

BOTANICAL RESULTS OF A TRIP TO THE SALAJAR ISLANDS

by

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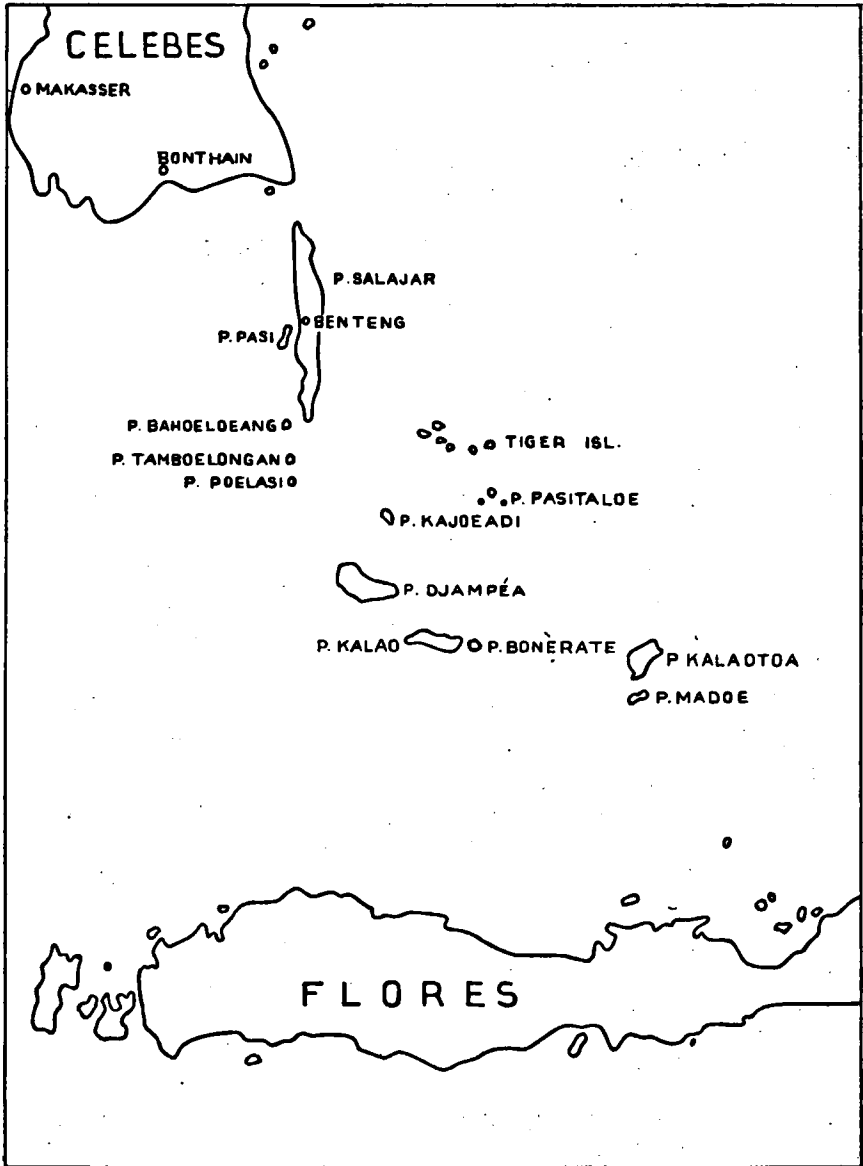
(Leersum, Holland).

1. INTRODUCTION.

The Salajar Islands strew the Flores Sea between Celebes and Flores. The group consists of no less than 73 smaller and larger islands. The principal islands are: Salajar or Tanadoang, Djampea, Kalao, Kalaotoa, and Bonerate. A number of smaller islands form together the group of the so-called Tiger Islands, and to the south of them are the very small, low Pasitaloe Islands. The Salajar group is situated between Long. $119^{\circ}50'$ E. and $121^{\circ}30'$ E. and between Lat. $5^{\circ}36'$ S. and $7^{\circ}25'$ S. See the map on p. 240.

In May 1913, I was enabled to visit this territory, thanks to a financial allowance of the „Maatschappij ter bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën” (Society for the Promotion of the Scientific Investigation of the Netherlands Colonies); for short: „Treub Society”, and also of the „Provinciaal Utrechtsch Genootschap voor Kunsten en Wetenschappen” (Utrecht Provincial Society for Arts and Sciences). The publication of the present paper was enabled by financial support of the „Leidsch Universiteitsfonds” (Leiden University Fund). I beg to tender my best thanks for all this valuable support here.

So far I did not come to giving an account of this trip and its botanical results. I nursed hopes to get an opportunity to pay another visit to these islands for completing the investigations. This opportunity, however, has never come, and at present a visit is altogether out of the question. Therefore I think it best now to record what I found in 1913. General surveys of the flora of many parts of the Malay Archipelago are as yet lacking, and for the present there is not much chance that an investigation will be made into the vegetation of these islands by somebody else. It may be, however, that if this yet might happen, my reconnaissance trip may serve as a basis for a more extensive inves-



P. = Poeloe = Island. Oe pronounce u.

tigation. This paper therefore is a description of the conditions observed at my visit in 1913. The conditions of the smaller, thinly populated islands will be the same as in those times. The main island Salajar was densely populated; remnants of the original vegetation were only to be seen here and there; very likely not much is left of them now, but for the sparsely populated southern point of the island.

Apart from the above-mentioned societies I also owe many thanks to the late Mr E. E. W. G. SCHRÖDER, who at the time of my visit was district-officer for the section Salajar. He accompanied me on my trip to the smaller islands and assisted me by word and deed. I also was his guest during my stay in Benteng, the capital of Salajar.

The governor of Celebes placed a Government steamer, the „Reiger”, at the disposal of the expedition, since the district-officer wanted to pay an official visit to the various islands belonging to his province. If we should not have had the disposal of this ship, we should have been compelled to make the excursions by sailing-proah, in which case much time would have been lost. The late Mr W. A. PÉNARD, official of the Encyclopedic Office at Batavia, also joined the excursion for studying the country and its population.

My botanical materials were incorporated in the Herbarium of the Utrecht University, where they were identified provisionally. Afterwards the plants were classified by Dr. J. G. B. BEUMÉE, at that time assistant, later on Director of the Herbarium at Buitenzorg. Besides he gave me a numbered list of the plants found in Salajar by J. E. TELJSMANN, part of which only was classified, and also a list of the plants collected by H. ZOLLINGER in the same island. The collection of TELJSMANN consists of 233 numbers, 6 numbers are known from ZOLLINGER. I myself brought 653 numbers from the various islands together. I do not conceal that thus only part of the flora is reconnoitred. The time of one month, which I had at my disposal, was too short for a thorough investigation of these islands situated so far apart. A great part of the available time had to be spent travelling. Here and there investigations could be made only at random. By the side of Phanerogams and Pteridophytes I made a collection of *Polyporaceae*, which are equally kept in the Herbarium at Utrecht. I also collected a great number of Zooecidia, A part of them have been described in 1916 (W. und J. DOCTERS VAN LEEUWEN - RELJNVAAN, 1916, p. 21); the descriptions of the remaining galls have been included in a larger, general work on the galls of the Netherlands' Indies (J. DOCTERS VAN LEEUWEN - RELJNVAAN and W. M. DOCTERS VAN LEEUWEN, 1926).

Short articles about part of the excursion and the vegetation appeared in serial form in the daily paper, the „Locomotief”, at Semarang in 1913.

2. FORMER INFORMATION ABOUT THE VEGETATION.

A few investigators have visited these islands, H. ZOLLINGER¹⁾, a Swiss botanist, who stayed in the Netherlands Indies for some considerable time, and J. E. TELJSMANN, the curator of the Botanic Gardens at Buitenzorg, who travelled a good deal in the Malay Archipelago in order to collect living plants and herbarium materials. Besides these, shorter and more extensive reports about the vegetation have been made in writings of missionaries or officials who visited these territories.

H. ZOLLINGER (1850, p. 1) stayed in Salajar from July 2nd to 5th, 1847. About this visit he wrote as follows: „As far as I know Salajar has not yet been visited by any natural scientist, at least nothing has been published about it. But since such a person will never be sent there on purpose, one will not take it amiss if I report about this island here, and will not return to this point in the future.” He climbed the top of the highest mountain of the island, the Bontanoharoe, which he mentions as being 1900 feet high. The food of the population consists mainly of maize and rice, grown on dry grounds. Besides these they grow many coco-palms and also cotton. *Arenga pinnata*, *Canarium commune* and tobacco are also found a good deal. Otherwise he does not mention anything about the vegetation or about making a collection. A few of the plants brought back by him occur in the „Systematisches Verzeichniss”, others were found in the Herbarium at Buitenzorg.

J. P. FRELJN (1850, p. 16), who stayed in Salajar in 1848, only mentions the occurrence of many coco-palms. W. H. DONSELAAR (1857, p. 227) gives more particulars. Good timber is found in Salajar, and also ebony, but the latter only of smaller dimensions. Quite common are capok (*Ceiba pentandra*) and various species of bamboo, *Canarium*, millet (*Setaria viridis* var. *italica*), maize, cotton, and some coffee; tobacco and indigo are also grown. J. A. BAKKER (1862, p. 215) visited the islands Bonerate and Kalao. In Bonerate timber is not found in

¹⁾ A biography of this able naturalist appeared in „Mitteilungen der Gruppe Niederländisch Indien der Neuen Helvetischen Gesellschaft”, Vol. VIII, no. 2, 1929, Buitenzorg. Dr. EDMUND SCHEIBENER gave a short biography of H. ZOLLINGER, Dr. D. F. VAN SLOOTEN sketched him as a botanist and described his importance for the knowledge of the Javanese flora.

great quantities, but fire-wood is, because the ground is covered for the greater part by brush-wood; in between occur open places covered with a species of tenuous grass. Probably *Andropogon contortus* is meant here, since this grass still covers vast areas. As to Kalao BAKKER only communicates that it is covered with wood. VAN DER STOK (1866, p. 398) furnishes more data; he says of Salajar that the flora is richly represented, notwithstanding the slight precipitation. Of the plants he mentions *Pandanus*, *Canarium*, one species of cactus (*Opuntia*), and *Liliaceae*. Many *Excoecaria* trees and *Nipa* palms grow in the marshes, and in the higher parts are found vast wildernesses of brushwood. Still higher the vegetation becomes sparse; *Cassia Fistula*, *Artocarpus incisa*, and *A. integræ*, *Dodonaea viscosa*, and *Ficus Benjamina* are recorded. In the vast grass wildernesses formed by *Imperata cylindrica*, are found species of *Labiatae*, *Euphorbiaceae*, *Rubiaceae*, and ferns.

Of the plants grown and used by man VAN DER STOK mentions: Coco-palms, *Zea mays*, millet, rice, sugar-cane, *Coffea arabica*, species of *Dolichos*, tobacco, *Tectona grandis*, *Gossypium* species, *Corypha Utan*, *Diospyros Ebenum* (particularly in Bonerate and Kalao), *Arenga pinata*, *Piper betle*, species of bamboo, *Calamus*, *Opuntia*, *Morinda citrifolia*, *Psidium Guajava*, *Annona muricata*, *Punica granatum*, *Ananas comosus*, *Capsicum annum*, species of *Dioscorea*, species of *Musa*, *Mangifera indica*, *Carica Papaya*, many species of *Amarantaceae*, *Cucurbitaceae*, *Maranta arundinacea*, *Metroxylon* species, *Cycas Rumphii*, *Uncaria*, *Terminalia*, *Ricinus communis*, *Jatropha Curcas*, *Manihot utilissima*, *Datura Stramonium*, *Hibiscus tiliaceus*, *Curcuma domestica*, *Zingiber officinale*, *Alstonia*; *Ocimum gratissimum*.

VAN DER STOK observed the most luxurious vegetation in the southern part of the island Salajar.

