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DUTCH N.W. NEW GUINEA.

A CONTRIBUTION
TO THE
PHYTOGEOGRAPHY AND FLORA
OF THE
ARFAK MOUNTAINS, &c.

BY
L. S. GIBBS, F.L.S., F.R.M.S.

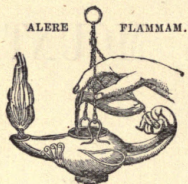
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A CONTRIBUTION
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OF
DUTCH N.W. NEW GUINEA.

INTRODUCTION.

1. HISTORICAL.

THE history of the navigation and exploration of New Guinea from the earliest times has been most exhaustively summarised by Dr. Wichmann in the two volumes of history included in "Nova Guinea." The following account is, therefore, strictly limited to records of botanical collections and observations in N.W. New Guinea alone.

From historical times the N.W. coast of Dutch New Guinea paid tribute to the Sultans of Tidor, and was subsequently included in the Residency of Ternate, which now administers the whole of the Sultan's dominions. Ternate, the capital, has always been the centre of the N. New Guinea trade in Birds-of-Paradise, the "Passaros del Sol" of the old Portuguese navigators, who widely distributed these highly prized objects both east and west, Oriental potentates and Moorish sultans with their courtiers vying in the possession of such treasured symbols of royal power and magnificence, which adorned the headgear on ceremonious occasions.

Subsequent to this the golden returns from the spice trade in the Moluccas, a monopoly most stringently held by the Dutch East India Co., attracted the attention of other European nations. In the search both for wild varieties of the precious trees and suitable areas for possible exploitation,

N. New Guinea offered the most promising field, the Dutch, from their base in the Moluccas, again holding most of the trumps. All navigation or detailed survey of the N.W. coasts of the country, with investigation into the numbers and condition of the inhabitants, dates from this period—about the 18th century.

In recent years, thanks to the dictates of fashion and enhanced value, the volume of the trade in Birds-of-Paradise has again enormously increased, regulated, however, in the Dutch Possessions by most adequate measures, stringently enforced, for the protection of these beautiful creatures.

All intercourse in N.W. New Guinea during the open season is dependent on this trade. Thanks to the enterprise of Tidorese, Malay, Arab, and Chinese traders, in whose hands it is chiefly concentrated, the coast Papuans have been brought more or less into contact with the outside world. This has resulted in a certain amount of intermarriage, as a ready means of consolidating and extending trade relations in the chief centres of distribution, and also in spreading a knowledge of Malay, even in remoter communities. In the season the chief trading-stations swarm with the miscellaneous agents engaged in this lucrative business, whilst the Papuans are occupied in hunting in the interior on their own account, or for the various Ternate traders or agents, so that it is next to impossible to obtain quarters or procure native hunters or carriers. It is advisable to take this fact into consideration in connection with biological work in this part of the country.

2. SUMMARY OF PREVIOUS WORK.

Geelvink Bay was first discovered and mapped out in 1705 (21, i. 138–152) by Jacob Weyland, who commanded the ships ‘Geelvink’ and ‘Nova Guinea.’ In the course of his work he touched at Dorei Bay, situated to the N.W. of Geelvink Bay.

In 1775 Forrest (1, 95–114) in the ‘Tartar,’ a 10-ton ship, in which he had sailed from Balambangan to obtain nutmeg and clove trees for the purpose of introducing them into that island,¹ spent part of January and February at Dorei, enjoying fine weather all the time, and his excellent straightforward account is quite one of the best relating to this place. The ‘Tartar’ lay off Wousi, where Forrest describes the whaleback Papuan houses spreading over the water, as they are still to be seen at the present day, and also the Arfak Mountains rising below Dorei. He even mentions Oranswari and Wariap as two inhabited places along the coast to the south, and notes the correct time to reach them by fast sailing in a favourable wind. He states that the people had many praus, and were said

¹ Off N. Borneo.

to deal honestly with the Chinese who traded with them, conditions which still prevail.

In July 1824, Duperrey (21, i. 316) in the 'Coquille' spent over a fortnight at Dorei, and the first collection of plants from there was made by Lesson, the surgeon accompanying the expedition (2, ii. 534).

Dumont d'Urville (3, iv. 578-612) in the Voyage of the 'Astrolabe' gives a very good general account of Dorei Bay, where he stayed in August 1827, after the discovery of Humboldt Bay, which was named, but not touched at. He mentions taking in water "au limpide ruisseau de Wirsi," and refers to the very rainy weather. The local Papuans are described as living in terror of the Arfakis, some mountain tribes established above Wousi on what is now the site of Manokoeari, who were always treacherously attacking the coast people, one such attack occurring during the stay of the 'Astrolabe.' Lesson, who accompanied him, made another collection of plants.

Wallace in 1858 (5, ii. 298-326) spent three months and a half, from March to July, at Dorei Bay collecting zoological specimens, and was there when the S.S. 'Etna' (8, 78), fitted out by the Dutch Netherlands Indian Government for ethnological and natural history investigations, put into the bay in June of that year. Some of the 'Etna's' company attempted to ascend the Arfak (8, 73) from the N. side, but turned back after reaching 1500'.

In September 1872, D'Albertis (9, 67-71), having spent three months at Andai with Beccari making zoological collections, succeeded in reaching Hatam, an Alfuero village, situated at 5000', three days' journey from Andai, where he spent a month, enduring great privations. This intrepid explorer was the first European to penetrate into these mountains and reveal their ornithological treasures, for, of the magnificent collection of Birds-of-Paradise and other types obtained by him, nearly all proved new to science.

In June 1875, Hatam was again visited, this time by Beccari (11, 35-38), who spent a month in this inhospitable place, much hindered by rains and swollen torrents. He attained 2040 m. in exploring the surrounding heights, and brought back, in addition to much valuable zoological material, a large collection of plants unfortunately not yet fully worked out.

Rosenberg in 1869 and 1870 (10) made several journeys to Dorei and the adjacent islands of the N.W. coast, of which he gives an interesting description. Accompanied by Malay hunters he spent three months at Andai, staying with the Missionary Woelders, with the intention of attaining Hatam (10, 99). Several abortive attempts were made, and he claims this achievement for his hunters, a claim since disproved (21, ii. 142). A vocabulary of the Noemfoer (coast) and the Alfuero (mountain) languages, with some excellent original drawings, are included in his book.

Teysmann, the well-known Dutch botanist, visited Dorei in 1871 (14, 61-95), and also touched at Andai and Wariap in coasting up Geelvink Bay, making large collections of plants.

In 1891 one of Veitch's orchid collectors, David Burke (21, ii. 539), a gardener, made his way to Small Hatam, a remarkable feat, referred to by E. St. Vraz, who in 1896 (15, 232-235) spent several weeks in Great Hatam, some distance beyond Small Hatam, which he states was D'Albertis' and Beccari's objective. Though much hampered by rain and the usual difficulties with carriers and hunters, the standing barrier to all work in the mountains of this country, St. Vraz's account is detailed and interesting.

In 1898 Manokoeari (21, ii. 677), the old Alfuero "campong"¹ on Dorei Bay, was raised to the status of a Government Station, to which Mr. van Oosterzee was appointed Assistant Resident, an appointment held until 1913, when he was obliged to retire through ill-health.

In April 1904 (17, 998-1021) van Oosterzee visited the Angi lakes, the first European to explore the more southern portion of the Arfak. On arriving at Ternate, on the way to Manokoeari, I heard with great regret of the serious illness of this very able administrator, who during his 16 years' residence at Manokoeari had made himself familiar with the Papuans and their language, his sympathetic rule giving him unusual influence with the chiefs, or "Koranos" as they are called. Manokoeari also bears witness to his initiative in the beautifully situated Residency and "Pasangrahan,"² in avenues of *Casuarinas* shading the level white roads, in the efficient water supply, substantial pier with well-arranged godowns, and the broad street of Chinese "tokos"³.

In 1908 Pratt, the well-known collector, with his two sons, spent some time at the Angi lakes. They were accompanied in the first instance by van Oosterzee, who, however, returned immediately to the coast.

In 1912 (25, 77-78) Gjellerup, attached as Officer of Health to the Exploration Detachment 1911-12, proceeded to the lakes, accompanied by a mining engineer named Hubrecht. They spent April and May in that region, where the former made important botanical collections, now in course of publication in "Nova Guinea." Unfortunately, many specimens were lost owing to the desertion of his carriers.

I had the pleasure of meeting Dr. Gjellerup in Java soon after his return from New Guinea, and acknowledge with keen appreciation his generous kindness in giving me the fullest benefit of his experiences, not only in relation to valuable details in organization and the areas to which he had devoted most attention, but also for most welcome data on Papuan

¹ Campong, a native settlement or village.

² Rest-house.

³ Shops.

idiosyncrasies, with special reference to the mountain tribes and the best method of dealing with them.

On my return from Wariap in 1913 I was fortunate in finding Mr. Pratt and his sons at Manokoeari, where they had arrived to organize another expedition to the Angi lakes. I gladly welcome this opportunity of thanking them for permission to reproduce the successful photographs subsequently taken in that region, including several purely botanical subjects selected especially at my request. My own results there had not proved satisfactory.

3. SCOPE AND CONDITIONS OF PRESENT WORK.

The chief objective of the present work was a direct outcome of results obtained and observations made on Mt. Kinabalu in British North Borneo in 1910.

The great interest in the higher regions of that mountain lies in the extra-Malayan facies of the vegetation and elements in the systematic composition of the flora. The predominance there of species in Orchidaceæ, Myrtaceæ, Ericaceæ, chiefly Rhododendrons and Vacciniums, is such a striking feature, that one felt it must be derived from some more continental type of vegetation than the limited occurrence on an isolated mountain could account for.

Celebes and the Moluccas did not suggest sufficient scope for the proposed key to the solution; but the mountains of New Guinea with their huge area, approximate rainfall, and great altitude offered a perfect basis of comparison; while Dr. Beccari's description in "Malesia" of his work and observations on the plants found by him on the Arfak mountains showed a very close approach to the phytogeographical facies of the Kinabalu "Massiv." This impression was further confirmed by the account of Mr. Pratt's first expedition to the more southern region of the range, and a few plants collected by him in an open marsh by the larger of the two Angi lakes, kindly shown to me at Kew by Dr. Stapf, finally led me to decide on that locality for comparative work.

Through the broad-minded interest and influence of my friend the late Sir Kenelm Digby, permission for the expedition was accorded, through the kind offices of the Foreign Office, by the Government, of the Netherlands. I must express my deep gratitude to His Excellency Mr. A. W. F. Idenburg, then Governor-General of the Netherlands-India, for the extreme courtesy of his reception and the interest he evinced in the scientific objects of the projected work, the success of which was assured, thanks to his generous assistance and detailed instructions.

My thanks are also due to Mr. C. Lulofs and Mr. J. C. Kielstra for much kind attention during my stay at Buitenzorg.

At Ternate the Resident, Mr. Ch. L. J. Palmer van den Broek, was

again most kind in forwarding my plans, and from Mr. L. J. J. M. (now Captain) Tabbers, Acting Assistant-Resident at Manokoeari, I met with every assistance which military training in grasp of the situation, judgment of men, and appreciation of fact and detail could do to ensure success. To Captain J. F. E. ten Kloosten, who most kindly procured me Dr. Gjellerup's sketch-map of the Angi lakes from the military cartographical office at the Woussi Bivouac, with permission to reproduce the same in this work; to Mr. J. W. Langeler, of the Dutch Navy, attached to the Mamberamo expedition; and to Mr. F. J. F. van Hasselt, Chief Missionary at Manokoeari, I am further indebted for much help and thoughtful consideration.

Any difficulty in reaching Wariap, about 60 miles south of Manokoeari, the best point of departure for the mountains, was obviated through the kind offices of Captain J. V. L. Opperman, Commander of the Mamberamo expedition 1913-1914. He gave me, with the escort kindly provided by the Dutch Government, a passage in the Government boat the 'Valk,' which was conveying his expedition to its destination. The 'Valk' landed us at Warèn, 10 miles south of Wariap.

As there had been recent fighting between the coast and hill people, Mr. Tabbers judged it advisable to send an unusually strong escort, comprising five Amboinese armed policemen, "Pradjoerit," and ten convicts, "Orang ranté," attached to them, to help in the carriage of provisions should the Papuans desert, according to their usual custom. It was no doubt partly owing to these two circumstances that all my carriers remained with me on this occasion; I noticed great reluctance to stray far from the protection of the guns.

The sergeant in charge, always called "Serzàn," a Timorese, who had served for 20 years through the Achin campaigns, was a most capable and tireless little man, a thorough soldier, not only very clever in handling his own men, who did him credit, but also in dealing with the Papuans, not such an easy matter.

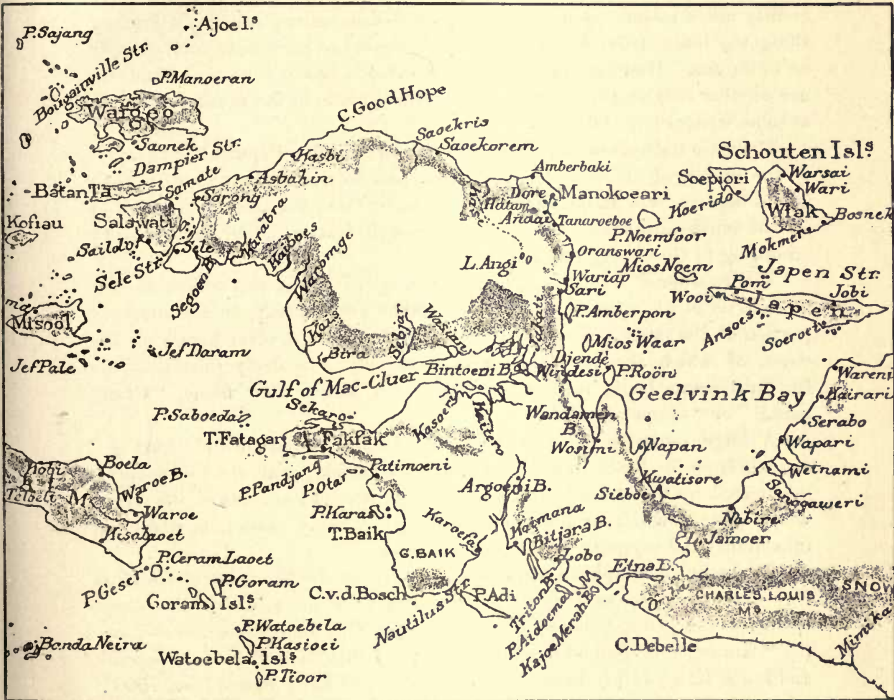
The "Orang ranté," all enormous men, who made a great impression on the Papuans, turned out very handy and willing. One of them acted as my cook, both in the mountains and until my departure from Manokoeari, while several became quite expert in carrying out botanical processes. It is a great tribute to the humanity of the Dutch rule that men like these Malays, to whom confinement is death, should be sent to expiate their offences, chiefly crimes due to jealousy and gambling, in outlying stations, where they have congenial work under easy and almost independent conditions. Escape is out of the question, as the Papuans shoot at sight any stragglers in the forest so it is not even necessary to guard them, while the best behaved are allowed to earn money by gardening or acting as "boys" to the civil and military officers.

GENERAL CHARACTERS OF THE COUNTRY.

1. TOPOGRAPHY.

The north-west coast of New Guinea is bleak, mountainous, and sparsely inhabited. The mountains, from 5000–7000', rise abruptly from the sea, there being little sloping foreground and few small bays to shelter

FIG. 1.



N.W. NEW GUINEA.

the schooners and Papuan praus, which only trade during the favourable monsun. There is no good anchorage for large boats between Sorong, an island on the extreme north-west, the first point of call, and Dorei Bay, a fine harbour, consisting of two bays, sheltered by the islands of Mansinam and the much smaller Meoswar. A low mangrove spit, on which a Papuan

“campong” is situated, separates the two bays, the further one being much smaller, very shallow, and probably rapidly silting up.

Manokoeari lies in the centre, on the lower slopes of a very recent “korang” or coral limestone range about 500' in height, while to the east the coast runs out into a low peninsula, where most of the Papuan plantations are situated, the soil there being much better than that of the sterile “korang” of the range.

To the south rise the Arfak Mountains, 9000' high, which run in parallel ranges down the western shore of Geelvink Bay, at about forty to fifty miles inland, except at one point—Tanaroeboe, one day's journey along the beach from Andai, where spurs from the mountains abut steeply on to the sea. How far south the range extends has not been determined, nor whether it is continuous with the mountain chain of the north-west coast, as some writers have inferred.

The main buttress of the Arfak rises above Andai, a Papuan “campong” at the mouth of the Andai River, about four to five hours by native prau across the bay from Manokoeari. From Andai there is a tract to Amberbaki on the north-west coast, which passes through Hatam, a four days' journey according to Rosenberg (10, 79).

The two small Angi lakes, to the vicinity of which this collection was limited, lie at an altitude of 7000' and 9000' respectively, on the southern portion of the range. The lakes are accessible from several points on the coast, of which the immediate shore-line only is sparsely inhabited, the few inhabitants being restricted to the beach, hence their name, “Orang pantai” or “beach people.”

A huge intervening low-lying belt of coral limestone or “korang” extends from the beach to the foot-hills of the Arfak. This tract of country, intersected by the alluvial terraces and large inundation-areas of the rivers, which pour down from the mountains in the rainy season, is devoid of inhabitants and suggests very recent elevation.

The main topographical features of this part of the W. coast of Geelvink Bay may therefore be roughly divided into four zones, which also correspond to the general plant-formations:—(a) The Immediate Shore-Line; (b) “Korang” or Coral-Limestone Zone; (c) Inhabited Zone of Foot-hills and lower Ranges; (d) Crests of main Range and Lake Basins from 7000'.

a. THE IMMEDIATE SHORE-LINE.

The immediate shore-line is sparsely inhabited, though many fine rivers and torrents sweep down from the mountains. With the exception of some mangrove formation, between Dorei Bay and Andai, and Oranswari and Wariap, the beach sweeps southward, consisting of big stones, shingle, or

loose sand. Large blocks of coral, as if just broken off from the reef, lie at the water's edge, where the surf beats ceaselessly and the dip of the beach is generally too steep for native praus to land without running the risk of being smashed to pieces. It is the presence of landing-places, with good water, which limits the stages in the tedious journey along the beach from Andai to Sjari.

The rivers in flowing into the sea either break up into many shifting mouths or are barred by banks of sand or shingle into semi-lagoons, with only a small exit to the sea.

Most of the trees fringing the beach are prostrate or semi-prostrate, as if torn up by the force of the waves. Stagnant lagoons, impenetrable bog, and shallow standing water occur in parts, while the undergrowth is covered and the ground strewn with seaweed, evidence of the retreating swirl of great waves. The natives told me that when the north wind blows the sea washes all over this belt of country, fish being often found stranded on bushes far inland.

The few small native "campongs" are placed just above the beach, where sand-banks have accumulated, on which some *Casuarinas* mark the permanence, as at Wariap and Warèn.

I returned from Wariap by the beach in December 1913, the first time this journey had been made by a European, to be followed by Mr. Pratt in April 1914, at the height of the north monsoon. He described the whole region as then more or less under water, the rivers, pouring down from the mountains in floods, being beaten back over the land by the huge surf raised by the north wind, which bars the exit of their waters to the sea.

This interesting observation accounts for the shifting river mouths, and also explains why the native habitations are generally so far from water and so few in number.

b. "KORANG" OR CORAL-LIMESTONE ZONE.

Behind the beach the low-lying belt of "korang," covered with forest, stretches uniformly from the coast to the foot-hills of the Arfak, a sterile porous formation showing so little depth of soil that it gives the impression of walking over a reef.

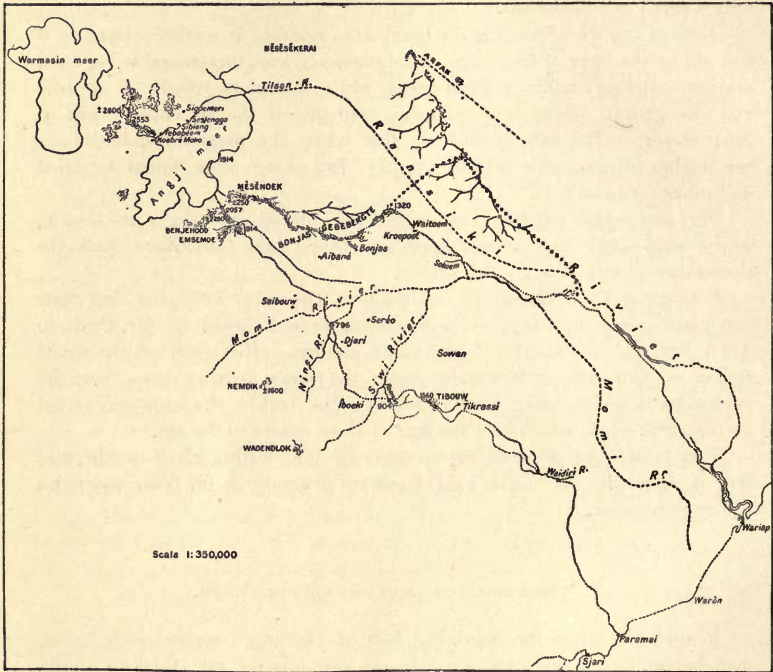
Rosenberg (10, 80) in 1870 refers to the recent appearance of this coral-limestone area, which he concluded must be still rising, and he quotes the older inhabitants of Andai as saying that they remembered low scrub where the forest now stands.

Van Gelder (20, 94) considers that a gradual rising of the whole of the north coast of New Guinea is taking place, or a lowering of the sea-level, which amounts to the same thing. He found evidence of this fact at

Manokoeari, in the presence along the beach, at slight elevation above the sea, of an undoubtedly very recent "Schelp Conglomeraat" (shell-limestone) that must have been formed in the surf zone.

The rivers cut their way through alluvial deposits of mud or sand, or form great open spaces—their present inundation-areas, all sand and stones in the dry season, but which, in the wet, are lakes of standing water.

FIG. 2.



MAP OF ANGI LAKES

(reduced from Dr. K. G. Gjellerup's sketch-map).

..... Dr. Gjellerup's route.

At Wanessi, the head of such an area on the Momi River, a day's journey from Wariap, the remains of an old "campong" can still be seen, where some of the hill people tried to establish themselves, but were forced to retire to Wariap on account of the floods.

This belt is uninhabited.

c. INHABITED ZONE OF FOOT-HILLS AND LOWER RANGES.

Once on the foot-hills the character of the country changes : the ground is broken by rocky outcrops and boulders, and the streams are now mountain torrents, plunging over great boulders which form their beds.

Crossing the Soedomi River, a rocky stream which falls into the Momi, one mounts steeply up the flanks of the spurs to the crests of the ridges, which are cleared. Native houses are first seen at about 1000', and from thence upwards, on the crests and slopes of the ridges, where the soil is deep and easy to work, there is evidence of extensive cultivation, past and present.

All the region of the subsidiary spurs and lower ranges seems to be inhabited. From commanding views it is easy to trace the line of the ridge, by which the approach to the lakes is made from Sjari, by the smoke rising from the houses, which are always perched in a conspicuous position, probably for the double purpose of observation and defence. Only in the case of one or two head-hunting tribes, who seem to inspire the whole neighbourhood with terror, were the houses situated on the lower slopes.

On the third, or Sjari ridge, from the Soedomi River, one looks down on to the Momi again, which rises in these mountains at right angles to its coast course. From below Soekoem the course of the Momi River (fig. 2) is erroneously indicated ; it should be that suggested for the Ransiki River (fig. 2).

Van Oosterzee (17, 999), who went up from Sjari, 20 miles along the coast from Wariap and 10 miles south of Warèn, mentions crossing the rivers Warèn and Waidiri, both flowing into the Momi, but the Warèn enters the sea at Warèn, halfway between Sjari and Wariap. The Soedomi was the only river we crossed, coming up from Wariap, till the Momi was again met with as a rocky torrent. Crossing to the west bank of the Momi we climbed another long spur in a westerly direction, till the latter joined the crest of the main range at 7000', called the S.W. ridge in this work, where the inhabited zone suddenly ceases, a fact probably determined by the steeper gradients and narrower crests, and the exposed and poor gravelly soil.

d. CRESTS OF MAIN RANGE AND LAKE BASINS.

The route to the lakes lies along the narrow crest of this ridge, marked as "Bonjas Gebebergte" on fig. 2, which runs S. to S.W. from 5000-8500' in height, bounded on the west by a valley, said by the Papuans to be that of the river issuing from the largest of the two lakes (Tilaan of fig. 2), and on the east by short spurs which run down to the Momi valley.

The Angi lakes are situated at about 7000' and 8000' respectively, separated on the west by the long Koebré Mountain, 9000' high, and

bounded to the east and the south by the S.W. ridge. The largest lake is called the Warmasin Bean or "Woman" Lake by the Papuans, in contradistinction to the higher and smaller one, the Warmasin Snoon or "Man" Lake. These names are so well recognised that the Malays with me invariably referred to each lake as "Prempuan" or "Anak," the Malay translation. According to Gjellerup (25, 77), the greatest length of the lowest or "Woman" lake is 9 km. south-west to north-east, and the greatest breadth is 4 km. on the south side. This lake is so deep that van Oosterzee (17, 1010) found that, on the south side, at a few hundred m. from the edge, he could no longer touch the bottom after 90 m. Gjellerup (25, 77) states that eels are the only living fish in it. On the north side the converging hills gradually slope into a marsh, the exit of the Tilaan River, which, according to both van Oosterzee (17, 1018) and Gjellerup (25, 77) joins the Ransiki River, which is stated by the former to fall into the sea at Wariap, obviously a mistake for the Momi River.

The western shore of this lake is inhabited by a small Alfuero tribe, their communal houses being in four groups on the extreme edge of the water, in separate bays, the "kebuus" stretching up the slopes behind. Further on, the sides of Koebré rise steeply from the water, while to the south a low ridge, about a couple of hundred feet high, connects with the S.W. ridge, which forms the boundary to the east.

The smaller or "Man" lake is reckoned by Gjellerup (25, 77) as roughly about 4 km. from the "Woman" lake, and he gives its north and west sides as inhabited. Van Oosterzee (17, 1013), who spent most of his time on the upper lake, estimated it to be 7 km. long, and 2 broad in the southern portion and he counted some thirty houses on the western shore with about 1000 souls; the houses seemed to me more numerous to the south-west, and I hardly think there can be so many inhabitants at the present time. He mentions the morass at the north end of the lake, also rafts on its surface, the cultivation of potatoes on the shores, and that eels are the only fish found in its waters. St. Vraz (15, 234), while at Great Hatam, heard from the natives that at four days' journey south there was a large lake called "Tschemti," with many fish and crocodiles, on whose banks Manikianos lived.

Inquiring of some of the Papuans with me, who had been up at the lakes before, if it were possible to reach the north coast and Manokoeari from the upper lake, they answered "Yes," and that it took twenty days, but, of course, in their estimate of time they would lose count beyond a certain number. Van Oosterzee met some Papuans (17, 1010) by the lower lake, who told him they had come from the north, and Gjellerup (25, 77) also mentions a way to the north coast, facts which agree with St. Vraz's information.

As I heard it was possible to return to Wariap in two days by keeping to the S.W. ridge, I decided at once on such a welcome alternative to the

RAINFALL, in mm.

| Up to 1912. | No. of years. | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Year. |
|------------------|---------------|------|------|------|--------|------|-------|-------|------|-------|------|------|------|-------|
| SORONG | 7 | 179 | 172 | 141 | 228 | 292 | 386 | 466 | 317 | 231 | 196 | 149 | 191 | 2898 |
| MANOKOEARI | 12 | 280 | 297 | 352 | 296 | 262 | 223 | 182 | 153 | 127 | 101 | 156 | 298 | 2727 |
| WINDESI | 6 | 306 | 319 | 306 | 235 | 272 | 380 | 300 | 294 | 303 | 314 | 253 | 253 | 3535 |
| DJENDÈ | 4 | 482 | 513 | 513 | 297 | 369 | 391 | 290 | 342 | 350 | 435 | 366 | 453 | 4745 |

five days spent in coming up. Our return route therefore followed the S.W. ridge, leaving the spur by which we had approached it from the Momi to the right. Continuing due north we gradually descended to about 5000', then bearing east along a lateral spur which finally dipped very steeply to the rocky bed of a tributary of the Momi. After crossing the latter, we emerged on to the north bank of the Momi River, where we bivouacked for that night, returning to Wariap the next day.

The chief difficulty of this somewhat strenuous route is the want of water, there being none between the vicinity of the lakes and the tributary of the Momi.

According to fig. 2 this route would follow the "Bonyas Gobebergte," which join the spurs of the Arfak indicated on the sketch-map to the north of the suppositional position of the Ransiki River.

The altitudes in the sketch-map, judging by the character of the vegetation, seem somewhat underestimated.

2. METEOROLOGY.

The following facts referring to the north-west coast are taken from Braak's (24, 210) paper on the climate of New Guinea, which summarizes all the information at present available.

On the north coast the east or dry monsun prevails from May and June to September and October, though even then much rain may fall. In Manokoeari the east monsun is the driest time (24, 219). It is probable that in the interior the difference between the character of the E. and W. monsun is much less pronounced.

In N. New Guinea it is at present not possible to give actual figures, though

it may be accepted that the temperature throughout the whole year is very constant, and that the mean variation is probably between 26° and 27° C. (24, 223).

Braak's table (24, 221) quotes the average rainfall for several years for Sorong, Manokoeari, Djendè on Roon Island, and Windesi to the south of Geelvink Bay. In both the latter stations the rainfall is much higher than on the more exposed N. coast at Sorong and Manokoeari.

In the historical summary the prevailing weather has been quoted whenever recorded, and it will be seen to vary considerably. At Manokoeari, January and June were considered the wettest months. During a stay there in November 1913 the weather was very fine; but on my return in December the rainy season had set in and there was rain every day, generally in the afternoon, the temperature being markedly cooler.

In the intervening period, spent at Warèn and Wariap, on the coast of Geelvink Bay, in the Arfak, and on returning to Manokoeari along the coast, only three half-days of rain were experienced, and these occurred on the way up and while at the lakes, where the rain was also accompanied by strong wind. Otherwise the fine still weather was a constant source of amazement to the Papuans, the rainy season being well overdue, and they attributed this lucky chance to the fact that sometimes at the change of the monsoon a short halcyon period of fine weather sets in.

At Warèn and Wariap a very strong N.W. breeze invariably sprang up between 3 and 4 P.M., causing a sudden fall of temperature.

Unfortunately my only available calendar was lost at Warèn. Consequently, no readings were taken either there or at Wariap, and only one or two in the mountains, which were as follows:—

On the Momi River, 3500'. 75° F. 6 P.M.

On the crest of the S.W. ridge, 8500'. 68° F. 4 P.M.

On the "Woman" lake, 7000'. 60° F. 7 A.M.; and on the following day at the same hour, 55° F.

Up at the lakes it was always cool in the early morning, the sun being very hot in the middle of the day, but cooling down in the afternoon and at night, though warmer than at the same altitude on Kinabalu. Both Pratt and Gjellerup reported very wet weather during their several stays at the lakes.

3. PHYTOGEOGRAPHY.

The general plant-formations, as is shown below, agree in broad outline with the topographical zones already described. They are:—

(a) Beach Formation : Immediate Shore-Line.

(b) Inundation Forest Belt : "Korang" or Coral-Limestone Zone,

(c) Secondary Associations : Inhabited Zone of Foot-hills or Lower Ranges.

(d) Low Mountain Forest above 7000' : Crests of Main Range and Lake Basins, 7000-9000'.

All systematic collection was limited to the last formation.

ITINERARY AND DESCRIPTIVE ACCOUNT OF VEGETATION.

(a) BEACH FORMATION.

Permanent sand-spits, Warèn and Wariap.

The beach at Warèn forms a long sweep on each side as far the eye can reach. A plantation belonging to a Japanese, who with his son had permission to accompany me to the lakes, was situated at the mouth of the Warèn River, which, dammed up by a sand-bank, formed a green lagoon, with only a very narrow outlet to the sea. A clump of *Casuarina equisetifolia* proved a certain stability, but the river-exit, with the dip of the beach, must be always in a state of flux with each N. monsun season. The great accumulation of sand to which Warèn and also Wariap owe their security from the inroads of the surf, must be due to the amount brought down and deposited by the rivers at their mouths.

Where the beach broadens out in the immediate vicinity of Warèn, a *Pes-caprae* association with *Tacca pinnatifida* is formed, to be succeeded by typical beach-shrubs, like *Thespesia populnea*, *Canavalia obtusifolia*, *Scavola Koenigii*, *Vitex trifolia*, *Clerodendron inerme*, *Premna nitida*, and a *Gmelina*, probably *villosa*, which must successively bank up the sand against the wash of the surf, as the Japanese had cleared behind them and planted coco-nuts on the pure sand, with cotton and pineapples as undercrops. This is the only spot along the coast besides Wariap where such a risk could be taken. Where the beach was lower and narrower, the surf washed through beach-jungle or under *Casuarinas* to the overhanging fringe of forest trees.

Sub-emerged Beach.

It is several hours from Warèn to Wariap along the coast to the north, by what may be styled a sub-emerged beach. A little beyond Warèn the sand decreases in volume, strand plants disappear, and the beach narrows considerably. Huge trees of *Barringtonia speciosa* lie prostrate to semi-prostrate over the sea. Young plants of *Pandanus* sp., *Dracana angustifolia*, an immense *Crinum*, probably *C. macrantherum*, with giant stools of *Asplenium Nidus*, no doubt displaced from the branches of trees as they fell, crowd the ground, all dusted over and growing plentifully amongst much water-washed débris and plant detritus, both terrestrial and marine,

which, with myriad prostrate *Barringtonia*-seedlings, attached by the one anchor-root, all pointing seawards, bear witness to the force of great waves retreating from their rush inland.

In many places this undergrowth was so thick, or the prostrate trunks so numerous, that it was easiest to walk through the surf, outside the branches of the fringing trees. The rivers, where there is no sand to bar their exit, form small mangrove swamps at their mouths, which have to be waded through. In one of these small swamps a tree covered with a vine of *Mucuna Krätkei*, also known from the N.E. and S.W., whose numerous huge racemes formed a dome of brilliant red flowers, was a magnificent sight.

Wariap.

Here, where the people all remembered Mr. van Oosterzee and the Pratts, I was welcomed as an old friend—the “korano,” a very fine man physically and quite a personality, and the “guru” (teacher), to whom I had a letter from Mr. van Hasselt, having already paid their respects at Warèn. It was arranged that the “korano,” Manao, should act as guide to my party to the lakes, and the Wariap people of themselves offered to accompany me as carriers, promising to remain as long as I stayed there—a promise sealed on “Pinang” and “Zabacco,” as they call the latter, and faithfully kept. “Pinang” replaces betel-nut on the coast of N. New Guinea, being obtained from the wild *Areca macrocalyx* Zipp. (12, i. 18) and eaten with lime and the fruit of *Piper Siriboa* (14, 69).

Wariap, situated on a sand-spit through which the Momi has cut its broad way on one side, forming a good harbour for praus, while on the other *Casuarinas* are massed, is quite a large and busy “campong,” where much prau-building and making of *Pandanus* mats (nokés) and sago-holders is carried on.

The long whale-backed houses are built above the beach, on a level spit of very fine sand, which, overgrown with grass and *Pes-Capra*, is broken by shallow green lagoons shadowed by a jungle upgrowth of *Thespesia populnea*, *Abrus precatorius*, *Casalpinia Nuga*, *Wedelia biflora*, etc.

(b) INUNDATION FOREST BELT.

Just behind the beach formation this forest forms a huge unbroken green wall, in which the pyramidal branching of *Terminalia Catappa* is easily distinguished from the outside, whilst most of the trees are covered with the heavy green curtains, falling straight from the crowns, of *Zanonia macrocarpa*, a Cucurbitaceous liane. In this forest *Ficus*, *Macaranga*, and *Artocarpus* sp., the latter with enormous leaves often about 1 m. long and $\frac{1}{2}$ m. or more broad, mostly predominate—their trunks screened with immense fronds of climbing ferns, spreading radially all the way up, or *Epipremnopsis Hugeliana*, *Raphidophora Peepla*, other *Philodendron* spp.,

Piper Forstenii, *Pothos*, and various large-leaved root-climbers. Piles of these huge leaves accumulate under the trees, to be dispersed by the floods of the rainy season. A giant *Korthalsia*, its interlaced stems scrambling up and down the trees or spreading in tangled mass over the ground, was the only "rotan" seen. *Asplenium Nidus* was abundant; but epiphytic orchids were few and far between, and the absence of flowers or fruits was most striking.

In this forest there is little undergrowth. Sodden leaves mostly fill up the interstices of the porous korang. Where light shoots through, some thin grass or patches of the creeping *Geophila reniformis* and *Hemigraphis reptans*, or single specimens of the small semi-herbaceous shrub *Amarocarpus Wichmannii*, with horizontal dorsi-ventral branches, appear; but the most conspicuous objects are the huge *Zanonia* capsules, the size of large pumpkins, in all stages of decay, scattered over the "korang," which is so porous that surface-water soon drains through; but where there is standing water, groups of Sago Palms occur, often forming swamps covering large areas.

A track from Warèn to the Arfak runs for a couple of days through Sago swamps.

Native Plantations.

These are dotted through this forest where little islands of soil accumulate, as at Warèn, or alluvial deposits have been formed by the rivers, as at Wariap. Here the well-stocked "kebuns"¹ surprised me by their extent, many kinds of bananas and plantains, coco-nuts, papaya, cassava, "kladi,"² "ubi,"³ "labu,"⁴ egg-fruit, and various "sayur"⁵ etc. being grown, with clumps of bamboo, probably planted.

On passing through this "korang" zone we followed a new route, keeping to the south bank of the Momi, so obviating the necessity of crossing the river, which is rather deep at its mouth. This track passes through the Wariap plantations and the sterile "korang" forest beyond, cutting off a great angle of the river. Then it skirts the shifting banks of the river as the latter cuts through alluvial deposits of mud and sand, or crosses wide sand-banks, the splash of crocodiles heralding our approach. These sand-banks afforded a fine view over the Momi, showing *Casuarinas* and the symmetrical *Terminalia*, the latter veiled in all-obliterating *Zanonia*, backed by the distant mountains. Thence the track alternates between the dome-like "korang" forest and the thicker undergrowth of alluvial flats, or, when nearer the river, over oozy slime which spreads over the stems and leaves of a small *Licuala* palm and the giant *Korthalsia*, the chief undergrowth in such areas.

¹ Gardens.

² *Colocasia antiquorum* Schott.

³ Sweet potatoes.

⁴ Gourds.

⁵ Vegetables.

Momi Inundation Area.

From the forest one emerges into the blazing sunshine, on an open plain, which it takes several hours to cross, all stones, gravel, sand, and "lalang," dotted with small trees of *Casuarina equisetifolia*. This open space forms an inundation-area of the river, and is under water during the rains. Amongst the stones *Geodorum pictum*, a pink-flowered orchid, was characteristic, and *Peristylus goodyeroides* was found among the "lalang" which covered the sandy areas. The most remarkable feature was abundant clumps of a new *Pteris*, *P. bambusoides*, with erect rhachises resembling stems rising from an underground rhizome, each rhachis about 2 m. in height, clothed with segments from the base to the apex, originally bilateral, becoming spiral later through the twisting of the cortex. The species was also seen near Wariap, in passing through the "kebuns." Professor Bower, to whom I submitted this interesting new fern, suggests that "the general habit might possibly compare with that of *Pteris grandiflora*, in so far that both are probably creeping rhizomatous."

Pandanus Trees.

The second day, while still in the "korang" forest, we passed through a striking group of old *Pandanus* trees, about 30 m. high, each rising out of the forest on numberless grotesque stilt roots for about a quarter of the height, succeeded by a straight stem with much-branched top; the old leaves hung in limp masses from every possible resting-place and strewed the wet ground underneath. These weird trees gave a pregnant impression of the scenic possibilities of this genus under primitive conditions. Even the Malays were impressed; but the Papuans spoke of similar isolated groups scattered through this forest. These groups possibly represent the first vegetative covering of the "korang," displaced later by more rapidly growing dicotyledonous forest trees, as only those plants which could respond by equal vertical growth and so maintain the same level as their competitors would have a chance of survival under such enveloping conditions. No fruit was seen on the trees or underneath them.

(c) SECONDARY ASSOCIATIONS.

Once on the foot-hills the character of the forest changes, the sodden effect of the "korang" belt works out, and it loses the mud-washed look and steaminess suggestive of constant inundation. The ground, rocky and broken, is strewn with Sapindaceous and Anacardiaceous fruits, red *Pometia*, and other brightly-coloured kinds, and undergrowth in the shape of plants and shrubs appears, *Mussaenda frondosa* being general. The foliage of both trees and lianes is less monstrous and more varied in form, while a graceful epiphytic flora puts in an appearance. From time to time small cleared

spaces were reached, evidently known rest camps, where we halted ten minutes to rest the carriers.

After a tedious climb up the flanks of the spurs, clothed in high forest, one emerges on to cleared narrow ridges, covered with long grass, showing the first signs of cultivation, where a beautiful view opens out, on the one side to the blue island-dotted waters of Geelvink Bay over the foot-hills and the flat inundation-belt just passed through, which spreads out like a green table, and on the other side across the Momi valley to the central mountain range with its many outlying spurs. After more climbing, bamboo thickets evidently planted, with the magic plant of Malaya, *Justicia Gandarussa*, never known to set seed, further confirm the impression of man's vicinity. Fine forest succeeded these abandoned gardens, from which we emerged on to old "kebuns" on the broad crest of the lower Serao range. Here were the Serao houses, surrounded by present cultivation, where we were very well received by the korano and his charming wife, the prettiest Papuan woman seen, though many are nice-looking.

The Serao people—great friends of Manao's—cordially invited me to sleep in their house; but as all the Papuans with the Japanese streamed in, to say nothing of the original inhabitants, I decided to camp outside in a newly made "kebun," with the "Pradjoerit" and "Orang ranté."

The korano's house was very large, with split-bamboo flooring and a few small partitions, while against each side a narrow strip was thickly sanded over for fires. Opposite the entrance a second door opened on to a balcony, commanding a lovely view over the dip of the ridge to the immediate Momi valley and the further spurs of the Arfak. A house inhabited by a head-hunting tribe was pointed out on the slopes below.

Native Plantations.

In the "kebuns" the luxuriance of the crops and method in cultivation is surprising. Sweet potatoes of very fine quality, gourds, plantains etc., and papayas, the latter replaced by maize and tobacco as the altitude increases, with some of the finest sugar-cane I have seen, are planted, the standing crops in diagonals alternately, with sweet potatoes and gourds, chiefly *Lagenaria hispida*, as undercrops.

Some of these plantations were situated on the steepest slopes, where, toiling up in the pitiless sun, one sinks to one's knees in fine deep soil. Fortunately there are always many logs lying in succession as they were felled, which facilitate the ascent.

The plantations or gardens are surrounded by a strong double stockade against wild pig, with notched poles slanting both ways at certain points for ingress and egress. One or two communal houses are generally built in the middle of the plantation, each on a maze of criss-crossed poles, about 20' from the ground, with a veranda back and front, approached by a notched

pole from the front only. Where the crest is narrow the houses are built at the edge, so that, entering on the level in front, the elevation at the back accords with the slope of the hill.

Strict etiquette demands that your name and business be shouted out by the most sonorous voiced Papuan at the point of ingress into the plantation, before intrusion on their domain, for the information of the owners. You are then received by the inhabitants, both men and women, all standing or sitting unarmed on the balcony, and after friendly greeting and distribution of tobacco one passes on in peace. This custom is described in the account of the 'Etna' expedition for the northern part of the Arfak (8, 74), and by van Oosterzee (17, 1002 & 1004) on the occasion of his expedition to the Angi lakes, in the Sjari region.

From the third ridge on leaving the Soedomi River, we looked down on to the Momi again, and descended to it over secondary slopes overgrown with *Rubus rosæfolius*, the fruit dirty-red in colour, hard, and like a small raspberry in shape, just as insipid but very different in appearance to the large scarlet, strawberry-like fruit of the same species in the uplands of British N. Borneo. A boggy bamboo-thicket lined the bed of the river, which we crossed, to camp for the third night on the other side in an old "kebun." Whole families of the hill people came down to visit us, even with babies in arms, each party, after wandering round gloating over the various sights of the camp, building its own shelter, to which they retired to cook their meal and spend the night. I distributed tobacco to the men, women, and bigger children, and rice to the babies, of which the very tiniest demanded its quota. Some of these people came on with us to the lakes, as others had done from Serao—a source of considerable relief to the coast carriers, many of whom were getting tired from the steady climbing. These mountain people are splendid carriers, but it is next to impossible to get them to go down to the coast.

The next day, proceeding through secondary forest up a lateral spur, old plantations opened out at 5000'. At about 6000' a couple of bushes of the copper-coloured *Rhododendron latum*, red when older, one of the glories of the Arfak, heralded the approach of the mountain collecting-grounds, which I alone intended to work. The korano of Wariap and his grandson Waspiri pointed out, on the southern flanks of the spur near the valley below, two houses of the "Orang Jatoe," or bad people, noted head-hunters according to my informants, Waspiri adding that the victims were decapitated at the house observed from the Serao ridge, the resulting trophies being brought up here. With glasses the people could be seen standing on a rise near by, while in front of the house, in a cleared space, twelve men were sitting, in two rows of six each, singing some barbaric chant, accompanying their song of defiance with reiterative movements of arms and legs, in Polynesian fashion. Certainly, unlike all the other mountain people, they did not attempt to

approach our party, which was, of course, much too large to invite any form of attack.

Higher up, a large solitary house inhabited by very friendly people marked the limit of the inhabited zone. Immediately above this the path enters true "rimbu,"¹ then strikes the track along part of the main range, which, running approximately N. to S.W., is clothed in low mountain forest, the plant-formation common to the crest of the main range and the lake basins.

(d) LOW MOUNTAIN FOREST FORMATION ABOVE 7000'.

From 7000' low mountain forest prevails up to the lakes, and systematic collection was limited to this formation.

Advancing due south, with increase of altitude the crest of the S.W. ridge soon becomes narrower and the trees smaller, showing a gradual transition from mossless forest to an intermediate mossy forest with a fine variety of mosses and hepatics; while on higher points true mossy forest prevailed, but very limited in incidence and species. Coniferous trees, *Phyllocladus*, *Podocarpus*, *Dacrydium*, and *Libocedrus*, were conspicuous on this ridge, the facies of the vegetation being strongly reminiscent of that of the ridges of Kinabalu at the same altitude, but suggesting a wider and more continental origin.

Small open rest- and camping-places from time to time gave vantage points of observation, where the ground was always bright with clumps of a brilliant orange *Dendrobium* and the pretty mauve *Burmanna disticha*; otherwise, white and yellow predominated amongst the shrubs and trees of the mountain forest.

Other open spaces were caused by small landslips of the loose granite-gravel soil, on which no rock was seen exposed. In one place quite a large part of the crest had slipped away, leaving a steep wall about 100' high, difficult to scramble up, as the gravel gave beneath the feet. Probably the higher points of the ridge, now overgrown with roots of trees, are due to this agency. These open spaces afforded beautiful views over the Sjari ridge with its tiny trails of smoke, to the blue waters of the Bay in the distance on the east, and limited on the west by the densely-wooded slopes of the Tilaan valley.

That night, the fourth after leaving Wariap, we camped on the highest part of this ridge, on an open space above a mountain-torrent. I was awakened in the night by a wild stamping of feet, accompanied by a stentorian chant of powerful voices in unison, taken up by each Papuan party in turn. The "Papuas," as they are always called, rigidly kept to their separate clans, each putting up its own shelter. This somewhat alarming incident proved to be a primitive method of keeping warm.

¹ Virgin forest.

Even on the march when resting for meals the Papuans invariably sorted themselves into their own family groups. Notwithstanding the heterogeneous nature of the party—over forty carriers, men, women, and children, the men in most cases accompanied by their wives and other children, with the hill people joined on,—I never heard any complaint from the Serzàn nor a discordant note or quarrel.

No doubt the presence of my staunch friends Manao and Waspiri, both very fine men, and that of old Basi, the korano of another “campong,” a fund of quaint humour and good temper, who had been up several times before, had a great deal to do with this result. There were, however, many outside elements over which their control was not acknowledged; but the absence of bad temper and quarrelsomeness is always a distinguishing feature of primitive people who have been spared contact with our so-called civilization.

The next morning, after some hours' progress along the crest, we emerged from the small forest into a lower scrub, to look down on to the brilliant blue waters of a lovely lake, surrounded by slopes and ridges wooded to the water's edge as they ran into the lake, intersected by the white beaches of many bays of varying size and outline. This lake lies in a trough between the ridge we were on and Koebré Mountain, of which the bare summit with a few scattered trees limits the sky-line west, as it rises straight from the water's edge, except for a little cultivated land where the few Alfuero houses were dotted along the shores. One or two moving spots on the water showed that these people were observing us from the frail rafts made of three palm-stems tied together, which are their only means of transport (Pl. 1. fig. 2).

On the eastern side at one's feet the prevailing forest runs down to the water's edge where the banks are steep (Pl. 2. fig. 4), but where the slopes are gradual it is replaced by an open marsh bordering this side of the lake, on which some long spinneys and an isolated forest-patch intrude (Pl. 2. fig. 3).

Intersected about the centre by a few forest-clad lateral spurs from the S.W. ridge, the marsh sweeps round to the north, where a break in the hills marks the exit of the Tilaan River. This northern portion was not touched by me in the course of this work.

Angi Lakes.

Turning abruptly to the right, we descended steeply over roots and trunks of trees through a sheltered mossy forest, then splashing over logs and bog on to the marsh. Here it was open and easy walking where water streams over the coarse quartz sand, bright with *Riedelias*, *Dendrobiums*, and *Rhododendrons*, but impassible where boggy and covered with fern and sedge.

The marsh is not a natural association, but it is kept open by the Alfueros, who were busy burning it off during our stay; a practice which no doubt

facilitates drainage, as the small rivulets, issuing from the slopes, which stream over the marsh to drain into the lake, would form a water-logged area under forest conditions, impeding access to and from the lake. This is no doubt what the Papuans imply when they explain the burning by saying that it keeps the ground "panas" or dry. But more important still is the fact that the houses on the opposite side command the whole of this cleared area, so that the arrival of strangers can be controlled and warning received in case of hostile attack.

The practice of burning areas for observation or otherwise must always have been prevalent in the Arfak, as Forrest, in 1705 (1, 108), whose stay at Dorei Bay coincided with a very dry January, saw from there "many great fires on the mountains of Arfak."

Passing over the central portion of the marsh, we made our way to some rising ground, where the camp was pitched in front of an isolated forest patch facing the lake, from which it was separated by a muddy tract, where *Juncus lampocarpus* predominated. This tract soon became a morass from the constant Papuan traffic to and from the lake, where a long white beach formed the landing-stage of the native rafts.

The day after our arrival the Alfueros streamed over to visit us, accompanied as usual by wives, children, and babies. Wearing no clothes, many were plastered over with some black pigment, possibly for greater warmth. They brought to trade "ubi," corn-cobs, tobacco, and splendid potatoes. The latter, grown on the upper lake, were a most welcome delicacy after unlimited sweet potatoes, and as much appreciated by the Malays and Papuans as by myself. My people traded everything that could be scraped together for them and for the tobacco, which was said to be of very good quality. The "Pradjoerit" and "Orang ranté" exchanged their salt rations and matches, relying with touching faith on my supplies, even parting with the buttons on their uniforms. The Papuans traded their rice and sago rations, to return to the coast exhausted as a result of an "ubi" diet. St. Vraz (15, 235) mentions potatoes as doing well at Hatam, where they had been introduced for twenty years through the Missionary Woelders from Andai. The tobacco was carried at the top of long poles, rolled into large pointed ellipses, which looked like clubs.

In 1857 (8, 75), when the northern part of the Arfak was visited by members of the 'Etna' Expedition, they were told that tobacco was not grown on the north side but on the east, and that it was distributed from Hatam to Amberbaki, Dorei, and the south-west coast of Geelvink Bay. That it should be easiest to bring this appreciated article three days' journey down from Hatam to Andai, and then by "prau" along the coast, in preference to the two to five days' journey from the Angi lakes, proves how little intercourse there is between the Hill and Coast tribes, and also what a natural boundary the inundation "korang" belt forms.

The korano of Koebré was quite a superior man, a blood-brother of Manao's, who brought him up to me, when he presented me with splendid potatoes and corn-cobs, and I gave him knives and a "kain"¹ in return.

It was interesting to note how the character of the surrounding forest, even in such a small area as this lake-basin, varied with the exposure. The eastern slopes were characterized by mossy forest, while to the south-east *Araucaria Beccarii* predominated, gregarious and in groups, to near the water's edge (Pl. 1. fig. 1). To the north and north-east the forest was not so homogeneous, older *Libocedrus arfakensis* and *Podocarpus papuanus*, with the graceful palm *Kentia Gibbsiana*, standing out above the mass level, both on the slopes and the ridge. On the western slopes of Koebré it was much drier in type.

The most fertile part was the isolated patch of intermediate mossy forest behind our camp, which reminded me of Fiji in its beautiful moss-flora and wealth of creeping orchids. The possibilities of this patch, though continually worked through, seemed inexhaustible.

Accompanied by two of the "Pradjoerit," Manao and his friend the Alfuro korano, with the latter's two delightful boys, most keen to help in collecting and looking for plants, I spent a day on Koebré. We crossed the lake on two of the rafts tied together, following Dr. Gjellerup's advice. It was a very tedious journey, taking about an hour and a half; while coming back in the dark, with stormy gusts of wind and rain, we spent about two hours in crossing. The two rafts, attached by a rotan-tie at each end, worked against each other as the waves splashed up between.

The summit of Koebré is a bare, open, lichen-covered plateau, of which the wind-swept character is revealed in the shrubs, either prostrate and spreading on the ground or of clipped, erect, and compact habit. A few single trees which have survived the fires to which the open character of this summit is due, dot the surface, while in gullies and depressions small trees are crowded into shrubberies surrounded by a ring of burnt wood.

It was amazing to see solitary grotesque *Myrmedomas*, over a metre high, also recorded by van Oosterzee (17, 1008)—plants of such size, to say nothing of the terrestrial habit, being quite unknown to me (Pl. 3. fig. 6). The same may be said of an extraordinary *Hydnophytum*, just like a collection of pipes standing upright on the ground, each pipe representing a hollow stem, about one dm. across, bearing flowering branches round the rim. A couple of small isolated trees of *Dacrydium novo-guineense* bore an abundance of small red cones.

From the summit there is a splendid view over the smaller, or "Man" (♂), lake, beautiful in outline, with much cultivation round its shores, of which the upper slopes are much more densely wooded and the lower more thickly inhabited than the "Woman" (♀), especially towards the south,

¹ Cloth.

where the excellent potatoes are grown. To the north the surrounding hills slope on both sides to a marshy area, which marks the exit of a river, as on the lower lake.

To the south-west the houses of another head-hunting tribe were pointed out, who seem to dominate this part of the country, as those before mentioned cause a reign of terror at lower altitudes. These people possibly represent the tribe called "Hiraj," about which St. Vraz (15, 234) was told at Hatam that they lived beyond the lake Tschemti, and were spoken of as cannibals; but I never heard any of these "Orang jatoe" referred to as anything but head-hunters by my informants, Manao and Waspiri.

♀/ Our stay at the ♂ lake, much as I should have liked to prolong it, was limited to six days. The camp, never very dry at the best of times, became sodden and under water from so much trampling, and many of the Wariap people, who had faithfully kept their promise to stay with me, were suffering from bad colds and rheumatism, such a sudden change of temperature necessarily telling on people accustomed to tropical heat, when warm clothing cannot be provided.

The Malays of my escort were also becoming depressed, as they always do when out of their accustomed environment, so the order to break camp was hailed as a happy deliverance by everybody but myself. The beauty of these surroundings, their extraordinary variety, afforded such a wealth of material for work and reflection, which, with crisp air, cool temperature, and splendid weather, made one long to spend more time in this lovely spot.

Our return was along the S.W. ridge again, leaving on the right the spur by which we had ascended. Beyond this point a fine high forest developed as the altitude decreased, the huge climbing ferns still wreathing the trunks of the much finer trees, the undergrowth showing less herbaceous variety with more sub-staging of shrubs and young trees. A small clump of *Corsia arfakensis*, a new species, grew on some dead wood, and at about 5000' a group of two or three magnificent *Agathis Dammara*, with towering white stems, too large to climb, and very small crowns, occurred. Great lumps of white dammar stood out on the trunks, which the "Pradjoerit," to whom these trees were familiar in Amboina, immediately wanted to fire, so like the wasteful Fijians with their beautiful "Dakua" trees, which I sternly forbade. This practice, I was glad to see, seemed unknown to the Papuans.

Many young trees showing the fastigiate youth form were seen, and one of the Papuans found me a young seedling, about 2 m. high, from which I took the foliage, but had to content myself, so far as fruiting material went, with some old scales found beneath the old trees; they were sufficient, however, to determine the species.

Continuing down a lateral spur, running in an easterly direction, we

passed through a somewhat dense undergrowth of a small *Licuala* sp., where the pretty white *Medinilla arfakensis*, almost a small tree, a very handsome *Bulbophyllum* covering a prostrate log, and the climbing *Dichrotrichium brevipes*, another of Beccari's Hatam records, were also growing. From an open space we caught a glimpse of the buttress of the ridge we had descended from, with the glorious *Agathis* trees towering far above the rest of the forest.

Farther on, at another unusually large cleared resting-space, vaulted over by trees, we came upon some horizontal sticks, resting on a couple of forked supports stuck in the ground, on which a number of little forked prongs were arranged in groups. Waspiri exclaimed when he saw this peculiar arrangement, explaining that it was the practice of the Coast people to have these places, which show what parties have recently been in the mountains, the arrangement of the little prongs indicating how many and whether women or children, if the parties had returned, or if any of their members had been killed. On this occasion it was made out that a man and woman, missing from Wariap, had been killed in the hills.

Finally, always working east, we passed through the bamboo clumps, which herald cultivation, on to a large plantation, with a solitary house in the centre. Here an old man showed us the way down to the Momi River, an impossibly steep track, up which, considering the way it was worn, the people of the house must fetch all their water every day.

From this plantation a view up to the Serao ridge showed the "kebung," in which we had camped on the second night, and also the house of the head-hunters on the lower slopes.

Camping by the river that night we reached Wariap next day through the "korang" forest, joining our old tract later, just before the *Pandanus* group.

At Wariap my first inquiry was for the 'Valk,' as the Commander had most kindly promised to call in there on his return from the Mamberamo River, on the chance of our being there. As there was no news I decided not to wait in that sand-fly stricken spot, but, giving the men two days' rest, to return by the beach to Manokoeari, which everybody at Manokoeari, even Mr. van Oosterzee, had told me was quite impossible. The Serzàn, however, after searching inquiries, found that this route was feasible and well-known to the Wariap people, taking four days. Two "praus" from Wariap carried kit and provisions, landing at night at the native camping-places, to which it is always wisest to keep, though somewhat long, as they are determined by good water and landing-stages.

I had hoped to be in time for the December boat to Java, but on crossing in "praus" from Andai to Manokoeari, once past the mouth of the estuary, we could see the smoke of the steamer across the bay. Watching intently which direction she took, the Serzàn exclaimed, "Poelang!" (Home). This

entailed a month's wait at Manokoeari for the next boat; I put in the time working about Dorei Bay, as Dr. Gjellerup told me it had not been collected over. As the next boat called at Humboldt Bay, the limit of the Dutch possessions, which is only visited every other month, I was able to take that trip as well, collecting at each stopping-place, with very good results.

The coast-collections proved very interesting, but phytogeographically so distinct from the Arfak plants, no two species proving common to both regions, that they have been separately enumerated.

PLANT ASSOCIATIONS OF LOW MOUNTAIN FOREST FORMATION.

A. FOREST ASSOCIATIONS.

[Endemic species are marked °, and those of wider distribution *.]

a. S.W. RIDGE.

1 a. Mossless Forest.

On the main range, or S.W. ridge, at 7000', a mossless forest association prevails, of slender straight trees about 13-16 m. high, with a very open undergrowth of chiefly herbaceous plants.

Undergrowth.—°*Alpinia domatifera*, 1-2 m., always in appreciable colonies of one height, the flowers varying from white to red with red fruit, and *A. arfakensis* var. *subsessilis*, with pink flowers and white fruit, were dominant, more or less covering the open ground.

Lianes.—**Gleichenia linearis*, spread over supports up to 7 m., while the trunks of the trees were wreathed in the climbing ferns **Nephrolepis acuminata* and *Polybotrya arfakensis*, from base to branches, the long fronds standing out radially from the stems. *Freyinetia Gibbsea*, with very handsome red sheaths, hung bunched from the trees or spread in thick masses underneath, and *F. flaviceps*, with yellow fruit, was more slender in habit.

Trees.—A group of °*Quercus Lauterbachii*, the ground underneath strewn with magnificent acorns of all sizes, some of those collected having proved the largest known, represented a family recorded by D'Albertis (9, 69), Beccari (12, i. 177), and St. Vraz (15, 33) from Hatam. **Podocarpus Rumphii*, recorded by Beccari, but not seen in fruit, was abundant; likewise *Phyllocladus hypophyllus*, the Kinabalu species, and °*Podocarpus papuanus*, recorded as *P. imbricatus* (which it very much resembles, the seedling form being indistinguishable) by Beccari from Hatam, and since found by Kloss on Mt. Carstensz. Advancing due south, as the crest of the ridge narrows, a gradual transition to an intermediate mossy forest of smaller trees with branched stems and denser crowns, the trunks and bases covered with small hepatics and mosses, takes place as the altitude increases.

2 α , β . Intermediate Mossy Forest.

Undergrowth.—*Sphagnum novo-guineense*, with **Rhacopilum spectabile* and the magnificent and abundant \circ *Dawsonia gigantea*, all in fruit, with the creeping **Lycopodium cernuum*, formed part of the prevailing moss-carpet, from which rose the orchids *Platanthera elliptica*, vars. *longicalcarata* and *elator*, green in colour and varying in size, gregarious and general in this association; \circ *Cryptostylis arfakensis*, with red lip and green perianth, and \circ *Bulbophyllum muricatum*, with large red-spotted yellow flowers, were found in single examples. Clumps of \circ *Alpinia domatifera* (dwarfed), **Gahnia psittacorum*, previously known only from Australia and Tasmania, **Histiopteris incisa*, **Dipteris conjugata*, gregarious as usual where more open, with the small shrubs *Diplycosia Lilianææ*, about .25 m. high, with rigid branches and striking white-tipped red flowers, *Vaccinium pilosiflorum* with pretty, very hairy rose-pink corollas, also seen as an epiphyte, and *V. leptospermoides*, with red-pink flowers, were often grouped together at the base and between the dwarfed trees.

Tiny tufts of \circ *Gentiana Vanderwateri*, with large white flowers, showed up in damp places and, where drier and the small trees opened out, the minute *Lobelia arfakensis* spread its large patches on the ground, dotted with white flowers, while innumerable seedlings of all the conifers previously mentioned, with *Dacrydium* and *Libocedrus*, formed the most general and conspicuous part of the undergrowth, including the slender tree-ferns *Alsophila arfakensis*, with stems 1 dm. through and about 1 m. high, the fronds 1 m. long, and *Cyathea arfakensis* not much larger.

Epiphytes.—The small ferns collected on the moss-grown trunks of the trees were **Trichomanes palmatifidum*, *Hymenophyllum cinnatum*, **Lindsaya hymenophylloides*, \circ *Polypodium remigerum*, **P. stenophyllum*, **P. clavifer*, and the minute yellow orchids, *Octarrhena cylindrica*, with *Dendrobium glauco-viride* (magenta), *Phreatia spatulata* (white), and *Piper arfakanum*.

Lianes.—**Gleichenia linearis* and **G. volubilis* abounded, with *Freycinetia Gibbseæ*, much less luxuriant, *F. flaviceps*, and *Calamus arfakanus*; a slender bamboo, identical in habit and appearance with the Kinabalu plant, but not seen in flower, and *Lyonsia albiflora* were also pretty general.

Trees.—*Dacrydium novo-guineense* with *Libocedrus arfakensis*, \circ *Podocarpus papuanus*, **P. Rumphii*, and **Phyllocladus hypophyllum* were dominant, as the profusion of seedlings testified; but a great variety of other small trees were associated, especially towards the southern portion of the ridge, where it broadens out again and is consequently more sheltered—*Drimys arfakensis*, with a dense round crown, bore its small, white, later pink flowers on pendent pedicels; *Spiræanthemum bullatum*, **Bæckea frutescens*; *Backhousia arfakensis*, flat-topped like a *Leptospermum*, with very small coriaceous

leaves, and smothered in golden-orange flowers. A *Psychotria* sp., resembling *P. sarmentosa*, with white panicles of flowers, *Idenburgia arfakensis* representing a new natural order, *Myrtus flavida* var. *glabrescens*, a glabrous form of the Kinabalu species, *Jambosa arfakensis*, with small thick leaves and white flowers, *Palmervandenbroekia papuana*, an interesting new genus in Araliaceæ, and *Timonius filipes*, were in full flower.

3. Mossy Forest.

The occurrence of this sterile type of mossy forest, as distinct from the intermediate form, was limited to the highest points of the ridge, where the prostrate and erect trunks of the small stunted trees with the ground between were swathed in long moss, which, as usual in this type of association, stands out straight from its supports, rigidly turgid and generally in vegetative condition.

**Schizæa malaccana*, **Gahnia psittacorum*, 1 m. high, *Halorrhagis suffruticosa*, *Nepenthes maxima* var. *nana*, the twining *Luzuriaga aspericaulis*, *Rhododendron angiense*, an undershrub, with **Trichomanes digitatum*, *Hymenophyllum cincinnatum*, *Polypodium papuanum*, and *P. remigerum* as epiphytes, were collected.

b. LAKE BASIN.

2 α. Intermediate Mossy Forest.

An isolated circular forest patch, in about the centre of the marsh, proved the best collecting-ground in the mountain-forest area.

The average height of the trees was about 16 m.—a few symmetrical conical dark green crowns of *Libocedrus arfakensis*, the topmost branches of which were all dead, as if the trees had reached the limit of their development or the roots had penetrated into an unfavourable substratum, with the smaller feathery glaucous green of *Podocarpus papuanus* rising above them.

On the exterior a fringe of bracken bordered this patch on the north, while towards the south a wild dense upgrowth of grass-jungle, fern, and shrubs seemed to point to the forest spreading in that direction. On the western or lake side, a raised spit of coarse granite-sand, carrying a graduated growth of *Bæckea frutescens*, intruded into the marsh, the level, no doubt, marking that of the forest-patch.

Trees.—On the southern edge, where the trees were more advanced, **Podocarpus Rumphii* and *P. papuanus* in full fruit, **Phyllocladus hypophyllus*, *Trimenia arfakensis* with white flowers, the scented *Pullea papuana*, *Spiræanthemum bullatum*, both with plumose white racemes, the latter showing peculiarly bullate leaves, *Acronychia papuana*, **Dodonæa viscosa*, **Bæckea frutescens*, the delicate *Metrosideros arfakensis*, with small glistening leaves

and the tender pink flowers in clusters on the bare stems of the old wood, *Myrtus arfakensis* with yellow flowers and black berries, and *Poikilogyne arfakensis* with spreading cymes of pink flowers, the size of blackberries; in the young plants of this, in which the long single wand-like shoots flower at 2 m., the flowers of the ample terminal cyme are larger.

The very abundant *Anomopanax arfakensis*, *Shefflera arfakensis* of compact habit, and *Kissodendron bipinnatum*, with terminal bunches of enormous leaves and inflorescence, were interesting representatives of the Araliaceæ, a family generally typical of primitive forest, the first to disappear under secondary conditions. *°Rhododendron Devriesianum*, its huge white panicles just breaking into flower, *°Styphelia trochocarpoides*, with white flowers and striking bunches of black berries, one of Beccari's Hatam plants, *Vaccinium roseiflorum*, with small massed racemes of waxy pink flowers, while *Mæsa fruticosa*, the handsome *Symplocos novo-guineensis* with *S. arfakensis*, and *°Timonius brevipes*, all showed white flowers.

Once inside this forest, it reminded me strikingly of Fijian conditions in the abundance of stictaceous Lichens, so absent through Malaya, the luxuriance of the moss and fern flora, and the many creeping terrestrial orchids with a wealth of graceful epiphytic forms. The slender epiphytes and climbing plants combined in a sensuous harmony of well-balanced growth-forms, amongst which the stately trunks of the *Libocedrus*, and the straight stems of *°P. papuanus* and *Dacrydium novo-guineense*, with rough scaly brown bark, stood out amongst the smaller angiospermous forest trees.

Undergrowth.—The ground was carpeted with those most beautiful mosses **Rhodobryum giganteum* and *°Hypnodendron diversifolium* in fruit, and creeping between their soft tufts of delicate foliage, the pink-veined velvety-green leaves of *?°Eucosia papuana* in fruit, *Microstylis producta* with shading orange-yellow spikes, and the white spikes of *Goodyera arfakensis* were equally distributed. Colonies of the two varieties *elatior* and *longicalcarata* of *Platanthera elliptica* were abundant, also the ubiquitous **Lycopodium serratum*, while many tiny clumps of the quaint endemic saprophytic genus, first discovered by Beccari in the Arfak, but now established for the whole of New Guinea, the wine-red *°Corsia ornata*, with little heads all pointing in one direction, gave a typically Papuan note.

On the north-east side, creeping under the bracken, the fine *Pterostylis papuana* var. *arfakensis*, from cream to brown-pink in colour, *Liparis lacus*, a small plant with brown labellum and green petals, and a minute brown *Stigmatodactylus* sp. past flowering, grew on the forest edge. Taller plants were **Histiopteris incisa*, *°Pharus flavus* var. *papuanus*, *°Riedelia montana* var. *arfakensis*. Young plants of *Pandanus* sp. with *Kentia Gibbsiana*, a slight tree-fern *Cyathea fusca*, 3 m. high, with *Anomopanax arfakensis*. *°Rhododendron Vonroemeri*, the longly pedicelled small orange-yellow flowers recalling some *Azalea* sp., a very graceful plant, quite distinct in the genus,

with the seedling forms in all stages of the prevailing coniferous species, were general as forest undershrubs.

Lianes.—These comprised *Freycinetia Gibbseæ* with the climbing Bamboo of the S.W. ridge, °*Luzuriaga aspericaulis*, with white flowers and black berries, °*Palmeria arfakiana*, ♂, another of Beccari's Hatam plants, of which he collected the ♀, *Lyonsia albiflora*, *Tecomanthe volubilis*, of which the fallen pink corollas, recalling *Lapageria rosea* in size and colour, were plentiful, with *Lucinæa reticulata*, all slender graceful plants.

