns of Malaya* was being written. The Malayan specimens misnamed *C. ampla* are only distinct from *C. polypoda* in their broader leaflets, and are now included in that species (true *C. ampla* has indusiate sori).

Additional species are *C. incisoserrata* Copel., *C. sumatrana* Bak., and *C. alleniae* Holttum.

In *Flora Malesiana* are new keys for the identification of species. But as these keys cover 191 species, mostly not in Malaya, they

are unnecessarily complex for local use. A simplified key is therefore here provided, covering only the species known to be native in Malaya.

The final part of the present paper consists of a summary by Mrs. Allen of her observations, made over many years, on the local occurrence of the individual species in Malaya. These notes will be of great value to local field botanists. They will also be of historic interest, as unfortunately species have been exterminated in some localities by felling of the forest in which they once grew, and more areas of forest will suffer the same fate, as more land is taken over for other use. In addition to this information on local occurrence of species within Malaya, a summary of their known distribution outside Malaya is given; this is taken from *Flora Malesiana*, and is based on a study of specimens preserved in many herbaria in various parts of the world.

Key for identification of tree-ferns in Malaya

Note. In this key, the word *pinnules*, unless otherwise stated, refers to the larger pinnules of middle pinnae; upper pinnae are always smaller, and lower ones more or less reduced.

1. Scales at base of stipe dark, shining (except in *C. excavata*), with paler fragile edges which are often abraded when fronds are old.
   2. Pinnules lobed almost to costa throughout; an indusium always present (sometimes very small and hidden by sorus); lower surfaces of rachises rarely very dark; little difference in size between sterile and fertile pinnules.
      3. Pinna-rachis bearing some hairs on lower surface, at least distally; indusium a little wider than base of sorus, at least on costular side.
         4. Pinna-rachis rather densely hairy throughout on lower surface; indusium very fragile, completely covering young sorus, breaking at maturity and leaving an irregular shallow cup ..... 1. *C. sumatrana.*
         4. Pinna-rachis hairy towards apex only on lower surface; indusium rather firm and disc-shaped or only on costular side of receptacle.
            5. Indusium forming a disc round receptacle (sometimes asymmetric); stipe-scales to 4 mm. wide ..... 2. *C. hymenodes.*
            5. Indusium only on costular side of receptacle; stipe-scales to 1 or 1½ mm. wide.
               6. Lower pinnae usually much reduced; larger scales on costae not setiferous; pinnules to 10 cm. long ..... 3. *C. borneensis.*
               6. Lower pinnae not much reduced; larger scales on costae setiferous; pinnules to 14–15 cm. long ..... 4. *C. alleniae.*
      3. Pinna-rachis lacking hairs on lower surface; indusium either completely covering young sorus, or quite covered by sorus.
         7. Indusium completely covering young sorus, breaking later; no bullate scales on costae and costules ..... 5. *C. excavata.*
         7. Indusium very small, covered by sporangia; bullate scales abundant on costae and costules.
            8. Pinnules of well-grown plants commonly 2½ cm. wide, sometimes to 3½ cm., with several basal pairs of segments separately attached to costa; largest segments deeply lobed near bases; costules 4½–5½ mm. apart ..... 6. *C. incisoserrata.*
            8. Pinnules of well-grown plants rarely to 2 cm. wide; at most one basal segment almost free; segments not deeply lobed; costules usually 3–3½ mm. apart ..... 7. *C. latebrosa.*

2. Pinnules rarely lobed more than ½ way to costa, or if lobed nearly to costa the fertile segments much narrower than sterile; no indusium; lower surfaces of rachises always dark, often very dark.

9. Greatly reduced pinnae, separate from the rest, on basal part of stipe ..... 8. *C. recommutata.*

9. No greatly reduced pinnae at base of stipe.

10. Sterile pinnules lobed almost to costa throughout, bearing bullate scales on lower surfaces of costules; lobes of fertile pinnules greatly contracted ..... 9. *C. lurida.*

10. Sterile pinnules not lobed nearly to costa, with no bullate scales beneath; lobes of fertile pinnules not greatly contracted.