TELJSMANN (1879, p. 111) made an excursion to Celebes and the surrounding islands in 1877. He also collected in Salajar. He stayed in this island from November 16th to December 11th. Owing to barrenness, in consequence of a long period of drought, the vegetation fell short of expectation, and for want of uninjured woods only little could be collected. Of the flora he mentions: Coco-palms, *Cassia Fistula*, *Borassus flabellifer*, and *Corypha Utan*. On the highest parts of Mt. Bontanoharoe TELJSMANN found *Mangifera indica* run wild, and *Vitex trifolia* as a hedge plant.

ENGELHARD visited the islands, and about this visit several reports were published. In the first (1884 a, p. 306) only a few cultivated plants are mentioned, viz. *Nipa*, *Arenga*, *Metroxylon*, and *Borassus*. In

a more extensive publication (1884 b, p. 263) he says that virgin forests are no longer present in Salajar; remnants can only be found near the top of the Bontanharoe and in the region south of Barang-Barang. Small teak-forests are still found here and there in the regencies Balaboelo and Lajolo. They have been planted by order of the Governor of Celebes, CORNELIS SINTELAAR. These experimental plantations were made in 1735 from seed originating from the island Boeton and from Bima. According to ENGELHARD original teak-forests must still be present; he himself, however, has not seen them. Virgin forests of any importance do no longer occur in the islands Pasi, Bahoeleang, Tamboelongan, Poelasi, and Kajoeadi. The islands Djampea and Kalao, on the other hand, are still covered with virgin forests. In Djampea are still vast mangrove-forests which have developed to a smaller extent in Salajar.

This is what I have found on the older stages of the vegetation in these islands.

In the islands was a well-developed banana cultivation, the fruits were exported mainly to Makassar. In 1914 and 1915 complaints began to be heard about a serious disease which pretty well destroyed this cultivation. In 1915 the islands were visited by an official of the Institute for plant-disease (Phytopathological Service) at Buitenzorg, A. B. RIJKS; he reported about this visit, and this report has been published (1916, p. 1). He states that in 1880 the population numbered 75000 souls, who, for the greater part, were living in the main island Salajar. Agriculture is still in a very primitive stage; Kajoeadi and Djampea, however, formerly had a rather extensive banana cultivation. The main food-plant is maize, and in all the islands coco-palms are grown. A really popular cultivation was formerly that of cotton (*Gossypium* species); this cultivation, however, has been abandoned altogether, and the plant is now only found run wild. It stands to reason that the greater part of the report is taken up by a discussion of the banana disease, which did a great deal of harm to the plantations. The disease is an affection of the vascular system. In case of serious affection the plant is hardly able to develop.

3. GEOLOGICAL CHARACTER AND CLIMATE.

Few details are known about the geological nature of these islands; many islands have not been examined at all. WICHMANN (1895, p. 236) has described stones of Salajar, and further data may be obtained from an article by VERBEEK (1908, p. 31), who has examined Salajar and a

few other islands. In the geological lectures of RUTTEN (1927, p. 550) a short survey is given of what is known about this subject.

Salajar consists of a kernel of tufaceous sandstones and marls, sloping westwards, with on top very young corallites. Those which are found highest are probably the oldest. From west to east the level slopes over long ranges of hills up to the highest parts, only to go down steeply to the sea on the east side. ZOLLINGER and with him WICHMANN wrongly considered the highest top, the mountain Bontanoharoe, to be late eruptive. According to VERBEEK the mountain consists entirely of sandstones with interjacent andesite breccia. The limestone wall surrounding the island, which in parts is up to 80 m high, is interrupted wherever small rivers empty themselves into the sea. VERBEEK is of opinion that all the limestone depositions are late-Miocene. At the mouths of the rivers are found small areas of alluvion with mangrove vegetations.

The other islands too consist for the greater part of limestone rocks; the smallest are coral islands. The islands Tamboelangan and Poelasi consist, according to VERBEEK, of eruptive materials and raised coral reefs, which are not higher than 10 to 15 m.

VERBEEK saw Djampea only from a distance; he is of the opinion, judging by its shape, that it consists of eruptive rocks and breccia, may be from old corallites. WICHMANN described the stones brought back from this island by the Siboga expedition as granite and syenite-porphry, stones such as, RUTTEN remarks, would not have been expected in an island so near Salajar. But, he says, time will show whether this really is an old massive formation or that these plutonic rocks should rather be compared to tertiary granites, which have been known for some years as occurring in Flores.

The soil, where it is cultivated, is on the whole strongly washed away, and denuded of its humus. Only close to the sea good cultivation areas can still be found. In many islands the soil consists of hard coral substance, with between the projecting coral peaks patches of arable land. The result is that the areas which are no longer cultivated are overgrown for the greater part with grass vegetation and tenuous shrubs. The original wood too shows the luxuriousness of a real virgin forest in but a few places. RIJKS (1916, p. 3) also calls the soil rather poor with the exception of a few parts of Salajar and Djampea. In Bonerate the soil is extremely barren. In order to plant maize the inhabitants first have to dig holes in the limestone rocks and to fill these up with soil from lower, more fertile parts of the island.

The rainfall is not very great and rather equally divided over the months from November up to June inclusive, the other months being the dry monsoon. Raingauges are placed in Benteng, the capital of Salajar, and in Batangmata, situated half way between Benteng and the northern point of the island. Up to 1917 a pluviometer could be found in the island Bonerate, but in that year it was removed to the island Djampea. The figures of the rainfall were given to me by Prof. J. BOEREMA, director of the Meteorological Observatory in Batavia, for which I take pleasure in tendering him my thanks here. Below follow the said figures:

	Jan.	Febr.	Mrch	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
Salajar 1913-'33	152	133	157	168	220	135	45	14	12	26	101	192	1355
Batangmata 1922-'33	118	88	99	151	178	142	53	8	5	16	90	130	1078
Bonerate 1913-'17	346	245	257	111	203	113	35	13	10	24	203	351	1911
Djampea 1917-'33	228	192	184	87	96	52	19	9	21	28	80	198	1194

The measurements of Bonerate and Batangmata cover too short a time to yield a trustworthy average. RIJKS gives the average rainfall of the years 1909 to 1913 as regards Bonerate, and records as annual 1327 mm. It seems as if between 1913 and 1917 there must have been one or more years with a large rainfall.

The main of these two figures is 1619. BRAAK (1922, p. 460) gives an average over 9 years of 1596 mm. He also records that the islands Salajar and Bonerate have a lively air motion, and from that it follows that the drought is of great influence.

4. SHORT DESCRIPTION OF THE EXPEDITION.

On April 30th the ship of the Royal Dutch Navigation Company, which has taken me on board at Makassar, sails just before sunrise past the south coast of Salajar. The ranges of hills are clearly visible. At half past five the ship casts anchor in the bay between the main island and the small island Pasi. The district officer (Indian Civil Servant), Mr. E. E. W. G. SCHRÖDER meets me at the boat and receives me hospitably in his spacious house. The day of arrival and the next few days are spent with reconnoitring the neighbourhood and preparing the collecting materials for the trip by Government steamer. The „Reiger”

arrives in the roads in the afternoon of May 2nd and the actual trip begins the next day. We first sail round the northern side of Pasi, and then again to the south over a dead smooth sea, between the south point of Salajar and the island Bahoeleang, and next to the east of the islands Tamboelongan and Poelasi towards Kajoeadi. The first mentioned island displays along its coast a dense plantation of coco-palms, the ridge is covered with thin forest, and on the slopes we discern maize plantations and also a few lontar palms: *Borassus flabellifer*. With a field-glass we can recognize a few beach-plants such as *Ipomoea Pes-caprae* and *Spinifex littoreus*, growing on the sandy beach in front of the coco-nuts. The southern point of Salajar is densely covered with wood, and a few campongs are surrounded by coco-palms. On the most southern end, where the range of hills steeply descends down to the sea, we see behind the beach a few groups of *Casuarina equisetifolia*. The islands Tamboelongan and Poelasi have been disforested almost completely, on the southern side are slightly more trees than in the north and east parts; the naked, red-coloured hills project above the coco-palms, they bear only here and there a sparse vegetation of grasses and low shrubs.

In the afternoon the ship drops anchor at the west side of the island Kajoeadi; the island is surrounded by a coral reef which stretches far into the sea, and therefore we are rowed ashore. This coast, particularly the northern part, consists of limestone rocks with shallow caves. A large block, fallen down from these rocks, and now bathed by the sea, bears a Composita with fleshy leaves and beautiful, purple capitula: *Vernonia actaea*. The southern part has a sandy beach, covered with many beach plants. We walk along the beach, through the coco plantations and the campong. Everything looks extremely neglected. Through badly kept banana and maize plantations we walk some distance up the hill, the Tandjoenglipang. Up to the highest top it is pretty well bare. Finally we return to the ship.

May 4th. At half past five we go again by barge to the shore, and walk through the campong, the neglected coco, banana, and maize plantations towards the north, in the direction of the hill called Bonélabèrê. Behind the plantations we find a thin wood with small trees and a few lianas; but few plants are flowering. The soil consists of coral stones, which project with sharp points above the thin layer of humus, and which render walking very difficult. Then back to the ship again, which leaves at 10 o'clock. We sail to the north east of the largest island Djampea and to the north of Kalao, and by 5 o'clock we arrive at the west side of the island Bonerate. The northern coast of Kalao is steep,

and full of grottos and fissures, and towards the east is a reef of stones, projecting above the sea, but entirely bare. The coast of Bonerate is equally steep, and consists of rocks bearing an extremely sparse vegetation. An official of the Civil Service, residing in Bonerate, comes on board in order to accompany the trip some way.

May 5th. At 5.30 a.m. the ship sails past the south side of Bonerate towards the most easterly island of the group, Kalaotoa. We arrive at the island at 2 o'clock, and the ship casts anchor at about one hour's rowing away from the west coast; we disembark near a small campong, and look for plants in the neighbourhood.

May 6th. The boat is brought up again near the same campong; I make an excursion into the hills with 15 coolies. We first pass through neglected arable land, where here and there maize, *Ricinus*, and other field-produce is grown, and penetrate through again deserted parts which are covered with thin, young wood. Through thin forest up to the top, which is about 320 m high. We return to the campong by a steeper way, and go back to the ship with a small proah. A swarm of white butterflies (*Pieridae*) moved in the morning along the west coast from south to north, thus forming a long, white ribbon, which in the afternoon had become less dense, but which still went on. This phenomenon only ended by nightfall.

May 7th. The ship sails at half past five between Kalaotoa and the southern, neighbouring, smaller island Madoe in order to observe the shape of the mountain, and then returns to Bonerate. We pass along the steep north coast of this island, arrive at 2 o'clock at the west side, and are rowed ashore. As has been said before, a civil servant resides in this islands, and the consequences are clearly visible. The campong looks very trim and neat, with well-kept roads and houses with compounds. We collect plants in the surroundings, and return to the ship after sunset. From the house of the civil servant an avenue of a species of large *Ficus* leads almost down to the sea; the trees are full of glow-worms, which emit their light and go out simultaneously. We go back by proah across a strongly phosphorescing sea.

May 8th. In the morning we make an excursion to the hill, which is about a hundred meter high, through neglected arable land and low brushwood, with alternate stretches of grass. At 12 o'clock we are back on board the ship, which sails to the Pasitaloe islands. These are small, low coral islands. In one of them is a campong, consisting of only a few houses, and around it a few patches of arable land. Otherwise, however, these islands are only covered with small trees and beach plants.

May 9th. By sailing barge we go to the western island of the Pasitaloe group; it is about 1 kilometer long and half a kilometer broad. Although there are no houses in this island, the soil in the middle part is yet cultivated. In the afternoon the „Reiger” sails to the island Kalao. From the ship we see on the north side a light-coloured teakwood stand out against the surrounding vegetation. We make for this wood, and ascend the slope. The wood stretches from the coast to a height of about 50 m. Between the teak trees was very much brushwood, but only few plants were flowering. Later on we return to Bonerate, where the district officer has to look after some government affairs, and May 10th we spend before the coast.