Epiphytes.—Stictose Lichens and thallose hepatics, so conspicuously absent on Kinabalu, in comparison with Polynesia, were here well to the fore again, of which **Sticta variabilis* and **Riccardia maxima* were in fruit, and the beautiful **Spiridens Reinwardtii*, setting out straight from the tree-trunks, recalled vivid Fijian memories, other mosses collected being **Rhizogonium spiniforme*, °*Endotrichella arfakiana*, °*Ectropothecium arfakense*. The ferns **Trichomanes meifolium*, °*T. aphlebioides*, **Hymenophyllum paniculiflorum*, **H. Kurzii*, **H. australe*, **H. salakense*, **Humata alpina*, °*H. neoguineensis*, **Davallia dissecta*, **D. contigua*, °*Pteris papuana*, **Polypodium hirtellum*, **P. Curtisii*, and **Asplenium acutiusculum*, associated with *Lycopodium squarrosum*, *Burmannia longifolia*, and the orchids *Glomera angiensis* with terra-cotta flowers, *G. similis* and °*G. transitoria*, *Liparis Gibbseæ*, °*Ceratostylis arfakensis* and *C. angiensis*, a yellow *Pedilochilus* sp., °*Phreatia densissima*, *Dendrobium oxytophyllum*, °*D. riparium*, *Bulbophyllum ovalitopalum*, °*B. tricanaliferum*, °*B. octarrhenipetalum*, *B. ovalifolium*, *B. arfakense*, *B. birugatum*, *Octarrhena cylindrica* var. *major*, were mostly small species with delicate inconspicuous flowers; while only one plant was found in flower of the charming little *Vaccinium cyclopense* var. *arfakense*, which spreads with dorsiventral branches over the trunks of trees, the corolla red with green tips.

1β. *Araucaria Forest*.

The forest took on a totally different character in the spinneys and along the edge which bounded the marsh to the south-east, where the latter was very boggy with much standing water, a character also shown by the encircling forest, on the edge of which I collected, in a dense growth of °*Polypodium papuanum*, *Melastoma malabathricum* var. *adpressum*, *Vaccinium globosum* var. *adpressum*, *Trimenia arfakensis*, *Shefflera angiensis*, and *Symplocos arfakensis*. °*Araucaria Beccarii*, in groups and gregarious, here predominated, the undergrowth dank and impenetrable on the marshy land, where these trees were young, but absent under the older trees on the basal slopes of the eastern ridge, where it rose steeply from the lake (Pl. 3. fig. 5).

In this part the chocolate-brown humus, representing the remains of many generations of trees, covered huge boulders, pointing to a former dominance of this coniferous forest type, with the shed branches of which

the ground, rocks, and sub-stage trees were strewn. *Araucaria* and *Libocedrus* seedling plants in all stages of growth, °*Dawsonia gigantea* in giant clumps nestling between the depressions of the rocks with the fern **Polypodium Feei* (also as epiphyte), constituted most of the scattered undergrowth; while °*Trichomanes aphlebioides*, the peculiar *Dendrobium papuanum*, identical with *Scirpus nodosa* Rottb. in habit and appearance showing the same pinpoint white flowers, *Psychotria* sp., near *P. sarmentosa*, were collected as epiphytes, **Lycopodium casuarinoides* draping some slender under-trees.

This forest originally extended to the banks of the lake, which here rise steeply from the water, but had recently been burnt off for about 10 m. from it, the exposed surface of sandy soil being covered with the upgrowth of Bracken with *Lactuca prolixa*, and underneath **Marchantia polymorpha*, the moss **Funaria calvescens*, **Epipogon nutans*, and on a steep sandy bank *Dendrobium trifolium*, with quaint red and greenish flowers, and °*D. subradiatum*, a mass of small white ones, were found, both probably originally epiphytic on some of the burnt fallen trees.

3. Mossy Forest.

The western slopes of the S.W. ridge, descending steeply to the marsh, were clothed in a small dense mossy forest about 7 m. high, of which the moss-grown logs and roots of trees inhibited most undergrowth, except a slender tree-fern about 1 m. high. The standing trees were draped in moss, *Calamus arfakianus* and the climbing Bamboo often veiling the upper parts. There was little in flower beyond the epiphytic °*Dendrobium glauco-viride* and *Sericolea arfakensis*, with hanging shoots and pink flowers.

This forest ran out on to the marsh through much rotten wood and boggy areas, the latter gay with the beautiful white, pink-veined flowers of °*Impatiens Herzogii* with reddish stems and leaves, forming a long level spinney towards the lake, where, with the increase in the size of the trees, the distinctive mossy character was gradually lost.

Small clumps of *Dacrydium novo-guineense* and °*Podocarpus papuanus* marked the edge of this spinney, single crowns of *Kentia Gibbsiana* rising above the general forest level. In the lower portion nearest the lake *Phaius flavus* var. *arfakensis*, *Symbegonia arfakensis* with white flowers and bracts, the tree-fern *Alsophila angiensis* and a very common *Pandanus*, both isolated and gregarious, up to 13 m., high, with branched and unbranched stems, only the ♂ flowers being found. Young plants of the *Kentia* also abounded in this undergrowth, which included **Rubus glomeratus* with red acid berries, °*Rhododendron Vonroemeri*, and *Solanum Gibbsea*, the latter a semi-herbaceous spreading shrub, about 1 m. high, covered with straight yellow thorns and with small mauve flowers.

**Lycopodium volubile* formed a dense mass on trees up to 10 m., and a *Dendrobium* sp. grew thickly up to the same height in a tangled mass like a small Bamboo, the yellow-green flowers in pairs, unfortunately over.

2 β. Dwarfed Intermediate Mossy Forest.

A lateral spur from the S.W. ridge to the lake bounding the southern part of the marsh to the north, bore rather a spaced xerophytic type of small forest, on the edge of which the undergrowth between the small trees and shrubs was very thick; here the ferns **Dryostachyum splendens* and the delicate **Pæsia radula*, only known from Sumatra, °*Selaginella angustiramea*, with deltoid fronds up to .50 m., and °*Phaius flavus* var. *papuanus* were collected.

Of the small stunted trees about 3 m. high, those in flower were *Pipturus papuanus*, *Gibbsia insignis*, **Glochidion Merrillii*, only known from the Philippines, *Homalanthus arfakiensis*, **Dodonæa viscosa*, *Acronychia papuana*, and the very abundant °*Medinilla Forbesii*, with white and pink flowers in cauline fascicles up the bare grey nodose stems. °*Luzuriaga aspericaulis* twining, the moss °*Taxithelium substigmosum*, **Humata pusilla*, **Polypodium fasciatum*, °*P. scabristipes*, and *Glomera similis*, the latter with small white flowers, were epiphytic on the trunks and upper branches of the small trees.

c. SLOPES OF KOEBRÉ MOUNTAIN.

I did not work over the Alfuero "kebuns," which were dotted with a *Pandanus* sp., **Dodonæa viscosa*, clumps of **Rubus glomeratus* and **R. rosafolius*, also masses of the handsome cream-flowered **Riedelia lanata*, about 3 m. high, *Wedelia biflora* and *Hydrocotyle javanica*, the latter spreading on the ground.

2 α. Intermediate Mossy Forest, 7000-7500'.

Crossing a stream we entered a dry type of intermediate mossy forest with trees of about 13 m., where, as undergrowth, **Asplenium scandens*, a green orchid *Microstylis grandiflorus*, small erect plants of *Symbegonia parvifolia*, with red foliage and pink flowers, and *Riedelia exalata*, with yellow and red flowers, about 1 m. high, were collected. The typical coniferous seedlings of the region abounded as usual, with the undershrubs *Shefflera arfakensis* and the white *Medinilla arfakensis*, the epiphytic °*D. agathodæmonis*, *D. curvimentum*, and °*Bulbophyllum pristis*.

With increase in altitude the forest becomes smaller, though still dry in type, the trees being less erect and more branched in habit.

2 β. Dwarfed Intermediate Mossy Forest, 7500-8500'.

Trichomanes pallidum, *Dryopteris villosipes*, **Lindsaya rigida*, °*Davallia Schlechteri*, °*Polypodium argyropus*, **P. serratodentatum*, **Vittaria crassifolia*, **Psilotum flaccidum*, *Piper pilosulinodum*, and *Henslowia crassifolia* with minute fleshy-green leaves and twining ends to the branches, were collected as epiphytes. In an open space a group of young trees of *Libocedrus arfakensis*, about 30 m. in height, with graceful branches sweeping

the ground, were fruiting, like a *Thuja*, the ♂ and ♀ cones in all stages on separate branches of the same tree.

At about 8500' the forest again changed gradually in type, becoming lower and scrubbier, more open, with a denser growth of undershrubs.

Undergrowth.—*Diplycosia Lilianæ* reappeared and *Vaccinium pilosiflorum*, amongst which a stiff *Exocarpus* sp., with branches up to 1 m. in height, but not in flower, was conspicuous; *Backhousia arfakensis*, **Bæckea frutescens*, *Styphelia nutans* var. *arfakensis*, and *Psychotria vaccinioides*, from compact shrub to small tree, with huge clumps of **Gahnia psittacorum*, 3 m. in height, °*Gentiana Vanderwateri* again favouring damper spots, and °*Myrmedoma arfakiana*, with large slate-blue flowers, abundant on the trees, were collected at about this level.

2 γ. *Shrubberies bordering Crest of Mountain, 8500–9000'.*

On the crest of the mountain the forest passed into shrubberies. Signs of recent burning explained the open character of the summit with scattered trees, which surprised me when seen from the opposite side of the lake, as the altitude is not sufficient to warrant an open formation under the Equator. Dense shrubberies were also isolated in depressions and on raised knolls, all surrounded by a fringe of burnt trees and branches, which formed a protective screen from subsequent flames.

On the edge of shrubberies thus exposed, many species were in flower, viz.: **Phyllocladus hypophyllus*, very abundant, *Idenburgia novo-guineensis*, a fastigiate tree very like some *Drimys* sp. in the reddish stems and petioles and white flowers; also *I. arfakensis*, more spreading in habit, *Drimys Beccariana*, *Elæocarpus koebrensis*, *Sericolea novo-guineensis*, *Spiræanthemum bullatum*, in fruit, *Pogonanthera hexamera*, *Backhousia arfakensis*, *Myrtus koebrensis*, *Rhododendron angiense*, pink, the beautiful white *R. Devriesianum*, *Psychotria vaccinioides*. **Histiopteris incisa* was sometimes seen underneath, but the growth of the trees in these shrubberies is too dense to admit of much intruding undergrowth; *Tecomanthe volubilis*, here in flower, was draped over the trees.

B. OPEN¹ "OPPORTUNITY" ASSOCIATIONS.

a. S.W. RIDGE, 7000–8500'.

Papuan Rest- and Camping-places.

Several open spaces on the broader and higher parts of this ridge are kept open by the Papuans as rest- and camping-grounds. About 20 m. each way in size, with the surface where exposed of hard gravel, sheltered

¹ Gibbs, L. S., "A Contribution to the Flora and Plant Formations of Mt. Kinabalu and the Highlands of British N. Borneo," Journ. Linn. Soc., Bot. xlii. (1914) 19.

and bathed in sunshine these form very dry, pleasant resting-places. Considering their small size, the contrast of the floral association with that of the surrounding forest was very marked. Fringed by the forest trees, mostly in flower, being more exposed to light, these little spaces were always bright with herbaceous plants—*Lycopodium cernuum* creeping, and the brilliant terrestrial orchid, *Dendrobium angiense*, in clumps about .25 m. high, with bright orange flowers 3 cm. long; *Riedelia montana* var. *arfakensis*, with cream-red flowers, about the same height; *Burmanna disticha* and *Didiscus arfakensis*, with spreading stolons, were associated with *Diplycosia Lilianee* and *Vaccinium pilosiflorum*; the 3 cm. long single magenta flowers of *Dendrobium agathodæmonis*, springing out of the ground in bare spots without showing foliage, were generally found on digging up to be attached to a small piece of stick.

**Gleichenia vulcanica*, clumps of *Dipteris conjugata* and the extraordinary *Oleandra cuspidata*, with erect dendroid shoots about 1 m. high rising from a creeping rhizome, the fronds in verticillate whorls up to the apex of the vertical stems, of which Professor Bower writes "It seems to carry to an extreme the habit shown by other species," were massed on the edge under the trees.

Small Landslips.

In several places small slips of the loose granite gravel of the ridge had occurred, exposing the soil, which was covered with large separate ♂ and ♀ patches of *Dawsonia Beccarii*, closely resembling in habit and brown colouring *D. brevifolia* of the exposed peaks of the serpentine ridges of Kinabalu.

**Lycopodium cernuum*, *Gleichenia vulcanica*, *Dipteris conjugata*, grew densely, also *Spathoglottis aurea* and *Dianella cærulea*.

At another more recent slip, *Gleichenia vulcanica* with *Lycopodium cernuum* were associated with *Gahnia psittacorum*, 1.50 m., *Burmanna disticha*, the woody herbaceous *Halorrhagis suffruticosa*, the single shoots with verticillate spinous leaves terminated by a panicle of red flowers, *Oldenlandia nutans*, of similar habit, but quite herbaceous, with white flowers; *Myrtus arfakensis*, as a small spreading shrub, and the prostrate *M. koebrensis*, with reddish foliage and stems, both with yellow flowers, spread over the easier gradients.

b. MARSH BY ♀ LAKE.

Sand Pans with running water.

In certain areas of the marsh, more towards the centre, where coarse quartz-sand formed a solid surface, intersected by shallow streams or bathed in films of streaming water, many small herbaceous plants grew spaced between the larger clumps of more showy species.

Herbaceous Plants.—The little *Schizæa malaccana* with the cosmopolitan *Lycopodium carolinianum*, creeping tightly to the ground, and *L. cernuum*,

the minute **Bulbostylis capillaris* var. *trifida*, *Centrolepis novo-guineensis* in tufts, the first record of the genus in New Guinea, **Xyris pauciflora*, *°Eriocaulon leucogenes*, very variable in size, **Burmattia disticha*, up to 1 m., one or two examples of the little white *°Spiranthes papuana*?, **Polygonum alatum*, the small yellow **Utricularia bifida*, and the mauve **U. racemosa* from a few cm. to 2 dm. in height, both new records for New Guinea, dotted the surface; while abundant patches of the yellow and red *Riedelia montana* var. *puberula*, also var. *arfakensis*, cream and dark red, both about .50 m. high, with the beautiful terrestrial orchids, *°Dendrobium fruticicola*, the foliage .50 m., above which the brilliant orange flowers, red when older, rose to .30 m., *D. latifrons*, also yellow, and the splendid *°D. rhomboglossum*, 1 m. high with large convex flowers, magenta-pink outside, white inside, borne the whole length of the rhachis, made glorious patches of colour, blended with small slender plants of *Halorrhagis suffruticosa*, *Oldenlandia nutans*, and *Coleus Gibbseæ*, white to mauve, all of similar habit and dominant on the marsh in all situations; young plants of *Nepenthes maxima* var. *nana*, the mature trailing over any support, with **Lycopodium divaricatum* abounded.

Shrubs.—As the above plants eased off and a ranker growth inhibited close burning, shrubs occurred in small groups, chiefly **Backea frutescens*, *°Rhododendron Devriesianum*, of which the magnificent white flowers, turning pink later and fragrant at night, are about 1 dm. across, the whole inflorescence being 10 dm. in diameter, *°R. latum*, the little profuse flowering *°R. Vonroemeri*, and the bright red *R. Gibbseæ*, all further emphasize the wonderful colour-scheme of the more open portions of this interesting marsh association.

Denser Sedge Growth in Boggy Areas.

Boggy areas with deep ditches, standing water, or larger streams bore an impenetrable sedge-growth which included **Dryopteris Beddomei*, **Lycopodium divaricatum*, **Cladium falcatum* and **C. germanicum*, **Scirpus setaceus*, *°Trisetum latifolium*, *Ischænum aristatum* var. *arfakensis*, **Juncus lampocarpus*, *°Phaius Tankervilleæ* var. *papuanus*, the flowers brown, white inside, *Halorrhagis suffruticosa*, *Oldenlandia nutans*, *Coleus Gibbseæ*, and **Emilia sonchifolia*, all drawn up to the level of the surrounding sedge.

In other boggy areas sloping down to the lake, generally under water, **Juncus lampocarpus* predominated, easing off with **Carex Gaudichaudiana* to the sand-pan association.

Edging the lake, limiting the white coarse quartz-sand beach, a higher and drier sandy bank, well bound together by the roots of the sedges, and broken in parts where small streams ran into the lake, carried **Marchantia polymorpha*, **Lycopodium divaricatum* and **L. complanatum*, *Cladium arfakense* and **C. germanicum*, **Carex Gaudichaudiana*, **Gahnia psittacorum*, **Rhynchospora aurea* and **R. glauca*, *°Trisetum latifolium*, **Dianella*

carulea, °*Riedelia orchoides*, 75 m. high with red perianth-segments and red-tipped lip, replaced, where the sandy ground was more exposed, by the creeping **Isachne miliacea*, **Centella asiatica*, **Galium javanicum* var., and the fleshy-leaved **Mycetia javanicum* var. *anthotricha*.

Shallow Standing Water.

Behind this fringing bank, where the level was lower, sandy shallow basins of standing water held the algæ **Microspora pachyderma*, *Spirogyra* sp. sterile, **Netrium oblongum*, and a *Penium* sp., possibly a form of *P. phymatosporum*, surrounded with patches of **Sphagnum Junghuhnianum*, °*Dawsonia gigantea*, to be succeeded by **Hypericum mutilum*, *Halorrhagis micrantha*, **Centella asiatica*, **Hydrocotyle vulgaris*, abundant here, **Polygonum barbatum* and **P. strigosum*, the white **Viola distans*, **Galium javanicum* var., **Bidens bipinnatus*, and **Emilia sonchifolia*.

Grass-jungle on Edge of Forest.

Growth on the edge of the forest as it ran on to the marsh was always rampant, and this was especially the case to the south side of the isolated forest-patch, where, meeting over one's head, the tangled mass of fern, sedge, and shrubs had to be forced aside to penetrate into it.

Amongst the herbaceous growth **Stenochlæna sorbifolia*, **Gleichenia vulcanica*, and °*Oleandra cuspidata* were common all round, the scrambling **Gleichenia lævigata* abundant in the open to under the trees, **G. glauca* up to 6 m. with **G. linearis*, **Cladium falcatum*, **Gahnia psittacorum* up to 2 m., *Halorrhagis suffruticosa*, *Oldenlandia nutans*, and *Coleus Gibbseæ*, all drawn up to the level of their environment, with the shrubs °*Medinilla Forbesii*, **Melastoma malabathricum* var. *adpressum*, the lanky single shoots of young plants of *Poikilogyne arfakensis*, °*Rhododendron Devriesianum*, °*R. latum*, and the pink *R. undulaticalyx*. The gregarious °*Scævola Lauterbachii* with long semi-scandent shoots, shining leaves, and for the genus large yellow flowers, known hitherto from N.E. New Guinea, dominated in the tangled mass of fern and sedge.

c. OPEN SUMMIT OF KOEBRÉ MOUNTAIN, 9000'.

Cladonia Association.

The open summit of Koebré forms a flat plateau with a hard surface of disintegrated quartz-granite on which quartz-gravel lies so thickly that it gives quite a white effect. Where the rock is exposed it shows as large a proportion of quartz-veins as of granite.

Herbaceous plants.—On this open plateau, for which systematic burning is again responsible, a remarkable association of *Cladonia* spp. prevailed, spreading over the whole area as a uniform grey carpet, about 3 cm. high, composed of **Cladonia verticillata*, **C. didyma*, and **C. coccifera*, displaced

in certain parts by stretches of short **Pteridium aquilinum* var. *lanuginosum* or **Gleichenia vulcanica*, and in damper places dense mats of *Centrolepis novo-guineensis*.

Associated with the *Cladonia* were clumps of °*Riedelia montana* var. *arfakensis*, and colonies of **Burmanna disticha* and **Gahnia pittacorum*, the latter dwarfed to 50 m. high. *Patersonia novo-guineensis* in full flower, the gleaming white or pale mauve corollas well exposed, was dotted in tufts all along the summit, a most interesting first record of a genus known from Kinabalu, Mt. Halcon in the Philippines, and Australia.

A small example of the green °*Platanthera elliptica* was a remarkable find, the species alone being previously known from S.W. New Guinea, while the two new varieties, so abundant in the moss-grown forest of the S.W. ridge and the small high mossy forest-patch by the lower lake, were not seen on the slopes of Koebré. Patches of the familiar °*D. rhomboglossum* and °*D. fruticicola*, both as conspicuous as on the marsh, with the magenta °*D. infractum*, represented the terrestrial orchids in flower, with *Glomera Gibbseæ* epiphytic on the upper branches of a wind-swept shrub.

Didiscus koebrensis with many radiating stolons, near a species already collected on Mt. Scratchley in the S.E. supposed to be a variety of *D. saniculæfolius* of Kinabalu and Mt. Halcon. *Oldenlandia nutans* var. *alpinum* was dwarfed to 50 m. °*Myrmedoma arfakiana* (Pl. 3. fig. 6) with its slate-blue flowers the size of a shilling, showing all round the formless bristly stems, of which the fleshy consistency no doubt resists the fires, grew in solitary examples, one of which, about a metre in height, sent out a metre-long shoot from the apex at right angles to the main stem.

Shrubs.—The exposed and wind-swept character of this summit plateau was shown in the shrubs, which either spread prostrate over the surface or were clipped back into small compact shapes. *Hibbertia novo-guineensis*, a plant with large flowers and spreading habit and very near to *H. scandens* of E. Australia, is the first species in this genus, hitherto known from Australia and New Caledonia, to be described for Malaya or New Guinea. The ever-present **Bæckea frutescens* took on a prostrate form, *Acronychia arfakensis*, with insignificant white flowers and reddish fruit, was either prostrate or erect, while *Myrtus prostrata*, with reddish stems and small coriaceous leaves, had developed quite dorsiventral shoots, resting on the ground.

Small erect shrubs were **Henslowia umbellata* with yellow foliage, *Diplycosia Lilianææ*, and *Vaccinium villosiflorum*, while the dark green *Telminthodiu rotundifolia*, the typical °*Styphelia Gjellerupii*, with white flowers and pink berries, and another *Styphelia* sp., of which the material was not sufficiently complete for identification, °*Rhododendron angiense*, *Sericolea novo-guineensis* with *Psychotria vaccinioides*, were of clipped compact habit.

A couple of small trees of *Dacrydium novo-guineense* dwarfed to about 4 m., with stiff, Araucaroid, ascending branches, bore many tiny ripe cones,

glinting red through the dark green foliage, a fortunate fact, deciding the genus of a very prevalent species of conifer, of which it was certain that the abundant seedlings in various growth-forms could only represent a new *Dacrydium* sp., but the search for fruiting specimens at lower altitudes proved unsuccessful.

In reference to this exposed lichen-covered plateau a quotation from Lorenz (22, viii. (1909) 178) in "Nova Guinea" suggests the presence of a similar association on the Charles Louis Mountains, while Mr. Stroeve of the Dutch Navy, whom I had the pleasure of meeting at Manokoeari after my return from the Arfak, described what seemed a very similar formation as occurring on the mountains to the south of Geelvink Bay at about the same altitude, where not only the practice of burning obtains but potatoes are also grown. I heard later with great regret of the untimely fate of this promising young officer, who, after most successful exploration and surveying work on the Ruffaier River, was treacherously shot by arrow by Papuans on the Waroza River, near the coast to the east of Geelvink Bay (26, 782).

PHYTOGEOGRAPHICAL CONCLUSIONS.

These may be summarized as follows :—

- (1) New Guinea, the centre of distribution for many so-called Polynesian, Australian, and to a lesser extent Malayan types, of which the Papuan species are not only older in type, but also show extraordinarily pronounced specific differentiation.
- (2) Wide distribution in New Guinea of endemic Mountain types.
- (3) Low Mountain Forest formation approximates to the Ridge formation of Mt. Kinabalu and the Philippines.
- (4) Mountain Forest Flora of the Arfak Mountains possibly represents the oldest Papuan type.
- (5) Pteridophytic and Bryophytic Floras are more Polynesian than Malayan in incidence and luxuriance.
- (6) Open "Opportunity" Plant Associations offer further proof of the autochthonous character of the Papuan Flora.

1. NEW GUINEA THE CENTRE OF DISTRIBUTION FOR MANY SO-CALLED MALAYAN, POLYNESIAN, AND AUSTRALIAN TYPES.

Evidence of New Guinea as the centre of distribution for many plant-types, so far considered Polynesian or Australian, has been strikingly confirmed on the present occasion. Emphasized by the well-known botanists who have worked out the results, such evidence has been a marked feature of recent Dutch and German exploration, and was also shown in Kloss's Mt. Cartensz collections¹.

¹ Ridley, H. N., "Report on the Botany of the Wollaston Expedition to Dutch New Guinea," Trans. Linn. Soc., ser. 2, Bot. ix. (1916) 1-269, pls. i.-vi.

Geological support for this theory is quoted by Wallace (7, 443) in 'Island Life,' who points out that the "1000 fathom line, which indicates the land area which would be produced if the sea-bottom were elevated 6000', extends in a broad mass westwards, then sending out two great arms, one reaching to beyond Lord Howe's Island, while the other stretches over Norfolk Island to the great barrier reef, thus forming a connection between Tropical Australia and New Guinea."

Sieberg¹ explains the same configuration in greater detail as follows:— "Neuguinea und der Bismarckarchipel gehören nach E. Suess dem innersten unter den Bögen junger Faltengebirge an, die vom Osten her sich gegen die alte starre Festlandstafel Australien anlegen und die in Neuseeland zusammentreffen. Dieser innerste australische Bogen setzt sich aus zwei annähernd parallelen Teilstücken zusammen, die beide in die Nordnordwesthalbinsel Neuseelands münden. Die Nordwestlich streichenden Ketten hoher Faltengebirge, die das innere Neuguineas der Länge nach durchziehen (Bismarck und Krätkegebirge, Viktor-Emanuel, Charles-Louis Gebirge) reichen untermeerisch noch weithin und ragen in ihren höchsten Spitzen als die Inselgruppe der Louisiaden und Neukaledonien empor; der östliche parallelbogen setzt sich zusammen aus Neumecklenburg, den Salomonen und Neuen Hebriden."

Of the preponderating influence of the New Guinea Flora, when sufficiently well-known, we have an instance in the Orchidaceæ, a family which in the N.E. has received the expert attention of Schlechter (23), the well-known authority and collector. Dr. J. J. Smith, of Buitenzorg, an equally keen expert in this family, has not only described nearly all the orchids of the N.W. and S.W. so far known, but has also consistently enjoined on collectors in the Dutch possessions to devote particular attention to these plants, so that from both these sources we can form some idea of the general incidence and distribution of this one order throughout the country.

Such is the wealth of material in a single instance in this little-explored island that Schlechter, whose unrivalled experience in N.E. New Guinea has spread over a number of years, summarizes his results in orchids alone as 116 genera with 1450 species, of which 1102 are new (23, i. 14, xiii). He considers that nowhere in the world is the Orchid flora so rich, quoting 2600 species as being known from there. Orchids known from Australia and common to New Guinea he (23, i. 14, xix) looks upon as branches of the Malayan-Papuan flora in Australia, the Orchid flora of tropical Australia having developed under strong Malayan-Papuan influence, but it has had little influence on the Papuan flora. This remark, to those who have

¹ Sieberg, A., "Die Erdbebenätigkeit in Deutsch-Neuguinea (Kaiser-Wilhelms-land und Bismarckarchipel)," Peterm. Mitth. lvi. pt. 2 (1910) 118.

worked over the two areas, succinctly summarizes the whole relation of both floras.

This Malay-Papuan influence is the determining factor extending to the South Sea Islands, while the Moluccas show Malay with Philippine ground-types and a strong Papuan influence (23, i. 14, xx), and Schlechter describes New Guinea as the centre of distribution of an endemic Orchid flora ("Ausgangszentrum einer eigener Orchideenflora") (23, i. 14, xx) as evidenced by *Corysanthes*, supposed to be Australian, but now truly Papuan, 13 species being known from N.E. New Guinea alone. The presence of this genus in Australia, New Caledonia, Samoa, Java, Philippines, and the Himalayas suggests radiation from a Papuan centre of development (23, 14, xxiii).

This overwhelming Papuan influence is amply demonstrated in many other families, which not only show an actual numerical predominance in species, but also a greater range of specific differentiation than is known from elsewhere: for example, *Libocedrus* (4), *Drimys* (19), *Myrtus* (6); of *Pandanus* and *Freycinetia*, I have never seen such a wide range in form; while in *Rhododendron*, *Vaccinium*, *Styphelia*, the numerical predominance along with the great morphological range of form is unsurpassed in any other region, except perhaps, in the case of the first, Central China.

Further interesting proof of the soundness of this point of view is afforded by comparison of the Australian and New Guinea representatives of the same genera, the Papuan forms showing decidedly the oldest types.

In the present collection perhaps *Trimenia* is the most striking case in point. *T. weinmanniæfolia* Seem., described in 1852 from Fiji, a diœcious plant, remained the type of a supposed monotypic Polynesian genus, closely allied to *Piptocalyx Moorei*, also diœcious, ranking as a monotypic Australian one, till Ridley described *T. papuana* from Mt. Carstensz in 1916. *T. arfakensis* is included in the present paper.

Two species of *Trimenia* are now known from New Guinea, both hermaphrodite, while two new species in a closely allied new genus, *Idenburgia*, show a syncarpous bilocular ovary, proving not only that the diœcious habit of the two isolated outliers of this order is probably derived, but also that the systematic position of *Trimenia* and *Piptocalyx* in the apocarpous Monimiaceæ is untenable, necessitating the new order Trimeniaceæ.

An equally convincing example is that of *Pullea*, a genus established by Schlechter in Saxifragaceæ to include two plants with inferior ovary from N.E. and N.W. New Guinea respectively, to which *P. papuana* is now added, with a N. Queensland species, *P. Stutzeri* = *Callicoma Stutzeri* F. Muell., first distributed as *Stutzeria* by him, but afterwards included in *Callicoma*. *Pullea*, therefore, now includes three distinct Papuan species and one N. Australian, but, had the latter plant first been accorded proper generic position, the former would have been cited as evidence of a wave of Australian immigration into New Guinea.

Of the two Papuan species in *Backhousia*, another of the so-called Australian endemic genera, one was described by Ridley from Mt. Carstensz, to which a second, one of the commonest trees in the Arfak, is now added. Both have normal calyx-lobes, while the Australian species show a secondary petaloid development of the lobes, evidently derived in character, though previously considered a generic distinction.

The same case may be quoted for *Didiscus*, where the older types, according to the Monographer,¹ showing a normal calyx, occur in Malaya and New Guinea, with one species in N. Australia, whereas those with aborted calyx-lobes, by far the most numerous, are known from the rest of that continent, with one species from some Polynesian Islands.

Further evidence is also forthcoming in interesting new records of genera not previously known from New Guinea, namely, *Hibbertia*, hitherto considered Australian and New Caledonian; *Centrolepis*, abundant at 7000' and 9000', connects New Guinea with the open summit of Kinabalu in N. Borneo at 13,000', Mt. Halcon in the Philippines at 7000', and S. China on the one hand, and Australia and New Zealand on the other; while the genus *Patersonia*, supposed on inadequate knowledge to be endemic Australian, shows the same distribution, with the exception of S. China, and now includes three very distinct Malayan mountain types.

In the case of species, *Gahnia psittacorum*, abundant everywhere in the Arfak from 7000', is the first record for Malaya of a plant widely distributed in E. Australia to Tasmania.

2. WIDE DISTRIBUTION IN NEW GUINEA OF ENDEMIC MOUNTAIN TYPES.

In considering questions bearing on the phytogeography of New Guinea, as a whole, it is important to take into consideration the fact that it is a country of 786,000 km. in area (23, i. 14, i), most of which is mountainous in character and undisturbed in condition. A huge region of vast ranges, in which all intercourse between the relatively few and scattered inhabitants is not only restricted by natural barriers, but also by the many different languages, no two tribes having a common speech, even when living in apparent proximity on the same range of mountains. Both these facts have effectually debarred outside penetration into the mysterious back-country.

Though our knowledge of the plant-covering of these mountains is extremely limited, such phytogeographical exploration so far accomplished points, as would be expected under such virgin conditions, to the homogeneity and stability of the flora as a whole. This fact is evinced in the pronounced endemism and wide distribution throughout the whole country, further

¹ Domin, K., "Monographie der Gattung *Didiscus* (DC)." Sitz. Kön. böhm. Ges. d. Wiss. ii. Cl. (1908) 21.

convincing proofs of which are afforded in the present collection. The following instances may be quoted.

All the mountains of New Guinea show a preponderating number of species belonging to *Rhododendron* and *Vaccinium* in Ericaceæ and *Styphelia* in Epacridaceæ, though but few identical species have been so far recorded; but that this point is only a question of further investigation is proved by the distribution of the very distinct *R. Vonroemeri*, which, most abundant in the Arfak, is recorded for the Cyclops Mountains in the north, and from the Hellwig Mountains and Mt. Carstensz in the south-west (= *R. calceolarioides* Wernham). *Medinilla Forbesii*, collected in the south-east and the south-west, is now established for the north-west as well, while *Timonius filipes* and *Podocarpus papuanus*, first collected on Mt. Carstensz, are common on the Arfak at higher altitudes. *Quercus Lauterbachii*¹ and *Scævola Lauterbachii*¹, generally collected in the north-east, were not previously known from Dutch N.W. New Guinea.

In small herbaceous plants two new species of *Didiscus* link up the Arfak with the Owen Stanley range in the south-east, while *Eriocaulon leucogenes*, *Trisetum latifolium*, and *Gentiana Vanderwateri* are common to the former and Mt. Carstensz. *Spiranthes papuana* is now known from the north-east and north-west, *Platanthera elliptica* from north and south-west. New species in genera first recorded from New Guinea through Kloss's Carstensz collections, such as *Trimenia* and *Backhousia*, are now proved to be common to the Arfak as well; also the genera *Pullea* and *Sericolea*, the latter represented by six species in the north-east, one in the south-east, three on Mt. Carstensz, and now by two in the Arfak; while *Libocedrus*, known from the north-east, south-east, and south-west, and *Dacrydium* from the north-east, south-west, and south-east, are abundantly represented by one very distinct species each in the Arfak.

3. THE LOW MOUNTAIN FOREST FORMATION APPROXIMATES TO THE RIDGE FORMATION OF MT. KINABALU AND THE PHILIPPINES.

The low forest formation approximates very closely to that of the serpentine ridges of Kinabalu from 7000', but with a larger proportion of what I would have previously described as southern hemisphere types, but prefer now to refer to as Papuan.

Identical plants so far recorded are *Phyllocladus hypophyllus*, *Myrtus flavida* var. *glabrescens*, a glabrous variety of the Kinabalu plant, while closely allied species occur in *Dawsonia*, *Podocarpus*, *Dacrydium*, *Centrolepis*, *Patersonia*, *Didiscus*, *Gentiana*, and others.

¹ Schumann, K., and Lauterbach, K., 'Flora der deutschen Schutzgebiete in der Südsee,' Leipzig, 1901. Nachträge, 1905.

The prominence of orchids, Myrtaceæ, *Rhododendrons*, *Styphelias*, and *Vacciniums*, in relation to other plants, is equally emphasized, but members of the Araliaceæ, an old type of plant so prominent in the Arfak of New Guinea, are, so far as we know, absent on the N. Bornean mountain.

From descriptions of the Philippine mountain-ridge vegetation it would appear that the Papuan facies again predominates, thus approximating it to that of the Arfak and Mt. Kinabalu, the absence of araliaceous types being less marked, though of the typical Papuan genera *Anomopanax* is represented by one species, and *Kissodendron* and *Mackinlaya* are absent. *Phyllocladus hypophyllus* is common to all, with allied *Dacrydium* and *Podocarpus* spp. *Glochidion Merrillii* is also common to the Arfak, but a thinning out in the number of *Styphelia* and *Vaccinium* spp. is apparent, while the *Rhododendrons* show a great reduction in variety of type.

4. THE MOUNTAIN FOREST FLORA OF THE ARFAK MOUNTAINS POSSIBLY REPRESENTS OLDEST PAPUAN TYPE.

It is in the Arfak alone, of all the Papuan mountain ranges of similar or greater altitude, that two different localities have been worked over on three separate occasions. This fact gives a wider field of comparison in relation to this range. On comparing the general type of vegetation and the generic and specific distinctness of the plants so far collected on this range with those known from similar localities, one feels inclined to look upon these granite mountains as carrying an older part of the Papuan flora. Where so little is known, however, of the mountain flora of the country as a whole, and collections remain limited to vertical sequence, it is impossible to base such an impression on any actual fact, and the hypothesis is only worth advancing as a possible consideration for future workers.

The contrast is very striking between the recent "korang" belt, from which this range on the east rises almost without transition as abruptly as the mountains on the north from the sea, and the well-defined limits and deep soil of the foot-hills and lower ranges. The extreme homogeneity of the mountain forest zone, the extraordinarily small incidence of outside or immigration plants, combined with the relatively broad crests of the ridges and the tremendously weathered condition of the main range, are all facts which point to general stability in condition, spreading over a considerable epoch of time.

The climate of the Arfak would also seem to be more favourable than on other ranges, and the nature and structure of the plants are not so limited by the edaphic and atmospheric factors which play such a large part in the restriction of floral conditions on Kinabalu.

For instance, all the Arfak plants show coriaceous to very small leaves, and the hairy covering or tomentum, common to many of the Kinabalu

plants, is quite absent—a fact possibly to be attributed to the warm well-drained soil of disintegrated granite and the even conditions of illumination with less direct exposure to wind. The “Nebelwald” of the German botanists, described as predominating on the mountains of the north-east, with trees swathed in lichen, is absent, also the “Krüppelwald” association, while the turgid vegetative form of mossy forest is limited in incidence.

But, of course, so far as the two former associations are concerned, the lower altitude is a possible and limiting factor.

5. PTERIDOPHYTIC AND BRYOPHYTIC FLORAS ARE MORE POLYNESIAN THAN MALAYAN IN INCIDENCE AND LUXURIANCE.

The Pteridophytes and Bryophytes of the Arfak proved exceedingly varied and luxuriant in incidence, more Polynesian than Malayan in facies, but endemic Papuan in type. In mosses *Spiridens*, with a limited distribution in Polynesia, and since recorded from the north-east and north-west of New Guinea and Borneo, is probably a Papuan generic type.

6. OPEN “OPPORTUNITY” PLANT ASSOCIATION.

In a mountainous forest country like New Guinea, sparsely inhabited, with little or no intercommunication between the different tribes, and no migratory herds of grazing animals, there is everything to conserve and nothing to modify natural conditions.

Lying in what may be called the centre of the monsun region, the whole country is subjected to a more or less regular rhythm of alternating air currents. Beccari (12, i. 216) has emphasized that the north-east monsun, blowing regularly from November to April, must affect the general distribution of plants in the regions which come under the immediate influence of these prevailing winds. This opinion has been already advanced by myself,¹ and later² from observations on the granite core of the exposed summit of Kinabalu, before I had seen Beccari's convincing remarks in relation to his own observations throughout Malaya.

Beccari aptly remarks that seeds are lighter than grains of sand from volcanoes, and are adapted to remain longer in the air. Authenticated instances of the possibilities of long-distance transport of grains of sand and volcanic ash by the agency of wind are quoted by him (12, i. 216–220). Warming³ advances the same theory, for which extraordinary proof is forthcoming in recent work of the Geological Survey of India. La Touche⁴

¹ L. S. Gibbs, “A Contribution to the Montane Flora of Fiji, with Ecological Notes,” Journ. Linn. Soc., Bot. xxxix. (1909) 137.

² —, “A Contribution to the Flora and Plant Formations of Mt. Kinabalu and the Highlands of Brit. N. Borneo,” *l. c.* xlii. (1914) 47.

³ T. Warming, ‘History of the Flora of the Færoes,’ Botany of the Færoes—II. Copenhagen, 1903.

⁴ T. H. D. La Touche, Mem. Geol. Surv. Ind. xxxv. (1902) 42.

discovered small undamaged foraminifera in the desert sand of Barmar and Bikanir, which must have reached the heart of the desert by wind transportation over a distance of 500 miles from the coast of Cutch.

This interesting observation gave the first clue to the remarkable work organized by T. H. Holland,¹ to explain the origin of several intermittent saline lakes in the Rajputana desert, in which the quantity of salt stored is in excess of the amount that could be accumulated by normal freshwater rivers acting within any reasonable geological period under present physiographic conditions. The Rann of Cutch dries up in the hot dry season, to be covered with a thin incrustation of salt. This salt is transported by strong winds from the south-west, which blow regularly from April to June, to be followed by the rainy season, when the salt, deposited on the surface of the desert, is washed in solution into convenient hollows, forming small lakes. It was found, as a result of this investigation, which should be widely known amongst botanists, that during four months of the hot season of 1908 the amount of wind-borne salt passing a front of 300 km. broad and 100 m. high must have been something of the order of 130,000 tons.

Recently our airmen² operating in Mesopotamia have found the "dust chokes the engines and the sand above blows as high as 4000'." Further interesting proof of the constant direction of air-currents is afforded in the first report on upper air research in Australia,³ when difficulties were encountered owing to the fact that Melbourne is on the south coast of Australia, and the prevailing winter winds, as well as the upper currents in advance of cyclonic disturbances, are from a northerly direction, and thus carry the balloons out to sea. Material carried by wind is deposited on reaching contrary currents, when should the seeds carried be precipitated on to a suitable habitat germination takes place (12, i. 220).

Cross-currents would be most likely met with on the summits of high mountains, where conditions in the tropics would alone be favourable to ombrophobous plants requiring temperate conditions. We have now sufficient evidence to prove that the area of high open country on the immense chains of mountains in New Guinea must carry an enormous number of species of this type of plant. The summits of Mt. Kinabalu in Borneo, Mt. Halcon and others in the Philippines, and Bonthain Peak in Celebes, would offer the only suitable habitat for such plants between New Guinea and the Himalayas in the west monsoon region of distribution.

In those cases where not only the suitable area but also the fauna is much restricted, though identical conditions of temperature and rainfall prevail,

¹ T. H. Holland: successive Annual Reports of the Geological Survey of India published in *Records G. S. I.* during 1904-09; "Discussion on the Physiography of Arid Lands," Report Brit. Assoc. Adv. Sci. for 1914, 363 (1915).

² Candler, Edmund, 'Daily Mail,' Dec. 19, 1916.

³ Commonwealth Bureau of Meteorol., Bull. 13 (Melbourne, 1915).

possibilities in the evolution of new species are practically inhibited, and we get the same or very closely allied representatives.

But when cross-currents from the Antarctic (24, 222) cause precipitation in Australia, the opportunity habitat is that of a large and open arid plateau with little or no elevation, low rainfall, and a different and unlimited insect fauna. Where constant conditions in illumination, temperature, and limited rainfall prevail, there is practically nothing to limit the multiplication of species able to survive the widely prevailing arid conditions of this continent, of which the rainfall is less than 10" over 100,000,000 sq. miles.¹ A multitude of plants, so similar in appearance that it is difficult on casual acquaintance to separate the different species, are evolved, especially as annuals or ephemerals of the eremaea. To quote the genus *Didiscus* again, which well exemplifies this theory: according to Domin² the Calycina section represents the oldest form, limited to four species, of which two are Papuan, one extending to N. Borneo and the Philippines; the others occur in Celebes and N.E. Australia respectively. Pseudo-calcina, considered atavistic, is represented by one Papuan species and two in N.E. Australia. The rest, or Eudidiscus, are all mostly annuals, younger types, represented largely in W. Australia, with one in the Polynesian Islands, where restricted conditions would limit the evolution of the many closely allied species, so marked a feature of Australian xerophytic types.

Open plant associations at the Angi lakes belong to the "Opportunity" category, as under normal conditions these areas would be in forest, being only kept open by the means of artificial burning at regular intervals. It is extremely interesting in this respect that it should be possible to compare two distinct associations of this type, developed under absolutely opposed conditions, viz. :—

1. The open marsh at 7000', sheltered in position, showing varying conditions of soil and constant conditions of moisture.

2. The *Cladonia* association of Koebré at 9000', where constant conditions of exposure and drainage prevail with a hard surface soil, sterilised by the constant burning.

No more certain proof is afforded of the derived character of a flora than that offered in a forest country by open spaces due to artificial circumstances, providing conditions, rainfall, and temperature are favourable. This fact is well exemplified in New Zealand and the Pacific Islands, where both rainfall and original plant covering once approached present Papuan conditions, but now, under the stress of competition with ombrophobous immigrant plants, not a single native species will be found in such areas.

¹ Griffith Taylor, "Discussion on the Physiography of Arid Lands," Report Brit. Assoc. Adv. Sci. for 1914, 303 (1915).

² Domin, K., "Monographie der Gattung *Didiscus* (DC)." Sitz. Kön. böhm. Ges. d. Wiss. ij. Cl. (1908) 13, 20-23.

So much is this the case that the history and country of origin of immigrant man, to whose agency the presence of this "Opportunity flora" is indirectly due, can be pretty accurately determined by the nature of the invading plants. It is the absence of aliens in the "Opportunity" associations of the Arfak which form the engrossingly interesting feature in the phytogeography of this region.

1. *Open Marsh.*

Endemism is the dominant note in the plant-covering of this marsh. Most of the dominant plants found there are now described for the first time, or were first collected by Beccari and Gjellerup. One or two have been previously described from New Guinea, as *Eriocaulon leucogenes* and *Trisetum latifolium*; others, to quote new Papuan records alone, are incidental wind immigrants from the Himalayas, as *Xyris pauciflora*, *Polygonum strigosum*, and *Viola distans*. The latter is unknown in Malaya with the exception of the Philippines, while the others reach N.E. Australia, and therefore their incidence in New Guinea was to be taken for granted. In *Utricularia racemosa* and *U. bifida*, the former shows the Himalayan range and the latter is limited to Malaya, while *Gahnia psittacorum*, abundant on both these open areas and also at home in the forest, reaches E. Australia and Tasmania. Most of the other Cyperaceæ are cosmopolitan temperate types, of incidental wind distribution, like the cryptogams, of which, in relation to the freshwater Algæ, Professor West writes "that all the species observed are ubiquitous, few of the tropical ascending to 7000', the one exception being *Closterium Bacillum*, known only from Burma." The lichens, most mosses and ferns, including the *Lycopodiums* of these areas, are also cosmopolitan, while the only *Selaginella* collected is endemic.

The one plant to suggest man's agency was *Desmodium Scalpe*, an unexpected representative of a genus that may almost be described as alien to the Papuan mountain flora, but, growing on the site of van Oosterzee's and the Pratts' camps, it may be considered the one relic of alien intrusion. On Kinabalu this plant has so far only been found at Lobang, on the invariable camping-site.

2. *Cladonia Association of Koebré.*

None of the ombrophobous herbaceous plants with the exception of the *Riedelias*, a feature of the open spaces of the S.W. ridge and of this summit plateau, were collected in the surrounding forest. They were all plants requiring constant illumination and low temperature for their development, of which the germination of the seeds would be inhibited under shade conditions.

Some of these plants, such as the *Dendrobiums* and *Centrolepis*, are common to the open spaces of the S.W. ridge and to the marsh; of the

others, *Didiscus* has been recorded from Mt. Scratchley in the south-east, and the *Platanthera* from the south-west.

The presence of the other plants must be due to wind-incidence, and they would be derived from natural exposed areas above the tree-level on the mountains of greater altitude to the east and south of the country.

The cryptogams, again, as is the case on the marsh, are all cosmopolitan.

This remarkable ridge association of Koebré combines some of the most peculiar elements of what have been considered the Malayan, Polynesian, and Australian floras.

The plants found there show roughly what the systematic enumeration of the species collected proves in detail, that the flora of the mountains of New Guinea, almost unknown outside the last ten years, must now be considered the axle of a wheel of distribution, of which the spokes alone have so far been familiar to us. This is in agreement with all recent work at similar or greater altitudes. Had that axle, even now barely investigated, been worked out first, we would, as a matter of course, speak of the dominance of Papuan elements in neighbouring floras as the German and Dutch botanists have already rightly suggested.

SOME PLANT ASSOCIATIONS OF THE N.W. COAST.

Dorei Bay.

The chief plant association of Dorei Bay is that of the "korang" forest clothing the low coral-limestone range which rises immediately behind Manokoeari to the height of about 500', in a gradual slope from the sea-shore.

This forest is still in its pristine condition, as all the surface-water drains through the sterile and porous subsoil, to a certain level line, about 200' above the beach, which marks the issue of the small streams representing the drainage of the ridge. This line also limits possible cultivation, as below it the "korang" is covered with sufficient depth of soil, due mostly to the erosive action of these streams, to allow of necessary but not luxuriant cultivation.

The old "pisang"¹ plantations of the Alfueros, now run to seed, with secondary jungle upgrowth, abut on to the natural forest at this level, on which both the reservoirs collecting for the water-supply of Manokoeari are situated at different points.

The peculiarities of this "korang" forest were noted by Forrest in 1750 (1, 111), who wrote "there being no underwood it is easy travelling under the lofty trees"; and Dumont d'Urville in 1827 (3, iv. 581) estimated the trees in the forest as 80-200' high, writing of a "sol dégagé, arbrisseaux clairsemés,

¹ Banana.

fougères de petite taille, et fort peu de plantes herbacées," and further on (3, iv. 602), "Tous les environs du hâvre proprement dit sont occupés par des forêts à l'état de nature, situées sur un sol entièrement madréporique, qui s'élève en pente très douce"; and, finally, Wallace, in 1852 (6, 173), describes "the Dorey promontory is a raised coral reef, and, geologically speaking, a very recent one. The beach is a mass of dead and broken coral, not yet ground into sand, quite impracticable for walking, and from this beach up into the jungle, and even on to the hill, to the height of 200' or 300', there is scarcely a perceptible change in the coral rock, and the masses of coral and shells that everywhere strew the surface. In some of the gulleys, however, I found traces of a core of stratified rock."

I did not work over any of the gullies, as once off the "korang" range the conditions are all secondary, every inch of ground having been under present or past cultivation.

With regard to the beach, the coral mentioned by Wallace had possibly been washed up by a heavy N.W. monsoon, as our own beaches are often covered with shingle during the winter gales, to be dispersed again later. At the period of my stay it was certainly not an apparent factor.

On the "korang" the soil is so thin that the coral is always visible, mostly covered with dead leaves. The most interesting portion is along the flat-topped summit where the surface is more even and advantageous to plants, and in parts small soak-areas hold shallow standing water. The immediate flanks proved barren of results, being very dry with great overhanging outcrops of pure "korang"-like cliffs, too porous to offer much hold for plants.

On what may perhaps be referred to as the drainage-line of the streams issuing from the range, quite a different type of undergrowth prevailed, almost luxuriant in character, comprising chiefly ferns, Zingiberaceous and Araceous plants.

Trees.—Most conspicuous were fine isolated examples of that magnificent palm **Pigafetta pilaris*. Too beautiful to cut down, I only took some old fruit and the measurements of the immense leaves,—those shed, with the old flowering rhachises, remaining piled around each tree, which in consequence form isolated spots in the forest. Dr. Beccari, however, with his personal knowledge of this locality and expert interest, had no difficulty in determining this splendid species. **Ficus myriocarpa*, **F. celebica*, **F. botryocarpa*, and °*F. brachiata*, the two latter with green receptacles which all contained water, were very general, with the large-leaved °*Macaranga riparia*, **Mallotus tiliofolia*, *Aglaiā Gibbsea*, with large branching white racemes, **Euonymus javanicus*, and **Albizia moluccana*.

Climbing plants.—All the trunks of the trees were covered with root-climbing epiphytes, as in the "korang" forest of the inundation-zone of

Geelvink Bay—*Pothos* sp. not seen in flower or fruit, **Piper Forstenii* with huge leaves, also sterile. The scandent fern *Thysanosoria dimorphophylla* (Pl. 4. fig. 7) with fertile fronds at the apex of the shoots, the type of a new genus, was very common with **Lygodium digitatum*, °*Freycinetia lanceolata*, **Dracena angustifolia*, **Flagellaria indica* in huge examples running up the tallest trees in the forest, and **Zanonia macrocarpa* enveloping most of them in its heavy curtains. m.c.

Epiphytes.—As in the littoral korang forest these were not numerous and not a single orchid was collected. Possibly the thick swathing growth of climbing epiphytes and stem-clasping lianes may, to a certain extent, account for their absence, also perhaps the porous nature of the subsoil, which reduces the constant evaporation so essential to the support of the large epiphytic flora common to the primary high forest of the foot-hills. The moss **Pelekium trachypodium* on dead wood, the fern **Antrophyum reticulatum*, with the white-flowered °*Mymecodia pulvinata*, were collected.

Undergrowth.—The hepatic **Dumortiera velutina* was found in patches, and the ferns **Stenosemia aurita* always in colonies, while **Asplenium laserpitiiifolium*, **Aspidium Lenzeanum*, with **Dryopteris truncata* and **Diplazium proliferum*, the two latter like small tree-ferns in habit, were dotted about. Small colonies of the creeping **Hemigraphis reptans*, **Geophila reniformis*, with the orchids, always grouped, *Microstylis Gibbseæ* and the larger orange-green °*M. xanthocheila*, with *Liparis maboroensis* var. *bistriata*. Of larger plants, **Centotheca lappacea* and **Schleria margaritifera*, the small white *Dracena novo-guineensis* with very screwed leaves, were abundant; *Pellionia Vanhasseltii* massed on a prostrate trunk and on the ground beneath, the stinging °*Laportea armata* about 1–2 m. high, gregarious on a small soak-area, and the shrubby *Amarocarpus Wichmannii*, about 1 m. high with dorsiventral branches, were scattered over the surface, which showed no understaging of shrubs and little even of young trees.

In the denser undergrowth at the base of the forest, on the drainage-line, abounded **Aspidium pachyphyllum* with fertile and sterile fronds, °*Aglaionema novo-guineensis* about 1 m. high, the leaves crowded towards the top and the flowers with green spathes and white spadix and red fruit, and °*Cyrtosperma macrotum*; °*Alocasia acuta*, a peculiar plant with large fleshy leaves on long petioles, crowded at the apex of a stem about 2 m. high, with the flowers bunched in the axils of the leaves, was common, with the white **Peristrophe ialappæfolia*, not previously recorded outside Java. *Schismatoglottis dorensis* spread in large colonies in more open places where the white translucent *Clavaria Gibbseæ* and **Dictyophora phalloidea*, always yellow, were plentiful, the presence of the latter being invariably revealed by the smell, with **Geaster fimbratus* and the smaller *G. mirabilis* var. *trichifer*.

Clearings at Edge of Forest and Secondary Jungle.

This form of tropical upgrowth was not so rampant as is usually the case, on account of the poor "korang" subsoil, but it proved more than usually interesting in character in showing such a large proportion of endemic Papuan and Moluccan species.

In clearings *Gigantochloa novo-guineensis*, apparently cultivated, was in flower, the fine *Pandanus Tabbersianus* bearing fruits almost 1 m. long, **Mallotus tiliaefolia*, **Melochia arborea*, **Kleinhofia hospita*, **Tamarindus indica*, **Rubus moluccanus*, **Callicarpa erioclona*, white, °*Premna nitida*, also white-flowered with black fruit, and the ubiquitous **Wedelia biflora*, with the scandent **Allophyllus Cobbe*, **Flagellaria indica*, **Rhyssopteris timorensis*, the bright yellow °*Scævola novo-guineensis*, **Merremia nymphæifolia*, with the epiphytic °*Loranthus Versteegii*, of which the flowering, vertically hanging shoots bear dense red racemes, standing out at right angles to the stems for half their length, were all general. There has been some question lately about the fertilization of *Loranthus* sp. by butterflies. I can only say that, on vigorously pulling one of the long shoots in the first excitement at seeing such a peculiar *Loranthus* form, I was covered by showers of very large red ants. The denseness and position of the racemes would certainly favour fertilization by these insects.

Just below the drainage-level of the forest-clad range, a damp area of some extent, shaded by a secondary unidentified upgrowth, proved a very good collecting-ground for fungi. In fact, almost the whole total of the species collected were found on this area, the "korang" forest itself being too dry in character to encourage this form of growth.

Cultivation.

In the grounds of the Residency, bread-fruit, Avocado pears, pumiloes, custard-apples, mangoes, *Canarium* nuts, jambu, limes and lemons, pine-apples, with small water-melons and hill-rice, have been successfully grown. Roses were always in flower in the garden, of which the chief interest was a well-grown young °*Araucaria Beccarii* about 5 m. high, brought down from the Angi lakes by Mr. van Oosterzee, who had laid out and planted these gardens. The old convict gardener who looked after them lost no opportunity of denouncing the "korang," which certainly outcrops in most inopportune places, and the shallow soil. Surrounding the "Pasangrahan" and the quarters of the "Pradjoerit," all the usual "sayur" were grown by the "Orang ranté" in the well-kept gardens, and also by the Chinese, who all have their own plots of cultivated ground.

Mangrove Association at Langgên.

On the spit of land between the two bays a Papuan "campong" was built among the mangroves, where **Ægiceras floridum* flourished as a round shrub about 1 m. high, covered with the white flowers and quaint fruit. On a tree overhanging the sea-water, **Lycopodium phlegmarioides* with °*Dendrobium pseudo-calceolum* in flower and various *Dischidia* spp. abounded. **Pandanus polycephalus* with small red fruit bunched at the apex of the peduncle, common through the Moluccas, with **Excoecaria Agallocha* and the climbers **Tristellateia australasica*, a mass of yellow flowers, **Derris uliginosa* and °*Sarcolobus retusus*, marked the land-edge of the mangrove-spit; while °*Freycinetia Beccarii*, °*Erythrospermum candida*, the yellow-flowered **Durandea parvifolia*, a *Gardenia* sp., with **Pollia sorzogonensis* as undergrowth, were found where the ground was more consolidated, and young colonies of **Pigafetta pilaris* were quite abundant towards the shores of the second bay.

Wousi and Genbela.

Wousi, in earlier times the watering-place for all the boats calling at Dorei Bay, where the Papuan "campong," with a fringe of houses built over the sea, still stands, is a tiny valley cut out of the "korang" range by the action of the stream, the range from this point gradually sloping to the level ground. At the time of my stay Wousi was also the site of the Military Bivouac, and the base for the work of the Exploration detachments so successfully organized from 1907 by the military authorities at Amboina. The survey having been completed by the successful results of Captain Opperman's Expedition (27, 542-3) the bivouac has now been closed.

In the military cartographical office hung a huge map of Dutch New Guinea, originally blank, filled in by degrees with tracings of the work of each Exploration detachment in turn. When I was shown this map only one blank space remained, viz. the source of the Mamberamo River. With the successful results of Captain Opperman and Mr. Langeler that blank space has also disappeared, and with it this admirable era of organized exploration is closed, the whole of the Dutch possessions in North New Guinea being now mapped out.

At Wousi, under the shade of the overhanging trees, the ideal and classical anchorage was reserved for naval and military needs, and all the ground underneath the beautiful century-old trees behind the beach was cleared and grass sown, forming a fine green sward, where the quarters of the military and naval officers were built. Farther up the valley were the open barracks for the native troops, carefully arranged with intersecting white paths, beyond which again excellent gardens had been made up the banks of the stream, where all the vegetables for the needs of the forces were

grown, a herd of the beautiful little Bali cattle being also kept for regular killing; on these occasions the requirements of the official residents of Manokoeari were also taken into account.

Genbela.

Beyond Wousi secondary forest with Malay houses at intervals bounded the beach to Genbela, where fine sands run out to the cape that limits the bay to the east. In the forest the fungus **Favolus scaber*, the lianes **Entada scandens* and *°Mucuna Krätkei* were collected. **Peristrophe jalappæfolia*, **Hemigraphis reptans* and *H. dorensis*, with **Geophila reniformis*, formed constant undergrowth. On the edge of the sandy beach **Pandanus dubius* grew in clumps, the young plants unbranched with thin leaves about 3 m. long; the old trees about 8 m. high, with many branched crowns and shorter leaves of much stiffer consistency, bore large round heads of glaucous mericarps. Behind this beach, on a level stretch of country with intermittent sago-swamps, the native plantations were mostly situated.

Island of Roon.

We stopped a day at Djendè, the chief place on the island, of which the gneiss¹ formation carries a mainland type of vegetation. Djendè lies in a deep sheltered bay, the native houses being all built over the water, like a miniature Brunei. It is surrounded by hills about 500' high, which, from the little seen, seemed to carry a very interesting association of plants.

Along the road bordering the bay, *Anthoceros bullato-spongiosus* associated with the minute mosses **Garckea phascoides* and **Wilsoniella pellucida* and young plants of **Lycopodium cernuum* grew in the shade, while **Schleria margaritifera* and *°Otanthera novo-guineensis* were found in the open.

On the forest slopes *°Cyathea rumensis* grew as undergrowth, where the orchid *°Vrydagzynea elongata* was growing sporadically with *Centotheca lappacea*; **Trichomanes bipunctatum* was collected as an epiphyte, also **Piper Forstenii* in flower, with hanging yellow ♀ spikes, about 4 dm. long. The forest was in a very dry condition, rather a surprising fact, taking the heavy rainfall into account (p. 13), also considering it was the rainy season; this fact again proves the fallacy of the all-embracing term rain-forest applied in general to all and sundry tropical forest formations. The actual rainfall is by no means the dominant factor, as it is the limiting characters, no matter how small their incidence, which have to be taken into account; that is to say exposure, soil, and drainage, while should drier

A. Wichmann's Berichte in Bull. nos. 43, 44 & 46 v/d Maatsch. ter bev. van het Natuurk. Onderzoek d. Nederl. Kolon. (N. Guinea Exped. 1903, Bull. nos. 3, 4 & 6). 8c. Leiden.

conditions obtain for only one week, that week will limit the conditions of the forest formation.

In N. New Guinea as in Brit. N. Borneo I saw no forest that answered to the description of rain-forest.¹

Humboldt Bay.

This bay forms a most beautiful inlet, broken in outline, surrounded by mountains and protected by a small island, on which a very picturesque Papuan pile-village with an imposing "spirit house" is situated. As the Tidorese never penetrated so far (8, 87) the natives here are still unspoilt in primitive condition. The Government Station is at the head of the bay, just behind the beach. On a marshy spot near the "campong" **Thoracostachyum hypolyroides*, a sedge with white upper leaves, bracts, and inflorescence, grew abundantly. On the banks of the river *Gigantochloa novo-guineensis* was in flower, as at Manokoeari, also **Dracena angustifolia*. We entered the "rimbu," the Contrôleur having most kindly found me two Malays who knew the forest, on the edge of which a handsome *Casuarina* with a spreading crown, most distinct in habit, was abundant. Ascending the ridge, clothed in fine high forest on deep brown soil, we found as undergrowth **Trichomanes javanicum* var. *rhomboideum*, **Diplazium maximum*, with **Selaginella plumosa*, creeping, the palms °*Licuala montana* with red fruit and **Arenga microcarpa*, the aroid °*Holochlamys Beccarii*, like a *Caladium* in habit, and the under-trees **Pipturus argenteus* and *Clerodendron Lindavianum* var. *glabrescens*, the latter with handsome white flowers and black fruit, also the climbing **Polypodium normale* and *Calamus humboldtianus*.

Over the crest of the ridge, where great mounds of dead leaves testified to Megapode activity in building their nests, we descended by a stream into quite a different type of vegetation, one of those sudden changes in comparatively small areas, which so constantly characterize the mixed tropical forest.

Along the course of the stream, in which I picked up pure alabaster, much fancied by the Papuans for nose-ornaments, **Trichomanes humile* was found on rocks with **Vittaria elongata*, the hanging fronds to 2 m. in length. The fungi **Polyporus arcularius* and **Hirneola polytricha* grew on dead wood.

As undergrowth the handsome °*Pteris torricelliana* with fronds 1.50 m long, and *Hypolepis grandifrons* on a rhachis about 3 cm. through, bearing magnificent single deltoid fronds about 5 m. long, the petiolé about 3 m., and lamina 2 m. long, rising at intervals from an underground rhizome, was

¹ L. S. Gibbs, "A Contribution to the Flora and Plant Formations of Mt. Kinabalu and the Highlands of Brit. N. Borneo," Journ. Linn. Soc., Bot. xlii. (1914) 8.

quite distinct from anything in ferns so far familiar. **Angiopteris evecta* was abundant, and *Alsophila straminea* well represented. *Begonia humboldtiana* with mottled leaves and pink flowers grew all along the banks in large clumps, but it was impossible to find any normal fruit, the capsules being all swollen through the action of some insect. *Ficus conocephalifolia*, most aptly named, with enormous leaves and bearing red receptacles, was a common tree.

Bosnik, on the Island of Wiak.

On the return to Manokoeari, half a day spent on Bosnik, on one of the Schouten Islands, was interesting, it being the first time the steamer had called there, this new Government station having been built as an alternative to Mosmer as a point of call. The island is coral-limestone, a high ridge rising behind Bosnik, and low-lying flats in front of the latter are rapidly being cleared for the "campong" plantations.

Under the strand trees bordering this area **Cycas circinalis*, the ferns **Dryopteris stenobasis*, **Diplazium polypodioides*, with **Fleuria ruderalis*, *Ophiorrhiza insularis*, *Piper bipunctatum*, and *P. bosnicum*, the latter epiphytic on a tree, were found.

As this was quite a new station, the strand trees were not yet stripped of their epiphytic treasures, and one splendid example, a veritable garden of various plants, yielded **Lycopodium phlegmaroides*, **Psilotum flaccidum*, the orchids °*Hippeophyllum alboviride*, *Dendrobium inconspicuum* and °*D. potomophilum*, °*Eria rigida* var. *papuana*, and °*Sarcanthus bicornis*, all with inconspicuous flowers, with the handsome *Medinilla rhodorhachis* with pink flowers.

All the streams drain through the "korang" into the sea at the beach level, so that it is possible to drink fresh water from the salt.

At all the other stopping-places the time was too short to do more than collect a few plants, or, the islands being entirely under cultivation, possibilities in collection were limited to the beach.

SYSTEMATIC RESULTS.

Over 330 plants were collected in the Arfak, of which 100 have proved new to science, with one new natural order and five very distinct new genera. Of the new species perhaps the most interesting are a *Dacrydium*, the first species in fruit to be described from New Guinea, a *Libocedrus*, a genus new for Dutch N.W. New Guinea, and a *Kentia*. A new species each in *Trimenia*, *Telfimthodia*, and *Backhousia*, establish Papuan preponderance in those genera, while a new species in *Patersonia*, *Centrolepis*, and *Hibbertia* represent new generic records for New Guinea.

* of V. Albernott v. Basenburgh. Bull. Jard. Bot. 2^e s. No. XXVIII. p. 66. 1918.

The few widely distributed plants included comprise about 30 new records for New Guinea, of which the most interesting are *Xyris pauciflora*, *Bulbostylis capillaris* var. *trifida*, *Spathoglottis aurea*, *Polygonum strigosum*, *Viola distans*, and *Hydrocotyle rotundifolia*.

Several of Beccari's Hatan plants have been re-collected, viz. *Riedelia orchinoides*, *Palmeria arfakiana*, in a ♂ example, of which the ♀ is so far described, *Styphelia trochocarpoides*, and *Dicrotrichium brevipes*. Of Gjellerup's plants, as would be expected in working over the same ground, the duplicate examples are more numerous, especially in the orchids, but even in that order Smith has described 20 new species with four new varieties, and in Ericaceæ two *Rhododendrons*, four *Vacciniums*, and one *Diplycosia* prove new, with one variety in *Styphelia* in Epacridaceæ.

Collections made subsequently round Manokoeari (Dorei Bay) on some of the islands along the coast, and at Humboldt Bay, have been separately enumerated, no two species proving common to both the mountain and coast flora. About 150 plants are comprised in this list, which includes one new genus and several new species in ferns, with 27 new species in other genera, and interesting new records, of which the larger portion is more Malayan in type. Wide distribution of endemic plants is again a very marked feature.

In working out these collections I must express my thanks to the expert botanists who have so kindly determined those orders in which they were interested. To Dr. J. J. Smith of Buitenzorg I am under especial obligation, not only for undertaking the Orchidaceæ, Ericaceæ, and Epacridaceæ, but also for many valuable details concerning work already done in the Arfak, and in arranging for the services of one of his trained native collectors who accompanied me to New Guinea. I am indebted to Dr. Odoardo Beccari for working out the Palmæ; Dr. Valetton for the Zingiberaceæ and Rubiaceæ; and M. Casimir de Candolle and Professor J. Macfarlane for the Piperaceæ, Meliaceæ, and the Nepenthaceæ. In London my thanks are due to Drs. Stapf and Rendle and the staffs of Kew and the British Museum for much kind help; and in particular to Professor G. S. West for the determination of the Freshwater Algæ; Miss A. Lorrain Smith for the Lichens; Dr. A. B. Rendle for Pandanaceæ, Cyperaceæ, and Gramineæ, and a new genus in Urticaceæ; Dr. O. Stapf for Utriculariaceæ and valued criticism; Messrs. J. Ramsbottom, A. Gepp, L. Hutchinson, E. G. Baker, H. N. Ridley, and J. R. Drummond for Fungi, Bryophytes and Pteridophytes, Euphorbiaceæ, Melastomaceæ, Moraceæ, and Solanaceæ; and to Mr. S. Moore for the Labiateæ, Acanthaceæ, and Compositæ, and his great kindness in revising the proofs.

The plants may be consulted at the British Museum, Kew, Leiden, and Buitenzorg, and in my own collection (on loan to the British Museum).

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[References to papers not referring to Dutch N.W. New Guinea are given in the text.]

PLATE I.



FIG. 1.



FIG. 2.

PLATE II.



FIG. 3.



FIG. 4.



FIG. 5.



FIG. 6.

PLATE IV.



P. Highley, photo.

THYSANOSORIA DIMORPHOPHYLLA, Gepp.

SYSTEMATIC ACCOUNT OF THE PLANTS COLLECTED AT THE
 ANGI LAKES, 7000-9000', IN THE ARAFAK MOUNTAINS, IN
 DUTCH N.W. NEW GUINEA, IN DECEMBER 1913.

[An asterisk denotes new records for New Guinea. Collectors' names and localities are given for Dutch New Guinea only.]

THALLOPHYTA.

FRESHWATER ALGÆ. (G. S. WEST.)

The geographical distribution has not been included, since all the species observed are ubiquitous except *Closterium Bacillum* Joshua, known only from Burma. The reason for this general ubiquity is the altitude. few of the tropical types ascending to 7000'.

MYXOPHYCÆ.

CHROOCOCCUS MINOR Näg. Gatt. einzell. Alg. 1849, 47, t. 1 A, f. 4 ; Rabenh. Flor. Europ. Alg. ii. 30.

