

The Botany of Some Islets East of Pahang and Johore

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Abstract

The appearance and vegetation of the islets Babi Tengah, Baru, Berhala, Chibeh, Duchong, Gup, Labas, Pyah, Rengis, Sepoi, Setindan, Tokong Burong, and Tulai are compared with Tanjong Ruit in Tioman, as they were in 1932-1936. Their status as degenerate headlands in the Riouw Pocket is considered. The islets belong to three geological formations. Remains of the giant clam, *Tridacna*, were found on Pulau Tulai.

This is a historical account of the vegetation of the small islands to the west and south of Pulau Tioman (Tioman) and off the Mersing coast, as I found them fifty years ago. In June 1932 and August 1935 I accompanied Mr William Birtwistle, Officer-in-charge of Fisheries F.M.S., on his inspection of fishing boats and fishing villages on the Pahang coast. We visited most of the islets on one or other day from early morning till 1 p.m. The ocean swell would then rise and squalls descend, and we would have to return in the rowing boat to the launch, either the Sri Gala in 1932 or the Sri Pekan in 1935; generally, the shore was too rocky for safe approach except in calm sea. The first trip was exploratory, for no one could tell me what the islands looked like or what vegetation they had; the second was more thorough. There was usually time to investigate fully in the one morning the vegetation of one islet. Collections were made of plants that I could not identify for certain and they have been deposited in the Singapore herbarium. Uncertainty of names has delayed publication but, now, with many revisions in the *Flora Malesiana*, edited by Professor C.G.G.J. van Steenis, most problems have been resolved. I have followed that botanical nomenclature and have, accordingly, omitted the burden of citation of authors.

On the second trip I realised that most of these islands corresponded with granite headlands of Tioman in various degrees of disintegration. I have used, therefore, the headland of Tanjong (Tanjung) Ruit at the north end of Juara Bay, on the east side of Tioman, as the standard for comparison.

At the end of this article I have given notes, mainly geographical, on some of the more characteristic plants. The whole region is the northern part of the Riouw (Riau) Pocket (Corner 1978); the plants are vestiges of its history. If their extraneous distribution is plotted, not as circular or elliptical areas but as outline tracks, more in the manner of Croizat's Panbiogeography, it will be seen that they enter the region from all points of the compass, as if they were comets orbiting about it.

Tanjong Ruit, Juara Bay, Pulau Tioman

Figure 1, plates 1 & 2

Tanjong Ruit ends in a low rocky point, about 30 ft high, of granite boulders. It is connected with the main island by a neck or isthmus, about 50 yards long, com-

Editorial Note. Current spellings of place names, if different, are inserted in parentheses following the old spelling on first mention in the main text.

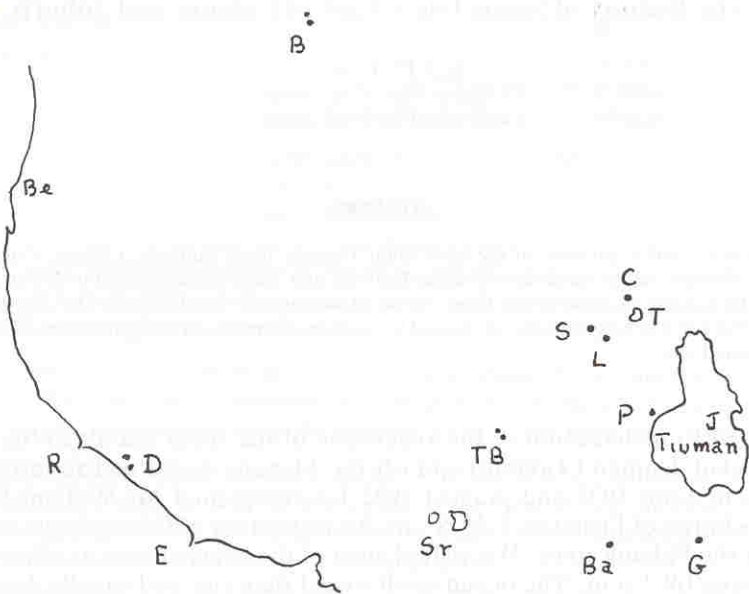


Fig. 1. Map of the islands about Pulau Tioman; scale, 1.5 in = 10 miles. B, P. Berhala; Ba, Baru Rock; Be, Bebar; C, P. Chibeh; D, P. Duchong; E, Endau; G, P. Gup; J, Juara Bay; L, P. Labas; P, P. Pyah; R, Rompin; S, P. Sepoi; Sr, P. Sribuat; T, P. Tulai; TB, P. Tokong Burong.

posed of small water-worn granite boulders just above high tide level, but probably awash at the highest tides and in storms. The island here descends into a steep granite face plunging into the sea. It leads westwards for about a third of a mile to meet the sandy bay where it turns, as it were, inland. I explored the forest that bordered on to this steep face, the isthmus, and the rocky point.

The bare granite face varied 12-35 ft high between the high tide level and the edge of the forest. It consisted of steeply sloping blocks of granite, broken up in places into irregular ledges and, where the face was breaking up, there were big boulders piled precariously on one another. At the foot of the face there was a talus of water-worn boulders exposed at low tide; a few big isolated boulders stood as rocks in the sea. Above the face the forest stretched inland on the steep hillside, with a moderately thick layer of earth and humus. The granite face, itself, swept by waves during the north-east monsoon, was bereft of vegetation except for some ledges and rock hollows in its upper part, and they supported small grasses, sedges, and other herbs. This bare granite face was a feature of most of the granite islets which plunged into the sea, its depth ranging from 17 fathoms off P. Sepoi to 20 fathoms off Tg Ruit. I limited my exploration to the *Terminalia*-zone which was the front of the forest at the top of the granite face, and to the zone of *Eugenia grandis* immediately behind. There was no time to explore further inland.

The *Terminalia*-zone was a broken and almost single file of trees and climbers with some shrubs and herbs, typical of the *Terminalia-Barringtonia* formation on the rocky east coast of Malaya. Here and there, in sheltered places, there were intrusions of the inland forest. The seeds and fruits of many of these plants are water-borne and, presumably, are splashed up the granite face by waves. The list of plants in this zone is given in Table 1. It will be seen that there were no *Cycas*,

Lumnitzera, *Peltophorum*, *Scaevola*, or *Casuarina*, which belong to the sandy or less boisterous coasts.

A striking feature of this *Terminalia*-zone, as on other rocky parts of the east coast, was the great abundance, often thick masses, of such epiphytes as orchids, aroids, and ferns growing on the rocks. Conditions of insolation, drainage, and intermittent rain seem comparable with those of the limbs of trees, and the epiphytes which can stand the sea-spray become truly saxicolous. Climbers, also, where they could root into a crevice between the exposed boulders, spread thickly over them in a mat or carpet that hid the boulders, curtained the sides, and could be lifted off. Similarly, several species of strangling fig, normally beginning as epiphytes, carpeted the exposed rocks without developing erect branches; such carpets were mostly sterile and it was not till many years later that I managed to identify the species more or less satisfactorily.

Another feature of the granite face was a special habitat for small herbs where some humus and rain-water could collect in crevices and small hollows, especially where shaded by trees. Some of the hollows were merely little basins in the rock from which the plants could be scooped, as if from a pot. Such plants were *Aneilema* (SFN 29794), *Cyperus cyperinus*, *C. dubius*, *C. javanicus*, *Fimbristylis dichotoma*, *Oldenlandia paniculata*, *Sporobolus virginicus*, and *Vandellia hirsuta*. This habitat was noticeably absent from the granite islets around Tioman; the granite face might have been too wave-swept or have been unable to accumulate enough soil or rain.

Immediately behind the *Terminalia*-zone there was that of *Eugenia grandis*, mostly 1-2 trees deep. The trees did not actually front the coastal forest but occurred where there was shade enough for their roots. The seeds of *E. grandis* germinate in the open or in shade but seem unable to establish themselves in high forest or in the shade of their own kind. Thus, the trees start in the open and come slowly to overshadow the *Terminalia*-zone. However, this coastal fringe of forest was retreating, as witnessed by the fallen boulders, and the interaction between *E. grandis* and the *Terminalia*-zone was by no means clear. The inland forest intruded with seedlings and saplings into the zone of *E. grandis*. The coastal forest at Tg Ruit was thinned to a strip and, on the islets around, it was variously disrupted as they were disintegrated. The headland had two special features.

The point itself carried the *Terminalia*-*Barringtonia* formation which stopped abruptly at the isthmus of water-worn boulders. These were mixed with coral debris and sandy detritus, heaped together by the waves as a low barrier. It carried an almost pure stand of *Pemphis acidula*, which did not occur elsewhere at the headland. It formed twiggy gnarled bushes, up to 12 ft high, the leaning and twisted trunks rooting in the debris. This sort of junction of a headland with a spit of talus seems to be a favourite habitat of *Pemphis*. On the rocky mainland coast of east Johore, with haematite quartzite shale, *Pemphis* forms prostrate sprawling mats, scarcely a foot high, and rooted in the crevices, but I did not see it in this manner on the granite boulders of the Tioman complex.

Then at the landward end of the isthmus, where the granite face rose steeply, there was a little wood of *Ochrosia oppositifolia*, about 50 yards long and 30 yards wide, between the *Terminalia*-zone and that of *E. grandis*. The trees, up to 50 ft

tall, were thickly placed, rather slender, and together with many of their seedlings and saplings formed an almost pure stand. The ground was a mixture of small boulders and sand at the foot of the cliff. It was difficult to see why such a stand should have developed. The species did not occur in the *Terminalia*-zone on the granite face; on the east coast of Johore it frequented sandy shores. It seemed to be the result of a freak current or storm which had washed up the fruits on this part of the beach at a time when it was bare of vegetation, and that the colony had persisted while the *Terminalia*-zone took over the frontage.

Pulau Tulai

Figure 1

This is the largest of the small islands off Tioman and lies about 3 miles WNW. of its north end. In 1935 it was largely covered with inland forest. I was able to explore in detail only the NW. coast and the bay on the west of the island. The whole coast, except for this bay, is rocky and composed of granite blocks c. 20 ft high *in situ* and others tumbled on top of them, and on the NW. side, at least, there was the talus of water-worn boulders plunging into the sea without foreshore. The coastal flora was essentially the same as at Tg Ruit but without *Ochrosia*; there was the fringing *Terminalia*-zone along the top of the granite face with an interrupted zone of *E. grandis* connecting with the inland forest. There were, however, the following additions:—

Adenanthera pavonina (strangely none seen at Tg Ruit),
Cissampelos sp.,
Clerodendron inerme,
Colubrina asiatica,
Derris scandens,
Elatostema sp. (on rocks in the shade),
Ficus variegata (in *E. grandis* zone),
Hemiscopia trimera (common on rocks in the *Terminalia*-zone),
Piper retrofractum (on shaded rocks with *Elatostema*, often in thick carpets sweeping up vertical sides of rocks),
Randia schoemannii (*R. exaltata*),
Streblus ilicifolius (not on exposed rocks),
Xylocarpus (*Carapa*) *moluccensis* (a frequent spreading tree).

Hydnocarpus ilicifolia was abundant as a small tree to 30 ft high both in the coastal fringe and in the inland forest. There were no *Cycas*, *Pandanus*, or *Podocarpus*.