May 11th. Early in the morning we sail to the almost unvisited south coast of the island Kalao; we are set ashore on a narrow, sandy beach, near a small campong. The coast consists of limestone full of grottos, and behind a narrow girdle of beach plants we find a rather dense virgin forest. We walk in a western direction, and encounter coral rocks, which end in the sea, so that we have to wade through the water for quite a long time. Here and there are small, sandy patches of beach. The excursion comes to an end at a large campong; we are rowed back to the ship, and then sail to the largest island, Djampea.

May 12th. The ship rides at anchor in a large bay to the south west of the island; we are rowed in to shore near the campong Marégé. Together with 24 coolies we make for the interior of the island, first through coco plantations, then through *Imperata* wildernesses, which are surrounded by high forest. Everywhere we see trails of deer, and here and there wild boars are startled. The wood into which we penetrate next consists of heavy trees, with much growth of rattan; the plants climb high up in the trees, and long festoons lie over the ground, so that a wilderness has arisen into which it is hardly possible to penetrate. The trees stand rather far apart, and the shade is not very dense, but yet the growth of plants seems to be hampered by other causes. But for rattan there is very little undergrowth. We soon reach the hills, and climb gradually upwards. After about 4 hours' climbing we reach the highest top, some 500 m high. The greater part of the coolies and my plant-collector have been left behind on a foretop in order to put up some accommodation for the night. On the top are large stones, which bear here and there specimens of a white flowering *Begonia*. There are more specimens of *Asplenium Nidus* here than on the slopes. The entire wood is strikingly poor in epiphytes and flowering plants. In the meantime a tent has been put up on the foretop; we return to

this point, take some lunch, and then decide to go back to the ship, since the scarcity of flowering plants renders a longer stay unnecessary. There was one exception: a huge liana, *Mucuna gigantea*, was flowering everywhere. The inflorescences with the yellow-green papilionaceous flowers hang down by long, thin peduncles, from the crowns of the trees to about $1\frac{1}{2}$ —2 m above the ground.

May 13th. The ship sails past the south coast towards the east, and we are rowed ashore at the campong Pekangkang; from here we first walk in an eastern direction along the coast, partly we sail by praoh through a marvellous mangrove forest, then we sail some distance up the river Elè Lampa, and next walk towards the campong Paromana, which is situated on the south-eastern point of the island. From here we walk right across the island towards the campong Oedjong on the north coast. The territory we pass consists for the greater part of neglected maize fields, woods which have been cut down, and mainly *Imperata* wildernesses. The ship has sailed past the east coast, and now rides at anchor before Oedjong.

May 14th. With a few coolies I make an excursion to the west side, through vast *Imperata*-fields towards the hills, and to one of the many tops, some 300 m above sea-level. Here we find a beautiful virgin forest; the undergrowth, however, was very poor.

May 15th. The ship sails in a westerly direction, and we go ashore near the campong on the north side, Boné Lamběřě, where all men are absent. Finally we find a few persons who bring us through endless *Imperata* fields to the wood. A path has to be cleared; this detains us a long time owing to the rattan wildernesses. We pass by a clear brook, but nor is here the vegetation any richer than what we have seen so far. We climb up to the 300 m level, and then descend through other parts; here also virgin forest and many *Imperata* fields. We arrive in the west side near the campong Benteng; the ship lies in a large bay surrounded by islands.

May 16th. We go ashore and walk along the beach and through the vast mangrove, which consists mainly of species of *Bruguiera*, species of *Rhizophora*, and *Sonneratia*; the *Bruguieras* particularly had developed into robust trees with enormous aerial-roots.

May 17th. Overnight the ship sails back to Salajar, where we arrive at 5 o'clock in the afternoon.

The next few days are spent with arranging the collections, and making preparations for an excursion to the mountains of Salajar.

May 20th. With many coolies we leave early in the morning; the

way first leads through coco plantations and mangrove forests, and along shaded roads into the hills. The vegetation gradually becomes richer, but yet it is a poor remnant of what formerly it must have been. By 12 o'clock we arrive at the pasanggrahan (Government resthouse for visitors), where we stay a few days in order to collect plants in the neighbourhood. The pasanggrahan is situated at an altitude of about 300 m, just above a campong Bitombang, so that the surroundings are cultivated for the greater part. At the back of the house we have a view of the highest mountain of the island, the Bontanoharoe.

May 22nd. We continue our way upwards, and after a few hours' climbing a long steep paths we reach the top of the Bontanoharoe, about 600 m above sea-level. On a ridge, covered with grass, between remnants of the virgin forest, is a small hut, from where we have a beautiful view of the west side of the island. The top itself is flat, and covered with wood, with alternate grass and shrub wildernesses. *Psidium Guajava* has run wild everywhere and is fructifying amply. In the evening the wild boars feast upon the fallen fruits. Towards the east coast the country goes down steeply, and the slopes bear but little vegetation. This part of the island is richer in plants than any other visited so far. For several days we make excursions and collect as many plants as possible.

May 25th. We go back to Benteng along a ridge running in a north-western direction; at first the way leads down gradually, but nearer to the plain the slope becomes steeper. The ridge is very narrow, with on both sides perpendicular walls; everything is quite white owing to the limestone; the growth of plants is extremely poor.

May 26th. This day is spent with preparing an excursion to the southern point of Salajar; the chief of a campong there, of Barang-barang, goes home to-morrow by proah, and I may join him.

May 27th. In a small heavily laden flying proah we leave Benteng early in the morning, at first rowing, later on by sail. We sail close under the west coast, which consists of steep limestone rocks bearing many *Pandanus* and *Cycas*. The sea undermines the coast, everywhere are caves, and large blocks of rock lie spread in the sea. Halfway, at campong Tiele-Tiele, we take a heavier proah and before long we are sailing again southwards over a rough sea. At half past six we reach the campong Tonkè-Tonkè, from where we reach Barang-Barang after a quarter of an hour's walk. We put up our camp-beds in the house of the chief of this campong, and soon retire behind the mosquito-curtain, for this part is known for its many mosquitos and malaria.

The next few days we make excursions in the neighbourhood, and

amongst others right across the island towards the east side, where a few small campongs are situated, Bonesela and Pinang. The greater part of the south point is covered with thin wood and along the coast here and there with mangrove forests.

May 30th. We leave at 8 o'clock in the morning sailing before a stiff breeze, and thus we reach Benteng at half past two.

The next days are used for packing everything; we have to wait three days for the steamer of the Royal Dutch Navigation Company, which was expected on June 1st, but which did not arrive until June 4th, at 6 o'clock in the afternoon. At night we sail for Makassar, and there the trip came to an end.

5. THE ISLAND OF SALAJAR.

ENGELHARD (1884 b, p. 263) records that this island is 635 square kilometers large, the population being about 80 000. This rather dense population is cause of the fact that the greater part of the island is cultivated, or consists of deserted arable land. The original vegetation can still mainly be found in the thinly populated south point and along the coasts. The sandy beach, which occurs here and there, is covered with the ordinary beach plants: *Ipomoea Pes-caprae*, *Euphorbia Atoto*, *Cassythia filiformis*, *Caesalpinia Crista*, *Canavalia maritima*, *Desmodium umbellatum*, *Wedelia biflora*, and *Spinifex littoreus*. In some places where the beach is somewhat wider, and where small dunes have developed, occur dense wildernesses of *Caesalpinia Crista*, *Pandanus tectorius*, and *Opuntia* species, which are pretty well impenetrable. The steeper limestone beaches bear mainly *Cycas Rumphii*, *Pandanus tectorius*, and the *Vernonia* with fleshy leaves, *V. actaea*, which is mainly found close above the sea. A shrubby *Euphorbia*, *E. plumerioides*, is common on calcareous coasts on the east side of the southern point of the island.

A mangrove vegetation has developed at the mouths of rivers on the west side of the island and in moist, muddy parts along the coast. It is not rich in species, and the population has cut down a good deal. *Avicennia officinalis* formed on the inner side of the actual mangrove small dense groves; full-grown specimens were rare; there were also here and there dense groves of *Excoecaria Agallocha*. I failed to find any well-developed *Barringtonia* association, although various representatives occurred along the coasts of this island.

Everywhere behind these formations are plantations of *Cocos nucifera*, sometimes wide, sometimes narrower strips, and this palm is also

cultivated by the population in the interior even quite up in the hills. The trees stand very close together, and the ground is badly kept, so that there is a dense undergrowth of weeds. Among them are particularly common: *Triumfetta indica*, *Crotalaria striata*, *Sida acuta* and *S. rhombifolia*, *Urena lobata*, *Elephantopus scaber*, and *Oplismenus compositus*, often also *Imperata cylindrica*. Behind, and sometimes between the coco plantations are the fields of the population, and arable land is also found in and against the hills wherever there is a proper tillable top-part. The greater part of these hills, however, especially there where the soil consists of limestone, is uncultivated, and is covered with a very sparse vegetation of grass and shrubs. Everywhere the white limestone is visible between the plants. Nothing is left of the original vegetation. *Imperata cylindrica* is common, but close grass-fields have developed nowhere. The principal shrubs which grow scattered are: *Lantana Camara*, *Streblus asper*, *Sida rhombifolia*, *Glochidion molle* and *G. nigrum*, *Pittosporum timorense*, *Grewia acuminata*, *Ehretia laevis*, and *Azima sarmentosum*, all of them as small specimens. There are also small specimens of *Ficus retusa*. This poor vegetation covers the ridges and slopes up to a height of about 250 m; from here upwards is rather more arable land, and remnants of the original vegetation are found along moisty, sunken roads, and along brooks and small rivers. At the highest part, about 600 m above sea-level which is a kind of plateau, are small patches of virgin forest, but here too the greater part is covered with grass. Besides there are vast wildernesses of *Psidium Guajava*. In places where the soil is marshy, occur small wildernesses of a large *Pandanus*. In the woods are still other larger trees, which, however, are not in flower, so that I could not collect any materials. *Ficus fistulosa* and *F. retusa*, *Dysoxylum* species and *D. arborescens*, *Actinodaphne* species, *Alangium sundanum*, and *Pithecolobium Junghuhnianum* occur, and besides many shrubs, such as: *Diospyros ellipticifolia*, *Pavetta indica*, a *Coffea* species, *Petunga longifolia*, *Glochidion zeylanicum*, *Rubus alcaefolius* and *R. rosaefolius*, *Grewia laevigata*, *Evodia* species, *Leea angulata* and *L. aequata*, *Schefflera elliptica* and *S.* species. Several lianas and climbers such as: *Embelia philippinensis*, *Thunbergia fragrans*, *Ipomoea gracilis*, *Cissus hastata*, *Mucuna pruriens*. Among the herbs particularly several ferns, such as: *Arthropteris obliteratedata*, *Diplazium polypodioides*, and also *Desmodium zonatum*, *Panicum colonum*, *Calanthe veratrifolia*, *Habenaria* species. *Calanthe* occurs locally in dense vegetations. Also in these wood remnants epiphytes are rare; *Asplenium Nidus* only could be found here and there in larger numbers.

The steep south coast, which is about 400 m high, was covered for the greater part with grass and thin shrub vegetations.

In the southern part of the island, which is more thinly populated, are more forests, but here too they are thin and poor in epiphytes. In the muddy bay near the campong Barang-Barang is a vast mangrove forest, which, however, consists of but few species, mainly species of *Bruguiera*, *Ceriops Candolleana*, and *Rhizophora mucronata*. On rocky patches are found rather more *Rhizophora stylosa*, *Bruguiera caryophylloides*, and *Pithecolobium umbellatum*.

In many places the limestone rocks rise steeply up from the sea, and these walls bear particularly *Cycas Rumphii*, *Pandanus tectorius*, and *Euphorbia plumerioides*; *Casuarina equisetifolia* is found in sandy zones; *Piper retrofractum* is also common on these coasts.

Plants found in the island of Salajar.

Pteridophyta.

Lycopodiaceae.

1. *Lycopodium cernuum* L., 550 m, D.¹⁾ 1742.

Selaginellaceae.

2. *Selaginella plana* Hieron., T. 13879; 500 m, D. 1761.

Psilotaceae.

3. *Psilotum nudum* L., D. 1793.

Schizaeaceae.

4. *Lygodium circinatum* Sw., 300 m, D. 1714; 500 m, D. 1749.