No. 5971.

CHROOCOCCUS TURGIDUS Näg. Gatt. einzell. Alg. 1849, 46 ; Rabenh. Flor. Europ. Alg. ii. 32.

No. 5971.

MERISMOPEDIA GLAUCA (Ehrenb.) Näg. Gatt. einzell. Alg. 1849, 55, t. 1 D, f. 1.

No. 5971.

OSCILLATORIA AMPHIBIA Ag. in Flora, x. 1827, 632.

No. 5971.

OSCILLATORIA ANGUSTISSIMA W. & G. S. West in Journ. Bot. 1897, 300.

No. 5723.

OSCILLATORIA LIMOSA Ag. Dispos. Algar. Suec. 1812, 35.

No. 5723.

OSCILLATORIA TENUIS Ag. Algarum Decades, ii. 1813, 25.

No. 5723.

OSCILLATORIA TEREBRIFORMIS Ag. in Flora, x. 1827, 634.

No. 5971.

LYNGBYA VERSICOLOR (Wartm.) Gom. in Ann. Sci. Nat. 7^e série, Bot. xvi. 1892, 147, t. 4, f. 4-5.

No. 5971.

STIGONEMA OCELLATUM Thuret, Essai de classification des Nostochinées, Ann. Sci. Nat. 6^e série, Bot. i. 1875, 380.

No. 5971.

SCYTONEMA MIRABILE (Dillw.) Thuret. [= *S. figuratum* Ag. Syst. Algar. 1824, 38.]

No. 5971.

BACILLARIÆ.

FRAGILARIA PARASITICA (W. Sm.) Grun. Van Heurck, Synops. Diat. Belg. 1885, t. 45, f. 30. *Odontidium parasiticum* W. Sm.

No. 5978. Epiphytic on *Surirella robusta* var. *splendida*.

EUNOTIA BICAPITATA Grun. Van Heurck, l. c. 1885, t. 35, f. 11.

No. 5971.

EUNOTIA LUNARIS (Ehrenb.) Grun. in Van Heurck, l. c. 1885, 144, t. 35, f. 3, 4, et 6.

No. 5971.

EUNOTIA ROBUSTA Ralfs. Van Heurck, l. c. 1885, 144, t. 33, f. 11-13.

No. 5971. Both forms originally described by Ehrenberg as *E. octodon* and *E. polyodon* were plentiful.

NAVICULA APPENDICULATA Kütz. Bacill. 1844, 93, t. 3, f. 28.

Nos. 5723 and 5971.

NAVICULA BICAPITATA Lagerstedt, Spitsberg. Diat. 1873, 23, t. 1, f. 5.

No. 5971.

NAVICULA EXILIS Kütz. Bacill. 1844. Van Heurck, l. c. 101, t. 12, f. 11, 12.

No. 5723.

NAVICULA MAJOR Kütz. Bacill. 1844, 97, t. 4, f. 19.

No. 5971.

NAVICULA PARVA (Greg.). *N. gibba* var. *brevistriata* Van Heurck, l. c. 78, t. 6, f. 5.

No. 5971.

NAVICULA VIRIDIS Kütz. Bacill. 1844, 97, t. 4, f. 18.

No. 5971.

COCCONEMA LÆVE (Näg.) G. S. West in Journ. Linn. Soc., Bot. xxxviii. 1907, 159. *Cymbella levis* Näg. in Kütz. Spec. Alg. 1849, 59.

No. 5971.

NITZSCHIA COMMUNIS Rabenh. Alg. no. 949; Flora Europ. Alg. i. 1864, 159. Van Heurck, l. c. 184, t. 69, f. 32.

No. 5723.

NITZSCHIA CONSTRICTA (Kütz.) Pritch. Infus. 1861, 780. *N. dubia* W. Sm.
Brit. Diatom. i. 1853, 41, t. 13, f. 112.

No. 5978.

NITZSCHIA PALEA (Kütz.) W. Sm. Brit. Diatom. ii. 1856, 89. *Synedra*
Palea Kütz. Bacill. 1844, t. 3, f. 27 ; t. 4, f. 2.

No. 5978.

NITZSCHIA FRUSTULUM (Kütz.) Grun., var. PERMINUTA (Grun.). Van Heurck,
l. c. t. 69, f. 4.

No. 5723.

HANTZSCHIA AMPHIOXYS (Ehrenb.) Grun. in Kongl. Sv. Vet.-Akad. Handl.
xvii. no. 2, 1880, 103.

No. 5723.

SURIRELLA ROBUSTA Ehrenb. in Ber. Akad. Berlin, 1840, 215. *S. nobilis*
W. Sm. Brit. Diatom. i. 1853, 32, t. 7, f. 63.

Var. SPLENDIDA (Ehrenb.) Van Heurck, l. c. 185, t. 72, f. 4.

No. 5978.

All the specimens were covered with the small epiphyte *Fragilaria*
parasitica (W. Sm.) Grun.

CHLOROPHYCEÆ.

SCENEDESMUS ACUTIFORMIS Schröder in Forschungsb. Biol. Stat. Plön, v.
1897, 17, t. 2, f. 4.

No. 5971.

ULOTHRIX SUBTILIS Kütz. Phyc. Germ. 1845, 197 ; Tab. Phyc. ii. 1852,
t. 85, f. 1.

No. 5971.

MICROSPORA PACHYDERMA (Wille) Lagerh. *Conferva pachyderma* Wille in
Öfvers. af K. Vet.-Akad. Förh. 1881, no. 8, 20, t. 1, f. 28-35.

No. 5971.

SPIROGYRA sp. (sterile).

No. 5978. This species was undeterminable, but may possibly be one of
the forms of *Sp. decimina* (Müll.) Kütz.

NETRIUM OBLONGUM (De Bary) Lütkem. in Cohn's Beiträge zur Biol. der
Pflanz. viii. 1902, 407.

Var. CYLINDRICUM W. & G. S. West in Journ. Bot. 1903, 8 (sep.),
t. 446, f. 10.

No. 5971.

PENIUM sp.

No. 5971.

Several specimens were observed of a small *Penium*, but they were not in good condition for identification. It is possible that it is a form of *P. phymatosporum* Nordst.

CLOSTERIUM BACILLUM Joshua in Journ. Linn. Soc., Bot. xxi. 1885, 652, f. 4-6.

Long. 224 μ ; lat. 34 μ .

No. 5971.

Known previously only from Burma.

MICRASTERIAS DECEMENTATA (Näg.) Archer in Pritch. Infus. 1861, 726.

Long. 68 μ ; lat. 68 μ ; lat. isthm. 15 μ ; crass. 24 μ .

No. 5971.

COSMARIUM LÆVE Rabenh. Flor. Europ. Alg. iii. 1868, 161; G. S. West in Journ. Linn. Soc., Bot. xxvii. 1899, 386, t. 10, f. 1-6.

No. 5971.

COSMARIUM PSEUDOPYRAMIDATUM Lund in Acta R. Soc. Scient. Upsala, ser. 3, viii. 1871, 41, t. 2, f. 18.

No. 5971.

COSMARIUM PUNCTULATUM Bréb. W. & G. S. West, Brit. Desm. iii. 1908, 206, t. 84, f. 13, 14; t. 102, f. 22.

No. 5971.

HYALOTHECA DISSILIENS (Sm.) Bréb. in Ralfs' Brit. Desm. 1848, 51, t. 1, f. 1.

No. 5971.

LICHENES. (A. LORRAIN SMITH.)

*CLADONIA COCCIFERA (L.) Willd. Fl. Berol. 1787, 361.

Arfak Mts., Koebré ridge, growing thickly on burnt open summit, 9000'.
Dec. 5598.

Distrib. Cosmopolitan.

*CLADONIA DIDYMA (Fée) Wain., var. MUSCIGENA Wain., Monogr. Clad. i. 1887, 141.

Arfak Mts., Koebré ridge, 9000', growing thickly on burnt open summit.
Dec. 5720.

Distrib. New Caledonia; West Indies; Central America; Brazil; Chile; Peru.

*CLADONIA VERTICILLATA (Floerk.) Schaer. Lich. Helv. Spic. 1831, 31.

Arfak Mts., Koebré ridge, 9000', carpeting on burnt open summit.
Dec. 5739.

Distrib. Cosmopolitan.

STICTA VARIABILIS Achar. Lichenogr. 445. Schum. & Laut. N. 30.

Arfak Mts., Angi lakes, epiphytic in forest by ♀ lake, 7000'. Dec.
5905.

Distrib. N.E. New Guinea. Polynesia to E. Africa.

FUNGI. (J. RAMSBOTTOM.)

PYRENOMYCETES.

HYPOCREACEÆ.

PODOCREA CORNU-DAMÆ (Pat.) Lind. in Engl. & Prantl, Naturfam. i. 365
(1897).

Lower foot-hills, Arfak Mts., 500', terrestrial in forest. Jan. 5703.

This species was described from China by Patouillard, who placed it in the genus *Hypocrea*. The stromata of typical species of this genus are crustaceous, cushion-shaped or hemispherical, and those species which have an elongated or vertical stroma are better separated off as a distinct genus. Saccardo placed them in the subgenus *Podocrea*, which Lindau afterwards (*l. c.*) raised to generic rank. Atkinson (Bot. Gaz. xl. 401 (1905)) showed that the generic name *Podophyllum* had meanwhile been proposed by Karsten (Hedw. xxxi. 294 (1892)) and therefore had priority. As *Podophyllum* was a name used by Linnæus (1735 and Sp. Pl. i. 723 (1753)) for a genus of Berberidaceæ it cannot be duplicated amongst the fungi, and *Podocrea* must stand.

XYLARIACEÆ.

XYLARIA POLYMORPHA (Pers.) Grev. Flor. Edin. 355 (1824).

On dead trunk in forest. Lower foot-hills by Momi River, Arfak Mts.
500'. Dec. 6151.

Distrib. World-wide.

XYLARIA DOMINGENSIS (Berk.) Sacc. Syll. i. 315 (1882).

On dead wood in forest, foot-hills by Momi River, Arfak Mts., 500'.
6136.

Distrib. West Indies, etc.

BASIDIOMYCETES.

AGARICACEÆ.

OMPHALIA ARFAKENSIS Ramsbottom, sp. nov.

Tota alba. Pileo carnuloso, ex umbilicato infundibuliforme, margine primum inflexo, crenato, 1-2 cm. lato; stipite fistuloso, 1 cm. longo, 2 mm. crasso; lamellis decurrentibus, valde distantibus, postice latissimis (hinc triangulis), interdum dichotomis, venoso-connexis; sporis suballantoideis, 3-guttulatis, 6-7 μ \times 3-4 μ ; basidiis c. 25 μ \times 5 μ .

Cæspitosa ad lignum putridum.

Hab. In forest, foot-hills by Momi River, Arfak Mts., 500'. Dec. 6148.

XEROTUS CINNAMOMEUS Ramsbottom, sp. nov.

Mesopus; cinnamomeus, coriaceus; pileo convexo, centro papillato, c. 2 cm. diam., ad centrum plicato sulcato, margine acuto, integro; stipite subfistuloso, deorsum cylindrico, sursum compresso sulcato, basi strigoso; lamellis parvis (c. 10), valde distantibus, non decurrentibus, latis, intermixtis brevioribus, interdum venæformibus; sporis ellipsoideis, subgranulosis, 6-7 μ \times 4-5 μ ; basidiis c. 50 μ \times 8 μ .

Ad lignum putridum.

The radiating depressions on the upper surface of the pileus mark the position of the gills below. A transverse section of the stipes shows a pseudo-sclerenchymatous tissue, which greatly simulates the sclerenchyma seen in Gramineæ and certain other glumiferous Monocotyledons.

Hab. In forest, lower foot-hills by Momi River, Arfak Mts., 500'. Dec. 6150.

POLYPORACEÆ.

HEXAGONA APIARIA (Pers.) Fr. Epier. Syst. Myc. 497 (1838).

Foot-hills by Momi River, Arfak Mts., plentiful, 400'. Dec. 6149.

Distrib New Guinea. India, Ceylon, Java, Philippines, etc.

Fungi Imperfecti.

SPHEROPSIDEÆ.

LEPTOTHYRELLA SERICOLEÆ Ramsbottom, sp. nov.

Pycnidii amphigenis, sparsis, dimidiato scutellatis, radiato-cellulosis, atris c. 500 μ diam., zona purpurascenti cinctis, sporis fusoido-ellipsoideis vel clavulatis, rectis vel curvulis, hyalinis, multiguttulatis, continuis, dein medio uniseptatis, non constrictis, 25-35 μ \times 4-5 μ .

In foliis Sericoleæ.

On *Sericolea arfakensis* Gibbs (p. 147).

BRYOPHYTA. (A. GEPP.)

The number of species brought home is but small, and obviously fails to represent adequately the richness of the moss-flora in the districts visited. Attention was exclusively directed to the collection of fruiting plants.

HEPATICÆ.

**RICCARDIA MAXIMA* Schiffn. *Hepat. Flor. von Buitenzorg*, i. 57 (1900).

Arfak Mts., Angi lakes, forest patch by ♀ lake, on dead wood in forest, 7000'. Dec. 5680.

Distrib. Java ; Sumatra.

**MARCHANTIA POLYMORPHA* Linn. *Spec. Plant. ed. i.* 1603 (1753).

Arfak Mts., Angi lakes, on open gravel-bank by ♀ lake, 7000'. Dec. 5906.

Distrib. Cosmopolitan.

MUSCI.

SPHAGNUM JUNGHUHNIANUM Doz. et Molk. *Bryologia Javanica*, i. 27, tab. 18 (1855).

Arfak Mts., Angi lakes, in open marsh by ♀ lake, 7000'. Dec. 5967.

Distrib. New Guinea. Malay Islands ; Formosa ; Japan ; India.

SPHAGNUM NOVO-GUINEENSE Fleisch. et Warnst. in Engler, *Pflanzenreich*, Heft 51, Sphagnales, p. 520 (1911); *Nova Guinea*, xii. (1914) 127, t. xxxiv. B.

Arfak Mts., ridge running up to Angi lakes, terrestrial in moss-grown forest, 8000'. Dec. 6006.

Distrib. New Guinea (D.S.W., Goliath-Gebirge, *de Kock*).

**FUNARIA CALVESCENS* Schwaegr. *Spec. Muscorum, Suppl. i. sect. 2*, 77, tab. 65 (1816).

Arfak Mts., Angi lakes, on ground amongst bracken, where burnt, on bank of ♀ lake, 7000'. Dec. 5938.

Distrib. Warmer regions of the world.

**RHODOBRYUM GIGANTEUM* Paris, *Index Bryolog.* 1116 (1898).

Arfak Mts., Angi lakes, abundant on ground in isolated forest patch by ♀ lake, 7000'. Dec. 5892. "Very handsome moss."

Distrib. Malay Islands ; India ; Bourbon ; Hawaii.

RHIZOGONIUM SPINIFORME Bruch in Flora, 1846, 134.

Arfak Mts., Angi lakes, on living tree in isolated forest patch by ♀ lake, 7000'. Dec. 5979.—Also, on dead wood in same forest patch, 7000'. Dec. 5894.

Distrib. New Guinea (N.E.). Throughout the tropics.

DAWSONIA GIGANTEA C. Müll. ex Geheeb in Bibliotheca Botanica, Heft 44, 13 (1898).

Arfak Mts., abundant in moss-grown forest of ridge running up to Angi lakes, in mossy forest sloping down to ♀ lake and in the open by same, 7000–8500'. Dec. 5523.—Angi lakes on open banks by edge of ♀ lake and in forest, 7000'. Dec. 5935.

Distrib. New Guinea (D.N.W., Mt. Arfak, *Beccari*; D.S.W., Went-Gebirge, *von Roemer*; Hubrecht-Gebirge, *van Nouhuys*; Siriwo-Fluss, *Janowsky*).

DAWSONIA BECCARII Brotherus et Geheeb in Bibliotheca Botanica, Heft 44, 13 (1898).

Arfak Mts., ridge running up to Angi lakes, steep open slopes of gravel, 8000'. Dec. ♂ & ♀ together. 5521.—Ridge running up to Angi lakes in open gravelly spaces, 8500'. Dec. 6005.

Distrib. New Guinea (D.N.W., Mt. Arfak, *Beccari*).

RHACOPILUM SPECTABILE Reinw. et Hornsch. in Nov. Act. Acad. Cæs. Leop. xiv. 721, tab. 40 (1828).

Arfak Mts., ridge running up to Angi lakes, in forest, 8000'. Dec. 6121, 6122.

Distrib. New Guinea (D.N.W., Mt. Arfak, *Beccari*; D.S.W., Went-Gebirge, *von Roemer*; N.E.). Malay Islands to Fiji and New Caledonia.

SPIRIDENS REINWARDTI Nees ab Es. in Nov. Act. Acad. Cæs. Leop. xi. 143, tab. 17 (1823).

Arfak Mts., Angi lakes, in isolated forest patch by ♀ lake, 7000'. Dec. 5591.

Distrib. New Guinea (D.N.W., Mt. Arfak, *Beccari*; S.E., *Armit*, *MacGregor*, *Micholitz*; N.E.). Malay Islands.

ENDOTRICHELLA ARFAKIANA C. Müll. ex Geheeb in Bibliotheca Botanica, Heft 44, 16, tab. 14 (1898).

Arfak Mts., Angi lakes, with *Rhizogonium spiniforme* on living tree in isolated forest patch by ♀ lake, 7000'. Dec. 5979 *pro parte*.

Distrib. New Guinea (D.N.W., Mt. Arfak, *Beccari*).

TAXITHELIUM SUBSTIGMOSUM Broth. in Engl. & Prantl, Nat. Pflanz. i. Abt. 3, 1092 (1908).

Arfak Mts., Angi lakes, small forest by ♀ lake, on dead wood, 7000'. Dec. 5965.

Distrib. New Guinea (D.N.W., MacCluer Bay, *Naumann*; N.E.).

ECTROPOTHECIUM ARFAKENSE Broth. et Geheeb in Bibliotheca Botanica, Heft 44, 24 (1898).

Arfak Mts., Angi lakes, on dead wood, in isolated forest patch by ♀ lake, 7000'. Dec. 5904.

Distrib. New Guinea (D.N.W., Mt. Arfak, *Beccari*).

HYPNODENDRON DIVERSIFOLIUM Broth. et Geheeb in Öfvers. Finsk. Vet. Soc. Förh. xl. 191 (1898).

Arfak Mts., Angi lakes, forest patch by ♀ lake, carpeting in forest, 7000'. Dec. 5667.

Distrib. New Guinea (S.E., Mt. Dayman, *Armit*).

PTERIDOPHYTA. (A. GEPP.)

FILICALES.

The references to the descriptions of the following ferns are to be found in Christensen's 'Index Filicum,' 1905-13.

*TRICHOMANES DIGITATUM Sw.

Arfak Mts., S.W. ridge running up to Angi lakes, 9000', epiphytic in moss-grown forest. Dec. 6000.

Distrib. Malay Islands to the Mascarenes and New South Wales.

*TRICHOMANES PALMATIFIDUM K. Müll.

Arfak Mts., S.W. ridge, Angi lakes, 8000', epiphytic in moss-grown forest. Dec. 5520.

Distrib. Java.

TRICHOMANES PALLIDUM Bl.

Arfak Mts., Koebré Mt., 8000-9000', epiphytic in forest. Dec. 5728.

Distrib. New Guinea (D.N.W., Arfak Mts., *Beccari*; D.S.W., Hellwig-Gebirge, *von Roemer*; Mt. Carstensz, *Kloss*; S.E.). Trop. Asia. Polynesia.

TRICHOMANES APHLEBIOIDES Christ.

Arfak Mts., Angi lakes, 7000', epiphytic in forest by ♀ lake, 5947; forest patch by ♀ lake, epiphytic, 6137. Dec.

Distrib. New Guinea (D.N.W., R. Begowri, *Gjellerup*; D.S.W., Noord Rivier, *Versteeg*).

TRICHOMANES MEIFOLIUM Bory.

Arfak Mts., Angi lakes, 7000', epiphytic in forest patch by ♀ lake. Dec. 5678.

Distrib. New Guinea (D.N.W., Arfak Mts., *Beccari*; D.S.W., Mt. Carstensz, *Kloss*). Malay Islands to Polynesia and Réunion.

HYMENOPHYLLUM AUSTRALE Willd.

Arfak Mts., Angi lakes, 7000', epiphytic in forest patch by ♀ lake.
Dec. 5893.

Distrib. New Guinea (D.N.W., Arfak Mts., *Beccari*; N.E.). India.
Malay Islands. Australasia.

*HYMENOPHYLLUM PANICULIFLORUM Presl.

Arfak Mts., Angi lakes, 7000', epiphytic in forest patch by ♀ lake.
Dec. 6141.

Distrib. Malay Islands and Japan.

*HYMENOPHYLLUM SALAKENSE Racib.

Arfak Mts., Angi lakes, 7000', epiphytic in forest patch by ♀ lake.
Dec. 6138.

Distrib. Java.

*HYMENOPHYLLUM KURZII Prantl.

Arfak Mts., Angi lakes, 7000', epiphytic in forest patch by ♀ lake.
Dec. 5679.

Distrib. Java.

HYMENOPHYLLUM (LEPTOCIONIUM) CERNUUM Gepp, sp. nov.

Rhizoma longe repens pilosum; stipites remoti erecti pilosi obsolete alati, ad 10 cm. longi, 1 mm. crassi. *Frons* 20-22.5 cm. longa, 5-7.5 cm. lata, lanceolata, rhachi omnino sed anguste alata pilosa; pinnis alternis 20-jugatis contiguis ovato-lanceolatis pinnatifidis, costa alata pilosa; pinnulis 1-2-dichotome lobatis; segmentis ultimis planis serrulatis 2 mm. long., 0.5 mm. lat., costula anguste et dentate cristata. *Sori* in lobis brevibus pinnarum superiorum terminales, 1-8. *Indusium* vix ad medium divisum, valvis rotundatis ± integris, basi obovatum, longitudinaliter cristatum. *Receptaculum* exsertum.

Hab. Arfak Mts., Angi lakes, 7000', terrestrial in spinneys by ♀ lake.
Dec. 5964.

The tall narrowed frond is in general habit somewhat like *H. Zollingerianum* as figured by Van den Bosch (*Hymen. Javan.* t. 50), and bears about 20 pinnæ on each side. In the dried specimens the frond-apex is cernuous and the pinnæ complicato-decurved. The narrowly winged stipes and rhachis, the flat serrulate ultimate segments, the narrowly dentato-cristate costules, and the hairiness of stipes, rhachis, costæ, and costules are characters to be noted.

HYMENOPHYLLUM (LEPTOCIONIUM) CINCINNATUM Gepp, sp. nov.

Rhizoma longe repens pilosum; stipites remoti erecti pilosi obsolete alati, 3-5 cm. longi, 0.5 mm. crassi. *Frons* circ. 5 cm. longa, 2 cm. lata, lanceolata, rhachi alata pilosa; pinnis alternis 10-12-jugatis contiguis (circ. 1 cm. longis, 0.5 cm. latis) pinnatifidis; pinnulis 1-2-dichotome lobatis; segmentis ultimis planis

paucidentatis, 2-3 mm. longis, 0.5 cm. latis. *Sori* solitarii in lobis brevibus pinna-
rum terminales. *Indusium* ad medium divisum, valvis obtusis truncatisve integris,
basi obovatum, parce longitudinaliter cristatum. *Receptaculum* exsertum.

Hab. Arfak Mts., S.W. ridge, Angi lakes, 8500', epiphytic in moss-grown
forest. Dec. 5989.

This species has sori much as in *H. cernuum* (No. 5964), but is not one-
quarter the size, and is not cristate on the costules of the segments. It
approaches *H. holochilum* Van den Bosch (Hymen. Javan. t. 34), but has a
stouter, more hairy rhizome and stipes (the latter winged throughout its
length), and much narrower ultimate segments. The dried plants are very
convolute.

CYATHEA ARFAKENSIS Gepp, sp. nov.

Stipes circ. 18 cm. longus muricatus inferne fuscus superne griseo-purpurascens;
rhachis purpurea haud nitens supra ferrugineo-pubescentis glande juxta cujusque pinnae
basin instructa. *Frons* lineari-lanceolata, circa 80 cm. longa, 13 cm. lata, bipinnata;
pinnae alternae 35-jugatae stipitatae lanceolatae, 8 cm. longae, 2 cm. latae, obtusae,
pinnulis 15-20-jugatis, stipitatis 1 cm. longis, 0.4 cm. latis, imbricatis oblongis
obtusis, inferioribus paucipinnatis (segmentis rotundatis), superioribus lobatis vel
crenatis vel integris (versus apicem); rhachibus pinnae supra pubescentibus, infra
squamulis albidis sparse instructis. *Sori* costales 4-5-jugati; venulae pinnularum
5-6 parum conspicuae simplices furcatae. *Textura* coriacea; frons supra griseo-
purpurea, infra pallide brunnea. *Indusium* persistens hemisphericum.

Hab. Arfak Mts., S.W. ridge, Angi lakes, 8000', undergrowth in moss-
grown forest. Dec. 6008. "Tree-fern."

The pinnae are not contiguous, but are attached to the rhachis at intervals
of about 3 cm. In the dried specimen the shortly-stalked opposite rows of
pinnulae are appressed to one another and directed upwards (apically),
displaying the sori and concealing the upper surface.

CYATHEA FUSCA Baker.

Arfak Mts., Angi lakes, 7000', undergrowth in forest by ♀ lake. Dec.
5932. "Tree-fern, 3 m. in height (pinnae)."

Distrib. New Guinea (S.E.).

ALSOPHILA ANGIENSIS Gepp, sp. nov.

Stipes (?). *Frons* tripinnatifida; rhachis purpureo-fusca sparse aculeata im-
polita sparse et breviter atro-hispida; pinna brevi-stipitata, ± 37 cm. longa, 19 cm. lata,
oblongo-lanceolata; rhachis pinnae supra atro-tomentosa purpureo-fusca, infra sulcata
furfuraceo-squamulata; pinnulae suboppositae ± 30-jugatae contiguae imbricatave
sessiles ± horizontales lineari-lanceolatae acuminatae ± 1.5 cm. latae, fere ad costam
pinnatisectae; costa pinnulae supra fulvo-tomentosa, infra sulcata furfuraceo-squamu-
lata; segmenta ± 26-jugata lineari-oblonga falcata integra ± 3 mm. lata, supra
fusco-purpurea glabra, infra glauca; costula segmenti supra glabrum, infra pauci-
pilosa et squamulis flavidis fimbriatis versus basin ± vestita; venulae inconspicuae
tenues ± 14-jugatae, 1-2-furcatae, paucipilosa. *Sori* (?). *Textura* coriacea.

Hab. Arfak Mts., Angi lakes, 7000', spinney by ♀ lake, undergrowth in forest. Dec. 5968. "Tree-fern, 3 m. in height, brown paleæ on young stem and fronds. Brown and with thorns on old."

This plant is represented by two pinnæ which are entirely sterile. It is tentatively referred to *Alsophila*. In some respects it recalls *A. glauca*, but differs in having the pinnules crowded together and imbricated, and the rhachises dull and unpolished. The pinnules are inserted on the pinna-rhachis at intervals of about 1.25 cm. and overlap; the middle pinnules are horizontal, the lower are deflexed.

ALSOPHILA ARFAKENSIS Gepp, sp. nov.

Stipes (?). *Frons* tripinnatifida, pinnis remotis alternis stipitatis. *Rhachis* (versus apicem) pallida, supra breviter tomentosa, infra glabra ruguloso-aspera; rhachis pinnulæ similis est. Pinnæ infimæ ± 28 cm. longæ, 9-10 cm. latæ, lineari-lanceolatæ breviter acuminatæ ad apicem pinnatifidæ. Pinnulæ ± 12-jugatæ remotæ alternæ stipitatæ, usque ad 5 cm. longæ, ± 1 cm. latæ, lineari-lanceolatæ obtuse acuminatæ, ad $\frac{2}{3}$ pinnatifidæ; costa pinnulæ supra tomentosula, sed versus apicem glabra, infra rugulosa squamulis paucis lanceolatis rubris ornata; segmenta ± 12-jugata (apice excluso), ± 3.5 mm. lata, oblonga obtusissima crenata margine recurvata; costula segmenti supra glabra, infra squamulata; venulæ ± 5-jugatæ furcatæ simplicesve. *Sori* 4-5-jugati prope costam dispositi, segmenti latitudinem haud obtegentes. *Textura* coriacea.

Hab. Arfak Mts., S.W. ridge, Angi lakes, 7000-8500', common undergrowth in moss-grown forest. Dec. 5990. Also common about ♀ lake, in forest. "Slender tree-fern, stem 1 dm. in diameter and 1 m. in height. Fronds 1 m. long."

The material consists of the two lowest pinnæ and the top 37 cm. of a frond. A small dark gland is present at the base of the stalks of the pinnules.

**DRYOPTERIS* (*LASTREA*) *BEDDOMEI* O. Kuntze.

Arfak Mts., Angi lakes, 7000', common in open marsh by ♀ lake. Dec. 5939. "Creeping rhizome."

Distrib. Philippine Islands; Ceylon; South India; South China.

DRYOPTERIS (*LASTREA*) *VILLOSIPES* Gepp, sp. nov.

Rhizoma erectum squamulis lineari-lanceolatis ferrugineis dentatis vel subintegrissimum vestitum. *Stipites* ± 12.5 cm. longi, c. 1 mm. crassi, atro-purpurei, inferne squamulis angustis capillaribus c. 1 mm. longis ferrugineis vestiti, superne breviter et sparse pubescentes et squamulis paucis lineari-lanceolatis ornati (ut etiam rhachis). *Frons* lanceolata ± 10 cm. longa, 3 cm. lata; pinnæ subcontiguæ alternæ plerumque brevi-stipitatæ, versus frondis apicem sessiles, elliptico-lanceolatæ ± 30-jugatæ, ± horizontales, inferne 1.3-1.7 cm. longæ, 0.4-0.5 cm. latæ, fere ad $\frac{2}{3}$ pinnatifidæ, ad apices crenatæ vel subintegre obtusæ; segmenta 6-8-jugata approximata subfalcata obtusa, segmento infimo superiori oblongo quam reliquis majori interdum

libero; venulæ segmenti paucæ pinnate dispositæ inconspicuæ. *Sori* singuli plerumque ad media segmenta, prope pinnæ costam dispositi, indusio persistente. *Textura* coriacea; lamina superne fusca, inferne griseo-viridis.

Hab. Arfak Mts., Koebré Mt., 7000–8000', epiphytic in forest. Dec. 5627.

The lower pinnules are slightly deflexed, and the lowest pair are a trifle shorter than the pair above them. The plant differs in every respect from *D. viscosa*.

POLYBOTRYA ARFAKENSIS Gepp, sp. nov.

Stipes paleis linearibus brunneis \pm deciduis 0.5 cm. longis vestitus et earum cicatricibus muricatus, 15 cm. longus, atro-purpureus. *Frons* circa 1 m. longa, 40 cm. lata, bipinnata obovato-lanceolata; rhachis atro-purpurea \pm paleacea muricata (velut stipes) ad apicem haud evoluta, superne breviter ferrugineo-tomentosa, inferne parum furfuracea, pinnas circa 9 alternas remotas dimorphas (inferiores 6 fertiles, superiores 3 steriles) gerens; pinnæ brevi-stipitatæ ad apicem abrupte (haud evolutæ), steriles circa 30 cm. longæ, 13 cm. latæ, lanceolatæ, fertiles circa 25 cm. longæ, 7.5 cm. latæ; rhachis pinnæ superne ferrugineo-tomentosa; pinnulæ alternæ circa 12-jugatæ stipitatæ; pinnulæ steriles 6.5 cm. longæ, 1.2 cm. latæ, oblongo-lanceolatæ acuminatæ apice serrato, usque ad $\frac{1}{3}$ pinnatifidæ, lobis (fere 20-jugatis) rotundatis crenulatis, venulis in lobis pinnatæ dispositis c. 3-jugatis; pinnulæ fertiles \pm 3.5 cm. longæ, 4–8 mm. latæ, lineares usque ad costam pinnatisectæ, lobis parvis oblongis sessilibus propter soros copiosos omnino obtectis. *Textura* subcoriacea. *Lamina* superne purpureo-brunnea, inferne pallidior glabra.

Hab. Arfak Mts., S.W. ridge, Angi lakes, 7000', climbing in forest, clasping trunk to top. Dec. 5984. "Fronds 1 m. long, sterile like barren portion of fertile frond; fertile frond distinct."

This fern is remarkable for its dimorphous fronds and pinnæ and for the arrested growth of its frond-apices. The material consists of one frond, the six lower pinnæ of which are fertile, and the three upper are sterile. The apex of the main rhachis has failed to attain its full development, as also have the apices of the secondary rhachises (pinnæ both fertile and sterile). Hence, the proper apices are absent. Whether the apical growth has been temporarily interrupted or permanently arrested, and whether the arrest of growth is due to injury or is of normal occurrence in the life-history of the plant is uncertain. The lower pinnæ are shorter than the others. The sterile pinnules are inserted at intervals of about 2 cm., the fertile at about 1.5 cm. The fertile pinnules recall those of *Osmunda javanica* in shape, but not in arrangement. Dimorphism of frond and pinnæ occurs in the tropical American *P. osmundacea*.

P. arfakensis climbs by means of its rhizome and puts out its fronds at right angles to the axis of the tree up which it climbs.

DIPTERIS CONJUGATA Reinw.

Arfak Mts., Angi lakes, 7000', growing on bank by edge of ♀ lake, in open. Dec. 5913. "Also abundant on open steep gravel slopes on S.W. ridge, running up to lakes from 8000-8500'."

Distrib. New Guinea (D.N.W., Arfak Mts., Andai, *Beccari*; D.S.W., Noord Rivier, *Versteeg*; submontane region, *von Roemer*; Mt. Carstensz, *Kloss*; S.E.). Asia. Polynesia.

OLEANDRA CUSPIDATA Baker.

Arfak Mts., Angi lakes, 7000', common on edge of forest patch by ♀ lake, growing in clumps. Dec. 5559. "Up to 2 m. in height, leaves in interrupted whorls up the stem Also seen on S.W. ridge."

Distrib. New Guinea (D.N.W., Arfak, *Beccari*; D.S.W., Noord Rivier, *Versteeg*; Mt. Carstensz, *Kloss*).

NEPHROLEPIS ACUMINATA Kuhn.

Arfak Mts., S.W. ridge, Angi lakes, 7000', climbing in forest. Dec. 6123. "Fronds with apical fertile portion or with entire fertile fronds."

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*). Malay Islands. Perak.

HUMATA PUSILLA Carr.

Arfak Mts., Angi lakes, 7000', epiphytic in forest, spinneys by ♀ lake. Dec. 5960.

Distrib. New Guinea (N.E.). Melanesia.

HUMATA NEOGUINENSIS C. Chr.

Arfak Mts., Angi lakes, 7000', epiphytic in forest or creeping on edge. Dec. 5588. "Sterile and fertile frond."

Distrib. New Guinea (D.S.W., Hellwig-Gebirge, *von Roemer*).

HUMATA ALPINA Moore.

Arfak Mts., Angi lakes, 7000', epiphytic in forest patch by ♀ lake. Dec. 5674.

Distrib. New Guinea (D.S.W., Low country and Hellwig-Gebirge, *von Roemer*; N.E.). Malay Islands. Polynesia.

*DAVALLIA DISSECTA J. Sm.

Arfak Mts., Angi lakes, 7000', epiphytic in forest patch by ♀ lake. Dec. 5592.

Distrib. Java; Sumatra.

DAVALLIA (PROSAPTIA) SCHLECHTERI C. Chr.

Arfak Mts., Koebré Mt., 8000-9000', epiphytic in forest slopes. Dec. 5634, 5640, 5625.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*; N.E.).

DAVALLIA (PROSAPTIA) CONTIGUA Spr.

Arfak Mts., Angi lakes, 7000', epiphytic in isolated forest patch by ♀ lake. Dec. 5895.

Distrib. New Guinea (D.S.W., Noord Rivier, *Versteeg*; Mt. Carstensz, *Kloss*; N.E.). Malay Islands. Polynesia.

LINDSAYA HYMENOPHYLLOIDES Bl.

Arfak Mts., S.W. ridge, Angi lakes, 8000', epiphytic in moss-grown forest. Dec. 6120.

Distrib. New Guinea (N.E.). Malay Islands. Polynesia.

LINDSAYA RIGIDA J. Sm.

Arfak Mts., Koebré Mt., epiphytic and terrestrial in forest slopes, 7500–8500'. Dec. 5626.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*; N.E.). Malay Islands. Perak.

ASPLENIUM ACUTIUSCULUM Bl.

Arfak Mts., Angi lakes, 7000', epiphytic in forest patch by ♀ lake. Dec. 5730.

Distrib. New Guinea [sec. V. *Ald. v. Rosenb.*]. Malay Islands. Samoa.

ASPLENIUM (DAREA) SCANDENS J. Sm.

Arfak Mts., Angi lakes, terrestrial in high forest near "Campong," 7000'. Dec. 5642.

Distrib. New Guinea (D.N.W., Andai, *Beccari*; N.E.; S.E.). Philippine Islands. Fiji.

STENOCHLÆNA SORBIFOLIA J. Sm.

Arfak Mts., Angi lakes, 7000', massed on edge of forest by ♀ lake. Dec. 5590. "Sterile and fertile fronds."

Distrib. New Guinea (D.N.W., Arfak, *Beccari*; D.S.W., Noord Rivier, *Versteeg*; coastal lowlands, *von Roemer*; N.E.). Pantropical.

PTERIS PAPUANA Ces.

Arfak Mts., Angi lakes, spinney by ♀ lake, 7000', epiphytic in forest. Dec. 5731.

Distrib. New Guinea (D.N.W., Arfak, *Beccari*; D.S.W., Noord Rivier, *Versteeg*; N.E.).

HISTIOPTERIS INCISA J. Sm.

Arfak Mts., Angi lakes, 7000–8000', abundant everywhere. Dec. 5669.

Distrib. New Guinea (N.E.). Tropics and subtropics.

PTERIDIUM AQUILINUM Kuhn, var. LANUGINOSUM V. Ald. v. Rosenb.

Arfak Mts., summit of Koebré Mt., 9000', plentiful where burnt and open. Dec. 5599. "Short."

Distrib. New Guinea (N.E.). Cosmopolitan; the variety is chiefly tropical.

*PÆSIA RADULA C. Chr.

Arfak Mts., Angi lakes, terrestrial on edge of open marsh by ♀ lake, 7000'. Dec. 5956.

Distrib. Sumatra.

*VITTARIA CRASSIFOLIA Baker.

Arfak Mts., Koebré Mt., 8000', epiphytic in forest. Dec. 5729.

Distrib. Borneo; Banca.

VITTARIA ELONGATA Sw.

Arfak Mts., Koebré Mt., 8000–9000', epiphytic in forest slopes. Dec. 5643.

Distrib. New Guinea (D.N.W., Sorong, Ramoi, *Beccari*; D.S.W., Coastal lowlands, *Versteeg*; N.E.; S.E.). Trop. Asia. Polynesia. Queensland, N. S. Wales.

POLYPODIUM FASCIATUM Presl.

Arfak Mts., Angi lakes, spinney by ♀ lake, 7000', epiphytic in forest. Dec. 5971.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*). Malay Islands.

POLYPODIUM HIRTELLUM Bl.

Arfak Mts., Angi lakes, 7000', epiphytic in forest and spinneys. Dec. 5551.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*). Perak. South China. Malay Islands. New Caledonia.

POLYPODIUM SCABRISTIPES Baker.

Arfak Mts., Angi lakes, spinney by ♀ lake, 7000', epiphytic in forest. Dec. 5972.

Distrib. New Guinea (S.E.).

POLYPODIUM CUCULLATUM Nees et Bl.

Arfak Mts., Angi lakes, epiphytic in forest patch by ♀ lake, 7000'. Dec. 5734.

Distrib. New Guinea (D.N.W., Arfak, *Beccari*; D.S.W., Mt. Carstensz, *Kloss*; N.E.). Ceylon. Malay Islands. Fiji. New Caledonia.

*POLYPODIUM CURTISII Baker.

Arfak Mts., S.W. ridge, Angi lakes, 7000–8000', epiphytic in moss-grown forest. Dec. 5733.—Epiphytic in forest patch by ♀ lake, 7000'. Dec. 5664.

Distrib. Sumatra,

*POLYPODIUM SERRATODENTATUM V. Ald. v. Rosenb.

Arfak Mts., Koëbré Mt., 7000–8000', epiphytic in forest. Dec. 5628.

Distrib. Java? [True habitat unknown.]

POLYPODIUM CLAVIFER Hook.

Arfak Mts., S.W. ridge, Angi lakes, 8000–9000', epiphytic in moss-grown forest. Dec. 6119.

Distrib. New Guinea (D.N.W., Arfak, *Beccari*; D.S.W., Hellwig-Gebirge, *von Roemer*; Mt. Carstensz, *Kloss*). Borneo.

POLYPODIUM (PLEOPELTIS) PAPUANUM Baker.

Arfak Mts., S.W. ridge, Angi lakes, epiphytic in moss-grown forest, 9000'. Dec. 6010.—Terrestrial in forest by ♀ lake, 7000'. Dec. 5933.

“Fertile and sterile fronds on running rhizome.”

Distrib. New Guinea (D.N.W., Arfak, *Beccari*).

*POLYPODIUM (PLEOPELTIS) STENOPHYLLUM Bl.

Arfak Mts., S.W. ridge, Angi lakes, 8000–9000', epiphytic in moss-grown forest. Dec. 6015, also 5987 *pro parte*.

Distrib. Penang. Perak. Malay Islands. Fiji.

POLYPODIUM (PLEOPELTIS) REMIGERUM Ridley (in sched.). *Pleopeltis renifera* Ridley in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 263.

Arfak Mts., S.W. ridge, Angi lakes, 8000–9000', epiphytic in moss-grown forest. Dec. 5987, also 6118.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*).

The specific name as printed is misleading and absurd, and is due to an orthographic error. The MS. name on the label of the type in Herb. Mus. Brit. is “*Polypodium remigerum*,” an apt and descriptive name—for the long slender fronds stand up perpendicularly from the rhizome and strikingly recall the tossed oars of a man-of-war's boat.

POLYPODIUM (PLEOPELTIS) ARGYROPUS Ridley in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 262.

Arfak Mts., Koëbré Mt., 7500–8500', epiphytic in forest slopes. Dec. 5632.—Angi lakes, epiphytic on edge of forest patch by ♀ lake, 7000'. Dec. 5589.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*).

POLYPODIUM (SELLIGUEA) FEEI Mett.

Arfak Mts., Angi lakes, epiphytic and on ground, in forest by ♀ lake, 7000'. Dec. 5948.

Distrib. New Guinea (D.S.W., Hellwig-Gebirge, *von Roemer*; S.E.). Malay Islands. Polynesia.

DRYOSTACHYUM SPLENDENS J. Smith.

Arfak Mts., Angi lakes, terrestrial on edge of spinneys by ♀ lake, 7000'. Dec. 5970.

Distrib. New Guinea (D.S.W., coastal lowlands, *von Roemer*). Malay Islands.

CHEIROPLEURIA BICUSPIS Presl.

Arfak Mts., lower part of S.W. ridge, terrestrial in high forest, 5000–6000'. Dec. 6134. Fertile frond only.

Distrib. New Guinea (S.E.). Java; Philippine Islands; Formosa; Liu-kiu Islands.

GLEICHENIA VULCANICA Bl.

Arfak Mts., Koebré ridge, terrestrial on burnt open summit, common, 9000'. Dec. 5611.—Angi lakes, abundant at edge of forest and spinneys by ♀ lake, 7000'. 5727.—S.W. ridge, terrestrial on open steep gravel slopes, 8000–9000'. 5996.

Distrib. New Guinea (S.E.). Malay Islands.

GLEICHENIA GLAUCA Hook.

Arfak Mts., Angi lakes, abundant on edge of forest by ♀ lake, 7000'. Dec. 5668. "One frond climbing up to 7 m."

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*). Asia. Australia. Polynesia.

**GLEICHENIA LÆVIGATA* Hook.

Arfak Mts., Angi lakes, abundant on edge of forest patch by ♀ lake, 7000'. Dec. 5577. "3 m. in height, almost arboreal in habit. Leaves glaucous underneath."

Distrib. Malay Islands.

GLEICHENIA LINEARIS Clarke.

Arfak Mts., Angi lakes, running up trees at edge of forest patch by ♀ lake, 7000'. Dec. 5575. "Massed."—S.W. ridge, common in forest, where more open, 7000–8000'. 5991. "Scrambling up to 7 m.; half frond."

Distrib. New Guinea (D.N.W., Arfak Mts., *Beccari*; D.S.W., Noord Rivier, *Versteeg*; S.E.). Tropics and subtropics.

**SCHIZÆA MALACCANA* Baker.

Arfak Mts., Angi lakes, common on open drier and gravelly parts of marsh by ♀ lake, 7000'. Dec. 5945.—S.W. ridge, 8500', in moss in forest undergrowth. 6011.

Distrib. Malay Islands. Burma.

LYCOPODIALES.

LYCOPODIUM SERRATUM Thunb.

Arfak Mts., Angi lakes, forest patch by ♀ lake, terrestrial in humus, 7000'. Dec. 5724.

Distrib. New Guinea (N.E.). Asia. Polynesia. Mexico. Bourbon.

LYCOPODIUM SQUARROSUM Forst.

Arfak Mts., Angi lakes, spinneys by ♀ lake, 7000', epiphytic in forest. Dec. 5725.

Distrib. New Guinea (N.E.; S.E.). Asia. Polynesia. Mascarene Islands.

LYCOPODIUM PINIFOLIUM Bl.

Arfak Mts., Angi lakes, epiphytic under *Araucaria* forest by ♀ lake, 7000'. Dec. 5936.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*; N.E.). Java; Borneo.

LYCOPODIUM CERNUUM L.

Arfak Mts., Angi lakes, common on open marsh by ♀ lake, 7000'. Dec. 5658, 5925.—S.W. ridge, creeping in forest and on open steep slopes, 8000–9000'. 5995.

Distrib. New Guinea (D.N.W., Arfak Mts., *Beccari*; D.S.W., Mt. Carstensz, *Kloss*; N.E.; S.E.). Tropics and some subtropics.

LYCOPODIUM CASUARINOIDES Spring.

Arfak Mts., Angi lakes, scrambling on edge of forest by ♀ lake, 7000'. Dec. 5944.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*). Trop. Asia.

LYCOPODIUM CLAVATUM L., var. WALLICHIANUM Spring.

Arfak Mts., Angi lakes, open gravel bank by ♀ lake, 7000'. Dec. 5911.—Open marsh by ♀ lake. 5556.

Distrib. The species is recorded for New Guinea (D.N.W., Arfak Mts., *Beccari*; S.E.). The species is cosmopolitan in temperate regions. The variety occurs in Java and India.

LYCOPODIUM COMPLANATUM L.

Arfak Mts., Angi lakes, by open marsh and bank of ♀ lake, 7000'. Dec. 5912.

Distrib. New Guinea (D.N.W., Arfak Mts., *Beccari*). Asia. Polynesia. Africa, America; but mostly in the north temperate zones.

LYCOPODIUM VOLUBILE Forst.

Arfak Mts., Angi lakes, scrambling up to 10 m. in forest spinneys by ♀ lake, 7000'. Dec. 5954.—S.W. ridge, scrambling in moss-grown forest, 7000–8500'. 5982.

Distrib. New Guinea (D.N.W., Arfak Mts., *Beccari*; S.E.). Malay Islands. Australasia. Polynesia.

PSILOTUM FLACCIDUM Wall.

Arfak Mts., Koebré Mt., epiphytic in forest, 7500'. Dec. 5633.

Distrib. New Guinea (D.N.W., Arfak Mts., *Beccari*; D.S.W., Noord Rivier, *Versteeg*; Mt. Carstensz, *Kloss*; N.E.). Tropics.

SELAGINELLA ANGUSTIRAMEA F. Muell. & Baker.

Arfak Mts., Angi lakes, terrestrial on edge of forest by ♀ lake, 7000'. Dec. 5726. "Growing in patches."

Distrib. New Guinea (N.E.; S.E.).

SPERMATOPHYTA.

CONIFERÆ.

TAXACEÆ.

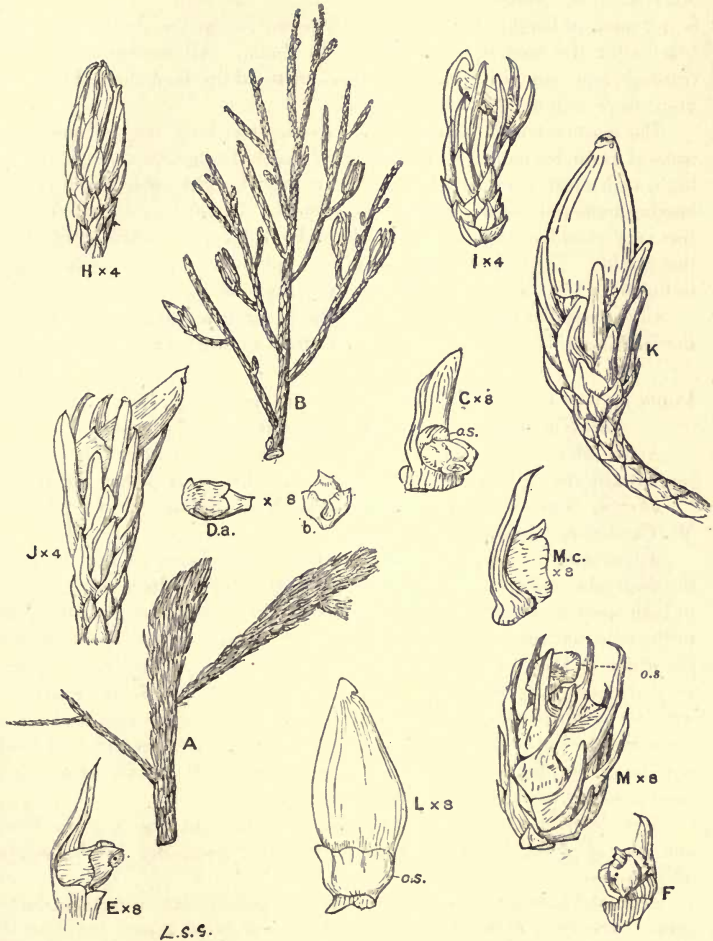
DACRYDIUM NOVO-GUINEENSE Gibbs, sp. nov.

Arbor parva, dioica, in statu juvenili erecta; ramulis foliis longioribus 5-seriatim imbricatis præditis, postea ramulis gracilioribus folia breviora gignentibus. *Folia* in statu plantæ juvenili laxiuscula, squarrosa, acicularia, incurvato-pungentia, sectione triangulare; folia in statu adultiori parva, dense imbricata, 5-seriata squamiformia, triangularia, apice pungentia, facie plana, dorso carinata; folia ramorum fertilium arcte applicata, rhombica, acuta, dorso carinata, sectione sub-tetragona. *Strobili* masculi ignoti. *Strobili* feminei ad apicem ramulorum brevissimorum axillarium erecti, parvi; bracteæ ±24, lineares, apice apiculatæ, incurvatæ, carinatæ, margine membranaceæ, basi incrassatæ, demum carnosæ, rubræ, bractea fertillis unica, terminalis. *Squama ovuligera* fere usque ad basin libera, sub anthesi teres, cucullata. *Ovulum* in statu pollinifero liberum, squama ovuligera adhuc immatura circumdatum. *Semina* erecta vel obliqua, bracteam summam sterilem superantia, ovoideo-angulata, viridia, nitida, basi ad $\frac{1}{4}$ vel $\frac{1}{5}$ squama ovuligera incrassato-cupuliforme cincta.

Hab. Arfak Mts., crest of ridges and forest by ♀ lake, 7000–9000'. Seedling, ♀ lake, 7000'. Dec. 5508.—Koebré ridge, open summit, 9000'. ♀. Fr. with mature foliage. 5648.

Foliage of seedling branches 1 cm. across, the leaves 4 mm. by .5 mm.; that of more adult branches 1.5 mm. across, the leaves 1.5 by .4 mm.; foliage of fruiting branches 2 mm. across, the adpressed lozenge-shaped leaves 1.7 mm. by 1 mm. Strobilus 7 mm. by 3 mm., imbricating, with bracts

FIG. 3.



Dacrydium novo-guineense Gibbs.—A. Youth foliage; B. Mature ♀, nat. size; C. Ovule in pollination-stage, ovuliferous scale appearing; D. a. Lateral, b. ventral view; E, F. Stages in development of ovule; H, I, J, K. Stages in development of strobilus; L. Seed with ovuliferous scale still attached; M. Strobilus, showing swollen bases of sterile bracts forming strobilus (seed shed); M.c. Ovuliferous scale.

gradually increasing in length till at the apex they are 3 mm. by .5 mm., of which the apical bract only is fertile; the mature strobilus, with swollen bract-bases, is 7 mm. by 4 mm., not including the seed. Ovuliferous scale is ± 2 mm. in height and 2 mm. broad, persisting in the axil of the fertile bract after the seed is shed. Seed 5 by 2 mm. All measurements of the fruiting-stages and drawings are from material in formalin. Pollination drops were seen on the young ovules.

The mature fruiting-form of this species was only seen in one or two isolated examples on the open summit of Koebré ridge, small trees ± 10 m. high, with short trunks and rounded crowns of rigid ascending branches, bearing numerous small red and fleshy cones. In younger stages this plant was very abundant on the crest of the S.W. ridge and in the forest round the ♀ lake. The foliage of the seedlings is plumose in character to $\pm .50$ m. in height, when the small adpressed scaly leaves begin to appear.

In the peculiar habit and the strap-shaped laminae of the bracts composing the strobilus, this species is quite distinct from known members of the genus.

PODOCARPUS PAPUANUS Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. 158, quoad spec. Klossianum de Camp III apportatum, non aliorum.

Arfak Mts, Angi lakes, common on the surrounding ridges and in spinneys by the ♀ lake, 7000–9000'. Fl. ♀., Fr. (yg.). Dec. 5540.

Distrib. New Guinea (D.N.W., Arfak Mts., Hatam, Beccari; D.S.W., Mt. Carstensz, Kloss).

A fine tree, ± 30 m. in height, very like *P. imbricatus* Bl. in habit and in the dimorphic foliage, both seedling and youth form of foliage being identical in both species—in fact, like Beccari, I took the young plant for that species in the field, but the foliage of the mature tree is more spreading and distinct, the scales of the ♂ cones differ in shape, while the ♀ cones are larger and very glaucous in appearance. The fusion of the lamina of the fertile bract with the ovuliferous scale is also less complete than is the case in *P. imbricatus* and the position of the seed is more oblique. Dr. Beccari most kindly sent me some of his Arfak material, published as *P. imbricatus*, which, on comparison, proved identical with the above.

The description of this plant being limited to the mature foliage and one ♂ cone, I append what is necessarily wanting in the original diagnosis:—

Arbor alta; truncus teres, erectus; rami fere penduli, copiose ramulosi; ramuli flexuosi, graciles. *Folia* dimorpha, juvenilia 1 cm. longa, 2 mm. lata, biseriatim expansa, plana, anguste linearia, mucronato-pungentia, decurrentia, apicem et basin versus decrescentia. *Strobili* feminei 1.2 cm. longi, .5 mm. lati, ad apicem ramulorum brevium erecti. *Bracteæ* 2 vel 3, ± 2 mm., glaucescentes, laminae teretiusculæ, apice obtusæ, 2 mm. longæ, .8 mm. latæ (inter se connatæ), basi incrassata, verruculosa ± 4.5 mm. longa, 1 vel 2 superioribus fertilia, lamina bracteis fertilibus cum

FIG. 4.



Podocarpus papuanus Ridl.— A, B. Youth foliage; C. Mature foliage, sterile; D. Branch, bearing 2 ♀ strobili, one showing two fertile bracts (pollination-stage); E. ♀ strobilus (fertilization-stage): all nat. size. G, H, I. Same stages; J. Strobilus with oblique ovule; K. Mature foliage: all $\times 4$.

squama ovuligera tota longitudine connata. *Squama ovuligera* cum ovulo connata, viridis, nitida. *Ovula* juvenilia in statu archegoniale, oblique erecta, bractees superantia, 7 mm. longa, 5 mm. lata.

All the measurements given are from formalin material. On a mature tree in fruit small branches of the young foliage occurred up the stem. The ♀ strobili were in the pollination to the archegonial stage, and may be compared with similar stages in *P. imbricatus* (Gibbs, in Ann. Bot. xxvi. (1912) pl. xlix. figs. 1-6). The terminology given on p. 518, *l. c.*, is that followed on the present occasion.

There seems little doubt that Giulianetti's specimen, included by Mr. Ridley in his description of *P. papuanus*, represents *P. imbricatus* Bl., as Dr. Stapf had already named it on the Herbarium sheets at Kew; the two ♀ cones on the specimen prove the correctness of this determination. These cones were not seen by Koorders (Nova Guinea, viii. (1911) 615).

PODOCARPUS RUMPHII Bl. Rumphia, iii. (1847) 214; Becc. Malesia, i. 179.

Arfak Mts., S.W. ridge, in forest from 7000-9000'. Veg. Dec. 5985.

Distrib. New Guinea (D.N.W., Arfak, *Beccari*; D.S.W., Lobo, *Zippelius*; N.E.). Moluccas, Amboina, Celebes.

A tree, ± 16 m. high, very common on the crest of the ridge, but not seen in fruit; therefore the determination must remain uncertain. Leaves over 2 dm. long.

PHYLLOCLADUS HYPOPHYLLUS Hook. f. Ic. Pl. 889; F. Muell. in Trans. Roy. Soc. Vict. i. (1888) 32.

Arfak Mts., common on ridges. Koebré ridge, open summit, 9000'. ♀ (very yg.). Dec. 5657. Seedling, 5657 a.—S.W. ridge, foliage glaucous. ♀ (yg.). 5992.

Distrib. New Guinea (S.E.). N. Borneo, Philippines.

Very plentiful on ridges and in the forest, showing glaucous and non-glaucous foliage as on Kinabalu. Only the remains of some mature cones were collected. I fail to distinguish any difference between the above species and *P. protractus* Pilg. It is a very variable plant like other *Phyllocladus* spp., differing according to the age of the plant and whether the fertile branches occur on the old or the young wood. The series of variations obtained by me on Kinabalu are duplicated in the Arfak material, and appear also marked in the large amount of material from the Philippines available at Kew for comparison.

PINACEÆ.

AGATHIS DAMMARA (Lamb.) A. Rich. Conif. lxxxiii. t. 19; Rumph. Herb. Amboina, ii. 174, t. 57; Becc. Malesia, i. 180; Warb. Monsunia, i. 182; K. Laut. in Engl. Bot. Jahrb. l. (1913) 48.

Arfak Mts., S.W. ridge, 5000', in high forest. ♀. Dec. 6127. Veg. (yg. plant). 5747.

Distrib. New Guinea (D.N.W., Waigiou, *La Billardière*; Ramoi, Jobi Island, Ansus, *Beccari*). Amboina, Celebes, Borneo, Java, Philippines, Malay Peninsula.

A beautiful tree, about 40 m. high, with straight white shaft branching at the very top into a small, not very spreading crown with yellowish-green foliage.

The distinct habit of these trees, of which three to four were growing near together, the crowns rising above the surrounding forest, was especially noted, to be confirmed by the excellent description given by Rumphius above, quoted by Parlatoꝛe (DC. Prod. xvi. 2, 374). Great lumps of white resin stood out on the straight white trunks.

The trees were all too big to climb, so it was only possible to collect the old scales underneath, still in sound condition and in some cases attached to the axes of the cones. Many young trees, ± 20 m. high, showed the fastigate youth form characteristic of the genus (16, t. ix. f. 1). The leaves in the above collection were from a young plant ± 2 m. high, with one whorl of single branches ± 2.75 m. long. As the leaves vary in size and texture with the age of the plant, it is impossible to base a species on vegetative characters alone, and *A. Labillardieri* Warb. is no doubt synonymous with the above, as already suggested by Lauterbach, *l. c.*

ARAUCARIA BECCARII Warb. *Monsunia*, i. 187. *A. Cunninghamii* Becc. in *Malesia*, i. 180 (*non* Ait.). *A. Cunninghamii* Ait., var. *papuana* Laut. in *Engl. Bot. Jahrb.* l. (1913) 51.

Arfak Mts., gregarious in parts in forest by ♀ lake. Seedlings. Dec. 5934. Young plant (1 m.). 5748. Old foliage and cones (pro-embryo stage). 5749.

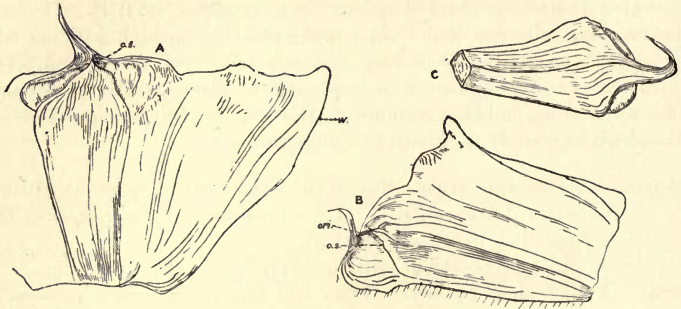
Distrib. New Guinea (D.N.W., Arfak Mts., Hatam, *Beccari*).

These handsome trees were quite abundant on the eastern bank of the lake. They were about 25 m. in height and mostly in fruit. The large erect cones are borne on the horizontal uppermost branches of the trees. Many of the mature cones seen on the largest trees must be double the size given by *Beccari*, but the indurated bases of old leaves densely investing the trunks rendered climbing out of the question, and, having no axes with us, they could not be felled. A smaller tree, felled by "parang," yielded two ♀ cones, one of which approximated to *Beccari's* measurements, while the other was smaller. Both the cones were in pro-embryo stage, with the seed-coat already quite indurated. The ovuliferous scale, not shown in *A. Cunninghamii*, is very noticeable in this species, as *Beccari* has described, and in this character it approximates to *A. Hunsteinii* K. Schum. (*Fl. Kais. Wilhelmisland*, 12 (1889)). The cone-scales are more elongate than in *A. Cunninghamii*, with narrower base, more swollen apophysis, and a more pungent apex. The leaves of the fertile branch are more spreading, 1 cm. long and

3 mm. broad at the dilated base, with pungent apex more or less reflexed. In habit these trees differ from *A. Cunninghamii*, for, though fastigiate-pyramidal in growth, the branching is not so defined or symmetrical, showing little trace of the candelabra-like habit so familiar in the latter. There is also a difference in the size and shape of the leaves, in their stomatal markings, and in the much larger size of the ♀ cones. I must thank Dr. Beccari for material of his species, which he most kindly sent me for purposes of comparison; also Dr. Stapf for carefully considering the points of difference between the two plants. (Pls. 1, 3, figs. 1, 5.)

In both the available cones an apparent orifice (*ori.*, B) is visible on the swollen pulvinus of most of the bracts, behind the apex of the ovuliferous scale, possibly due to rupture of tissue.

FIG. 5.



Araucaria Beccarii Warb.—A. Sporophyll; *o.s.*, ovuliferous scale, *w.*, wing.
B. Lateral view; *ori.*, apparent orifice. C. Dorsal view.

LIBOCEDRUS ARFAKENSIS Gibbs, sp. nov.

Arbor alta, in diversis ramis monoica; rami teretes, cortice fusco obducti, ramuli oppositi, distichi. *Folia* decussatim opposita, in statu juvenili omnia conformia, linearia, in statu adulta adpresse quadrifariatim imbricata, difformia, marginalia navicularia, subacuta, coriacea, maxima ex parte adnata, complicata, apice solum libera, facialia plana, squamiformia, triangularia, carinata, acuminata. *Strobili* masculi in ramulis lateralibus solitarii, terminales, cylindranei. *Antheræ* ∞-seriatæ, spiraliter dispositæ, stipite breve, connectivi appendicula squamiformi, late ovata, leviter peltata, chartacea, loculi 3-6, globosi, deorsum 2-valves. *Strobili* feminei in ramulis brevibus erecti; bracteæ 4, elongato-ovatae, demum lignosæ, appendicem magnum late ovatum obtusum antice proferentes. *Nucula* elliptica, subacuta, alata, altera subboSOLETA, altera elongato-ovata.

Hab. Arfak Mts., on ridges and in the forest by ♀ lake, 7000-8000'.

Seedling, ♀ lake, 7000'. Dec. 5550.—Youth form, S.W. ridge, 8000'.
5500.—Koebré ridge, 8000'. ♂ ♀. Dec. 5594.

The abundant seedlings of this plant, both on the ridges and at the

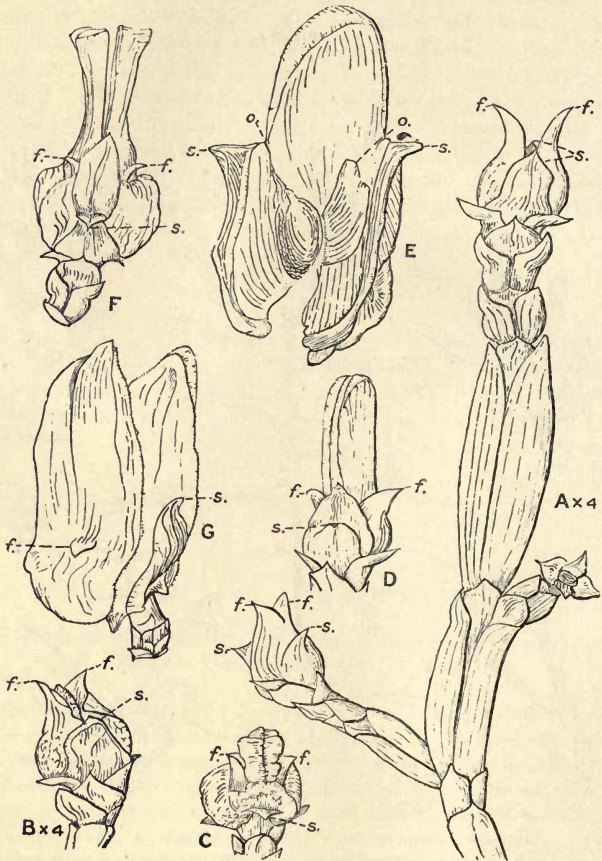
FIG. 6 a.



Libocedrus arfakensis Gibbs.—A. Seedling, nat. size; B. Mature foliage, sterile; C. ♀ branch;
D. ♂ branch; E. ♂ strobilus, $\times 8$; F, G, H. Sporophylls showing three sporangia,
 $\times 8$; J. Sporophyll with four sporangia, $\times 8$.

♀ lake, formed a conspicuous feature of the forest undergrowth, from the peculiar shape, herbaceous texture, and light green colour of the leaves, which in this stage are ± 2 cm. long and 8 mm. broad in the median portion,

FIG. 6b.



Libocedrus arfakensis Gibbs.—A. Fertile ♀ branch, with very young strobili showing four bracts: *f.*, *f.*, fertile, *s.*, *s.*, sterile; B, C, D. Progressive stages, showing gradual displacement of bract apices by secondary upgrowth of tissue; E. Strobilus before dehiscence, anterior bract removed, exposing the two ovules *o.*, with wings still undeveloped, on the posterior *f.* bract; F. Mature strobilus, exposing wings of ovules on dehiscence; G. Old strobilus, ovules shed.

with divaricating falcate apices 1 cm. long by 7 mm. broad. The leaves gradually become smaller and more modified in form as the plant matures, till, in young trees of ± 19 m. in height, they are fleshy coriaceous in texture, 1 cm. long by 6-7 mm. broad, showing ± 5 whitish lines of stomata in formalin material, connate almost to the extreme apex, which is apiculate or acute, with incurved tendency. The small scale-like leaves of the fruiting branches are 1 mm. long by about the same in breadth, with a few faint stomatal lines. The σ cone is 14 mm. by 3 mm., with peltate sporophylls bearing 4-6 sporangia (4 being the usual number) at the base; in one case 3 sporangia to each scale were present throughout the strobilus, and in another 4-6 were seen; the strobilus (first ovoid) elongates considerably on the dehiscence of the sporangia, the sporophylls drying light brown in colour. The ρ strobilus consists of 4 simple bracts, opposite decussate in arrangement, subtended by 4 modified scale-leaves; the 2 fertile interior bracts, each bearing 2 ovules at the base, are longer, and in the pollination stage unmodified, when they are ± 4 mm. long by 3 mm. broad, showing no differentiation between the fertile and sterile bracts. As the strobilus increases in size, a swelling appears between the two fertile bracts. This swelling gradually develops into 2 ovate-elongate projections which displace the apices of the bracts, and it is these secondary projections which open to liberate the ovules, both reflexing on dehiscence, like the outside bracts, which are modified in the same manner but to a less extent. In both cases this hypertrophied secondary tissue is ciliate round the margin. The strobilus before dehiscence may be 1.4 cm. long by 9 mm. broad, and the ovule, of which the wing is still undeveloped, 5 mm. by 4 mm. All measurements are from formalin material.

On the ridges this tree was small and not seen in fruit. Some beautiful specimens occurred in the sheltered forest by the lake, ± 34 m. high, with very straight round boles and red scaly bark; the more or less conical crowns, spreading at the base, of graceful dark green foliage, rose above the level of the forest. All these fine trees showed dead branches at the tops, as if their development had been arrested or their maximum passed. The only trees seen in fruit were in a more or less open space on the western slopes of Koebé; these were grouped together, ± 16 m. high, with the σ cones just shedding their pollen and the ρ cones in all stages, both borne abundantly on separate branches as in *Thuja*.

This species is distinct, like *L. papuana* F. Muell., in the spirally-arranged sporophylls of the σ strobilus and in the varying number of the sporangia. It differs in the shape and texture of the leaves, which are dark green on both surfaces, in the more numerous rows of sporophylls in the σ , and in the bracts of the ρ strobilus.

MONOCOTYLEDONEÆ.

PANDANACEÆ. (A. B. RENDLE.)

FREYCINETIA (§ OLIGOSTIGMA) FLAVICEPS Rendle, sp. nov.

Ramus subtenuis in parte superiore foliatus infra cicatricibus foliorum annulatus. *Folia* in sicco tenuiter coriacea, lineari-lanceolata, superne ad apicem acutum pungentem attenuata, margine et costa media tenui nisi sub apice inermi. *Inflorescentia frugifera* ramum terminans, axi trigono bracteis deciduis nudo. *Syncarpia* terna, subglobosa, flava, pedunculo hispido. *Carpella* matura succulenta, apice libero obtuse pyramidata; *stigmata* 2, hippocrepiformia vel semiorbicularia. *Semina* apice et basi rubro-brunneo-tincta, rhaphe lata raphidophora et strophiole angusto prædita.