The main bay, as a bight on the west side of P. Tulai, had a mangrove forest of considerable extent. Here the granite face receded inland and, at the SE. corner of the bay, a small sluggish stream flowed over a shallow flat of coral detritus, exposed at low water, before emptying into the bay. The shallow flat was roughly semicircular and about 200 yards in diameter. Here was the mangrove forest composed of *Rhizophora conjugata*, *R. mucronata*, and *Bruguiera gymnorrhiza*, on clean firm ground without the usual mud and slime. There were many coral fragments mixed with the sand and in places lumps of dead coral more or less buried *in situ*. *R. mucronata* was by far the commonest, occupying most of the flat and all the seaward front, but scarcer inland. *R. conjugata* occurred sparingly on the landward side. *B. gymnorrhiza* was scattered in the central part of the flat and abundant on its landward side, even in places to the exclusion of *Rhizophora*. Some trees of *B.*

gymnorhiza stood 60-70 ft high, those of *R. mucronata* being somewhat smaller. Pneumatophores were present in great abundance and, at low water, it could be seen that a tangle of *Rhizophora* roots flanked the stream; at high water a prahu could float down it. The mangrove was advancing into the bay which was sheltered from the NE. monsoon and from the SE. tenggara*. How old this mangrove was, I could not determine, but it was growing on a fringing reef that must have been raised in fairly recent times.

Immediately behind the mangrove flat, there was a sandbank 4-5 ft high, stretching inland, and evidently a former beach. It was largely planted with coconuts but had clearly been covered originally with the *Terminalia-Barringtonia* formation and that of *E. grandis*; there were many plants of *Tacca leontopetaloides*. The sandbank led to the granite slope with inland forest.

Just north of the mangrove flat, by some large rocks at high tide level, there were several large shells of the giant clam *Tridacna*, 2-3 ft across, *in situ* and upright but almost completely buried in sand; the wavy outline of the valves was more or less visible. Out in the bay we saw through its clear water smaller living clams about a foot wide at depths of 8-10 ft; we also met them in our early diving efforts with helmet and air-pump in this bay. They lived close to the rocks, neither in the sand of the bay nor in the living coral. Here was further evidence that P. Tulai had been raised or tilted, perhaps some 20-30 ft, to uplift and expose the giant clams. Previously there could have been no mangrove there, and where the stream flowed there might have been a narrow strait separating the SW. part of the island from the rest. As this part was raised, so the bay silted up to give the sandy padang with coconuts. In other words, the age of the mangrove must be connected with the raising or tilting of the island.

No one lived on P. Tulai but it was frequented by fishermen and, doubtless, the owner of the coconuts. There was a well, supplying fresh water, on the south side of the mangrove. From the general appearance of the forest, it seemed that the island had never been inhabited.

The broad-leaved and tree-like *Pandanus dubius* was abundant on the west side of P. Tulai. It grew on the sandy shore of the bay in the *Terminalia*-zone and in the hillside forest somewhat inland, but not on the rocky coast. The biggest plants had stems up to 25 ft high and were not so large as those on P. Chibeh (Cibeh). I saw it at the north end of Tiuman and on the south side of Juara Bay, but not at Tg Ruit, and I did not see it on the south and west of Tiuman. I found no flower or fruit anywhere in August 1935, but its seedlings were abundant.

Pulau Chibeh

Figures 1 & 2, plates 3-6

This small island, about 250 ft high, lies a mile or so north of P. Tulai. It consists of immense granite blocks more or less *in situ*, immense fallen boulders, a bare granite face above tide level, and more or less of a submerged talus of boulders and pebbles. It resembled a disintegrated headland of Tiuman and its vegetation was that of Tg Ruit on a diminished scale, but without regular formation (Table 1). I visited it on 19 August 1935 from 7 a.m. till 1 p.m. when the swell forced me to

*"Tenggara" means south-east but as used by the fishermen of the East Coast, the use is transferred from the direction to the afternoon wind itself on which they sailed home. Ed.

return to the launch. I explored most of the island but did not cover the whole of the exposed east side where the immense boulders made passage very difficult. However, they were largely bare of vegetation and I did not miss any plant of importance.

The north and south ends of the island were steep with the boulders exposed and hot, but on some of them there were mats of saxicolous strangling figs with tufts of *Cyperus javanicus* and *Nephrolepis* in crevices, as the only vegetation. The specimens which I collected resolved into *F. kurzii*, *F. stricta*, and *F. tinctoria* ssp. *gibbosa*, not *F. microcarpa* as I had supposed; all occur, together with *F. microcarpa*, on rocky parts of the east coast of Malaya and they show no obvious ecological preferences. Higher up on the north end of the island there were scrubby patches of *Diospyros ferrea*, *Memecylon coeruleum*, and *Premna obtusifolia*. Then, in sheltered nooks on the north and west sides, near to the sea-level, there were a few bushes of *Scaevola*.

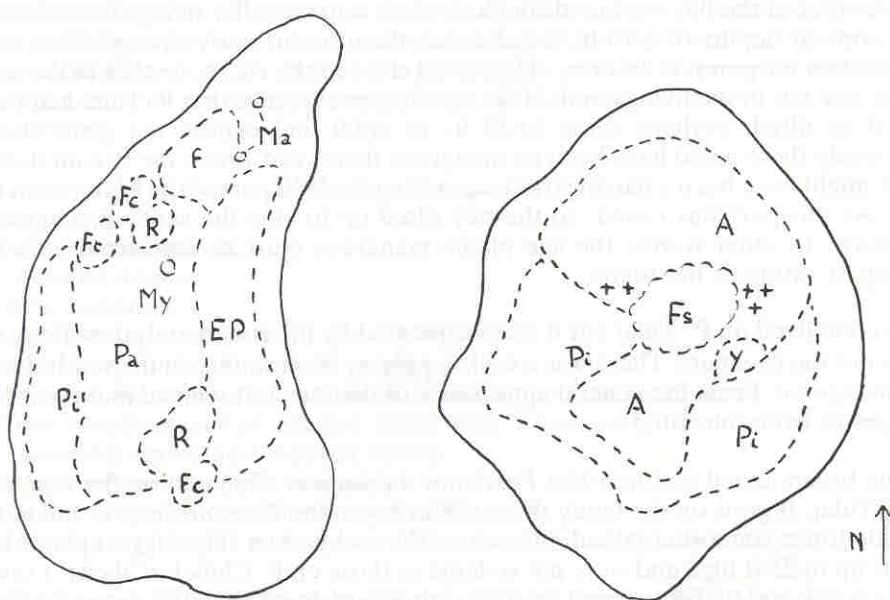


Fig. 2. Sketch map of the main vegetation on P. Chibeh (left) and P. Sepoi (right). A, *Atalantia* wood; EP, *Eugenia grandis* and *Pandanus dubius*; Fc, *Ficus caulocarpa*; Fs, *Ficus superba*; Ft, *Ficus tinctoria* ssp. *gibbosa*; f, *Diospyros-Premna* scrub; Ma, *Manilkara kauki*; My, *Myristica guatterifolia*; Pa, wood of *Parinari corymbosa*; Pi, *Pisonia grandis* wood; R, *Calamus chibehensis*; Y, *Phyllanthus* sp., SFN 29848; ++, *Knema globularia*.

On the east side, above the bare granite face, there was a rather open wood of *Eugenia grandis* with other trees of the *Terminalia*-zone and abundant *Pandanus dubius*. On the west side, which was sheltered and not so steep, this kind of woodland with trees up to 50 ft high was better developed and had a frontage of *Pisonia grandis*, the white branches of which were conspicuous from out at sea. The woodland extended over the centre of the island and consisted mainly of tall trees of *E. grandis*, *Parinari corymbosa*, *Sterculia foetida*, *Vitex pubescens*, and *Ficus caulocarpa* with *F. stricta*; the smaller trees were *Atalantia monophylla*, *Caryota mitis*, *Eurycoma longifolia*, *Gnetum gnemon*, *Hydnocarpus ilicifolia*, *Knema globu-*

laria, and *Pandanus dubius* (up to 40 ft high with stilt-roots up to 12 ft high). Surprisingly, the herb *Pseuderanthemum* was very abundant in this woodland. There were three plants of special interest in the upper part of the island. At the north end there were two trees of *Manilkara kauki*, up to 30 ft high, standing apart from the woodland. In the woodland in the centre of the island there were one or two trees of *Myristica guatteriifolia*. Then, in the north-west corner of the woodland and in the south part, there were two clumps of the rotan which C.X. Furtado called *Calamus chibehensis*. Beside the northern clump of rotan there stood two big trees of *Ficus tinctoria* ssp. *gibbosa* and one of *F. caulocarpa* which had a nest of the sea eagle. Another big tree of *F. caulocarpa* stood on the outside of the southern clump of rotan. I noted two trees of *Ficus variegata* in the woodland. It was an extraordinary association of forest relics.

The trunks of the strangling fig-trees stood directly on the boulders over which their roots spread and entered into crevices, possibly down to the water-table (? brackish) in the centre of the island. The roots were so numerous and strong that they undoubtedly helped to basket the loosening boulders and hold them up. How the fig-trees had started was not evident. If they had begun as epiphytes, which their trunks suggested, there was no trace of the host-tree. I did not meet *Manilkara* anywhere else on the islets off Tioman; it was not likely to have been overlooked because of its appearance like a chiku tree with dark fissured bark and white undersides to the stiff shiny leaves. At the time of my visit in August, the trees of *F. caulocarpa* and *Pisonia* were getting new leaves.

The climbers and ferns mostly formed carpets on the boulders, both in the open and in the lighter shade of the woodland. Their variety added to the peculiar composition of the flora.

I concluded that P. Chibeh had a woodland made largely of plants of the *E. grandis* forest of rocky coasts, with a few relics of inland forest, as shown by *Manilkara*, *Myristica*, and *F. variegata*.

I noted that ants were very abundant, especially the red keringga with fiery bite. There were several large ant-hills or mounds up to 3 ft high.

Pulau Sepoi

Figures 1-4, plates 7-13

This is a single rounded hill-top, 230 ft high, three miles due west of P. Tulai, and the sea-depth around is given as 17 fathoms. It is a mass of granite blocks and boulders similar to P. Chibeh and rather smaller. Its vegetation was also similar but with still fewer species (Table 1). I visited it in June 1932 and on 20 August 1935. It was tenanted by many terns which nested on the higher rocks where the vegetation began; they laid their eggs, apparently one to a nest, on bare ground under a projection of the rock without any sticks or leaves. There were numerous rocky caves round the foot of the island, as on P. Pyah (Paya), but which I did not note on P. Chibeh. The upper part of the island was covered with a low wood, 30-40 ft high, from which some large fig-trees projected, notably *Ficus superba*. The top consisted of large and small boulders with very little, if any, soil. The trees were well spaced, mostly on the boulders, with little or no undergrowth so that it was easy to walk among them. The granite face between the sea and the vegetation had scattered tufts of *Cyperus javanicus* and some sprawling patches of *Lygodium* and *Stenochlaena*.