Polypodiaceae.

5. *Adiantum caudatum* L., 250 m, D. 1678 — 6. *A. lunulatum* Burm., 200 m, D. 1657 — 7. *Anthrophium callifolium* Bl., D. 1722 — 8. *Arthropteris oblitterata* J. Sm., 550 m, D. 1769 — 9. *Aspidium polymorphum* Wall. et Wright., 300 m, D. 1720 — 10. *Asplenium contiguum* Kaulf., 50 m, D. 1884 — 11. *A. nidus* L., 400 m, D. 1699 — 12. *Cyclophorus lanceolatus* Alston, 200 m, D. 1659; 500 m, D. 1783 — 13. *Davallia denticulata* Mett., 200 m, D. 1840 — 14. *Dietyopteris irregularis* Pr., D. 1751 — 15. *Diplazium polypodioides* Bl., 550 m, D. 1770 — 16. *D. proliferum* Thou., D. 1768 — 17. *Drynaria querci-*

¹⁾ T = J. E. Teijsmann; Z = H. Zollinger; D = W. M. Docters van Leeuwen.

folia J. SM., T. 13636, 13856; 200 m, D. 1660 — 18. *Dryopteris pteroides* O. K., 300 m, D. 1719 — 19. *D. subpubescens* O. K., D. 1785 — 20. *D. uliginosa* C. CHR., T. 13877 — 21. *Hemionitis arifolia* MOORE, 300 m, D. 1652 — 22. *Microlepia speluncae* MOORE, T. 13584 — 23. *Nephrolepis biserrata* SCHOTT, 200 m, D. 1825 — 24. *N. exaltata* SCHOTT, T. 13618; 300 m, D. 1731 — 25. *Notholaena hirsuta* DESV., 300 m, D. 1811 — 26. *Polypodium scolopendria* BURM., 300 m, D. 1715, 1721 — 27. *Pteris quadriaurita* RETZ, 300 m, D. 1723 — 28. *Stenosemia aurita* PR., D. 1747.

Gymnospermae.

Cycadaceae.

29. *Cycas Rumphii* MIQ., D. 1881.

Gnetaceae.

30. *Gnetum Gnemon* L., D. 1779.

Angiospermae — Dicotyledonae.

Casuarinaceae.

31. *Casuarina equisetifolia* L., T. 13890; D. 1511.

Moraceae.

32. *Cudrania javanensis* TRÉC., T. 13828 — 33. *Fatoua japonica* BL., T. 13920; 200 m, D. 1828 — 34. *Ficus Ampelos* BURM., 300 m, D. 1650 — 35. *F. annulata* BL., T. 13762 — 36. *F. Benjamina* L., T. 13864; D. 1886 — 37. *F. callicarpa* MIQ., T. 13616, 13793, 13926 — 38. *F. fistulosa* REINW., D. 1772, 1808 — 39. *F. glomerata* ROXB., 100 m, D. 1669 — 40. *F. hispida* L. f., D. 1889 — 41. *F. infectoria* ROXB., T. 13758 — 42. *F. retusa* L., T. 13581; D. 1757, 1798; 300 m, 1810, 1912 — 43. *F. Rumphii* BL., T. 13824 — 44. *F. superba* MIQ., 400 m, D. 1725 — 45. *Phyllochlamys taxoides* KOORD., 50 m, D. 1908 — 46. *Streblus asper* LOUR., T. 13812; 50 m, D. 1672, 1735.

Ulmaceae.

47. *Trema orientalis* (L.) BL., T. 13884, 13908.

Urticaceae.

48. *Fleurya ruderalis* GAUD., D. 1897 — 49. *Laportea* species, T. 13791 — 50. *Pilea* species, D. 1697 — 51. *Pipturus incanus* WEDD., T. 13901.

Piperaceae.

52. *Heckeria umbellata* KUNTH. var. *subpeltata* DC., 550 m, D. 1758 — 53. *Peperomia pellucida* H. B. K., 150 m, D. 1841 — 54. *P. species*, 400 m, D. 1797 — 55. *Piper betle* L., 550 m, D. 1741 — 56. *P. caninum* BL., 300 m, D. 1734; 400 m, D. 1807; 550 m, D. 1745 — 57. *P. miniatum* BL., T. 13638 — 58. *P. retrofractum* VAHL, D. 1913.

Santalaceae.

59. *Exocarpus latifolius* R. BR., D. 1928.

Olacaceae.

60. *Ximenia americana* L., T. 13810.

Loranthaceae.

61. *Amylotheea stenopetala* DANS., T. 13587; 200 m, D. 1822 — 62. *Ginalloa Arnottiana* KORTL., 300 m, D. 1712 — 63. *Scurrula fusca* G. DON., T. 13771; 400 m, D. 1709.

Chenopodiaceae.

64. *Salicornia brachiata* ROXB., T. 13892; D. s. n.

Amaranthaceae.

65. *Achyranthes aspera* L., 50 m, D. 1872 — 66. *Aerva scandens* WALL., 50 m, D. 1873 — 67. *Allmania nodiflora* R. BR., D. 1862 — 68. *Cyathula prostrata* (L.) BL., D. 1842.

Nyctaginaceae.

69. *Boerhaavia diandra* BURM., T. 13589 — 70. *B. mutabilis* R. BR. T. 13899 — 71. *Pisonia aculeata* L., T. 13625, 13830; D. 1869.

Aizoaceae.

72. *Glinus lotoides* LOEFL., T. 13613 — 73. *Sesuvium portulacastrum* L., D. s. n.

Cactaceae.

74. *Opuntia species*, D. s. n.

Portulacaceae.

75. *Portulaca oleracea* L., D. s. n.

Euphorbiaceae.

76. *Acalypha Caturus* BL., T. 13594, 13610, 13875; 550 m, D. 1765 — 77. *Alchornea rugosa* MUELL.-ARG., 400 m, D. 1850 — 78. *Antidesma*

ghaesembilla GAERTN., T. 13871 — 79. *Breynia* species, 100 m, D. 1877 — 80. *Bridelia monoica* MERR., 200 m, D. 1835; 50 m, D. 1891 — 81. *Cladogynos orientalis* ZIPP., Z. 1165 — 82. *Claoxylon* species, D. 1654; 400 m, D. 1694 — 83. *Codiaeum variegatum* BL., 550 m, D. 1764 — 84. *Euphorbia Atoto* FORST., T. 13925 — 85. *E. plumerioides* TEYSM., D. 1894 — 86. *Excoecaria Agallocha* L., 1856, 1931 — 87. *Gelonium* species, 400 m, D. 1695 — 88. *Glochidion molle* BL., 250 m, D. 1816 — 89. *G. rubrum* BL., 200 m, D. 1827 — 90. *G. zeylanicum* JUSS., T. 13799; 600 m, D. 1726 — 91. *Homalanthus populneus* O. K., 300 m, D. 1716 — 92. *Macaranga hispida* MUELL.-ARG., D. 1754, 1755 — 93. *Mallotus philippinensis* MUELL.-ARG., 200 m, D. 1681; 400 m, D. 1855, 1866, 1870 — 94. *M. resinosus* MERR., T. 13912 — 95. *Phyllanthus* species, D. 1680 — 96. *Ricinus communis* L., D. s. n. — 97. *Rottlera tinctoria* HASSK., T. 13881 — 98. *Strophoblachia fimbriicalyx* BOERL., D. 1879.

Annonaceae.

99. *Artabotrys odoratissimus* R. BR., 50 m, D. 1904 — 100. *Polyalthia canangioides* BOERL., T. 13576 — 101. *Unona discolor* VAHL, D. 1650 — 102. *Uvaria littoralis* BL., T. 13611; 250 m, D. 1690.

Aristolochiaceae.

103. *Aristolochia Tagala* CHAM., 300 m, D. 1817.

Lauraceae.

104. *Actinodaphne* species, 500 m, D. 1773 — 105. *Cassytha filiformis* L., D. s. n. — 106. *Litsea Forstenii* BL., T. 13588 — 107. *L. ochracea* BL., T. 13604.

Hernandiaceae.

108. *Hernandia peltata* MEISSN., T. 13850.

Menispermaceae.

109. *Stephania Forsteri* A. GRAY, 400 m, D. 1792.

Capparidaceae.

110. *Capparis sepiaria* L., T. 13836.

Moringaceae.

111. *Moringa oleifera* LAMK., D. 1868.

Flacourtiaceae.

112. *Casearia grewiaefolia* VENT., T. 13815.

Begoniaceae.

113. *Begonia* species, 550 m, D. 1746.

Dilleniaceae.

114. *Tetracera scandens* MERR., 550 m, D. 1750.

Guttiferae.

115. *Calophyllum Inophyllum* L., 400 m, D. 1848.
116. *Garcinia dulcis* KURZ, T. 13579.

Pittosporaceae.

117. *Pittosporum timorense* BL., D. 1914.

Rosaceae.

118. *Rubus alcaefolius* POIR., 500 m, D. 1732 — 119. *R. rosaefolius* SM., 600 m, D. 1737.

Mimosaceae.

120. *Acacia* species, 100 m, D. 1661 — 121. *Pithecolobium Jung-huhnianum* BENTH., 400 m, D. 1805 — 122. *P. umbellatum* BENTH., T. 13759; D. 1933.

Papilionaceae-Caesalpinioideae.

123. *Bauhinia binata* BLANCO, D. 1932 — 124. *B. Lingua* DC., T. 13639, 18031 — 125. *Caesalpinia Crista* L., 300 m, D. 1812 — 126. *Cassia alata* L., 400 m, D. 1852 — 127. *C. Fistula* L., T. 13860 — 128. *C. marginata* ROXB., T. 13757 — 129. *C. megalantha* DCNE, T. 13829 — 130. *C. Sophora* L., T. 13763; 200 m, D. 1662; D. 1826 — 131. *C. Tora* L., 350 m, D. 1708 — 132. *Cynometra ramiflora* L., T. 13840 — 133. *Mezoneurum pubescens* DESF., T. 13873 — 134. *Peltophorum pterocarpum* BACK., T. 13769, 13848.

Papilionaceae-Papilionatae.

135. *Abrus precatorius* L., 250 m, D. 1686 — 136. *Cajanus* CAJAN DRUCE, 400 m, D. 1789 — 137. *Canavalia maritima* THOU., D. s. n. — 138. *Cantharospermum volubile* MERR., D. 1936 — 139. *Clitoria Ternatea* L., D. s. n. — 140. *Crotalaria ferruginea* GRAH., 400 m, D. 1800; D. 1849 — 141. *C. striata* DC., D. 1305, 1946 — 142. *Derris elegans* BENTH., T. 13838 — 143. *D. elliptica* BENTH., T. 13641 — 144. *D. multiflora* BENTH., T. 13603 — 145. *D. scandens* BENTH., D. 1790, 1892 — 146. *Desmodium laxiflorum* DC., 300 m, D. 1655 — 147. *D. umbellatum* DC., D. 1940 — 148. *D. zonatum* MIQ., 400 m, D. 1794 — 149. *Dioclea*

javanica BENTH., 500 m, D. 1775 — 150. Dolichos falcatus KLEIN, 400 m, D. 1802 — 151. Dunbaria circinalis BAKER, 300 m, D. 1692 — 152. Flemingia strobilifera R. BR., 200 m, D. 1824 — 153. Inocarpus edulis FORST., T. 13623, 13874 — 154. Mucuna pruriens DC., 500 m, D. 1776 — 155. Phylaceum bracteosum BENN., D. 1756 — 156. Pongamia pinnata MERR., T. 13909; D. 1942, 1947 — 157. Pseudarthria viscida W. et A., D. 1871 — 158. Psophocarpus tetragonolobus DC., D. 1788 — 159. Rhynchosia acuminatissima MIQ., 400 m, D. 1795 — 160. Sesbania grandiflora PERS., D. 1926 — 161. Tephrosia purpurea PERS., 200 m, D. 1664 — 162. Teramnus labialis SPRENG., D. 1691 — 163. Uraria lagopodioides DESV., 350 m, D. 1818 — 164. U. species, D. 1915.