Hab. Arfak Mts., S.W. ridge running up to Arfak lakes, scandent in forest, 6000–8000'. Fr. Dec. 6125.

Branch 4–3 mm. thick, internodes 8–16 mm. long. Leaves 6–8 cm. long, 4.5–7 mm. wide. Axis of inflorescence barely 1 cm. long; syncarp about 1.5 cm. long and nearly as broad, somewhat flattened at the base; about 6–7 ripe carpels in a line drawn from apex to base, ripe carpel 2–3 mm. broad, free apex 1.5–2 mm. high. Seed with a broad raphe bearing a double line of white raphides, and on the opposite side a narrow wing-like strophiole.

Near *F. inermis* Ridl. from the Utakwa River, which, however, has ellipsoidal red syncarpis with more numerous carpels and seeds with a much broader strophiole.

FREYCINETIA (§ PLEIOSTIGMA) GIBBSEÆ Rendle, sp. nov.

Ramus ramulosus superne foliatus, infra cicatricibus foliorum delapsorum annulatus. *Folia* coriacea, e basi latiore amplexicauli linearia, superne gradatim angustata, acuta, recurvata, margine spinulifera; costa media tenuis, supra leviter impressa, in facie inferiore subprominens et sparsius spinulifera. *Inflorescentia* mascula. . . . *Inflorescentiæ femineæ* ramulos breves terminantes; ramuli in parte inferiore bracteis triangularibus acutis margine spinuliferis, seriebus 3 dense imbricatis superne gradatim increscentibus arcte induti, bracteis superioribus usque ad 7 subito majoribus et spathiformibus, late ovatis, rubris, deciduis, margine sub apice spinuloso, alibi inermi. *Spicæ* florentes apice ramuli axillares, oblongo-ellipsoideæ, pedunculo valido hispido. *Carpella* dense aggregata, parte brevi apicale 5–6-gona; *stigmata* 4–6, interdum 3, in disco plano apicale ordinata; *ovarium* super locellos dense sublignosum.

Hab. Arfak Mts., S.W. ridge running up to Angi lakes, common over ground and on trees in forest, 7000–9000'. ♀. Dec. 5516.

Branch 4–7 mm. thick, internodes between the leaf-scars 3.5–4 mm. long. Leaves 16–22 cm. long, 3.5–5 mm. wide above the broader base. Stem of female flowering branchlets about 2 cm. long, covered below with densely imbricating closely superposed bracts increasing in size upwards from 1–2.5 cm. long; above them are a series of larger, spathe-like, more spreading bracts, increasing rapidly in size up to 5 cm. long and 4 cm. broad. Flower-

spikes to 1.7 cm. long, 1.1 cm. in diameter; peduncle to 2.5 cm. long, 3.5 mm. thick. Carpels 3 mm. long, about 1 mm. thick.

Recalls the Philippine species *F. ensifolia* Merrill in its foliage and female spikes, but the dwarf fertile branches with the large spathe-bracts are distinctive.

PANDANUS sp.

Arfak Mts., Angi lakes, isolated or gregarious, general in forest by ♀ lake, 7000'. Fl. ♂. Dec. 5969.

"About 30 m. in height, with branched and unbranched crowns. Leaf 3.75 m. long. Pedicel of the ♂ inflorescence 4 dm. long. ♂ flowers yellow; ♀ not seen or fruit." Possibly a new species, but the material is too incomplete for determination.

GRAMINEÆ. (A. B. RENDLE.)

ISCHÆMUM ARISTATUM L., var. ARFAKENSE Rendle, var. nov.

Planta circa 1 metralis, nodis et foliorum (superiorum) vaginis glabris. *Spicæ* approximatae, 7-9.5 cm. longæ. *Callus* et pedicellus spicularum pilis albis instructi, spiculæ glabræ. *Spiculæ* sessiles, gluma prima nodulis marginalibus sæpius 3 obsolete uno latere notata, 7 mm. longæ. *Spiculæ* pedicellatæ, gl. prima æquilongæ, glaberrima, gl. quarta aristam imperfectam ipsa brevioris generis.

Hab. Arfak Mts., Angi lakes, open marsh by ♀ lake, 7000'. Fl. Dec. 5564, 5719.

ISACHNE MILIACEA Roth, Nov. Pl. Sp. 58.

Arfak Mts., Angi lakes, in open by ♀ lake, 7000'. Fr. Dec. 5916.

Distrib. East India.

SETARIA GLAUCA Beauv. Agrost. 51; Schum. & Laut. 180; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 248.

Arfak Mts., Angi lakes, open marsh by ♀ lake, 7000'. Fr. Dec. 5560.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*; N.E.). Cosmopolitan.

TRisetum LATIFOLIUM Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 250.

Arfak Mts., Angi lakes, in open marsh by ♀ lake, 7000'. Fl. Dec. 5900.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*).

CYPERACEÆ. (A. B. RENDLE.)

*BULBOSTYLIS CAPILLARIS Kth., var. TRIFIDA C. B. Clarke in Hook. f. Fl. Brit. India, 652.

Arfak Mts., Angi lakes, common in open marsh by ♀ lake, 7000'. Fl. Dec. 5565.

Distrib. Wide in tropical and subtropical regions.

SCIRPUS SETACEUS L. Sp. Pl. ed. 1, 73 ; Schum. & Laut. 195.

Arfak Mts., Angi lakes, open marsh by ♀ lake where boggy, 7000'. Fl. Dec. 5973.

Distrib. New Guinea (N.E.). Widely distributed in the Old World, temperate and alpine.

CLADIUM FALCATUM C. B. Clarke MS. ex Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 243.

Arfak Mts., Angi lakes, common in open marsh and edge of forest by ♀ lake, 7000'. Fl. Dec. 5924.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*).

CLADIUM GERMANICUM Schrad. Fl. Germ. i. 75, t. 5. f. 7.

Arfak Mts., Angi lakes, by open beach of ♀ lake, 7000'. Fl. Dec. 5902.

Distrib. Temperate and subtropical regions.

CLADIUM ARFAKENSE Rendle, sp. nov.

Caulis sub-compressus, in parte superiore bractea longe vaginante indutus. *Folia* e basi caulis specimine 2 super basin vaginantem teretia, pungentia, exteriori caulem et paniculam excedens. *Panicula* contermino obovata, sublate brunnea, densa, ramosa, ramis ascendentibus e bracteis acuminatis oriundis. *Spiculæ* plurimæ sessiles, oblongæ, plurifloræ. *Glumæ* membranaceæ, rubro-brunneæ, ovatæ, sub-obtusæ, 3 inferiores vacuæ, breviter mucronatæ, superiores sæpe 5 quisque florem ♀ includens. *Stamina* 3; connectivum super antheram anguste lineari-lanceolatam breviter aristatum. *Stylus* filiformis prope medium in ramis 3 ciliolatis solutus. Nux

Hab. Arfak Mts., Angi lakes, edge of open sandy beach by ♀ lake, 7000'. Fl. Dec. 5901.—Abundant in open marsh by ♀ lake. Fl. Fr. 5561.

Stem with panicle 5.5 cm. high, 3–2 mm. thick, invested in the upper third by a long sheathing bract with a short blade; outer leaf nearly 9 cm. long, the loosely sheathing lower portion about 1 dm. long, the terete blade about 2 mm. in diameter at the middle. Panicle 7 cm. long, 4 cm. broad, the lowest bract somewhat foliaceous, 5 cm. long, linear-lanceolate and tapering above the short sheathing base; upper bracts similar, but progressively and rapidly shorter. Lowest branch 5.5 cm. long, the upper shorter. Spikelets about 5 cm. long; empty glumes 3.5–4 mm. long, upper glumes each subtending a ♂ flower, up to 4.5 mm. long. Stamens 5 mm. long, the flat ribbon-like filament 2 mm.

A very distinct species, characterized by its broad dense panicle and numerous-flowered spikelets.

RHYNCHOSPORA GLAUCA Vahl, Enum. ii. 233.

Arfak Mts., Angi lakes, common in marsh by ♀ lake, 7000'. Fl. Dec. 5563.—Edge of beach by ♀ lake. Fl. Dec. 5899.

Distrib. Tropics of both hemispheres.

*GAHNIA PSITTACORUM Labill. Nov. Holl. Pl. i. 89, t. 115.

Arfak Mts., Angi lakes, Koebré ridge, undergrowth in summit forest, 9000'. Fr. (red). Dec. 5635.—Edge of forest and stunted on open burnt summit, 50–3 m., 9000'. Fl. 5615.—Edge of forest and spinneys by ♀ lake, 7000'. Fl. Fr. (red & yellow). 5585.—Open edge of sandy beach by ♀ lake. Fr. (yg.). 5914.—S.W. ridge, running up to Angi lakes, in moss-grown forest, 8500'. Fl., Fr. (yg.). 6007.

Distrib. Australia, Tasmania.

*CAREX GAUDICHAUDIANA Kth. Enum. Pl. ii. 417.

Arfak Mts., Angi lakes, sandy marsh by ♀ lake, 7000'. Fl. Dec. 5898.

Distrib. Alpine regions of Australasia.

PALMÆ. (O. BECCARI)

KENTIA GIBBSIANA Becc., sp. nov.

Caudice procero; frondium vagina dense tomentosa; segmentis concinne pectinatis æquidistantibus, rigide chartaceis, 1-costulatis, inferioribus angustissimis in acumen filiforme terminatis; intermediis linearibus, 50–55 cm. longis, 2.5 cm. latis, apice inæquali et bifidis; superioribus sensim minoribus, apice truncatis et præmorsodentatis; spadicibus duplicato-ramosis, ramis floriferis glabris, alterne inter glomerulos compressiusculis; floribus usque ad apicem glomerulato-3nis, glomerulis oppositis et decussatis; floribus masculis 12–15 mm. longis; calyce parvo acute tridentato; petalis lanceolatis et acuminato-subfalcatis; staminibus 6–8; antheris sinuose lanceolato-acuminatis, acutis vel subaristatis, filamento brevissimo suffultis; ovarii rudimento brevi, 3-corne; floris feminei calyce subtruncato, sepalis rotundatis brevibus, petalis e basi late imbricata abrupte in acumen trigonum crassum valvatum contractis; fructibus ovatis, parvis, vertice minute mammillato.

A fine Palm with a relatively slender trunk, up to 30 m. high, and with the crown rising above the level of the primeval forest. *Leaves* about two metres long. *Leaf-sheaths* about 60 cm. long, coriaceous, thicker on their backs, strongly striate longitudinally internally and outside (in the dry condition), but internally glabrous, and externally clothed with a thick, soft, rusty tomentum. *Petiole* flat above at its base, rounded beneath, and with acute margins; rhachis acutely trigonous in the intermediate and apical parts, scabrid-furfuraceous. *Leaflets* numerous, equidistant, neatly bifarious, alternate, 4–5 cm. apart on each side of the rhachis, rather stiff, thinly coriaceous, of the same colour on both surfaces, linear-ensiform, slightly narrowing in their lower parts, with the margins reduplicate at the rather

broad bases ; mid-costa rather strong and prominent above, slender beneath, and furnished (in proximity to the base) with a few narrow and long ramentaceous scales ; on each side of the mid-costa is a very slender, secondary nerve, slightly prominent on the under surface, and marked by a faint furrow above ; tertiary nerves numerous and distinct, giving a neatly striate appearance to both surfaces ; the margins are very sharp (not furnished with a marginal nerve) ; the lowest leaflets are very narrow, very long-acuminate to a slender, subulate apex, 5-12 mm. broad, 35-40 cm. long, and are slightly falciform ; the intermediate leaflets are 50-55 cm. long and 2.5 cm. wide, slightly narrow above and have also a tendency to be falcate at the apex, which is acute, but subbifid with a small indentation on the lower margin ; the upper leaflets are quite straight, gradually shorter and narrower than the intermediate, and have the apex truncate and præmorse ; the two terminal are the smallest, 22-25 cm. long, 1-3-costulate, and quite free at the base. *Spadix* scopiform, apparently twice branched, the primary branches not numerous, divided (nearly from the base) into a few (3-4 in the specimens at hand) secondary or flower-bearing branches. Complete spathes apparently two (the outer not seen by me), the inner lanceolate-subfalcate, acuminate, about 50 cm. long, 5 cm. wide, papyraceous, flattened, and finely striate, the margins not winged. *Flower-bearing branches* straight, slender, but rigid, 40-50 cm. long, of the uniform thickness of 2-3 mm. from base to apex, glabrous, finely wrinkled in the dry condition ; in their lower part the branches apparently carry male flowers only, but in the remainder, up to the apex, the flowers are in glomerules of 3, that in the middle being a female, and the two side ones male ; the glomerules rest on superficial pulvinuli ; they are in opposite pairs, and the pairs are decussate, and between the pairs the branches are flattened in alternate directions ; the pulvinuli are surrounded by very narrow semiannular bracts. *Male flowers* 12-15 mm. long, sessile, asymmetrical ; the calyx very small, trigonous, with 3 acute teeth ; the corolla several times longer than the calyx ; the petals narrowly lanceolate, almost flat, very long-acuminate-subulate, the apices wavy-falcate ; stamens 6-8, filaments very short and thick ; anthers erect, one-third shorter than the petals, linear-lanceolate sinuose-subulate-aristate ; rudimentary ovary very short, terminated by 3 small horns. *Female flowers* ripen a little after the male, have a globular base, and a trigonous, pyramidate-acuminate, and subfalcate point ; the calyx is low, cupular-subtruncate, formed by broad sepals, having rounded, hyaline, ciliate margins ; petals strongly imbricate, concave, orbicular in their basal part, and suddenly contracted into a valvate, trigonous-acuminate, thickish point, longer than the broadened basal part ; staminodes 6, very small, tooth-like. Ovary broadly ovoid, suddenly shortened into 3 fleshy, slender, obtuse stigmas. The young *fruit* has a glossy or polished surface, is 5 mm. in diam. and 10 mm. long, including the perianth, and has a

terminal discoid mammillate areola, bearing the remains of the small stigmas. *Fruiting perianth* not accrescent, but hardened, and with the apices of the petals spreading.

Hab. Arfak Mts., Angi lakes, 2100–2400 m. ♂ ♀. Fr. Dec. 5951.

Without doubt rather closely related to *Kentia procera*, from which it differs in having the uppermost leaflets truncate and præmorse-toothed, and in the male flowers having larger anthers, as long as two-thirds of the entire flower. In *K. procera* the uppermost leaflets are bidentate at apex, and the anthers reach only to about the middle of the petals. The mature fruit of *K. Gibbsiana* is probably more broadly ovate than that of *K. procera*.

K. Gibbsiana is one of the very few palms that belong to the true genus *Kentia* as understood by me in 'Webbia,' vol. iv. (1913) 143.

CALAMUS HUMBOLDTIANUS Becc., sp. nov.

Scandens, caudice vaginato 15–20 mm. diam.; vaginis flagelliferis, spinis parvis armatis, ocrea magna, elongata, acuminata, chartacea, 50 cm. et ultra longa, spinulis minutis confluentibus crebre seriatim ornata; foliis non cirriferis, circiter metralibus; segmentis paucis per greges paucos approximatis, papyraceis, lanceolatis, breviter acuminatis, unicostulatis, nervis omnibus nudis vel costa media supra prope apicem spinulosa; segmento terminali profundissime bilobo; spadice ♂ foliis breviori, stricto; panicula densa, cupressiformi; snatha exteriori elongata, basi tubulosa, superne aperta; ramis primariis densissime floriferis, dum floribus ovastis spiciformibus, subteretibus; spicis parvis densifloris.

Scandent, and of moderate size. *Sheathed stem* apparently 15–20 mm. in diam. *Leaf-sheaths* (in the small portion seen by me) closely armed with short small prickles. *Ocrea* extraordinarily large and long, as much as 50 cm. in length, very gradually long-acuminate, slightly inflated, enfolding the younger part of the stem, covered with thin fuscous-furfuraceous scurf, chartaceous, exsuccous, rigid, later splitting longitudinally on the outer side and not dissolving into fibres, fugaciously furfuraceous outside and ornamented all over, and rather closely, with oblique, interrupted, slightly raised, spinuliferous lines or ridges. *Leaf-sheath flagella* slender and very long, armed, but not very regularly, with ternate or quinate claws, intermingled with smaller scattered prickles. *Leaves* non-cirriferous; in one specimen about 1 m. long on the whole; the petiole alone 35 cm. long, almost biconvex, slightly prickly, and with obtuse margins; rhachis smooth, bifaced, with an acute salient angle above, and armed beneath, at first, with quinate and higher up with ternate claws. *Leaflets* very conspicuously approximate into very few distant groups (3 in the specimen at hand) with long vacant spaces of the rhachis interposed; in one specimen the leaflets are 7 on each side of the rhachis, of which 8 (4 on each side) form a basal group, and 7 (3 on each side with a deeply bilobed apical one) form the terminal group; between these two main groups is another intermediate

formed of 2 opposite leaflets only; the leaflets are lanceolate-ensiform, or oblanceolate, and taper almost equally to both ends, have the base rather acute, and are shortly and suddenly acuminate in a slightly bristly-spinulous tip; are papyraceous, rather firm, glossy on both surfaces, but especially above, very slightly paler beneath, with an acute mid-costa and a few slender side-nerves, all quite naked on both surfaces, though at times the mid-costa is slightly spinulous above near the apex; margins remotely and minutely ciliate-spinulous, more closely near the apex; transverse veinlets very crowded, fine and sharp; intermediate leaflets 40-50 cm. long, 3.5-4 cm. broad, the lowest smallest, those of the terminal group shorter, but not narrower. *Male spadix* somewhat shorter than the leaves (70 cm. long in one specimen), erect, strict, having an elongate pedicellar part bearing only one dense and narrow cupressiform panicle, about 20 cm. long (perhaps at times the spadix is longer, and with more than one panicle); the primary spathe is very elongate, and at first enfolds the spadix; it is tubular, flattened with acute edges, closely sheathed in its lower part, and is produced above into an open, thinly membranous, lacerate, lanceolate-acuminate limb, it is sprinkled all over outside with minute tuberculiform prickles; the panicle is composed of several gradually diminishing, very approximate, very densely flowered, short spikelet-bearing branchlets, inserted at an angle of 45° , subtended by secondary thinly membranous, dry, lanceolate-acuminate, more or less lacerated, secondary spathes, only a little shorter than their respective branchlets; the branchlets have the appearance of being small, simple, cylindrical spikes, 5-6 cm. long in the basal part of the panicle, gradually a little shorter above; in fact, however, they are composed of several, very short, very closely drawn together, alternate, distichous spikelets, the lowest of which are 8-10 mm. long, with 7-8 very approximate flowers on each side; the upper spikelets gradually diminish in length and number of flowers; spathels bracteiform, membranous, concave with a triangular acute apex, surpassing the involucre; this is deeply cupular, or subcampanulate, truncate, not distinctly two-keeled, and bidentate on the side next to the axis. *Male flowers* very closely packed together, oblong, 6 mm. long; the calyx deeply 3-lobed; the corolla twice as long as the calyx, narrowing a little above to a bluntish apex. *Female spadix* and fruit unknown.

Hab. Humboldt Bay, ridge behind the village, 700', scrambling in high forest. ♂. Jan. 6267.

A very distinct species, but with very marked affinities with *C. macrochamis* Becc. It belongs to Group V. of my monograph, characterized mainly by non-cirriforous leaves, and by the leaf-sheaths furnished with a long clawed flagellum; in that group it falls into the division which contains *C. macrochlamys* and other Papuan species, all having very large and elongate chartaceous ocreæ. Even among these species *C. humboldtianus*

is easily distinguishable by its relatively short leaves, having few, lanceolate, grouped leaflets, glossy and smooth on both surfaces; by the sheaths prolonged into an excessively long, slightly inflate ocrea, which is ornamented with oblique spinuliferous slightly raised ridges; by the strict long-pedicelled spadix with a very densely flowered panicle; and by the primary spathe having an elongate, thinly-membranous, lacerate, externally prickly limb.

CALAMUS ARFAKIANUS Becc., sp. nov.

Gracilis, scandens, caudice 5-10 mm. diam., vaginis flagelliferis, spinis gracilibus, interdum brevissimis, parce armatis, in ore et in ocrea brevi barbatis; foliis non cirriferis, brevibus, petiolo brevissimo, segmentis paucis per greges paucos inter se remotos approximatis, lineari-lanceolatis, subulato-acuminatis, tenuiter papyraceis, unicostulatis, nervis secundariis utrinque 1-2 tenuibus, costa media et nervis omnibus levibus; segmentis intermediis circiter 20 cm. longis, 15-20 mm. latis, duobus terminalibus basi breviter connatis vel fere liberis; spadicebus valde elongatis et flagelliformibus; spathis elongatis arcte vaginantibus; spadiceis ♂ ramis primariis paucis, remotis, spicas numerosas deflexas ferentibus; spicis majoribus 15-18 mm. longis, floribus utrinque 13-15 fere contiguis; spathellis concavis, bracteiformis; spadiceis ♀ ramis primariis paucis, remotis; spicis majoribus 4-5 cm. longis, floribus utrinque 8-10; fructibus late ovato-ellipticis, abrupte mucronatis, 15 mm. diam.; seminibus albumine homogeneo.

Scandent and very slender. *Sheathed stem* 5-6 or at most 8-10 mm. in diam. *Leaf-sheaths* flagelliferous, not or only slightly gibbous above, at times almost smooth, and only slightly (and very minutely) tubercled-spinulose in their upper part; but in some specimens rather densely covered with scattered or slightly confluent bristle-like spines, which become closer, considerably longer, and more hair-like, near and on the margins of the mouths of the same leaf-sheaths, and of the ocrea, which because of them looks bearded. *Leaf-sheath flagella* very slender and long, and armed irregularly with very minute scattered claws. *Leaves* non-cirriferous, short, 40-60 cm. long; petiole very short, 2-3 cm. long at most; rhachis fugaciously rusty-furfuraceous like the petiole, armed beneath with unequal, rather long-tipped, scattered or ternate claws. *Leaflets* few, 15-19 in all, very irregularly set, usually approximate in three groups separated by long vacant spaces of rhachis; they are narrowly lanceolate or linear-lanceolate, gradually subulately acuminate, thinly papyraceous, almost shining and about the same colour on both surfaces; have the mid-costa very sharp above, and one, or at times two slender secondary nerves on each side of it; mid-costa and nerves quite naked and smooth on both surfaces; transverse veinlets rather sharp and not very crowded; the margins have only a few distant, almost inconspicuous, appressed spinules, closer and more distinct in the apical part; the leaflets of the intermediate and lower groups are about

20 cm. long and 15–20 mm. broad; those of the terminal group somewhat smaller; the two terminal are the smallest, free, or more or less connate, at the base. *Male* and *female spadices* similar, flagelliform, very long and slender, with a very few distant partial inflorescences; primary spathes very narrowly tubular and elongate, very closely sheathing, more or less armed with scattered small claws; the lowest slightly compressed, the others cylindraceous. Male partial inflorescences (primary branches) zigzag sinuous, spreading, inserted outside their respective spathes with a distinct axillary callus; the lowest 18–20 cm. long, with 7–8 rather distant spikelets on each side; the upper ones gradually shorter, and with fewer spikelets; secondary spathes 8–10 mm. long, smooth or at times very slightly spinulose, tubular-infundibuliform, or with a narrow flattened base, and slightly enlarged above, very closely sheathing, obliquely truncate and glabrous at the mouth, where acute at one side; spikelets flattened, 6 mm. broad, comb-like with very approximate or contiguous bifarious flowers; spikelets strongly deflexed, inserted just at the mouths of their respective spathes; the lower spikelets 15–18 mm. long, bearing 13–15 flowers on each side; the others gradually shorter; spathe bracteiform, broad, concave, acute, strongly striately-veined; involucre cupular, obsolete two-keeled and two-toothed on the side next to the axis. *Male flowers* very close together, ovate, subacute, 2.5 mm. long; the calyx deeply 3-lobed, strongly striately-veined; the corolla twice as long as the calyx. *Female spadix* has shorter partial inflorescences and fewer but larger spikelets than the male spadix; the largest (lowest) spikelets are 4–5 cm. long, and carry 8–10 flowers on each side; spathe broadly infundibuliform, truncate; involucrophorum obliquely campanulate; involucre deeply cupular, truncate, as long as the involucrophorum; areola of the neuter flower rather conspicuous, subcupular. *Female flowers* ovate, inserted at an angle of about 45°. *Fruiting perianth* almost explanate, not pedicelliform. *Fruit* broadly ovoid-elliptical, 17–18 mm. long (not taking into account the beak), 15 mm. broad, equally rounded at both ends, suddenly topped by a beak 2.5 mm. long; scales in 21 longitudinal series, rather deeply grooved along the centre, straw-yellowish with a very narrow dark brown marginal line; tip bluntish. *Seed* irregularly globose, with homogeneous albumen.

Hab. Arfak Mts., Angi lakes, common all through the forest round ♀ lake at 7000–8000'. "A small rotang, excellent for tying." 5977 (♀ type-specimens) with the sheathed stem 8–10 mm. in diam. and rather densely prickly leaf-sheaths. The male plant (6144, Dec., Mt. Arfak, 5000' on the S.W. ridge, scrambling in high forest): very slender; sheathed stem 8–10 mm. in diam.; leaf-sheaths nearly smooth.

It is evidently related to the Australian *C. Muelleri*, from which it mainly differs in the leaflets not being distinctly 3-costulate, and in the female spadix

having the flowers inserted at an angle of about 45° (not horizontal), and in its larger fruit.

C. arfakianus is characterized by its slender stem, by the cirriferous leaf-sheaths, and short non-cirriferous leaves, with a few narrowly lanceolate leaflets approximated into a few (three) distant groups; the two terminal leaflets free, or but slightly united at their bases; by the very slender and long filiform spadices, not very dissimilar in the two sexes, and by the ovoid-elliptical, suddenly-beaked fruit, having the seed with equable albumen.

CALAMUS ARFAKIANUS var. IMBERBIS Becc.

Vaginis inermibus, in ore minime barbatis; ocrea brevi truncata; segmentis interdum obsolete 3-costulatis.

Differs from the type in having the leaf-sheaths unarmed and strongly striate longitudinally, and not bearded at their mouths; in the ocrea being short, truncate, and marcescent, and also without bristles; the leaflets in this variety have the side nerves more distinct, and at times appear almost 3-costulate.

Hab. Arfak Mts., S.W. ridge, leading to Angi lakes; scrambling in forest at 7000'. ♀. Dec. 6143.

CALAMUS PRATTIANUS Becc., sp. nov.

Gracilis, scandens, caudice circ. 1 cm. diam.; vaginis flagelliferis, spinis gracilibus subsetiformibus densiuscule obsitis, in ore dense longiuscule hispido-barbatis; foliis non cirriferis, brevibus; petiolo brevissimo; segmentis paucis, inæquidistantibus, sæpe utrinque geminatis (non per greges remotos approximatis), anguste lanceolatis, subulato-acuminatis, chartaceis, firmis, unicostatis, utrinque nudis vel superne in costa media et in nervis secundariis duobus inconspicue remoteque spinulosis; segmentis intermediis 15-18 cm. longis, 20-25 mm. latis, superioribus sensim minoribus, duobus terminalibus basi liberis vel breviter unitis; spadice ♂ gracillimo, elongato; inflorescentiis partialibus paucis, brevibus, remotis, spicas paucas erectopatulas ferentibus; spicis majoribus 3 cm. longis, flores 13-15 utrinque ferentibus, remotiusculis, spathellis breviter lateque infundibularibus, truncatis. Cætera desunt.

Scandent and very slender. *Sheathed stem* about 1 cm. in diam. *Leaf-sheaths* flagelliferous, not or but slightly gibbous above, rather densely covered with scattered or slightly confluent bristle-like spines, becoming closer and considerably longer and more hair-like near the mouths of the same leaf-sheaths and their ocreæ, which latter are very short and on account of these bristles look densely bearded. *Leaf-sheath flagella* very slender, long, and armed irregularly with very minute scattered claws. *Leaves* non-cirriferous, short (the few seen by me are 35 cm. long); petiole very short, or almost obsolete; rhachis fugaciously rusty-furfuraceous, armed with a line of solitary, rather long-tipped claws. *Leaflets* few, about 16 in all; very irregularly set, usually approximate in pairs on each side of the rhachis, with irregular vacant spaces of rhachis interposed; they are narrowly

lanceolate, gradually tubulately acuminate, papyraceous, rather rigid, almost shiny and of about the same colour on both surfaces, have the mid-costa very sharp above, and one or two slender secondary nerves on each side of it; underneath they are quite smooth, but above have occasionally a few very minute spinules on the mid-costa, and on a secondary nerve on each side of it; transverse veinlets much interrupted and not very sharp; the margins almost smooth, or very inconspicuously spinulose, more distinctly so at the apex; the intermediate leaflets are 15–18 cm. long and 20–25 mm. wide, the lowermost and the upper ones gradually smaller, the two terminal being the smallest, free, or more or less connate at the base. *Male spadix* flagelliform, very long and slender, with very few and distant partial inflorescences; primary spathes very narrowly tubular and elongate, very closely sheathing, more or less armed with scattered small claws, the lowest compressed with rather acute margins; the others cylindraceous, somewhat produced and lacerated at apex; partial inflorescences ascendent, rather short, the lowest and largest about 10 cm. long with 5–6 spikelets on each side; secondary spathes very narrowly tubular-infundibuliform, or with a flattened base, and slightly enlarged above, obliquely truncate at their mouths, and there slightly produced at one side into a triangular point, which embraces the bases of their respective spikelets; spikelets spreading, the largest (lowest) about 3 cm. long, with 13–15 flowers on each side; the upper are shorter, and have fewer flowers; spathels shallowly and broadly infundibuliform, truncate, strongly striately-veined; involucre cupular, obsolete two-keeled and slightly two-toothed on the side next to the axis. *Male flowers* ovoid, inserted at an angle of about 45°, not in contact with each other, but separated by the blades of their respective spathels. *Female spadix* and *fruit unknown*.

Hab. Arfak Mts., near the Monswoon Snoon (♂ lake) at about 8000'. Collected by Mr. A. E. Pratt.

It is closely related to *C. arfakianus*, from which it differs in the leaves having unequidistant, but not distinctly grouped leaflets, on that account resembling *C. Muellieri* more than *C. arfakianus*. From *C. Muellieri* it differs also in having larger spikelets, and having ascendant non-contiguous flowers.

C. Prattianus is characterized by its slender stem with cirriferous leaf-sheaths and short non-cirriferous leaves; by the ocreæ and the mouths of the leaf-sheaths being furnished with long bristles; by the lanceolate unequidistant (but not distinctly grouped) and almost smooth leaflets; by the very slender and long-flagelliform male spadix having only a few partial inflorescences furnished with but few spreading spikelets; these have briefly infundibular spathels and bear the flowers inserted at an angle of about 45°, a little apart one from the other.

CENTROLEPIDACEÆ.

CENTROLEPIS NOVO-GUINEENSIS Gibbs, sp. nov.

Planta perennis, densissime cæspitosa, multifoliata. *Folia* basi vaginata, vagina hyalina, margine longe pilosa, lamina lineare, canaliculata, leviter scabriuscula, obtusa. *Pedunculus* gracilis, scabriusculus; glumis 2, inæqualibus, calyptratis, margine hyalinis, unifloris. *Flores* bractea unica hyalina stipati. *Stamen* 1. *Ovarium* 2-loculare, loculis 2, superpositis. *Styli* 2.

Hab. Arfak Mts., Angi lakes. Abundant in marsh by ♀ lake where open on sand, 7000'. Fl., Fr. Dec. 5566.—Koebré ridge, abundant on open burnt summit, where damp, 9000'. Fl., Fr. 5646.

Plants 2·4 cm. high, with branched stems, all densely matted with white hairs at the base. Leaves 8 mm. long, with vagina 3 mm. long and 1 mm. broad, the lamina 4 mm. by 5 mm. Peduncle 1·5–1·8 cm. in length, much longer exerted in 5646, each bearing one spikelet, 4 mm. long. Glumes 2, the largest 3·5 mm. long, and the smaller 3 mm. Hyaline bract 4 mm. long, ovate acute. Stamen with versatile anther 1 mm. in length; filament 3·5 mm. long. Ovary 1·5 mm. long. Styles 3 mm.

Very near *C. philippinensis* Merr., but is a smaller plant with shorter, radially arranged, spreading leaves, hairy at the base, with, as far as seen, one flower in each glume.

This interesting record affords further striking proof of the wider distribution of a so-called Australian genus. One species alone was previously known from Asia, viz. *C. cambodiana* Hance, till Merrill in 1906 found *C. philippinensis* on Mt. Halcon at 2400 m. In 1910 *C. kinabaluensis* was found by me in N. Borneo, on Mt. Kinabalu at 13,000', which now, with the above, gives 4 well-defined Asiatic species, indeed 5, if an undescribed plant in the Kew Herbarium should belong to this genus; and no doubt further exploration of the magnificent mountain ranges of New Guinea with their unlimited possibilities will yield many more.

¹ CENTROLEPIS KINABALUENSIS Gibbs, = *C. philippinensis* W. B. Turrell, ex Gibbs in Journ. Linn. Soc., Bot. xlii. (1914) 172 (non Merr.).

Planta perennis, 2-3 cm. alta, cæspitosa. *Folia* disticha, imbricata, ±1·2 cm. longa, vagina 6 mm. longa, 2 mm. lata, hyalina, glabra, lamina 8 mm. longa, 5 mm. lata, obtusa, setosa. *Pedunculus* 1·2 cm. longus; glumis 2, inæqualibus, inferne latis concavisque, superne angustatis, apice obtusis, dorso carinatis, 4·5 mm. long. *Flores* 6-8, in quaque gluma 3-4, flos quisque bractea hyalina, 3·5 mm. longa. *Filamentum* 3 mm. longum, anthera 1·2 mm. longa. *Ovarium* 1·5 mm. longum, stylis 2 mm.

Hab. Kinabalu, granite core, summit, cracks in granite, forming mats. Fl., Fr. Feb. 4207.

A note of Turrell's on the herbarium sheet at Kew states, "The number of flowers in a spikelet varies in this plant. I have found 4, 6 or 8 flowers in one spikelet. The Philippine type is described as having 4 flowers and all the flowers of Merrill 6160 that I have dissected have this number in each spikelet." The plant also differs in the glabrous distichous leaves and the shape of the glumes, which have blunt apices.

XYRIDACEÆ.

*XYRIS PAUCIFLORA Wildm. *Phytopr.* i. 2, t. i. f. 1.

Arfak Mts., Angi lakes, common in open marsh by ♀ lake. Fl., Fr. Dec. 5928.

Distrib. India ("Foot-hills of the Himalayas, in marshes, from Nepal eastwards, N. Bengal to Burma," Hook. f. *Fl. Br. Ind.* vi. 365), Ceylon, Malay Peninsula, N. Borneo, Celebes, Philippines, and China. N.E. Australia.

ERIOCAULACEÆ. (A. B. RENDLE.)

ERIOCAULON LEUCOGENES¹ Ridl. in *Trans. Linn. Soc.* ser. 2, Bot. ix. (1916) 240.

Arfak Mts., Angi lakes, common on marsh by ♀ lake, where open and sandy, 7000'. Fl. Dec. 5567.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*).

"Flower heads mauve." The plants show a great range in size from 6 cm. to 20 cm., the heads varying in diameter from .5 to 1 cm.

JUNCACEÆ. (A. B. RENDLE.)

JUNCUS LAMPOCARPUS Ehrh. *Calam. n.* 126; Ridl. in *Trans. Linn. Soc.* ser. 2, Bot. ix. (1916) 231.

Arfak Mts., Angi lakes, open marsh by ♀ lake, 7000'. Fl. Dec. 5927.

Distrib. Temperate Europe and Asia, N. and E. Africa, Eastern N. America, S.E. Australia and New Zealand.

LILIACEÆ.

DIANELLA CERULEA Sims, *Bot. Mag.* (1801) t. 505; Schum. & Laut. 219; Nova Guinea, viii. (1914) 996; Ridl. in *Trans. Linn. Soc.* ser. 2, Bot. ix. (1916) 230.

Arfak Mts., in high forest below, and in open spaces on the S.W. ridge, running up to Angi lakes, also in open marsh by ♀ lake, 7000-8000'. Fl. Dec. 5519.

Distrib. New Guinea (D.N.W., Arfak Mts., *Gjellerup*; D.S.W., *G. Lieb*, *Brandenhorst*; Mt. Carstensz, *Kloss*; N.E.). Philippines, New Caledonia, and Fiji; N.E. Australia to Tasmania.

Acaulescent, and with light blue flowers.

LUZURIAGA ASPERICAULIS Hall. f. in Nova Guinea, viii. (1914) 991, t. clxxxi.

Arfak Mts., twining in mossy forest on S.W. ridge running up to Angi

¹ A species of *Eriocaulon* was also collected by Miss Gibbs on Mt. Kinabalu at 12,000' (no. 4209) by Kadamaian torrent, on the granite core near the summit of the mountain; it was mixed with *Centrolepis kinabaluensis* Gibbs (no. 4209) (see p. 99). It is a caespitose plant, forming small cushions 2.5 cm. high, with glabrous leaves 2-2.5 cm. long, ± 1 mm. wide in the middle, linear-tapering from a broad membranous base. The specimens are all sterile. No *Eriocaulon* has hitherto been recorded from the granite core of the mountain.

lakes, 8000–9000'. Fl. Dec. 5536.—Common in forest slopes by ♀ lake, 7000'. Fl., Fr. 5744.

Distrib. New Guinea (D.N.W., Arfak Mts., *Gjellerup*).

A common and very pretty twiner with white flowers. The fruit, which was not available in Dr. Gjellerup's specimens, is a roundish berry, 8 mm. long by 6 mm. broad, 1–2-seeded, with persistent style and remains of perianth-tube at the base.

IRIDACEÆ.

PATERSONIA NOVO-GUINEENSIS Gibbs, sp. nov.

Planta perennis; caulis brevissimus. *Folia* circiter 5–8, scapum æquantia vel superantia, disticha, linearia, rigida, acutissima, in marginibus dense rufo-pilosa, tenuiter multistriata. *Spathæ* subæquales, lineari-oblongæ, acutissimæ, carinatæ (carinâ ad $\frac{3}{4}$ rufo-pilosa vel glabra) striatæ, scarioso-marginatæ. *Bractææ* spathis similes nisi magis membranaceæ necnon angustiores brevioresque, ad apicem piloso-marginatæ vel glabræ. *Flores* in spatha 2–3, sessiles; tubus gracillimus, vix exsertus; lobi exteriores obovati, patentes, in carinâ dorsali ad apicem dense barbati, interiores nulli. *Filamenta* in tubum integrum connata. *Stylus* superne, leviter incrassatus; lobi stigmatici lineari-oblongi, papilloso.

Hab. Arfak Mts., Koebré ridge, plentiful on open burnt summit, 9000'. Fl., Fr. Dec. 5600.

A small rigid plant, with gleaming white or pale mauve flowers, \pm 1–3.5 dm. in height. Leaves from 1.2–3.5 dm. by 5–6 mm., characterized by a line of matted branched hairs, containing brown colouring-matter, up the dorsal keel, and from the vagina to the apex on the adaxial margin of the leaf. Sheathing scales at the base of the leaves from 3.5 cm. long, lanceolate acute, brown, the old bases persisting round the stem. Scape 7.3 cm. long, more or less exserted from the sheathing leaves, which it exceeds or equals, or it may be shorter. Spathes 3.8 cm. by 5 mm. Perigonium tube 2 cm. long, lobes 8 mm. long, including apical tuft of hairs 1 mm. long. Anthers 3 mm. Stigma-lobes 2 mm.

This species is near *P. Louii* Stapf. It differs in the somewhat broader leaves with marginal line of brown hairs and the generally white corollas with an apical tuft of hairs to each lobe. The transverse section of the leaf shows many more fibro-vascular strands and is more attenuated at the margin than in the above species. There is also no trace of an inner perianth, as Stapf also found for the Kinabalu plant. The marginal line of matted branched hairs is common to some Australian species, viz. *P. sericea* R. Br. and *P. pygmaea* Lindl., but in every case apparently the hairs are hyaline and much finer in texture.

This genus, for many years supposed to be endemic in Australia, now includes three Malayan mountain types, viz. *P. borneensis* Stapf and *P. Louii* from Mt. Kinabalu in N. Borneo, the latter also common to Mt. Halcón in the Philippines, and the above.

ZINGIBERACEÆ. (TH. VALETON.)

ALPINIA ARFAKENSIS K. Sch. in Engl. Bot. Jahrb. xxvii. (1899) 296.

Var. SUBSESSILIS Val., var. nov.

Folia subsessilia minora, glaberrima, siccando valde convoluta coriacea. *Ligula* 20 mm. longa vel longior, valde macerata. *Antheræ* appendicula magna truncata, canaliculata. *Cetera* genuinæ.

Arfak Mts., S.W. ridge, common, 7000'. Fl., Fr. Dec. 5524, 5983 bis. "Plant 1-1.50 m. in height, with pink flowers and white fruit."

This specimen answers so excellently to the description of *A. arfakensis* K. Sch., which I have not seen, only differing in the length of the petiole and ligula, that I think it must be a variety of it. There is, however, a large crista to the anther, as broad as the anther itself, and therefore easily overlooked. Schumann's description, "connectivi appendicula 0," must be a *lapsus*, the flowers being too like one another to admit of so great a difference in the anther.

Distrib. New Guinea (D.N.W., Hatam, *Beccari*).

ALPINIA DOMATIFERA Val. in Nova Guinea, viii. (1913) 955.

Arfak Mts., Angi lakes, S.W. ridge, common, 7000-8000'. Fl., Fr. Dec. 5980.—Lower high forest. 5000'. Fl. (red), 6132. Fl. (white), 6131.

Distrib. New Guinea (D.N.W., Arfak Mts., 2400', *Gjellerup*).

RIEDELIA MONTANA Val., var. ARFAKENSIS Val. l. c. 972.

Arfak Mts., Angi lakes, in forest by ♀ lake, 7000'. Fl. Dec. 5517.—Koebré ridge, 9000'; common on burnt open summit. 5612.

Most variable in the colour of the flowers.

RIEDELIA MONTANA var. PUBERULA Val., var. nov.

Ligula, rhachis, dentes calycis puberula, *cetera* genuinæ.

Arfak Mts., common in marsh by ♀ lake. Dec. 5515.

RIEDELIA EXALATA Val., sp. nov.

Herba glabra. *Folia* subsessilia, lineari-lanceolata, valde acuminata, basi angustata, costa canaliculata, glaberrima, 200 × 22 mm. longa. *Ligula* brevissima (1 mm.), lobis rotundatis, puberulis. *Racemus* gracilis-laxiflorus, 85 mm. longus. *Flores* graciliter pedicellati (pedic. 2-3 mm. longi). *Calyx* brevis, tubulosus, superne dilatatus, dorso brevissime fissus, bilobus vel subtrilobus, lobis brevibus rotundatis, exalatus, nervoso-striatus. *Corollæ* tubus inclusus; lobus dorsalis apice acute cucullatus, ceteros includens. *Labellum* alte partitum; lobi oblique truncati obtusi, lobulo laterali angusto. *Filamentum* breve, antheræ connectivo lato, apice emarginato.

Hab. Arfak Mts., Koebré ridge, in forest, 8500'. Fl. Dec. 5637.

This species has much resemblance to *R. orchoides*, but the flowers are smaller, the inflorescence is more laxiflorous, and the calyx has no wings; it is nearest to *R. urceolata* Val. (*vide* Engl. Bot. Jahrb. lii. (1914) 83).

RIEDELIA LANATA (Scheff.) Val. Nova Guinea, l. c. 961; Icones Bogor. iv. tab. 374. *Hedychium lanatum* Scheff. in Ann. Jard. Bot. Buit. i. (1867) 57. *Riedelia curviflora* Oliv. in Ic. Plant. t. 1419 (1883). *Nanochilus arrovicus* Gagnep. Bull. Soc. Bot. Fr. 4^e série, i. lxxxii (1901).

Arfak Mts., Koebré ridge, growing in masses at the base of the forest, 7000'. Fl. Dec. 5645.

Distrib. New Guinea (D.N.W., Doré, *Teysmann*; Arfak Mts., *Gjellerup*; D.S.W., Noord River, *Versteeg, von Roemer*). Moluccas, Buru.

RIEDELIA ORCHIOIDES (K. Sch.) Val. Nova Guinea, l. c. 976. *Alpinia orchoides* K. Sch. in Engl. Bot. Jahrb. xxvii. (1899) 278.

Arfak Mts., Angi lakes, abundant in open marsh by ♀ lake. Fl. Dec. 5526.

Distrib. New Guinea (D.N.W., Arfak Mts., near Hatam, *Beccari*, July 1871).

BURMANNIACEÆ.

BURMANNIA LONGIFOLIA Becc. Malesia, i. 244, t. xiii. figs. 1-5; Nova Guinea, viii. (1909) 195, (1912) 895; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 228.

Arfak Mts., epiphytic in forest by ♀ lake, 7000'. Fl. Dec. 5675.

Distrib. New Guinea (D.N.W., Arfak Mts., *Beccari*; Goliath Mts., *De Kock*; Cyclops Mts., *Gjellerup*; D.S.W., Johannes Keyts Mts., Le Cocq d'Armandville, Resi-Rücken, *Versteeg*; Hellwig Mts., *von Roemer*; Mt. Carstensz, *Kloss*; S.E. (Sogeri region, *Forbes*, Brit. Mus.). Philippines, Borneo, Amboina, Malay Peninsula.

BURMANNIA DISTICHA L. Sp. Pl. 287; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 228.

Arfak Mts., Angi lakes, abundant on open marsh by ♀ lake, 7000'. Fl. Dec. 5745.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*). India, Ceylon, Indo-China, Malay Peninsula, Sumatra, Banca, Philippines, E. Australia.

A charming plant, up to 1 m. in height, with mauve-white or mauve flowers; also abundant in open spaces at 8000' on S.W. ridge running up to Angi lakes.

CORSIACEÆ.

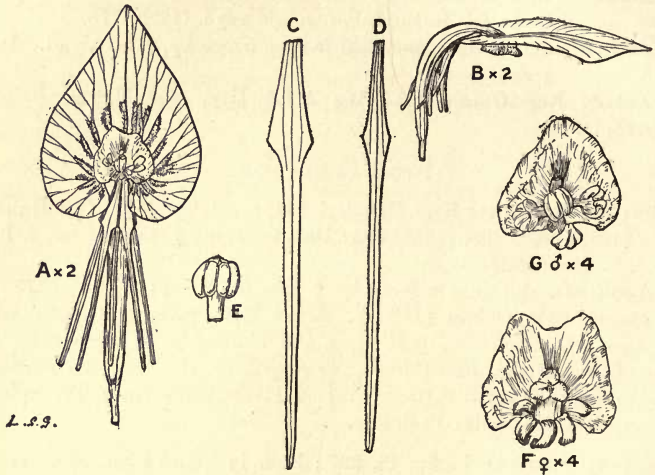
CORSIA ORNATA Becc. Malesia, i. 239, tab. ix.; Nova Guinea, viii. (1909) 197, (1912) 893; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 228.

Arfak Mts., Angi lakes, saprophytic in humus, in forest patch by ♀ lake. Fl., Fr. Dec. 5570.

Distrib. New Guinea (D.N.W., Mt. Morait, N. Coast, *Beccari*; Resi Rücken, *Versteeg*; Cyclops Mts., *Gjellerup*; D.S.W., Hellwig Mts., *von Roemer*; Mt. Carstensz, *Kloss*).

This plant, wine-red in colour, was dotted about in little colonies, chiefly at the base of trees; the erect stems, of equal height, were all horizontally inclined in one direction. The callosities at the base of the medium sepal are arranged as described for *C. cordata* Schtr. rather than as figured for *C. ornata*; but this is possibly a varying feature, as in *Kloss's* specimens they are not present at all.

FIG. 7.



Corsia arfakensis Gibbs.—A. Flower; B. Nat. position; C, D. Lateral outer and inner perianth segments; E. Stamen; F. ♀ stage; G. ♂ stage (*C. ornata*, two anthers fallen off).

CORSIA ARFAKENSIS Gibbs, sp. nov.

Herba terrestris, saprophytica, perennis. *Rhizoma* stoloniferum, nodosum. *Radices* filiformes, glabræ. *Caulis* strictus, glaber, 4-angulatus, vaginis 4-5 amplectentibus, uniflorus. *Bractea* ovata, acuta, laxè vaginante, ovario circa æquilonga. *Flos* horizontalis. *Sepalum* intermedium dorsale ovato-cordatum, sub-acutum, ima basi nectario hemisphærico, apice emarginata ornatum, 17-18 lamellatum, lamellis copiose ciliatis; sepala lateralia hastato-ligulata, obtusa, margine minute papillosa. *Stamina* 6, ovarii apici inserta; filamenta crasso-subulata; antheræ apice rotundatæ, filamentis æquales. *Stylus* cylindricus, glaber, post anthesin elongatus. *Stigma* trilobum, demum incrassato-carnosum.

Hab. Arfak Mts., S.W. ridge, saprophytic on dead wood in high forest, 6000'. Fl. Dec. 6147.

This plant is brown-green in colour, 1·5–2 dm. in height. It is larger in all its parts than *C. ornata*, and the flowers showed the same horizontal position. Middle sepal 1·3 cm. long from the centre and 1·8 cm. long from the lobes, by 1·5 cm. broad, the lamelli on the veins at the base being 2 mm. long and 1 mm. broad; the lateral sepals are 1·2 cm. long, 2·5 mm. broad at the base and 1 mm. in the ligulate upper portion; the outer perianth segments are somewhat shorter and narrower at the hastate base. *Stamens* 2 mm. long. In anthesis the style is undeveloped, and the stamens, more or less erect, close over it; as these mature they deflex (fig. 7, G, ♂ stage), until in the ♀ stage (fig. 7, F) the anthers are shed, the persistent filaments curling round the base of the mature elongated style, the stigma becoming fleshy and 3-lobed.

This species is nearest to *C. ornata*, but is distinct from all *Corsias* so far described in the hastate base to the lateral perianth segments.

The remarkable protandry characterizing this genus was suggested by J. J. Smith (*l. c.* 197), but he had not sufficient material to be quite certain on this point. The above description is based entirely on formalin material, but only the two flowers figured were available in this case. My abundant formalin material of *C. ornata*, however, quite confirms this point, and the stage in the position of the anthers is drawn from that.

ORCHIDACEÆ. (J. J. SMITH.)

The collection of Orchids is a rather extensive one; it totals up 83 numbers, representing 57 species and varieties, amongst which are 20 new species and 4 new varieties.

Remarkable is the occurrence of *Spathoglottis aurea* Lindl.—that is to say, the plant I described in “Die Orchideen von Java” under this name—in New Guinea. This species has also been collected in Sumatra. However, I have seen no authentic specimens of *S. aurea*, and, indeed, the description of *S. Wrayi* Hook. f. suits the plants better.

Phajus flavus Lindl. has now been collected by Miss Gibbs in much larger specimens than those of Gjøellerup: the variety may hardly be upheld.

Platanthera elliptica J. J. S. has been collected in 11 numbers. One of these agrees with the type-specimens, only it is larger. The remainder represent two forms, the one tall with a proportionally short spur to the lip, the other a smaller plant with a larger spur.

PLATANTHERA ELLIPTICA J. J. S. in Bull. Jard. Buit. 2^e sér. n. xiii. (1914) 53; in Nova Guinea, xii. (1915) 177, t. lv. 90.

Arfak Mts., Koebré ridge between ♂ and ♀ lakes, on burnt open summit plateau, 9000'. Fl. Dec. 5602.

Distrib. New Guinea (D.S.W., Wichmann Mts., *Pulle*).

Var. *ELATIOR* J. J. S., var. nov.

Folia radicalia petiolata, elliptica, breviter acuminata (semper?) c. 5-9.5 cm. longa, 1.5-3.2 cm. lata, petiolo c. 2-2.5 cm. longo. *Pedunculus* c. 27-37 cm. longus, vaginulis c. 3-4 foliaceis patentibus sessilibus oblongo-ellipticis ad lanceolatis leviter ovatis in bracteas vergentibus inferioribus c. 4.2-7.5 cm. longis 1-2.3 cm. latis donatus; rhachis c. 9-16 cm. longa, laxa c. 7-13-flora. *Labelli* lamina c. 0.42 cm. longa; calcar ovario brevius, lamina paulo longius, c. 0.65 cm. longum.

Hab. Arfak Mts., Angi lakes, terrestrial in forest, 6000-7000'. Fl., Fr. Dec. 5659, 5665, 5711, and 6139.

Var. *LONGICALCARATA* J. J. S., var. nov.

Folia radicalia petiolata, plus minusve ovato-elliptica, brevissime acuminata, c. 3-5 cm. longa, 1.3-2 cm. lata, petiolo c. 0.6-2 cm. longo. *Pedunculus* 12.5-21 cm. longus, vaginulis foliaceis c. 3-4 patentibus sessilibus oblongo- ad lanceolato-ovatis in bracteas vergentibus inferioribus c. 2.6-4.2 cm. longis donatus; rhachis c. 3.25-6.5 cm. longa, c. 3-7-flora. *Labelli* lamina c. 0.5 cm. longa, calcar ovarium aequans, laminam multo superans, c. 1.15 cm. longum.

Hab. Arfak Mts., Angi lakes, terrestrial in forest, 7000'. Fl., Fr. Dec. 5685, 5686, 5687, 5988, 6014, and 6140.

Amongst the eleven numbers of this species collected, only one (viz. n. 5602) is in habit very much like the type. The compact growth of both plants is probably due to the fact that they were found in open ground, whereas the other ones grew in the shade of the forest.

The remaining ten numbers readily may be divided into two series—the one characterized by a tall stem and a short spur, the other by distinctly shorter stem and a much longer spur.

The flowers of all are green.

PERISTYLUS GOODYEROIDES Lindl. Gen. et Sp. Orch. (1835) 299; in Nova Guinea, xii. (1915) 178.

Arfak Mts., Momi river, near old "campong" site, in "lalang," on inundation area. Fl. Dec. 6129.

Distrib. New Guinea (D.N.W., Arfak Mts., Angi lake, *Gjellerup*). Malay Archipelago, India.

STIGMATODACTYLUS?, sp. nov.

Arfak Mts., Angi lakes, forest patch by ♀ lake, edge of forest, terrestrial, 7000'. Fr. Dec. 5891.

Only in fruit, but apparently belonging to this genus.

CRYPTOSTYLIS ARFAKENSIS J. J. S. in Fedde Rep. xi. (1913) 553; in Nova Guinea, xii. (1915) 183, t. lix. 97.

Arfak Mts., ridge running up to Angi lakes, terrestrial in moss in forest, 7000'. Fl. Dec. 5522.

Distrib. New Guinea (D.N.W., Arfak Mts., *Gjellerup*).

Probably belonging here, but leaves much smaller than in the type-specimen. "Labellum red, with green perianth."

EPIPOGUM NUTANS Rehb. f. in Bonplandia, v. (1857) 36; etc.

Arfak Mts., Angi lakes, saprophytic amongst bracken, on bank by ♀ lake, 7000'. Fl. (white). Dec. 5949.

Distrib. New Guinea (D.S.W., Giriwo River, *Janowsky*; N.E.). Tropical Asia and Australia.

PTEROSTYLIS PAPUANA Rolfe in Kew Bull. 1899, 112; J. J. S. in Nova Guinea, xii. (1915) 185, t. lxi. 99.

Var. ARFAKENSIS J. J. S., var. nov.

Caulis c. 4 cm. longus, c. 5-folius. *Folia* patentia, petiolata, ovata, acuta, basi rotundata, costa media dorso carinata, laxè reticulato-venosa, c. 0.95–2 cm. longa, 0.8–1.4 cm. lata; petiolus canaliculatus, cum vagina c. 1.1–1.8 cm. longus; folium summum ellipticum et brevius petiolatum. *Inflorescentia* erecta, 1-flora, pedunculo c. 9 cm. longo, vaginulis 2 sessilibus erectis bracteæ similibus c. 1–1.1 cm. longis donato. *Bractea* erecta, adpressa, foliacea, ovata, acutiuscula, c. 1.15 cm. longa. *Flos* erectus. *Sepalum* dorsale erectum, incurvum, valde concavum, inferne longitudine c. 0.55 cm. gynostemio adnatum, ovatum, sensim longe acuminatum, acutum, mucronatum, carinatum, c. 9–11-nerviium, c. 2.85 cm. longum, 1.1 cm. latum. *Sepala* lateralia lacinia angusta ad pedem gynostemii decurrentia, ultra apicem pedis gynostemii longitudine c. 0.6 cm. inter se connata, oblique oblonga, longe caudato-acuminata, concava, cauda canaliculata, c. 7–8-nervia, supra apicem pedis gynostemii c. 2 cm. longa, parte lata 1.3 cm. longa, 0.47 cm. lata. *Petala* lacinia angusta ad pedem gynostemii decurrentia, oblique lanceolata, acuta, subfalcata, margine superiore in $\frac{2}{3}$ partibus supra basin obtusangula et irregulariter marginata, inferne oblique cuneato-angustata, supra basin c. 5-nervia, tota c. 2.3 cm. longa, 0.67 cm. lata, parte pedi gynostemii adnata c. 0.35 cm. longa. *Labellum* pedi gynostemii insertum, erectum, apice recurvum, inexplanatum, gynostemio paulo brevius, subovato-lanceolatum, apicem versus sensim angustatum, anguste obtusum, basi obtusum, convexum, plica longitudinali supra costato-prominente subtelus canaliculata instructum, papillosum, c. 5-nerviium, appendice basilari cum labeo angulum obtusum faciente lineari incurva apice in lacinias c. 3 crenulatas divergentes divisa c. 0.27 cm. longa, explanatum c. 1.175 cm. longum, infra medium 0.325 cm. latum. *Gynostemium* erectum, elongatum, gracile, in bene $\frac{1}{3}$ parte supra basin obtusangule incurvum, inferne sepalo dorsali adnatum, bene $\frac{1}{3}$ parte superiore late alatum, alis parallelis e basi semicuneata abrupte oblique quadrangulo-dilatatis, postice in laciniam conspicuam reversam triangulam obtusam productis, margine antico incurvis ciliatisque, angulo antico in appendicem subulatam productis, cum appendicibus c. 0.625 cm. longis, apice gynostemii late semi-elliptico obtuso valde concavo, cum anthera c. 1.5 cm. longum. *Anthera* erecta, cucullata, quadrangula, selliformis, apice bilobula cum apiculo brevi obtuso, basi 4-lobula, c. 0.15 cm. longa. *Stigma* c. $\frac{1}{3}$ partem medianam gynostemii occupans, longitudinale, c. 0.43 cm. longum. *Pes* gynostemii cum gynostemio angulum acutum faciens, linearis, $\frac{3}{4}$ partibus inferioribus sepalis lateralibus petalisque adnatus, ceterum liber, c. 0.5 cm. longus. *Ovarium* 6-angulatum, in angulis parcellis dentatum, c. 1.35 cm. longum; pedicellus tenuior, c. 2.7 cm. longus.

Hab. Arfak Mts., Angi lakes, terrestrial under edge of forest patch by ♀ lake, 7000'. Fl. Dec. 5713 and 5890.

This differs from the plant collected by Mr. G. M. Versteeg in the valley between the Hubrecht and Wichmann Mts. in being smaller in all its parts, especially in the flower, the somewhat more acuminate dorsal sepal, more angular petals, and longer pedicel. I do not think the plants are specifically distinct.

The flowers are said to be pink.

SPIRANTHES (?) PAPUANA Schltr. Orch. D. Neu-Guinea, (1911) 46.

Arfak Mts., Angi lakes, open marsh by ♀ lake, on gravel, 7000'. Fl. Dec. 5673.

Distrib. N.E. New Guinea.

The material consists of two very small plants. Schlechter's description suits it better than my *S. angustilabris*. There are two conspicuous scales at the base of the lip, which, however, so far as I have seen, are not hairy.

The petals are more acute than in *S. angustilabris* and the lip is much broader and 3-nerved. The dorsal sepal is 1-nerved, whereas it has three nerves in *S. angustilabris*.

The colour of the flowers is white.

GOODYERA (§ EUGOODYERA) ARFAKENSIS J. J. S., sp. nov.

Caulis pars erecta c. 9 cm. longa, c. 5-folia, inferne vaginata. *Folia* patentia, oblongo- ad lanceolato-ovata, sensim acuminata, acuta, 5-nervia, laxissime reticulato-venosa, costa media et præsertim venis transversis in sicco albis, mediana maxima ad c. 3·4-3·8 cm. longa, 1-1·1 cm. lata; petiolus canaliculatus, cum vagina tubulosa c. 1·2-1·3 cm. longus. *Inflorescentia* erecta, densius multiflora, pedunculo grossius pubescenti, c. 5·3 cm. longo, vaginulis 2 foliaceis in bracteas vergentibus donato, rhachide parce puberula, c. 5·5 cm. longa. *Bracteæ* adpressæ, subulatæ, acutæ, basi dilatatæ ciliolatæque, concavæ, 1-nerviæ, c. 1-0·5 cm. longæ. *Flores* patentes, parvi, glabri. *Sepalum* dorsale ovatum, obtusum, concavum, 1-nerviium, c. 0·26 cm. longum, 0·16 cm. latum. *Sepala* lateralia oblique ovata, obtusa, concava, 1-nervia, c. 0·275 cm. longa, 0·15 cm. lata. *Petala* sepalo dorsali agglutinata, oblique spatulato-ligulata, falcata, obtusa, superne irregulariter marginata, concava, 1-nervia, c. 0·275 cm. longa, superne 0·075 cm. lata. *Labellum* cum gynostemio angulum acutum faciens, magnam partem rotundato-saccatum, lamina obtusangule recurva, concavula, subtus convexa, subtus longitudinaliter sulcatum, 1-nerviium, c. 0·26 cm. longum, explanatum late subovato-triangulum, 0·26 cm. longum, fere 0·3 cm. latum, sacco marginibus latis exceptis carnosulo et in utraque parte costæ mediæ muricibus c. 12 adperso, sensim in laminam triangulo-semiorbicularem obtusam c. 0·07 cm. longam, 0·1 cm. latam producto. *Gynostemium* rectum, dorso convexum, dorso visum rhombeum, c. 0·15 cm. longum, clinandrio cucullato. *Anthera* cucullata, cordata, obtuse acuminata, c. 0·1 cm. longa. *Rostellum* falcato-bidentatum. *Stigma* majusculum, transverse ovali-obreniforme, margine inferiore rotundatum. *Ovarium* 6-sulcatum, apice leviter attenuatum, glabrum, bene 0·4 cm. longum.

Hab. Arfak Mts., Angi lakes, forest patch by ♀ lake, creeping in humus, 7000'. Fl. Dec. 5571.

This species, belonging to the section *Eugoodyera*, is easily recognized by the markings of the leaves and the floral characters.

The flowers are white.

EUCOSIA (?) *PAPUANA* Schltr. Orch. D. Neu-Guinea, (1911) 76.

Arfak Mts., Angi lakes, forest patch by ♀ lake, creeping in humus, 7000'. Fr. Dec. 5666 and 5573.

Distrib. N.E. New Guinea.

I think this is *Eucosia papuana* Schltr., though the description shows slight differences. The Arfak specimens, however, were in fruit.

CÆLOGYNE ASPERATA Lindl. in Journ. Hort. Soc. iv. (1849) 221; etc.

Manokoeari. Said by Mr. van Hasselt to have been collected at the Mamberano river; flowered at Residency. Fl. Jan. 6232.

Distrib. New Guinea, Halmaheira, Borneo, Sumatra, Malay Peninsula, Philippines.

PHAJUS TANKERVILLIÆ Bl. Mus. Bot. Lugd.-Bat. ii. (1852) 177; etc.

Var. *PAPUANUS* J. J. S. in Nova Guinea, xii. (1915) 203.

Arfak Mts., Angi lakes, marshy ground by ♀ lake, 7000'. Fl. Dec. 5539.

Distrib. New Guinea (D.N.W., *Gjellerup*).

PHAJUS FLAVUS Lindl. Gen. et Sp. Orch. 128; etc.

Var. *PAPUANUS* J. J. S. in Nova Guinea, xii. (1915) 205.

Arfak Mts., Angi lakes, terrestrial in forest patch by ♀ lake, 7000'. Fl. Dec. 5682 and 5952.

Distrib. New Guinea (D.N.W., Arfak Mts., Angi lakes, *Gjellerup*).

The material is much more robust than the specimen collected by *Gjellerup*.

**SPATHOGLOTTIS AUREA* Lindl. in Paxt. Fl. Gard. i. 16; etc.

Arfak Mts., ridge running up to Angi lakes, terrestrial, open slopes, 7000'. Fl. Dec. 6116.

Distrib. Java, Sumatra, Malay Peninsula.

The material on hand was not very satisfactory. I could not distinguish it from *S. aurea* Lindl., only the petals were a little broader; otherwise it agrees exactly with the Javanese material I have seen.

MICROSTYLIS (§ *CREPIDIUM*) *PRODUCTA* J. J. S., sp. nov.

Caulis e basi decumbente radicante adscendens, parte adscendente c. 3 cm. longa, c. 5-folia. *Folia* oblique lanceolata, sensim angustata, acuta, minute undulata, costa media subtus carinata, ad c. 4.6 cm. longa, sicco 0.7 cm. lata; petiolus canaliculatus, cum vagina c. 0.4–1.4 cm. longus, supremus brevissimus. *Inflorescentia* erecta, laxa

multiflora, pedunculo c. 7·8 cm. longo, angulato, c. 2 vaginulas bracteiformes gerente, rachide angulata, 3·5 cm. superante. *Bractea* reflexæ, lanceolato-triangularæ, acutæ, concavulæ, 1-nerviæ, ad c. 0·4 cm. longæ. *Flores* (macerati) bene 0·6 cm. longi, sepalis petalisque patentissimis, recurvis, convexis. *Sepalum* dorsale ovato-ovale, obtusum, 1-nerviium cum nervulo 1 rudimentario utrinque (semper?), c. 0·3 cm. longum, 0·225 cm. latum. *Sepala* lateralia oblique ovata, obtusa, valde convexa, 1-nervia, c. 0·27 cm. longa, 0·18 cm. lata. *Petala* ligulata, basin versus leviter angustata, apice retusa, 1-nervia, c. 0·3 cm. longa, 0·08 cm. lata. *Labellum* hippocrepidiforme, 3-lobum, fovea oblongo-ovali incrassatione lata convexa circumdata, explanatum c. 0·35 cm., cum auriculis 0·52 cm. longum, 0·36 cm. latum, lobis lateralibus patentissimis, late triangulis, vix productis, obtusis, lobo intermedio producto, oblongo-subtriangulo fere quadrangulo, apicem versus angustato, fere ad medium in laciniis contiguas oblongas obtusas bifido, c. 0·22 cm. longo, basi 0·175 cm. lato, dente 1 patente cum lobo medio angulum rectum faciente anguste triangulo subacuto lobis lateralibus vix brevior utrinque inter lobos, auriculis oblique triangulis, obtusis vel subacutis, c. 0·17 cm. longis. *Gymnostemium* breve, a dorso compressum, ambitu quadrangulum, apicem versus dilatatum, dorso convexum, c. 0·075 cm. longum, clinandrio concavo, auriculis divergentibus, oblique oblongo-quadrangulis, oblique truncatis, subretusis. *Anthera* cucullata, transverse ovali-reniformis, apice rotundata, c. 0·06 cm. lata. *Pollinia* 4, in corpuscula 2 compressa obovata unita, c. 0·03 cm. longa. *Rostellum* auriculis vix brevius, late retusum. *Ovarium* pedicellatum curvatum, 6-costatum, c. 0·45 cm. longum.

Hab. Arfak Mts., Angi lakes, forest patch by ♀ lake, creeping in humus, 7000'. Dec. 5677.

Flowers yellow. A distinct species with the mid-lobe elongate.

MICROSTYLIS (§ HERPETHORHIZIS) GRANDIFLORA J. J. S., sp. nov.

Rhizoma repens, elongatum, radicans, omnino vaginis sese amplectentibus tectum, radicibus pubescentibus. *Caules* remoti, erecti, c. 6·5–7 cm. longi, c. 7-folii, foliis infimis vix laminam gerentibus. *Folia* erecto-patentia, oblique elliptica ad lanceolato-elliptica, interdum subovata, acuminata, acuta, minute undulata, nervis 3–5 majoribus curvatis dorso prominentibus, ad c. 7–7·5 cm. longa, 2·7–2·4 cm. lata; petiolus latus, cum vagina ad 3·4 cm. longus. *Inflorescentia* erecta, laxè multiflora, pedunculo angulato, bene 10 cm. longo, vaginulam 1 bracteiformem gerente, rhachide angulata, c. 11–18 cm. longa. *Bractea* reflexæ, lanceolato-triangularæ, acutæ, concavæ, 1-nerviæ, c. 0·75 cm. longæ. *Flores* in genere magni, quaquaversi, macerati c. 1·5 cm. longi. *Sepalum* dorsale deorsum spectans, oblongum, apicem versus leviter dilatatum, obtusum, convexum, 5- vel subquinquennerviium, c. 0·9 cm. longum, 0·4 cm. latum. *Sepala* lateralia oblique reflexa, oblique ovali-oblonga, superne leviter dilatata, valde convexa, apice recurva, obtusa, c. 0·77 cm. longa, 0·425 cm. lata. *Petala* reflexa, ligulata, obtusa, retusa, convexa, 3-nervia, 0·8 cm. vix superantia, 0·25 cm. lata. *Labellum* magnuum, erectum, convexum, dorso basi convexa excepta concavum, biauriculatum, subtrilobum, fovea majuscula, altiuscula, margine incrassato U-formi cruribus in labelli partem anticam convexam decurrente, in utraque parte foveæ costa convexa addita, costa media medio incrassata itaque labellum medio 5-costatum, 3- supra basin 5-nerviium, nervis exterioribus valde ramosis, explanatum ambitu quinquangulare,

absque auriculis subsemiorbiculari, apice in lobum medium acuminatum, c. 0·8 cm., totum bene 1 cm. longum, 0·9 cm. latum, lobis lateralibus rotundatis, breviter triangulo-basin versus repando-dentatis, dentibus c. 7-8 utrinque, lobo intermedio incurvulo, triangulo, obtuso, brevissime obtuse 2-dentato, c. 0·24 cm. longo, 0·3 cm. lato, auriculis breviusculis, valde remotis, oblique triangulis, acutis obtusive, c. 0·2 cm. longis. *Gynostemium* a dorso compressum, apice dilatatum, ambitu oblongo-quadrangulum, c. 0·3 cm. longum, clinandrio concavo, cum parte inferiore gynostemii angulum obtusum faciente, auriculis divergentibus, obtusis, plus minusve retusis. *Anthera* erecta, reniformis, apicem versus angustata, obtusa, emarginata, c. 0·125 cm. lata. *Rostellum* auriculas aequans, latum, retusum, lobulis obtusis. *Stigma* angulatum. *Ovarium* pedicellatum leviter sigmoideum, 6-costatum, c. 0·7 cm. longum. *Fructus* erectus.