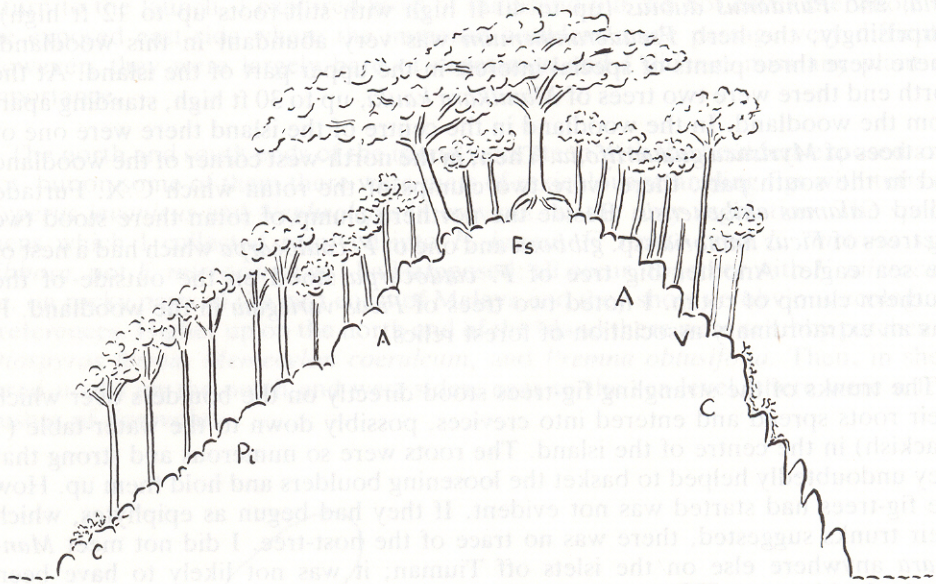


Fig. 3. Sketch of a transect from west (left) to east across P. Sepoi. A, *Atalantia* wood; C, mats of climbers on the rocks; Fs, *Ficus superba*; Pi, *Pisonia grandis* wood; V, *Vitex pubescens*.

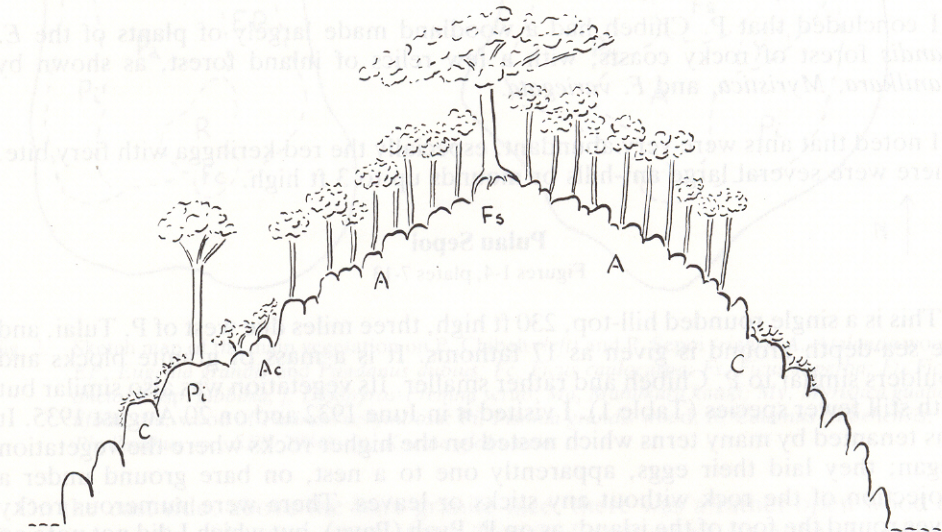


Fig. 4. Sketch of a transect from south (left) to north across P. Sepoi. Letters as in Fig. 3; Ac, *Allophylus cobbe*.

The woodland had two very different parts. That covering the upper part of the island I called the *Atalantia* wood because of the abundance of *A. monophylla*. The other was the *Pisonia* wood on the west and south-east parts of the island, on the lower slopes where there was some shelter from the NE. monsoon and the slopes were less steep. The *Atalantia* wood had also abundant *Hydnocarpus ilicifolia*, *Planchonella obovata*, and *Ficus superba*, the many roots of which clasped the rocks and descended into the depths of the granite. The fluted trunks of *A. monophylla*, set with thorny twigs, were easily recognisable. Near the top, in the *Atalantia* wood, there were numerous trees of *Knema globularia*. At its outskirts in the south-west, *Derris uliginosa* formed close mats on the rocks. Several large trees of *Vitex pubescens*, up to 50 ft high, occurred on the east side of the wood where there was the one patch of the small climber *Phyllanthus?* (SFN 29848). In contrast, the *Pisonia* woods were almost pure stands of *P. grandis* with an undergrowth of *Stenochlaena palustris* and a few trees of *Adenanthera pavonina*, *Ficus microcarpa* (with many aerial roots from the branches), and some stray *Atalantia*. The smooth grey trunks of *Pisonia* were seated on the rocks, with roots spreading over them in the manner of fig-roots. All the *Pisonia* trees were, in August, getting new leaves and beginning to flower, as on P. Chibeh; their white branches rendered them conspicuous. The trees of *F. superba* were also getting new leaves.

In many places there appeared to have been landslips or, at least, the fall of boulders which had destroyed parts of the *Atalantia* wood, and masses of creepers were covering the fallen rocks. Remarkably, there were no *Eugenia grandis*, palms of any kind, *Pandanus dubius*, *Terminalia catappa*, Apocynaceous climber *Aganostoma*, or epiphytes. In fact, there was no vestige of either the formation of *E. grandis* or of *Terminalia*.

In August 1935, many of the trees showed signs of wilting. What little soil there was between the boulders was dry; fallen leaves crackled under foot. Patches of *Lygodium* and *Stenochlaena* in the open were brittle. The leaves of many smaller trees and their saplings were drooping, wilting or dried out. At first, I thought that this might be due to a landslip upsetting and breaking roots, but there was no actual indication of a recent fall. Then, I thought that the wilting might have been caused by the abundance of guano round the nests of the terns, but I could discover no relation between the nests and the wilting trees. The only cause seemed to be, simply, the lack of rain. The roots of the fig-trees, of *Pisonia*, and of *Vitex pubescens* penetrated deeply into the mass of boulders and their leaves showed no signs of wilting.

There were many old and rotting trees, standing and fallen, in both the *Atalantia* and the *Pisonia* woods, where there were also plenty of seedlings and saplings. Hence I concluded that the vegetation of the island must have been of long standing. Landslips, boulder-falls, and periods of excessive drought evidently killed some of the trees and enabled a new generation to arise. Pigeons and fruit-bats, even the large hornbills, visiting the island from Tioman or P. Tulai, might carry seeds to re-stock, but all the evidence that I could gather pointed to the conclusion that P. Sepoi was a degenerating headland of ancient coastal forest. Indeed, this cluster of islets about P. Tulai probably made long ago one hill or mountain which, in its turn, may have been part of Tioman itself. I was thinking of subaerial denudation. Lowering of the sea-level during glaciations would have exposed the base of the hills without necessarily a connection.

Pulau Labas

Figure 1

This is the fourth and smallest island of the P. Tulai group. It lies about two miles SW. of P. Tulai and about one mile SE. of P. Sepoi. I visited it also on 20 August 1935. It is a collection of large and enormous granite boulders raised about 30 ft above the sea-level. There were scattered trees of *Ficus superba*, mats of *F. microcarpa* and *Aganosma marginata* on some rocks, and scattered clumps of *Cyperus javanicus* and the mangrove fern *Acrostichum aureum*. Otherwise, the only other 'higher plant' on the island was a tall fruiting coconut palm, evidently planted, with several seedlings around it. The island seemed to represent the stump of a headland to which, in time, P. Sepoi would be reduced. However, the presence of *Acrostichum* brought in another factor to suggest that P. Labas might be the remains of a small granite headland, such as at Tg Ruit, beside a mangrove forest such as on P. Tulai. Indeed, this mangrove at P. Tulai was probably the vestige of a much more extensive mangrove forest when all four islands were joined in periods of glaciation.

All four islands were, and should be allowed to remain, historical sanctuaries.

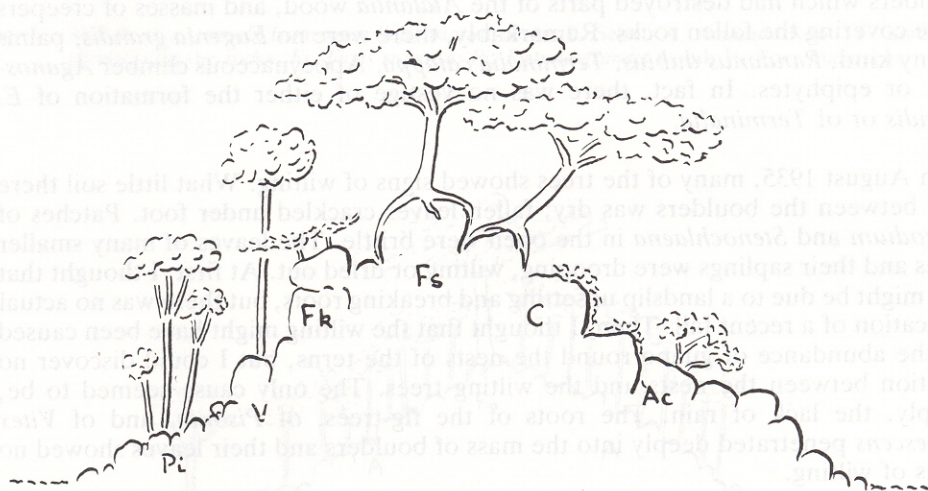


Fig. 5. Sketch of a transect of P. Rengis. *Ac*, *Allophylus cobbe*; *C*, climbers on the rocks; *Fk*, *Ficus kurzii*; *Fs*, *Ficus superba*; *Pi*, *Pisonia grandis*; *V*, *Vitex pubescens*.

Pulau Rengis and P. Pyah

Figure 1

The very small island P. Rengis (Renjis), about 80 yards, across lies about a third of a mile from the west coast of Tiuman in Telok (Teluk) Tasek. I visited it on 16 August 1935. It was a mass of granite boulders piled on top of one another as P. Labas, and with water-worn boulders strewn at the base. The island was tenanted by frigate birds, not nearly so numerous as the terns on other islets, and the guano was not so persistent; nevertheless, many trees were white with guano. The flora

was very limited to 11 species. There was no *Terminalia*-zone or *Eugenia grandis*, and I saw no herbs, grass, or sedge. It consisted of:—

Allophylus cobbe var. *marinus*, common by the shore,
Callicarpa longifolia, as a few scattered bushes,
Ficus kurzii, as a few small spreading trees at the south end, with copious aerial roots, starting as a bush on the rocks; (easily mistaken for *F. microcarpa*),
Ficus superba, as frequent big trees in the centre of the island, never as a prostrate mat,
Hoya diversifolia, very common on trees and rocks,
Nephrolepis biserrata, a single clump,
Pisonia grandis, as the commonest tree by the shore,
Premna obtusifolia, as a scraggy subscandent bush,
Schefflera venulosa, abundant on trees and rocks, all its leaves white with guano,
Trema amboinensis, as a few scraggy treelets,
Vitex pubescens, as a single tree 50 ft high.

On 11 June 1932, when we had anchored for the night in Ayer (Air) Batang bay, I visited the islet P. Pyah, just off the south headland of the bay, but I failed to make an inventory of its flora. It was, as P. Rengis, a cluster of granite boulders on which the chief tree was *Ficus superba*. There were many caves round the foot where I spent most time looking for algae, but with little success.