11. Pinnules borne on very short stalks and lobed ½ way to costa or more; sori on lowest veins not near costule, those on higher veins progressively nearer to it, the arrangement thus an inverted V; basal basiscopic vein of each group often from costa, not from costule ..... 10. *C. gigantea.*

11. Pinnules borne on stalks 2–4 mm. long, lobed less than ½ way to costa; sori on all veins about equidistant from costule; basal basiscopic vein of a group attached to costule above base of costule ..... 11. *C. glabra.*

1. Scales at base of stipe thinner, usually pale, edges not of different texture but bearing many short oblique dark setae.

12. Most segments of pinnules quite free as tertiary leaflets; sori apparently indusiate, actually covered by overlapping scales ..... 12. *C. tripinnata.*

12. Most segments of pinnules not free; sori indusiate in nos 13 & 14, in other species exindusiate, never covered by overlapping scales.

13. Fronds simply pinnate; pinnae entire or ± crenate; indusium conspicuous, covering young sorus (disppearing later) .....
13. *C. moluccana.*

13. Fronds with deeply lobed or pinnate pinnae.

14. Pinnae deeply lobed, or almost pinnate near base .....
14. *C. alternans.*

14. Pinnae fully pinnate or almost so throughout; no indusia.

15. Pinnules lobed almost to costa throughout; stipe and lower surfaces glaucous, stipe strongly spiny .....
15. *C. contaminans.*

15. Pinnules not lobed nearly to costa; lower surfaces not glaucous, stipe not strongly spiny.

16. Long spreading hairs present on lower surfaces of pinna-rachis, costules and veins ..... 16. *C. trichodesma.**

16. No long spreading hairs on lower surfaces.

17. Largest pinnules with a free segment at base; pinnules on stalks to 4 mm. or more long; texture firm ..... 17. *C. polypoda.*

17. Largest pinnules lacking a free segment at base, sessile or nearly so; texture thinner.

18. Sori on 3–4 pairs of basal veins of each group only, not on distal veins, at maturity confluent
18. *C. obscura.*

18. Sori on almost all veins, not confluent at maturity ..... 19. *C. squamulata.*

* A plant intermediate between *C. trichodesma* and *C. alternans,* probably a hybrid, has been found near Ampang Reservoir, Kuala Lumpur (*see* Flora Malesiana p. 150).

Notes on the distribution of the Malayan Tree-ferns (B.M.A.).

Cyathea sumatrana Baker

General distribution: Sumatra and the Malay Peninsula, between 500—1500m.

One sterile specimen has been found in Malaya, in 1957 (M.A. 3447). It was growing at an altitude of about 500m in Selangor in tall forest on the upper side of the Ginting Sempak road, near the 19 9/10 milestone. The fern was in a sandy patch which was in the middle of a flat, wide but shallow stream. Although it was not in the water it must frequently be inundated, and perhaps had been washed down from a higher altitude, for no others were found in the vicinity, either in the stream-bed or in the forest, where there was comparatively little floor covering. Some young plants which appear to be this species were found alongside the Kinta and Ulu Piah rivers in Perak at about 170m in altitude. No adults were found although the area was searched, and so they should be looked for further upstream.

The Selangor specimen had a very short trunk, not more than 30cm tall and the fronds when living, were soft in texture and bluish-green and dull above. The stipes, rachises and costae were almost black above but pale below and there were distinct excavations at the stipe bases.

C. *hymenodes* Mett. (syn. C. *latebrosa* var *indusiata* Holtt.)

General distribution: Sumatra and the Malay Peninsula, 700-2200m.

This is not a common Malayan fern for so far has been found only in Pahang and Johore in mountain areas, but of course may turn up on other hills, especially on the Main Range. It grows in the shade of tall dark forests often where the ground is sloping and the soil loose and damp, sometimes by streams but more often well above them.