Hab. Arfak Mts., Angi lakes, forest slopes by "campong" ♀ lake, Fl., Fr. Dec. 5595 and 5652.

This species belongs to Schlechter's section *Herpethorhizis*. From *M. distans* Schltr. and *M. megalantha* Schltr., it differs in the form of the lip, especially in the very short auricles and the shortly dentate mid-lobe. The flowers are as large as those of *M. megalantha*, but the mid-lobe is conspicuously produced.

The colour of the flowers is described as green; in the dried plant the lip is dark sepia.

LIPARIS (§ RHACHIDIBULBON) LACUS J. J. S., sp. nov.

Rhizoma repens, vaginis accrescentibus tectum, vagina ultima maxima, foliacea, tubulosa, ad c. 3·75 cm. longa. *Pseudobulbi* ad c. 3 cm. distantes. *Folia* 2, ovata, acuminata, acuta, curvinervia, parce transverse venosa, costa media dorso prominente, sicco membranacea, c. 4·5-6 cm. longa, 2·75-3·5 cm. lata; petiolus late canaliculatus, cum vagina pseudobulbum amplectente c. 2-2·75 cm. longus. *Infloréscentia* terminalis, erecta, dense multiflora, pedunculo c. 4-4·3 cm. longo basi in pseudobulbum ovatum carnosum c. 1·6-2·2 cm. longum incrassato, rhachide c. 0·9-1·4 cm. longa. *Bractea* subulata, acuta, 1-nerviæ, c. 1·2 cm. longæ, basi 0·27 latæ. *Flores* vagi. *Sepalum* dorsale oblongo-ovatum, sensim acuminatum, acutum, convexum, 3-nerviium, c. 0·925 cm. longum, 0·35 cm. latum. *Sepala* lateralia oblique oblongo-ovata, sensim acuminata, 3- supra basin 5-nervia, costa media dorso prominente, dorsali æquilonga. *Petala* linearia, apicem versus sensim angustata, acuta, 1-nervia, c. 0·825 cm. longa, basi 0·1 cm. lata. *Labellum* porrectum, leviter sigmoideum, valde concavum, subtus convexum, apice pellucido-punctatum, erosulum, intus supra basin callo U-formi postice rotundato antice sensim evanescente donatum, fascia longitudinali lineari convexa apicem versus decrescente ultra medium labelli producta minutissime papilloso-rugulosa inter crura calli ante callum excavationem subsemiorbiculari reliquente, 3-nerviium, explanatum angulato-ovatum, leviter cordulatum, lobulis basilaribus angulato-rotundatis, apice abrupte triangulo-acuminatum, c. 0·85 cm. longum, 0·7 cm. latum. *Gynostemium* breve, latum, bene curvatum, ambitu oblongo-quadrangulum, apice truncatum, basi lata truncatum, dorso convexum et apice longitudinaliter bicostatum, subtus concavum, absque anthera c. 0·25 cm. longum,

clinandrio parvo, concavo cum costula longitudinali in rostellum decurrente, auriculis obtusis. *Anthera* cucullata, longe ultra thecas producta, ambitu subquadrangula vel melius 7-angula, apice abrupte subulato-acuminata, basi truncata, c. 0.14 cm. longa, connectivo in costulam longitudinalem incrassato, thecis suborbicularibus. *Pollinia* 4, geminata, lateraliter compressa, triangula, extus convexa. *Ovarium* pedicellatum 6-costatum, c. 0.9 cm. longum. *Capsula* oblongo-obovoidea, basi acuta, c. 1.1 cm. longa, pedicello c. 1.1 cm. longo.

Hab. Arfak Mts., Angi lakes, forest patch by ♀ lake, edge of forest in humus, terrestrial, 7000'. Fl., Fr. Dec. 5689.

The first species of the section *Rhachidibulbon* recorded from New Guinea. It much resembles *L. brevistylis* J. J. S. (*L. montana* Lindl. var., *brevistylis* J. J. S.).

Flowers green with a brown labellum.

LIPARIS (§ PLATYCHILUS?) GIBBSIÆ J. J. S., sp. nov.

Rhizoma repens, radicans, teres, vaginis magnis ad c. 3.25 cm. longis tectum. Pseudobulbi c. 2.5 cm. distantes, cum rhizomate angulum anguste acutum facientes, sicco tenues, teretes, c. 2.5 cm. longi, 1-folii, basi nonnullis vaginis magnis acute acuminatis ad c. 4 cm. longis cincti. *Folium* inarticulatum, erectum, lanceolatum, acuminatum, acutum, basi sensim in petiolum angustatum, nervis 5 majoribus subtus prominentibus, sicco membranaceum, c. 9.75–10.5 cm. longum, 2.1–2.25 cm. latum; petiolus canaliculatus, nervosus, c. 2.5–4 cm. longus. *Inflorescentia* in pseudobulbo maturo terminalis, folio brevior, satis multiflora, pedunculo c. 4.5 cm. longo, vaginula angusta acuta c. 2.75 cm. longa ad basin, rhachide fractiflexa, c. 6 cm. longa. *Bractea* adpressæ, lanceolato-triangulæ, acutissimæ, concavæ, 1-nerviæ, ad c. 0.55 cm. longæ. *Flores* c. 16, quaquaversi, patentes, sepalis patentissimis, convexis. *Sepalum* dorsale oblongum, superne angustatum, obtusum, 3-nerviium, costa media dorso apicem versus prominente, c. 0.65 cm. longum, 0.25 cm. latum. *Sepala* lateralia divergentia, oblique oblonga, falcata, obtusa, vix apiculata, 3-nervia, costa media dorso prominente, c. 0.67 cm. longa, 0.3 cm. lata. *Petala* reflexa, linearia, obtusa, basi leviter oblique dilatata, leviter convexa, 1-nervia, c. 0.57 cm. longa, medio 0.06 cm. lata. *Labellum* porrectum, cum gynostemio angulum acutum faciens, basi gynostemio adnatum, in utraque parte canaliculæ latæ longitudinalis convexum, subtus convexum, e basi contracta quadrangula sensim dilatatum, 2-lobum, obcordatum, lobis remotis obtusis grosse crenatis cum lobulo brevi obtuso in sinu, basi contracta excepta ciliolatum, 3-nerviium, nervis exterioribus ramosis, callo majusculo antice dentes 2 erectos parallelos falcato-triangulos acutiusculos utrosque basi antice in costulam brevem exeuntes gerente in basi, explanatum c. 0.67 cm. longum, antice 0.45 cm. latum, parte contracta c. 0.2 cm. longa, 0.275 cm. lata. *Gynostemium* superne valde hamato-incurvum, dorso convexum, basi valde dilatatum, medio labello adnatum, ovario multo latius, c. 0.32 cm. longum, basi 0.17 cm. latum, clinandrio concavo, intus ad basin rostelli dente acuto instructo, auriculis subquadrangulis. *Anthera* cucullata, transverse quadrangulo-ovalis, apice truncata, basi emarginate bidentata. *Stigma* obverse rotundato-triangulum, margine elevatum. *Ovarium* 6-sulcatum, cum pedicello c. 0.4 cm. longum, curvatum.

Hab. Arfak Mts., Angi lakes, forest patch by ♀ lake, epiphyte in forest 7000'. Dec. 5689 and 5897.

This species belongs to the group on which Schlechter bases his sections *Platyphilus* and *Genyphilus*. It is well-marked by its strongly curved column and the form of the lip, with a bidentate callus at the base.

The flowers are described as green with a brown or creamy-brown labellum.

GLOMERA (§ EUGLOMERA) SIMILIS J. J. S., sp. nov.

Caules elongati, laxè ramosi, compressi, sectione transversa elliptici, pars adest 43 cm. longa, internodiis ad c. 3 cm. longis, 0·23 cm. latis, superne decreescentibus. *Folia* erecto-patentia, linearia, apicem versus sensim leviter angustata, valde inæqualiter 2-dentata, dente brevissimo acuto, dente longissimo obtuso c. 0·3–0·6 cm. longo, basi paulo angustata semiamplexicaulia, costa media sicco supra sulcata subtus obtuse prominente, sicco coriacea, c. 6·5–8·25 cm. longa, 0·5 cm. lata; vaginæ tubulose, præsertim superne antice verrucosæ, inferne sublævæ, apice laminæ oppositæ dente adpresso triangulo obtuso donatæ. *Inflorescentia* reflexa, subracemosa, secunda, c. 9-flora, spatha e basi brevissime tubulosa pedunculum arete amplectente orbiculari-ovata, acuminata, acuta, præsertim inferne valde concava, c. 11-nervia, c. 1·1 cm. longa, 0·85 cm. lata, pedunculo cum rhachide paulo elongata c. 0·85 cm. longo. *Bracteæ* oblongo-subellipticæ, acuminatæ, acutæ cum mucrone dorso ad apicem, concavæ, 3-nerviæ, membranaceæ, c. 0·57 cm. longæ, 0·27 cm. latæ, bractea infima inter sequentes et spatham intermedia. *Flores* c. 0·7 cm. longi. *Sepalum* dorsale lateralibus breviter adnatum, ovali-ellipticum, obtusiusculum, 3-nervium, c. 0·48 cm. longum, fere 0·3 cm. latum. *Sepala* lateralia breviuscule connata, calcar amplectentia, mentum saccatum subglobosum fere 0·2 cm. longum formantia, oblique ovata, obtusiuscula cum apiculo conico dorso ad apicem, 3-nervia, c. 0·46 cm., tota 0·56 cm. longa, 0·36–0·375 cm. lata. *Petala* oblique subrhombea, obtusiuscula, 3-nervia, c. 0·44 cm. longa, 0·24 cm. lata. *Labellum* gynostemio breviter adnatum, usque ad apicem ovarii c. 0·3 cm., cum calcar 0·475 cm. longum; lamina concava, apice margine recurvo convexa, 7-nervia, explanata subsemiorbicularis, basi abrupte transverse incrassata, c. 0·2 cm. longa, 0·3 cm. lata; calcar cum ovario angulum acutum faciens, oblique oblongum, obtusum, c. 0·3 cm. longum. *Gynostemium* supra basin leviter incurvum, dorso convexum, cum anthera c. 0·16 cm. longum, apice late trapeziformi, obtusissimo, retuso, clinandrio concavo, fere integerrimo, auriculis triangulis, subacutis. *Anthera* cum gynostemio angulum rectum faciens, cucullata, transverse ovalis, apice truncato-rotundato non recurvo membranaceo-marginata, connectivo basi conico-elevato postice canaliculato, c. 0·12 cm. lata. *Rostellum* latum, semilunatum, late retusum. *Stigma* transversum, semilunatum, margine inferiore valde productum incurvumque. *Ovarium* curvum, 3-sulcatum.

Hab. Arfak Mts., Angi lakes, epiphytic in forest patch by ♀ lake, 7000'.
Fl. Dec. 5975.

Nearly allied to *G. subracemosa* J. J. S., but differing by the much less warty sheaths, smaller flowers, a differently shaped lip, with much shorter blade, and edentate clinandrium.

The flowers are white.

GLOMERA (§ EUGLOMERA) TRANSITORIA J. J. S. in Fedde, Rep. xi. (1913) 558; in Nova Guinea, xii. (1915) 244, t. lxxxv. 148.

Arfak Mts., Angi lakes, forest slope by ♀ lake, epiphytic, 7000–8000'. Fl. (white). Dec. 5545.

Distrib. New Guinea (D.N.W., Arfak Mts., Angi lake, *Gjellerup*).

GLOMERA (§ GLOSSORHYNCHA) GIBBSIE J. J. S., sp. nov.

Caules erecti, tennes, teretes, superne valde ramosi, dense foliati, c. 1.3 cm. longi, ramulis erecto-patentibus, internodiis inferioribus c. 0.5 cm., in ramulis 0.1 cm. longis. *Folia* patentia, distincte petiolata, anguste oblonga, apicem versus angustata, obtusa, basi satis abrupte in petiolum contracta, crasse carnosa, supra canaliculata, subtus angulata et subcarinata, c. 0.6–0.67 cm. longa, 0.17 cm. lata; vagina tubulosa, verrucosa, apice setis numerosis laxe adpressis longis crispulis ciliata. *Inflorescentia* terminalis, erecta, sessilis, 1-flora. *Spatha* erecta, adpressa, flore multo brevior, bracteam basi tantum amplectens, apicem calcaris includens, lata, valde cucullato-concava, basi breviter tubulosa, acuta, dorso apicem versus carinata, dorso praesertim ad basin sparse furfuraceo-punctata, membranacea, c. 0.43 cm. longa. *Bractea* spathae similis, angustior, acute acuminata, dorso parce furfuraceo-punctata, membranacea, c. 0.4 cm. longa. *Flos* parvus, c. 0.8 cm. longus (maceratus). *Sepalum* dorsale oblongo-ovatum, distincte verruculoso-apiculatum, concavum, 3-nervium, c. 0.63 cm. longum, 0.225 cm. latum. *Sepala* lateralialia apicem calcaris haud amplectentia, basi brevissima connata, oblique ovato-oblonga, longius subulato-apiculata, basi margine anteriore leviter rotundato-dilatata, concava, 3-nervia, c. 0.7 cm. longa, basi 0.3 cm. lata. *Petala* erecto-potentia, lanceolata, obtusa, concava, 1-nervia, c. 0.675 cm. longa, 0.14 cm. lata. *Labellum* basi gynostemio adnatum, usque ad apicem ovarii c. 0.3 cm., usque ad apicem calcaris 0.47 cm. longum; lamina porrecta, cum calcaris angulum subrectum faciens, concava, subtus convexa, supra visa ambitu suborbicularis, basi in regulam transversam conspicuam incrassata, 7-nervia, explanata semielliptica, apice in lobulum angulato-rotundatum sicco nigrum papillosum producta, basi utrinque rotundata, c. 0.3 cm. longa, 0.325 cm. lata; calcar rectum, oblongum, superne leviter lateraliter compressum, obtusissimum, dorso c. 0.3 cm. longum. *Gynostemium* a dorso compressum, dorso leviter convexum, margine apicali repandulo-dentatum, medio retusum, absque anthera c. 0.15 cm. longum, clinandrio concavo, auriculis triangulis, apice breviter libero dentiformibus. *Anthera* cucullata, transverse ovalis, apice rotundato-producta recurva et pellucida, fere 0.13 cm. lata, connectivo triangulo, convexo. *Rostellum* transverse ovale, truncatum. *Stigma* semilunatum, margine inferiore valde productum et recurvum. *Ovarium* sessile, 6-sulcatum, c. 0.3 cm. longum.

Hab. Arfak Mts., Koebé ridge between ♀ and ♂ Angi lakes, epiphytic on open burnt summit plateau, 9000'. Dec. 5605.

The nearest ally of the species seems to be *G. salicornioides* J. J. S. This differs by the more robust stems, probably different-shaped leaves, colour of the flowers, much broader blade to the lip, and longer spur.

I suppose that only the rooted upper parts of the stems were collected.

The flowers are described as being white.

GLOMERA (§ GIULIANETTIA) ANGIENSIS J. J. S., sp. nov.

Caulis tenuis, ramosus, parte adest 10 cm. longa, internodiis c. 1-0.4 cm. longis. *Folia* patentia, lanceolata, apicem versus angustata, apice conduplicata, subacuta, basi in petiolum brevem contracta, c. 0.7-1.3 cm. longa, ad c. 0.2 cm. lata; vagina tubulosa, verrucosa, apice fimbriis adpressis crispis ciliata. *Inflorescentia* erecta, 1-flora. *Spatha* tubulosa, obtusa, membranacea, furfuraceo-punctata, $\frac{2}{3}$ partes inferiores ovarii pedicellati includens, explanata oblonga, bene 0.9 cm. longa, 0.4 cm. lata. *Bractea* spathæ similis, apiculata, c. 0.85 cm. longa. *Flos* parvus, valde apertus, c. 1.3 cm. latus. *Sepalum* dorsale lanceolatum, apice recurvum, obtusum, apiculatum, valde convexum, 3-nerviium, c. 0.87 cm. longum, 0.24 cm. latum. *Sepala* lateralia e basi erecta patentissima, basi breviter connata, oblique lanceolata, apice recurvula, obtusa, apiculata, basi antice in lobum oblique triangulum obtusum concavum calcar adpressum producta, valde convexa, 3-nervia, c. 0.9 cm. cum lobo basilari bene 1 cm. longa, 0.25 cm. lata. *Petala* e basi erecta patentissima, oblique lanceolata, obtusa, valde convexa, 3-nervia, c. 0.84 cm. longa, supra medium 0.26 cm. lata. *Labellum* longe calcaratum, lamina inferne dimidio inferiori gynostemii adnata, infundibuliformi-cucullata, 3-loba, subtus ventricosa, gynostemium bene superante et includente, intus inferne leviter transverse incrassata, supra basin 7-nervia, explanata e basi late cuneata transverse rhombea, c. 0.44 cm. longa, 0.58 cm. lata; lobi laterales incurvi, apice sese obtegentes, rotundato-trianguli; lobus intermedius multo minor, recurvulus, triangulus, obtusus, c. 0.06 cm. longus; calcar ovario adpressum, tenue, obtusum, bene 1 cm. longum. *Gynostemium* obtusangule curvatum, dimidio inferiore labello adnatum, apice obtusum subretusumque, c. 0.25 cm. longum, clinandrio concavo, integerrimo. *Anthera* cucullata, ovato-orbicularis, apice recurva retusaque, fere 0.125 cm. lata, connectivo leviter conico, postice sulcato. *Pollinia* 4, 2 obovoidea et 2 pyriformia. *Rostellum* porrectum, semiorbiculare, triangulo-excisum. *Stigma* semilunatum, margine inferiore valde producto et recurvo. *Ovarium* 6-sulcatum, parce minute punctatum, cum pedicello clavatum, c. 1.75 cm. longum.

Hab. Arfak Mts., Angi lakes, epiphytic in forest patch by ♀ lake, 7000'. Fl. Dec. 5661.

The nearest allies of this species are *G. fruticula* J. J. S. and *G. salmonea* J. J. S. It differs from the former by the smaller flowers, differently shaped petals, relatively broader lip, edentate clinandrium, and from the latter by the weaker stems, shorter spathe, somewhat smaller flowers, differently shaped petals, broader lip, edentate clinandrium.

The material seen consists of two stem-tips, with one flower and a flower-bud.

The colour of the flowers is described as terra-cotta.

CERATOSTYLIS (§ EUCERATOSTYLIS) ARFAKENSIS J. J. S. in Fedde Rep. xii. (1913), 394; in Nova Guinea, xii. (1915), 264, t. xcv. 162.

Arfak Mts., Angi lakes, epiphytic under *Araucaria Beccarii* Warb., by ♀ lake, 7000'. Fl. (white). Dec. 5721.

Distrib. New Guinea (D.N.W., Arfak Mts., Gjellerup).

CERATOSTYLIS (§ EUCERATOSTYLIS) ANGIENSIS J. J. S., sp. nov.

Caules approximati, teretes, c. 12·5–15 cm. longi, macerati 0·17 cm. diam., basi vaginis tubulosis superne acerescentibus sese amplectentibus siceo membranaceis laxo reticulato-venosis brunneis ad c. 2·25 cm. longis tecti. *Folium* erectum, subulato-teres, acutiusculum, antice leviter longitudinaliter costatum cum sulco tenuissimo, c. 2·7 cm. longum, maceratum c. 0·125 cm. diam.; vagina tubulosa, antice rumpens, c. 0·3 cm. longa. *Inflorescentia* fascicularis, pluriflora, squamata, pedunculis partialibus tenuibus, 1-floris, c. 0·3 cm. longis, basi vaginulam latam obtusam membranaceam c. 0·26 cm. longam gerentibus. *Bractea* ample cucullata, obtusa, ovario multo brevior, membranacea, c. 0·14 cm. longa. *Flores* parvi, bene 0·4 cm. longi, sepalis dorso parce pubescentibus. *Sepalum* dorsale oblongum, obtusum, 3-nerviium, c. 0·25 cm. longum, bene 0·1 cm. latum. *Sepala* lateralia lacinia oblique oblonga concava pedem gynostemii bene superante decurrentia, mentum reversum ovario parallelum oblongum apice subinflatum obtusum bene 0·1 cm. longum formentia, oblique oblonga, apice angustata, obtusa, 3-nervia, c. 0·24 cm. tota fere 0·4 cm. longa, 0·125 cm. lata. *Petala* oblique oblonga, acutiuscula, falcata, 1-nervia, c. 0·2 cm. longa, fere 0·07 cm. lata. *Labellum* cum pedi gynostemii angulum fere rectum faciens, gynostemio parallelum, ima basi ultra apicem pedis gynostemii obsolete productum, supra basin leviter recurvum, concavum, gynostemium bene superans, basi unguiculato-angustatum, $\frac{1}{2}$ parte superiore contractum carnosio-incrassatum et utrinque convexum, obtusum, parte mediana marginibus incurvum et ciliolatum, 3-nerviium, lineis 2 elevatis puberulis parallelis intus usque ad medium, explanatum c. 0·35 cm. longum, medio 0·14 cm. latum, apice incrassato bene 0·1 cm. longo, fere 0·1 cm. lato. *Gynostemium* ultra medium bifidum, c. 0·14 cm. longum, brachiis parallelis, oblongis, obtusis, extus convexis, intus concavis. *Anthera* cucullata, transverse suboblongo-elliptica, apice truncata, c. 0·06 cm. lata. *Pes* gynostemii reversus, cum ovario angulum acutum faciens, apice a sepalis lateralibus libero obtusangule incurvus, c. 0·1 cm. longus. *Ovarium* pubescens, c. 0·375 cm. longum.

Hab. Arfak Mts., Angi lakes, isolated forest patch by ♀ lake, epiphytic, 7000'. Dec. 5718.

A very inconspicuous species.

The colour of the flowers is white.

DENDROBIUM (§ CADETIA) SUBRADIATUM J. J. S. in Fedde Rep. xii. (1913) 27; in Nova Guinea, xii. (1915) 273, t. c. 171.

Arfak Mts., Angi lakes, terrestrial in forest by ♀ lake, 7000'. Dec. 5542 and 5908.

Distrib. New Guinea (D.N.W., Arfak Mts., *Gjellerup*).

DENDROBIUM (§ LATOURIA) RHOMBOGLOSSUM J. J. S. in Bull. Jard. Bot. Buit. 2^e sér. n. ii. (1911) 9; in Nova Guinea, xii. (1913) 44, t. xiii. 34.

Arfak Mts., Angi lakes, marsh by ♀ lake, terrestrial, abundant, 7000'. Dec. 5511.—Koebré ridge, between ♂ and ♀ lake, burnt open summit plateau, 9000'. Dec. 5609.

Distrib. New Guinea (D.N.W., Goliath Mts., *De Kock*).

“Plant up to 1 m., perianth segments magenta outside and white inside; abundant.”

DENDROBIUM (§ LATOURIA) CURVIMENTUM J. J. S., sp. nov.

Caules (1 adest) tenuiter clavati, c. 6-nodes (absque internodiis summis foliiferis brevissimis), c. 19.5 cm. longi, apice 3-folii, internodio maximo incrassato infra folia c. 6.3 cm. longo. *Folia* erecto-patentia, ovato-elliptico-lanceolata, apicem versus angustata, acuta, basi breviter contracta, sicco rigide coriacea, c. 5-6.7 cm. longa, 1.2-1.6 cm. lata. *Inflorescentiæ* e nodis summis inter folia, folia superantes, c. 15-floræ, pedunculo tenui, c. 5.2 cm. longo, vaginulis c. 4 tubulosis acutis donato, rhachide sicco angulata, c. 4 cm. longa. *Bracteæ* late triangulæ, acutæ, concavæ, c. 0.3 cm. longæ. *Flores* parvi, incurvi, carnosuli, glabri. *Sepalum* dorsale cum ovario angulum obtusum formans, oblongo-triangulum, dimidio superiore angustatum, obtusum, concavum, 5-nerviium, c. 0.54 cm. longum, bene 0.3 cm. latum. *Sepala* lateralialia ad pedem gynostemii decurrentia, mentum ovario parallelum valde incurvum breve crassum obtusum basi subconstrictum bene 0.3 cm. longum formantia, late oblique triangula, subobtusa, basi antice in laciniam brevem triangulam dilatata, margine superiore valde rotundata fere quadrangula, concava, 5-nervia, fere 0.5 cm. longa, basi 0.5 cm. lata. *Petala* oblique anguste oblonga, falcata, obtusa, basi leviter contracta, apice erosula, concava, 1-nervia, c. 0.46 cm. longa, 0.14 cm. lata. *Labellum* pedi gynostemii insertum, unguiculatum, 3-lobum, concavum, carnosum, subexplanatum c. 0.45 cm. longum, 0.6 cm., bene explanatum 0.65 cm. latum, ungue pedi gynostemii parallelo valde recurvo, canaliculato, fascia longitudinali bicostata ad basin laminae dilatata et in dentes 3 conicos exeunte instructo, dentibus lateralibus membrana angusta labello adnatis, callo rotundato verruculoso ante dentem intermedium, carinula transversa utrinque ad basin lobi intermedii, lamina transversa, c. 0.3 cm. longa; lobi laterales inexplanati porrecti, paralleli, gynostemium et lobum intermedium superantes, explanati lobum intermedium æquantés vel vix superantes, late oblique ovati, rotundati, concavi; lobus intermedius transversus, bipartitus, concavus, subtus convexus et crasse carinatus, carina infra sinum in apiculum crassum conicum exeunte, lobulis oblique triangulis, margine antico rotundatis, obtusis, explanatis divergentibus, explanatus c. 0.14 cm. longus, 0.325 cm. latus. *Gynostemium* a dorso compressum, in utraque stigmatis parte obtusangule dilatatum, absque anthera c. 0.175 cm. longum, clinandrio concavo, margine denticulato, filamentum incurvulo, oblongo, rotundato, auriculis paulo brevioribus, obtusis, leviter denticulatis. *Anthera* cucullata, transverse ovali-reniformis, basi rotundato-biloba, apice breviter rotundato-producta, c. 0.16 cm. lata. *Pollinia* 4, in corpusecula 2 oblique obovata supra convexa subtus plana unita, lateraliter compressa, interiora quam exteriora angustiora, c. 0.07 cm. longa. *Stigma* obverse triangulum, basi rotundatum, apice truncatum. *Pes* gynostemii cum ovario angulum acutum faciens, reversus, medio fere rectangule incurvus, oblongus, obtusus, valde excavato-concavus, inexplanatus c. 0.35 cm. longus. *Ovarium* valde incurvum, 6-sulcatum, c. 0.33 cm. longum; pedicellus 1.1 cm. longus.

Hab. Arfak Mts., Koebré ridge, forest, 8000-9000'. Fl. (green). Dec. 5647.

This *Dendrobium* belongs to the small-flowered species of the section *Latouria*. The shape of the labellum calls to mind that of *D. dendrocolloides* J. J. S. and *D. latifrons* J. J. S., but the habit is very different.

DENDROBIUM (§ TRACHYRHIZUM) LATIFRONS J. J. S., sp. nov.

Rhizoma breve, vaginis brevibus tubulosis sese amplectentibus omnino obtectum, radicibus dense verrucosis. *Caules* simplices, elongati, superne flexuosi, c. 47 cm. longi, internodiis c. 3·7–1·3 cm. longis. *Folia* patentia, oblonga, oblique bidentata, dentibus acutiusculis, costa media supra sulcata subtus prominente, marginibus in sicco recurvis, sicco tenuiter coriacea, ad c. 5·5 cm. longa, 1·8 cm. lata, superiora et inferiora decrescentia; vaginæ tubulosæ, apice truncatæ, internodiis breviores. *Inflorescentiæ* in caulibus foliatis axillares, vaginam dorso ad basin perforantes, arcuatæ, laxæ 3–5-floræ, pedunculo cauli adpresso, c. 3–4 cm. longo, nonnullis vaginulis tubulosis ad basin, rhachide c. 1·5–2 cm. longa. *Bracteæ* adpressæ, triangulæ, concavæ, c. 0·3 cm. longæ. *Flores* quaquaversi. *Sepalum* dorsale late triangulum, marginibus curvatum et base utrinque angulatum, obtusum, concavum, 7-nervium, c. 0·8 cm. longum et latum. *Sepala* lateralia cum pede gynostemii mentum obtusum formantia, antice omnino libera, late oblique triangula, obtusa, breviter crasse obtusa apiculata, margine postico basi angulata, 7-nervia, costa media dorso obtuse prominente, c. 0·95 cm. longa, basi 1·15 cm. lata. *Petala* oblique subovalia, basi lata, breviter obtusiuscule triangulo-acuminata, concava, minutissime erosulo-ciliolata, basi 3-nervia, c. 0·77 cm. longa, 0·53 cm. lata. *Labellum* ungue brevi lato 5-nervio pedi gynostemii insertum, 3-lobum, curvatum, subtus supra basin concavum cum nervis 5 obtuse prominentibus, intus fascia latissima longitudinali carnosio-incrassata subquinquecostata cum costis 3 medianis alte elevatis basi in appendicem reversam rotundato-trapeziformem obsolete retusam concavam carnosam unguem æquantem, c. 0·2 cm. longam, 0·35 cm. latam, producta in basi lobi intermedi in lamellam transversam porrectam excavationem anticam obtegentem verrucosam antice dentes c. 5 porrectis irregulariter conicis gerentem utrinque nonnullas costulas transversas emittentem terminante, intus papillosum, explanatum c. 1·13 cm., usque ad apicem loborum lateraliurn 0·93 cm. longum, ad lobos laterales c. 1·43 cm. latum, ungue c. 0·2 cm. longo; lobi laterales erecti, patentes, oblique ovati, rotundati, basi lati, concavi, margine postico manifeste incurvi; lobeus intermedius latissimus, concavus, 2-lobus, medio plica supra concava subtus convexa et in sinu dente brevi triangulo donatus, lobis transverse oblique rotundato-quadrangulis, apice truncatis, irregulariter crenatis, angulum anteriorem versus repandulis, explanatus c. 0·43 cm. longus, 1·3 cm. latus. *Gynostemium* (fœcundatum) bene 0·3 cm. longum, apice porrecto utrinque dente donato, auriculis triangulis. *Pes* gynostemii cum ovario angulum obtusum fere rectum formans, late oblongus, intus pubescens, basi dorso convexus, apice altius excavatus et dorso rotundato-gibbosus, c. 0·7 cm. longus. *Ovarium* (fœcundatum) obconicum, 6-sulcatum, c. 0·4 cm. longum; pedicellus c. 1·3 cm. longus.

Hab. Arfak Mts., Angi lakes, terrestrial in marsh by ♀ lake, 7000'. Dec. 5558.

This species is nearly allied to *D. appendiculoides* J. J. S., from which it differs, so far as the single specimens allow comparison, by its more robust

stems, less flowered racemes with the peduncle pressed against the stem, broader petals, the lip with different-shaped keels, shorter, blunter, not falcate lateral lobes, a shorter and much broader mid-lobe and a broader basal appendix, whereas the column-foot is much less excavated. Moreover, the plant was collected in a much higher altitude above the sea.

The species recalls *D. prosteriglossum* Schltr. var. *obtusilobum* Schltr. to mind; it is possible that the two plants will prove to be identical.

The flowers are described as yellow.

DENDROBIUM (§ OXYGLOSSUM) TRIFOLIUM J. J. S., sp. nov.

Caules approximati, c. 4–5 cm. longi, inferne vaginis mox fatiscentibus, apice c. 3-foliati. *Folia* erecto-patentia, lanceolata, oblique obtusa, breviter apiculata, omnino sed præsertim apice minutissime denticulata, costa media subtus prominente, sicco rigide coriacea, c. 2.6–4 cm. longa, 0.67–0.83 cm. lata; vaginæ inferne tubulosæ, superne canaliculato-conduplicatæ. *Inflorescentia* pseudoterminalis, brevissima, c. 3-flora. *Bracteæ* rachidem amplectentes, late triangulæ, acute acuminatæ, ad c. 0.7 cm. longæ. *Flores* erecti, majusculi, c. 3.1 cm. longi, sepalis sicco dorso parce nigro-punctatis. *Sepalum* dorsale ellipticum, obtusum, apice minutissime denticulatum, 5-nerviun, c. 1.25 cm. longum, 0.65 cm. latum. *Sepala* lateralia lacinia elongata partim anguste lineari ad pedem gynostemii decurrentia, mentum rectum ovario adpressum c. 1.7 cm. longum, superne marginibus anticis longitudine c. 0.6 cm. connatis anguste calcariforme apice retusum formantia, parte anteriore oblique triangulum, marginibus curvatis, subacuta, acute apiculata, apice minutissime denticulata, 7-nervia, costa media dorso prominente, c. 1.2 cm. longa, basi 2 cm. margine antico 2.9 cm. metientia. *Petala* spatulato-rhombea, vix acuminata, acuta, superne papilloso-ciliolata, 3-nervia, c. 1.23 cm. longa, 0.57 cm. lata. *Labellum* pedi gynostemio et gynostemio parallelum et adpressum, pedi gynostemii longitudine c. 0.95 cm. adnatum, gynostemium superans, anguste lineare, apicem versus dilatatum, apice 3-lobum, concavum, infra apicem subventricosum, ecallosum, inferne 3-, superne 7-nerviun, explanatum c. 2.6 cm. longum, ad lobos laterales fere 0.4 cm., basi partis liberæ 0.175 cm. latum; lobi laterales breves, rotundati, papilloso; lobus intermedius revolutus, triangulus, acutus, papilloso-ciliolatus, c. 0.25 cm. longus, basi 0.16 cm. latus. *Gynostemium* a dorso compressum, in utraque stigmatis parte obtusangulum, absque anthera c. 0.2 cm. longum, clinandrio in utraque filamenti parte lacinulato, filamento subulato, incurvo. *Anthera* cucullata, antice visa quinquangularis, apicem versus angustata, truncata et parte superiore adpresse puberula, basi 2-loba, e. 0.2 cm. lata. *Pollinia* 4, in corpuscula 2 oblique obovata supra convexa subtus concava unita, oblique oblonga, 2 interiora quam exteriora paulo angustiora. *Stigma* suborbiculare. *Pes* gynostemii linearis, canaliculatus c. 1.7 cm. longus. *Ovarium* pedicellatum clavatum, superne 3-alatum et 3-costatum, ala superiore quam ceteræ longiore et in dentem liberum triangulum producta, sparsa nigro-punctatum, c. 3 cm. longum.

Hab. Arfak Mts., Angi lakes, on bank by ♀ lake. 7000', terrestrial. Dec. 5907.

This species, the flowers of which agree in colour with *D. pentacteron*

Schltr., differs from the latter in the larger flowers, a blunt dorsal sepal, differently shaped petals and lip, lacinulate clinandrium, not 5-winged ovary.

The flowers are described as dull yellow, with a red tip to the labellum.

DENDROBIUM AGATHODÆMONIS J. J. S. in Bull. Dép. Agr. Ind. Néerl. n. xxxix. (1910) 7; etc.

Arfak Mts., ridge running up to Angi lakes, terrestrial in open gravel spaces, 8000'. Dec. 5530 and 5596.

Distrib. New Guinea (D.N.W., Cyclops Mts., *Gjellerup*; D.S.W., Agathodämonsberg, *von Roemer*, Hellwig Mts., *van Nouhuys*).

Perhaps it would be better to keep the typical *D. agathodæmonis* apart as a species and not to unite with it the different forms I successively added. However, these forms are, in the material at hand, almost all represented by single specimens, and therefore it is very difficult to make a decision.

The flowers of the Arfak specimens are described as magenta.

DENDROBIUM (§ CALYPTROCHILUS) PAPUANUM J. J. S., sp. nov.

Caules approximati, elongati, superne flexuosi, sicco inferne teretes superne alte sulcati, c. 46 cm. longi, internodiis ad c. 2.6 cm. longis. *Folia* basi semitorta, ovato-lanceolata, longe acuminata, acutissima, longe mucronata, acumine denticulata, costa media subtus prominente, sicco rigidiuscula, c. 6-7.5 cm. longa, 1.2-1.9 cm. lata; vaginæ tubulosæ, internodia paulum superantes, minute verrucosæ, novellæ sicco fusce punctatæ. *Inflorescentiæ* ad nodos caulium defoliorum, abbreviatæ, c. 4-floræ, pedunculo nonnullis vaginulis brevibus tubulosis tecto. *Bractæa* valde approximata, patentes, ovato-triangulæ, acute acuminatæ, concavæ, sicco c. 0.85 cm. longæ. *Flores* parvi, macerati c. 1.4 cm. longi. *Sepalum* dorsale subovale, apice brevissime productum, obtusum, valde concavum, 3-nerviium, c. 0.65 cm. longum, 0.4 cm. latum. *Sepala* lateralia lacinia oblique triangula ad pedem gynostemii decurrentia, marginibus anticis longitudine c. 0.65 cm. connata, mentum magnum conicum ovario parallelum suberectum anguste obtusum c. 0.9 cm. longum formantia, parte libera oblique ovato-triangula, præsertim margine postico valde curvata, obtusa, apiculata, concava, c. 4-nervia, c. 0.625 cm. longa, margine antico c. 1.35 cm., basi 1 cm. metientia. *Petala* oblique subelliptico-oblonga, subulato-apiculata, concava, superne erosula, 3-nervia, c. 0.65 cm. longa, 0.27 cm. lata. *Labellum* gynostemium æquans, basi gynostemii longitudine c. 0.4 cm. adnatum, concavum, apice cucullatum, cæulosum, c. 5-nerviium, nervis exterioribus ramosis, cucullo plicato margine apicali truncato dense et breviter subulato-lacinulato, explanatum cuneatum, late obverse rhombeum, fere 1.1 cm. longum, 0.84 cm. latum, ab apice cuculli usque ad marginem apicalem c. 0.37 cm. metiens. *Gynostemium* recurvulum, a dorso compressum, apicem versus dilatatum, in utraque stigmati parte obtusangule dilatatum, c. 0.26 cm. longum, filamento curvulo, lineari, obtuso, dorso convexo, auriculis magnis, quadrangulis, obtusissimis, dimidio superiore apice leviter productis et denticulatis, dimidio inferiore rotundatis. *Anthera* cucullata, ambitu transverse subquadrangula, leviter 6-angulata, basi biloba, apice producta, truncata et papillosa, c. 0.225 cm. lata. *Pollinia* 4, oblonga, in corpuscula 2 oblique subovalia supra convexa subtus concava conglutinata. *Pes* gynostemii linearis, canaliculatus,

c. 0.9 cm. longus. *Ovarium* pedicellatum clavatum, minutissime furfuraceo-puncticulatum, c. 1.25 cm. longum.

Hab. Arfak Mts., Angi lakes, epiphytic in forest patch by ♀ lake, 7000'. Dec. 5712.

Amongst the small-flowered purple or pink coloured species of the section *Calyptrochilus* this one differs from *D. roseum* Schltr. in its long acuminate leaves, smaller flowers, and much broader lip without callus.

The flowers are pink.

DENDROBIUM (§ CALYPTROCHILUS) INFRACTUM J. J. S. in Fedde Rep. xii. (1913) 118 ; in Nova Guinea, xii. 340, t. cxxiii. 225.

Arfak Mts., Koebré ridge between ♂ and ♀ lake, terrestrial on burnt open summit plateau, 9000'. Fl. Dec. 5655.

Distrib. New Guinea (D.N.W., Arfak Mts., *Gjellerup*).

DENDROBIUM (§ CALYPTROCHILUS) RIPARIUM J. J. S. in Fedde Rep. xii. (1913) 117 ; in Nova Guinea, xii. 343, t. cxxiv. 227.

Arfak Mts., Angi lakes, forest patch by ♀ lake, epiphytic in forest, 7000'. Fl. Dec. 5896.

Distrib. New Guinea (D.N.W., Arfak Mts., *Gjellerup*).

DENDROBIUM (§ CALYPTROCHILUS) FRUTICICOLA J. J. S. in Fedde Rep. xii. (1913) 116 ; in Nova Guinea, xii. t. cxxv. 229.

Arfak Mts., Angi lakes, terrestrial in open marsh by ♀ lake, growing in patches, abundant, 7000'. Fl. Dec. 5510.—Forest patch by ♀ lake, 7000'. Fl. (orange). Dec. 5553.—Koebré ridge between ♂ and ♀ lake, terrestrial on open burnt summit plateau, 9000'. Dec. 5608.

Distrib. New Guinea (D.N.W., Arfak Mts., *Gjellerup*).

The flowers show the same slight differences as in the original specimens.

DENDROBIUM (§ CALYPTROCHILUS) PARVIFOLIUM J. J. S., sp. nov.

Planta parva (?). *Caulis* ramosus, valde flexuosus, sicco longitudinaliter alte sulcatus, pars adest 13.5 cm. longus, internodiis c. 0.6–0.3 cm. longis. *Folia* parva, patentissima, oblongo-ovata, apicem versus angustata, breviter acuta, apiculata, praesertim superne erosula, costa media sicco supra sulcata subtus cum nervis sequentibus prominente, rigida, sicco ad c. 1.1 cm. longa, fere 0.4 cm. lata; vaginae tubulosae, verruculosae, internodia aequantes. *Inflorescentiae* (1 adest) in flexibus caulium foliatorum, brevissimae, 1-florae, pedunculo abbreviato, nonnullis vaginulis tubulosis verruculosis obtecto. *Bractea* cucullata, apiculata, c. 0.35 cm. longa. *Flos* c. 1.8 cm. longus. *Sepalum* dorsale ovatum, apicem versus angustatum, anguste obtusum, breviter obtuse apiculatum, basi latum, concavum, 5-nerviium, c. 0.75 cm. longum, 0.4 cm. latum. *Sepala* lateralia lacinia falcatulo-trianguia ad pedem gynostemii decurrentia, margine antico inferne longitudine c. 0.45 cm. connata, mentum conicum leviter curvatum obtusum ovario subparallelum c. 1.25 cm. longum formantia, oblique triangula, obtusa, apice dorso leviter incrassata, c. 6-nervia, c. 0.75 cm. longa, basi 1.4 cm. lata. *Petala* lanceolata, dimidio superiore sensim angustata et erosula, obtusa, 2-nervia, c. 0.7 cm. longa, 0.225 cm. lata. *Labellum*

pedi gynostemii et gynostemio parallelum, in $\frac{2}{3}$ partibus supra basin obtusangule recurvum, gynostemium superans, inferne c. 0·9 cm. pedi gynostemii adnatum, spathulatum, valde concavum apice subrectangule cucullato-incurvum, margine apicali truncatum et breviter serrato-fimbriatum, ecallosum, 5-nerviium, c. 1·4 cm. longum, explanatum 1·525 cm. longum, lamina (parte libera) obverse rhombea, cucullo obtusa, c. 0·85 cm. longa, 0·84 cm. lata, ab apice cuculli usque ad marginem apicalem fere 0·4 cm. longa. *Gynostemium* latum, in utraque stigmatis parte obtusangule dilatatum, absque anthera c. 0·275 cm. longum, clinandrio transverso, concavo, filamento subulato, incurvo, auriculas paulo superante, auriculis latis, in dentem triangulum subfalcatulum acutum margine superiore irregulariter marginatum productis. *Anthera* cucullata, ambitu quadrangula, apice truncata et margine lato puberula, basi biloba, c. 0·2 cm. lata. *Pollinia* 4, in corpuscula 2 obovata supra convexa subtus concava unita, interiora quam exteriora minor. *Stigma* suborbiculare. *Pes* gynostemii ovario parallelus, leviter curvatus, linearis, canaliculatus, apice excavatione longitudinali præditus, c. 1·25 cm. longus. *Ovarium* pedicellatum subclavatum, c. 2·1 cm. longum.

Hab. Arfak Mts., Angi lakes, forest patch by ♀ lake, and on ridge above, epiphytic in forest, 7000–8000'. Fl. Dec. 5547.

The flower recalls very much that of *D. angiense* J. J. S., but the habit of the plant is very different. I do not know whether the plant is indeed a small one or that only the end of a stem was collected.

The colour of the flower is described as red.

DENDROBIUM (§ CALYPTROCHILUS) ANGIENSE J. J. S. in Fedde Rep. xii. (1913) 116 ; in Nova Guinea, xii. 346, t. cxxvi. 230.

Arfak Mts., ridge running up to Angi lakes, open spaces on ridge, terrestrial, 7000–8000'. Fl. Dec. 5528.

Distrib. New Guinea (D.N.W., Arfak Mts., *Gjellerup*).

DENDROBIUM (§ CALYPTROCHILUS) GLAUCOVIRIDE J. J. S. in Fedde Rep. xii. (1913) 119 ; in Nova Guinea, xii. 350, t. cxxviii. 234.

Arfak Mts., Angi lakes, epiphytic in mossy forest slopes to ♀ lake, 7500'. Fl. Dec. 5506.—Ridge running up to Angi lakes, epiphytic in forest, 8000'. Fl. Dec. 5998.

Distrib. New Guinea (D.N.W., Arfak Mts., *Gjellerup*).

Flowers purple-magenta.

BULBOPHYLLUM (§ CÆLOCHILUS) ARFAKENSE J. J. S., sp. nov.

Rhizoma repens, radicans, vaginatum. *Pseudobulbi* c. 0·6–1 cm. distantes, cum rhizomate angulum acutum facientes, verisimiliter ovoidei, sicco 1–8 cm. longi, 1-folii. *Folium* erectum, petiolatum, anguste lanceolatum, acutiusculum, basi sensim in petiolum angustatum, costa media sicco supra sulcata subtus prominente, coriaceum, c. 8–10 cm. longum, 1·3 cm. latum; petiolus canaliculatus, c. 1·3–2 cm. longus. *Inflorescentiæ* 1-floræ, pedunculo tenui, c. 2·2 cm. longo, basi nonnullis vaginulis tubulosis acutis carinatis donato. *Bractea* tubulosa, acuminata, acuta, bene 0·6 cm. longa. *Flos* majusculus. *Sepalum* dorsale lineari-lanceolatum, concavum, apice marginibus incurvis brevissime acuminatum, 3-nerviium, fere 2·2 cm. longum, 0·4 cm.

latum. *Sepala* lateralia oblique lanceolata, brevissime acuminata, margine anteriore anguste incurva, 3-nervia, c. 2.1 cm. longa, 0.55 cm. lata. *Petala* parva, gynostemio adpressa, oblique lanceolato-triangulari, sensim acuminata, subfalcata, apice recurva et convexa, 1-nervia, c. 0.375 cm. longa, bene 0.1 cm. lata. *Labellum* immobile, subrectum, leviter sigmoidium, spatulato-lanceolatum, totum c. 1.45 cm. longum, ungue lineari-oblongo, basi lobulis 2 erectis obtusis postice transverse conjunctis excavato-concavo, basi postice excavato, c. 0.35 cm. longo, subtus longitudinaliter sulcato, marginibus sulci in lamina in costas parallelas longitudinales aliformes tenues superne evanescentes exeuntibus, lamina anguste elliptica, obtusa, valde convexa, papillosa. *Gynostemium* subgracile, curvatum, c. 0.44 cm. longum, ad basin stigmatum infra medium gynostemii callo triangulo lateraliter compresso donatum, apice (filamento) recurvo, cum gynostemio angulum obtusum faciente, triangulo, acuto, concavo, clinandrio concavo, lateribus dilatatis oblique quadrangulis dentatis. *Anthera* cucullata, connectivo longitudinaliter incrassata. *Stigma* longitudinale. *Pes* gynostemii brevis, in callum transversum carnosum obtusissimum in excavationem basilarem labelli quadrans incrassatus, subtus infra callum in partem incurvam anguste oblongam concavam labellum gerentem productus, totus c. 0.13 cm. longus. *Ovarium* curvulum, 6-sulcatum, c. 0.43 cm. longum; pedicellus tenuis, c. 0.35 cm. supra basin articulatus, c. 2 cm. longus.

Hab. Arfak Mts., Angi lakes, epiphytic in forest patch by ♀ lake. Dec. 5663.

This plant differs from *B. concolor* J. J. S., probably its nearest ally, by its longer leaves, shorter peduncle, larger, differently coloured flowers, and differently shaped petals.

The sepals are described as brown, the lip shading to yellow.

BULBOPHYLLUM (§ POLYBLEPHARON) BIRUGATUM J. J. S., sp. nov.

Rhizoma elongatum, probabiliter dependens, ramosum, vaginis tubulosis acutis vel acute acuminatis dorso carinatis ad c. 0.6 cm. longis diu persistentibus fere omnino obtectum. *Pseudobulbi* parvi, spiraliter dispositi, c. 1.5 cm. distantes, $\frac{2}{3}$ partibus inferioribus rhizomati adnati, toti c. 0.3–0.35 cm. longi (sicco), parte libera rhizomati adpressa, bene semitereti, truncata, c. 0.1 cm. longa, 1-folia. *Folium* lanceolatum, brevissime acutatum, conico-apiculatum, basi brevissime contractum et conduplicatum, costa media supra sulcata, carnosum, maceratum c. 2 cm. longum, 0.5 cm. latum. *Inflorescentiæ* numerosæ, ad nodos rhizomatis fasciulatæ, brevissimæ, 1-floræ, pedunculo c. 0.1 cm. longo, vaginula tubulosa ad basin. *Bractea* oblique cucullata, dorso ad apicem carinata, ovario brevior, c. 0.07 cm. longa. *Flos* parvus, maceratus c. 0.36 cm. longus, sepalis conniventibus, apice recurvulis. *Sepalum* dorsale horizontale, oblongum, obtusum, breviter obtuse conico-apiculatum, concavum, superne vix erosulum, 3-nerviium, c. 0.37 cm. longum, 0.15 cm. latum. *Sepala* lateralia porrecta, cum pede gynostemii mentum subrectangulum cum ovario angulum obtusum faciens obtusum postice c. 0.13 cm. longum formantia, margine proximo ultra medium conglutinata, oblique triangulari, falcata, margine exteriori rotundata, obtusa, breviter obtuse conico-apiculata, concava, 3-nervia, tota c. 0.35 cm. longa, 0.17 cm. lata. *Petala* gynostemio adpressa, parallela, oblique oblonga, superne denticulata, longe subulato-acuminata, 1-nervia, c. 0.3 cm. longa, 0.1 cm. lata,

acumine 0·1 cm. longo. *Labellum* membrana tenui 3-nervia pedi gynostemii insertum, mobile, erectum, sigmoideum, e basi contracta dentibus brevibus reversis falcato-triangulari et intus callo erecto quadrato ornata dilatatum, fascia mediana longitudinali convexo-incrassatum et subtus convexum, lateribus supra convexum subtus concavum, 3-nerviis, $\frac{1}{3}$ parte superiore recurva et utrinque plica parva sed distincta supra convexa a parte inferiore separata, itaque subtrilobum, medio utrinque minute ciliolatum, inexplatum c. 0·15 cm. longum, explanatum spatulato-obovatum, c. 0·17 cm. longum, 0·075 cm. latum, lobo intermedio rotundato, semi-orbiculari, convexo, subtus concavo, carnosulo, eciliato, c. 0·05 cm. longo, 0·075 cm. lato. *Gynostemium* cum ovario angulum obtusum faciens, curvatum, totum c. 0·12 cm. longum, clinandrio concavo, filamento elongato, subulato, auriculis filamentum bene superantibus, subulatis, falcato-incurvis, margine inferiore lobulo subobsoleto obtuso munitis. *Anthera* cucullata, semiglobosa, apice producta incurva truncata, connectivo gibboso-incrassato papilloso, c. 0·05 cm. alta. *Pollinia* in corpusculum semiglobosum unita. *Rostellum* triangulum, obtusum. *Stigma* magnum, fere totam faciem inferiorem gynostemii occupans, profunde excavatum, obovato-triangulum. *Pes* gynostemii cum ovario angulum obtusum faciens, subrectus, basi dorso convexus, apice vix recurvulus, oblongus, obtusus, canaliculatus, crassiusculus. *Ovarium* 6-sulcatum, c. 0·075 cm. longum.

Arfak Mts., Angi lakes, forest patch by ♀ lake, epiphyte in forest, 7000'. Fl. Dec. 5662.

Differs from *B. myrtilus* Schltr., probably its nearest ally, by the mentum, the broader slightly three-lobed lip biauricled at the base and only ciliolate in the middle beneath the semi-orbicular mid-lobe, and the papillate connective.

The flowers are described as yellow; in the dried plant the petals are distinctly red.

BULBOPHYLLUM (§ MONOSEPALUM) MURICATUM J. J. S. in Bull. Dép. Agr. Ind. Néerl. n. xlv. (1911) 9; in Nova Guinea, viii. (1911) t. C, B; xii. 374.—*Monosepalum muricatum* Schltr. Orch. D. Neu-Guinea, (1912) 682.

Arfak Mts., ridge running up to Angi lakes, terrestrial in mossy forest, 8000'. Fl. Dec. 5997.

Distrib. N.E. New Guinea.

Flowers yellow with red spots.

BULBOPHYLLUM (§ NEMATORHIZIS) OVALITEPALUM J. J. S., sp. nov.

Rhizoma elongatum, repens, filiforme, longinode, ad nodos plerumque 1-subpseudobulbis paucis radices emittens, pars adest 25 cm. longa, internodiis c. 0·5–1 cm. longis, vaginis tubulosis, quam internodia multo brevioribus. *Pseudobulbi* c. 1·5–3·2 cm. distantes, erecti, oblique ovoidei, sicco valde rugosi, c. 0·5–0·65 cm. longi, 1-folii. *Folium* erectum, breviter petiolatum, oblongum ad ligulatum, obtusum, apice leviter inæqualiter vel subæqualiter breviter obtuse bilobulatum, basi acutum, costa media subtus prominente, c. 1·5–3·1 cm. longa, sicco 0·45–0·55 cm. lata; petiolus canaliculatus, c. 0·1–0·2 cm. longus. *Inflorescentiæ* ad basin pseudobulborum et ad

nodos rhizomatis solitariae, pedunculo 1-floro filiformi, c. 1.3 cm. longo, inferne c. 2-vaginulis tubulosis superne leviter ampliatis obtusis c. 0.125 cm. longis donato. *Bractea* brevis, cupuliformis, obtusa, c. 0.08 cm. longa. *Flos* parvus. *Sepalum* dorsale ovatum, obtusum, concavum, 3-nerviium, c. 0.34 cm. longum, 0.225 cm. latum. *Sepala* lateralia oblique ovalia, obtusissima, breviter obtuse apiculata, 3-nervia, c. 0.35 cm. longa, 0.22 cm. lata. *Petala* vix obovato-ovalia, obtusissima, 3-nervia. *Labellum* mobile, curvum, carnosum, ambitu subquadrangulo-ovale, basi truncatum, apice rotundatum, dimidio inferiore excavato-concavum cum marginibus erectis, antice convexum, glabrum, c. 0.2 cm. longum, 0.12 cm. latum. *Gynostemium* breve, apice obtuso, auriculis brevibus. *Anthera* cucullata, explanata reniformis, obtusa, c. 0.075 cm. lata. *Pollinia* 4, lateraliter compressa, a latere visa obovata, exteriora extus convexa, interiora manifeste tenuiora. *Stigma* majusculum, transversum. *Pes gynostemii* cum ovario angulum obtusum faciens, quadrangulus, apicem versus paulo angustatus, truncatus, c. 0.075 cm. longus et fere æquilatus. *Ovarium* 6-sulcatum, parce punctatum, c. 0.25 cm. longum; pedicellus tenuis, supra basin articulatus, c. 0.45 cm. longus.

Hab. Arfak Mts., Angi lakes, forest patch by ♀ lake, epiphytic in forest, 7000'. Dec. 5683.

This seems to be the first known species of the section *Nematorhizis* from the Arfak Mts.

The column was not in a very good state, hence the description of it wants completion.

The flowers are green.

BULBOPHYLLUM (§ PELTOPUS) OCTARRHENIPETALUM J. J. S. in Fedde Rep. xii. (1913) 400; in Nova Guinea, xii. 400, t. cxlviii. 277.

Angi lakes, forest patch by ♀ lake, epiphytic, 7000'. Fl. (white). Dec. 5504.

Distrib. New Guinea (D.N.W., Arfak Mts., *Gjellerup*).

BULBOPHYLLUM (§ DIALEIPANTHE) PRISTIS J. J. S. in Fedde Rep. xii. (1913) 399; in Nova Guinea, xii. 419, t. clviii. 296.

Arfak Mts., Angi lakes, slopes by "campong," ♀ lake, terrestrial in forest, 7500'. Dec. 5638.

Distrib. New Guinea (D.N.W., Arfak Mts., *Gjellerup*).

Only an inflorescence.

BULBOPHYLLUM (§ HYALOSEMA) TRICANALIFERUM J. J. S. in Fedde Rep. xii. (1913) 398; in Nova Guinea, xii. 426, t. clx. 302.

Arfak Mts., Angi lakes, epiphytic in forest patch by ♀ lake, 7000'. Dec. 5548.

Distrib. New Guinea (D.N.W., Arfak Mts., Angi lakes, *Gjellerup*).

Flowers yellow with brown spots.

PHREATIA (§ BULBOPHREATIA) SPATHULATA J. J. S., sp. nov.

Pusilla. *Rhizoma* elongatum, repens, ramosum, radicans, vaginis tubulosis tectum. *Pseudobulbi* parvi, remoti, omnino vaginis obteeti, 2-folii. *Folia* erecta, inaequimagna, lanceolato-spathulata, obtusa, retusa, apiculata, sicco ad c. 2·3 cm. longa, 0·35 cm. lata. *Inflorescentia* folia bene superans, laxe c. 13-flora, pedunculo tenui, c. 4·5 cm. longo, vaginulis c. 6-tubulosis apiculatis inferne magis approximatis ad c. 0·35 cm. longis donato, rhachide tenui, c. 3 cm. longa. *Bractea* ovato-triangularæ, acuminatæ, acutissimæ, ad c. 0·225 cm. longæ. *Flores* parvi. *Sepalum* dorsale ovatum, obtusum, concavum, 1-nervium, c. 0·2 cm. longum, 0·14 cm. latum. *Sepala* lateralia divergentia, late oblique ovata, acuta, oblique concava, 1-nervia, c. 0·2 cm. tota 0·25 cm. longa, 0·2 cm. lata. *Petala* oblique ovata, subacuta, concava, 1-nervia, c. 0·16 cm. longa, 0·1 cm. lata. *Labellum* leviter sigmoideum, unguiculatum, concavum, explanatum c. 0·14 cm. longum, ungue quadrangulo, basi utrinque in lobulum parvum rotundatum dilatato, probabiliter 2-glanduloso, c. 0·07 cm. longo, basi 0·06 cm. lato, abrupte in laminam dilatato, lamina semilunato-reniformi, apice latissime rotundata, medio leviter retusa cum lobulo distincto obtuso in sinu, lobis lateralibus obtusa, incrassationibus 2 convexis intus ad basin, intus papillosa, c. 0·06 cm. longa, 0·175 cm. lata. *Gynostemium* breve, cum ovario angulum obtusum faciens, dorso convexum, papillosum, absque anthera c. 0·075 cm. longum, clinandrio alte excavato. *Rostellum* latum. *Stigma* transversum, margine elevatum. *Pes* gynostemii reversus, c. 0·1 cm. longus, basi ovario adpressus et intus convexus, parte superiore incurva, quam partem inferiorem angustiore, truncata. *Ovarium* cum pedicello trigono torto clavatum, c. 0·35 cm. longum.

Hab. Arfak Mts., ridge running up to Angi lakes, epiphytic in forest, 8000'. Dec. 6004.

A small plant remarkable for the two convex thickenings at the base of the blade of the lip.

Flowers white.

PHREATIA (§ RHIZOPHYLLUM) DENSISSIMA J. J. S. in Fedde Rep. xii. (1913) 26; in Nova Guinea, xii. 438, t. clviii. 314.

Arfak Mts., Angi lakes, epiphytic in forest patch by ♀ lake, 7000'. Fl. (green). Dec. 5550.

Distrib. New Guinea (D.N.W., Arfak Mts., *Gjellerup*).

OCTARRHENA CYLINDRICA J. J. S., sp. nov.

Caules approximati, compressi, simplices, basi valde radicales, c. 5·5 cm. longi, cum vaginis c. 0·375–0·4 cm. lati, internodiis c. 0·5–0·7 cm. longis. *Folia* equitantia, erecto-patentia, articulata, lateraliter compressa, linearia, interdum falcata, acuta, basi valde obliqua, dorso c. 2–3·5 cm. longa, medio 0·275–0·35 cm. lata; vaginæ sese amplectentes, tubulosæ, lateraliter compressæ, antice alte fissæ, apice valde obliquæ, internodia superantes. *Inflorescentiæ* axillares, erectæ, dense multifloræ, cylindricæ, pedunculo tenui, c. 1·75–2 cm. longo, inferne nonnullis vaginulis tubulosis longe acuminatis, superne numerosis vaginulis bracteiformibus donato, rachide angulata, c. 2·4–2·8 cm. longa. *Bractea* e basi lata longe lineari-acuminatæ, concavæ, irregulariter marginatæ, c. 0·14 cm. longæ. *Flores* vagi, minimi c. 0·17 cm. longi.

Sepalum dorsale erectum, triangulum, obtusiusculum, convexum, c. 0·06 cm. longum et latum. *Sepala* lateralia oblique ovato-triangula, apice interdum plus minusve contracta, anguste obtusa, c. 0·075 cm. longa, 0·07–0·075 cm. lata. *Petala* divergentia, anguste oblique triangula, subfalcata, acuta, convexa, 1-nervia, c. 0·07 cm. longa. *Labellum* simplex, decurvum cum ovario angulum obtusum faciens, medio fere obtusangule incurvum, subsigmoideum, manifeste concavum, 1-nervium, basi medio tantum affixum, callis 2 longitudinalibus parallelis approximatis oblongis in $\frac{2}{3}$ partibus inferioribus labelli, explanatum ovato-oblongum, anguste obtusum, c. 0·1 cm. longum, fere 0·05 cm. latum. *Gynostemium* cum anthera c. 0·06 cm. longum, clinandrio cum dorso gynostemii angulum rectum faciente, concavo. *Anthera* cucullata, ovato-triangula, basi leviter emarginata, apice anguste truncata, c. 0·04 cm. longa. *Pollinia* 8, clavato-pyriformia. *Rostellum* productum. *Stigma* transversum. *Ovarium* obconicum, cum pedicello angulum obtusum faciens, c. 0·06 cm. longum; pedicellus crassus, tortus, c. 0·06 cm. longus.

Hab. Arfak Mts., ridge running up to Angi lakes, epiphytic in forest, 8000'. Dec. 5993.

From the other species this one is readily distinguished by its moderately dense and broad leaves and dense spikes.

The flowers are said to be yellow.

Var. MAJOR J. J. S., var. nov.

Caules elongati, inferne defoliati cum radicibus adpressis, ad c. 21 cm. longi. *Folia* 2·4–3 cm. longa, 0·37–0·475 cm. lata. *Pedunculus* c. 2·25–25 cm. longus; rhachis 4–5 cm. longa. *Flores* majores. *Sepalum* dorsale c. 0·1 cm. longum, 0·075 cm. latum, lateralia 0·12 cm. longa, 0·8 cm. lata.

Hab. Arfak Mts., Angi lakes, mossy slopes by ♀ lake, 7000–8000'. Fl. Dec. 5536.

This differs from the type-specimen only by its longer stems and larger, differently coloured flowers.

The flowers are white.

In the dried specimens the flowers of the type as well as those of the variety are greenish with a large white anther.

DICOTYLEDONEÆ.

PIPERACEÆ. (C. DE CANDOLLE.)

PIPER ARFAKIANUM C. DC., sp. nov.

Ranulis glabris, junioribus in nodis hirtellis; foliis modice petiolatis glabris, limbo ovato-acuminato basi ima æquilatera acuto apice longe et acute acuminato, 5-nervio, petiolo basi ima vaginante; pedunculo glabro quam petiolus brevior, spica quam limbus pluries brevior cylindrica et apice obtusa, rhachi pilosa, bracteæ glabræ, pelta transverse elliptica centro late et brevissime pedicellata, ovario inferne rhachi at haud profunde immerso superne libero ovato et glabro, stigmatibus rotundato-ovatis.

Hab. Arfak Mts., S.W. ridge running up to Angi lakes, in forest, 8000'.
Fl. Dec. 5525.

Dioicum, epiphytum. Ramuli spiciferi 1 mm. crassi, collenchyma libriforme in fasciculos discretos dispositum, fasciculi intramedullare, 1-seriati, canalis lysigenus unicus centralis. Limbi in sicco firmi fusciscentes et pellucido-punctulati, superi usque ad 5 cm. longi et 2·5 cm. lati. Petioli usque ad 5 mm., pedunculi usque ad 3 mm. longi. Spica matura 7 mm. longa, 4 mm. crassa, in sicco nigra.

PIPER PILOSULINODUM C. DC., sp. nov.

Ramulis tantum in nodis pilosis, primum lævibus postea lineatim lenticellatis; foliis parvis modice petiolatis, limbo ovato-acuminato basi obtuso apice obtusiuscule et sat longe acuminato supra glabro subtus haud dense piloso, 5-nervio, petiolo piloso basi ima vaginante; pedunculo glabro quam petiolus brevior, spica florente quam limbus paullo brevior, rhachi hirsuta, bracteae glabrae, pelta rotunda, staminibus 2, antheris tetragonis 4-valvatis.

Hab. Arfak Mts., slopes of Koebré ridge between Angi lakes, 8000'. Fl. Dec. 5624.

Dioicum, epiphytum. Ramuli spiciferi 1 mm. crassi, collenchyma libriforme in fasciculos discretos dispositum, fasciculi intramedullares 1-seriati, canalis lysigenus unicus centralis, in ramulis 2 mm. crassis lineatum lenticellatis cellulae sclerosae circum collenchyma creberrimae. Limbi in sicco subcoriacei fusciscentes et creberrime pellucido-punctulati usque ad 4·2 cm. longi et 2 cm. lati. Petioli circiter 5 mm., pedunculi 3 mm. longi. Spicae florentes 3 cm. longae, 1 mm. crassae, bracteae pelta 0·75 mm. diam.

FAGACEÆ.

QUERCUS LAUTERBACHII Seemen in Engl. Bot. Jahrb. xxiii. Beitr. lvii. 54;
Schum. & Laut. 264, t. iv. figs. A-E.

Arfak Mts., S.W. ridge, 6000'. Fr. Dec. 6124.

Distrib. New Guinea (D.S.W., Arfak Mts., 6000', A. E. Pratt; (Herb. Brit.) N.E.).

A tall tree with slender stem. Pratt's collection consists of a single acorn, very striking in size, 6·5 cm. long, with cupule 6 cm. by 5 cm. and nut 4·5 cm. long and about the same in breadth, enclosed in the cupule for 1·5 cm. from the base. I came across the same group of trees on the exact spot kindly described to me by Mr. Pratt; the ground was strewn with acorns of all sizes, of which the one originally collected would represent the largest. The leaves are larger than in Seemen's measurements, with the veins pilose on the under surface, but they were collected from young plants.

URTICACEÆ.

PIPTURUS PAPUANUS Gibbs, sp. nov.

Arbuscula vel frutex: ramulis internodiis brevibus, cortice rugoso-lenticelloso; innovationes tomentosae. *Folia* parva, petiolata, lanceolata, sensim angustata, acuminata, basi obtusa, integerrima, leviter revoluta, rigide membranacea, supra

hirsuta, pilis albidis adpressis dense obtecta, demum asperrima, subtus subtiliter brunneo-velutina, trinervia, costa media prominente nervis 2 lateralibus, arcuato-anastomosantibus, reticulo inter venas conspicuo. *Glomeruli* feminei axillares, sessiles, pisiformes, densiflori. *Perigonium* tomentosum, fructiferum albo-carnosum.

Hab. Arfak Mts., Angi lakes, edge of forest by ♀ lake, 7000'. Fl. ♀, Fr. Dec. 5955.

Leaves ± 6 cm. by 1.5 cm., green, but drying a dusty brown, densely covered on the upper surface with punctiform cystoliths. Petioles 1.3 cm., slender, densely puberulous. Stipules 4 mm., lanceolate, acute, tomentose on the outside. Glomerules 4 mm. across, in fruit, forming a white swollen receptacle. Flower ♀ 3 mm. long; style filiform, hirsute, 2.5 mm. Achene ± 1 mm. long, covered with short stiff white hairs.

This plant is distinct in the small narrow leaves with scabrid upper surface and the very well-marked network of minor veins, forming minute interstices, covered with dense brown tomentum on the under surface. In the shape of the leaves it is nearest to *P. mindanensis* Elm., but differs in the small size, more rigid texture and entire margins, the prominent venation with fewer lateral veins, and the brown coloration when dry.

GIBBSIA Rendle, gen. nov. (A. B. RENDLE.)

Flores monoici, unisexuales: *Masculi* alabastro depresso-globosi, mucronati; *perianthio* fere ad basin 5-partito, segmentis valvatis, ovatis. *Stamina* 5, antheris subrotundis, dorsifixis, in alabastro inflexis. *Ovarii rudimentum* lanuginosum. *Feminei perianthio* brevi, late cupuliforme, persistente et basin fructus cupula carnosula adnata tegente. *Ovarium* ovoideum valde obliquum; stigma apicale, sessile, discoideum, papillosum, margine setulis fimbriato; ovulum a basi erectum, micropyle elongata, superne ampliata et fimbriata. *Fructus* subdrupaceus, parvus, valde obliquus, exocarpium tenue, carnosulum, et super cupulam demum separabile, endocarpium crustaceum. *Semen* conforme, testa membranacea; albumen carnosum; cotyledones parvæ, ellipticæ; radícula superior.

Frutices, foliis alternis, petiolatis, crenato-serratis, 3-nerviis, subtus canescentibus. *Stipulæ* membranacæ, in unam intrapetiolaem alte bifidam connatæ, deciduæ. *Inflorescentiæ* axillares, solitariae vel binæ, foliis multo breviores, dichotomæ. *Flores* in cymulis parvulis androgynis apice ramulorum ultimorum breviter pedicellati. *Bracteæ* minutæ, ovatæ, scariosæ.

Recalls the genus *Debregeasia* in its leaf-characters, but in characters of flower and fruit is nearest the Malayan and Pacific Island genus *Leucosyke*, which, however, has a penicillate stigma and the fruits crowded on a fleshy receptacle; there is no trace of a fleshy receptacle in *Gibbsia*. The fruit is very characteristic; the upper portion of the thinly succulent exocarp separates like a cap, and the endocarp enclosing the seed is then readily separable from the cup formed by the union of the somewhat fleshy perianth with the lower part of the exocarp.

GIBBSIA INSIGNIS Rendle, sp. nov.