Pulau Tokong Burong, Baru Rock, and P. Gup

Figure 1, plates 14 & 15

A cluster of three steep islets of haematite shale or laterite-looking rock, about 10 miles SW. of P. Sepoi and some 17 miles from Tg Penyabong on the mainland, make the group of Tokong (Tukong) Burong. I visited them on 16 August 1935. The largest rises to 160 ft high and the base, strewn with large boulders, reminded me of Tg Sedili. There was no forest. The islands were tenanted by thousands of terns which nested under tussocks of the grass *Chrysopogon fulvus*, as the only vascular plant on the islands. It grew from high tide level on the south face on terraces or niches in the rock, and right over the summit. There was no sward because the runways of the terns kept the tussocks more or less apart. There were no seedlings of other plants, stumps, or traces of others, from which it seemed that the islands, as they now stand, might never have been forested. The top of the large island had the appearance of having been burnt but, if so, the effect had merely halted the grass temporarily.

Baru Rock, or P. Baru, and P. Gup are islets of roughly the same size, comparable with the largest of the Tokong Burong group. Baru Rock, 190 ft high, lies about 11 miles south of Tokong Burong. P. Gup, 140 ft high, lies to the east in the same latitude and about 4 miles south of Tiunan. I was never able to visit either of them but, on a voyage to Kemaman in October 1935 in S.S. *Mahidol* of the Danish East Asiatic Company, I persuaded the captain to pass as close as possible to the islands so that I could have a look at them. He enjoyed the manoeuvre and handed me his telescope. The difference between the islands was as astounding as that between Tokong Burong and Sepoi. Baru Rock was a firm consolidated mass of rock, probably the haematite shale, with precipitous sides, serving as a ternery, and rising straight from the sea with few or no boulders at the foot. The upper two-thirds were covered with a tussock grass, presumably the same as on Tokong Burong. At the

north end, half-way up the island, there were a few small stunted trees with rather large leaves, which could have been *Morinda citrifolia*. Thus Baru Rock may have been less degraded than Tokong Burong. Perhaps both were originally forest-clad like P. Duchong (Ducong).

In complete contrast, P. Gup was a mass of granite boulders with the upper part rather closely wooded, very similar to P. Sepoi. I could not distinguish any floristic details but looked unsuccessfully for the white branches of *Pisonia*.

Pulau Duchong

Figure 1, plate 16

Two small islands lie near the mainland just south of Pontian. The larger, P. Duchong Darat, 80 ft high, is about a mile off the coast. The smaller, P. Duchong Laut, is about half a mile SE. of the larger. I visited Duchong Darat on 22 August 1935, but had no time to visit the smaller, which did not appear to differ floristically. They are steep craggy masses of haematite shale, similar to P. Setindan off Mersing and to Tg Sedili. The flora was that of the *Terminalia-Barringtonia* zone and of *Eugenia grandis* forest with some additions as relics, perhaps, of inland forest. Thus, in a general way, it resembled the coastal flora of Tioman but several conspicuous plants were missing, namely the trees *Atalantia*, the strangling figs, *Hydnocarpus ilicifolia*, *Manilkara*, *Pandanus dubius*, *Pisonia*, and *Sterculia foetida*, the climber *Aganosma*, and the sedge *Cyperus javanicus*. The floristic list is given in Table 1.

Round the foot of the island there was the *Terminalia*-zone. The rest was covered with rocky forest with trees up to 60 ft high, though those of the upper part were merely 15-20 ft. Exposed rocks were covered with masses of sprawling climbers and epiphytes among which *Asplenium nidus-avis* was conspicuous. There was no evidence that the forest had been cut over. Various herbs and grasses of the sandy shore of the mainland occurred in small sandy places among the lower rocks. The *Chrysopogon* of Tokong Burong did not occur.

Pulau Setindan

I visited this island off Mersing on 15 August 1935 and on 30 January 1937. Geologically and floristically it was similar to the headlands of the east coast of Johore and to P. Duchong. There were the formations of *Terminalia-Barringtonia* and of *Eugenia grandis*, but where there had been inland forest, I found mostly scrub; at some time the island had been extensively cut over. The plants which I found are given in Table 1, for comparison with P. Duchong. The islands were generally similar but Setindan is larger and more representative; yet, there were unaccountable differences. Certainly, Setindan relates more with the flora of the Riouw Pocket, as shown by the abundance of the southerly *Tristania obovata*. The lists in Table 1 largely repeat what I have written about the Sedili coast, but I decided to include it as a record what deforestation is likely to obliterate. It reminds one of what might be expected.

Pulau Berhala

Figures 1 & 6, plates 17-21

This islet lies north-west of Tiuman and about 20 miles north-east from Bebar on the Pahang coast. It is a flat granite platform, roughly circular, about 400 ft wide, raised a foot or more above sea-level and, probably, awash at highest tides or in storms. The platform is dissected radially by deep gullies plunging into the sea (12-13 fathoms deep). In the centre there was a sandstone mass, about 80 ft high, shaped like the crown of a hat to which the granite platform was the brim. It was neither the mass of granite boulders of the Tiuman islets nor the compact haematite of the coastal islets. The sandstone was fairly hard and distinctly, though not deeply, undercut round the granite platform. The islet clearly belonged with another geological formation and recalled Gunong Pantl in east Johore.

The vegetation was confined to the upper half of the sandstone hillock where it was rather evenly dense, but the granite platform was destitute of any plants except, perhaps, some lichens and microscopic algae. The flora consisted of merely 5 species, thus:—

Stenochlaena palustris and *Polypodium scolopendria* in a low tangle, with tufts of *Cyperus javanicus*, forming the lowest fringe of vegetation;

Morinda citrifolia as bushes up to 10 ft high, mostly higher up the hillock from the fern tangle;

Parinari corymbosa as a cluster of several much branched trees up to 20 ft high, at the top beside the Survey Beacon.

I remember, but have failed to note, rather numerous large and metallic green 'rose-beetles' buzzing about on the summit as if they were bees. On the west side of the summit, which was actually a slight ridge running north and south, there was a large nest of the sea-eagle, surrounded by fish-bones and the skeletons of sea-snakes.

Half a mile north of P. Berhala, roughly in line with its slight ridge, there was a skerry of granite rocks just breaking the surface of the sea, about 40 yards across, and devoid both of sandstone and vegetation. It indicated another such islet worn down to the granite platform that was itself disintegrating.

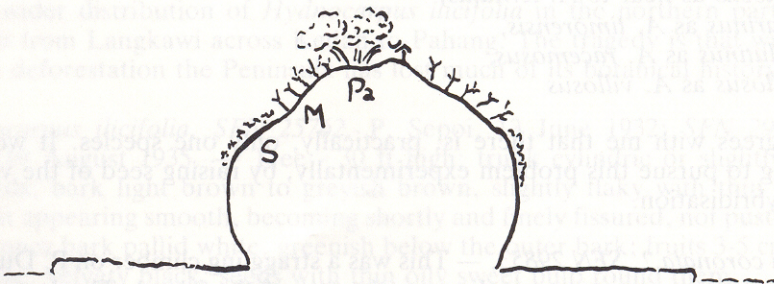


Fig. 6. Sketch of a transect across P. Berhala, with granite platform and sandstone hill. *M*, *Morinda citrifolia*; *Pa*, *Parinari corymbosa*; *S*, *Stenochlaena*.

Pulau Babi Tengah

I visited this island off the Johore coast on 10 June 1932, 27 September 1936 and 29 October 1936. It is a granite island with an accumulation of granite boulders on the points with sandy bays between them. It had been largely deforested but retained on the north and east shores a *Terminalia*-zone with its backing of *Eugenia grandis*, typical of the east coast of Johore. Coconut palms had been planted over most of the island. At the north-east end the small headlands or spits of granite boulders were connected with the main island by necks of small water-worn boulders and coral detritus on which *Pemphis acidula* formed elfin woods, almost pure stands, as at Tg Ruit. Between these spits, the sandy bays had small stands of mangrove as at P. Tulai. A sandy spit at the north-west end had a natural growth of *Casuarina equisetifolia* and some tufts of *Spinifex littoreus* on the growing front.

It will be seen from the list in Table 1 that none of the plants characteristic of the granite islets of Tioman occurred, unless the rather ubiquitous *Atalantia* and *Diospyros*. I failed to record the ferns and coastal aroids and orchids. Hence there are many apparent absentees in Table 1, which account for its low total of species. It could have been that, before deforestation, the island had much of the flora of the granite islets off Tioman.

I make the following observations on a few of the plants:- *Atalantia* was very abundant. *Barringtonia macrostachya* and *Garcinia nigrolineata* were common inland. *Pandanus odoratissimus* var. *laevis* (*P. spurius*, as the thornless variety) grew under the coconut palms and might have been planted. The record of *Schizachyrium sanguineum* is the only one for the Malay Peninsula according to Gilliland. The shrub *Timonius compressicaulis* was common on rocky headlands on the north-east side of the island. Concerning *Messerschmidia* (*Tournefortia*) one would like to know its distribution in the Peninsula.

Notes on special plants

Allophylus cobbe — I made several varieties for this species in the Malay Peninsula (Corner 1939a). They have been recognised by Leenhouts (1967) who equates them as follows:—

- var. *glaber* as *A. javanicus* and *A. longipes*,
- var. *limosus* as near to *A. ternatus*,
- var. *marinus* as *A. timorensis*,
- var. *velutinus* as *A. racemosus*,
- var. *villosus* as *A. villosus*

but he agrees with me that there is, practically, only one species. It would be interesting to pursue this problem experimentally, by raising seed of the varieties and by hybridisation.

Breynia coronata ?, SFN 29853. — This was a straggling climber on P. Duchong, 22 August 1935, common on rocks near the top of the island. The leaves were glaucous beneath. All the plants were sterile.

Cissampelos ?, Corner s.n., P. Tulai, 18 August 1935; common climber in the *Terminalia*-zone, with yellowish leaves.

Calamus chibehensis, SFN 29842. — Furtado (1956) attributed this collection to M.R. Henderson, which is an error. I saw what I took to be the same plant also at P. Tulai and Juara Bay. It is probably no other than a variety of *C. burkillianus* which occurs on Tiuman.

Celastrus ? SFN 29829, P. Chibeh, 19 August 1935. — This was a frequent small tree on rocks at the top of the island and on the west slope. It resembled the guava-tree (*Psidium*) in shape, leaf, and pale brown, slightly papery-flaky, bark. I collected it as *Aporosa* ?, but it was referred to *Celastrus* by M.R. Henderson. It is not listed by Ding Hou (1965).

Chrysopogon fulvus. — This tussock grass occurs in Africa, India, and Thailand, but in Malaya it is known only from Kedah (Bukit Wang) and P. Tokong Burong (Gilliland 1971). It would seem to be carried somehow by terns, but that would not explain its strange distribution.

Diospyros ferrea. — Concerning the variation in this very widespread species there is the article by Fosberg (1939). Recently, however, doubt has been thrown on the use of this name (Smith 1981).

Ehretia sp., SFN 29827, P. Chibeh, 19 August 1935; SFN 29845, P. Sepoi, 20 August 1935; straggling climber on more or less exposed rocks; berries small, dull orange.

Ficus. — When I visited the islets, the identification of the strangling figs was in a state of confusion. I believe, now, that I mistook several records which I made on the spot as *F. microcarpa*. Certainly some, for which I made specimens, have turned out to be *F. kurzii* and *F. stricta*. Careful study of the venation of the dried leaves is necessary to identify these sterile saxicolous fig-plants. I note that *F. hispida*, abundant in the northern half of the Peninsula, was absent from the southerly islands, just as from the south of the Peninsula.