It is not uncommon at Fraser's Hill but is easily overlooked as it resembles C. *latebrosa*. One of the places it occurs frequently is on the forest slopes on the north side, below Victory and Cecily bungalows, near and below the main contour path. It has also been found on the quartz ridge at the beginning of the path above Pahang bungalow, and in the forest about half-way to Pine Tree Hill. At Cameron Highlands where it seems to be more local, it has been collected near the junction of the Terla and Telom rivers at about 1200m, and on Gunong Batu Brinchang where specimens were collected at an altitude of 2200m; the plant was growing on steep but wet ground and had a trunk of nearly 250cm in height. An interesting habitat was in an area of recently cleared forest, where only a few saplings and shrubs remained; near some well established young plants of C. *excavata* were a few adult C. *hymenodes* in full sun. One had a trunk of about 1m in height, and the fronds were shiny and tough. Although it was too early then (1962) to know whether they were really established, it would be interesting now to

have further observations. The area is in a peaty ridge near Walkerburn cottage (now Che Foo) and above Brinchang village, on a woodcutters' path a few metres from the road.

In Johore C. *hymenodes* was collected from the summit of Gunong Muntahak. Fronds are usually dark green above and the trunk is slender and not more than about 350cm in height.

C. *borneensis* Copel. (syn. C. *obtusata* Rosenst.)

General distribution: from Mergui southwards, and Peninsula Thailand; Malayan peninsula and Sarawak, in lowland forest to 1200m.

In Malaya this species has been collected from between 100-1200m from Perak, Pahang and Selangor, but not very much is known about its distribution and is possibly more widespread than we know. It is a forest species not tolerating much sunlight and therefore may have been more common when it was first collected in Perak last century, for specimens do not seem to have turned up again until 1957. In an area which many years ago was milled but not cleared, where there was tall secondary growth mixed amongst the taller trees, C. *borneensis* was found to be common. In 1962 this place (on the slopes of Bujang Melaka mountain) was completely cleared for rural development, but on more remote places on the mountain it may still exist. It has also been found in several places in the Tapah Hills Forest Reserve on the foothills of the Main Range in Perak, and although apparently absent from wide areas is common enough where it does occur. In Pahang it grows in more or less undisturbed tall forest below Fraser's Hill on the north side at about 1200m, sometimes together with C. *hymenodes*. In Selangor it occurs sporadically in the tall forest by the side of the Sungei Berok above Kepong Forest Research Institute; in the forest surrounding the Ampang Reservoir, alongside streams, and in the Ginting Sempak it was once collected by a streamside in the forest above the road at 300m.

The fern is nearly always near water and always in gloomy places. When living, the fronds are usually very dark green above and pale below, and one Pahang specimen had a trunk of nearly 5m in height with a circumferance of only 30cm.

C. *alleniae Holttum*

General distribution: Malayan Peninsula, between 1100-1200m.

So far known only from the Kuala Terla area in the Cameron Highlands district of Pahang. The original plant was growing in a band of forest above the Terla river, near the junction of the Terla and Telom rivers. No others were found here, but a few hundred metres further on by the main road towards Blue Valley Estate, several patches of young plants (some fertile) were found, and about 16m above the Telom river, under a light forest canopy and on steeply sloping ground, others were seen. Some had trunks to 2m in height and all had pale green fronds. Several miles away,

near a tributary of the Telom more plants were found, but none so tall as the type which had a trunk about 4m tall, with small crowns of fronds from near the base of the trunk. The species apparently tolerates a great deal of light but not exposure to wind, favouring forest edges and open places which are sheltered, or in light forest and not on streamsides, but often growing well above where the humidity would be more or less constant. Without more field work it is difficult to be sure of its proper habitat, adapting itself as it does to disturbed forest. The pinnules break off very easily but the stipe base does not (in most species of *Cyathea* this is easily detached from the trunk by a tug).

C. *excavata Holttum*

General distribution: Malay Peninsula; again known only from the Cameron Highlands district of Pahang, from about 1170 to 1900m.

This is a very distinctive species and occurs in many areas around the hill station environs. It is common in open places alongside streams where the forest has been cleared but where a few small trees, shrubs and tall grasses line the banks, and seems to be increasing by the sides of shaded streams near bungalows where the banks undergo periodic cleaning. These two habitats are no doubt artificial ones, and as Dr. Holttum states this species was originally found in primary forest, and it is still to be found on the more or less undisturbed forest slopes of mountains such as Jasar, Ruil and Brinchang by small streams or on flat wettish ground. It also occurs in the forests below Cameron Highlands near the Terla and Telom rivers. Apparently it will grow when away from water for in a cleared area on the slopes of a peaty ridge (see under C. *hymenodes*) C. *excavata* was quite common, yet there was no stream near enough to influence it.