Elaeagnaceae.

165. Elaeagnus species, T. 13648.

Lythraceae.

166. Pemphis acidula FORST., T. 13891, 13923; D. 1939.

Sonneratiaceae.

167. Sonneratia alba SM., D. s. n.

Rhizophoraceae.

168. Bruguiera caryophylloides BL., D. 1923 — 169. B. gymnorrhiza LAMK., T. 13817 — 170. Ceriops Candolleana ARN., T. 13921; D. 1927 — 171. Rhizophora mucronata LAMK., T. 13816 — 172. R. stylosa GRIFF., T. 13814.

Combretaceae.

173. Lumnitzera racemosa WILLD., D. 1935 — 174. Terminalia Cattapa L., D. s. n. — 175. T. edulis BLANCO, T. 13839.

Myrtaceae.

176. Eugenia Cumini MERR., T. 13619 — 177. E. malaccensis LAMK., D. 1305 — 178. E. polycephala MIQ., T. 13760 — 179. E. Reinwardtiana DC., D. 1920 — 180. E. species, D. 1907 — 181. E. species, 300 m, D. 1676 — 182. Psidium Guajava L., D. s. n.

Melastomataceae.

183. Melastoma Malabathricum L., 550 m, D. 1730 — 184. Meme-cylon species, T. 13600.

Oenotheraceae.

185. Ludwigia parviflora ROXB., 200 m, D. 1819.

Malvaceae.

186. *Abutilon indicum* Sw., 100 m, D. 1876 — 187. *Gossypium obtusifolium* ROXB., D. s. n. — 188. *Hibiscus tiliaceus* L., T. 13761; 200 m, D. 1836; 500 m, D. 1752 — 189. *Sida acuta* BURM., D. 1838 — 190. *S. rhombifolia* L., 300 m, D. 1693 — 191. *Thespesia Lampas* DALZ. et GIBS., 200 m, D. 1821 — 192. *Urena lobata* L., 550 m, D. 1763.

Tiliaceae.

193. *Grewia acuminata* JUSS., D. 1916 — 194. *G. laevigata* VAHL, T. 13646; D. 1823; 50 m, D. 1882; 500 m, D. 1784 — 195. *G. multiflora* JUSS., T. 18037 — 196. *Triumfetta indica* LAMK., D. 1305, 1845, 1885.

Sterculiaceae.

197. *Kleinhovia hospita* L., 50 m, D. 1874 — 198. *Pterospermum acerifolium* WILLD., 250 m, D. 1683 — 199. *Sterculia* species, D. 1918.

Elaeocarpaceae.

200. *Elaeocarpus floribundus* BL., D. 1753.

Oxalidaceae.

201. *Biophytum sensitivum* DC., D. 1943.

Malpighiaceae.

202. *Hiptage benghalensis* KURZ, T. 13821.

Rutaceae.

203. *Evodia* species, 600 m, D. 1740 — 204. *Glycosmis cochinchinensis* PIERRE, T. 13595 — 205. *Micromelum pubescens* BL., T. 13826.

Simarubaceae.

206. *Brucea amarissima* MERR., T. 13898, 13907.

Burseraceae.

207. *Canarium commune* L., D. s. n.

Meliaceae.

208. *Aglaiia argentea* BL., T. 13854; 100 m, D. 1667 — 209. *Dysoxylum amooroides* MIQ., T. 13859 — 210. *D. arborescens* MIQ., 500 m, D. 1759, 1787 — 211. *D. species*, 500 m, D. 1703.

Anacardiaceae.

212. *Buchanania arborescens* BL., T. 13858; 250 m, D. 1679 — 213. *Mangifera indica* L., D. s. n. — 214. *Semecarpus gigantifolius* VIDAL, T. 13583; D. 1942.

Sapindaceae.

215. *Allophyllus* Cobbe BL., D. 1899 — 216. *Arytera littoralis* BL., D. 1921 — 217. *Cardiospermum Halicacabum* L., 200 m, D. 1663 — 218. *Dodonaea viscosa* JACQ., T. 13852; D. 1944 — 219. *Schleichera trijuga* WILLD., T. 13626, 13764.

Celastraceae.

220. *Evonymus javanicus* BL., D. 1739.

Rhamnaceae.

221. *Colubrina asiatica* BROGN., T. 13615 — 222. *Gouania javanica* MIQ., 100 m, D. 1887 — 223. *Zizyphus celtidifolia* BL., 100 m, D. 1875 — 224. *Z. Oenoplia* MILL., 200 m, D. 1837.

Vitaceae.

225. *Ampelocissus aculeata* PLANCH., T. 13924 — 226. *A. arachnoidea* PLANCH., T. 13858 — 227. *Cissus adnata* ROXB., T. 13634; 550 m, D. 1760 — 228. *C. discolor* VENT., 300 m, D. 1656 — 229. *C. hastata* PLANCH., 500 m, D. 1778 — 230. *C. nodosa* BL., 200 m, D. 1665 — 231. *C. repanda* VAHL., 400 m, D. 1853 — 232. *Leea acuata* L., 400 m, D. 1846 — 233. *L. angulata* KORTL., 550 m, D. 1767 — 234. *L. rubra* BL., T. 13865 — 235. *Vitis flexuosa* THUNB., T. 13857.

Cornaceae.

236. *Alangium sundanum* MIQ., 600 m, D. 1726.

Araliaceae.

237. *Schefflera elliptica* HARMS., 400 m, D. 1700 — 238. *S. species*, 600 m, D. 1728.

Plumbaginaceae.

239. *Plumbago zeylanica* L., 50 m, D. 1890.

Myrsinaceae.

240. *Aegiceras floridum* R. et SCH., T. 13813 — 241. *Embelia philippinensis* DC., 500 m, D. 1734 — 242. *Maesa indica* WALL., 150 m, D. 1844.

Ebenaceae.

243. *Diospyros ellipticifolia* BAKH., T. 13645, 13686; Z. 3325; 400 m, D. 1796 — 244. *D. malabarica* KOSTEL., T. 13900 — 245. *D. maritima* BL., T. 13910 — 246. *D. montana* ROXB., T. 13914.

Convolvulaceae.

247. *Ipomoea gracilis* R. BR., 550 m, D. 1736 — 248. *Erycibe paniculata* ROXB., T. 13596 — 249. *Ipomoea Pes-caprae* SWEET, D. 1865 — 250. *Merremia hastata* HALL. f., T. 13888; D. 1910 — 251. *M. vitifolia* HALL. f., 300 m, D. 1702 — 252. *Stictocardia* species, Z. 3327.

Borraginaceae.

253. *Cordia Myxa* L., D. 1919 — 254. *Ehretia laevis* ROXB., D. 1917 — 255. *Tournefortia argentea* L. f., D. 1906.

Solanaceae.

256. *Datura fastuosa* L., T. 18033; 20 m, D. 1673.

Scrophulariaceae.

257. *Ilysanthes* species, 400 m, D. 1801.

Bignoniaceae.

258. *Dolichandrone spathacea* SCHUM., T. 13861; D. 1305.

Acanthaceae.

259. *Asystasia intrusa* BL., 50 m, D. 1900; 250 m, D. 1682; 400 m, D. 1847 — 260. *Barleria Prionitis* L., D. 1911 — 261. *Hypoestes* species, 250 m, D. 1687 — 262. *Josephinia imperatricis* VENT., T. 18034 — 263. *Justicia Gendarussa* BURM. f., T. 13855 — 264. *Lepidagathis javanica* BL., T. 13643; D. 1902 — 265. *Pseuderanthemum diversifolium* MIQ., T. 13590; 250 m, D. 1680 — 266. *Ruellia repens* L., D. 1650, 1698 — 267. *Thunbergia fragrans* ROXB., 500 m, D. 1738.

Verbenaceae.

268. *Avicennia officinalis* L., D. 1934 — 269. *Clerodendron inerme* GAERTN., D. 1305, 1947 — 270. *Gmelina asiatica* L. var. *villosa* BAKH., T. 13845; 550 m, D. 1750 — 271. *Lantana Camara* L., D. 1674 — 272. *Vitex parviflora* JUSS., T. 13813 — 273. *V. trifolia* L., D. 1710, 1863.

Labiatae.

274. *Coleus atropurpureus* BENTH., 50 m, D. 1888 — 275. *Cymaria acuminata* DECNE., 50 m, D. 1883 — 276. *Hyptis capitata* JACQ., 550 m, D. 1762 — 277. *H. suaveolens* PORT., T. 13796.

Loganiaceae.

278. *Strychnos septemnervis* CLARKE, 550 m, D. 1743.

Apocynaceae.

279. *Aganosma marginata* G. DON., T. 13872 — 280. *Anodendron tenuiflorum* MIQ., T. 13614 — 281. *Cerbera manghas* L., D. 1303 — 282. *Kopsia flavida* BL., 400 m, D. 1696 — 283. *Ochrosia* species, D. 1896 — 284. *Rauwolfia amsoniifolia* DC., T. 13833, 13863, 13882, 13913; Z. 3322; D. 1867 — 285. *Tabernaemontana floribunda* BL., 200 m, D. 1831 — 286. *Wrightia calycina* DC., T. 13602; 300 m, D. 1813.

Asclepiadaceae.

287. *Asclepias curassavica* L., 200 m, D. 1666 — 288. *Ceropegia curviflora* HASSK., 50 m, D. 1671 — 289. *Cynanchum carnosum* SCHLTR., D. 1929 — 290. *C. species*, 250 m, D. 1689; 550 m, D. 1768 — 291. *Dioschidia rafflesiana* WALL., D. 1895 — 292. *Gymnanthera paludosa* BL., D. 1930 — 293. *Secamone* species, D. 1938 — 294. *Tylophora exilis* COLEBR., 300 m, D. 1713.

Rubiaceae.

295. *Azima sarmentosa* B. et H., T. 13905; D. 1925 — 296. *Coffea* species, 500 m, D. 1777 — 297. *Guettarda speciosa* BL., T. 18035 — 298. *Morinda tinctoria* ROXB., T. 13880 — 299. *Oldenlandia corymbosa* L., 200 m, D. 1830 — 300. *O. paniculata* L., D. 1992 — 301. *Pavetta indica* L., 400 m, D. 1705 — 302. *Petunga longifolia* DC., 500 m, D. 1766 — 303. *Psychotria* species, 300 m, D. 1706 — 304. *Tarenna saleirensis* VALETON, T. 13640.

Cucurbitaceae.

305. *Benincasa hispida* COGN., 200 m, D. 1820, 1893 — 306. *Lagenaria leucantha* RUSBY., D. s. n. — 307. *Melothria perpusilla* COGN., 400 m, D. 1698.

Compositae.

308. *Blumea balsamifera* DC., 250 m, D. 1815 — 309. *B. chinensis* DC., 350 m, D. 1707 — 310. *Crepis japonica* BENTH., 400 m, D. 1803 — 311. *Elephantopus scaber* L., 250 m, D. 1701 — 312. *Gynura sarmentosa* DC., T. 13609 — 313. *Mikania cordata* B. L. ROBINSON, 400 m, D. 1711 — 314. *Pterocaulon sphacelatum* BENTH. et HOOK.F., T. 13887 — 315. *Senecio sonchifolius* MOENCH., 300 m, D. 1814 — 316. *Vernonia actaea* KOST., D. 1937 — 317. *V. erigeroides* DC., T. 13878, 13880; 200 m, D. 1834 — 318. *Wedelia biflora* DC., T. 13599, 13922; D. s. n. — 319. *W. species*, 400 m, D. 1799.

Angiospermae - Monocotyledonae.

Hydrocharitaceae.

320. *Enhalus acoroides* STEUD., T. 18027.

Potamogetonaceae.

321. *Cymodocea ciliata* EHRENB., T. 13917.

Liliaceae.

322. *Smilax zeylanica* L., 200 m, D. 1650; D. 1839.

Pontederiaceae.

323. *Monochoria vaginalis* PRESL, 400 m, D. 1804.

Dioscoreaceae.

324. *Dioscorea alata* L., Z. 1171 — 325. *D. oppositifolia* L., 250 m, D. 1688 — 326. *D. triphylla* L., T. 13866.