Gnetum gnemon. — There are notes on the wild occurrence of this tree in Malaya (Corner 1939b).

Hemiscolopia trimera. — The strange distribution of this small tree, resembling the rukam (*Flacourtia*), is given by Sleumer (1954), to whose account must be added his later records from Malacca and Ulu Sedili. It suggests a north-south line from Indo-China to the Sunda Straits. On P. Tulai it must be a relic. It may have had the wider distribution of *Hydnocarpus ilicifolia* in the northern part of the Peninsula from Langkawi across Kedah to Pahang. The tragedy is that with such intensive deforestation the Peninsula has lost much of its botanical history.

Hydnocarpus ilicifolia, SFN 25762, P. Sepoi, 13 June 1932; SFN 29826, P. Chibeh, 19 August 1935. — Tree - 30 ft high; trunk cylindric or slightly fluted downwards; bark light brown to greyish brown, slightly flaky with thin angular pieces but appearing smooth, becoming shortly and finely fissured, not pustulate or rugose; inner bark pallid white, greenish below the outer bark; fruits 3-5 cm wide, subglobose, velvety black; seeds with thin oily sweet pulp round them.

Manilkara kauki. — This tree, widely spread from Burma and Indo-China to north Australia, occurs in the Malay Peninsula only 'on rocky headlands and

islands off the east coast of Johore and Pahang' (Ng 1972). I found it only on P. Chibeh. Like *Hydnocarpus ilicifolia*, it seems to be a relic of the monsoon climate at the north of the Riouw Pocket (Corner 1978).

Myristica guatteriiifolia. — The remarkable and almost coastal distribution of this 'very distinct species' is given by Sinclair (1958, 1968). It is surely connected with the northerly shore-line of the Riouw Pocket as it impinged on the China Sea and extended along the east coast of Malaya to Sumatra and Java; in fact, it circumscribes the Riouw Pocket. In Malaya it is known from P. Tenggol (Dungun), P. Tiuman, P. Chibeh, P. Setindan, and the coast of Johore from Mersing to the Sedili rivers (Corner 1978).

Pandanus dubius. — As I have noted (Corner 1978), this tree-like species with stout stilt-roots and broad leaves reaches its western limit of distribution on P. Tenggol (Dungun), P. Tiuman and some of its islets, and Tanjong Sedili Kechil (Kecil). It is another indication of the northern limit of the Riouw Pocket. It is common on the rocks at Bako National Park in Sarawak where it is accompanied by the saxicolous state of *Pandanus epiphyticus*. That species occurs in the south-east of Malaya and indicates the more central part of the Riouw Pocket. Strangely, it seems never to occur on coastal rocks in the Peninsula (Corner 1978).

Phyllanthus ?, SFN 29848, P. Sepoi, 20 August 1935; sprawling climber on rocks half-way up the island and at the south end; leaves subglaucous beneath; berries pinkish purple, small.

Pisonia grandis. — This seashore tree, which I used to call *P. excelsa*, is widely distributed on rocky coasts in the west Pacific but, in Malaya, only on the granite islets about Tiuman and at Kuala Trengganu. Its sticky fruits adhere to the feathers of birds which distribute it, and it is thought to succeed only in soil enriched with guano. It appears, like *Pandanus dubius*, to have come westwards; yet, unlike that pandan, it has not been recorded from the China Sea coast of Borneo. There is a photo of it, which I took on P. Sepoi, in the Flora Malesiana (Stemmerik 1964). Concerning the general occurrence of *Pisonia* forest and its competition with *Ochrosia oppositifolia*, there is the article by Fosberg (1976).

Planchonella firma. — This is said to be a tree of mossy mountain forest in Malaya, with P. Setindan as the only lowland record (Ng 1972). There are other plants, such as *Baeckia*, *Styphelium*, and *Vaccinium bracteatum*, which move from mountain to lowland, but none of these occurred in the islets around Tiuman. It may be a relic of the mountain flora of P. Aor and P. Tinggi, and it should be looked for on Gunong Pant. See, also, the following note.

Planchonella linggensis. — This species is distributed throughout Malesia to Australia and the Pacific islands, but in the Malay Peninsula it appears to be restricted to the rocky sea-coast of Penang, Pahang, and east Johore, except for records from Penang Hill and Mt Ophir (Ng 1972). I found it on P. Chibeh, P. Tulai, and P. Duchong. It is a remarkable relict occurrence.

Polyalthia sclerophylla. — Concerning the identity of the collection from P. Duchong, I have already published a note (Corner 1978).

Premna obtusifolia. — This name supplants those of *P. corymbosa* and *P. integrifolia*, which have been widely used for this common plant (Fosberg 1953).

Tristania obovata — Tanjong Penyabong and P. Setindan appear to be the northern limits, on the east coast of Malaya, of this species of the Riouw Archipelago.

Table 1. List of flowering plants and ferns at Tanjong Ruit (R), Pulau Chibeh (C), P. Sepoi (S), P. Duchong (D), P. Setindan (St), and P. Babi Tengah (B).

(+ means present; – means absent or not found)

| | R | C | S | D | St | B |
|---|---|---|---|---|----|---|
| TREES, SHRUBS, PALMS, PANDANS | | | | | | |
| <i>Adenanthera pavonina</i> | – | + | + | + | + | – |
| <i>Allophylus cobbe</i> v. <i>limosus</i> | – | – | – | – | – | + |
| v. <i>marinus</i> | + | + | + | – | – | + |
| v. <i>velutinus</i> | – | – | – | + | – | – |
| <i>Antidesma cuspidatum</i> | – | + | + | – | – | – |
| <i>Ardisia crispa</i> | – | – | – | – | + | – |
| <i>Ardisia elliptica</i> | + | + | – | – | + | – |
| <i>Arthrophyllum ovalifolium</i> | – | – | – | – | + | – |
| <i>Atalantia monophylla</i> | + | + | + | – | – | + |
| <i>Barringtonia asiatica</i> | + | – | – | + | + | + |
| <i>Barringtonia macrostachya</i> | – | – | – | – | – | + |
| <i>Buchanania arborescens</i> | – | – | – | – | + | – |
| <i>Callicarpa longifolia</i> | + | + | – | – | – | – |
| <i>Caryota mitis</i> | – | + | – | – | – | – |
| <i>Casuarina equisetifolia</i> | – | – | – | + | – | + |
| <i>Cedrela</i> ? | – | + | + | – | – | – |
| <i>Celastrus</i> SFN 29829 | – | + | + | – | – | – |
| <i>Cerbera manghas</i> | + | – | – | – | – | – |
| <i>Chionanthus ramiflorus</i> | + | – | – | – | – | – |
| <i>Cocculus ovalifolius</i> | – | – | – | – | + | – |

| <i>Trees, etc., cont.</i> | R | C | S | D | St | B |
|--------------------------------|---|---|---|---|----|---|
| <i>Cordia subcordata</i> | - | - | - | - | - | + |
| <i>Croton heterocarpus</i> | - | - | - | - | + | - |
| <i>Cycas rumphii</i> | - | - | - | - | - | + |
| <i>Cynometra ramiflora</i> | - | - | - | - | + | - |
| <i>Decaspermum paniculatum</i> | + | - | - | - | - | - |
| <i>Desmodium umbellatum</i> | - | - | - | + | + | + |
| <i>Diospyros ferrea</i> | + | + | - | - | - | + |
| <i>Diplospora malaccensis</i> | + | + | - | + | + | - |
| <i>Dracaena maingayi</i> | - | - | - | + | - | - |
| <i>Elaeocarpus floribundus</i> | - | - | - | - | + | - |
| <i>Erioglossum rubiginosum</i> | - | - | - | + | - | - |
| <i>Erythrina indica</i> | + | - | - | + | - | + |
| <i>Erythroxylon cuneatum</i> | + | + | - | + | + | - |
| <i>Eugenia claviflora</i> | - | - | - | + | - | - |
| <i>Eugenia glauca</i> | - | - | - | - | + | - |
| <i>Eugenia grandis</i> | + | + | - | + | + | + |
| <i>Eugenia longiflora</i> | - | - | - | + | + | - |
| <i>Eugenia palembanica</i> | - | - | - | - | + | - |
| <i>Eugenia polita</i> | - | - | - | - | + | - |
| <i>Eugenia subdecussata</i> | - | - | - | - | + | - |
| <i>Eurycoma longifolia</i> | - | + | - | + | + | - |
| <i>Excoecaria agallocha</i> | - | - | - | + | + | - |
| <i>Ficus caulocarpa</i> | + | + | + | - | - | - |
| <i>Ficus crassiramea</i> | + | - | - | - | - | - |
| <i>Ficus deltoidea</i> | - | + | - | - | - | - |
| <i>Ficus drupacea</i> | + | - | - | - | - | - |

| Trees, etc., cont. | R | C | S | D | St | B |
|---|---|---|---|---|----|---|
| <i>Ficus fistulosa</i> | + | - | - | - | + | - |
| <i>Ficus grossularioides</i> | - | - | - | - | + | - |
| <i>Ficus hispida</i> | + | - | - | - | - | - |
| <i>Ficus kurzii</i> | - | + | - | - | - | - |
| <i>Ficus microcarpa</i> | + | + | + | - | + | - |
| <i>Ficus stricta</i> | - | + | - | + | - | - |
| <i>F. sundaica</i> v. <i>beccariana</i> | - | - | - | + | - | - |
| <i>Ficus superba</i> | - | - | + | - | + | - |
| <i>F. tinctoria</i> ssp. <i>gibbosa</i> | + | + | - | - | - | - |
| <i>Ficus variegata</i> | - | + | - | - | - | - |
| <i>Garcinia hombroniana</i> | - | - | - | - | + | - |
| <i>Garcinia nigrolineata</i> | - | - | - | - | - | + |
| <i>Gelonium glomerulatum</i> | - | - | + | + | - | + |
| <i>Glochidion littorale</i> | - | - | - | - | + | - |
| <i>Gnetum gnemon</i> | + | + | - | + | - | - |
| <i>Grewia paniculata</i> | + | - | - | - | - | - |
| <i>Guettarda speciosa</i> | + | - | - | + | + | + |
| <i>Guioa pleuropteris</i> | - | - | - | - | + | - |
| <i>Heritiera littoralis</i> | + | - | - | - | - | + |
| <i>Hernandia nymphaeifolia</i> | + | - | - | - | + | - |
| <i>Hibiscus tiliaceus</i> | - | - | - | + | + | + |
| <i>Hydnocarpus ilicifolia</i> | + | + | + | - | - | - |
| <i>Ixora congesta</i> | - | - | - | - | + | - |
| <i>Kleinhovia hospita</i> | + | - | - | + | - | - |
| <i>Knema globularia</i> | - | + | + | + | - | - |