Frutex ramulis foliiferis colore cinerascente et pilis brevibus appressis hispidis. *Folia* breviter petiolata, lanceolata, acuminata, margine crenato-dentato recurvato, in facie superiore eleganter reticulato-imprensa, hispidula, subtus inter nervos rubros conspicuos dense albo-tomentosa; petiolus ut in ramulo hispidus. *Stipulæ* infra medium bifidæ, triangulari-acutæ, in margine superiore ciliolatæ, uninerviæ. *Inflorescentiæ* geminatæ, sæpius bis vel ter dichotomæ, pedunculo ramisque tenuibus, foliis 4-2-plo breviores. *Cymulæ* sæpe floribus evolutis 7. *Antheræ* connectivo umbonato; filamenta perianthium æquantia. *Exocarpium* læte-brunneum.

Leafy branchlets 2-2.5 mm. thick. Leaves 5-8 cm. long, 1.2-1.7 cm. wide; petiole 3-7 mm. long. The leaves have a striking appearance; the three main nerves are impressed on the upper face, which is beautifully embossed with small chequer-like areas representing the transverse and small connecting veins; the red main nerves on the lower face stand out conspicuously on the intensely white tomentum covering the rest of the surface. Stipules 3.5 mm. long, united in the lower third, each with a strong median nerve. Inflorescences generally in pairs in the leaf-axils, to 2.5 cm. long; the small dense cymes are crowded at the ends of the short ultimate branches, the number of flowers in each varies—a typical one is represented in fig. C, of which a diagrammatic analysis is given in fig. D. Bracts about .5 mm. long. Flowers jointed on very short pedicels, which are less than 1 mm. long. Bud of male flower 1.5 mm. in diameter, perianth-segments 1.6-1.7 mm. long. Ovary slightly compressed, ovoid, with a narrow rounded keel running along the back and bearing a row of short forwardly-pointing setæ, at the base of each of which is a black dot; similar but slightly larger setæ surround the stigmatic disc, covering it when young but ultimately becoming reflexed (figs. I, J). Fruit about 1 mm. long; crowned with the withered stigmatic disc; exocarp bright chestnut-brown.

Hab. Arfak Mts., Angi lakes, edge of forest by ♀ lake, 7000'. Fl., Fr. Dec. 5961.

A second species of this genus was collected by Mr. Kloss on Dr. Wollaston's Dutch New Guinea Expedition. The material is scanty, but there is no doubt that it represents a plant congeneric with the Arfak specimen and a distinct species. A description is appended:—

GIBBSIA CARSTENZENSIS Rendle, sp. nov.

Frutex ramulis foliiferis veluti in *G. insignis* hispidis. *Folia* longius petiolata, elliptica, acuminata, margine crenato-dentato, recurvato, in facie superiore reticulato-imprensa, hispidula, subtus nervis exceptis albido-tomentosa; petiolo tenui, hispido. *Stipulæ* supra medium bifidæ, acutæ. *Inflorescentia et fructus* veluti in *G. insignis*.

Leaves 4.5-7 cm. long, 2-2.5 cm. wide; petiole 1-2.5 cm. long; bracts .75 mm. long.

Hab. Dutch New Guinea: Mt. Carstensz, 5500–6700'. Collected by C. B. Kloss. Fr. Jan. 1913.

Distinguished from *G. insignis* by its relatively much broader elliptical leaves and larger petioles; the upper face is less conspicuously chequered. The bracts are also somewhat larger.

FIG. 8.



Gibbsia insignis, Rendle.—A. Branch, bearing leaves and inflorescences; B–L. Description in text. A. B. Rendle, anal.; P. Highley, del.

Description of Fig. 8 (B-L) (p. 131).

- B. Cymules clustered at the ends of branchlets; $\times 4$.
 C. A typical cymule with its subtending bract, *B*; the terminal female flower was incompletely developed. *a*, *b*, lateral bracteoles, each subtending a female flower the lateral bracteoles of which (*a'*, *b'* in fig. D) subtend each a male flower—the four male flowers indicated; the stalk of each of these male flowers bears a pair of minute bracteoles, each of which subtends an undeveloped male flower with a lateral bracteole. The apex of the inflorescence and the bracteoles *a* and *b* are pushed forward away from the axis. $\times 15$.
 D. Diagram of same.
 E. Male flower, with dehiscent anthers; $\times 4$.
 F. Stamen; $\times 15$. G. A stamen taken from a bud, showing the umbo-like dorsal connective; $\times 15$.
 H. Female flower; $\times 15$.
 I. Young stigma, covered by the ring of inflexed setæ.
 J. Mature stigma. I and J, $\times 40$.
 K. Fruit, showing detached upper part of exocarp (*a*), endocarp containing seed (*b*), and cupule (*c*); $\times 8$.
 L. Ovule; $\times 20$.

SANTALACEÆ.

EXOCARPUS sp. ?

Arfak Mts., Koebré ridge, common in forest undergrowth from 8000–8500'. Veg. 5617.

A leafless parasite, with dark green, rigid, flattened, much branched shoots, about 1 m. high. The cladodes are 5 mm. broad, showing swollen round scars alternately up the nodes, on which the flowers are evidently borne in fascicles. I am indebted to Mr. S. Moore for this determination, but, as he points out, in the absence of flowers or fruit the genus must remain uncertain.

HENSLOWIA UMBELLATA Bl. Mus. Bot. Lugd.-Bat. i. (1850) 243 = *H. Reinwardtiana* Bl. cf. Koords, Excursionsfl. Java, ii. 168; Schum. & Laut. 300; Nova Guinea, viii. (1910) 287; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 146.

Arfak Mts., Koebré ridge, open summit, 9000'. Fl., ♂ ♀. Dec. 5623.

Distrib. New Guinea (D.S.W., Noord River, *Versteg*; Mt. Carstensz, *Kloss*; N.E.). Java, Sumatra, Central and Eastern Himalayas.

A saprophyte with yellow foliage and flowers.

HENSLOWIA CRASSIFOLIA Gibbs, sp. nov.

Frutex epiphyticus; ramuli graciles, apice interdum volubile, angulati. *Folia* petiolata, parva, ovata, apice apiculata (apiculo demum incurvato), basi acuta, margine incurvata, lamina demum convexa, crasso-coriacea, in siccio nigrescente-rugosa, nervis inconspicuis. *Flores* 4–5-meri, axillares, sessiles, bracteis minutis, triangularibus stipati. *Flos* ♂ perigonium 4-fidum; lobi triangulares; stamina 4, filamenta brevia, antheræ loculis didymis. *Flos* ♀ perigonium 4–5-fidum; lobi

triangulares, subacuti; stamina 0; ovarium inferum, lineare; stylus brevis, stigmatibus 4-lobis coronatus.

Hab. Arfak Mts., slopes of Koebré Mt., 8000', epiphytic in forest. Fl., ♂ ♀. Dec. 5620.

A green epiphyte with thick leaves. The mature leaves are generally deflexed (when dried), 8 by 3.5 mm., with margins and apex convexly incurved—spread out after boiling, they are \pm 8 mm. long and 5 mm. across. The apiculus often disappears in the mature state, when the apex is just rounded and incurved. The flowering branches are 4.9 cm. long. The ♂ flowers are fasciculate and extremely minute, 1 mm. long. The ♀ flowers are 2 mm. long, generally binate. Fruit \pm 5 mm. long and 3 mm. broad, angular and curved, crowned with the persistent lobes of the perigonium.

This plant, in its very minute thick leaves, with the incurved apiculus, is distinct from all members of the genus so far known.

POLYGONACEÆ.

*POLYGONUM STRIGOSUM R. Br. Prod. 420.

Arfak Mts., Angi lakes, open marsh by ♀ lake. Fl., Fr. Dec. 5941.

Distrib. Burma and Malay Peninsula; Java, Philippines; N.E. to S.E. Australia and Tasmania. Africa.

A very glabrous form with white flowers.

POLYGONUM ALATUM Hmlt. ex Don, Prod. Fl. Nep. (1825) 72; Ridl. in Trans.

Linn. Soc. ser. 2, ix. (1916) 139.

Arfak Mts., Angi lakes, common in open marsh by ♀ lake, 7000'. Fl., Fr. 5919.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*). Philippines, Java, Japan, N.W. and S.W. China to India.

POLYGONUM BARBATUM L. Spec. Pl. i. 362; Schum. & Laut. 302.

Arfak Mts., Angi lakes, in open marsh by ♀ lake, 7000'. Fl., Fr. Dec. 5940.

Distrib. New Guinea (N.E.). Polynesia, N.E. Australia, Malaya, N.W. to S. Asia. Tropical and S. Africa.

A rather reduced form with pink flowers.

MAGNOLIACEÆ.

DRIMYS (TASMANNIA) BECCARIANA Gibbs, sp. nov.

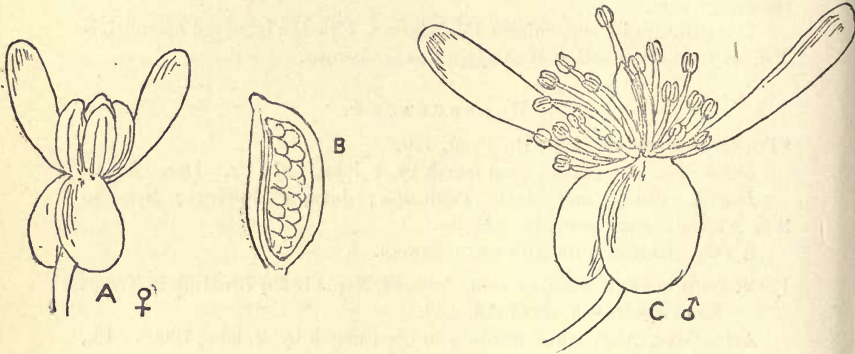
Frutex omnino glaber, dioicus, ramuli teretes, cortice cinnamoneo obducti. *Folia* obovato-lanceolata, obtusiuscula, basi sensim in petiolum angustata, margine revoluta, integerrima, coriacea, glanduloso-punctata, rete nervorum utrinque prominente nervis lateralibus ante marginem arcuatim anastomosantibus. *Flores* in axillis foliorum fasciculatim dispositi. *Flos* ♂ sepala 2, late oblonga, glanduloso-

pellucida. *Petala* 2 linearia, apicem versus dilatata. *Stamina* ∞ , valde inæqualia, filamentis ligulatis. *Flos* ♀ sepala 2. *Petala* 2. *Stamina* 0. *Ovaria* 2-5, stipitata, oblique ovata, paululum compressa; stigma decurrens; ovula 12-16.

Hab. Arfak Mts., Koebré Mt., 9000', edge of shrubberies, where burnt on summit. Fl., ♂ ♀. Dec. 5651.

This shrub showed the reddish stems and petioles with greenish-white flowers so general in the genus, and was fairly abundant in the above locality. In the dried specimens the ♀ plant has a smooth reddish cortex, whereas in the ♂ plant it is rugulose and flecked with yellow. Leaves ± 6.5 cm. by 2 cm.; neither leaves nor cortex are pungent or aromatic.

FIG. 9.



Drimys Beccariana Gibbs.—A. ♀ flower; B. Longitudinal section of carpel; C. ♂ flower: magnified.

Flowers spreading in the axils of the upper leaves on the old wood, on thin pedicels, 1.8-2 cm. long. Sepals ♂ 4 mm. long by 3.5 mm. Petals 7 mm. by 1.5 mm. Stamens 2.4 mm. long. Sepals ♀ 3.5 mm. by 3 mm. Petals 4 mm. by 1.5 mm. Ovaries 2 mm. by over 1 mm.

This species is so near *D. hatamensis* Becc. ex descrip. that I concluded it to be that plant. However, on sending the material to Dr. Beccari for verification, he most kindly returned me, not only the accompanying drawings of my species, but also a small piece of *D. hatamensis* for comparison; from this the new species differs in the almost obtuse, coriaceous and quasi-sessile leaves, only shortly attenuated into the petiole, the longer thinner pedicels, and the smaller flowers. It is a great pleasure to dedicate this plant to Dr. Beccari, coming as it does from a region into which he was the first botanist to penetrate, which will always be associated with his name through his splendid zoological and botanical work.

DRIMYS (TASMANNIA) ARFAKENSIS Gibbs, sp. nov.

Arbor parva, utrinque glaberrima, dioica; rami et ramuli bene foliati; cortex fere nigrescente, striati. *Folia* leviter obovato-lanceolata, basi sensim in petiolum subalatum satis longum angustata, apice acutiuscula, margine revoluta, integra, coriacea, supra nitentia, utrinque reticulosa-venosa. *Flores* parvi, graciliter pedicellati e basi innovationum fasciculatim oriundi. *Flos* ♂ sepala 2, petaloidea. *Petala* 12-14, ligulata. *Ovaria* 2-4. *Stigma* carnosum, cristatum, apice introrsum decurrens. *Ovula* ±15.

Hab. Arfak Mts., on S.W. ridge, running up to Angi lakes, 7000-8000'. Fl., ♂ ♀. Dec. 5533.

This tree, with symmetrical dense crown of dark leaves and pendent white flowers, turning pink later, was abundant in the forest and in a few open spaces along the crest of the ridge. Largest leaves ± 5.5-6 cm. by 2.3 cm., the midrib conspicuous, with lateral veins anastomosing on the margin of the leaf. Petiole dark-coloured, 5 mm. long. Pedicels slender, ± 1.2 cm. long. Sepals 6 mm. by 2 mm. Petals unequal, up to 6 mm. long and not 1 mm. broad. (The specimens show only expanded flowers: what I have described as a sepal is still in position on one of the flowers, and as there is apparently a scar opposite, it points to there being two members, very caducous, in the outside whorl of the perianth.) Ovaries 4 mm. long. Leaves, sepals, and ovaries are densely gland-dotted, but neither cortex nor leaves are pungent to the taste and only very slightly aromatic. This plant is nearest to *D. piperita* Hook. f., of N. Borneo, Philippines, and S.W. New Guinea. It differs in habit, in the shape and texture of the leaves, and the much smaller flowers with more numerous and narrower petals.

MONIMIACEÆ.

PALMERIA ARFAKIANA Becc. Malesia, i. 186.

Arfak Mts., twining in forest, 7000'. Fl., ♂. Dec. 5676.

Distrib. New Guinea (D.N.W., Hatam, Mt. Arfak, 5500', Beccari).

As the ♀ plant only was previously collected, a description of the ♂ flowers is appended:—

Paniculæ ♂ oppositæ ±8 cm. longæ, quam folia breviores, aliter ut in fl. femineis. *Flores* albidii. *Receptaculum* 4 mm. diam., patelliforme, intus hinc inde pilis obtectum, extus dense flavescente-pilosum. *Tepala* 5, 1.5 mm. longa, obtusocarinata. *Stamina* circa 1-4, eglandulosa. *Antheræ* sessiles $\frac{1}{3}$ mm. longæ.

TRIMENIACEÆ.

Trimeneæ Perk. & Gilg.

Trib. MONIMIACEARUM emend.

Flores actinomorphi, hermaphroditi, polygami vel dioici. *Receptaculum* parvum. *Tepala* 4-20, parva. *Stamina* 6-15, biseriata, raro uniseriata, libera, omnia fertilia, filamentis brevissimis, antheræ rimis longitudinalibus dehiscentes,

connectivis apiculatis vel rarius obsolete. *Gynæceum* syncarpium, uni- vel biloculare, ovula solitaria, ab apice loculi pendula, anatropa; stylus magnus, pileiformis. *Arbores.* *Folia* opposita vel alterna, coriacea nisi membranacea, penninervia. *Stipulæ* 0. *Flores* sæpius in racemos dispositi, parvi.

TRIMENIA ARFAKENSIS Gibbs, sp. nov.

Arbor parva, ramuli rigidi, subangulati, cortice cinerascete, leviter longitudinaliter striato. *Folia* opposita, petiolata, ovato-lanceolata, acuta, basi in petiolum attenuata, serrata, membranacea, supra nitidula, subtus minute glandulospunctata. *Inflorescentia* pedunculata, axillaris, rufo-tomentosa, quam folia triplo brevior. *Flores* breviter pedicellati, plerumque hermaphroditi, receptaculo parvo, hemispherico. *Stamina* 10-14, biseriata. *Ovarium* glandulosum, 1-ovulatum.

Hab. Arfak Mts., edge of forest by ♀ lake, 7000'. Fl. Dec. 5743.

Largest leaves 6 by 2 cm., drying cinnamon-brown; the midrib generally villous, impressed above and prominent below, red-brown, with many transverse lateral veins. Petiole 6 mm., slender, villous, dark brown. Racemes 1.5 mm. long (including the 5 mm. peduncle), of 3-4 pairs of flowers with a single terminal one. Flowers in bud, 4 mm. long, consisting of many spirally imbricating, very caducous scales or perianth-segments (15 were counted in one flower), 5-7 lower ones smaller and strongly keeled, ciliate on margins, the upper larger, petaloid (white), entire. Pedicels 1 mm. Stamens 13 (in one flower), 2.5 mm. in length, with anthers 1 mm. and subulate filaments 1.5 mm. long, the inner series shorter. Ovary 1.5 mm. long, while still enclosed in the perianth-segments, when the immature stigma is grooved by the pressure of the inner series of stamens on the papillæ, forming vertical lines growing out later. The papillæ cover the stigma on maturity. After the fall of the perianth-segments, the ovary is 2.5 mm. long. Receptacle minute, \pm .5 mm. across.

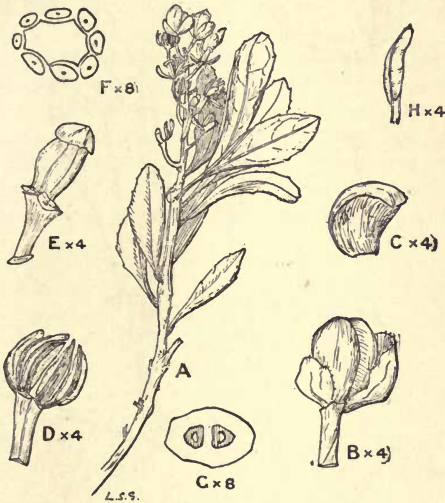
This plant is nearest *T. papuana* Ridl., but differs in the rufous tomentum on the young parts and inflorescence, in the non-acuminate, serrate, and membranous leaves, and the small simple racemes.

IDENBURGIA Gibbs, gen. nov.

Flores hermaphroditi. *Receptaculum* parvum, bilaterale. *Tepala* 4, petaloidea, 2-seriatim imbricata, decussata, subæqualia, caducissima. *Stamina* 6-9-10, pistillum circumdantia post anthesin caduca, ad apicem receptaculi 1-2-seriatim affixa; filamenta libera, lata, crassa, brevissima, antheræ pro rata magnæ, adnatæ, lineare-oblongæ, loculis parallelis, longitudinaliter dehiscentibus, connectivo plano vel apice apiculato. *Ovarium* syncarpium, bicarpellatum, oblongum, biloculare, stigma maximum, sessile, pileiforme, apice truncatum, carnosum, sicut ovarium filamentis impressis longitrorsum rugatum; ovula 2, in quoque loculo 1 ab apice pendulum, anatropum. *Fructus* ignotus. *Arbor* vel *arbuscula*, glaberrima, folia alterna vel opposita, petiolata, glanduloso-serrata, penninervia. *Flores* pedicellati, in racemos terminales, breves, pauciflores dispositi.

This genus is nearest to the monotypic *Piptocalyx*, so far only known from N.E. Australia, in the reduced number and arrangement of the perianth-segments and the shape of the stigma; but it approaches *Trimenia* in the hermaphrodite flowers, differing from both in the terminal inflorescence, larger flowers, thick stamens with very short strap-shaped filaments, and bilocular ovary. In habit both species agree with *Trimenia*, but the leaves in *I. novo-guineensis* differ in being small and coriaceous, alternately to sub-verticillately arranged, while *I. arfakensis*, on the contrary, approaches *Piptocalyx* in the large opposite leaves, pseudo-herbaceous in texture, produced at the apex in a long caudate appendage.

FIG. 10.



Idenburgia novo-guineensis Gibbs. — A. Branch; B. Flower with tepals; C. Inner tepal; D. Flower, tepals shed; E. Ovary; F. Showing pressure of stamens at base of ovary; G. Transverse section of ovary; H. Stamen.

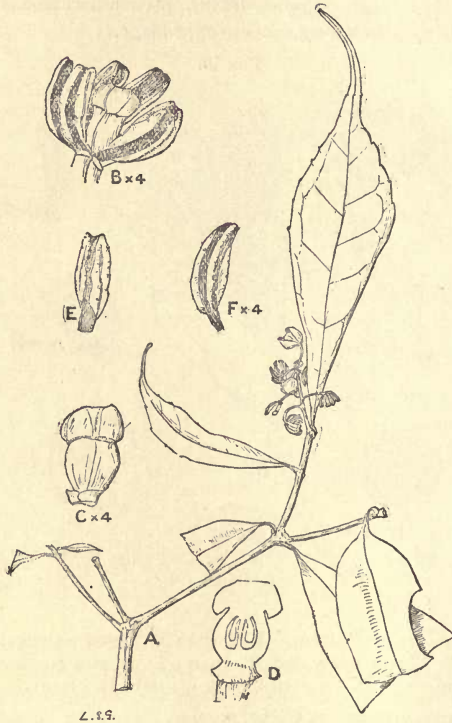
IDENBURGIA NOVO-GUINEENSIS Gibbs, sp. nov.

Arbor parva, glaberrima, rami erecti, teretes, cortice cinerascente, striguloso obducti, innovationes rufescentes. *Folia* parva, alterna vel subverticillata, petiolata, oblanceolata, obtusa vel subacuta, basi in petiolum attenuata, glanduloso-serrata, recurvata, coriacea, supra minute punctata. *Tepala* 4, biseriata, albida, rotundata, obtusa, margine subcrenulata. *Stamina* 8-9. *Ovarium* late ovoideum, aliquanto compressum, glabrum.

Hab. Arfak Mts., Koebré Mt., edge of shrubberies on summit, 9000'.
Fl. Dec. 5654.

A small symmetrical tree, fastigate in habit, with red stems and whitish-green flowers, recalling *Drimys* sp. in habit and colouring. Leaves ± 5 by 1.5 cm. with petiole ± 1.5 mm. included; the leaves show conical marginal glandular teeth, dark red in colour, and a thick midrib produced at the extreme apex of the leaf, impressed on the upper, dull red and prominent on the lower surface, where it shows 2-4 transverse lateral veins, anastomosing

FIG. 11.



Idenburgia arfakensis Gibbs.—A. Branch, nat. size; B. Flower, tepals shed; C. Ovary; D. Longitudinal section of ovary; E. Stamen; F. Stamen, after dehiscence.

on the margins. Inflorescence ± 6 by 1.6 cm. Flowers with sepals 6 mm. long and about the same in breadth. The longest pedicels are 8 mm. long by .5-1 mm. thick, spreading at the apex into a small bilateral receptacle 2 mm. across. Stamens 6 mm. long. Anthers 5 mm. long, with the cells

sometimes confluent at the apex. Filaments 1 mm. long and ± 0.5 mm. thick, with the connective produced at the apex. The ovary is flattened in one plane, 4 mm. by 2.5 mm., 8-10-angled according to the number of stamens. The thick circular style is 1 mm. high.

IDENBURGIA ARFAKENSIS Gibbs, sp. nov.

Arbuscula, glaberrima, ramuli divaricati, cortice striato cinerascete præditi. *Folia* opposita, petiolata, ovato-lanceolata, tenuiter caudato-acuminata, basi attenuata, glanduloso-serrata, membranacea, nervis subtus prominentibus 5-6, rete venulorum conspicuo. *Racemus* terminalis, foliis duplo brevior. *Tepala* 4, petaloidea, decussato-imbricata, rotundata, apice obtusa. *Stamina* 6, antherarum connectivo haud apiculato.

Hab. Arfak Mts., Koebré ridge, on open summit, 9000'. Fl. Dec. 6003.

Leaves 11 by 3.3 cm. (including petiole 6 mm. long and acumen 1.5 cm. by 1 mm.), dull brown in colour above with veins barely visible, lighter beneath with dark brown veins, the midrib being produced into the extreme apex of the acumen. Racemes 2 cm. long; pedicels 6 mm. long, the upper ones shorter. Flowers 5 mm. long in bud. Stamens 4 mm. long and 1.1 mm. broad, with the rim of the anthers ± 0.5 mm. broad and filaments red-brown, when dry. Ovary 3 mm. long. Stigma just over 1 mm. high.

The Trimeniaceæ comprise the two anomalous genera *Trimenia* and *Piptocalyx* (I cannot accept *Xymalos* as showing any affinity with either genus), which have so far been included in Monimiaceæ, under Tribe II. Trimeniæ, though showing little relation to such a systematic position; indeed Perkins and Gilg (Das Pflanzenreich, iv. 101. 11), the monographers of that order, consider that with a better knowledge of the two genera they would probably show themselves as not related to the Monimiaceæ. The correctness of this point of view is borne out by the discovery of the new genus *Idenburgia*, including two species very closely related to both the above genera, but with a syncarpous bilocular ovary.

A very interesting sequence in development is shown in the floral structure of the three genera. In *Idenburgia* the flowers are hermaphrodite, whereas both *Trimenia* (*T. weinmanniifolia* Seem. from Fiji, for many years the sole representative of the genus) and *Piptocalyx* were supposed to be diœcious; *T. papuana* Ridley, however, recently discovered in Dutch S.W. New Guinea by Kloss, like *I. arfakensis*, is hermaphrodite. The monotypic *Piptocalyx* is diœcious.

The many spirally-arranged perianth segments of *Trimenia*, graduating from scales to petaloid tepals, are reduced in *Piptocalyx* to six biseriate petaloid tepals; whereas in *Idenburgia* we get four large biseriate petaloid tepals—in each case, however, equally caducous, falling before anthesis, exposing the stamens before these mature. The structure of the stamens

is identical in the three genera, though in *Idenburgia* they are larger and more massive in size and appearance.

Dr. Rendle kindly examined the pollen, which is tetrahedral in shape, offering no points of interest or comparison.

The unilocular ovary of *Trimenia* and *Piptocalyx* is identical in structure with the bilocular *Idenburgia*. This organ is somewhat flattened in one plane, showing angulation according to the pressure and number of the inner whorl of stamens, or in *I. arfakensis* the one whorl of stamens. The peculiar massive, sessile stigma is also identical, but the shape is masked in the first two genera by the outgrowth of papillæ. In *Trimenia*, however, in the younger stages, the lines formed by the pressure of the stamens before the outgrowth of the papillæ show the similarity of structure with that of *Idenburgia*.

The anatomical characters agree with those given in Perkins and Gilg's Monograph of the Monimiaceæ. The wood in all three genera is soft and pithy. In the three species of *Trimenia* which I have been able to compare with *Idenburgia* there is absolute conformity. The primary cortex is characterized by stone cells, united in groups, though in *I. arfakensis* these show a more or less continuous ring; balsam cells, with contents soluble in alcohol, are scattered through the bast. The xylem is composed of radial rows of often chambered vessels of considerable size, with 1-4-celled medullary rays, and is succeeded by a large medulla of parenchymatous cells without contents. In *I. arfakensis* the vessels of the wood are much smaller.

There is the same agreement in the structure of the leaves so far as *Trimenia* and *Piptocalyx* are concerned; but in *Idenburgia* we get a difference between the two species, viz., the small alternately disposed coriaceous leaves of *I. novo-guineensis* show a very small-celled epidermis without stomata, no hypoderm, then a regular two-layered palisade-tissue, the lower row of much smaller cells, succeeded by a loose-celled spongy parenchyma and a small-celled epidermis, which alone shows stomata. The much larger quasi-membranous leaves of *I. arfakensis* agree in structure with those of *Trimenia* and *Piptocalyx*, as given in the Monograph and examined by myself, viz., a small-celled epidermis, without stomata, no palisade-tissue or hypoderm, but a very loose-celled mesophyll interspersed with large secretory cells and showing stomata on the lower epidermis only. Balsam, soluble in alcohol, is distributed equally through all the tissues of leaf and stem in *I. novo-guineensis*, giving the characteristic red colouring which recalled *Drimys* in the field.

This genus is named in honour of Mr. A. W. F. Idenburg, lately Governor-General of the Netherlands Indies, to whom I am indebted for the many facilities which his great courtesy and interest in the scientific scope of the proposed work most generously assured me while in Dutch N.W. New Guinea.

NEPENTHACEÆ. (J. M. MACFARLANE.)

NEPENTHES MAXIMA Reinw. in Ann. Sc. Nat. iii. (1824) 369, t. xx. f. 2.

Var. MINOR Macfarlane, var. nov. Omnibus partibus minor.

Arfak Mts., in open marsh by ♀ lake, 7000', abundant. Fl., Fr. Dec. 5502.

Distrib. (of type). New Guinea (D.N.W., Hatam, Mt. Arfak, *Beccari*; D.S.W., Mt. Carstensz, *Kloss*; S.E. (Sogeri region), *Forbes*). Amboina, Celebes, N. Borneo.

"Also common in small mossy and moss-grown forest on the S.W. ridge, running up to Angi lakes, from 8000–9000'. Both in the small forest of the ridges and in the open marsh this plant was uniformly seen of the small dimensions of the specimens collected." The great interest attaching to this material is that it is a truly dwarf or nanoid form, which in every particular is smaller than the typical species—this peculiarity being true alike of stem, leaves, pedicel, and inflorescence.

NEPENTHES AMPULLARIA Jack, in Comp. Bot. Mag. i. (1835) 271; F.

Muell. Pap. Pl. 52; Nova Guinea, viii. (1910) 339.

Arfak Mts., Monswoon Been, ♀ lake, 7000', coll. by A. E. Pratt. ♂ ♀ Fl. Dec. (*O. Stapf*.)

Distrib. New Guinea (D.S.W., Noord River, *Versteeg*; S.E.). Malay Peninsula, N. Borneo, Sumatra.

SAXIFRAGACEÆ.

PULLEA PAPUANA Gibbs, sp. nov.

Arbor parva, ramosa; ramuli teretes, bene foliati, glabri; cortice brunneo-cinerascente. *Folia* opposita, petiolata, crasse coriacea, lanceolato-ovata, basi cuneata, in petiolum angustata, apice obtusa vel emarginata, penninervia, venis ramulisque copiosis reticulata, utrinque glabra, obscure repanda. *Panicula* folia excedentibus e capitulis parvis pluribus subdistantibus, nunquam bifloris vel etiam unifloris persistentibus. *Calyce* 5-lobato; lobi membranacei, tomentosuli. *Petala* 0. *Stamina* 10, libera, calycem excedentia; antheræ dorsifixæ. *Glandulae* 5–10, apice incrassato-foveolatae. *Styli* 2, liberi. *Ovarium* inferum, tubo calycis adnatum, biloculare; ovula 4, ab apice septi pendula.

Hab. Arfak Mts., edge of forest by ♀ lake, 7000'. Fl. Dec. 5576.

On the specimens collected the largest leaves are ± 5.4 by 3 cm., with the median vein reddish in colour on the upper and prominent on the lower surface, the 5–6 lateral veins enclosing raised reticulate areas, the ultimate nerve-endings being reduced to fine hair-lines. The petioles are red-brown, glabrous, flattened above. Stipules 1 cm. long, very caducous, subulate and pubescent. Inflorescence ± 8 by 2 cm., with peduncle 3–4.5 cm. long, faintly pubescent, scented; secondary peduncles in 1–2 superposed whorls,

2.5–3 cm. long, bearing small capitula, over 5 mm. across, of 6–7 flowers, each flower subtended by a small caducous, concave, pubescent bract 1.5 mm. long. Calyx-lobes 2 by 1 mm., ovate acute, adnate to the ovary. Longest stamens with anthers 3 mm. long. Style 2.5 mm. long, subulate with minute punctiform stigma. Ovary 1.2 mm. long, pubescent, adnate to the axis.

This plant is very near *Callicoma Stutzeri* F. Muell., first distributed by him as *Stutzeria callicomoides*, then reduced to *Callicoma*, as, in the absence of fruit, he considered the generic position dubious. It undoubtedly belongs to *Pullea*, the only discrepancy being in the position of the ovules, which are figured for *Pullea* (Engl. Bot. Jahrb. lii. (1914) 165, fig. 9) as lateral; whereas in both the above plants they are inserted as described by von Mueller for *P. Stutzeri*, which is distinguished from *Callicoma* by the glands—erroneously called petals by him, but correctly described as glands by Bailey ('Queensland Flora,' pt. ii. 536),—which occur opposite the inner whorl of stamens, and the more or less inferior to semisuperior ovary. The Arfak plant is distinct from the above in the obscurely dentate, obtuse, more reticulate leaves, the more compound, less densely capitate inflorescence, smaller flowers, greater number of glands, and the inferior ovary.

CUNONIACEÆ.

SPIRÆANTHEMUM BULLATUM Gibbs, sp. nov.

Arbor parva, ramuli teretes, cinereo-pubescentes. *Folia* ternatim verticillata, petiolata, suborbicularia, rotundata, in petiolum brevem attenuata, margine integerrima, revoluta, bullata, superne hirsuta demum glabra et nitentia, utrinque nervis hirsutis impressis, lateralibus 4–6 prope marginem arcuatim anastomosantibus, subtus prominentibus. *Stipulae* subulatæ, pubescentes, mox caduæ. *Panicula* axillaris vel terminalis, puberula, foliis longior. *Flores* albidæ, longe pedicellatæ, 4-meri. *Calyx* lobis acutis. *Stamina* 8, alternatim inæqualia, majora calycem superantia. *Disci* squamulæ 8, obtusæ. *Carpella* 4, incano-pilosa, stylis staminibus æqualibus coronata.

Hab. Arfak Mts., Angi lakes, edge of forest by ♀ lake and on S.W. ridge running up to the lakes. Fl. Dec. 5543.

The leaves of this species are very distinct, the largest being 5 cm. by over 3.5 cm., with veins so impressed on the upper surface that they limit raised lateral reticulate areas, which make the leaves very concave and bullate in appearance, the convex under surface being lighter in colour and tomentose. The young leaves are densely pubescent on both surfaces. Petioles 8 mm. long, pilose. Panicles 8–13 cm. by 4.3–4.5 cm., composed of ternately verticillate cymes, with bracts simulating foliage-leaves greatly reduced in size. Flowers 2 mm. long, sometimes 5-lobed, pilose with scattered dark glandular hairs, as are also the pedicels, which are 2 mm. long,

articulated above the middle. Stamens 3 mm. long, including globose anthers \pm .5 mm. long, glabrous. Carpels sometimes 3, with glabrous styles nearly 2 mm. long.

This plant is distinct from known members of the genus in the almost orbicular bullate leaves and the terminal inflorescence, much longer than the leaves. It approaches *S. integrifolium* Pulle from the Hellwig Mts. in S.W. New Guinea, but is distinguished by the ternate arrangement of the leaves and the 5-lobed calyx.

ROSACEÆ.

RUBUS GLOMERATUS Bl. Bijdr. 1111; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 35.

Arfak Mts., Angi lakes, 7000', common on edge of forest and in Papuan "kebuns" on W. side of ♀ lake. Fl., Fr. Dec. 5976.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*; S.E.). Malay Peninsula, Java, N. Borneo.

Under surface of leaves rusty brown; flowers white; fruit red, not sweet.

LEGUMINOSÆ.

DESMODIUM SCALPE DC. Prod. ii. 334.

Arfak Mts., Angi lakes, 7000', in forest and where burnt by lake. Fl. Jan. 5902.

Distrib. India, Ceylon, Java, N. Borneo, Timor, Celebes, Philippines; Mauritius and tropical Africa.

RUTACEÆ.

TERMINTHODIA ROTUNDIFOLIA Ridl., sp. nov.

Frutex, ramis crassiusculis. *Folia* opposita, obovata, rotundata, basi angustata coriacea, nervis vix conspicuis 3 paribus, 2.4 cm. longa, 1.5 cm. lata, petiolis vix 2 mm. longis. *Flores* singuli in axillis superioribus, pedunculo brevi 3 mm. longo, angulato. *Bractea* brevissima, ovata, acuta. *Pedicellus* crassus, 2 mm. longus. *Sepala* 4, brevissima, ovata, obtusa. *Petala* 4, ovata, acuta, persistentia. *Staminodia* nulla. *Stamina* 4, filamenta linearia crassiuscula, anthera oblonga rotundata. *Discus* pulviniformis. *Stylus* brevior cylindricus. *Cocci* 2, ovati, acuti, lignosi, 4 mm. longi. *Endocarpio* soluto. *Semina* singula in cocci alis lanceolatis.

Hab. Arfak Mts., Angi lakes, Koebré Mt., summit, in open, 9000'. Fl. (green), Fr. Dec. 5652.

Differs from *T. oppositifolia* Ridl., of Mt. Carstensz, in its stouter habit, rounded small leaves, with few nerves nearly sessile, and very short inflorescences of a single flower. I see no traces of the staminodes which occur in *T. oppositifolia*. It agrees with this species in the single seed to each coccus. There are now three species of this genus known—one from

Gunong Taban in the Malay Peninsula, which differs notably in having two seeds in each coccus, and this species and *T. oppositifolia* Ridl. in New Guinea. (H. N. R.)

ACRONYCHIA ARFAKENSIS Gibbs, sp. nov.

Frutex prostratus vel erectus; ramuli teretes, bene foliati, cortice fusconigrescente circumdati. *Folia* parva, opposita, simplicia, petiolata, apice obtusa vel acuta, basi cuneata, margine integerrima, revoluta, coriacea, glabra. *Corymbi* axillares, breviter pedunculati, 1- vel 4-flori. *Petala* 4, patentia, valvata, apice incurva. *Calyx* brevis, 4-lobus. *Stamina* 8, subæqualia, filamentis ligulatis, glabris. *Discus* prominens, 8-gonus. *Ovarium* 4-loculare, loculis 2-ovulatis, ovula superposita. *Bacca* carnosa, 4-sperma.

Hab. Arfak Mts., Koebré Mt., on burnt open summit, 9000'. Fl., Fr. Dec. 5610.

This shrub was characteristic of the exposed summit of the ridge associated with *Myrtus prostrata*, either spreading or erect to ± 1 m. in height, with thick stems and dark green foliage. Leaves ± 3 cm. by 1.3-2 cm., roundish to lanceolate in shape, the veins, showing tertiary reticulations, are prominent on both surfaces. Petiole thick, channelled above, 9 mm. long. Petals ± 4 mm. by 1.2 mm. Stamens 3-6 mm. long. Ovary with disc and style 2.5 mm. long, the latter showing a few hairs at the base. Fruit red-brown in colour (dried), ± 9 by 7 mm.

This plant is distinct in its dwarfed habit and mostly thick, almost round leaves from any members of the genus so far known.

ACRONYCHIA PAPUANA Gibbs, sp. nov.

Arbor parva. *Folia* opposita, petiolata, uni-foliolata, apice cuspidato-obtusa, basi cuneata, margine integerrima, chartacea, utrinque nitentia, glanduloso-punctata. *Cymæ* parvæ, axillares, pedunculatæ, 1-3-floræ. *Calyx* 4-fidus, persistens, laciniis semi-orbiculatis. *Petala* albida, decidua, lineari-lanceolata, apice inflexa, subhamata. *Stamina* 8, filamentis patentibus complanatis, inferne ciliatis. *Ovarium* tetragonum, disco 8-glanduloso impositum, stylus magnus, basin versus pilosus, 4-loculare, loculis biovulatis, ovulis superpositis. *Fructus* viridis, carnosus, tetraspermus.

Hab. Arfak Mts., edge of spinneys by ♀ lake, 7000'. Fl., Fr. Dec. 5958.

The specimens show rather attenuated branching, with long internodes and thin round greyish-brown stems. Leaves ± 6 cm. by 3 cm., greyish in colour, the same on both sides (dried), the cusps under 1 mm. long, with well-marked midrib and many transverse parallel veins anastomosing on the margins. Petioles ± 5 mm. long, terete and thick, articulated below the lamina. Cymes with flowers barely 1.5 cm. long, peduncle and pedicel each ± 5 mm. long. Petals 4 mm. by 1.5 mm., gland-dotted in the upper portion. Stamens strap-shaped, 2.5 mm. long, those opposite the petals somewhat shorter. Ovary with style 2 mm. long. Fruit ± 6 mm. in length and breadth.

This plant is very near *A. levis* Forst., common in New Caledonia and N.E. Australia, only differing in the cuspidate leaves and much reduced cymes with smaller flowers.

EUPHORBIA C E Æ. (J. HUTCHINSON.)

HOMALANTHUS ARFAKIENSIS Hutchinson, sp. nov.

Arbor parva, ramulis junioribus flexuosis in sicco costatis glabris. *Folia* ovato-lanceolata, sensim subacutè acuminata, basi rotundata, 4-6 cm. longa, 2-3 cm. lata, chartacea, utrinque supra impresso-reticulata, glabra; costa supra prominula, infra prominens; nervi laterales utrinsecus 7-9, a costa sub angulo lato abeuntes, infra prominuli, prominenter conjuncti; petioli 1-2 cm. longi, purpurascens, supra late canaliculati, glabri; stipulæ caducæ, lanceolatæ, acutæ, 1 cm. longæ, tenuiter chartaceæ, glabræ. *Inflorescentia* ♂ axillaris, racemosa, basi flore ♀ solitario instructa, circiter 2 cm. longa, glabra. *Flores* ♂ brevissime pedicellati, basi glandulosi. *Antheræ* sessiles, circiter 6. *Flores* ♀: pedicelli demum 1.5 cm. longi, recurvati, costati. *Calyx* breviter patelliformis, membranaceus, glaber, basi extra glandulo magno carnoso ornatus. *Ovarium* biloculare, glabrum, stylo nullo, stigmatibus 2 divaricatis 3.5 mm. longis. *Fructus* non visus.

Hab. Arfak Mts., Angi lakes, edge of forest by ♀ lake, 7000'. Fl., ♂ ♀. Dec. 5966.

*GLOCHIDION MERRILLII Robinson in Phil. Journ. Sci. iv. (1909) 100.

Arfak Mts., Angi lakes, edge of forest by ♀ lake. Fl., Fr. Dec. 5735.

Distrib. Philippines.

SAPINDACEÆ.

DODONÆA VISCOSA Jacq. Enum. Pl. Carib. 19; Schum. & Laut. 423; Nova Guinea, viii. (1907) 172; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 32.

Arfak Mts., Angi lakes, 7000', edge of forest and spinneys by ♀ lake. Fr. Dec. 5557.

Distrib. New Guinea (D.S.W., Okaba, *Brandenhorst*; Mt. Carstensz, *Kloss*; N.E. and adjacent islands). India, Indo-China, Malaya, Polynesia, Australia, New Zealand.

BALSAMINACEÆ.

IMPATIENS HERZOGII K. Sch. in Engl. Bot. Jahrb. ix. (1887) 204; Schum. & Laut. 425.

Arfak Mts., Angi lakes, 7000', marshy places in forest by ♀ lake. Fl. Dec. 5537.

Distrib. N.E. New Guinea.

About 1 m. high, with red stems, red veins to leaves, and white flowers. This beautiful species was always found in boggy places in the forest, as the latter ran out on the open marsh. Though rather smaller in all parts, which is to be expected from the altitude, the above specimens agree perfectly with Schumann's species.

ELÆOCARPACEÆ.

ELÆOCARPUS (MONOCERA) KOEBRENSIS Gibbs, sp. nov.

Frutex vel *arbor* parva; innovationes dense fusco-sericeo-pubescentes; ramuli quadrangulares, demum teretes, cinnamomei, glabrescentes. *Folia* alterna, petiolata, elliptica, basi cuneata, apice subacuta vel obtusa, serrata, incurvata, coriacea, supra

FIG. 12.



Eleocarpus koebrensis Gibbs.—A. Branch, nat. size; B. Portion of flower; C. Stamen; D. Ovary with disc; E. Transverse section of ovary.

nitida, subtus pubescentia. *Racemi* fusco-pubescentes, quam folia longiores. *Flores* parvi, albidi, hermaphroditi. *Sepala* 5, valvata, pubescentia. *Petala* 5, apice laciniata, basi extus puberula. *Stamina* 10-14, filamentis filiformibus, glabris,

antheris minutis, aristatis. *Ovarium* sessile, disco sub 5-lobo impositum, puberulum, 3-loculare, loculis 4-ovulatis; ovula parva, pendula.

Hab. Arfak Mts., Koebré ridge, edge of forest and burnt open summit, 9000'. Fl. Dec. 5737.

A densely branching shrub or small tree, with crowded leaves and white flowers with brownish calyx. Largest leaves \pm 5 cm. by 2.5 cm. with impressed midrib, and 3-6 lateral veins, with prominent reticulation on the upper surface; on the lower both midrib and lateral veins are conspicuously raised. Racemes 4-10 cm. long, single in the axils of the upper leaves, in two cases showing proliferation of the rhachis at the apex. Peduncle 1-1.5 cm. long. Flowers .5 cm. long. Pedicels 1 cm. long, with bracts linear-lanceolate, 5 mm. by 1.5 mm. Sepals 3 mm. by 1.5 mm. Petals 5 mm. long, lacinate \pm $\frac{1}{3}$ of length, contracted into a thickened keel at the base. Stamens with filaments 1 mm. long and anthers 3.2 mm. long, dehiscing at the apex. Ovary 1.5 mm. long with subulate style 2 mm. long.

The nearest affinity to this plant is *E. coriaceus* Hook. f. from the mountains of Ceylon, at 6000'. It differs in the tawny pubescence of the young shoots, under surface of leaves and inflorescence, and in the smaller flowers.

SERICOLEA NOVO-GUINEENSIS Gibbs, sp. nov.

Frutex vel *arbor*; ramuli teretiusculi, bene foliati, innovationes sericei, demum glabrati. *Folia* opposita, breve petiolata, oblongo-ovata, obtusa vel apiculata, basi rotundata, minute dentata, coriacea, superne glabra, subtus pilis aureo-fulvis dense sericea. *Racemi* axillares, pedunculati, 2-4-flori, foliis aequalongis, pedicellis filiformibus, sericeis. *Flores* parvuli, nutantes, 5-meri. *Sepala* oblongo-lanceolata, obtusiuscula, extus sericea, carinata. *Petala* cuneato-obovata, apice truncata vel brevissime trilobata, basin versus puberula. *Stamina* 15, biseriata, puberula; filamentis filiformibus, antheris oblongis, apice transverse breviter dehiscentibus. *Discus* obtuse 5-lobatus, lobis patentibus minutis, glabris. *Ovarium* glabrum, biloculare, loculis 2-ovulatis. *Stylus* glaber, subulatus, apice bilobatus. *Fructus* baccatus, glaber.

Hab. Arfak Mts., in upper forest and on the open plateau summit of Koebré ridge, 8500-9000'. Fl., Fr. Dec. 5613.

A much branched shrub to small tree, with stiff erect branches. Largest leaves 2 by 1 cm. with petioles \pm 2 mm. long, the median vein impressed above and very prominent below, with many transverse lateral veins, interconnected by fine reticulations. Racemes \pm 2-2.5 cm. long, including peduncles \pm 8 mm. long. Sepals 3 mm. long. Petals 4 by 1.5 mm. across. Stamens 2.5 mm. including anthers 1 mm. long. Ovary 1 mm. long. Style 1 mm. long; in one case a 3-locular ovary with 3 ovules in each loculus and 3-lobed stigma was seen, and in another 3 ovules were present in one loculus of a bilocular ovary. Fruit 6 mm. long with crustaceous endocarp and fleshy exocarp.

This plant is very near *S. Gaultheria* (F. Muell.) Schltr. from Mt. Yule

in S.E. New Guinea (Engl. Bot. Jahrb. liv. (1916) 100). It differs in the smaller leaves with much shorter tomentum underneath, the few-flowered racemes, and the truncate to 3-lobed petals.

SERICOLEA ARFAKENSIS Gibbs, sp. nov.

Fruticulus epiphyticus, sparsim ramosus. *Rami* teretiuseculi, innovationes fulvo-sericeæ. *Folia* opposita, ovata, acuminata, basi rotundata, minute dentata, incurvata, superne glabra, subtus fulvo-sericea, multinervia, reticulationibus conspicuis; petiolo brevi, sericeo. *Racemi* abbreviati, pedunculati; floribus parvis, oppositis vel subumbellatis, pedicellis gracilibus fultis. *Bracteæ* lanceolatæ, acuminatæ. *Sepala* 4, lanceolata, acuta, extus sericea, carinata. *Petala* 4, cuneato-obovata, apice truncata et brevissime trilobata, basi ciliata. *Stamina* 1/2, puberula. *Discus* 5-lobatus. *Ovarium* conicum, glabrum, biloculare; stylus subulatus; stigma truncatum; ovula in loculo utroque 2, pendula, anatropa.

Hab. Arfak Mts., Angi lakes, ridge above ♀ lake, 8000'. Fl. Dec. 6009.

Epiphyte with hanging branches ± 50 m. long, in moss-grown small forest. Leaves 3.5 cm. including hair-like acumen ± 5 cm. long by 1.9 cm. broad. Petiole 2 mm. long. Racemes ± 3 cm. long, including peduncle ± 1.4 cm. and pedicels 1.1 cm., both slightly sericeous; flowers 4 mm., pink. Sepals 2.5 mm. long. Petals 4 mm. Stamens 1.5 mm. long; anthers shorter than the filaments, with apical dehiscence. Ovary and style ± 3 mm. long.

This delicate little plant is, so far, distinct in *Sericolea* in the more remote pairs of leaves and the 4-merous pink flowers.

The leaves were infested with *Leptothyrella sericoleæ* Ramsbottom (p. 64).

Pyronota Ridl. and *Mischopleura* Wernham = *Sericolea*. In the generic diagnosis of the latter 10 stamens are given, but in one bud of *S. ovalifolia* examined 15 stamens were seen.

DILLENIA CÆ.

HIBBERTIA (SUBSESSILES) NOVO-GUINEENSIS Gibbs, sp. nov.

Frutex prostratus; rami volubiles, teretes, junioribus pubescentibus, demum glabrati. *Folia* lineari-lanceolata, acuminata, in petiolum basi dilatatum longe attenuata, integra, chartacea, superne glabra, inferne villosula. *Flores* solitarii, terminales, subsessiles, flavi. *Sepala* longe ovata, acuminata, coriacea, concava, subtus villosa. *Petala* 5, obovato-obtusa, integra. *Stamina* calyce breviora, antheris linearibus, filamentis filiformibus. *Ovaria* 5; styli flexuosi; stigmata simplicia, apice concava.

Hab. Arfak Mts., Koebré ridge, spreading on burnt open summit, 9000'. Fl. Dec. 5619.

A twining woody plant with large yellow flowers. Largest leaves ± 8.5 by 1 cm., the midrib much impressed on the upper surface and prominent on the lower. Flowers ± 4 cm. across. Sepals unequal, 1.5–1.8 cm. by 9 mm. Petals 1.5 by 1.2–3 cm., equalling the sepals. Stamens unequal, red-brown in colour (dried), the longest 6 mm. long; anthers 2 mm. long, with apical

pores; filaments 4 mm. long. Ovaries 4 mm. and styles 6 mm. long. The material is insufficient to determine the number of ovules in each ovary.

A species which resembles in habit and flowers *H. scandens* (Willd.) Gilg, from Queensland and New South Wales, but is at once distinguished by the more linear leaves and smaller flowers, and the longer stamens with shorter anthers and longer filaments. This is the first record of the genus from New Guinea and adds another to the long list of genera so far considered limited to Australia. The genus is also common to New Caledonia, and further investigation will no doubt prove it to be widely spread in New Guinea.

GUTTIFERÆ.

HYPERICUM MUTILUM L. Sp. Pl. ed. 1, 787; *cf.* Maximowicz in Bull. Ac. Sc. St. Petersburg, xi. (1881) 171.

Arfak Mts., Angi lakes, 7000', open marsh by ♀ lake. Fl. (yellow), Fr. Dec. 5963.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*; N.E.). Sumatra, Java, N. Borneo, Philippines, Central and S. China; New Zealand and Tasmania. Madagascar. N. and S. America.

VIOLACEÆ.

**VIOLA DISTANS* Wall. Cat. n. 4022.

Arfak Mts., Angi lakes, open marsh by ♀ lake, 7000', creeping amongst grass. Fl., Fr. Dec. 5962.

Distrib. Temperate Himalayas, Nilghiri Mts. to Ceylon. S. China.

Flowers white, striped violet on lower lip. Drawings of the style on herbarium sheets at Kew and the British Museum, including some excellent dissections by the late C. B. Clarke, show complete identity with the above specimens, which only differ in the so far recorded colour of the flowers (violet and blue).

BEGONIACEÆ.

SYMBEGONIA ARFAKENSIS Gibbs, sp. nov.

Herba, caule erecto in sicco rufo, pilis paucis longis suberectis pubescentibus onusto. *Folia* sessilia, oblique lanceolata vel ovata, basi uniauriculata, apice angustata acuta, grosse serrato-dentata, supra glabra, subtus albo-punctata, in nervis rufo-pubescentia. *Inflorescentia* terminalis, a basi ramosa, bracteis multis, latis, apice obtusis, albidis. *Flores* ♂ sepalis 2; staminibus haud multis in columnam gracilem connatis, supra liberis; antheris globosis. *Fructus* solitarii vel bini, pedicellati, 3-alati, pedunculo fructifero puberulo, alis apice divaricatis, protractis, acutis, sparsim serratis. *Placenta* bifida.

Hab. Arfak Mts., Angi lakes, in forest by ♀ lake. Fl. ♂, Fr. Dec. 6953.

The white bracts and flowers made this plant conspicuous in the field.

The terete and slender stems are 2 mm. thick, with very sharply serrate-dentate leaves, the largest being 6.5 cm. by 3 cm.; the acute, reddish, membranous stipules 1 cm. long and 4 mm. broad at the base. The inflorescence, \pm 2 mm. long, is branched at the base and consists of several pairs of bracts in the axils of which the σ flowers arise. The σ perianth is longly pilose, later glabrous, \pm .8 mm. across at the base of the segments, and about the same in length. The fruit is 1 cm. long and 1.6–2 cm. broad, the wings being .5 mm. in the middle and .6–.9 mm. at the apex; they may be unequally developed, and in one case four wings were seen. The capsules are generally binate, on pedicels .6–1 m. long, and peduncles 7–8 mm. long, pubescent.

This species is very near *S. bracteosa* Warb., but is easily distinguished by the white bracts, the thinner column and fewer stamens of the σ flowers, and the different shape of the wings of the capsule.

SYMBEGONIA PARVIFOLIA Gibbs, sp. nov.

Herba, caule erecto, in sicco striato, rufo-pubescente, demum glabro. *Folia* minima, fere sessilia, anguste lanceolata, apice acuminata, basi obliqua, distanter et irregulariter dentata, supra sparse glanduloso-pilosa, subtus in nervis rufo-pubescentia. *Inflorescentia* sanguinea, terminalis, flores σ 1 vel 2 in axillis bractearum superiorum dispositi. *Perianthio* florum σ 2-segmentato, staminibus paucis in columnam tenuissimam ordinatis, antheris parvis, stipitatis. *Fructus* 3-alatus, alis erectis, protractis, falcatis, mucronulatis ut pedunculus glabris.

Hab. Arfak Mts., Angi lakes, Koebré Mt., in small high forest, 7000'. Fl. σ , Fr. Dec. 5644.

This little plant is 3.2 cm. high, branching towards the apex, with stem, leaves, and indumentum red; the stem is terete, 3 mm. thick at the base. Stipules are transparent, brown, \pm 5 mm. by 2 mm., with midrib produced as mucro \pm 1 mm. long. Largest leaf is \pm 3 cm. by 8.7 mm. The inflorescence is \pm 2 cm. long by .9 mm. with 2–5 pairs of red, ovate-lanceolate, petaloid bracts; the lower or lowest pairs may be sterile. The flowers are pink, on pubescent pedicels 1 mm. long. Perianth σ glabrous, conspicuously net-veined, 7 mm. long and 5 mm. across at the base of the segments, which enclose the \pm 4 cm. long column, of which the stamens are 5 mm. long. The fruit is 1.2 cm. by 7 mm., with wings 2 mm. broad halfway up and 4 mm. at the apex of the capsule.

This plant in its small stature and leaves is very distinct from all *Symbegonias* so far described.

MYRTACEÆ.

MYRTUS FLAVIDA Stapf in Hook. Ic. Pl. t. 2290, var. *GLABRESCENS* Gibbs, var. nov.

A type differt habitu glabrescente, foliis majoribus, internodiis longioribus, nervis lateralibus minus conspicuis.

Arfak Mts., Angi lakes, on S.W. ridge, where open on summit, 8000'.
Fl. Dec. 5503.

I have found it impossible to separate this plant from the Kinabulu species, which at first glance looks distinct, because of the white villous indumentum densely covering the young shoots. The leaves of the Arfak plant are quite glabrous on both sides, but no young shoots are present on the specimens. The yellow flowers, 1-16 in the axils of the leaves, are identical in size and structure, even to the small number of ovules, 10-12 in each loculus; in both plants the calyx and pedicels are villous. On skeletonising the leaves no radical difference was apparent in the arrangement of the veins.

Many of the Kinabulu high altitude plants from 7000-10,000' are characterized by hairy covering, due to the exposed conditions and cold nature of the soil. None of the Arfak plants, on the contrary, show this peculiarity, being less exposed to wind and sudden changes of temperature, and growing on well-drained granite gravel soil.

Myrtus flavida is noted by Stapf as the first Myrtle described for Malaya, and it still maintains interest as being, so far, the only species common to both N. Borneo and New Guinea; but Ridley has since described three from Mt. Carstensz, in Dutch S.W. New Guinea, at still higher altitudes, while *Eugenia scolopacina* Ridl. from the same locality is undoubtedly a *Myrtus*, very near the present species, and three more are included here.

MYRTUS (AUSTROMYRTUS) PROSTRATA Gibbs, sp. nov.

Frutex ramoso-prostratus, novellis pilosulis, demum glabratis. *Folia* breviter petiolata, parva, opposita vel verticillata, ovata, basi leviter cuneata, apice obtusa, margine revoluta, coriacea, utrinque glabra, supra nitentia, subtus pallidiora, rugulosa, glandulis rufis punctata. *Flores* subsessiles, in axillis foliorum 2-3 pedunculatis. *Calyx* turbinatus, ultra ovarium breviter productus, 4-lobatus, lobis erectis, angustatis, acutis. *Petala* 4, flavida, unguiculata. *Stamina* ∞ , biseriata, filamenta in alabastro inflexa. *Ovarium* 3-loculare, ovula biseriata. *Fructus* sphaericus, glaber, lobis calycinis coronatus. *Semina* plus minus irregulariter triquetra, compressa.

Hab. Arfak Mts., Koebré Mt., spreading on open burnt summit, 9000'.
Fl., Fr. Dec. 5601.

A densely spreading shrub with small leaves suffused with red, very closely arranged up the stem, which is cylindrical, clothed with a reddish papery cortex, very glandular on the young wood. Leaves \pm 1 cm. by 8 mm., with midrib slightly impressed on the upper surface and indistinct on the lower; petioles 4 mm. long, glandular. Peduncles sparsely villous when young, 2-3 mm. long. Flowers subtended by two villous, narrow-linear bracts 3 mm. long. Calyx-lobes villous when young, 2 mm. long, narrowing from a broad base. Petals glandular, 4 mm. by 1 mm. Stamens as long as or just exceeding the petals; anthers globose. Style thick,

5 mm. long. Ovary 1.5 mm. long. Fruit gland-pitted, 2.6 mm. by 3 mm. Seeds large, 2 mm. long.

This plant is nearest to *M. rufo-punctata* Panch., a New Caledonian species, but differs in the prostrate habit, ovate leaves, and pedunculate flowers.

MYRTUS (AUSTROMYRTUS) ARFAKENSIS Gibbs, sp. nov.

Frutex prostratus, valde ramosus, glaberrimus et glanduligerus. *Folia* opposita, petiolata, late elliptica, basi subattenuata, apice obtusa vel emarginata, margine revoluta, coriacea, supra in sicco fusciscentia, subtus pallidiora, pagina utraque glandulis rufis prominentibus conspersa. *Flores* cymosi, pedicellati, bibracteolati, cymis axillaribus, subpedunculatis, 3-floris vel solitariis. *Calyx* 4-lobatus, lobi triangulares, obtusi. *Petala* 4, flavida, unguiculata. *Stamina* ∞ , biseriata. *Stylus* filiformis. *Ovarium* biloculare, ovulis biseriatis. *Bacca* carnosa.

Hab. Arfak Mts., Angi lakes, S.W. ridge, on open steep slopes, 8000'. Fl., Fr. Dec. 5994.

In this plant the stems are terete, with the older wood dark brown in colour, the younger reddish and rugulose with larger glands; the small leaves are closely arranged up the branches, the younger shoots being reddish in colour. The leaves are ± 7 mm. by 5 mm., but with the incurved margins appear 3 mm. across; the midrib is thick, somewhat raised on the underside but not conspicuous. Petiole thick and glandular, 1.3 mm. long. The flowers form little subsessile cymes, or are on solitary pedicels $\pm 1-3$ mm. long, with small, triangular, translucent, gland-dotted bracts at the base of the calyx. Calyx-tube 2 mm. long, with obtuse lobes 1.5 mm. long and the same in breadth at the base. Petals suborbicular, ± 2 mm. by 1.5 mm. Stamens 4.5 mm. long, with minute globose anthers. Style 4 mm. long. Berry black, crowned by persistent calyx-lobes, 5 mm. by 5 mm.

This plant is nearest to *M. prostrata*, described above, and in the field was very similar in habit and appearance. It is easily distinguished by the entire glabrous and more glandular leaves, the longer stamens, and bilocular ovary.

MYRTUS (AUSTROMYRTUS) KOEBRENSIS Gibbs, sp. nov.

Frutex vel *arbor* parva, ramosissima; ramis cortice cinerascete obductis, tota planta utrinque glaberrima. *Folia* parva, ovata, obtusa; basi in petiolum brevem attenuata, margine leviter recurvata, glandulosa, coriacea. *Flores* 4-meri, axillares, solitarii vel bini, pedicellis foliis minoribus. *Calyce* tubo turbinato, basi bibracteolato. *Sepala* late obtusa, glandulosa. *Petala* flava, reflexa, basi unguiculata. *Stamina* biseriata. *Ovarium* biloculare. *Ovula* biseriata.

Hab. Arfak Mts., in shrubberies on open summit of Koebré Mt., 9000'. Fl. Dec. 5614.

A compact shrub to small tree, with very small leaves ± 9 mm. by 5 mm., smooth and shining above, with the midrib indistinct on both surfaces; petiole 1 mm. long. The flowers arise in the axils of the leaves

all along the branches, on pedicels 4 mm. long, with two small bracts at the base. Calyx-lobes triangular, 1 mm. long and 1 mm. broad at the base, obtuse to acute and erect in flower. Petals 2.5 by 1.5 mm., the lamina reflexed in flower. Stamens with filaments 3 mm. long; anthers minute. Style 3.5 mm. long. Ovary 2 mm. long by 1 mm. Pedicels, calyx, and ovary thickly gland-dotted.

This plant approaches some forms of *M. tenuifolia* (Sm.), Mez, but is distinguished by the glabrous glandular habit, much smaller leaves, and the yellow 4-merous flowers.

JAMBOSA (CLAVIMYRTUS) ARFAKENSIS Gibbs, sp. nov.

Arbor parva; ramuli teretes, saturate brunnei. *Folia* coriacea, opposita, petiolata, obovata, spathulata, rigida, verisimiliter impellucida, glabra, leviter recurvata, basi attenuato-cuneata, apice obtusa vel emarginata, supra crebre punctata, subtus parallele venosa, striolata. *Panicula* axillaris vel terminalis, cymoso-pauciflora, folia superiora excedens. *Flores* 1-3-ni. *Calycis* tubus turbinatus, basi attenuatus, limbi 4-fidi lacinia subaequales, persistentes. *Petala* alba. *Stamina* filamentis brevissimis stylum aequantibus. *Ovarium* biloculare.

Hab. Arfak Mts., S.W. ridge, 8000'. Fl. Dec. 5986.

Largest leaf 3.5 cm. by 2.5 cm., with the midrib impressed on the upper surface and prominent on the lower. Petiole \pm 5 mm. long. Cymes 3-4 cm. long, with first ternate, then racemulose branching; peduncles 2 cm. long. Flowers small, sessile or shortly pedicellate, with two small deciduous bracteoles at the base. Calyx-tube 3-4 mm. long. Stamens 1 mm. long. Style 1 mm. long. Ovary bilocular, with a slightly swollen placenta in the centre of the septum and four horizontal ovules in each loculus.

This plant is very distinct in appearance when dried, the small spathulate leaves being arranged in erect pairs up the chocolate-brown stems, which bear numerous inflorescences of the same colour.

BACKHOUSIA ARFAKENSIS Gibbs, sp. nov.

Frutex vel *arbor* parva; ramuli teretes, novellis plus minus fulvo-villosis. *Folia* opposita, petiolata, parva, ovata, basi angustata, apice acuta, tenuiter coriacea, leviter recurvata, supra glanduloso-punctulata, primo villosula mox glaberrima, nitentia, subtus densius atque dilutius villosa (imprimis in costa). *Flores* flavidi, in cymas pedunculatas oppositas dispositi. *Calycis* tubus late campanulatus, villosus, 5-partitus. *Petala* 5, ovata. *Stamina* corolla longiora, filamenta in alabastro inflexa, antherae parvae, globosae. *Stylus* longus, filiformis. *Ovarium* hirsutissimum, 3-loculare; ovula plurima. *Fructus* (immaturus) in sicco coriaceus. *Capsula* calyceem persistentem excedens, in coccos 3 facile partibilis.

Hab. Arfak Mts., common everywhere; Koebré Mt., edge of shrubberies, 9000'. Fl. Dec. 5616.—S.W. ridge, in small forest, 8000'. Fr. (yg.). Dec. 5999.

One of the commonest of the ridge plants, with a compact crown of

dark green foliage, covered with the small orange-yellow flowers. Leaves $\pm 1-1.5$ cm. by 6-8 mm., with midrib impressed on the upper surface. Petiole ± 2 mm., villous when young. Cymes 1.5 cm. long. Peduncle ± 5 mm. long, densely fulvo-villous. Pedicels 2 mm. long, with two unequal bracteoles at the base, 1-3 mm. long. Calyx-tube 1 mm. long; lobes 2.5 by 2 mm., concave, from a broad base acute. Petals ciliate, concave, broad at base, 4 by 3 mm. Stamens pluriseriate, longest ± 6 mm. in length. Style 6 mm. long. Ovary 1 mm. by 1.5 mm., almost superior. Fruit red, capsular, rising well above the calyx-tube, of which the persistent lobes spread stellately around the base. In each coccus dehiscence down the centre is indicated.

In the small vaccinioid leaves this plant is so far distinct in the genus. It approaches *B. aurea* Ridl., collected on Mt. Carstensz, in the non-petaloid lobes of the calyx, which distinguish both plants from the known Australian representatives of this genus, and the 3-celled ovary, but it differs in the dense pubescence of the young petioles and inflorescence, and in the small axillary cymes. The structure and size of the flowers is more or less identical in both species, the calyx being densely villous and the petals fringed in the Arfak plant, which is quite xerophytic in habit, rather recalling some species of *Leptospermum*.

METROSIDEROS ARFAKENSIS Gibbs, sp. nov.

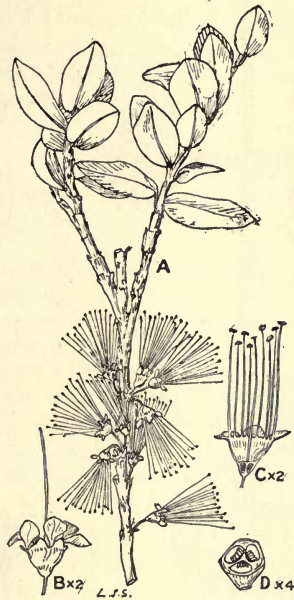
Arbor parva, tota glabra; ramuli teretes, junioribus quadrangularibus, cortice griseo. *Folia* parva, opposita, petiolata, ovato-obtusa vel acutiuscula, basi subcordata, plana vel leviter revoluta, coriacea. *Flores* rubri, pedicellati, pedicellis bi-bracteolatis, fasciculatis, fasciculis ex axillis foliorum delapsorum e ligno vetere oriundis. *Calycis* tubus campanulatus, 5-lobatus, lobis rotundatis, ciliatis. *Petala* 5, orbicularia, basi angustata, membranacea. *Stamina* circa 16 uniseriata, filamentis glabris, rubris, antheris cordatis, nigrescentibus. *Ovarium* inferum, triangulare, 3-loculare. *Stylus* longus, truncatus.

Hab. Arfak Mts., edge of forest by ♀ lake, 7000'. Fl. Dec. 5529.

Tree with slender erect branches, very few showing any flowers, which were only seen on the old wood. Flowering branches 3-6 mm. thick with internodes very close together, the point of insertion of the flower fascicles being raised. The small leaves are crowded towards the apices of the branches, the largest ± 2.2 cm. by 6 mm., gland-dotted, with raised midrib on both surfaces. Petiole 1.5 mm., flattened above. Flowers on glandular pedicels 4 mm. long, with two gland-dotted, narrowly linear bracteoles towards the base, ± 2 mm. long. Calyx gland-dotted, with tube 3 mm. long by 3.5 mm. broad at apex; lobes glandular, pellucid, 1 mm. long by 1.5 mm. broad. Petals 2 mm. long and the same in breadth. Stamens 1.3 cm. long. Anthers ± 5 mm. long. Style 1.1 cm. long, depressed in the centre of ovary, which is 1.5 mm. long with three prominent angles.

This plant is very near *M. ramiflora* Laut. from S.W. New Guinea, *ex descr.*, but is distinct in the small leaves. In this character it approaches *M. Regelii* F. Muell. from Mt. Musgrave in S.E. New Guinea, differing, however, in the fascicled flowers on the old wood.

FIG. 13.