It is easily distinguished from C. *contaminans* which is the common tree-fern of the open places at Cameron Highlands, by its soft fronds and completely smooth stipes.

C. *incisoserrata* Copel. (syn. *Alsophila latebrosa* var. *ornata* Ridley*)

General distribution: Sarawak and the Malay Peninsula; from the lowlands to 1400m or more.

This has been found in Penang, Perak, Pahang and Johore, and is a tall species growing on forest edges or in clearings within the forest, requiring light and sun. On Penang Hill it was growing at about 650m altitude, and in Perak was quite common on forest edges both on the lower slopes of Bujang Melaka and the foothills behind Gopeng. At Fraser's Hill it grows commonly on the edges of tall forest which borders Girdle Road, the trunks being as tall as C. *contaminans* with which it grows, but it differs by the more

* See H. N. Ridley: The Ferns of Malay Peninsula — J. Mal. Br. R. As. Soc. IV, 8: 1926.

lacy appearance of the fronds and the non-glaucous stipe bases. In Selangor it is quite conspicuous in sunny places on the forest edges at Ampang Reservoir: here the fronds are yellowish. In Johore it was found at Tanjong Kupang (Ridley) and on the forest edge between Mersing and Endau.

This is a species which is possibly increasing with the changing face of our forests, for it obviously tolerates much sun and seems equally happy in damp or dry ground; also plants become fertile at an early age.

C. *latebrosa* (Wall. ex Hook.) Copel.

General distribution: Hainan, Indochina and Thailand; Malaya, Sumatra, Borneo.

In Singapore and Malaya, throughout the lowlands and up to 2000m. This is the species most frequently seen on roadside ditches where there is shade; on the floor of old rubber estates; on streamsides in secondary growth; in swamp forests and is one of the few *Cyathea* species to be recorded from the bases of limestone outcrops. In the hill stations it is a common fern in both forest and rather open places, the highest being at 2000m on Gunong Batu Brinchang in Pahang. It is usually a small species with a slender trunk and soft fronds.

C. *recommutata* Copel.

General distribution: Central and S. Sumatra, Malay Peninsula & Borneo.

In Malaya it has been found between 600-1500m in Perak on Maxwell's Hill; in Pahang at Fraser's Hill and on Gunong Tahan; in one or two places on the mountain ridges in Selangor, and on Mt. Ophir in Johore. C. *recommutata* does not seem to be a common fern, apparently requiring a special environment. It has been found on peaty ground, on quartzite ridges and in short mossy forest, sometimes in association with C. *lurida*, but always in the shade. Previously it was collected from Bujang Melaka in Perak, but does not seem to be there now. It is a small dark tree-fern, easily distinguished by the very small pinnae on the stipe bases.

C. *lurida* (Bl.) Copel. (syn. C. *kingii* (Clarke) Copel.)

General distribution: Sumatra, Malay Peninsula, West Java and the Philippines (Mindoro only).

This species is found in Malaya between 1250-2220m in Perak and Pahang, on some of the higher hills. It is most easily seen in Perak near the summit of Gunong Hijau above Maxwell's Hill, and at Cameron Highlands and Fraser's Hill in Pahang, the highest altitude recorded being near the summit of Brinchang in mossy forest. Although a fern of the forest shade it seems to persist for some years on forest edges in rather open places, and is very common on the quartzite ridges around Fraser's Hill. It is nearly always trunkless, occasionally short ones are seen; this, together with the long stipes, drooping laminae and contracted fertile pinnae make it easy to recognise.

C. *gigantea* (Wall. ex Hook.) Holttum

General distribution: Ceylon and S. India, N. E. India to Burma, Thailand and Annam, Malaya, Central Sumatra and W. Java.

In Malaya found only on Langkawi Is. (Kedah), Penang and Upper Perak from sealevel to about 350m, in rather open places. In Langkawi it was collected from Gunong Raya, and in Penang on the east and north eastern slopes of the hill, but as much of this area has now been cleared it may not still be there. In Perak it was found recently (1960) growing on flat banks of the Plus river, towards Legap on the outskirts of light forest, and some, being close to the riverside were quite exposed. Another species (not fertile) was nearly always growing with it. Neither species was common. In the field C. *gigantea* has a similar appearance to C. *glabra;* the differences are given in the key.