| <i>Trees, etc., cont.</i> | R | C | S | D | St | B |
|----------------------------------|---|---|---|---|----|---|
| <i>Knema malayana</i> | - | - | - | + | - | - |
| <i>Leea indica</i> | - | - | - | - | + | - |
| <i>Lepisanthes fruticosa</i> | - | - | - | - | + | - |
| <i>Litsea glutinosa</i> | - | + | - | - | - | - |
| <i>Macaranga javanica</i> | - | - | - | - | + | - |
| <i>Mallotus tiliaefolia</i> | - | - | - | + | - | - |
| <i>Manilkara kauki</i> | - | + | - | - | - | - |
| <i>Melastoma sanguineum</i> | - | - | - | - | + | - |
| <i>Memecylon coeruleum</i> | + | + | + | + | + | - |
| <i>Memecylon myrsinoides</i> | - | - | - | + | - | - |
| <i>Memecylon ovatum</i> | - | + | - | - | + | - |
| <i>Messerschmidia argentea</i> | - | - | - | - | - | + |
| <i>Morinda citrifolia</i> | - | - | - | + | + | + |
| <i>Myristica guatteriifolia</i> | - | + | - | - | + | - |
| <i>Myrsine porteriana</i> | - | - | - | - | + | - |
| <i>Neolitsea zeylanica</i> | + | + | - | - | + | - |
| <i>Ochrosia oppositifolia</i> | + | - | - | - | - | - |
| <i>Oncosperma filamentosa</i> | - | - | - | + | + | - |
| <i>Pandanus dubius</i> | - | + | - | - | - | - |
| <i>Pandanus odoratissimus</i> | + | - | - | + | + | + |
| <i>Parinari corymbosa</i> | - | + | + | - | - | - |
| <i>Pemphis acidula</i> | + | - | - | - | - | + |
| <i>Phoebe declinata</i> | - | - | - | + | - | - |
| <i>Pisonia grandis</i> | - | + | + | - | - | - |
| <i>Pithecellobium contortum</i> | - | - | - | - | + | - |
| <i>Pithecellobium ellipticum</i> | - | - | - | + | - | - |

| Trees, etc., cont. | R | C | S | D | St | B |
|---------------------------------|---|---|---|---|----|---|
| <i>Pittosporum ferrugineum</i> | - | - | - | + | + | - |
| <i>Planchonella firma</i> | - | - | - | - | + | - |
| <i>Planchonella linggensis</i> | - | + | - | + | - | - |
| <i>Planchonella obovata</i> | + | + | + | + | + | + |
| <i>Podocarpus polystachyus</i> | - | - | - | + | + | - |
| <i>Polyalthia sclerophylla</i> | - | - | - | + | - | - |
| <i>Pongamia pinnata</i> | + | - | - | + | + | - |
| <i>Premna obtusifolia</i> | - | + | - | - | + | + |
| <i>Scaevola taccada</i> | - | + | - | + | + | + |
| <i>Sterculia foetida</i> | + | + | - | - | - | - |
| <i>Stereospermum fimbriatum</i> | + | - | - | - | - | - |
| <i>Terminalia catappa</i> | + | + | - | + | + | + |
| <i>Thespesia populnea</i> | - | - | - | + | + | - |
| <i>Timonius compressicaulis</i> | - | - | - | - | - | + |
| <i>Trema amboinensis</i> | - | + | - | - | - | - |
| <i>Trigonopleura</i> ? | - | - | - | + | - | - |
| <i>Tristania obovata</i> | - | - | - | - | + | - |
| <i>Vitex pubescens</i> | + | + | + | + | + | + |
| <i>Wendlandia ternifolia</i> | - | - | - | - | + | - |
| CLIMBERS | + | - | - | - | - | - |
| <i>Aganosma marginata</i> | + | + | - | - | - | - |
| <i>Caesalpinia bondhuc</i> | - | - | - | + | - | - |
| <i>Caesalpinia crista</i> | - | - | - | + | + | + |
| <i>Calamus chibehensis</i> | + | + | - | - | - | - |
| <i>Calamus perakensis</i> | - | - | - | - | + | - |
| <i>Canthium confertum</i> | - | - | - | - | + | - |

| Climbers cont. | R | C | S | D | St | B |
|---|---|---|---|---|----|---|
| <i>Cassytha filiformis</i> | - | - | - | - | - | + |
| <i>Cissus repennis</i> | + | - | - | - | - | - |
| <i>Connarus monospermus</i> v. <i>malayanus</i> | - | - | - | - | + | - |
| <i>Derris scandens</i> | - | - | - | + | + | - |
| <i>Derris thyrsiflora</i> | - | + | - | + | + | - |
| <i>Derris uliginosa</i> | - | - | + | + | + | - |
| <i>Ehretia</i> SFN 29827, 29845 | + | + | + | - | - | - |
| <i>Ficus parietalis</i> | - | - | - | + | - | - |
| <i>Flagellaria indica</i> | + | + | + | - | - | - |
| <i>Gnetum latifolium</i> v. <i>funiculare</i> | + | + | - | + | - | - |
| <i>Gynochthodes coriacea</i> | - | - | - | - | + | - |
| <i>Hoya diversifolia</i> | + | + | - | + | + | + |
| <i>Ipomoea illustris</i> | - | - | - | + | - | - |
| <i>Loeseneriella pauciflora</i> | - | + | - | - | - | - |
| <i>Morinda umbellata</i> | - | + | - | + | + | - |
| <i>Paramignya andamanica</i> | - | - | - | + | + | - |
| <i>Parsonsia spiralis</i> | - | - | - | - | + | - |
| <i>Phyllanthus</i> ? SFN 29848 | - | - | + | - | - | - |
| <i>Pisonia aculeata</i> | + | - | - | - | - | - |
| <i>Psychotria sarmentosa</i> | - | - | - | - | + | - |
| <i>Salacia chinensis</i> | + | - | - | + | - | - |
| <i>Sauropus albicans</i> | + | - | - | - | - | - |
| <i>Sauropus</i> sp. (s.n.) | - | + | - | - | - | - |
| <i>Schefflera venulosa</i> | + | + | + | + | + | - |
| <i>Tetracera assa</i> | - | - | - | - | + | - |
| <i>Tristellateia australasica</i> | - | - | - | + | + | + |

| Climbers cont. | R | C | S | D | St | B |
|--------------------------------|---|---|---|---|----|---|
| <i>Vitis japonica</i> | + | - | - | - | - | - |
| Yellow, cordate-leafed climber | - | + | + | - | - | - |
| HERBS, SEDGES, GRASSES | | | | | | |
| <i>Aneilema</i> sp. SFN 29794 | + | - | - | - | - | - |
| <i>Bulbophyllum vaginatum</i> | - | - | - | + | - | - |
| <i>Canavalia turgida</i> | - | - | - | + | - | - |
| <i>Cansjera zizyphoides</i> | - | - | - | + | - | - |
| <i>Chasalia curviflora</i> | + | + | - | - | - | - |
| <i>Coelorrachis glandulosa</i> | + | - | - | - | - | - |
| <i>Commersonia platyphylla</i> | - | - | - | + | - | - |
| <i>Cyperus cyperinus</i> | + | - | - | - | - | - |
| <i>Cyperus diffusus</i> | + | - | - | - | - | - |
| <i>Cyperus dubius</i> | + | - | - | - | - | - |
| <i>Cyperus javanicus</i> | + | + | + | - | - | - |
| <i>Cyperus kyllingii</i> | + | - | - | - | - | - |
| <i>Cyperus radians</i> | - | - | - | + | - | - |
| <i>Dianella ensifolia</i> | - | + | + | - | + | + |
| <i>Digitaria ciliaris</i> | - | - | - | + | - | - |
| <i>Eulalia ridleyi</i> | - | - | - | - | - | + |
| <i>Fimbristylis dichotoma</i> | + | - | - | - | - | - |
| <i>Hedyotis verticillata</i> | + | - | - | - | - | - |
| <i>Ipomoea pes-caprae</i> | - | - | - | + | - | - |
| <i>Ischaemum muticum</i> | - | - | - | + | - | + |
| <i>Lasianthus cyanocarpus</i> | - | - | - | - | + | - |
| <i>Oldenlandia paniculata</i> | + | - | - | - | - | - |
| <i>Panicum repens</i> | - | - | - | + | - | - |

| Herbs, etc., cont. | R | C | S | D | St | B |
|------------------------------------|---|---|---|---|----|---|
| <i>Paspalum conjugatum</i> | - | - | - | + | - | - |
| <i>Plocoglottis porphyrophylla</i> | - | - | - | - | + | - |
| <i>Pseuderanthemum crenulatum</i> | - | + | - | - | - | - |
| <i>Schizachyrium sanguineum</i> | - | - | - | - | - | + |
| <i>Scleria lithosperma</i> | + | - | - | - | - | - |
| <i>Spinifex littoreus</i> | - | - | - | - | - | + |
| <i>Sporobolus virginicus</i> | + | - | - | - | - | - |
| <i>Taeniophyllum serrula</i> | - | - | - | + | - | - |
| <i>Themeda villosa</i> | - | - | - | + | - | - |
| <i>Vandellia crustacea</i> | - | + | - | - | - | - |
| <i>Vandellia hirsuta</i> | + | - | - | - | - | - |
| <i>Vigna marina</i> | - | - | - | + | - | - |
| <i>Wedelia biflora</i> | - | - | - | + | + | + |
| <i>Zoysia matrella</i> | - | - | - | - | + | - |
| EPIPHYTES ON EXPOSED ROCKS | | | | | | |
| <i>Asplenium nidus-avis</i> | + | - | - | + | + | - |
| <i>Cymbidium finlaysonianum</i> | + | + | - | + | + | + |
| <i>Davallia solida</i> | + | - | - | + | + | - |
| <i>Dendrobium crumenatum</i> | + | + | - | + | + | + |
| <i>Dendrobium serra</i> | - | - | - | - | + | - |
| <i>Dischidia rafflesiana</i> | - | - | - | - | + | + |
| <i>Drynaria quercifolia</i> | + | - | - | + | + | - |
| <i>Fagraea auriculata</i> | + | - | - | - | + | - |
| <i>Hydnophytum formicarium</i> | - | - | - | - | + | - |
| <i>Medinilla hasseltii</i> | - | - | - | + | - | - |
| <i>Polypodium scolopendria</i> | + | - | + | + | + | - |

| <i>Epiphytes cont.</i> | R | C | S | D | St | B |
|--------------------------------|----|----|----|----|----|----|
| <i>Scindapsus</i> sp. | + | - | - | - | - | - |
| SFN 29816 | + | - | - | - | - | - |
| FERNS (OTHER THAN EPIPHYTES) | | | | | | |
| <i>Adiantum stenochlamys</i> | - | - | - | - | + | - |
| <i>Asplenium glaucophyllum</i> | - | - | - | + | - | - |
| <i>Asplenium macrophyllum</i> | + | - | - | - | - | - |
| <i>Blechnum orientale</i> | - | - | - | - | + | - |
| <i>Cyclophorus adnascens</i> | - | + | - | + | + | - |
| <i>Lygodium flexuosum</i> | - | + | + | - | - | - |
| <i>Nephrolepis biserrata</i> | + | + | - | + | + | - |
| <i>Pteridium aquilinum</i> | - | - | - | - | + | - |
| <i>Pteris ensiformis</i> | + | - | - | - | - | - |
| <i>Stenochlaena palustris</i> | - | + | + | + | + | - |
| <i>Vittaria elongata</i> | - | - | - | + | - | - |
| TOTALS | 76 | 63 | 27 | 83 | 94 | 40 |