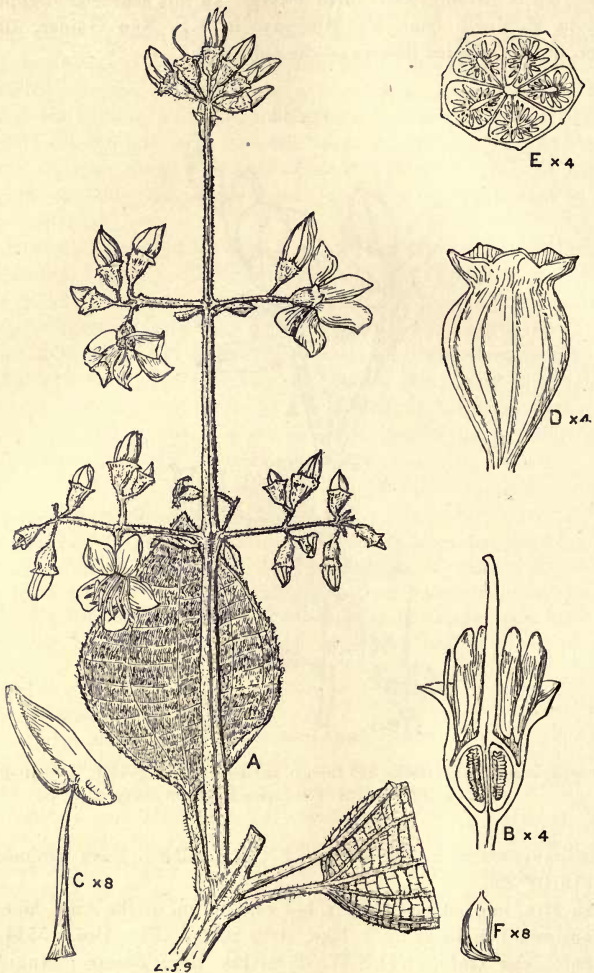
Metrosideros arfakensis Gibbs.—A. Branch, reduced; B. Flower; C. Longitudinal section of flower; D. Transverse section of ovary.

BECKEA FRUTESCENS L. Sp. Pl. ed. 1 (1753) 358; Nova Guinea, viii. (1910) 323.

Arfak Mts., in open spaces on ridge running up to the Angi lakes, and gregarious round spinneys by ♀ lake, 7000–8000'. Fl. Dec. 5514.

Distrib. New Guinea (D.N.W., Geelvink Bay, *Beccari*; Angi lakes *Pratt* (Herb. Kew.); D.S.W., *Gelieb*, *Brandenhorst*; S.E.). Indo-China, Malay Peninsula, Sumatra, Java, N. Borneo, Japan.

FIG. 14.



Poikilogyne arfakensis Bak. f.—A. Part of inflorescence, nat. size; B. Longitudinal section of bud showing inflexed stamens; C. Stamen; D. Capsule; E. Transverse section of ripe capsule; F. Ovule.

MELASTOMACEÆ. (E. G. BAKER.)

MELASTOMA MALABATHRICUM L., var. ADDRESSUM C. B. Clarke in Hook f. Fl. Brit. Ind. vii. 523.

Arfak Mts., Angi lakes, edge of forest by ♀ lake. Fl. Dec. 5934.

Distrib. Mergui to Singapore, Penang.

“Shrub, flowers pink.”

POIKILOGYNE, Bak. f., gen. nov.

Flores sæpius 5-meri. *Calycis tubus* campanulatus, pilis patentibus sparse indutus, limbus breviter 5-lobatus. *Petala* 5, oblonga, medioeria, apice acuta. *Stamina* 10, petalorum numero duplo, æqualia vel subæqualia. *Antheræ* medioeres, acuminatæ, subrectæ, sub anthesi inflexæ, connectivo basi non producto, antice inappendiculato, postice crasse calcarato. *Ovarium* ovoideum, 5-loculare, rarius 4- vel 6-loculare. *Ovula* in loculis numerosa, placentis prominulis angulo interiori loculis affixis inserta. *Stylus* filiformis, elongatus, stigmatè terminali. *Bacca* coriacea, obovoidea, longitudinaliter costata, limbo calycis coronata, 4-6-locularis. *Semina* minuta, numerosa.

Frutex vel *arbuscula*, ramis novellis indumento brevi dense indutis. *Folia* ovata, crassiuscula, 5-nervia, medioeria. *Flores* medioeres in paniculas terminales dispositi, ad extremitates pedunculorum verticillatim fasciculati, medioeriter vel breviuscule pedicellati. *Bracteæ* parvæ.

This genus is allied to *Omphalopus* Naud., but differs by having ten stamens instead of four, and by the structure of the fruit and anthers. It is allied to *Dissochæta pentamera* Burk., which should be transferred to this genus as *Poikilogyne pentamera* (Burk.) Bak. f.; but it differs from the genus *Dissochæta* in not having the two setiform appendages at the base of the connective. In bud the anthers are inflexed.

POIKILOGYNE ARFAKENSIS Bak. f., sp. nov.

Frutex vel *arbuscula*, ramis junioribus in siccò indumento brevi et purpureo dense indutis. *Folia* ovata, basi rotundata vel subcordata, margine serrata, 5-nervia, apice acuta vel subacuta, superne indumento aureo-brunneo dense obtecta, subtus costa prominente, nervis secundariis prominulis. *Flores* in paniculas terminales dispositi, pedicellis indumento brevi dense tectis. *Bracteæ* parvæ. *Calyx* extus pubescens, lobis brevibus. *Petala* oblonga, rosea. *Stamina* 10, æqualia vel subæqualia, connectivo basi postice calcarato, antice inappendiculato. *Bacca* coriacea, obovoidea, longitudinaliter costata, 4-6-locularis. *Semina* parva, numerosa.

Hab. Arfak Mts., Angi lakes, edge of forest. Shrub to small tree. Leaves up to 6 cm. long. Flowers lovely pink; living plants 1-stemmed up to 2.50 m. Fl., Fr. Dec. 5512.—Koebyé Mt., Angi lakes, 8060-9000'. Young!
2/11/12 Flowers pinkish red outside. Shrub or small tree. Dec. 5534.

Leaves 4-6 cm. long, 30-35 mm. broad; petiole 10-15 mm. long. Calyx ± 6 mm. long. Petals rose, ± 15 mm. long. Stamens 10. Anthers ± 4 mm. long. Berry coriaceous, 8-10 mm. long, 6-7 mm. broad.

POGONANTHERA HEXAMERA Bak. f., sp. nov.

Frutex, ramis obscure tetragonis sparse rufo-pubescentibus. *Folia* oblonga, apice basique acuta, supra demum glabra, subtus nervis rufo-pubescentibus, trinervia, petiolo rufo-pubescente instructa. *Paniculæ* terminales, pluri- vel multifloræ, bracteatae. *Bracteæ* lineares vel lineari-oblongæ. *Pedicelli* rufo-pubescentes. *Flores* hexameri. *Calycis tubus* campanulatus, dentibus acutis. *Petala* alba, acuta, carnosula. *Stamina* 12 æqualia, antheris lineari-lanceolatis apice 1-porosis, connectivo basi breviter postice auriculato antice inappendiculato. *Fructus* ignotus.

Hab. Arfak Mts., Koebré Mt., Angi lakes, edge of forest patches, 9000'. Fl., Fr. Dec. 5649.

Leaves 6–8 cm. long, 20–23 mm. broad; petiole 6–7 mm. long. Calyx-tube ± 5 mm. long. Petals 6–7 mm. long.

Noticeable on account of the rusty pubescence in the many-flowered panicles of hexamerous flowers, and the narrow, oblong, reddish bracts in pairs, and the white flowers.

MEDINILLA ARFAKENSIS Bak. f., sp. nov.

Frutex ad *M. speciosam* Blume et *M. myriantham* Merr. accedens, ramis 4-gonis vel brevissime 4-alatis ad nodos leviter incrassatis et barbatis. *Folia* opposita, sessilia, oblongo-lanceolata vel ovato-lanceolata, apice acuta basi late cuneata 7–9-plinervia, costa subtus conspicua. *Flores* minusculi, sæpius 5-meri in paniculas dispositi, quam in *M. speciosa* Blume minores. *Pedicelli* graciles, minute verrucosi. *Calycis tubus* campanulatus, verrucosus, limbo vix lobato. *Petala* alba, carnosula. *Stamina* 10 æqualia, connectivo postice calcarato, filamentis antheris paullo longioribus. *Ovarium* 5-loculare, stylo filiformi, stigmatibus punctiformi. *Fructus* ignotus.

Hab. Koebré Mt., Angi lakes, 8000–9000'. Fl. (white). Dec. 5597.

Leaves 16–18 cm. long, 6–6.5 cm. broad. Calyx ± 3 mm. long. Petals white, ± 6 mm. long. Anthers ± 2 mm. long.

The distinguishing characteristics are the opposite, sessile, 7–9-plinerved, ovate-lanceolate or oblong-lanceolate leaves, and the small white flowers in panicles, the calyx being externally somewhat warted and only ± 3 mm. long.

No. 6133, from lower ridge in high forest, must also probably be referred to the above.

MEDINILLA FORBESII Bak. f. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 55.

Arfak Mts., Angi lakes, common on edge of forest by ♀ lake, 7000'. Fl., Fr. Dec. 5736.

Distrib. New Guinea (D.S.W., Utakwa River to Mt. Carstensz, Kloss; S.E., Mt. Wariwari, Forbes).

“Shrub, inflorescence cauline at nodes all up the stem. Flowers white, petals pink, fruit red.”

HALORRHAGACEÆ.

*HALORRHAGIS MICRANTHA (Thunb.) R. Br. *ex* Sieb. et Zucc. Fl. Jap. Fam. Nat. i. 25.

Arfak Mts., Angi lakes, open marsh by ♀ lake, 7000'. Fl. Dec. 5918.

Distrib. India, Indo-China, China, Japan; N. Borneo, Philippines; Australia, Tasmania; New Zealand.

HALORRHAGIS SUFFRUTICOSA Gibbs, sp. nov.

Planta robusta, suffruticosa, erecta. *Folia* 3-4-verticillata, subsessilia, obovato-lanceolata, acuta, basi in caulem decurrentia angulum satis prominentem formantia, serrata, coriacea, supra glabra, nitida, subtus pilis albis sparsis adpressis inspersa, demum glabrata. *Inflorescentiæ* ad apices caulis dense racemoso-paniculatæ. *Flores* hermaphroditi, rubri, in bractearum axillis solitarii. *Calyx* 4-lobus, hirsutus. *Petala* 4. *Stamina* 8, filamentis tenuissimis, brevibus. *Ovarium* 4-loculare, 8-costatum. *Styli* 4 sessiles, stigmatibus papillosis.

Hab. Arfak Mts., Angi lakes, open marsh by ♀ lake, 7000', abundant. Fl. (♂ stage). Dec. 5555.—Fl. (♀ stage). 5942.

A shrubby herbaceous plant, also seen in the mossy forest on the crest of the S.W. ridge, the single shoots 1.2 m. high, rigid from the hard texture of the leaves, with hirsute stems 3 mm. thick. Leaves in crowded or more remote verticels, with hard spinous teeth and tips, 2 cm. by 1 cm., reticulately veined, with impressed midrib and inconspicuous cystoliths on the upper surface, while on the lower the midrib is raised and covered with hairs. Inflorescence spreading at the base, 11-16 by 2.5-8 cm. Flowers on hirsute pedicels 1.5 mm. Sepals 1.5 mm. long, acute to acuminate. Petals \pm 2.5 mm. long, boat-shaped, pilose on the cucullate apex, which is carinate, inflexed. Anthers 1.5 mm. long; filaments \pm .5 mm. long. Stigma red, \pm .5 mm. long.

The affinity is with *H. halconensis* Merr., but the plant is distinguished by the more robust habit, the glabrous, spinescent leaves and bracts, broader inflorescence, and the hirsute calyx with shorter lobes.

ARALIACEÆ.

SHEFFLERA (EUSHEFFLERA) ARFAKENSIS Gibbs, sp. nov.

Frutex parvus; ramuli glaberrimi, cortex (in sicco) flavescens, longitudinaliter striatus. *Folia* 5-digitata, glabra, longe petiolata; foliola inæqualiter petiolulata, petioluli ægre alati, ad apicem articulata; foliola obeuneata, apice obtusa, integerrima, incurvata, coriacea, nervis subtus magis prominentibus. *Inflorescentia* axillaris vel pseudo-terminalis, racemosa, racemi 1-4 in axillis foliorum superiorum dispositis, pedunculi pedicelli calycesque squamulosi. *Columna* styli in floribus subplana, in fructibus immaturis 5-angulata et leviter conico-elevata, apice in lobos 5 stigmaticos divisa.

Hab. Arfak Mts., Angi lakes, in forest by ♀ lake, 7000'. Fl., Fr. (yg.). Dec. 5621.

This plant is very small in all its parts; the largest leaf is .9 dm. by 9.5 cm. with petiole 1 dm. long; the petiolules vary from 1.5–2.5 cm., the two lateral ones being the shortest and bearing the smallest folioles, generally very unequal in size; the largest folioles are ± 7 cm. by 2 cm. with 5–6 lateral veins. The inflorescence is compound, composed of racemes grouped 1–4 in the axils of the upper leaves; the flowering racemes are ± 9 cm. by 4 cm. with peduncles 2–3 cm. long, the umbels are ± 1 cm. across and consist of 9–10 flowers, on pedicels ± 4 mm. long, each subtended by a minute bract. The fruiting racemes (immature) are 11 cm. long and chocolate-brown in colour when dried. Flowers green. Calyx 1.5 mm. by 1.7 mm. Petals angular acute, 2 mm. long. Stamens 1.5 mm. long, with ovate anthers .7 mm. long. Style $\pm .5$ mm. long. Fruit 5-ribbed with conical disc 3 mm. long; persistent style 1 mm. long.

The elongated style with five stigmatic lobes places this plant in the *Agalma* group. It is very closely allied to *S. monticola* Ridl., collected on Mt. Carstenz by Kloss, but differs in the larger leaves with much longer petioles and petiolules, the longer obtuse folioles, much narrowed into the petiolules, and in being much more sparsely squamulose.

SHEFFLERA (*EUSHEFFLERA*) *ANGIENSIS* Gibbs, sp. nov.

Arbor parva. Folia ampla, digitata, longe petiolata, petiolo glabro, vagina lata, in stipulam lanceolatam longe producto, squamulis setosis densissime obteeta; foliola 15, apice petioli verticillata, breviter petiolata, oblonga, basi obtusa, apice cuspidata vel obtusa, integerrima, coriacea, glabra. *Panicula* terminalis, rami pedunculati, florum capitula secus ramos paniculae racemosa, flores pedicellati, rhachis furfuracea. *Calyx* margine vix distinctus. *Corolla* et *stamina* non visa. *Discus* medio conicus, margine undulatus. *Ovarium* 5-loculare, semisuperum. *Styli* in columnam brevem connati, stigmatibus sessilibus. *Bacca* sessilis, 5-costata, apice convexa.

Hab. Arfak Mts., Angi lakes, edge of forest by ♀ lake, 7000'. Fl., Fr. (yg.). 5950.

A small tree with the habit of *Shefflera actinophylla* (F. Muell.) Harms. In the specimen leaf the petiole, including vagina, is 2–4 dm. long, the stipules being 2 cm. by 6 mm., very coriaceous in texture; the petiolules are comparatively thick and short, 1.5–3 cm. long; folioles vary from 7 cm.–1.7 dm. by 2.5–4.5 cm., all are more or less sharply cuspidate, though the cusp varies in length and may even not be developed; when dried the leaves are chocolate-brown in colour, with smooth upper surface, the lower being light brown and rugulose, with the veins showing faintly. The branches and the inflorescence are each 5.4 dm. by 3.5 cm., the small umbels on peduncles ± 1 cm. long consist of 10–12 flowers, on pedicels 3.5 mm. long, non-articulated, with minute scales almost forming little involucre at the base, 1 mm. long: these scales increase in size in fruit to 2 mm. long, as does also the furfuraceous covering of the rhachis. The

umbels in fruit become apparently capitate. The number of segments of the enormous leaves were counted in the field, while the measurements given for the length of the leaves include 1.2 dm. of the peduncle, which does not, however, represent its entire length. Calyx 3 mm. long. Disc and styles .7 mm. long. Fruit 4 mm. by 4 mm., semi-superior, with disc and styles 1 mm. long. Seeds laterally compressed, ± 3 mm. long.

This plant comes into *Eushefflera* on the strength of the pedicellate flowers, but the capitate heads of sessile fruit suggest *Cephaloshefflera*. In the pseudo-involucre of minute scales becoming longer in fruit, it seems distinct from either section. It belongs to the *Heptapleurum* group, in which the styles are joined in a short thick column.

KISSODENDRON BIPINNATUM Gibbs, sp. nov.

Arbor parva, glaberrima. *Folia* alterna, petiolata, bipinnata, 5-juga, imparipinnata; foliola petiolulata, lanceolato-ovata, integerrima, membranacea, basi acuta vel obtusa, inæquilatera, apice breviter acuminata. *Inflorescentia* axillaris, bipedata, maxime composita, pedunculi primarii bipedati, elongati; secundarii vel tertiarii verticillati vel oppositi, summi tertiarii umbellati, umbelluli 10-14-flori. *Flores* parvi, pedicelli articulati. *Calyx* 5-dentatus. *Petala* 5, lineari-lanceolata, apice longe carinata. *Filamenta* quam *antheræ* breviora. *Ovarium* triloculare. *Stylus* pyramidato-connatus. *Fructus* ignotus.

Hab. Arfak Mts., Angi lakes, edge of forest by ♀ lake, 7000'. Dec. 5581.

A small tree with large deltoid leaves aggregated towards the top, the inflorescences arising in the axils of the upper leaves; in dried condition the wine-brown colour of the stems and rhachis of both leaves and inflorescence is very characteristic. The petiole is 1.7 dm. long, dilated at the point of insertion, but contracted just above it, while the leaf is 3.3 dm. by 6 dm. at the base, with the lowest pinnæ 5-jugate and the upper 3-jugate, the largest folioles being 8.5 cm. by 3.6 cm., with petiolules 1.3 cm. long. The inflorescence (immature) is 4.5 dm. by 5.2 dm., with peduncle ± 12.5 dm. long. The secondary and tertiary branches are either opposite or verticillate, this arrangement being alternate to a certain extent; the secondary branches are terminated by one umbel (in specimen) of mature flowers, which is subtended by a whorl of tertiary umbels on much longer peduncles, interspersed with single pedicellate flowers, all the umbels being surrounded by involucre of small linear bracts; the tertiary peduncles are $\pm 4-5$ cm. long (very yg.) and bear bracts with, in some cases, single flower-buds in their axils at $\frac{1}{2}-\frac{3}{4}$ of their length. All the young parts are covered with a rusty tomentum. Petals 2.3 mm. by 1.4 mm. Stamens short and erect, with anthers 1.2 mm. with median insertion, and filaments 1 mm. long. Ovary 2.4 mm. by 1.3 mm. with 1 ovule in each loculus. Style 1 mm. in length.

This plant differs from the monotypic *Kissodendron australiensis* (F. Muell.) Seem. in the bipinnate leaves, the ovate-lanceolate shape of the

folioles, with a shining upper surface, and in the tertiary branching of the inflorescence

PALMERVANDENBROEKIA Gibbs, gen. nov.

Flores polygami. *Sepala* 5-dentata, basi dentibus lata, apice acuta vel acuminata. *Petala* 5, valvata, longe lanceolata, basi lata leviter adherentia, apice sensim attenuata, acuta, demum recurvata. *Stamina* 5, antheris dorsifixis, oblongis. *Ovarium* parvum, inferum, biloculare, loculis uniovulatis, ovulo ad apicem loculi pendulo, minuto, micropyle supera, raphe ventrali, discus planus, stylus magnus, pyramidato-connatus. *Folia* imparipinnata, foliola integra, petioluli basi articulati. *Umbella* parva, terminalis, pauciflora, pedicelli floribus circiter æquilongi, apice articulati.

This genus is intermediate between *Kissodendron* and *Polyscias*. In the pyramidal connate style it resembles the former, but in form of calyx, petals broad at the base and slightly cohering, with the 2-celled ovary, it is nearer the latter. In the small imparipinnate leaves and simple umbels it, indeed, somewhat resembles the most reduced forms of *Polyscias sambucifolius* (Lieber) Harms, in habit. As a genus it is distinct in the long tapering petals, separating at the apex and subsequently recurved, in the massive style, and extremely small ovary.

PALMERVANDENBROEKIA PAPUANA Gibbs, sp. nov.

Frutex glaber. *Folia* parva, imparipinnata, petiolata, petioli basi articulati, foliola 7, breviter petiolulata, oblique obovata vel oblanceolata, basi cuneata, apice attenuata, angusta, abrupte emarginata vel obtusa, integerrima, incurva, membranaceo-chartacea. *Umbella* parva, terminalis, 6-7-flora, pedunculata, basi bractea unica, foliolis simili. *Petala* albida, longe lanceolata, apice attenuata acuminata. *Calyx* repandus, 5-dentatus. *Stamina* erecta, filamentis quam antheræ triplo longioribus. *Stylus* unicus, conicus, elongatus. *Discus* planus. *Ovarium* parvum, biloculare, in sicco sulcatum. *Fructus* ignotus.

Hab. Arfak Mts., Angi lakes, on S.W. ridge, in shrubby growth, 8000'. Fl. Dec. 6003.

In the only specimen of this interesting plant the cortex is striate, light grey in colour, thin and papery. The leaves are greenish grey when dried, 8 cm. by 3-4 cm., including the 4-angled petiole \pm 2 cm. long; the petiolules are slightly 4-winged, .5 cm. long; the laminæ of the largest folioles are \pm 4.5 by 1.2-1.4 cm., the latter are often oblique, broader on one side than the other, the midrib prominent and projecting on both surfaces with 5-7 inconspicuous lateral veins, parallel in arrangement. Single umbels 1.5-3.5 by 1.6 cm. deep, on peduncles \pm 2 cm. long; pedicels 7-8 mm. long, each subtended by a minute scale. Petals 8.5 by 1.4 mm. Anthers 1 mm., filaments 2 mm. long. Ovary and style 3.2 mm. long, the style 2 mm. long and 1 mm. broad at base.

It is a great pleasure to name this interesting new genus after Mr. Palmer

van den Broek, who, during the long time he held the Residency of Ternate, identified himself with many scientific interests and to whom I was much indebted for most courteous help and interest in the successful issue of my work.

FIG. 15.



Palmervandenbroekia papuana Gibbs.—A. Branch, nat. size; B. Longitudinal section of bud; C. Very young fruit; D, E. Stamen.

ANOMOPANAX ARFAKENSIS Gibbs, sp. nov.

Frutex vel *arbor* parva, glaberrima. *Folia* alterna, longe petiolata, ampla, digitata; foliola ad apicem petioli verticillata, breviter vel longiuscule petiolata, valde inæqualia, chartaceo-membranacea, basi acuta vel rotundata, apice longe acuminata, margine integra vel grosse et remote sinuato-dentata. *Panicula* terminalis, amplissima, ramosissima, foliis longior. *Petala* albida, obovato-lanceolata, basin versus sensim cuneatim angustata. *Fructus* didymus, brunneus, compressus; pyrena obliqua. *Flores* effæti et fertiles in panicula commixti.

Hab. Arfak Mts., Angi lakes, edge of forest by ♀ lake, 7000'. Fl., Fr. Dec. 5582.

The petiole is ± 2 dm. long by 7 mm. broad, pithy, and markedly contracted immediately below the insertion of the petiolules, which are thick and of unequal length, the lateral ones being 1.5 cm., while two of the four lateral median are 4 cm., and the central 5.6 cm. long, respectively. The leaflets are very unequal in size and shape, the two small lateral ones being 1.4 dm. by 4 cm., with entire laminæ narrowed obliquely into the petiolules at the base, and long acute acumen, 2 cm. in length; the median folioles are from 1.5–2 dm. by 7.9 cm., rounded at the base, lengthily acuminate, entire below and remotely sinuate-dentate above. The compound inflorescence is 1.8 by 4.5 dm., composed of 10 primary rays with involueral bracts 2 cm. by 5 mm., the secondary rays varying from 9–11 cm. long, and bearing 3–16 umbellules, 7 predominating in number; these secondary rays often bear a small bract some distance below the umbellules and show cymose branching and often tertiary cymose-umbellate ramifications. The peduncle of the inflorescence is ± 1.8 dm. long, pithy, rising in the axil of a digitate 3-jugate bract or small leaf, broadly sheathing at the base, with very unequal leaflets. Flowers on pedicels varying in length, articulated under the flowers. Calyx-lobes 5, acute, 1 mm. long. Petals obovate-lanceolate, 2 mm. long, narrow at the base, with the apex incurved for half the length. Stamens 5; filaments 1 mm. long; anthers .5 mm. long. Disc crenulate with 2 short thick styles 1 mm. long, erect in flower, recurved in fruit. A few ♂ flowers of typical structure are mixed with the ♀, of which in one case 8 calyx-lobes and stamens were present, and sometimes the parts were in fours. Fruit green when collected, brown when dried, 1.5–1.8 cm. by 1.4–5 cm., the pyrenes separating on maturity. Embryo foliose.

The only point in which this plant differs from *Mackinlaya* is the structure of the mericarps and the embryo. In *Mackinlaya*, the former are plane on the surface, with thin exocarp and horny endocarp, both well differentiated and separating easily; the integument is thick, brown in colour, while the embryo is plane, homogeneous, and hard ("albumen homogeneum, indurans"). In the present case the separate pyrenes are more oblique, showing excavation on the wings, with no differentiation of exocarp and endocarp; the integument is membranous, light brown, and transparent; the embryo tapers to the base, is slightly folded, and very soft in consistency. As the tapering endosperm does not fill up the cavity in the pericarp, a furrowed surface results. I have not examined critically the other species of *Anomopanax*, but macroscopically this difference seems to hold for the genus, though not given by Harms in his diagnosis.

UMBELLIFERÆ.

CENTELLA ASIATICA (L.) Urb. Fl. Brasil., Umbellif. 287; Schum. & Laut. 486.

Arfak Mts., Angi lakes, open marsh by ♀ lake, 7000'. Fl., Fr. Dec. 5920.

Distrib. N.E. New Guinea and Caroline Islands. Wide in both hemispheres, except Europe, to Tasmania, New Zealand, and Patagonia.

*HYDROCOTYLE VULGARIS L. Sp. Pl. ed. 1, 234; Schum. & Laut. 487.

Arfak Mts., abundant in parts in open marsh by ♀ lake, 7000'. Fl., Fr. Dec. 5943.

Distrib. Marshall Islands. Europe, through Transcaucasia to Caspian Sea (*Astara* & *Enzeli*). N.E. to S.W. Australia. N. and S. America and West Indies.

This is apparently the first record of this plant for E. Asia, as well as New Guinea.

HYDROCOTYLE JAVANICA Thunb. Diss. Hydroc. n. 17, t. 2; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 62.

Arfak Mts., Angi lakes, in Papuan "kebuns" at foot of Koebré ridge, 7000'. Fl., Fr. Dec. 5650.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*). Malay Peninsula and Archipelago, Philippines; India, Ceylon, Indo-China; China and Japan.

DIDISCUS KOEBRENSIS Gibbs, sp. nov.

Planta perennis, glaberrima; radix sat robusta; caules decumbentes, radiatim dispositi. *Folia* parva, ad nodos rosulata, in petiolum sensim abeuntia, 3-lobata, lobis plerumque unodontatis. *Umbella* multiflora, involucrem polyphyllum, parvum, pedicellis parvis. *Calyx* dentibus 2-3, plerumque protractis, subulatis, ceteris obsoletis. *Petala* parva. *Fructus* carpello uno abortivo vel minore; mericarpia compressa, 6-vittata, apice plus minus acuta, basi rotundata. *Stylus* elongatus. *Carpophorum* indivisum, persistens.

Hab. Arfak Mts., Koebré Mt., abundant on open burnt summit plateau. 9000'. Fl., Fr. Dec. 5606.

A plant of rosulate habit, with smooth reddish stems, 4 dm. long or less, each shoot being densely invested with the old leaf-bases and bearing rosettes of leaves at the nodes. The leaves are gradually narrowed into the slender ± 2.5 cm. long petiole, with obtusely cordate lamina, ± 1.5 by 5 mm.; towards the apex of the branches the petioles are shorter and the lamina larger, ± 2 by 1 cm. The umbels are 1.5 cm. across with many linear involucre leaves, $\pm .5$ mm. long, on naked stalks, ± 11 cm. long, arising singly from the apical rosettes of leaves. The minute flowers are 4 by 2 mm., on pedicels ± 8 mm. long. Calyx-teeth ± 5 mm. long. Petals 1.5 by 1 mm. Fruit 2 mm. across, with mericarps ± 2.5 mm. long.

This plant makes the third in Domin's *Pseudocalycina* group with long drawn-out calyx teeth; in habit and shape of leaves it agrees with *D. saniculaefolius* (Stapf) Merr., var. *novo-guineensis* Dom., from Mt. Scratchley in S.E. New Guinea, to which it is probably allied, but in the little material available of the latter it is impossible to determine the form of the calyx teeth.

DIDISCUS ARFAKENSIS Gibbs, sp. nov.

Planta perennis; caules erecti vel decumbentes, glabri, teretes, tenuiter striati, remote foliati. *Folia* alterna, petiolata, petiolis basi dilatatis, longe setosociliolatis, ad basin quasi 3-5-partita, laxe setoso-pilosa. *Scapi* in axillas foliorum teretes, nudi. *Umbella* multiflora, pedicellis glabris, compressis, floribus multo longioribus, involucrem polyphyllum, foliola lineare-lanceolata, 1-2 dentata. *Calycis* dentes 5, deltoidei, persistentes. *Petala* alba, obovata, apice acuta, plus minus inflexa. *Fructus* a latere valde compressus, late cordato-rotundatus; mericarpia aequalia, glaberrima, 3-vittata.

Hab. Arfak Mts., on ridge running up to the Angi lakes, 8000'. Fl., Fr. (yg.). Dec. 5513.

A plant with spreading radiating branches ± 3 dm. long. Radical leaves on petiole ± 4.5 cm. long are 3 cm. long and ± 4 cm. across, broadly rotundate, 3-partite, each part 2-3-lobed, the lobes further divided into unequal rounded-acute teeth, with white setose hairs in the sinuses and along the veins. The leaves on the branches occur singly at each node, at diminishing intervals, from 10 cm., up the stems, with sparsely setose petioles, the longest being $\pm 3-5$ cm.; the laminae are more finely divided than is the case in the radical leaves and are somewhat pentamerous in outline, ± 5 cm. across and 2.5 cm. long, 3-partite, the two lateral parts being divided again to the midrib, so that they appear 5-partite. Peduncles ± 2 cm. long arise singly in the axils of the upper leaves, bearing umbels 1 cm. long by 1.5 cm. broad, the involucre equalling or slightly exceeding the pedicels, ± 6 mm. long. Flowers 2.5 mm. across. Stamens ± 1.5 mm. long; anthers .5 mm. long. Style .5 mm. long. Mericarps immature, 3-ribbed.

This species belongs to Domin's *Calycina* group (p. 42) with calyx of five triangular teeth, and is nearest to *D. saniculafolius* (Stapf) Merr., var. *brachystylus* Dom., from Mt. Scratchley; it is more robust in habit and less hirsute, but may prove identical on more material becoming available. Domin considers the *Calycina* group in *Didiscus*, which includes the palæotropic species, to represent the more ancestral branch of the family; *Pseudocalycina* showing atavistic tendencies. To quote Domin, "the presence of the calyx teeth in the endemic species in the Malayan and Papuan provinces, also in the Queensland *D. geraniifolius* (Bail.) Dom., must be considered as an older and more ancestral condition." The addition of two more species in these groups to the New Guinea Flora certainly confirms the correctness of this view. The four species now known from the mountains of Malaya include *D. celebicus* (Hemsley) Dom., from Bonthain Peak, 10,000', in S. Celebes; *D. saniculafolius*, from Kinabalu, 7000-13,000', Mt. Halcon in the Philippines, 7300', and New Guinea at 10,000', with the above.

EPACRIDACEÆ. (J. J. SMITH.)

STYPHELIA NUTANS J. J. S. in Nova Guinea, viii. (1912) 800, t. cxlv.

Var. *ARFAKENSIS* J. J. S., var. nov.

Frutex ramosus, ramulis tenuibus, sicco angulatis, pubescentibus, dense foliatis. *Folia* pulvinis inserta, alterna, patentissima, brevissime petiolata, lanceolata, plerumque leviter acuminata, acuta, minutissime erecto-ciliolato-serrulata, c. 5-7-nervia, nervo intermedio et interdum nonnullis sequentibus supra impressis, coriacea, supra nitidula, subtus pallidiora, c. 0.75-1.2 cm. longa, 0.125-0.225 cm. lata; petiolus a dorso compressus, puberulus, c. 0.075-0.1 cm. longus. *Inflorescentiæ* terminales, brevissimæ, breviter pedunculatæ, dense 5-6-floræ, pedunculo squamis imbricantibus adpressis tecto, cum rhachide puberula c. 0.3-0.4 cm. longo. *Bracteæ* persistentes, flori adpressæ, late ovato-triangularæ, obtusæ, concavæ, ciliolatæ, intus puberulæ, dorso prominenter nervosæ, pergamaceæ, bene 0.1 cm. longæ, 0.1 cm. latæ. *Flores* sessiles, toti c. 0.5 cm. longi. *Bracteolæ* adpressæ, orbiculari-ovatæ, obtusiusculæ, concavæ, ciliolatæ, intus puberulæ, dorso prominenter nervosæ, pergamaceæ, c. 0.15 cm. longæ et latæ. *Calyx* alte 5-partitus, laciniis adpressis, imbricatis, ovatis, obtusis, concavis, ciliolatis, intus puberulis, dorso prominenter nervosis pergamaceis, c. 0.18-0.2 cm. longis, 0.13-0.16 cm. latis. *Corolla* ample tubulosa, ad c. $\frac{2}{3}$ partes infra apicem 5-fida, extus glabra, intus $\frac{3}{4}$ partibus superioribus apice laciniarum excepto laxius villosa, explanata c. 0.36 cm. longa, fere 0.5 cm. lata, laciniis erectis (semper?), triangulis, obtusis vel subacutis, dorso elevato 5-nervis, c. 0.125 cm. longis, fere 0.1 cm. latis. *Stamina* 10; filamentum adnatum, quam anthera latius, apice tantum liberum; anthera deflexa, parva, laciniis corollæ multo brevior, oblonga, curvata, c. 0.05 cm. longa. *Pistillum* e basi depresso-globosa angulata conicum, in stylum attenuatum, glabrum, c. 0.225 cm. longum, 0.12 cm. diam. *Discus* cupuliformis, 5-lobus, extus longitudinaliter 5-sulcatus, glaber, vix 0.05 cm. altus, bene 0.1 cm. diam., lobis angulato-rotundatis, repandis, concavis. *Fructus* globosus, 10-locularis, loculis 1-spermis.

Arfak Mts., Angi lakes, ridge between ♂ and ♀ lakes, undergrowth in open forest, 7500'. Fl. Dec. 5631.

Distrib. (of type). New Guinea (D.S.W., Hellwig Mts., von Roemer, van Nouhuys).

Provisionally, I have described this plant as a variety of *S. nutans* J. J. S. The branchlet I have seen is more tender than the type-specimen, with thinner, distinctly angled twigs, and smaller leaves with a densely downy petiole. The flowers hardly show differences. Better material, perhaps, would show that the plant ought to get specific rank.

The flowers are said to be white.

STYPHELIA GJELLERUPII J. J. S. in Nova Guinea, xii. (1915) 540, t. ccxx.

Arfak Mts., Koebéré ridge, between ♂ and ♀ lakes, on open burnt summit plateau, 9000'. Fl., Fr. Dec. 5604.

Distrib. New Guinea (D.N.W., Arfak Mts., Angi lakes, Gjellerup).

Shrub, flowers white, berries pink.

STYPHELIA TROCHOCARPOIDES F. Muell. Pap. Pl. i. 107.

Arfak Mts., Angi lakes, edge of forest patch by ♀ lake, 7000'. Fr. Dec. 5583.

Distrib. New Guinea (D.N.W., Arfak Mts., near Hatam, *Beccari*).

The specimen seen is only in fruit, but I have no doubt that the determination is right.

Small tree, flowers white, berries black.

ERICACEÆ. (J. J. SMITH.)

The number of Ericaceæ amounts to 17, representing 14 species, viz. 6 *Rhododendron* (2 new), 1 *Diplycosia* (new), and 7 *Vaccinium*, of which 4 are new, whereas the remaining 3 are forms or varieties of previously described species.

RHODODENDRON UNDULATICALYX J. J. S., sp. nov.

Frutex, innovationibus c. 5 cm. longis, inferne nonnullis cicatricibus foliorum rudimentarium instructis, ramulis teretibus, glabrescentibus. *Folia* c. 3-4 spurie verticillata, petiolata, obovata et elliptica, obtusiuscule vel acute acutata, obtusa vel rotundata, basi acuta vel obtusiuscula, brevissime in petiolum acuminata integerrima, supra sparse lepidota et basi minute puberula glabrescentia, subtus siccò pallida densius sparse minute lepidota, in utraque parte costæ mediæ subtus obtuse prominentis nervis lateralibus c. 7 patentibus satis irregularibus intra marginem anastomosantibus tenuibus siccò supra subtusque prominulis, venis supra subtusque partim prominulis, coriacea, c. 3.6-5.7 cm. longa, 2-2.8 cm. lata; petiolus subsemiteres, minute puberulus et parce lepidotus, c. 0.6-0.8 cm. longus. *Inflorescentiæ* c. 5-floræ, rhachide breviter conica. *Bracteæ* (1 adest) lineares, apice paulo dilatatæ serratæque, acutæ, ciliolatæ, c. 1.3 cm. longæ. *Flores* mediocres, pedicello tenui, tereti, minute puberulo et parce minute lepidoto, bene 1 cm. longo. *Calyx* valde undulatus, obliquus, subquinque-lobulatus, ciliolatus, c. 0.275 cm. diam. *Corolla* oblique hypocrateriformis, curvata, 5-loba, extus glabra, non lepidota, intus in tubo puberula, explanata c. 3.25 cm. longa, limbo 2.85 cm. lata, tubo obliquo c. 1.6-2.15 cm. longo, 1 cm. lato, lobis ovalibus vel plus minusve obovatis, 4 obliquis, 1 recto, rotundatis, c. 0.9-1 cm. longis, 0.63-0.8 cm. latis. *Stamina* 10, c. 2.37-2.73 cm. longa; filamentum lineare, fere $\frac{2}{3}$ partibus inferioribus parcius hirtello-puberulum; anthera dorsifixæ, oblonga, basi retusa, apice oblique truncata, thecis antice sulco separatis poro introrso obliquo subsemirotondo hiantibus, c. 0.225 cm. longa. *Ovarium* subfusiformi-conicum, 10 sulcatum, erecto-patenter villosulum, c. 0.4 cm. longum; stylus filiformis, teres, ina basi tantum pilosus, apice in stigma capitatum manicatum incrassatus, c. 1.9 cm. longus. *Discus* annularis, 10-dentatus, pubescens, inferne glaber, c. 0.175 cm. diam.

Hab. Arfak Mts., Angi lakes, edge of forest patch by ♀ lake, 7000'. Fl. Dec. 5549.

Very near *Rh. angiense* J. J. S., but differing in the downy pedicels, undulate calyx, non-lepidote corolla: from *Rh. arfakianum* Becc., which also has a glabrous corolla, in the corolla-lobes not being twice as long as the tube and the separated non-ovate anthers.

A shrub with pink flowers,

RHODODENDRON ANGIENSE J. J. S. in Nova Guinea, xii. (1914) 133, t. xxx B.

Arfak Mts., Koebré Mt. between ♂ and ♀ lakes, open burnt summit plateau, 9000'. Fl. Dec. 5618.

Distrib. New Guinea (D.N.W., Arfak Mts., Angi lakes, *Gjellerup*).

Shrubby, flowers pink.

RHODODENDRON LÆTUM J. J. S. in Nova Guinea, xii. (1914) 139, t. xxxv.

Arfak Mts., Angi lakes, general on edge of forest, spinneys, and on open marsh by ♀ lake, 7000'. Fl., Fr. Dec. 5505.

Distrib. New Guinea (D.N.W., Arfak Mts., Angi lakes, *Gjellerup*).

Shrub, 0.5-1.5 m.; splendid yellow flowers, borne abundantly, when older suffused with red.

RHODODENDRON GIBBSLÆ J. J. S., sp. nov.

Frutex, ramulis adultis glabris, innovationibus c. 4.75-6 cm. longis, infra folia cicatricibus c. 3-4 foliorum rudimentarium notatis. *Folia* c. 5-6 spurie verticillata, breviter petiolata, elliptica ad obovata, plerumque breviter acuminata, subacuta vel anguste obtusa, basi subacuta obtusa vel subrotundata, integerrima, margine in sicco recurva, adulta supra glabra, subtus leviter impressa lepidota, costa media supra sulcata subtus obtuse prominente, nervis lateralibus subobsoletis satis irregularibus patentibus intra marginem anastomosantibus subtus non vel vix prominentibus supra leviter insculptis c. 6-7 utrinque, coriacea, c. 2.4-4.9 cm. longa, 0.85-2.65 cm. lata; petiolus bene semiteres, supra sulcatus, sicco longitudinaliter rugulosus, cum costa media subtus lepidotus, c. 0.225-0.4 cm. longus. *Inflorescentiæ* c. 4-5-floræ. *Flores* majusculi, pedicello tenui, puberulo, parvissime lepidota, c. 1.4-2.4 cm. longo. *Calyx* minimus, oblique discoideus, 10-lobulato-undulatus, extus patentissime pubescens, c. 0.25 cm. diam. *Corolla* hypocrateriformis, 5-loba, basi tubi reverse obtuse 5-loba, extus margine loborum excepto parce lepidota, intus glabra, explanata c. 4 cm. longa, tubo explanato c. 2.1-2.2 cm. longo, 1.4 cm. lato, lobis subobovatis, rotundatis, c. 1.7-1.8 cm. longis, 1.3-1.6 cm. latis. *Stamina* 10, c. 2.4-2.8 cm. longa; filamentum lineare, dimidio inferiore fere præsertim superne parcius patentissime pilosum, dimidio superiore glabrum; anthera supra basin dorsifixæ, oblonga, basi obtusa, c. 0.25 cm. longa, thecis parallelis, antice sulco separatis, poro obliquo apicali laterali dehiscentibus. *Ovarium* conicum subquinqungulare, dense patent sicco pallide villosum, c. 0.6 cm. longum, apice in stylum teretem $\frac{2}{3}$ partibus inferioribus dense superne parcius patentissime villosulum parte superiore glabrum cum stigmate capitato 5-lobato manicato c. 2.25 cm. longum contractum. *Discus* annularis, radiato 10-dentatus, superne et in dentibus villosus, c. 0.25 cm. diam.

Hab. Arfak Mts., Angi lakes, open marsh by ♀ lake, 7000'. Fl. Dec. 5535.

Amongst the Papuan species of the *Rh javanicum* Benn. group this is characterized by the small undulate calyx and the corolla glabrous inside. The leaves resemble those of *Rh. latum* J. J. S.

Only one open flower was on the material.

From the note of Miss Gibbs the flowers are bright red.

RHODODENDRON DEVRIESIANUM Kds. ! in Nova Guinea, viii. (1909) 185 ; viii. (1912) t. cli ; xii. (1914) 141.

Arfak Mts., Angi lakes, edge of forest and spinneys, in open marsh by ♀ lake, 7000'. Fl., Fr. (yg.). Dec. 5541.

Distrib. New Guinea (D.N.W., Arfak Mts., Angi lakes, *Gjellerup* ; D.S.W., Resi Rücken, *Versteeg*).

Magnificent white flowers, pink when older.

RHODODENDRON VONROEMERI Kds. ! in Nova Guinea, viii. (1912) 879, t. clv.

Arfak Mts., Angi lakes, in open marsh by ♀ lake, abundant, 7000'. Fl. Dec. 5554 & 5714.—The like in spinneys by ♀ lake, undergrowth in forest, 7000'. Fl. Dec. 5923.

Distrib. New Guinea (D.N.W., Cyclops Mts. ; Arfak Mts., Angi lakes, *Gjellerup* ; D.S.W., Hellwig Mts., *von Roemer*).

Shrub, flowers yellow.

DIPLYCOSIA LILIANÆ J. J. S., sp. nov.

Erutex, ramulis setis longis patentibus apicem versus attenuatis apice paulo incrassatis vestitis. *Folia* alterna, pulvinis inserta, patentia, petiolata, elliptica, sæpe plus minusve obovata, apice obtusa vel rotundata, apiculo lato obtuso a dorso compresso antice convexo dorso plano terminantia, basi obtusa vel cuneata, breviter in petiolum acuminata, subintegerrima, non raro insertionibus pilorum obsolete crenulata, setoso-ciliata, supra glabra, subtus sparse patenter setosa, 3-5-plinervia, nervis supra insculptis, basilaribus adscendentibus curvatis superioribus usque ad apicem productis, sicco rigide coriacea, supra nitidula et rugulosa, subtus opaca, c. 1.5-4.3 cm. longa, 0.85-3.5 cm. lata ; petiolus supra sulcatus, setosus, c. 0.25-0.5 cm. longus. *Inflorescentiæ* axillares, fasciculares, c. 2-3-floræ. *Flores* nutantes, pedicello tereti, basi leviter incrassatus, setis longis patentibus apice leviter incrassatis et sæpe incurvulis densius vestitis, c. 0.525-0.8 cm. longo, apice sub flore bracteolas 2 oppositas divaricatas ovato-semiorbiculares obtusas basi utrinque rotundatas concavas ciliolatas dorso setosas fere 0.1 cm. longas 0.13 cm. latas gerente. *Torus* supra bracteolas contractus. *Calyx* 5-partitus, c. 0.525 cm. diam., laciniis patentibus, ovato-triangularibus subacutis vel obtusiusculis, interdum apiculatis, concavis, ciliolatis, intus glabris, dorso margine excepto dense et longe patenter sicco ferruginæ setosis, c. 0.23-0.25 cm. longis, 0.175-0.2 cm. latis. *Corolla* cylindrico-urceolata, 5-loba, utrinque glabra, explanata c. 0.63 cm. longa, 0.75 cm., limbo 0.65 cm. lata, lobis recurvulis, triangularibus, apice contractis obtusis. *Stamina* 10, undata, c. 0.475 cm. longa ; filamentum lineare, inferne leviter dilatatum, minutissime papillosum, explanatum c. 0.36-0.375 cm. longum, anthera in $\frac{1}{3}$ supra basin dorsifixa, oblonga, ad $\frac{1}{3}$ infra apicem bifida, basi valde oblique obtuse 4-lobula, apice excepto echinulato papillosa, c. 0.15-0.16 cm. longa, thecis parallelis, antice sulco separatis, sulco longitudinali oblique laterali instructis, poro introrso hiantibus, pariete postico triangulo-productis apice obtusis incurvisque. *Ovarium* superum, medio alte excavatum ; stylus basi in excavationem ovarii immersus, teres, obtusus, glaber, totus c. 0.27 cm. longus. *Discus* e squamis 10 adpressis oblongo-triangularibus c. 0.04 cm. longis.

Hab. Arfak Mts., ridge running up to Angi lakes, undergrowth in moss-grown forest, 7500-8000'. Fl., Fr. (yg.). Dec. 5518.—Koëbré ridge, common in forest on open summit. Fl. Dec. 5630.

The only known species of *Diplycosia* from the Arfak Mountains is *D. Soror* Becc. From this *D. Lilianæ* J. J. S. differs in the longer pedicels and diverse sepals, which in *D. Soror* are only ciliate. The corolla, stamens, and pistil of the latter are unknown.

A low shrub, flowers red with white tips, young fruit red.

VACCINIUM LEPTOSPERMOIDES J. J. S. in Nova Guinea, xii. (1914) 154, t. xlii.

Forma GLABRUM.

Differt a forma typica ovario calyceque glabro.

Arfak Mts., ridge running up to Angi lakes, terrestrial in forest, 8000'.
Fl. Dec. 6012.

Distrib. (of type). New Guinea (D.N.W., Arfak Mts., Angi lakes, *Gjellerup*).

Small undershrub, flowers red-pink.

VACCINIUM GLOBOSUM J. J. S. in Nova Guinea, xii. (1914) 155, t. xliii.

Var. LATIFOLIUM J. J. S., var. nov.

Folia quam in typo latiora, ad c. 1 cm. longa, 0.43 cm. lata, retusa. Pedunculus longior, minute puberulus, c. 0.25-0.3 cm. longus.

Arfak Mts., Angi lakes, marsh edge by ♀ lake, open, 7000'. Fl., Fr. Dec. 5946.

Distrib. (of type). New Guinea (D.N.W., Arfak Mts., *Gjellerup*).

This differs from the type-specimen by its broader leaves and longer, shortly hairy peduncle.

A shrub with white flowers and black berries.

VACCINIUM CYCLOPENSE J. J. S. in Nova Guinea, xii. (1914) 156, t. xliiv.

Var. ARFAKENSE J. J. S., var. nov.

Folia quam in typo angustiora.

Arfak Mts., ridge running up to Angi lakes, epiphytic in moss-grown forest, 8000'. Fl. Dec. 5715.

Distrib. New Guinea (D.N.W., Cyclops Mts., *Gjellerup*).

Much more material is wanted to decide whether the variety may stand or not.

Spreading against trunk of tree; flowers red with green tips.

VACCINIUM VILLOSIFLORUM J. J. S., sp. nov.

Erutex bene ramosus, ramulis teretibus, villosis, dense foliatis. *Folia* alterna, parva, breviter petiolata, elliptica, basi apiceque obtusa, integerrima, margine in sicco recurva, glandula marginali parva impressa 1 vel interdum paucis utrinque supra basin, convexa, supra subtusque parce villosula, utrinque ad basin et in costa media densius pilosa, subtus sparse minute fusce muriculata, ciliata, 5-plinervia, nervis basilaribus adscendentibus curvatis, ceterum nervis brevibus patentibus 1-2 utrinque, nervis omnibus intra marginem anastomosantibus cum venis in sicco supra subtusque praesertim supra prominulis, coriacea, c. 1-1.8 cm. longa, 0.57-0.93 cm. lata; petiolus villosus, c. 0.2-0.275 cm. longus. *Inflorescentiæ* axillares, brevissimæ, 1-floræ,

pedunculo c. 0.1 cm. longo, pluribus squamis densissimis imbricatis superne accrescentibus triangulis ad oblongis concavis ciliatis donato. *Pedicellus* sub ovario articulatus, villosus, c. 0.25-0.3 cm. longus. *Calyx* 5-partitus, dentibus late triangulis, obtusis vel vix acuminatis, extus villosis, intus glabris, c. 0.125 cm. longis, 0.25 cm. latis. *Corolla* urceolata, 5-loba, extus margine loborum excepto villosula, intus basi et lobis exceptis pubescens, carnosula, explanata c. 0.95 cm. longa, 1.45 cm. lata, lobis semiellipticis, obtusis, c. 0.13 cm. longis, 0.15-0.17 cm. latis. *Stamina* 10, c. 0.65 cm. longa; filamentum lineare, supra basin dilatatum et villosum, superne parcescens pilosum vel nudum, margine obsolete denticulatum, antice convexum, c. 0.43-0.47 cm. longum; anthera in bene $\frac{1}{3}$ supra basin dorsifixata, oblonga, ad $\frac{1}{3}$ infra apicem bifida, basi obtusa bilobula, $\frac{2}{3}$ partibus inferioribus echinulato-papillosa, ecalcarata, c. 0.46-0.47 cm. longa, thecis parallelis, sulco separatis, sulco laterali longitudinali instructis, tubulis erectis, brevibus, poro introrso hiantibus. *Pistillum* totum c. 0.76 cm. longum; ovarium semiglobosum, villosum, c. 0.15 cm. altum, 0.25 cm. diam.; stylus crassus, teres, basi breviter contracta in excavationem disci insertus, apice truncatus, glaber, c. 0.55 cm. longus. *Discus* semiglobosus, medio excavatus, erecto-hirsutus, c. 0.25 cm. diam.

Hab. Arfak Mts., Koebré ridge, between ♂ and ♀ lakes, in moss-grown forest by open plateau, 8500-9000'. Fl. Dec. 5629.

The indumentum of the flowers recalls that of *V. Versteegii* Kds., which otherwise, however, is a totally different species.

The plant is a compact shrub to tree, with pink flowers.

VACCINIUM PILOSIFLORUM J. J. S., sp. nov.

Frutex, ramulis initio strigoso-villosis, deinde verruculosis. *Folia* parva, alterna, breviter petiolata, ovata, obtuse acuminata, basi rotundata vel obtusa, convexa, margine in sicco plerumque recurva, integerrima, glandula marginali parva orbiculari sicco impressa utrinque supra basin, supra praesertim prope marginem et costam mediam parces pilosa plus minusve glabrescentia, subtus sparse villosula et sparse breviter erecto-patenter muriculata, muricibus apice leviter glanduloso-incrassatis fuscis, crasse coriacea, rigida, c. 1.2-2.25 cm. longa, 0.7-1.1-1.375 cm. lata; petiolus villosulus, c. 0.17-0.27 cm. longus. *Inflorescentiae* axillares, brevissimae, uniflorae, pedunculo abbreviato, c. 0.05 cm. longo, pluribus squamis approximatis erecto-patentibus imbricantibus ovato-triangulis ad oblongis valde concavis ciliatis superne accrescentibus ad c. 0.1 cm. longis donato. *Pedicellus* brevis, teres, apice incrassatus et sub ovario articulatus, villosus, c. 0.17 cm. longus. *Calyx* 5-partitus, extus villosus, fere 0.5 cm. diam., dentibus sinu lato separatis, triangulis, acutis, c. 0.1 cm. longis, 0.17-0.2 cm. latis. *Corolla* urceolata, ovoidea, 5-loba, extus villosa, intus parces pilosa, carnosula, explanata c. 0.7 cm. longa, fauce 0.74 cm. lata, lobis recurvis, ovatis, rotundatis, basi latis, bene 0.1 cm. longis, 0.15 cm. latis. *Stamina* 10, c. 0.5 cm. longa; filamentum lineare, supra basin paulo dilatatum et parces pilosum, c. 0.34 cm. longum; anthera in $\frac{2}{3}$ partibus supra basin dorsifixata, curvula, oblonga, 2-fida, basi oblique 4-lobulata, $\frac{2}{3}$ partibus inferioribus echinulato-papillosa, ecalcarata, c. 0.2 cm. longa, thecis parallelis, antice sulco separatis, sulco laterali instructis, tubulis contiguis, inappendiculatis, poro obliquo hiantibus. *Ovarium* breve, vix semiglobosum, villosum, fere 0.3 cm. diam.; stylus inclusus,

crassus, teres, $\frac{1}{4}$ parte superiore contractus, apice truncatus, basi obovatus, glaber, c. 0.5 cm. longus, 0.13 cm. diam. *Discus* pulviniformis, semiglobosus, medio excavatus, circumferentia 10-lobulatus, vertice a parte inferiore bene distinctus et parcius erecto-pilosus, ceterum glaber, c. 0.23 cm. diam.

Hab. Arfak Mts., ridge running up to Angi lakes, terrestrial or epiphytic in forest, 8000'. Fl. Dec. 6013.

Amongst the species with one-flowered inflorescences this one is characterized by its acuminate leaves and very shortly peduncled hairy flowers.

A shrub with rose-pink flowers.

VACCINIUM ROSEIFLORUM J. J. S., sp. nov.

Frutex, ramulis tenuibus, minutissime puberulis. *Folia* alterna, breviter petiolata, elliptica, obtuse acuminata, basi acute acuminata, integerrima, margine in sicco recurva, glandulis marginalibus nullis, supra glabra, subtus patenter minutissime rubiginoso-glanduloso-muriculata, pilis apice leviter incrassatis, glabrescentia, 3-5-plinervia, costa media supra insculpta subtus prominente, nervis basilaribus adscendentibus curvatis superioribus fere ad apicem productis in foliis adultis interdum tenuiter insculptis, coriacea, c. 2.4-3.9 cm. longa, 1.3-2.15 cm. lata; petiolus subsemiteres, supra sulcatus, c. 0.15-0.3 cm. longus. *Inflorescentiæ* axillares, racemosæ, secundæ, laxæ c. 7-9-floræ, pedunculo brevissimo, cum rachide puberulo et minute muriculato 3.5-3.8 cm. longo. Bractæe caducæ, foliaceæ, oblongæ, obtusæ, basi breviter petiolato-contractæ, supra glabræ, subtus puberulæ et minute muriculatæ, c. 0.75-0.98 cm. longæ. *Pedicellus* tenuis, sub ovario articulatus, puberulus et minute clavato-muriculatus, c. 0.5-0.65 cm. longus. *Calyx* adpressus, 5-partitus, dentibus triangularibus, subacutis vel obtusis, concavulis, puberulis et minute muriculatis, c. 0.125 cm. longis, 0.15 cm. latis. *Corolla* cylindrica, vix urceolata, 5-loba, utrinque glabra, carnosula, explanata, subquadrata, bene 0.7 cm. longa, 0.77 cm. lata, lobis subsemiorbicularibus, rotundatis, intus papillois, ciliolatis, c. 0.075 cm. longis, 0.125-0.13 cm. latis. *Stamina* 10, c. 0.3 cm. longa; filamentum lineare, apicem versus leviter angustatum, supra basin villosum superne parce pilosum, c. 0.16 cm. longum; anthera supra basin dorsifixa, curvula, oblonga, bifida, basi oblique 4-lobulata, parte inferiore echinulato-papillosa, ecalcarata, c. 0.15 cm. longa, thecis parallelis antice sulco separatis, sulco longitudinali laterali instructis, tubulis erectis, parallelis, poro terminali hiantibus, margine recurvis et dentes 2-3 triangulos ad subulatos gerentibus. *Ovarium* semigloboso-turbinatum, patenter puberulum et minute muriculatum, c. 0.175 cm. altum, 0.275 cm. diam.; stylus inclusus, teres, truncatus, glaber, c. 0.475 cm. longus. *Discus* pulviniformis, medio excavatus, exterius leviter 10 lobulatus, glaber, c. 0.175 cm. diam.

Hab. Arfak Mts., Angi lakes, edge of forest-patch by ♀ lake, 7000'. Fl. Dec. 5586.

Near *V. muriculatum* J. J. S., but differing in the indumentum, the more elliptic leaves without marginal glands, the form of the calyx and corolla, the non-muriculate anther-tubes, and the enclosed style.

A small tree with pretty pink flowers.

VACCINIUM LIGUSTRIFOLIUM J. J. S., sp. nov.

Frutex ramosus, ramulis sicco angulatis, minute puberulis. *Folia* alterna, parvula, breviter petiolata, ovato-elliptica vel elliptica, apice angustata obtusa, basi acutiuscula vel obtusa, margine in sicco recurva, integerrima, glandula marginali orbiculari sicco impressa utrinque supra basin, adulta glabra, ut videtur initio plus minusve puberula, probabiliter 3-plinervia, nervis obsoletis, coriacea, sicco rigida, c. 1.75-3.25 cm. longa, 0.85-1.55 cm. lata; petiolus semiteres, supra sulcatus, sicco transverse rugulosus, initio puberulus, glabrescens, c. 0.15-0.35 cm. longus. *Inflorescentiæ* (1 adest) axillares, breves, c. 4-floræ, pedunculo cum rhachide c. 0.7 cm. longo, glabro, bracteis deficientibus. *Pedicellus* sub ovario articulatus, glaber, c. 0.45 cm. longus. *Calyx* 5-partitus, extus pubescens, c. 0.375 cm. diam., dentibus triangulis, acutis, concavis, ciliatis, c. 0.07 cm. longis, 0.15 cm. latis. *Corolla* angustius urceolata, 5-loba, extus glabra, intus parce pilosa, carnosula, explanata c. 0.77 cm. longa, fauce bene 0.6 cm., infra medium 0.9 cm. lata, lobis ovato-triangulis, obtusis, convexis, c. 0.075-0.08 cm. longis, 0.12-0.15 cm. latis. *Stamina* 10, c. 0.375-0.4 cm. longa; filamentum lineare, supra basin paulo dilatatum, inferne villosum, superne parce pilosum, c. 0.3-0.33 cm. longum; anthera infra medium dorsifixata, curvula, oblonga, ad $\frac{1}{2}$ partem infra apicem bifida, basi obtusa, tubulis exceptis echinulato-papillosa, ecalcarata, c. 0.14 cm. longa, thecis parallelis, antice sulco separatis, sulco longitudinali laterali instructis, tubulis contiguis, exappendiculatis, poro obliquo introrso hiantibus. *Ovarium* semiglobosum, patenter pubescens, c. 0.25 cm. diam.; stylus teres, apice contractus, glaber, c. 0.6 cm. longus. *Discus* pulviniformis, 10-lobulatus, medio excavatus, circa excavationem erecto-pilosus, ceterum glaber, c. 0.23 cm. diam.

Hab. Arfak Mts., Angi lakes, edge of forest by ♀ lake, 7000'. Fl. Dec. 5544.

In some respects near *V. muriculatum* J. J. S., but with the branches more robust, the leaves smaller and non-acuminate, shorter inflorescences, acute sepals, anthers without murices, and style enclosed.

A shrub or small tree with pink flowers.

MYRSINACEÆ.

MÆSA FRUTICOSA Gibbs, sp. nov.

Frutex parvus, ramuli stricti, teretes, dense foliati, cum inflorescentiis pilis brevissimis patentibus fugaceis puberulis onusti. *Folia* parva, obovata, basi rotundata, apice angustata, abrupte minute obtuse-apiculata, margine integerrima, recurvata, chartacea, supra glabra, subtus pallidiora, tenuiter striata. *Racemi* pedunculati, 1-3-flori, foliis 2- vel 3-plo breviores. *Flores* albidæ, gracile pedicellati. *Sepala* 4, late ovata, acuta. *Petala* 4, paulo ultra medium connata, lobis suborbicularibus, tenuiter crenulatis. *Stamina* petalis haud multo breviora, antheris ovatis, medio dorsifixis. *Stylus* brevis; stigmatæ obtuso, obscure lobulato. *Ovarium* ultra $\frac{3}{4}$ inferum, lepidotum.

Hab. Arfak Mts., edge of forest by ♀ lake, 7000'. Fl., ♀. Dec. 5579.

A small shrub, with rigid ascending branches and dark red-brown striate

cortex. Largest leaves 2 cm. by 1 cm. with midrib sparsely pilose, on lower surface prominent and reddish brown in colour, with 2-3 faint lateral veins. Petioles 2 mm. long. Racemes 0.5-1.5 cm. reduced to a peduncle ± 2 mm. long, with 1-3 flowers on pedicels ± 5 mm. long, sparsely pilose. Bracts ciliate-acute, 1 mm. long. Calyx-lobes 1 mm. long. Corolla 2 mm. long,

FIG. 16.



Mæsa fruticosa Gibbs.—A. Branch, reduced; B. Flower; C. Longitudinal section of flower.

sparsely pilose on exterior. Anthers 1 mm. long, filaments adnate to the base of the tube. Style with raised upper portion of ovary 1 mm. long, lower inferior portion 1 mm.

This species is very distinct in the shrubby habit and small leaves, recalling *Suttonia* spp., or some forms of *Myrsine africana* L. In the extremely reduced racemes, almost amounting to single flowers, it is so far unique in the genus.

SYMPLOCACEÆ.

SYMPLOCOS (BOBUA) ARFAKENSIS Gibbs, sp. nov.

Arbor parva, glaberrima, ramuli teretes, cortice leviter nigrescente. Folia petiolata, oblongo-lanceolata, sensim acuminato-obtusa vel emarginata, basi cuneata,

obscure serrata, coriacea. *Racemi* axillares, solitarii vel a basi trifurcati, petiolo duplo vel triplo longiores. *Flores* sessiles, bracteis 3 subæqualibus, squamiformibus, ciliatis. *Calyx* 5-lobus, lobi rotundati, incisi, ciliati. *Corolla* patelliformis, ad basin fere partita, calyce duplo longior, 5-lobata, lobi ciliati. *Stamina* ∞ inæquilonga, indistincte pentadelphica. *Stylus* fere glaber. *Ovarium* hirsutum, 3-loculare, loculis 2-ovulatis.

Hab. Arfak Mts., edge of forest by ♀ lake, 7000'. Fl. Dec. 5574, 5741 bis.

Largest leaves 8.5 cm. by 4 cm., midrib prominent below, the lateral veins 5-8, forming tertiary reticulations. Petioles 1-2 cm., channelled above. Leaves and petioles yellow-green (dried). Racemes ± 3 cm. long, the two lateral branches 2 cm. Flowers 6 mm. across. Calyx 2 mm. long, lobes spreading. Corolla 3 mm. long, tube 1 mm. long. Longest stamens ± 2 mm. long, the filaments broadening towards the base, with minute anthers. Style with stigma 3 mm. long; stigma $\frac{3}{4}$ mm. broad.

This plant is near *S. spicata* Roxb., but is distinguished by the less acute leaves, fewer flowering racemes, ciliate bracts and calyx-lobes, smaller flowers with narrower and more spreading corolla-lobes, and stamens much shorter than the corolla.

SYMPLOCOS (CORDYLOBLASTE) NOVO-GUINEENSIS Gibbs, sp. nov.

Arbor parva, ramuli teretes, cortice strigoso-fuscescente cincti. *Folia* petiolata, oblongo-elliptica, acutiuscula vel obtusa, basi cuneata, integerrima, chartacea, glabra, costa media supra inpressa subtus prominula. *Racemi* simplices, axillares, pauciflores, subumbellato-racemosi, rhachis griseo-pubescentis, pedunculi petiolo breviores. *Bracteæ* sub calyce 2, minimæ. *Calyx* lobis 5, rotundatis, campanulatis. *Corolla* extus pilosa, calyce 4-plo longior usque medium divisa, lobis 5, ciliatis. *Stamina* 4-serialia, apice libera, basi in tubum coalita. *Stylus* hirsutus, stigmatè parvo. *Ovarium* 3-loculare.

Hab. Arfak Mts., edge of forest by ♀ lake, 7000'. Fl. Dec. 5578.

Leaves 6 cm. long by 3 cm., midrib reddish in colour (dried), lateral veins 4-6, irregularly pinnate; with reticulations arcuate and anastomosing on the margins. Petiole 1 cm. long, dark red in colour, channelled on the upper surface. Inflorescence 2 cm. long, common peduncle, also pedicels ± 5 mm. long. Flower ± 1.5 cm. long. Calyx 5 mm. long. Corolla white, 1 cm. long. Staminal tube 3 mm. long, adnate to and produced above the corolla-tube. Anthers 5 mm. long, filaments flat, 1 mm. broad, free at the apex. Style 9 mm. long.

This plant is very near *S. Scortechinii* King & Gamble. It differs in the smaller leaves less conspicuously veined, in the almost glabrous pedicels, calyx, and corolla, with the calyx more deeply lobed and the style less pilose. With *S. Scortechinii* and *S. Maingayi* Benth. this species shows a 3-celled ovary which Brand gives as unknown to him in § *Cordyloblaste*, but these plants seem to fit into no other section.

GENTIANACEÆ.

GENTIANA VANDERWATERI Wernham in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 117.

Arfak Mts., Koebré Mt., on open banks in forest and on ridge, 8500'-9000'. Fl. Dec. 5641.—On S.W. ridge running up to Angi lakes, 7000'. Fl. 6001.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*).

A pretty little plant with dark green foliage and white flowers, fairly abundant as the forest-trees dwarfed and opened out towards the summit of the ridges.

APOCYNACEÆ.

LYONSIA ALBIFLORA Gibbs, sp. nov.

Frutex tenuis, volubilis, ramuli teretes, innovationes sparsim villosi, demum glaberrimi. *Folia* petiolata, oblongo-lineariter, acuta, basi retundata vel subcordata, sensim acuminata, supra nitida, reticulato-rugosa. *Inflorescentia* unilateraliter axillaris, longe pedunculata, quam folia longior, divaricato-trichotoma, bracteis linearibus. *Flores* pedicellati. *Calyx* villosus, usque basin fere partitus, laciniis ovatis acutis. *Corolla* extus villosa, intus inter stamina et ad fauces barbata, laciniis latis lanceolatis, strigosis. *Stamina* paullo infra basin tubo inserta, antheræ basi sagittatæ, semi-exsertæ, filamenta gracilia, piloso, non torta. *Ovarium* glabrum, disco 5-lobo circumdatum.

Hab. Arfak Mts., twining in forest on S.W. ridge, 8000'; also in spinneys by ♀ lake, 7000'. Fl. Dec. 5532.

Leaves 5.5 cm. by 1 cm., dull and smooth beneath, the young leaves yellowish with midrib impressed above and prominent beneath, with 4-5 lateral veins all dark brown in colour. Petioles twisted, ± 7 mm. long. Inflorescence 5-7.5 cm. long. Flowers 7 mm. long. Pedicels pilose, 5 mm. long. Calyx-lobes 1 mm. long. Stamens 5 mm., anthers ± 6 mm. long, filaments arching over ovary, 2 mm. long. Ovary 1.5 mm. in length.

Judging from Warburg's description this plant is nearest to his *L. diversifolia*, but differs in the inconspicuous venation of the leaves with fewer lateral veins, showing no reticulations on the under surface, the much longer peduncles, and the pilose outer surface of the corolla.

SOLANACEÆ. (J. R. DRUMMOND.)

SOLANUM GIBBSIÆ J. R. Drummond, sp. nov.

Suffrutex sarmentosus c. unum m. altus, ramis lignosis gracilibus stricte erectis sordide castaneis. *Ramuli* pilis stellatis satis copiose muniti, aculeis 6-12 mm. longis ad basin vix 5 mm. diametro attingentibus rectissimis stramineo-coloratis armati. *Folia* plana petiolis c. 1 mm. longis ramulis quoad indumentum et spinulas simillimis suffulta anguste oblongo-lanceolata c. 3-7 cm. longa 2 cm. vel minus lata margine grosse repando-dentata fere pinnatifida lobis patentibus acutis basi cuneata vel truncata apice acuminata spinis acicularibus aculeis caulinis omnino assimilatis

paulo eis longioribus utraque armata pagina superiore nitida glaberrima inferiore fulvide furfuraceo-tomentosa et cum nervis pilis stellatis albescentibus crebre conspersa. *Inflorescentia* extra-axillaris subcymosa; pedunculi singulares 1-3-flori sub anthesin c. 8 mm. longi capillares cum pedicellis fructiferis ad 20 mm. productis superne lente incrassatis petiola quoad indumentum emulantes sed cum calycibus sparse stellate hirsutis denique glabratis vix aculeis muniti. *Flores* roseo-purpurei eis *S. lucorum* simillimi sed quam illi multo glabriores subrotati. *Calyx* late campaniformis pilis stellatis satis parce ornatus inconspicuus dentibus brevissimis apice membranaceo subobtusos post fructum maturatum deciduis. *Corollæ* lobi 5, c. 3.5 mm. longi angustissime triangulares sensim acuminati extus pilis stellatis parcissime muniti intus cum antheris subconniventibus inæqualibus glaberrimi denique plus minusve reflexi. *Baccæ* (fere maturæ) depresso globosæ cuti membranaceo nitido diametro c. 8-10 mm. latæ modice succulentæ. *Semina* (vix matura) circa 12 flavescencia ambitu subreniformia nonnunquam paulo angulata lateraliter planoconvexa testa subpellucide nitente sub oculo armato minopere papillosa.