C. *glabra* (Bl.) Copel.

General distribution: Sumatra, Malaya, Borneo and W. Java. In Malaya it occurs in forest from sealevel to 1700m and has been collected from most states except Penang. On Kedah Peak it grows in light forest at about 860m; in Perak on the higher parts of Maxwell's Hill and near Ipoh on the edges of the rocky lowland forest bordering the Kinta river at more or less sealevel, and at 270m near a quartz outcrop on sloping dry ground. It does not seem to be common in the lowland swampy forests here, as it is further south. In Selangor and Pahang it grows under tall forest on sloping ground near the tops of ridges on the Main Range, but not near streams. It is common at both Cameron Highlands and Fraser's Hill. In Singapore it still occurs in Mandai forest but is now rare.

C. *tripinnata Copel.*

General distribution: Malaya, N. Borneo, W. Java, Amboyna, Philippines.

In Malaya found only on Pulau Tioman at Bukit Telang and Sedagong at 270m. This species should be looked for on the mountains near the east coast of the Peninsula(see Holttum, Ferns of Malaya p. 120). On Mt. Kinabalu where it is fairly common locally, it is quite distinctive with its attractive lacy fronds. It is a tall tree-fern.

C. *moluccana* R. Br. (syn. C. *brunonis* (J. Sm.) Wall. ex Hook.)

General distribution: Central Sumatra, Malaya, Lingga, Borneo (excluding S. & S.W.), South and (?) Central Celebes, Moluccas (Ceram, Amboyna).

It has been found throughout the Malay Peninsula except from perhaps Perlis, from sealevel to 1300m. Although a common lowland and foothill fern of disturbed forest and short secondary growth, it appears to be absent from wide areas. It is very common on Penang Hill; on the lower (dryer) slopes of Maxwell's Hill, on forest edges; and on the roadsides to both Cameron Highlands and Fraser's Hill, becoming rarer about 650m (one young plant was

found on a ridge near F. H. at 1300m). As it not only tolerates, but appears to thrive in short second growth, especially when near streams, it may be on the increase in many areas. C. *moluccana* is easily recognised by its simply pinnate fronds; it is nearly always trunkless, but in old plants in tall foothill forest, trunks may be seen up to 50cm. This species probably hybridises with C. *alternans*.

C. *alternans* (Wall. ex Hook.) Presl

General distribution: Sumatra, Malay Peninsula, Sarawak and N. Borneo.

In Malaya this species occurs in most States from Penang and Kelantan to Johore, from the lowlands to 1430m, but is often very local and thus may be overlooked. It is possible that it is more common than is known at present. It is certainly not uncommon on Penang Hill and in parts of Perak, and often grows in association with C. *moluccana* on forest edges, but is much rarer than this species, sometimes only solitary plants being found. In Perak C. *alternans* has been seen several times growing together with a *Pleocnemia* sp. (which was always infertile). Mature specimens on Penang Hill at about 650m had trunks 2-3m in height, but this does not seem to be commonly seen now, for young, trunkless plants are usually encountered, and these in shaded places in tall secondary growth. Tall and mature specimens which have also been seen in Perak, Pahang and Selangor, appear to be quite happy in full sun, on forest edges, and with one exception were not near streams, yet young specimens frequently are. Observation for nearly ten years on two plants suggests that they are slow growing, but young ones are definitely increasing in undisturbed secondary growth. At Fraser's Hill there is a mature plant with a trunk about 45cm high growing on the forest edge, on the lower side of Girdle Road which is just over 1300m, and a young trunkless one was seen on the summit of Peninjau near the wireless station. Fronds vary tremendously in the pinnae shape and lobing, and on the Gap road in Selangor, in one of the Agricultural plots at about 700m, are some tall specimens with curiously shaped pinnae.

C. *contaminans* (Wall. ex Hook.) Copel.

General distribution: Throughout Malaysia; from the Malay Peninsula northwards to the latitude of Mergui.