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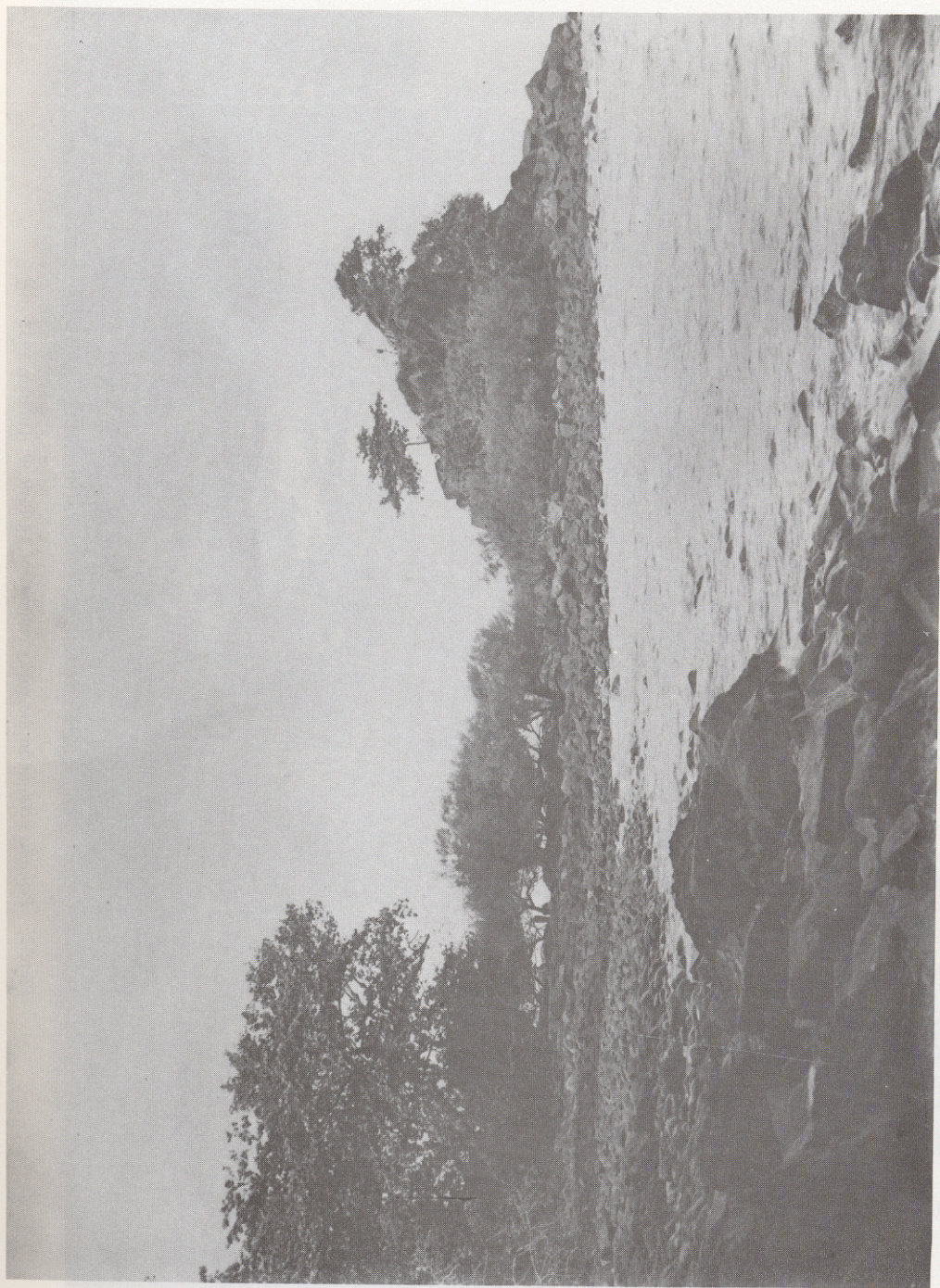


Plate 1. Tanjung Ruit, Pulau Tioman, in 1932.
The *Terminalia* headland is on the right, the rocky isthmus with *Penphis* in the centre, and the coastal forest of *Terminalia* and *Eugenia* on the left.

Gilliland, H.B. (1971). *Grasses of Malaya*. Revised Flora of Malaya vol. III. Singapore Botanic Gardens.



Plate 2. *Pemphis acidula* on the rocky isthmus of Tg Ruit, P. Tiunan; 1932.

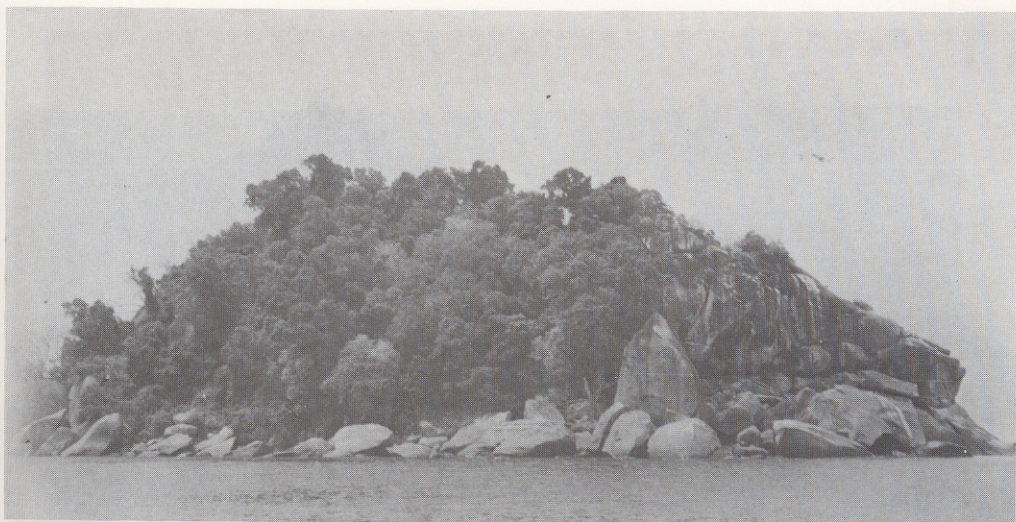


Plate 3. Pulau Chibeh from the south-west, 1935.

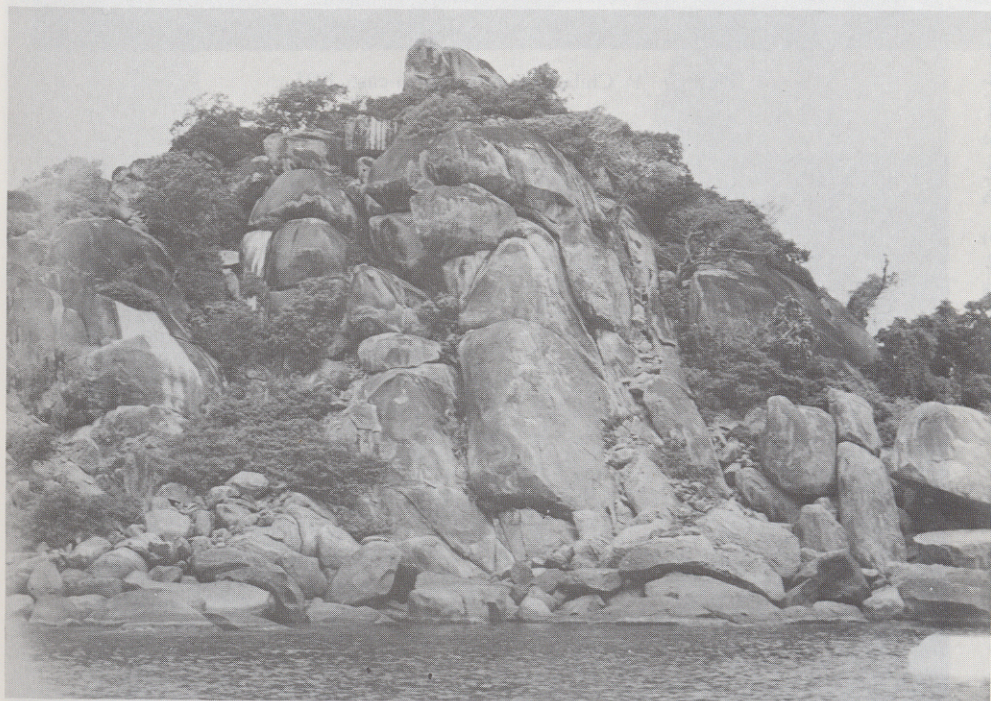


Plate 4. P. Chibeh, north end, 1935.

Plate 6. P. Chibeh, rocks at the south end, with the plant-collector Kiah bin Mohd. Salleh, 1935.

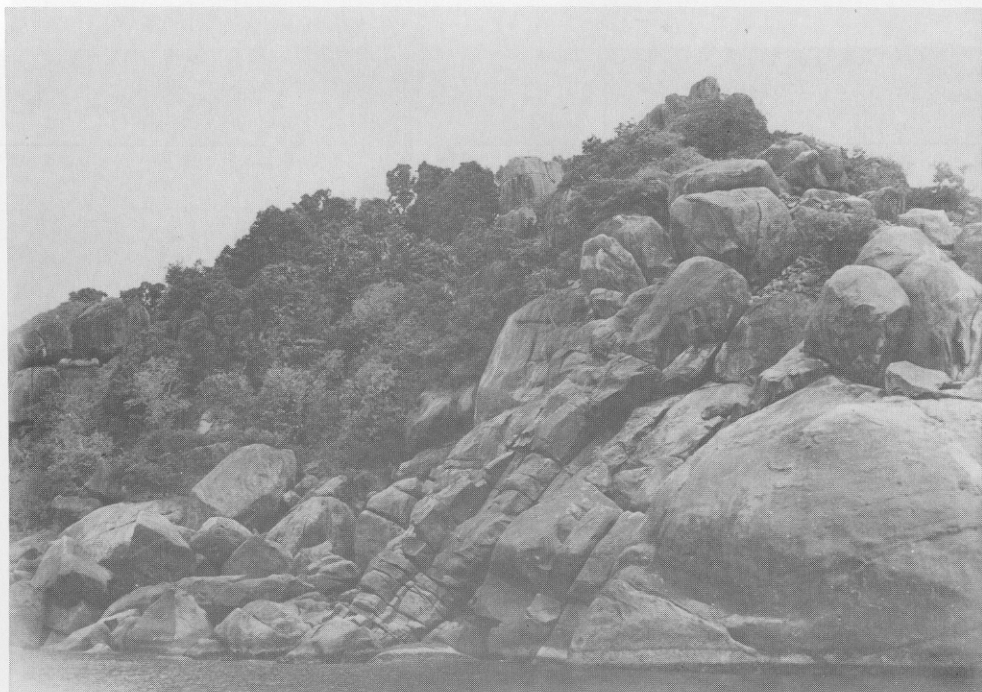


Plate 5. P. Chibeh from the north-east, 1935.