Cyperaceae.

327. *Cyperus distans* L. f., T. 13820, 13876 — 328. *C. pennatus* LAMK., T. 13919; D. 1858 — 329. *C. stoloniferus* RETZ, D. 1945 — 330. *Fimbristylis annua* R. et SCH., T. 13822; 300 m, D. 1718 — 331. *F. spathacea* ROTH., D. 1861 — 332. *Kyllinga monocephala* ROTH., D. 1857 — 333. *Scleria multifoliata* BOECK., 400 m, D. 1854.

Gramineae.

334. *Apluda mutica* L., 150 m, D. 1843 — 335. *Asthenochloa tenera* BUSE, 100 m, D. 1880 — 336. *Centotheca latifolia* TRIN., 50 m, D. 1670 — 337. *Imperata cylindrica* P. B., D. s. n. — 338. *Monerma repens* P. B., Z. 1083 — 339. *Oplismenus compositus* P. B., 200 m, D. 1658 — 340. *Panicum colonum* L., 500 m, D. 1782 — 341. *Pogonatherum panicum* HACK., T. 13819 — 342. *Spinifex littoreus* MERR., D. 1864 — 343. *Sporolobus diander* P. B., 200 m, D. 1684.

Cannaceae.

344. *Canna indica* L., 50 m, D. 1878.

Orchidaceae.

345. *Calanthe veratrifolia* R. BR., 550 m, D. 1771 — 346. *Cymbidium Finlaysonianum* LINDL., 250 m, D. 1685 — 347. *Dendrobium crumenatum* Sw., T. 13818 — 348. *Habenaria* species, 500 m, D. 1677 — 349. *Liparis* species, D. 1369 — 350. *Microstylis latifolia* J. J. S., 300 m, D. 1717 — 351. *Tropidia* species, D. 1372.

Palmae.

352. *Areca Catechu* L., D. s. n. — 353. *Arenga pinnata* MERR., D. s. n. — 354. *Borassus flabellifer* L., T. s. n. — 355. *Cocos nucifera* L., D. s. n. — 356. *Corypha Utan* LAMK., T. s. n. — 357. *Nipa fruticans* WURMB, D. s. n.

Araceae.

358. *Pothos Korthalsi* SCHOTT., 300 m, D. 1651.

Pandanaceae.

359. *Pandanus tectorius* SOL., D. s. n. — 360. *Pandanus* species, 600 m, D. s. n.

6. THE ISLAND OF KAJOEADI.

This is a small, oblong island; the direction of the longitudinal axis is NW to SE. It consists of raised coral rocks, only along the coast occur a few level patches, the rest is hilly; the tops are, from north to south: Bonélambère, Boehangpararang, and Tandjoenglipang, which are from 150 to 200 m high. There are only narrow strips of sandy beach, otherwise the coast is formed by raised coral reefs, fanciful and full of grottos. There are a few small campongs, the inhabitants of which live by fishing. Round the campongs are small fields where cocos, maize and *Musa* are cultivated. For the rest the island is covered with a thin-stemmed wood, and with shrubs. The soil consists for the greater part of limestone rocks, which are eroded in a very fantastic manner, so that points and blocks of the coral rocks stick out everywhere above the thin layer of humus. Where this layer is not too thin the wood is cleared and maize and *Cucurbitaceae* are cultivated. The plants stand in hollows between the coral rocks, often very far apart.

The remaining wood consisted for the greater part of young, non-flowering trees; epiphytes were not present, and lianas were very sparse. Mangrove was also absent. On the coral rocks near the sea I found a species of *Vernonia* with fleshy leaves and beautiful, purple capitula, *V. actaea*; the *Pescaprae* and *Barringtonia* associations were very poorly developed.

Plants found in the island of Kajoeadi.

Dicotyledonae.

1. *Fatoua japonica* BL., D. 1812 — 2. *Ficus retusa* L., D. 1306 — 3. *Fleurya ruderalis* GAUD., 200 m, D. 1327 — 4. *Deeringia amarantoides* MERR., 150 m, D. 1329 — 5. *Macaranga Tanarius* MUELL.-ARG., D. 1333,

1340 — 6. *Mallotus moluccanus* MUELL.-ARG., 150 m, D. 1328 — 7. *Aristolochia Rumphii* KOSTEL., 100 m, D. 1336 — 8. *Anamirta Cocculus* W. et A., 300 m, D. 1324 — 9. *Acacia* species, D. 1325 — 10. *Abrus precatorius* L., D. 1345 — 11. *Pongamia pinnata* MERR., D. 1314 — 12. *Glycosmis cochinchinensis* PIERRE, D. 1341 — 13. *Triumfetta indica* LAMK., D. 1307 — 14. *Kleinhovia hospita* L., D. 1346 — 15. *Pterospermum acerifolium* WILLD., D. 1326 — 16. *Brucea amarissima* MERR., D. 1332 — 17. *Munronia javanica* BENN., 200 m, D. 1339 — 18. *Gymnosporia montana* LAWS., D. 1316 — 19. *Tetrastigma lanceolarium* PLANCH., D. 1344 — 20. *Calonyction* species, D. 1308 — 21. *Ipomoea Pes-caprae* SWEET, D. 1310 — 22. *Jacquemontia paniculata* HALL. f., 100 m, D. 1330 — 23. *Josephinia imperatricis* VENT., D. 1313 — 24. *Asystasia intrusa* BL., D. 1321 — 25. *Clerodendron inerme* GAERTN., D. 1311 — 26. *Vitex parviflora* JUSS., D. 1309 — 27. *Leucas javanica* BENTH., D. 1318 — 28. *Tabernaemontana floribunda* BL., D. 1342 — 29. *Ceropegia curviflora* HASSK., D. 1337 — 30. *Cucumis Melo* L., D. 1331 — 31. *Cucurbita Pepo* L., 200 m, D. 1323 — 32. *Melothria perpusilla* COGN., D. 1334 — 33. *Scaevola frutescens* KRAUSE, D. 1317 — 34. *Senecio* species, D. 1319 — 35. *Vernonia actaea* KOST., D. 1320 — 36. *Wedelia biflora* DC., D. 1315.

Monocotyledonae.

37. *Dioscorea oppositifolia* L., 50 m, D. 1338 — 38. *Spinifex littoreus* MERR., D. s. n. — 39. *Cocos nucifera* L., D. s. n. — 40. *Pandanus tectorius* SOL., D. s. n.

7. THE ISLAND OF KALAO TOA.

This island is the most south easterly of the Salajar Archipelago. It is larger than Kajoeadi, but it displays the same particulars. The coast is formed for the greater part by raised coral formations with many caves; sandy beaches occur only here and there, the *Pescaprae* and *Barringtonia* associations are, consequently, scarcely developed. Mangrove is entirely absent. The interior of the island is hilly, and in the south-east it reaches a height of 320 m; a ridge, the tops of which reach up to 250 and 300 m, runs in the direction north to south. The soil consists of black earth with in between pointed coral rocks. In the south-west is a small fishermen's campong, surrounded by disorderly arable land, and behind this, deserted and weed-grown fields with young trees and low shrubs growing in them. The rest is covered with thin wood, only a few specimens of larger trees rising above them. One single epiphyte,

Polypodium punctatum, occurs in the higher parts, and there were also found two fructifying terrestrial orchids, *Liparis* and *Tropidia* species. A large liana, *Mucuna gigantea*, was remarkably common; the inflorescences consisted of a thin peduncle, about 1 m long, with at the end an accumulation of greenish white flowers. Many trees were cut down, but it appeared that they were not flowering, so that nothing can be recorded about the composition of the wood.

Plants found in the island of Kalaotoa.

Pteridophyta.

1. *Dryopteris pteroides* O. K., 300 m, D. 1378 — 2. *Polypodium punctatum* Sw., 150 m, D. 1374.

Dicotyledonae.

3. *Ficus Ampelos* BURM., D. 1376 — 4. *Phyllochlamys taxoides* KOORD., 200 m, D. 1381 — 5. *Trema orientale* (L.) BL., D. 1401 — 6. *Pipturus incanus* WEDD., D. 1400; 50 m, D. 1409 — 7. *Deeringia amarantoides* MERR., D. 1402 — 8. *Acalypha Caturus* BL., 250 m, D. 1370 — 9. *Bridelia monoica* MERR., D. 1399 — 10. *Cyclostemon* species, 300 m, D. 1365 — 11. *Macaranga Tanarius* MUELL.-ARG., D. 1347 — 12. *Mallotus philippinensis* MUELL.-ARG., 50 m, D. 1407 — 13. *Pycnarrhena celebica* DIELS, 300 m, D. 1368 — 14. *Albizia saponaria* BL., D. 1357 — 15. *Cassia timorensis* DC., D. 1398 — 16. *Desmodium laxiflorum* DC., 300 m, D. 1380 — 17. *Mucuna gigantea* DC., 300 m, D. 1371 — 18. *Phyllacium bracteosum* BENN., D. 1382 — 19. *Quisqualis sulcata* v. SL., D. 1405 — 20. *Abelmoschus moschatus* MEDIC., 50 m, D. 1385 — 21. *Abutilon indicum* Sw., 100 m, D. 1386 — 22. *Gossypium obtusifolium* ROXB., D. 1360 — 23. *Hibiscus hirtus* L., D. 1352 — 24. *Urena lobata* L., 150 m, D. 1383 — 25. *Dracontomelum mangiferum* BL., D. 1367 — 26. *Allophylus Cobbe* BL., D. 1356 — 27. *Erioglossum edule* BL., D. 1348 — 28. *Corchorus acutangulus* LAMK., D. 1361 — 29. *Grewia laevigata* VAHL, D. 1358 — 30. *Cardiopteryx lobata* WALL., D. 1395 — 31. *Gouania javanica* MIQ., 20 m, D. 1397 — 32. *Leea indica* MERR., 100 m, D. 1408 — 33. *Tetrastigma lanceolarium* PLANCH., D. 1411 — 34. *Ellipanthus* species, 300 m, D. 1364 — 35. *Maesa indica* WALL., D. 1359, 1404 — 36. *Cordia Myxa* L., D. 1406 — 37. *Tournefortia argentea* L. f., D. 1387 — 38. *T. sarmentosa* LINK., 200 m, D. 1384 — 39. *Asystasia intrusa* BL., D. 1351 — 40. *Hypoestes* species, D. 1388 — 41. *Lepidagathis* species, 200 m, D. 1377 — 42. *Ruellia repens* L., D. 1363 — 43. *Callicarpa longifolia* LAMK., D. 1349 — 44. *Clerodendron*

Blumea SCHAUER, D. 1375 — 45. *C. kalaotoense* H. J. LAM, D. 1373 — 46. *Premna integrifolia* L., D. 1540 — 47. *Vitex parviflora* JUSS., D. 1355 — 48. *Anisomeles indica* O. K., D. 1392 — 49. *Ceropegia curviflora* HASSK., D. 1389 — 50. *Cynanchum* species, D. 1354; 10 m, D. 1393 — 51. *Blumea balsamifera* DC., 100 m, D. 1379 — 52. *Vernonia patula* MERR., D. 1362 — 53. *Wedelia biflora* DC., D. 1390.

Monocotyledonae.

54. *Smilax zeylanica* L., D. 1410 — 55. *Dioscorea oppositifolia* L., D. 1394, 1396, 1403 — 56. *Oplismenus compositus* P. B., D. 1366 — 57. *Setaria verticillata* P. B., D. 1391 — 58. *Liparis* species, 250 m, D. 1363 — 59. *Tropidia* species, 300 m, D. 1372.