In Malaya this species is almost as widespread as C. *latebrosa* and certainly the commonest species of the hills. It grows in abundance on forest edges, on streamsides in cleared valleys and on mountain slopes in open places, and tolerates a great deal of sun and exposure, and is not a fern of the forest understory. This is our tallest species and adapts itself easily to new habitats, and has fairly recently been recorded from about sealevel, on riversides in flat areas (near Taiping, behind the town; on the banksides of the Sungei Raia where it emerges into the Kinta Valley). It would thus appear to be on the increase in the lowlands. It has been collected from as high as 2000m on Gunong Batu Brinchang in Pahang.

C. *trichodesma* (Scort.) Copel. (syn. C. *burbidgei* of Ferns of Malaya, not (Bak.)).

General distribution: Central part of the Malay Peninsula, Sarawak, N. Borneo in lowland and hilly forest (to 1500m in Borneo).

So far it has been found in Perak, Pahang, Selangor and Negri Sembilan, up to 430m. It seems rather rare, except in Selangor where it is common locally. In Perak it grows in rocky forest (near the edges and thus in a fair amount of light) on the Kampar side of Bujang Melaka mountain, facing west, yet apparently not on the Chenderiang side which is of a more northern aspect. In Selangor it has been found on the edges of light forest below the Gap, usually in damp places; in the forest above Kepong and Sungei Buloh and at Ampang Reservoir near streams. This species with its softly hairy olive-green fronds is easily recognised in the field.

Two adult plants found at Ampang Reservoir may be hybrids having C. *trichodesma* as one of the parents. More observation is needed; the plants were on the lower (left hand side) side of the contour path past the lake at about 60m above the stream, and on very steep ground. C. *trichodesma* and four other species were growing fairly near.

C. *polypoda* Bak.

General distribution: Malay Peninsula, Sarawak, N. Borneo and the Philippines (Panay, Mindanao).

C. *polypoda* has been found only in Perak and Johore, with an uncertain record from Pahang, between 1100-1300m and is a species, so far we know, of restricted distribution. In Perak it is common where it grows on the upper slopes and summit of Gunong Kledang, a small mountain near Ipoh, where there were many tall specimens. Below a forest ridge above Lake Chenderoh, several small infertile plants were found, but were undoubtedly this species. In Pahang in the Telom Valley below Cameron Highlands at about 930m. one small infertile plant was seen and the adults should be looked for on the small isolated peaks around there (below Mt. Penelope). This is a distinctive species with shiny deep green fronds and pinnules cut into large segments. Apparently it prefers a dryish ridge or steeply sloping ground in mid-mountain forest, but not near streams.

C. obscura (Scort.) Copel.

General distribution: Sumatra and the Malay Peninsula, in forest between 900-2000m.

This has been collected from Penang, Perak, Pahang and Selangor, and is a common species of the higher forest slopes of Maxwell's Hill, Cameron Highlands and Fraser's Hill and on other hills in the Main Range in Selangor. It is a fern of the heavy forest,

not necessarily near streams, but usually in dampish places, yet it will survive on forest edges where clearing has exposed the plants. The fern is a large one with trunks to about 3-4m; fronds are deep green above (yellowish and contracted when in exposed places) and rather thick and brittle. The long paraphyses which are amongst the sporangia in the sori are very easily seen.

C. *squamulata* (Bl.) Copel.

General distribution: Sumatra, Malaya, W. Java, Borneo and the Sulu Archipelago.

To be found in lowland forest to at least 300m, but more field work is needed in Malaya for us to know its present day distribution and habitat. The fern was locally common on the lower part of Penang Hill, but appears to be rare there now; there is one record from Perak, growing in light secondary growth by an old rubber estate towards the base of Maxwell's Hill; in Selangor it was found (again one plant) on the edge of secondary growth where there was a Resam (*Gleichenia* sp.) thicket In the past it has been collected quite often in Johore and in Singapore and in the latter place it is still found in several localities: Nee Soon and Mandai forests and in light growth near the base of Bukit Timah.

Almost certainly the original habitat of this fern in Malaya was moist lowland forest (see Holttum, Ferns of Malaya p. 123), but with so much of this now destroyed, it seems to be, today, more frequent in dryer and lighter places in secondary growth.