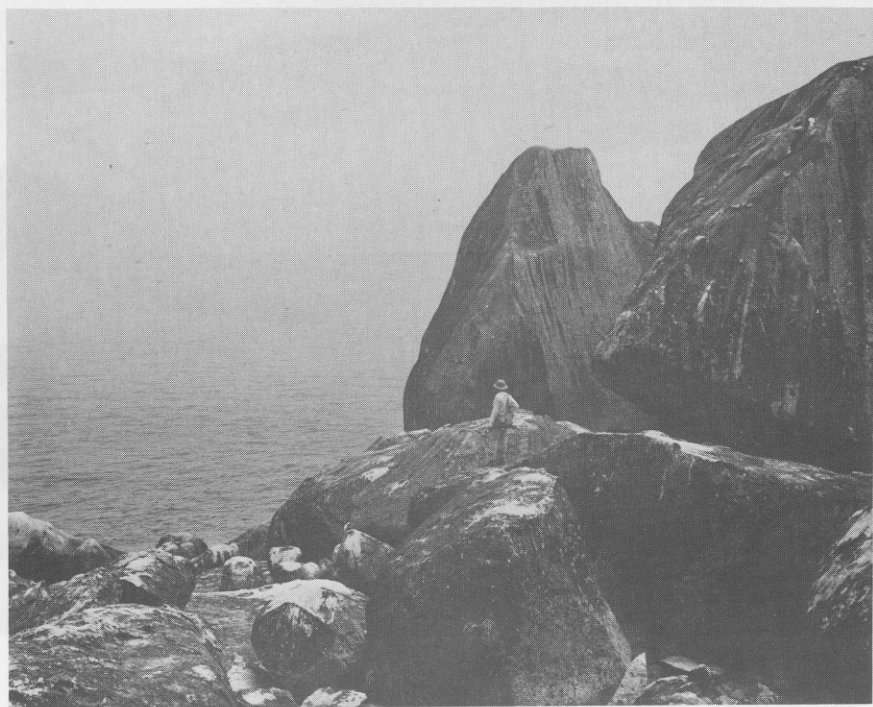


Plate 6. P. Chibeh, rocks at the south end, with the plant-collector Kiah bin Mohd. Salleh; 1935.

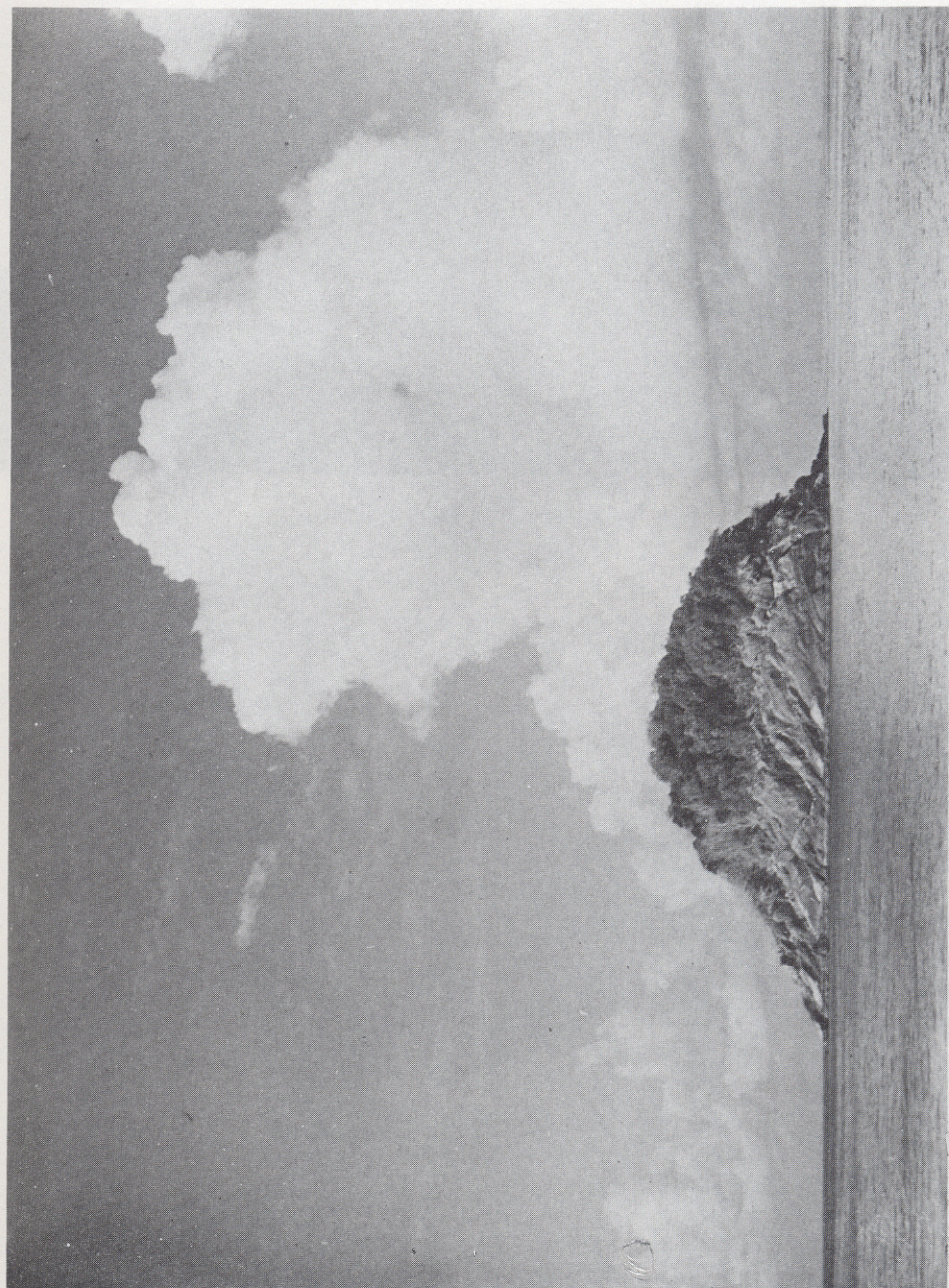


Plate 7. Pulau Sepoi from the north, 1932.

Plate 10. *P. Sepoi* at the south-east end, 1935.

Trees of *Paonia graminea* with white, almost bare, branches.

Plate 9. *P. Sepoi* at the north-west end, 1932.



Plate 8. P. Sepoi from the east, 1932.



Plate 9. P. Sepoi at the north-west end, 1935.

Plate 6. P. Chibeh, rocks at the south end, with the plant collector Kiah bin Mohd. Salleh, 1935.



Plate 10. P. Sepoi at the south-east end, 1935.
Trees of *Pisonia grandis* with white, almost bare, branches.



Plate 11. P. Sepoi in the forest, 1935.
The tangle of fig-roots claspng the boulders and tree-trunks.

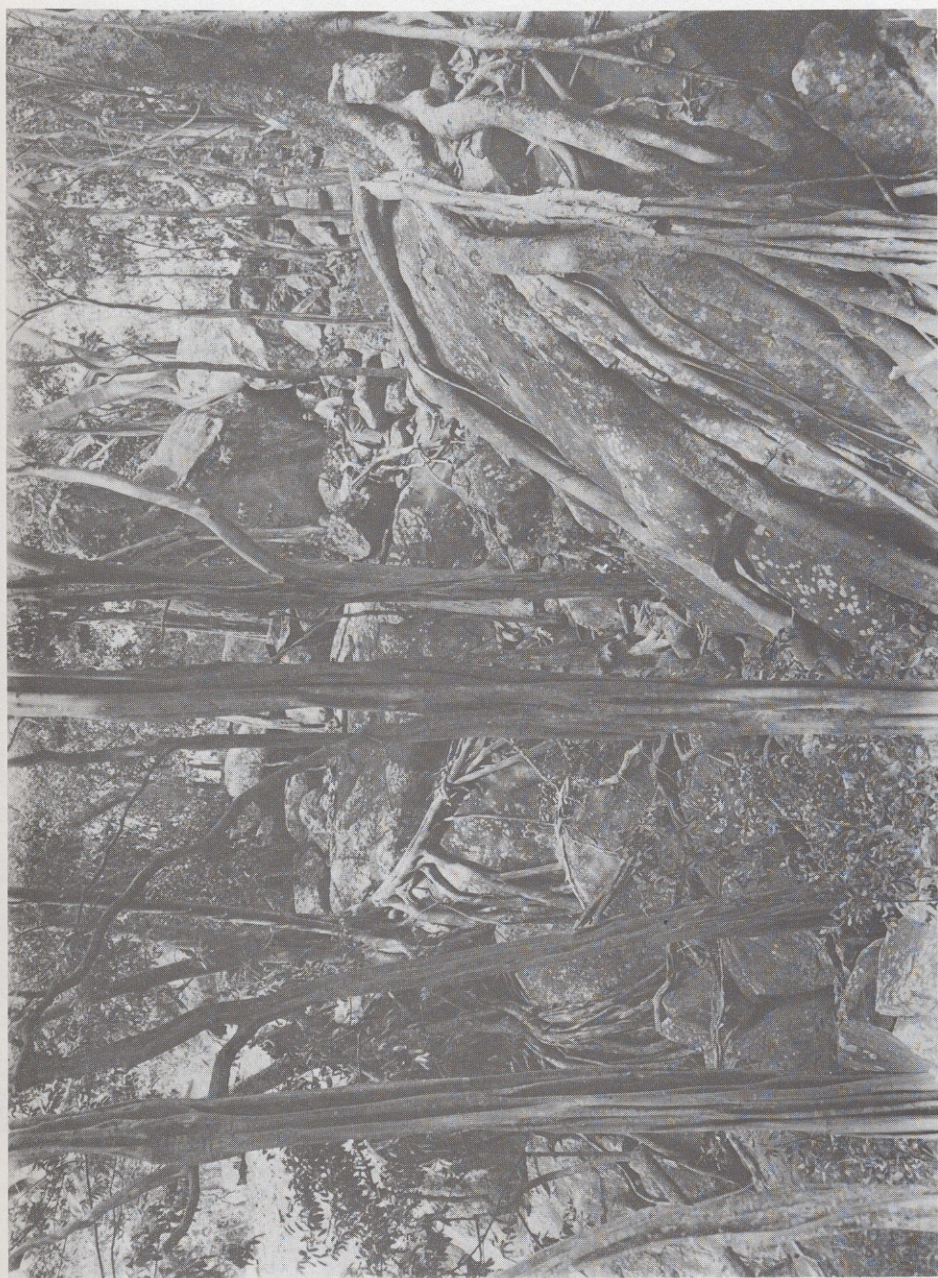


Plate 12. P. Sepoi inside the forest, 1935.

The fluted trunks of *Alantia monophylla* among the fig-roots (mainly of *Ficus superba*).

The plant-collector Kiah bin Mohd Salleh in the middle distance to the right.

The two small islands as seen from the summit of the main island, 1935.



Plate 13. *P. Sepoi* in the forest of *Pisonia grandis* with undergrowth of *Stenochlaena palustris* and the *Atalantia-forest* behind; the plant-collector Kiah bin Mohd Salleh; 1935.



Plate 14. Pulau Tokong Burong.
The two small islands as seen from the summit of the main island; 1935.



Plate 15. The tussocks of the grass *Chrysopogon fulvus* on the top of the main island of P. Tokong Burong; 1935.



Plate 16. Pulau Duchong Laut from the east, showing the frontage of *Terminalia* and, to the left, *Barringtonia*; 1935.



Plate 17. P. Berhala, showing the granite platform, with the launch Sri Gala in the distance; the seated figure on the right, W. Birtwistle; 1932.



Plate 18. Pulau Berhala from the north, with the crowns of *Parinari corymbosa* showing as a cockade on the hat; 1932.



Plate 19.
The rocks to the north
of P. Berhala; 1932.

Plate 20.
P. Berhala, the
granite platform
with the base of the
sandstone hill to the
right, and in the
distance the low
rocky island to the
north; 1932.



Plate 21.
P. Berhala, showing
the granite platform
from the summit of
the hill; 1932.