8. THE ISLAND OF BONERATE.

This island is populated somewhat denser than the other smaller islands of this archipelago, and consequently little is left of the original vegetation. The coast is for the greater part a steep coral coast, so that vegetations of beach plants have developed but sparsely. The country is hilly, and shelves away to the sea; the highest top is about 100 m above sea-level. Near the campongs is arable land, partly cultivated, partly deserted, and then covered with thin brushwood and grasses. Little is left of the forest, the trees are slender-stemmed, large trees are pretty well absent. Up to the highest points small woods alternate with monotonous vegetations of *Andropogon contortus*, with only here and there such shrubs as *Bridelia monoica*, *Glochidion rubrum*, *Capparis horrida*, and *Grewia laevigata*. BAKKER (1862, p. 215) mentions the presence of plains covered with thin grass and shrubs, and the absence of large trees, so that this island seems to have been disforested for quite a long time already. *Vernonia actaea*, *Vitex parviflora*, *Colubrina asiatica*, and *Pemphis acidula* grow scattered on the limestone rocks near the sea.

Plants collected in the island of Bonerate.

Dicotyledonae.

1. *Piper retrofractum* VAHL, D. 1463 — 2. *Achyranthes aspera* L., D. 1430 — 3. *Pupalia lappacea* MIQ., 100 m, D. 1466 — 4. *Anamirta Cocculus* W. et A., D. 1439 — 5. *Bridelia minutiflora* HOOK.f., D. 1412 — 6. *B. monoica* MERR., D. 1414 — 7. *Cladogynos orientalis* ZIPP., D. 1449 — 8. *Euphorbia serrulata* REINW., D. 1417, 1441 — 9. *Glochidion rubrum* BL., D. 1413 — 10. *Macaranga Tanarius* MUELL.-ARG., D. 1436 — 11. *Cassitha filiformis* L., D. 1440 — 12. *Capparis horrida* L., D. 1457 —

13. *Adenia* species, D. 1431 — 14. *Albizzia saponaria* BL., 50 m, D. 1447 — 15. *Canavalia ensiformis* DC., D. 1443 — 16. *C. maritima* THOU., D. 1464 — 17. *Cantharospermum scarabaeoides* BAILL., D. 1450 — 18. *Clitorea Ternatea* L., D. 1434 — 19. *Mucuna gigantea* DC., 50 m, D. 1451 — 20. *M. pruriens* DC., D. 1458 — 21. *Vigna marina* MERR., D. 1425 — 22. *Pemphis acidula* FORST., D. 1422 — 23. *Abutilon crispum* Sw., D. 1460 — 24. *Hibiscus vitifolius* L., D. 1461 — 25. *Leea rubra* BL., D. 1462 — 26. *Grewia laevigata* VAHL., D. 1470 — 27. *Triumfetta indica* LAMK., s. n. — 28. *Helicteres Isora* L., D. 1427 — 29. *Pterospermum acerifolium* WILLD., D. 1448 — 30. *Ryssopteris tiliifolia* JUSS., D. 1432 — 31. *Colubrina asiatica* BROGN., D. 1456 — 32. *Gymnosporia montana* LAWS., D. 1419 — 33. *Diospyros maritima* BL., D. 1416 — 34. *Ipomoea Nil* ROTH., D. 1452 — 35. *Jacquemontia paniculata* HALL.f., 40 m, D. 1435 — 36. *Merremia hastata* HALL.f., 50 m, D. 1445 — 37. *Ipomoea Quamoclit* L., D. 1438 — 38. *Asystasia intrusa* BL., D. 1420 — 39. *Premna integrifolia* L., D. 1418 — 40. *Vitex parviflora* JUSS., D. 1426 — 41. *Coleus atropurpureus* BENTH., D. 1444 — 42. *Ixora timorensis* DECNE., D. 1459 — 43. *Adenostemna Lavenia* O. K., D. 1435 — 44. *Vernonia actaea* KOST., D. 1423 — 45. *V. erigeroides* DC., D. 1424 — 46. *Wedelia biflora* DC., D. 1421.

Monocotyledonae.

47. *Smilax zeylanica* L., D. s. n. — 48. *Dioscorea bulbifera* L., 50 m, D. 1453 — 49. *Andropogon contortus* L., 20 m, D. 1429 — 50. *Apluda mutica* L., D. 1433 — 51. *Imperata cylindrica* P. B., D. s. n. — 52. *Cocos nucifera* L., D. s. n.

9. THE PASITALOE ISLANDS.

These are three small coral islands, the largest being 1 kilometer long and three quarters of a kilometer broad, but slightly raised above the sea-level; the egg-hills only of the orange-legged Megapode, *Megapodius duperreyi* (LESS & GARN), form slight elevations of the soil. My hopes that these islands would be uninhabited were not realized; in one of the islands was a small campong, the central parts of the three islands were cultivated and many coco-nuts had been planted. High trees, such as occur in the coral islands north of Batavia, were lacking. The sandy beaches were covered with a few representatives of the *Pescaprae* association: *Euphorbia Atoto*, *Canavalia maritima*, *Tribulus cistoides*, *Ipomoea Pes-caprae*, *Wedelia biflora*, and *Spinifex littoreus*. The last plant particularly covered vast areas with close vegetations. *Sesuvium*

portulacastrum also grew on the sandy beach. *Casuarina equisetifolia* was numerous, but only as small specimens. *Guettarda speciosa* was the only common representative of the *Barringtonia* association, there were a great many specimens, particularly as shrubs. *Pemphis acidula* formed groves on this soil, which owing to blocks of coral stone was rich in limestone. *Pandanus tectorius* was found as large specimens.

Plants collected in the Pasitaloe Islands.

Dicotyledonae.

1. *Casuarina equisetifolia* L., D. 1475 — 2. *Deeringia amarantoides* MERR., D. 1481 — 3. *Boerhaavia diffusa* L., D. 1480 — 4. *B. chinensis* DR., D. 1484 — 5. *Sesuvium portulacastrum* L., D. 1477 — 6. *Portulaca oleracea* L., D. 1474 — 7. *Euphorbia Atoto* L., D. 1465 — 8. *Canavalia maritima* THOU., D. s. n. — 9. *Polanisia viscosa* DC., D. 1472, 1482 — 10. *Pittosporum timorense* BL., D. 1471, 1485 — 11. *Pemphis acidula* FORST., D. 1479 — 12. *Tribulus cistoides* L., D. 1467 — 13. *Ipomoea Pes-caprae* SWEET, D. s. n. — 14. *Diclyptera* species, D. 1478 — 15. *Guettarda speciosa* L., D. 1473 — 16. *Muellerargia timorensis* COGN., D. 1468 — 17. *Melothria perpusilla* COGN., D. 1469 — 18. *Vernonia actaea* KOST., D. 1466 — 19. *Wedelia biflora* BL., D. s. n.

Monocotyledonae.

20. *Spinifex littoreus* MERR., D. s. n. — 21. *Cocos nucifera* L., D. s. n. — 22. *Pandanus tectorius* SOL., D. s. n.

10. THE ISLAND OF KALAO.

When seen from the sea the island seems to be entirely covered with virgin forests. There are a few unimportant settlements, surrounded by small fields. The coast is, for the greater part, rocky, only here and there small, white beaches are visible. Mangrove has developed but slightly; it is found here and there along the mouths of small rivers. In the north-west a rather vast area is covered with teak-forest, which owing to the light colour of the inflorescences stands out clearly against the virgin forest. I had an opportunity to make an excursion to this teak-forest and one along the south coast of this island. The teak-forest was a pretty well pure wood, it was mixed with but few other species of trees; the ground was densely covered with various species of shrubs, such as are regularly met with in the teak-forests in Java: species of *Glochidion*, *Grewia laevigata*, and other species which were not flowering. Along the south coast the wood reached down to the sea; on the steep

rocky coasts were many specimens of *Cycas Rumphii*, and on the sandy patches various beach plants. Epiphytes were rare in the part I visited. I do not possess any data about the composition of the wood.

Plants found in the island of Kalao.

Pteridophyta.

1. *Selaginella plana* Hieron., 50 m, D. 1490 — 2. *Acrostichum aureum* L., D. 1511 — 3. *Adiantum lunulatum* Burm., D. 1489 — 4. *Asplenium adiantoides* C. Chr., D. 1524 — 5. *Cyclophorus lanceolatus* Alston, D. 1542 — 6. *Diacalpe aspidioides* Bl., 100 m, D. 1499 — 7. *Dryopteris extensa* O. K., 100 m, D. 1498 — 8. *Polypodium punctatum* Sw., D. 1534.

Gymnospermae.

9. *Cycas Rumphii* Miq., D. 1531.

Ang.-Dicotyledonae.

10. *Casuarina equisetifolia* L., D. 1511, 1516, 1536 — 11. *Pipturus incanus* Wedd., 150 m, D. 1500 — 12. *Piper bantamense* Bl., 50 m, D. 1487 — 13. *Boerhaavia diffusa* L., D. 1527 — 14. *Acalypha caturus* Bl., 150 m, D. 1493 — 15. *Glochidion molle* Bl., D. 1518 — 16. *G. rubrum* Bl., D. 1522 — 17. *Macaranga tanarius* Muell.-Arg., D. 1505 — 18. *Mallotus molluccanus* Muell.-Arg., D. 1506 — 19. *Pycnarrhena celebica* Diels, 50 m, D. 1488 — 20. *Litsea resinosa* Bl., D. 1509 — 21. *Caesalpinia crista* L., D. 1543 — 22. *Desmodium laxiflorum* DC., D. 1521 — 23. *D. umbellatum* DC., D. 1517 — 24. *Sophora tomentosa* L., D. 1512, 1539 — 25. *Vigna marina* Merr., D. 1519 — 26. *Bruguiera caryophylloides* Bl., D. 1514 — 27. *Grewia laevigata* Vahl, 150 m, D. 1503 — 28. *Triumfetta indica* Lamk., D. 1535 — 29. *Hibiscus tiliaceus* L., D. 1530 — 30. *Sida acuta* Burm., D. 1525 — 31. *Thespesia populnea* Sol., D. 1538 — 32. *Ryssopteris tiliaefolia* Juss., 100 m, D. 1493 — 33. *Glycosmis cochinchinensis* Pierre, D. s. n. — 34. *Arytera littoralis* Bl., D. 1532 — 35. *Tetrastigma lanceolarium* Planch., D. 1544 — 36. *Ellipanthus species*, D. 1528 — 37. *Stictocardia species*, D. 1526 — 38. *Merremia hastata* Hall.f., D. 1533 — 39. *Cordia myxa* L., D. 1541 — 40. *Tournefortia argentea* L.f., D. 1523 — 41. *T. sarmentosa* Link., D. 1502 — 42. *Asystasia intrusa* Bl., D. 1520 — 43. *Hemigraphis reptans* F. Anders., D. 1437 — 44. *Pseuderanthemum diversifolium* Miq., 50 m, D. 1432 — 45. *Premna integrifolia* L., D. 1540 — 46. *Tectona grandis* L.f., D. s. n. — 47. *Vitex negundo* L., D. 1513 — 48. *Hyptis capitata*

JACQ., D. 1544 — 49. *Alstonia scholaris* R. BR., D. 1510 — 50. *Personia Cumingiana* DC., D. 1515 — 51. *Adenostemna Lavenia* O. K., 50 m, D. 1491 — 52. *Wedelia biflora* DC., D. 1532.

Monocotyledonae.

53. *Crinum asiaticum* L., D. 1545 — 54. *Centotheca latifolia* TRIN., 100 m, D. 1501 — 55. *Thuarea involuta* R. BR., D. 1537 — 56. *Scleria multiflora* BOECK., D. 100 m, D. 1504 — 57. *Peristylus goodyeroides* LINDL., 100 m, D. 1495 — 58. Orchidacea, 100 m, D. 1496.

11. THE ISLAND OF DJAMPEA.

This is the second largest island of the group, and the soil consists of older rocks (see paragraph 3). In this island one would expect a different and a richer flora than in the other islands which consist for the greater part of younger rock formations. Therefore I made several and longer excursions in this island, but the results did not come up to the expectations. Here too epiphytes are rare, and so were lianas. On the coasts are several campongs, the surroundings consisting of small fields and vast grass wildernesses, mainly covered with *Imperata cylindrica*. The hills in the interior, however, are covered with old virgin forest, which has a remarkable habitus; it consists of large trees with little undergrowth, so that the wood could easily be penetrated into, but the results of the botanical investigation were extremely poor, because the large trees could not be felled. At an altitude of about 300 m the surroundings began to be somewhat moistier; a small species of *Begonia* was common here and there, but here too epiphytes were so to speak absent. The liana *Mucuna gigantea* was common; the inflorescences hung down from the crowns of the trees, the peduncles were 15 to 20 m long, or even longer, and at the end was the inflorescence proper with its greenish white flowers and brown fruits, about 1½ to 2 m above the ground. Living water was restricted to a few rivulets, which, however, entirely run dry in the dry season. Here and there, particularly in the lower parts of the hills, the undergrowth of the wood consisted of dense rattan wildernesses. The ground is, for the greater part, bare and dry, and covered with dry leaves, the layer of humus is thin.

Here and there are a few sandy beaches, and on the west side is a very vast mangrove vegetation, which, however, consists of relatively few species. Many trees of the mangrove had developed into robust specimens. Mangrove also occurs, although to a lesser extent, on the south coast near the campong Marégé.

Plants found in the island of Djampea.

Pteridophyta.

1. *Lygodium flexuosum* Sw., 20 m, D. 1578 — 2. *Adiantum lunulatum* BURM., D. 1636 — 3. *Anthrophium callifolium* BL., D. 1558 — 4. *A. immersum* METT., D. 1566 — 5. *Asplenium adiantoides* C. CHR., D. 1569, 1596 — 6. *A. Nidus* L., 400 m, D. s. n. — 7. *Dryopteris concolor* KUHN, D. 1622 — 8. *D. mollis* HERON., D. 1559 — 9. *Hemigramme latifolia* COPEL., 150 m, D. 1620 — 10. *Leptochilus virens* C. CHR., 150 m, D. 1621 — 11. *Pteris quadriaurita* RETZ., 200 m, D. 1616, 1629 — 12. *P. cretica* L., D. 1635 — 13. *P. ensiformis* BURM., D. 1561, 1619.

Dicotyledonae.

14. *Ficus retusa* L., D. 1590 — 15. *Phyllochlamys taxoides* KOORD., D. 1615 — 16. *Piper bantamense* BL., D. 1625 — 17. *P. betle* L., D. 1097 — 18. *P. caninum* BL., D. 1637 — 19. *P. retrofractum* VAHL, D. 1627 — 20. *P. sarmentosum* ROXB., D. 1552 — 21. *Cyathula prostrata* BL., D. 1614 — 22. *Boerhaavia diffusa* L., D. 1603 — 23. *Portulaca oleracea* L., D. 1638 — 24. *Codiaeum Stellingianum* WARB., 400 m, D. 1566, 1567 — 25. *C. Cumingii* MUELL.-ARG., D. 1613 — 26. *Anomianthus auritus* BACK., D. 1643 — 27. *Unona discolor* VAHL, D. 1546, 1579, 1624 — 28. *Stephania Forsteri* A. GRAY, D. 1626 — 29. *Begonia* species, 300 m, D. 1568 — 30. *Tetracera scandens* MERR., D. 1640 — 31. *Pithecolobium umbellatum* BENTH., D. 1598 — 32. *Caesalpinia Nuga* ART., D. 1591 — 33. *Cassia alata* L., D. 1574 — 34. *C. occidentalis* L., D. 1548 — 35. *Canavalia ensiformis* DC., D. 1655 — 36. *Indigofera suffruticosa* MILL., D. 1606 — 37. *Desmodium umbellatum* DC., D. 1517 — 38. *Mucuna gigantea* DC., 100 m, D. s. n. — 39. *Pongamia pinnata* MERR., D. 1650 — 40. *Psophocarpus tetragonolobus* DC., D. 1581 — 41. *Sophora tomentosa* L., D. 1512, 1539 — 42. *Cynometra ramiflora* L., D. 1570 — 43. *Terminalia Catappa* L., D. 1594, 1599 — 44. *Sonneratia alba* SM., D. 1654 — 45. *Ludwigia parviflora* ROXB., D. 1575 — 46. *Bruguiera caryophylloides* BL., D. 1642 — 47. *B. gymnorhiza* LAMK., D. 1641 — 48. *Rhizophora mucronata* LAMK., D. 1649 — 49. *R. stylosa* GRIFF., D. 1618 — 50. *Hibiscus surattensis* L., D. 1557 — 51. *H. tiliaceus* L., D. 1573, 1600; 300 m, D. 1571 — 52. *Sida cordifolia* L., D. 1645 — 53. *S. thyrsoflora* MIQ., D. 1586 — 54. *Pterospermum acerifolium* WILLD., D. 1623 — 55. *Micromelum pubescens* BL., D. 1550 — 56. *Glycosmis cochinchinensis* PIERRE, D. s. n. — 57. *Canarium commune*

L., D. 1551 — 58. *Xylocarpus moluccensis* ROEM., D. 1588 — 59. *Cardiopteris lobata* WALL., D. 1612 — 60. *Cissus adnata* ROXB., D. 1589 — 61. *Leea angulata* KORTH., D. 1631 — 62. *Tetrastigma lanceolarium* PLANCH., D. 1553 — 63. *Aegiceras floridum* R. et SCH., D. 1593, 1653 — 64. *Embelia philippinensis* DC., D. 1549 — 65. *Diospyros maritima* BL., D. 1587 — 66. *Stictocardia* species, D. 1595 — 67. *Merremia hastata* HALL.f., D. 1604 — 68. *Cordia Myxa* L., D. 1601 — 69. *Physalis minima* L., D. 1639 — 70. *Limnophila* species, D. 1585 — 71. *Torenia* species, D. 1634 — 72. *Josephinia imperatricis* VENT., D. 1560 — 73. *Acanthus ilicifolius* L., D. 1646 — 74. *Pseuderanthemum diversifolium* MIQ., D. 1584 — 75. *Ruellia repens* L., D. 1577 — 76. *Clerodendron Blumeanum* SCHAUER, D. 1630 — 77. *C. inerme* GAERTN., D. 1652 — 78. *Vitex pubescens* VAHL, D. 1592 — 79. *Coleus atropurpureus* BENTH., D. 1651 — 80. *Hyptis capitata* JACQ., D. 1554, 1644 — 81. *H. suaveolens* POIT., D. 1647 — 82. *Alstonia scholaris* R. BR., 300 m, D. 1572 — 83. *Rauwolfia amsoniifolia* DC., 50 m, D. 1628 — 84. *Gymnanthera paludosa* BL., D. 1643 — 85. *Geophila herbacea* O. K., D. 1610 — 86. *Ophiorrhiza neglecta* BL., 400 m, D. 1573 — 87. *Coccinea cordifolia* COGN., D. 1582 — 88. *Melothria perpusilla* COGN., D. 1576 — 89. *Momordica Charantia* L., 30 m, D. 1583 — 90. *Ageratum conyzoides* L., D. 1605 — 91. *Erigeron linifolius* WILLD., D. 1611.

Monocotyledonae.

92. *Aneilema nudiflorum* R. BR., 60 m, D. 1632 — 93. *Cyperus diffusus* VAHL, 300 m, D. 1564 — 94. *C. dilutus* VAHL, D. 1608 — 95. *Centotheca latifolia* TRIN., 200 m, D. 1562 — 96. *Eragrostis amabilis* O. K., D. 1607 — 97. *Imperata cylindrica* P. B., D. s. n. — 98. *Panicum trigonum* RETZ, D. 1580 — 99. *Calamus* species, 150 m, D. 1565 — 100. *Cocos nucifera* L., D. s. n. — 101. *Homalomena* species, D. 1617.

12. CONCLUSION.

We have seen from the descriptions of the vegetations of the various islands that the vegetation may be called relatively poor. It stands to reason that when the investigations will be resumed, and if more time is available, many names of plants will be added to the plant-lists. General conclusions may yet be drawn from what has been found so far. From the fact that the vegetation is so very poor we may infer that the soil is not very fertile, and from the extreme scarcity of epiphytes that the atmosphere is dry. On my numerous excursions in the Malay Archipelago I have never seen a place where epiphytes are so

scarce and have so poorly developed. The dry season prevails for a very long time (cf. paragraph 3 on the climate). In Bonerate are found vast wildernesses of *Andropogon contortus*, a species of grass which mainly occurs in places with a strongly prevailing east-monsoon. In the island situated most easterly, Kalaotoa, I found *Setaria verticillata*, a species of grass which, in the Netherlands Indies, is only found in the very dry island Soemba and on the extreme north-east of Java, where the east-monsoon is also strongly prevailing.

An other remarkable and rare species of grass, *Asthenochloa tenera*, (see HENRARD, 1929, p. 579) was collected at an altitude of about 100 m on a limestone hill in the southern part of Salajar. So far this grass has been found on the slopes of Mt Idjen in East Java, between 200 and 1000 m above sea-level, and in the Philippine Islands.

Remarkably small is the number of new species found in this territory which as yet has been investigated so very seldom. There will probably be new species among the *Orchidaceae* which have not yet been identified, and it is likely that the *Begonia* found in Djampea is also an unknown species. The following new species have been described as occurring only in Kalaotoa: *Clerodendron kalaotoense* H. J. LAM (LAM, 1919, p. 307) and *Quisqualis sulcata* v. SL. (VAN SLOOTEN, 1924, p. 61); a variety of this species: var. *subcordata* v. SL. (VAN SLOOTEN, 1924, p. 62) has been found in the island Wetar near Timor, so that *Q. sulcata* can hardly be called endemic. There are species which do not occur west of Celebes, for instance *Amylotheca stenopetala* DANS. is known as occurring in Flores and has been found all over Celebes (see DANSER, 1931, p. 249); *Strophoblachia fimbricalyx* BOERL. is found in Indo China, and besides only in Celebes and the Philippine islands (see MERRILL, 1926, p. 96); *Vernonia octaea* KOSTR. is known as occurring in several islands of the Salajar group, and it can certainly not be called rare here, and besides it is found in the island Moena situated to the south-east of Celebes, the Toekangbesi islands, and the Tanimbar islands, see KOSTER (1935, p. 453), and thus I could enumerate a few others. The greater part of the plants, however, is found also in the western parts of the Malay Archipelago; a special relationship with the flora of the neighbouring island Celebes, which is very rich in endemic plants, could not be deduced from the findings. Almost all the plants are species with a wide distribution area.

From the above it may be concluded that the flora of these islands is relatively young, and consists mainly of elements which can easily be dispersed, which indeed are widely spread. The investigation of

Krakatau with its flora, the elements of which are at best 50 years old, has taught us that the immigrating plants are chiefly species with a wide distribution area. The flora of the Salajar islands is far older, but a comparison with the floras of islands such as Borneo and Celebes, both islands with many endemic plants, points to the young age of the flora of the Salajar islands. Geologically too they must be counted among the younger islands of the Malay Archipelago. The islands Djampea and Kalao may be exceptions to this statement, what is known of their floras yet consists of species with a wide distribution area.

The limestone in the soil, which in many islands is present up to the highest parts, must also be looked upon as a cause of the poorly developed vegetation. In the tropics these limestone formations do not bear a typical flora of calciphilous plants; there are a few plants which demand a certain amount of limestone in the soil, but according to VAN STEENIS (1935, p. 35) these are rather kremnophytic forest-plants growing in steep localities; the plants mentioned by him: *Epithema saxatile* BL., *Monophyllaea Horsfieldii* R. BR., and *Stauranthera ecalcarata* R. BR. were, in the Salajar islands, not even found in the grottos. In the well-known limestone caves near Maros (Makassar) in West-Celebes a species of *Monophyllaea* grows in great numbers. The investigation of the flora of Salajar also supports the opinion of VAN STEENIS (1935, p. 36): „I arrive at the conclusion that so far there are no or hardly any data which justify us in speaking of guiding plants for limestone in the Netherlands' Indies.” See also VAN DER PIJL, 1933, p. 86.

For lack of data mangrove is not indicated in the islands of the Salajar group on the coloured vegetation map accompanying the above-mentioned article by VAN STEENIS. Mangrove is yet to be found in various islands, particularly on the west side. Tidal forests are on the whole of but small extent; in the island Djampea, however, a large, quiet bay is entirely bordered by one.

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