Hab. Arfak Mts., Angi lakes, edge of forest by ♀ lake, 7000'. Fl., Fr. Dec. 5974.

The nearest ally of this interesting species is probably *S. jericissimum* Lindl. in Mitch. Three Exped. ii. 58 from East Australia, but the specimens of that are not quite sufficient for a decision. From *S. retrorsum* Elmer (*S. reflexispinosum* Merrill, MSS. in Herb. Kew.) it differs by the spines, which in the Philippines plant are curved, the form of the corolla, and the habit.

LABIATÆ. (S. MOORE.)

COLEUS GIBBSLÆ S. Moore, sp. nov.

Planta semimetralis vel ultra, caule ascendente ramoso glabro, ramulis foliosis subtiliter puberulis, foliis parvis petiolatis anguste ovato-lanceolatis obtusis basi cuneatis margine serrato-crenatis glabris, spicastrois sæpe subpaniculatis circa 8-floris floribus pedicellatis, calycis puberuli dente postico suborbiculari marginibus haud decurrentibus dentibus lateralibus ovatis obtusissimis quam anteci angusti ultra medium connati brevioribus calycibus tandem patentibus vix reflexis, corollæ extus puberulæ tubo infundibulari quam limbus longiore hujus labio postico 4-lobo lobis centralibus quam laterales majoribus labio postico cymbiformi, staminibus exsertis.

Hab. Angi lakes, edges of forest and in open marsh by ♀ lake, 7000'. Fl., Fr. Dec. 5909.

Leaves mostly 1.5-2 cm. long at their widest part, 6-8 mm. broad, brown in the dry state; petioles 4-7 mm. long. Spicastro usually more than 20 cm. long, their bracts cymbiform, in outline ovate, commonly about 3 mm. long. Pedicels filiform, \pm 4 mm. long, in the fruiting stage often 7 mm. or more. Flowering calyx 3 mm. long; hinder tooth 2.5 mm. long and broad, lateral teeth 1 mm., front ones 2 mm. long. Fruiting calyx 7 mm. long; hinder tooth suborbicular, 4 by 3.5 mm., lateral teeth 2.5 by

2 mm., front 4.5 mm. long, the free tips of these last narrowly triangular, acuminate, about 1 mm. long. Corolla white; tube 8-9 mm. long, at the mouth about 4 mm. in diameter; central lobes of the hind lip connate beyond the middle, 2.5 by 4.5 mm.; front lip 6 by 5 mm. Nutlets suborbicular in outline, dark, polished, 1.5 mm. in diameter.

Besides several floral points, the very small leaves serve in this case as an easy mark of distinction.

BIGNONIACEÆ.

TECOMANTHE VOLUBILIS Gibbs, sp. nov.

Suffrutex scandens, volubilis, glaberrimus; ramuli teretes, cortice griseo-striguloso, lenticellis prominulis obtectis. *Folia* parva, opposita, petiolata, imparipinnata, foliola 4-jugata, opposita, petiolata, elliptica, obtusa vel acuta, basi cuneata, apicem 1-3-plo serrata, margine recurvata, coriacea, nitida, anteriora sursum minore supra venis lateralibus 2-3 impressis, subtus glanduloso-punctata. *Flores* majusculi, axillares, breviter racemosi. *Calyx* campanulatus, 5-lobus, lobi inæqualibus (posticis 2 majoribus), acuminatis, ciliatis. *Corolla* late infundibuliformis, rosea, tubus sursum dilatatus, extus apice pilosus, intus supra basin glaber, lobi deltoideo-acuti, quinquefidi, tomentoso-marginati, quarum duo majores. *Stamina* 4, didyma, inclusa; filamenta filiformia, glabra, basi aliquantum stipposa; antheræ loculis divergentibus. *Stylus* filiformis, glaber; stigma bilamellatum. *Ovarium* cylindraceum glabrum, pseudo-biloculare, ovula pluri-seriata.

Hab. Arfak Mts., Koebré ridge, twining in shrubberies, 9000'. Fl. Dec. 5603.

A slender twining plant with pink flowers, recalling *Lapageria rosea* Ruiz & Pav. in colour and habit. In the forest by the ♀ lake the plant was plentiful, and the fallen corollas often conspicuous on the ground; but on Koebré Mt. it was still in flower, both on the old and the young green wood. The leaves with petioles are ± 5 cm. long, petioles 2.7 cm. long, sub 4-angled, like the rhachis, which is contracted at the insertion of the folioles, the latter being 8 mm. long, the lower pair shortly petiolate and often smaller; the surface of the folioles when dried is transversely striate above and longitudinally so below. Racemes ± 2 cm. long, with peduncle 1 cm. long, bearing a pair of subulate bracts and two to three pairs of reduced leaves or folioles, the upper with single flowers in their axils, on slender pedicels 1 cm. long, with two opposite bracteoles 4 mm. long, borne about halfway up. Calyx ± 2 cm. long and 8 mm. across at the base of the lobes, the longest lobes 1.3 cm. and 6 mm. broad at the base; the lobes are reflexed in flower. Largest corolla ± 8.5 cm. long and 4 cm. broad at the base of lobes. Longest stamens 4 cm. long, shorter pair 3 cm., both inserted 1 cm. from the base of the tube, which widens out immediately above the point of insertion; anthers 5 mm. long. Style ± 6 cm. long, stigmatic lamella oblong,

5 mm. long. Ovary 4 mm. long and 3 mm. broad, surrounded by the fleshy crenulated disc.

This plant is nearest to *T. leptophylla* Bl., known to me only by description, but differs in the shorter leaves with fewer folioles, the large calyx with incised ciliate lobes and the corolla not fuscous-striate inside.

GESNERIACEÆ. (S. MOORE.)

DICHROTRICHUM BREVIPES Clarke in DC. Monog. Phan. v. 54.

Arfak Mts., lower spurs, twining in high forest, 4000'. Fl. (red). Dec. 6130.

Distrib. New Guinea (D.N.W., Arfak Mts., near Hatam, *Beccari*, 5000–6000').

LENTIBULARIACEÆ. (O. STAFF.)

*UTRICULARIA BIFIDA L. Sp. Pl. 18.

Arfak Mts., Angi lakes, in open marsh by ♀ lake, 7000'. Fl. (yellow). Dec. 5672.

Distrib. India and Ceylon. Malay Peninsula, Java, Borneo, Philippines. China and Japan. E. Australia.

*UTRICULARIA RACEMOSA Wall. Cat. 1496.

Arfak Mts., Angi lakes, minute, in marsh by ♀ lake where open and sandy, 7000'. Fl. (purple). Dec. 5670.—Larger plant. 5671.

Distrib. India, Corea, Philippines, Thursday Island.

RUBIACEÆ. (TH. VALETON.)

OLDENLANDIA NUTANS Val., sp. nov., aff. *O. KOCHII* Val. in Nova Guinea, viii. (1911) 439.

Hab. Arfak Mts., Angi lakes, on edge of forest by ♀ lake, 7000'. Fl., Fr. Dec. 5587.—Common in marsh. 5922.—S.W. ridge, open, steep slopes, 8000'. 5716.—*A. E. Pratt*, Monswoon Bean, 7000'. (Herb. Kew.)

Herbacea, 1–1.5 m. alt., foliis parvis, inflorescentia terminali racemosa, floribus nutantibus albis c. 6 mm. longis.

Forma ALPINA Val.

Koebré Mt., shrubby herbaceous, on open summit, 9000'. Fl., Fr. 5607.

LUCINÆA RETICULATA Val., sp. nov.

Frutex scandens, glaber. *Stipulæ* membranaceæ, ochreatim connatæ. *Petiolus* supra complanatus et bisulcus 3–5 mm. longus. *Folia* 40–70 mm. longa, 10–26 mm. lata, lanceolata, subacuminata, acuta, basi attenuata, coriacea, glabra, siccando luteo-viridia nitidula, dense reticulata, costa nervis et venulis supra et subtus prominulis,

nervi laterales utrinque 4-6 oblique-patuli, ante marginem arcuato-conjuncti. *Capitula* parva, breviter pedunculata, vulgo 4 in apice ramuli umbellata. *Flores* parvi. *Calyx* truncatus, discus globosus, corollæ lobi crassi apice valde incrassati incurvis et uncinati in alabastra apice gibbosi. *Corolla* aperta, 4 mm. longa, infundibularis; antheræ et villi generis. *Fructus* ignoti.

Hab. Arfak Mts., Angi lakes, twining on edge of forest by ♀ lake, 7000'. Fl. (white). Dec. 5580.

MYCETIA JAVANICA var. ANTHOTRICHA Val. Icones, Pars iii. (1908) tab. 270; Nova Guinea, viii. (1911) 463.

Arfak Mts., Angi lakes, creeping in open marsh by ♀ lake, 7000'. Fl., Fr. Dec. 5910.

Distrib. New Guinea (D.N.W., Kambu Tirá, Wichmann; N.E.). Malaya. (Type in Java.)

PSYCHOTRIA VACCINIODES Val., sp. nov.

Frutex parvus, squarrosus. *Stipulæ* minutæ, rotundato-ovatæ, caduæ, cicatrices læves annulati. *Ramuli* subteretes, ignosi denudati, ultimi densa foliosi. *Folia* parva elliptica, brevi-petiolata vel subobovata, apice acuta, basi attenuata, crasse coriacea, cuticula supera in sicco valde rugulosa, marginibus incurvis, subuninervia. *Corymbi* parvi brevi-pedunculati, brachiati, internodiis brevibus articulatis, densiflori. *Flores* in ramulis ultimis vulgo terni, brevi-pedicellati, bracteis minutis ovatis glanduliferis. *Flos* nunc brevistylis. *Calyx* cum ovario turbinatus, glaber, limbo patelliformi dentato. *Corolla* hypocraterimorpha, papilloso-tomentella, limbus tubo 2-3-plo brevior. *Antheræ* nunc exserti, filamentis brevibus, faucis ostium glabrum, tubus intus ad et infra medium parce hirsutus. *Stylus* brevis, glaber; stigma breviter bilobum. *Drupa* oblongo-globosa. *Pyrenæ* dorso profunde sub 5-sulcatæ, costis rotundatis, ventre planæ, leviter costulatæ. *Semen* transsectu 4-loba, lobis anterioribus exsculptis. *Albumen* sublæve tegmine crasso hic inde leviter intruso.

Hab. Arfak Mts., Angi lakes, Kosbré Mt., shrubby and small tree, very compact, in forest and on open summit, 8500-9000'. Fl., Fr. Dec. 5622.—Shrub, compact. 5717.

Leaves 10-20 mm. long, petiole 1-3 mm. long. Corymbs, with peduncle 5-10 mm. long, 20 mm. long and broad.

Distrib. New Guinea (D.N.W., Arfak Mts., 2500 m., Gjellerup (1202 in Herb. Bogor.)).

Species rather near to *P. densiflora* Stapf (Kinabalu, 2200 m.) and *P. Lorentzi* Val. (S.W. New Guinea, Hellwig Mts., 2600-3000 m.). Easily distinguished by the very small leaves and ericaceous habit.

[TIMONIUS FILIPES Wernham in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 73.

Arfak Mts., on S.W. ridge, running up to Angi lakes, 8000', and edge of forest by ♀ lake, 7000'. Fl. (♂). Dec. 5546.

Distrib. New Guinea (D.S.W., Mt. Carstensz, Kloss).

As the ♀ plant of the type was alone collected, I add the description of the ♂ flower :—

Pedunculi glabri, 2 cm. longi, quisque flores tres ad apicem gerens quorum intermedius sessiles. *Calyx* campanulatus, 4-dentatus, sericeus, 1·5 mm. longus. *Corollæ* sericeo-villosæ, intus glabræ, tubus graciles, leviter incurvus, 2 cm. longus, limbi lobi crassi, acuti, 2 mm. longi. *Antheræ* lineares 4 mm. longæ, basi bifidi, lobis obtusis, filamenta brevia, supra medium corollæ affixa, inclusa (apicem ipsem solum exserte). *Ovarium* subobsoletum; stylus 5·5 mm. longus, hirsutus; stigma bilobato, glabro.

This plant agrees with the above in the peculiar shape, texture, and venation of the leaves, though the latter in this case are more rounded to semicordate at the base. In size they agree uniformly with Wernham's var. *acuminatissima*, which I cannot separate from the type. the reduced size of the leaves—not uniform in Kloss's specimen, but well-marked in the Arfak plants—being no doubt correlated with the higher altitude.—L. S. G.]

PSYCHOTRIA sp., resembles *P. SARMENTOSA* Bl.

Arfak Mts., S.W. ridge, running up to Angi lakes, 8000'. Fl. Dec. 5527.—Epiphytic in forest by ♀ lake, 7000'. Fl. 5930.

"Shrub to small tree, flowers white." In the absence of stipules and fruit the species cannot be more closely determined.

MYRMEDOMA ARFAKIANA Becc. Malesia, ii. 94.

Arfak Mts., Koebré Mt., in upper forest and on open summit, 8500–9000'. Fl. Dec. 5639.

Distrib. New Guinea (D.N.W., Hatam, Mt. Arfak, *Beccari* (epiphyte); Angi lakes, *Gjellerup*).

"Terrestrial. Most grotesque plants, over 1 m. high, with often a lateral branch at right angles to main shoot 1 m. in length. Large slate-blue flowers up the stem (Pl. 3. fig. 6). The same species, judging from the colour and size of the flowers, was also very abundant as an epiphyte, showing no peculiarities in size and habit (Pl. 2. fig. 4). I saw one or two of these plants on the ground on Koebré, fallen from trees the branches of which had been singed in the annual burning. Possibly these plants, continuing their existence under more favourable circumstances, develop into the monstrous forms described above."

MORINDA sp., aff. *M. UMBELLATA* L.

Arfak Mts., Angi lakes, Koebré Mt., twining in forest, 8000'. Fr. Dec. 5636.

This species resembles very much the Australian *M. jasminoides* Cunn.

GALIUM JAVANICUM Bl., var.

Arfak Mts., Angi lakes, creeping in open marsh and on banks by ♀ lake, 7000'. Fl. Dec. 5917.

CAMPANULACEÆ.

LOBELIA (ISOLOBUS) ARFAKENSIS Gibbs, sp. nov.

Planta pusilla, a basi crebro ramosa, humifusa, caules repentes, tota planta alba-pilosa. *Folia* parva, petiolata, orbicularia, regulariter grossedentata. *Flores* axillares, longe pedicellati. *Calyx* laciniis linearibus, acutis, tubum æquantibus. *Corolla* quam laciniæ calycinæ triplo longior, laciniis anguste linearibus superioribus erectis, a basi partitis, inferioribus trilobis. *Stamina* lobis corollæ brevioribus, anterioribus albo-barbatis, filamenta fere usque ad basin coalita.

Hab. Arfak Mts., S.W. ridge, just above the ♀ lake, 8000'. Fl., Fr. Dec. 6117.

A tiny plant of *Pratia* habit, spreading on the ground where open between shrubs, with white flowers tinted mauve on the outside. Leaves 4 by 5 mm., with deltoid teeth 1 cm. long. Petioles 2 mm. long. Flower 8 mm. long. Pedicels $\pm 1-1.2$ cm. long. Calyx 5 mm. long. Corolla 6 mm. long. Stamens 5 mm. long, anthers ± 1 mm. Capsule 6-7 by 4 mm.

The only species known in this section in Malaya is *L. radicans* Bl., a much larger and quite glabrous plant.

GOODENIACEÆ.

SCÆVOLA LAUTERBACHIANA Krause in Pflanzenreich, iv. 277 (1912) 132.

Arfak Mts., Angi lakes, edge of forest by ♀ lake, 7000'. Fl., Fr. (yg.). 5742.

Distrib. N.E. New Guinea.

A scrambler with yellow flowers, striped with dark veins, occurring massed in the open. Evidently an extremely variable plant in the shape of the leaves and extent of the tomentum on the peduncle, corolla, and ovary. The above specimens are glabrous, the leaves broadly ovate and irregularly dentate, a character also shown in the type-specimen (Schlechter, 14446, Herb. Kew.). The corolla is sparsely pilose on the outer surface and barbate on the veins to the base of the lobes on the inner; the style is also markedly shorter than in the type.

COMPOSITÆ. (S. MOORE.)

BIDENS BIPINNATA L. Gen. Pl. ed. 1, n. 641; Nova Guinea, viii. (1910). 337.

Arfak Mts., Angi lakes, abundant in open marsh by ♀ lake, 7000'. Fl., Fr. Dec. 5562.

Distrib. New Guinea (D.S.W., Merauke, *Versteeg*). Wide in tropics and recorded from Europe,

EMILIA SONCHIFOLIA (L.); DC. in Wight, Contrib. 24; Schum. & Laut. 602.

Arfak Mts., Angi lakes, in open marsh and on edge of ♀ lake, 7000'. Fl. 5915.

Distrib. N.E. New Guinea and adjacent islands. Tropics of both hemispheres.

LACTUCA PROLIXA S. Moore, sp. nov.

Caulis simplici elato gracili striato, foliis radicalibus caulinis perpaucis anguste lineari-oblongatis acutis basi in petiolum longissimum extenuatis margine distanter denticulatis membranaceis glabris, capitulis submediocribus in paniculam brevem vel elongatam oligo- vel polycephalam satis laxam digestis pedunculis propriis quam bractea subulata basali plane longioribus teneris, involucri oblongo-campanulati glabri phyllis linearibus acutis sæpe anguste albo-marginatis additis paucis exterioribus abbreviatis ovato-lanceolatis acutis, flosculis exsertis, achæniis anguste fusiformibus pluricostatis glabris in rostrum quam se ipsa brevius desinentibus, pappi setis levibus albis.

Hab. Arfak Mts., Angi lakes, in bracken where burnt, 7000'. Fl. Dec. 5921.

At most more than a metre high. Single leaf seen 10 cm. long, above the middle 5-6 mm. broad; petiole almost as long as lamina, swollen at the base. Inflorescence sometimes only 7 cm., at others more than 20 cm. long, 5-15 cm. broad. Bracts few, ± 2 mm. long. Capitula 1 cm. long. Involucres 9 by 1-1.5 mm., their outer leaves 1-2 mm. long. Achenes (with the beak 2 mm. long) 6 mm. long; pappus 5 mm. long.

A remarkable plant, differing from the widely diffused *L. levigata* DC. in the tall habit, the narrow leaf on its very long stalk, and the narrower and longer flowering heads.

List of Plants collected in the Vicinity of Manokoeari, Humboldt Bay, and on the Islands of Roon, Waklé, and Wiak, Dutch N.W. New Guinea, in January and February 1914.

THALLOPHYTA.

FUNGI. (J. RAMSBOTTOM.)

ASCOMYCETES.

DISCOMYCETES.

PILOCRATERA HINDSII (Berk.) P. Henn. in Hedw. xxxii. 225 (1893).
Trichoscypha Hindsii Sacc. Syll. viii. 161 (1889).

Manokoeari, on dead wood, sec. jungle, edge of "korang" forest, 200'.
Jan. 6169.

Distrib Common in tropics.

Hennings (Engl. Bot. Jahrb. xiv. 363 (1892)) has proposed the generic name *Pilocratera* to replace the name *Trichoscypha* (Cooke) Sacc. (*l. c.*)—the latter name having been used by Cooke (1879) as a subgenus. As in several cases, the name has been duplicated in different plant-groups, J. D. Hooker (Benth. & Hook. Gen. Plant. i. 423 (1862)) using it for a genus of Anacardiaceæ. The question of these duplicate names should be considered in general; it can then be seen whether the principle of *nomina conservanda* should be invoked for the name in one group used for a large number of species in a well-known genus, as against the name used for a little-known genus with few species.

PILOCRATERA NOVO GUINEENSIS Ramsbottom, sp. nov.

Rubra; ascomatibus ceraceo-carnosis, stipitato-cupulatis, 1.5-2 cm. diam., extus pruinosis, margine pilosis, quoque pilo e tubulis septatis hyalinis coalitis composito, cupulo hemispherico, stipite compresso, 3-3.5 cm. longo, 1 mm. crasso, pruinoso; ascis cylindraceis, c. 320 μ \times 15-16 μ , breviter stipitatis, partibus sporiferis c. 170 μ longis, apice non iodo cærulescentibus, octosporis; sporis monostichis, fusoido-ellipticis, biguttulatis, 23-28 μ \times 12-15 μ ; paraphysibus cylindraceis, septatis, 5 μ crassis.

In ligno putrido.

The hairs on the disc margin are composed of a cone of septate hyaline filaments, which are about 7-8 μ wide at the base. The cone is about 350 μ in length, with a base of about 150 μ . The cells of the peridium are spherical, and vary in size from about 25 μ towards the middle of the disc to about 10 μ at the margin. They are thick-walled, as are also the paraphyses and spores.

Hab. Manokoeari, sec. jungle, edge of "korang" forest, 200'. Jan. 6152.

SARCOSOMA NOVO-GUINEENSIS Ramsbottom, sp. nov.

Ascomatibus gelatinosis, brunneis, discis pallidioribus, turbinatis, 8 cm. altis, 5 cm. latis, extus strigoso-hirsutis; setis simplicibus, septatis, castaneis, 450–1200 μ \times 10–17 μ ; ascis cylindraceo-clavatis, obtusis, ad 400 μ \times 17–18 μ , partibus sporiferis c. 250 μ , octosporis, paraphysatis; paraphysibus subclavatis, fuscidulis, 4–6 μ crassis; sporis monostichis, ellipsoideis, 1–2 guttulatis, 25–40 μ \times 11–15 μ , hyalino-fuscidulis.

Ad terram.

Hab. Manokoeari, common in forest and sec. jungle. Jan. 6198.

This magnificent species is closely allied to *Bulgaria celebica* P. Henn. (Monsunia, i. 30 (1899)) = *Sarcosoma celebicum* Sacc. & Syd. (Sacc. Syll. xvi. (1902)), but differs in its larger size and in the somewhat greater dimensions of all its parts. Hennings, who did not at that time separate *Sarcosoma* from *Bulgaria*, writes concerning his species:—"Eine sehr grosse, stattliche Art, die aussen sowie am Rande mit dichten schwarzem Haarfilz bekleidet, von allen bisher bekannten Arten ganz verschieden ist jedoch mit *B. platydiscus* (Casp.) [*Sarcosoma platydiscum* Casp.] gewisse Aehnlichkeit besitzt." The interior of *S. novo-guineensis* is whitish, and in formalin appears translucent. The spores are almost colourless.

BASIDIOMYCETES.

AURICULARIACEÆ.

HIRNEOLA POLYTRICHA (Mont.) Sacc. Syll. vi. 766 (1888).

Humboldt Bay, ridge behind "campong," dead wood in forest, 500'.
Jan. 6269.

Distrib. Widespread in tropics.

Eaten by Chinese.

POLYPORACEÆ.

PORIA GIBBSIÆ Ramsbottom, sp. nov.

Cremicolor, 2–3 cm. longa, effuso-crustacea, usque ad 3–4 mm. crassa, subiculo tenuissimo; tubulis obliquis, 2–5 mm. longis; poris irregularibus demum laceratis (ad marginem regularibus) c. 1 mm. diam.; sporis ellipticis 6–8 μ \times 4–5 μ ; basidiis c. 25–30 μ \times 6–7 μ .

Ad lignum putridum.

Manokoeari, sec. jungle, edge of "korang" forest, 200'. Jan. 6153.

POLYPORUS (LENTUS) ARULARIUS Fr. Syst. Myc. i. 342 (1821).

Humboldt Bay, ridge behind "campong," dead wood in forest, 500'.
Jan. 6255.

Distrib. Practically world-wide.

HEXAGONA APIARIA (Pers.) Fr. Epicr. Syst. Myc. 497 (1838). *H. Wightii* (Klotz.) Fr. *Polyporus apiarius* Pers. in Freyc. Voy. 169 (1826). *P. Wightii* Klotz. in Linnæa, vii. 200 (1832).

Humboldt Bay, ridge behind "campong," plentiful on dead wood in forest, 500'. Jan. 5701.—Manokoeari, 500'. Jan. 5700.

Distrib. Philippines, India, Ceylon, Java, New Guinea, etc.

FAVOLUS SCABER B. & Br. in Journ. Linn. Soc., Bot. xiv. 57 (1875).

Manokoeari, Genbela, on dead wood, forest track along coast. Jan. 6214.

Distrib. Ceylon, Malaya, etc.

CLAVARIACEÆ.

PTERULA GRANDIS H. & P. Sydow in Engl. Bot. Jahrb. liv. 252 (1916).

Manokoeari, sec. jungle on edge of "korang" forest, on buried wood, 200'. Jan. 6165.

Distrib. N.E. New Guinea.

The collecting-notes give "smoke-grey in colour," whereas Sydow's description says, "dilute brunnea vel flavo-brunnea." The dried specimens are rufescent.

CLAVARIA GIBBSIÆ Ramsbottom, sp. nov.

Alba, translucens, gregaria, subfasciculata, clavata, recta, c. 10 cm. alta, 4.5 mm. crassa; clavis simplicibus; sporis hyalinis, ellipsoideis, basi subapiculatis, 7-11 μ \times 4-6 μ ; basidiis clavatis, vix emersis, c. 40 μ \times 8-10 μ ; sterigmatibus binis.

Ad terram.

Hab. Manokoeari, in forest, 200'. Jan. 6174.

DACRYOMYCETACEÆ.

GUEPINIA CONFERTA Ramsbottom, sp. nov.

Alba, gelatinosa, conferta, confluenti-cæspitosa; pileo stipitato, primitus sulcato-cylindræo dein plano-convexo vel excavato; stipitibus teretibus vel compressis sæpe in 2-3 ramos divisa; basidiis linearibus, longe furcatis, bisporis, 5-6 μ crassis, ad basim ramosissimis; sterigmatibus filiformibus, c. 15-20 μ longis, basi 2-3 μ diam.; sporis cylindræis, curvulis, multiguttulatis, 10-13 μ \times 4 μ .

In ligno putrido.

The hyphæ of the interior are laxly interwoven and have a diameter of 2-3 μ .

Hab. Manokoeari, sec. jungle, edge of "korang" forest, 200'. Jan. 5702.

GASTEROMYCETES.

PHALLOIDACEÆ.

DICTYOPHORA PHALLOIDEA Desv. in Journ. d. Bot. ii. 88 (1809).

Manokoeari, very common on ground where damp in forest, 200'. Jan. 6156.

Brown, reticulum yellow. Eggs brown. Smells like *Phallus impudicus*.

Distrib. Widespread in tropics.

In specimens preserved in spirit the pileus and the wide-netted reticulum have a dark, somewhat orange colour and the stipe is almost white; the liquid contains a flocculent powder, which is of the same colour as the reticulum, but somewhat lighter. In dried specimens the pileus is blackish brown, the net and stipe orange, and the volva looks like touchwood. The pileus, stipe, and indusium of *D. phalloidea* are in most collections normally white; and Fischer (1891, 1893) gives thirty-six synonymous forms, though he includes *D. rosea* (Cesati), recorded from French Guinea and Java, in which the indusium is pink.

D. phalloidea seems to be extremely variable in the shape and size of its parts, chiefly the pileus and the indusium. Möller, discussing the question of varieties ('Brasilische Pilzblumen,' 122 (1895)), says:—"Die Varietätenbildung kann meines Erachtens keine andere Bedeutung haben, als die einer übersichtlichen Anordnung der in den Sammlungen zufällig erhaltenen Stücke. Jeder neue Fund wird sie verändern und erweitern. . . . Würde man auf diesem Wege weiter gehen, so müsste beinahe für jeden neuen Einzelfund nun ein neuer Varietäten-Name gemacht werden, mit ebenso grossem und ebenso geringem Rechte, wie man früher einen neuen Artnamen einsetzte. In der Sache wäre kaum etwas geändert. Ich möchte es für ausreichend halten, wenn man neue Fundorte bekannt giebt und auf die vorkommenden Formabweichungen aufmerksam macht, um das Maass der Formschwankungen innerhalb dieser merkwürdigen Art allmählich festzustellen." Petch (Ann. Roy. Bot. Gard. Peradeniya, iv. 139 (1908)) gives an account of the variations in the pileus and net which led to the formation of "species." The New-Guinea specimens fall well within the morphological series described by various authors.

With regard to colour there seems to be just as great a variation, and certain species have been described on what seems to be differences in colour alone. One of these, *Dictyophora multicolor*, was described from Brisbane by Berkeley and Broome (Trans. Linn. Soc. 2nd ser. Bot. ii. 65 (1883)). The type-specimen is in the herbarium of the British Museum. Two drawings accompanied the specimen sent by Bailey—one by himself, the other by his young son. The drawing and colouring in each is very poor, and Bailey calls his own colouring "incorrect." The notes on colour are "orange" for the pileus, "lemon" for the net, and "cream" for the stipe.

(The original of Miss Ellis's drawing, *tom. cit.* t. xiv. f. 16, is in the B.M. collection. It is made up from the specimen and the accompanying sketches, and probably poorly represents the former when gathered, either in shape or colour.) The veil is dependent, but judging from the type-specimen there is no reason against considering it, from a morphological point of view, as a badly-preserved *D. phalloidea*. Penzig (*Ann. Jard. Bot. Buitenzorg*, xvi. 154 (1899)) records *D. multicolor* from Java, where he found it not very common. He regards it as easily distinguishable from *D. phalloidea* by its orange-coloured indusium. The volva is dark brown, the stipe pale yellow (cream), and the pileus dark yellow after the dark olive-green gleba has been washed away; the mycelial strands are reddish. He regards this species as, on the average, smaller than *D. phalloidea*.

The specimens of the present collection are doubtless *D. multicolor* as interpreted by Penzig.¹

Another species which apparently differs only in colour from *D. phalloidea* is *D. callichroa* Möll., based upon a single collection (Möller, *tom. cit.* 129). The pileus of both specimens was orange, and the mouth rose-coloured. The stipe and indusium were pure white. "Bei keinem der sonst beobachteten (über 40) Fruchtkörper von *D. phalloidea* wurde eine ähnliche Färbung, wie hier, auch nur andeutungsweise je beobachtet."

Hennings (*Engl. Bot. Jahrb.* xxv. 505 (1898)) gives the name *D. phalloidea* forma *aurantiaca* to a specimen from New Guinea with an orange-yellow pileus and a snow-white indusium. Fischer (*Mitt. naturf. Gesell. Bern*, 110 (1907)) describes a form with a white volva and a yellowish-brown indusium.

Concerning Ceylon specimens, Petch (*l. c.*) says that the commonest form has a white stalk, a white cap, and a salmon-pink net. A pure white specimen is rare, though the specimens developed from "eggs" were white, suggesting that separation from the mycelial strands influenced the colour. (Möller's specimens, except *D. callichroa*, were developed from collected eggs.) Petch summarizes his observations: "Altogether, it may be said that the cap may be white, pale yellow, or orange; the stalk may be white, yellow, orange, or pink; and the net may be white, yellow, orange, orange-red, pink, or salmon. Examples occur with all possible combinations of these colours, without any structural differences which would warrant their separation as species. . . . In some of the Ceylon specimens the mycelium and volva are white, in others they are violet, or the top of the unopened egg is purple; and there seems to be some correlation between the presence of colour in the volva and mycelium, and its absence from the mature fructification. . . . It seems impossible to maintain species on colour. In Ceylon, one is certain after gathering

¹ Cleland and Cheel record this form for Australia (*Journ. Roy. Soc. N.S.W.* xlix. 200 (1916)).

fifty specimens that he has *phalloidea*, *multicolor*, and *callichroa*; by the time he has seen one hundred this belief is considerably shaken: and further experience forces him to the conclusion that there is only one species. Nor is it possible to separate forms on such characters as the relative position of the cap and net, the rounded or flattened bands of the net, the size of the meshes, the depth of the net, and the extent of its spread."

Lloyd ('Synopsis of the known Phalloids,' 20 (1909)) says that the colour forms of *D. phalloidea* "have a geographical significance. They do not occur in Samoa; and Mr. C. B. Ussher, who has observed the species in tropical Africa, informs me that they are absent there."

The smell of *D. phalloidea* is, according to Möller, worse than that of *Phallus impudicus*; the smell of *D. callichroa* bears no resemblance to it, and is "schwach, wiederlich süsslich." Bailey writes concerning *D. multicolor*:—"The odour of this beautiful fungus is decidedly strong and far from being agreeable, but it has not the loathsomeness of an *Aseroë*." Petch says the smell of the Ceylon specimens is not by any means so offensive as that of *P. impudicus*, being rather sweet, slightly offensive indoors, and scarcely perceptible at a short distance from the fungus in the open, so that he was never able to detect it by its smell, as one often does *Phallus*. Miss Gibbs informs me that after her first gathering of the fungus it was nearly always by smell that she afterwards detected it.

LYCOPERDACEÆ.

GEASTER FIMBRIATUS Fr. Syst. Mycol. iii. 16 (1829).

Manokoeari, rank jungle at edge of "korang" forest on ground, 200'.
Jan. 6173.

Distrib. Recorded from all continents except Asia (?).

GEASTER MIRABILIS Mont., var. TRICHIFER Lloyd, Mycological Notes, xxv. 314, 317 (1907). *G. trichifer* Rick in Lloyd, *l. c.*

"Is really a form of *Geaster mirabilis*, but the exoperidium is strongly strigose, and the only *Geaster* known that has this character" (Lloyd).

Manokoeari, rank jungle at edge of "korang" forest on wood, 200'.
Jan. 5753.

Distrib. Brazil.

Fungi Imperfecti.

HYPHOMYCETES.

CYLINDROPHORA EPITRICHA Ramsbottom, sp. nov.

Cæspitulis minutis albis, byssinis; hyphis ad basim 4 μ cr.; septatis, ramulos simplices unilaterales ferentibus; hyphis fertilibus ascendentibus vel subrepentibus, non-septatis; conidiis ellipsoideis, 7-10 $\mu \times 3-4 \mu$.

In setis *Sarcosoma novo-guineensis* (q. v.). 5751.

BRYOPHYTA. (A. GEPP.)

HEPATICÆ.

*DUMORTIERA VELUTINA Schiffn. Hepat. Flora von Buitenzorg, i. 26 (1900).

Manokoeari, track to Ambani, terrestrial in forest, 500'. Jan. 6196.
"Mossy green in appearance."

Distrib. Java, Sumatra.

ANTHOCEROS BULLATO-SPONGIOSUS Gepp, sp. nov.

Frons furcatim divisa; rami c. 1 cm. longi cuneate subflabellatimve expansi c. 0.5 cm. lati translucetes, inferne plani, superne lamellis magnis (scilicet parietibus cavernarum perruptis) bullato-crispatis lobulatis oblique ascendentibus subcontiguis ornati, interne spongiosi e cavernis allantoides c. 0.1-0.3 mm. diam. ± 1 mm. longis longitudinaliter dispositis 3-4-seriatis oblique apicem rami versus ascendentibus per parietes unilamellatos sejunctis compositi. Cellulæ lamellarum c. 40 μ diam. *Involucrum* c. 0.3 cm. longum lamellis paucis parvis crispatis thallinis ornatum. *Capsula* c. 2.5 cm. longa, 0.35 mm. diam.; valvæ stomatibus pertusæ; columella tenuis. *Sporæ* c. 30 μ diam. unicellulares brunneæ verruculosæ. Pseudo-elateres c. 300 μ long., 5 μ crass. vermiculariter flexuosi brunnei opaciusculi hic illic articulati sine spira.

Hab. Island of Roon, road along Bay, on open bank. Jan. 6241.
"Thallus like *Dendroceros javanicus*, yellow and fluffy."

MUSCI.

*GARCKEA PHASCOIDES C. Müll. in Bot. Zeit. 1845, 865.

Island of Roon, road along Bay, on open bank. Growing among *Anthoceros bullato-spongiosus*. Jan. 5754.

Distrib. Malay Islands to S. China and India.

*WILSONIELLA PELLUCIDA C. Müll. in Bot. Centralbl. 1881, 345.

Island of Roon, road along Bay, on open bank. Growing among *Anthoceros bullato-spongiosus*. Jan. 5755.

Distrib. Java, Macassar, Ceylon.

PELEKIUM TRACHYPODUM Jaeg. & Sauerb. Gen. et Spec. Musc. ii. 334 (1878).

Manokoeari, ridge behind "campong," on dead wood in forest, 400'. Jan. 6184.

Distrib. New Guinea (D.N.W., Onin, west coast, *Beccari*; N.E.). Malay Islands. India.

PTERIDOPHYTA. (A. GEPP.)

FILICALES.

The references to the descriptions of the following ferns are to be found in Christensen's 'Index Filicum,' 1905-13.

TRICHOMANES HUMILE Forst.

Humboldt Bay, over ridge behind "campong," on rocks by stream, in high forest, 300'. Jan. 6251.

Distrib. New Guinea (S.E.). Java. Formosa.

TRICHOMANES BIPUNCTATUM Poir.

Island of Roon, ridge above "campong," epiphytic in high forest, 300'. Jan. 6236.

Distrib. New Guinea (D.N.W., Arfak Mts., Soron, *Beccari*; Aru Islands; N.E.). Asia. Africa. Polynesia.

TRICHOMANES JAVANICUM Bl., var. RHOMBOIDEUM C. Chr.

Humboldt Bay, ridge behind "campong," 500', common in high forest, terrestrial. Jan. 6263.

Distrib. New Guinea (D.N.W., Andai, Ramoi, *Beccari*; D.S.W., Noord River, *Versteeg*; Papuarand, *von Roemer*; N.E.). Trop. Asia. Trop. Australia. Polynesia.

CYATHEA RUNENSIS V. Ald. v. Rosenb.

Island of Roon, ridge rising from bay, 300', undergrowth in high forest. Jan. 6237. "Small tree-fern, 3 m. in height, very thin stem, paleaceous. Fronds 2 m. long, bases dry and thorny."

Distrib. New Guinea (D.N.W., Roon Island).

ALSOPHILA STRAMINEA, Gepp, sp. nov.

Stipes (?). *Frons* tripinnatifida; rhachis straminea sparse muricata, supra fusco-pubescentia; pinnæ basales circa 40 cm. longæ 15 cm. latæ, mediæ circa 55 cm. longæ, brevi-stipitatæ lanceolatæ acuminatæ apice pinnatifidæ; rhachis pinnæ sparse punctato-muricata, supra rufo-tomentosa infra sparse pallide et crispate pubescens; pinnulæ alternæ 14-19-jugatæ lineari-lanceolatæ acuminatæ brevi-stipitatæ, 8 cm. longæ \pm 1.5 cm. latæ, fere ad costam (ad $\frac{2}{3}$) pinnatisectæ; costa pinnulæ supra rufo-tomentosa infra sparse et crispate pubescens; segmenta \pm 16-jugata, 4 mm. lata, inter sese \pm 1 mm. sejuncta, oblonga falcatura obtusa serrulata, infra minute pubescentia; costula supra glabra; venulæ 8-10-jugatæ furcatæ. *Sori* mediani \pm 8-jugati in venulæ furca siti. *Textura* herbacea; color laminæ viridis.

Hab. Humboldt Bay, ridge behind "campong," 500', undergrowth in high forest. Jan. 6256. "Tree-fern, 3 m. in height. Stem thin and thorny, paleæ bark brown."

The pinnules are inserted on the costa (secondary rhachis) at intervals of about 2.25 cm., and their margins are \pm 1 cm. apart. The frond is not hairy enough to be referred to *A. trichodesma*.

DRYOPTERIS (NEPHRODIUM) TRUNCATA O. Kuntze.

Manokoeari, track to Ambani, terrestrial in "korang" forest, 700', common. Jan. 6206. "Fronds 1.50 m., arranged as in a small tree-fern."

Distrib. New Guinea (D.S.W., Noord River, von Roemer; N.E.). Madagascar to Polynesia and tropical Australia.

***DRYOPTERIS (LASTREA) STENOBASIS** C. Chr.

Schouten Island, Bosnik, Wiak, terrestrial in forest, near beach. Jan. 6280. "Rosette habit; frond 2 m. long."

Distrib. Celebes; Philippine Islands.

CYCLOPELTIS PRESLIANA Berk.

Manokoeari, track to Ambani, epiphytic in "korang" forest, 500'. Jan. 6207. "Fronds on rhizome."

Distrib. New Guinea (D.N.W., Andai, Beccari: sine loc., Gjellerup; N.E.). Malay Islands. Burma.

ASPIDIUM (SAGENIA) PACHYPHYLLUM Kze.

Manokoeari, base of high forest behind Manokoeari, 200', terrestrial. Jan. 6168. "Sterile and fertile fronds."

Distrib. New Guinea (D.S.W., Mt. Carstensz, Kloss; N.E.). Malay Islands. Polynesia.

ASPIDIUM (PLEOCNEMIA) LEUZEANUM Kze.

Manokoeari, track to Ambani, undergrowth in "korang" forest, 700'. Jan. 6194.

Distrib. New Guinea (D.N.W., Arfak, Beccari: im feuchten Urwald, Gjellerup; N.E.; S.E.). Polynesia. Malay Islands. South China. India.

THYSANOSORIA Gepp, gen. nov.

Sori parvi globosi copiosi submarginales super venis simplicibus terminales. Indusium nullum. Rhizoma scandens; stipes rhizomati haud articulatum adjunctus; frondes dimorphæ pinnatæ, pinnis rhachi articulatum adjunctis.

THYSANOSORIA DIMORPHOPHYLLA Gepp, sp. nov. (Pl. 4.)

Axis scandens volubilis stramineus paleis deciduis primum vestitus. *Frondes* dimorphæ. *Stipes* basi decurrens haud articulatus, 7-9 cm. longus stramineus parcissime paleaceus. *Frons sterilis* oblonga, c. 35 cm. longa 18 cm. lata, fere pinnata, rhachi angustissime alata, pinnis plerumque alternis 6-8-jugatis sessilibus basi articulatis, ad intervalla c. 4 cm. insertis, e basi cuneata lineari-lanceolatis acuminatis, 14-15 cm. longis 2 cm. latis (pinna apicali ceteris congruente, sed haud articulata), margine veniformi integro, venis pinnatim dispositis simplicibus (rare furcatis) usque ad marginem excurrentibus. *Frons fertilis* oblonga, 22-28 cm. longa c. 15 cm. lata, pinnata, pinnis plerumque 9-jugatis stipitatis, rhachi ad intervalla

2-3 cm. articulatum insertis, anguste linearibus versus apicem attenuatis, 10-15 cm. longis 1-50 mm. latis (3 mm. cum soris), margine inconspicue sinuoso, lamina pallida, venis simplicibus marginem haud attingentibus. *Textura* chartacea. *Sori* globosi intramarginales sed ultra marginem multo eminentes, copiosissimi (90-100-jugati), ad lobulos minutos singulariter ad intervalla ± 2 mm. dispositi, super venis simplicibus terminales. *Indusium* nullum.

Hab. Manokoeari, ridge behind Manokoeari, 500', common climbing in "korang" forest. Jan. 6162. "Sterile and fertile fronds."

This is the most remarkable fern in the collection and the most difficult to place systematically. It is a climbing fern with twining axis and dimorphous pinnate short fronds; the stipes is non-articulate and emerges gradually from the axis; the sterile pinnae are sessile and articulated to the narrowly alate rhachis; the fertile pinnae are articulate, stipitate, very narrow, pallid, and fringed along each side by about 100 small prominent globose sori at close intervals, arising intramarginally on the apex of simple veins. Each sorus is subtended by an inconspicuous lobule which appears to be too small to cover over the young sorus. No trace of an indusium can be found.

The systematic position, in view of the exindusiate sori and the non-articulate stipes, would seem to be near to *Phegopteris*, though the plant recalls *Stenochlæna* in its climbing habit and dimorphous fronds, and *Nephrolepis* in its articulated pinnae.

From Cesati's description of his *Gymnogramme pteridiformis* (in Rendic. Accad. Soc. R. Napoli, xvi. 1877, p. 30), collected by Beccari at Andai, and transferred to *Notochlæna* by J. G. Baker (in Beccari's 'Malesia,' iii. 49), one infers that that plant may prove to be nearly allied to the present, and possibly congeneric. Hitherto it has failed to find a satisfactory systematic position.

STENOSEMIA AURITA Presl.

Manokoeari, ridge above "campong," 500', common in "korang" forest, terrestrial. Jan. 6176. "Rosette habit, fertile fronds, overtopping sterile."

Distrib. New Guinea (D.N.W., Andai, Beccari; N.E.). Malay Islands. Solomon Islands.

DIPLAZIUM MAXIMUM C. Chr.

Humboldt Bay, ridge behind "campong," 200', very common undergrowth in high forest. Jan. 6257.

Distrib. New Guinea (N.E.; S.E.). Asia. Polynesia. Australia.

DIPLAZIUM POLYPODIOIDES Bl.

Schouten Islands, Bosnik, Wiak, terrestrial in forest, near beach. Jan. 6281.

Distrib. New Guinea (D.N.W., Arfak Mts., Beccari; N.E.). Malay Islands. India. Australia.

DIPLAZIUM (ANISOGONIUM) PROLIFERUM Thouars.

Manokoeari, terrestrial in base of high forest, 200'. Dec. 6159. "Like small tree-fern in habit."

Distrib. New Guinea (D.S.W., Noord River, *Versteeg*; Mt. Carstensz, *Kloss*; N.E.). Malay Islands to Polynesia and tropical Africa.

ASPLENIUM LASERPITHIFOLIUM Lam.

Manokoeari, common in "koraug" forest, 500'. Jan. 6183. "Rosette habit, fronds 1 m., naked stipes 0.50 m., young plantlets make roots on parent plant."

Distrib. New Guinea (D.N.W., Ramoi, *Beccari*; D.S.W., Hellwig-Gebirge, *von Roemer*; N.E.; S.E.). Malay Islands. Polynesia. Trop. Australia.

HYPOLEPIS GRANDIFRONS Gepp, sp. nov.

Frons maxima subdeltoidea (pinna basalis c. 72 cm., pinna media c. 92 cm. longa) tripinnata; pinnæ primariae lanceolatae acuminatae 22-25 cm. latae; pinnæ secundariae alternæ c. 40-jugatae breviter stipitatae, intervallis c. 2.5 cm. insertæ, lineari-lanceolatae acuminatae usque ad 12.5 cm. longæ 2.5 cm. latae; pinnulae alternæ 20-22-jugatae breviter stipitatae oblongæ obtusissimæ pinnatifidæ, lobis anticis 5 et posticis 4 instructæ, apice ± flabellatæ; lobi oblongi paucicrenati vel integri, venulis 3 anticis 1 postico percursi; lobus anticus inferior duplo major, venulis 3-jugatis furcatis percursus. *Sori* in lobis solitarii, in sinu marginis antici positi, lobulo (indusio) parvo luteo-fusco involuto obtecti; in lobo antico inferiore duo sori adsunt. *Sporangia* circum penicillum paraphysium articularum disposita. *Textura* membranacea; color valde viridis. *Rhachis* primaria (? 1 cm. crassa) straminea; rhachis secundaria et tertiaria atque pinnularum costæ superne sulco pilis articulis brevibus ± villosis exaratae; costa et venulae pilis paucis hinc illinc instructæ.

Hab. Humboldt Bay, ridge behind "campong," 500', terrestrial by stream in high forest. Jan. 6258. "Magnificent single fronds from underground creeping rhizome, 5 m. long, petiole 3 m., lamina 2 m. deltoide."'

The huge fronds, the stipitate pinnules, and the few sori distinguish this species from the rest. The material consists of two pinnæ with fragments of the main rhachis attached.

PTERIS (EUPTERIS) BAMBUSOIDES Gepp, sp. nov.

Rhachis erecta crassa atro-purpurea subnitens minute pubescens. *Pinnæ* intervallis circa 4 cm. insertæ, erecto-patentes, alternæ (?) brevi-stipitatae, ad basin imam 1-2-dichotomæ, segmentis usque ad 40 cm. longis e basi cuneata linearibus sensim attenuatis, fertilibus integris, sterilibus serrulatis, versus apicem spinuloso-serratis, margine incrassata venuliformi, lamina nitente, costa inferne plerumque rubella et ad latera sæpe pubescenti, venulis plurimis (circa 33 in centimetri spatio) conspicuis simplicibus furcatisve. *Indusium* angustum brunneolum membranaceum.

Hab. Arfak Mts., inundation area of Momi River, and common down to Wariap. Dec. 5732. "Each shoot up to 3 m. tapering; growing in clumps. Pinnæ on young fronds plane, but on rhachis twisting in growth, finally arranged spirally."

The material collected consists of a longitudinal half of a fragment of rhachis, about 38 cm. long, with pinnae attached. The pinna-segments closely resemble the pinnae of *P. moluccana*, but differ, of course, in being dichotomously disposed at base.

The remarkable fronds of this fern, rising to a height of 3 m. from the ground and growing in clumps, must form a conspicuous feature in the savannah landscape. It is surprising that so well developed a species should not have been recorded previously, unless, indeed, its distribution is extremely limited.

PTERIS TORRICELLIANA Christ.

Humboldt Bay, ridge behind "campong," 400', by stream in high forest, undergrowth. Jan. 6252. "Petiole 1.50 m., frond 1 m. long."

Distrib. New Guinea (N.E.).

VITTARIA ELONGATA Sw.

Humboldt Bay, ridge behind "campong," 200', epiphytic by stream in high forest. Jan. 6254. "Pendent from rock, fronds 2.80 m. long."

Distrib. New Guinea (D.N.W., Soron, Ramoi, *Beccari*; D.S.W., coastal lowlands, *Versteeg*; N.E.; S.E.). Trop. Asia. Polynesia. N.E. Australia.

ANTROPHYUM RETICULATUM Kaulf.

Manokoeari, track to Ambani, 700', epiphytic in high forest. Jan. 6193.

Distrib. New Guinea (D.S.W., coastal lowlands, *Versteeg*; N.E.; S.E.). Madagascar to Polynesia and tropical Australia.

POLYPODIUM (PLEOPELTIS) NORMALE Don.

Humboldt Bay, ridge behind "campong," 500', common, climbing in high forest. Jan. 6271.

Distrib. New Guinea (N.E.). Trop. Asia. China. Madagascar.

**LYGODIUM DIGITATUM* Presl.

Manokoeari, track to Ambani, 500', common in forest and clearings. Jan. 6208.

Distrib. Philippine Islands. Malacca.

ANGIOPTERIS EVECTA Hoffm.

Humboldt Bay, ridge behind "campong," 500', very common by stream in high forest. Jan. 6259.

Distrib. New Guinea (D.N.W., Arfak Mts., *Beccari*; D.S.W., Mt. Carstensz, *Kloss*; S.E.). Tahiti. Trop. Asia. Africa.

OPHIOGLOSSUM PEDUNCULOSUM Desv.

Dammar Island, in open "kebun" near seashore. Jan. 6289.

Distrib. New Guinea (N.E.). Trop. Asia. Australasia.

LYCOPODIALES.

LYCOPODIUM PHEGMARIOIDES Gaud.

Manokoeari, Langgèn, epiphytic on tree hanging over sea. Dec. 6221.

Distrib. New Guinea (N.E.). Malay Islands. Polynesia.

LYCOPODIUM CERNUUM L.

Island of Roon, young plants, spreading in the open, in shade by road round bay. Jan. 6225.

Distrib. New Guinea (D.N.W., Arfak Mts., *Beccari*; D.S.W., Mt. Carstensz, *Kloss*; N.E.; S.E.). Tropics and some subtropics.

PSILOTUM FLACCIDUM Wall.

Schouten Islands, Bosnik, Wiak, epiphytic on strand trees. Jan. 6273.

Distrib. New Guinea (D.N.W., Arfak Mts., *Beccari*; D.S.W., Noord River, *Versteeg*; Mt. Carstensz, *Kloss*; N.E.). Tropics.

SELAGINELLA PLUMOSA Baker.

Humboldt Bay, ridge behind "campong," creeping in high forest, 500'. Jan. 6265.

Distrib. New Guinea (N.E.). Solomon Islands. Trop. Asia.

SPERMATOPHYTA.

CYCADALES.

CYCADACEÆ.

CYCAS CIRCINALIS L. Sp. Pl. ed. 1, 1188; F. Muell. Pap. Pl. ii. 71;

Schum. & Laut. 153; Nova Guinea, viii. (1910) 343.

Schouten Islands, Wiak, Bosnik, under trees on seashore. Veg. Jan. 6278.

Distrib. New Guinea (D.S.W., Noord River, *Versteeg*; S.E.: N.E. and adjacent islands). S. Asia to Polynesia.

MONOCOTYLEDONEÆ.

PANDANACEÆ. (A. B. RENDLE.)

FREYCINETIA OBLANCEOLATA Martelli in Webbia, iii. 176.

Manokoeari, "korang" forest, 500'. Fl., ♂. Jan. 6158. Spathes light green.—Fl., ♀. 6157. Spathes pink-green.

Distrib. New Guinea (D.N.W., Doré, *Teysmann*).

The specimens agree with Martelli's description, except that the number of the stigmas varies from 2-4 in the above specimens.

FREYCINETIA BECCARII Solms-Laub. in Ann. Jard. Buit. (1883) iii. 100.

Manokoeari, Langgên, scandent on land-edge of mangrove association. Fr. Jan. 6219.

Distrib. New Guinea.

Fruit red-brown, 2.5 mm. long, not quite ripe.

PANDANUS DUBIUS Spreng. Syst. Veg. iii. (1826) 897; Schum. & Lant. 159.

Manokoeari, Genbela, plentiful by cape, on edge of sandy beach. Jan. 6215.—Wakdé Island, gregarious on edge of beach. Fr. Jan. 6248.

Distrib. New Guinea and adjacent islands. Java, Borneo, Moluccas, Celebes, Philippines, Carolines, Marianne Islands, and New Hebrides.

*PANDANUS POLYCEPHALUS Lam. Encycl. i. (1785) 372.

Manokoeari, Langgên, common in mangrove association. Fr. Jan. 6230.

Distrib. Amboina, Batjan, Ceram, Timor, Sumatra.

“Plant \pm 10 m. high, with branched head. Fruit red.”

PANDANUS TABBERSIANUS Rendle, sp. nov.

Arbor parva. Folia valde spiraliter ordinata, e basi dilatata linearia, superne gradatim attenuata, basin versus late canaliculata cæterum plana; marginibus in parte basilari nudis cæterum dentibus minutis acutis crebris munitis; costa media in facie inferiore prominente, velut in margine denticulata. *Syncarpium* magnum, pendulum, pedunculo longo suffultum, anguste lanceolato-ellipsoideum, axe fibroso-lignoso, spathis plurimis indutum. *Spathæ* lineari-lanceolatæ vel lanceolatæ, subæquilongæ, coriaceæ, extus leves, carinatæ, marginibus et carina (basi excepta) velut in foliis denticulatæ. *Drupæ* maturæ brunneæ, numerosissimæ, confertæ, irregulariter 5-7-gonæ, parte apicale libera et infra pileum depresso-pyramidatum angulosum constricta; stigma laterale, horizontale, plus minus compressum superne autem rotundatum vel interdum bilobatum; endocarpium osseum, anguste ellipsoideum, basi angustatum, mesocarpium inferne fibrosum.

Hab. Manokoeari, forest edge, track to Ambani, 100'. Fr. Jan. 6213.

Plant 5 m. high. Leaves 3 m. long, 13 cm. wide at the base, 6 cm. wide about the middle; teeth 1.5-2 mm. long. Syncarp 4 dm. long, 1 dm. in greatest diameter, core up to 5 cm. in diameter; peduncle 3.7 dm. long. Drupes 1.8-2.1 cm. long, 4-5 mm. thick, upper free part about .5 cm., cap 2-2.75 mm. long; endocarp about 1 cm. long.

From the description evidently near *P. Englerianum* Martelli from Neu-Mecklenburg, which, however, has a much larger trigonous syncarp, scarlet drupes, and a discoid stigma. The syncarp of our species is described as of a uniform chocolate-brown colour.

This plant has been named in honour of Mr. (now Capt.) Tabbers, Acting Assistant Resident at Manokoeari, to whose ready help, practical experience, and judgment Miss Gibbs was much indebted during her stay.

GRAMINEÆ. (A. B. RENDLE.)

CENTOTHECA LAPPACEA Desv. in Journ. de Bot. (1813) 70; Schum. & Laut. 185; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 250.

Island of Roon, ridge beyond Djendè, common undergrowth in forest, 400'. Fl. Jan. 6234.

Distrib. New Guinea (D.S.W., Utaqua River, *Kloss*; N.E. and adjacent islands). West Africa, through India, Malesia, and Polynesia.

GIGANTOCHLOA NOVO-GUINEENSIS Rendle, sp. nov.

Culmus arborescens, ramis teretibus glabris. *Folia* subsessilia, lineari-oblonga, apice subabrupte acuminata, ad basin valde obliquam et inæqualiter cordatam paullo angustata, multinervia sed haud conspicue, haud tessellata, utrinque glabra, margine scabridula; *vaginæ* tubuliformes, persistentes; ore auriculatæ, ciliatæ; *ligula* angusta, ciliata. *Inflorescentiæ* terminales et axillares, rhachi elongata, ramis multo brevioribus, suberectis, spiculis capituliforme fasciculatis, capitulis distantibus, ad apicem rami interdum glomeratis. *Spiculæ* numerosissimæ, dense confertæ, lanceolatæ, compressæ, plurifloræ; *glumæ inferiores*, sæpe 2, steriles, fertilibus minores, late ovatæ, apice mucronatæ, multinerviæ, in margine superiore sparse ciliolatæ; *glumæ fertiles* 2-5 distichæ, 1 vel 2 superiores imperfectæ, late ovatæ, breviter acuminatæ, apice pungente, in margine superiore ciliolatæ, multinerviæ; *palea* glumæ subæqualis vel paullo brevior, bi-carinata, carinæ minute ciliolatæ, lamina inter carinam et marginem 3- vel 2-nervata, pars inter carinas haud nervata. *Lodiculæ* 0. *Stamina* 6, exserta, filamenta pro majore parte longitudinis in tubum tenuiter membranaceum demum valde fragilem connata; antheræ anguste lineares, obsolete apiculatæ. *Ovarium* breviter pedicellatum, anguste pyramidatum, glabrum, stylo elongato, filiforme, superne in stigmata plunosa 3- vel 2-diviso.

Culms about 16 ft. high; the young culm about 1 cm. thick; sheaths membranous, tubular, 11-12 cm. long, with margins ciliate above, and a truncate auricled apex bearing a fringe of long erect stiff cilia, 1·8 cm. long, small leaf-blade, subsessile, ovate, acuminate, with shallowly cordate base. Fully formed leaves on flowering shoots 4-4·5 dm. long, 7-9 cm. wide, on the young leafy shoots up to 6 dm. long, 9·5 cm. wide; apex acuminate, ending in a twisted scabrous point; ligule a ridge bearing stiffish cilia which are about 1 cm. long. Rhachis and branches of inflorescence smooth, glabrous; the rhachis up to 6 dm. long; spikelets crowded in somewhat distant heads, 1·2-2 cm. long, which are generally 3-5 cm. apart, but closer toward the end of the axis, where they sometimes unite to form a spherical compound head. Branches of inflorescence and heads subtended by the dry, brown, persistent bract-sheath, which is about equal in length to the head. Spikelets about 1 cm. long, 4 mm. broad. Lower barren glume 4 mm. long, 9-nerved, upper 6 mm. long, 11-nerved; flowering glumes 8-9 mm. long.

A very distinct species, suggesting *Oxytenanthera* in habit of inflorescence.

Hab. Manokoeari, open cultivated slopes above "campong," 100'. Jan. 6270 *a* & *b*.—Humboldt Bay, beyond "campong" in the open and along stream. Jan. 6266 *a* & *b*.

CYPERACEÆ. (A. B. RENDLE.)

THORACOSTACHYUM HYPOLYTROIDES C. B. Clarke in Hook. f. Fl. Brit. Ind. vi. (1894) 680.

Humboldt Bay, by "campong," swamp behind beach, abundant. Fl. Jan. 6249.

Distrib. New Guinea. Asia and tropical Australia.

*SCLERIA MARGARITIFERA Willd. Sp. Pl. iv. 312.

Manokoeari, edge of forest, 200'. Fl., Fr. Jan. 6166.—Island of Roon, near Djendè, in the open, by road round the bay. Fr. Jan. 6239.

Distrib. Polynesia. Australia.

PALMÆ. (O. BECCARI.)

ARENDA MICROCARPA Becc. in Schum. et Hollr. Fl. von Kaiser Wilhelms Land (1889) 16. *A. gracilicaulis* Bailey in Queensl. Agric. Journ. iii. pt. 3 (1898) 202. *A. microsperma* (sphalmate pro *A. microcarpa*) Becc. in Reching. Bot. u. Zool. Ergebnisse, etc. v. (1913) 64, et in Schum. et Laut. Fl. deut. Schutzg. in d. Südsee, 204.—*Didymosperma microcarpa* Warb. in Mons. ined. ex Schum. et Laut. l. c. 204. *D. novoguineensis* Warb. in Mons. ined. ex Schum. et Laut. l. c. *D. humile* Laut. et K. Schum. in Schum. et Laut. l. c. 204.—? *Saguerus australasicus* Wendl. et Dr. in Linnæa, xxxix. (1875) 219.

Humboldt Bay, by river near "campong." Fl., Fr. Jan. 6268.

Distrib. N.E. New Guinea and N.E. Australia.

CARYOTA RUMPHIANA Mart. Hist. nat. Palm. iii. 195; Blume, Rumphia, ii. 140; Becc. Malesia, i. 70, 74.

Dammar Island. Fl., Fr. Feb. 6288.

Distrib. Moluccas.

LICUALA MONTANA Dammer et K. Sch. in Schum. et Laut. Fl. deut. Schutzg. in d. Südsee, 200; Becc. in Webbia, i. 291 (in note).

Humboldt Bay, ridge behind the "campong." Fl. Jan. 6262.

Distrib. N.E. New Guinea.

PIGAFETTA FILARIS Becc. Malesia, i. 89 (*Pigafettia*). *Metrozylon filare* Mart. Hist. nat. Palm. iii. 216 & 343. *Sagus filaris* Bl. Rumphia, ii. 154 & 128. *Pigafettia papuana* Becc. Malesia, i. 89.

Manokoeari, ridge behind, single specimens in forest, 500'. Jan. 6180.

Distrib. New Guinea (D.N.W., near Andai, *Beccari*). Moluccas.

ARACEÆ.

HOLOCHLAMYS BECCARII Engl. in Malesia, i. 265; Schum. & Laut. 212; Nova Guinea, viii. (1912) 806.

Humboldt Bay, ridge behind "campong," 500', undergrowth in high forest. Fl. Jan. 6261.

Distrib. New Guinea (D.N.W., Ramoi, Andai, *Beccari*; D.S.W., Hellwig Mountains, von *Roemer* [fl. Nov.]; N.E.). Aru Islands (*Moseley*, 'Challenger' Exp. Herb. Kew.).

Spadix green when collected with only remains of spathe.

CYRTOSPERMA MACROTUM Becc. (MS.) ex Engl. in Bull. Soc. Tosc. Ort. iv. (1879) 295; Malesia, i. 279, t. xxiv. figs. 1-6; Nova Guinea, viii. (1910) 249; Ridl. in Trans. Linn. Soc., ser. 2, Bot. ix. (1916) 24.

Manokoeari, track to Ambani, undergrowth in high forest, on "korang." Fl. (yg.). Jan. 6211.

Distrib. New Guinea (D.N.W., Batantá, *Beccari*; D.S.W., Noord River, *Versteeg*, *Brandenhorst*, marsh land, von *Roemer*; Mt. Carstensz, *Kloss*; S.E.).

Plant 1 m. high. Spathe white.

SCHISMATOGLOTTIS DORENSIS Gibbs, sp. nov.

Herba parva; caudiculus hypogæus. *Cataphylla* lineari-lanceolata, membranacea. *Folia* oblongo-lanceolata, acuminata, basi breviter late cordata, superne flavo-viridia, subtus pallida, nervis ± 16 , vagina lata. *Spatha* solitaria, albida, basi constricta, lamina convoluta, dilatata, cuspidata. *Spadicis* pars feminea triente inferiori dorso spathe adnata, superne laxiflora, inflorescentia mascula a feminea interstitio nudo separata. *Staminum* filamenta quam antheræ paullo longiora; thecæ obovoideæ, concavo-rufescentes. *Staminodia* truncata, rufo-punctata. *Ovaria* oblonga, ovoidea, stigmatum parvi sessili coronata, ovula plurima.

Hab. Manokoeari, terrestrial in secondary jungle, forming large patches. 200'. Fl., Fr. Jan. 6167.

Plant ± 3 dm. high. Largest leaf ± 1.5 dm. by 5 cm., acumen 1 cm. Petiole ± 1.8 dm. long, vagina 3.5 cm. Peduncle ± 7 cm. long; cataphylls ± 2.5 cm. long. Spathe white, 3.6 cm. long, basal portion 1.5 cm. by 4 mm. Spadix white, 2 cm. long; ♀ portion cylindric, 1.2 cm. by 2.5 mm., constricted above; upper part club-shaped, 1 cm. by 4.5 mm., with stamens below and staminodes at the apex. Fruit green (when collected), 2 cm. by .7 mm.

Near *S. Klossii* Ridl., but differs in the longer petioles, larger and broader leaves, longer peduncles, and the naked interval between the upper and lower portion of the spadix. Mr. N. E. Brown was good enough to give me his opinion on this plant as a new species.

AGLAONEMA NOVO-GUINEENSIS Engl. in Bot. Jahrb. xxv. (1898) 22; Schum. & Laut. 214.

Manokoeari, undergrowth in damp secondary jungle, 100'. Fl., Fr. Jan. 6164.

Distrib. N.E. New Guinea.

Stem 1 m. high, with leaves aggregated at the top. Spathes green, sometimes bipartite; spadix white; fruiting spathes green, fruit red.

ALOCASIA ACUTA (Engl.) Hall. f. in Bull. Herb. Bois. vi. (1898) 605; Malesia, i. 294; Schum. & Laut. 214; Nova Guinea, viii. (1910) 251.

Manokoeari, common on edge of forest, where damp, 200'. Fl., Fr. 6190.

Distrib. New Guinea (D.N.W., Andai, *Beccari*; D.S.W., Noord River, *Versteeg*; N.E.). Skru and Aru Islands, Batyan (Herb. Kew.).

A very striking plant with stem 2 m. high, the large fleshy leaves aggregated at the top, bearing numerous flowers, on short peduncles, in their axils. The greenish spathes enclose the spadix, which is white at the top (♂), then red (sterile), and green at the base (♀). The fruit contains 2-6 bright red seeds, with fruiting spathes red at the base and green above.

FLAGELLARIACEÆ.

FLAGELLARIA INDICA L. Sp. Pl. ed. 1, 333; F. Muell. Pap. Pl. i. 73; Ridl. in Journ. Bot. xxiv. (1886) 358; Schum. & Laut. 215; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 231.

Manokoeari, scandent on the highest trees in the forest and in open clearings. Fl. Jan. 6210.

Distrib. New Guinea (D.S.W., Mt. Carstensz, *Kloss*; N.E.; S.E. and adjacent islands). Tropical Asia, Africa, and Australia.

COMMELINACEÆ.

POLLIA SORZOGONENSIS (E. Mey.) Endl. Gen. Pl. (1841) 368; Schum. & Laut. 216; Nova Guinea, viii. (1913) 907; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 231.

Manokoeari, Langgên, undergrowth in secondary jungle. Fl. (white). Jan. 6222.

Distrib. New Guinea (D.N.W., Salt Spring, Begowri River, *Gjellerup*; D.S.W., Mt. Carstensz, *Kloss*; N.E. and adjacent islands). India and Ceylon; Indo-China; Formosa; Malaya, N.E. Australia, and New Caledonia.

LILIACEÆ.

DRACENA ANGUSTIFOLIA Roxb. Fl. Ind. ii. 155; Ridl. in Journ. Bot. xxiv. (1886) 357; Schum. & Laut. 220; Nova Guinea, viii. (1914) 1002.

Humboldt Bay, edge of forest. Fl., Fr. Jan. 6250.

Distrib. New Guinea (D.N.W., Humboldt Bay, Bogowri and Tor rivers,

Gjellerup; D.S.W., Merauke, *Versteeg*; Okaba, *Brandenhorst*; N.E.; S.E.). India. Indo-China, Philippines and Formosa, Malay Archipelago and N.E. Australia.

Common, but not in flower about Manokoeari.

DRACÆNA NOVO-GUINEENSIS Gibbs, sp. nov.

Caulis simplex, fruticosus. *Folia* petiolata, ascendentia, spiraliter arcte imbricata, lineari-lanceolata vel oblanceolata, acuta vel acuminata, membranacea, viridia, oblique parallele costata. *Panicula* longe pedunculata, quam folia brevior. *Flores* solitarii vel bini, pedicellis graciliter dispositis. *Bracteæ* membranaceæ, deltoideo-acuminatæ. *Perianthium* albo-viridulum, lobis ultra medium liberis, obtusis, apicem incurvatis, tubo basin versus angustato. *Stamina* gracilia, filamentis complanatis, antheris basi divaricatis. *Ovarium* sessile: stigma 3-lobatum. *Bacca* disperma.

Hab. Manokoeari, common undergrowth in high forest on "korang." 500'. Fl., Fr. Jan. 6195.

A very characteristic little plant, 25-50 m. in height, well marked by the spirally twisted leaves, like a screw pine in appearance. Leaves 3-4.6 dm. in length, including linear petiole ± 1 dm. long, slightly broader and sheathing at the base, by 3-3.5 cm. broad, the shorter leaves being the broadest. Inflorescence 1.3-2.7 dm. long, including peduncle 1-1.4 dm. long and 6 cm. broad, generally branching three times, but in the single fruiting example unbranched and epedunculate. Bracts ± 3 cm. long, those subtending flowers 3 mm. long; bracteoles 2 mm. Perianth 1.3 cm. long, with segments 7 mm. long and 2 mm. broad. Stamens 5 mm. long; anthers 3 mm.; filaments 2.5 mm. by 1 mm. Style 1.1 cm. long, with minute stigma. Ovary 2 mm. long. Fruit ± 6 by 7 mm..

This species seems distinct from the Malayan *Dracænas*, so far known, in the lengthily petiolate spirally arranged leaves, with very straight linear petioles, and the strap-shaped filaments to the anthers. This is the first member of the genus to be described from New Guinea.

ORCHIDACEÆ. (J. J. SMITH.)

VRYDAGZYNEA ELONGATA Bl. Fl. Jav. n. ser. 1, 61, t. 28, f. 1, etc.

Island of Roon, ridge beyond Djendè, terrestrial in forest. Fl. Jan. 6240.

Distrib. N.E. New Guinea.

HIPPEOPHYLLUM ALBOVIRIDE J. J. S. in Fedde Rep. xi. (1912) 135; in Nova Guinea, xii. (1915) 217, t. lxxi. 123.

Schouten Islands, Island of Wiak, Bosnik, epiphytic on strand tree. Fl. (white). Jan. 6283.

Distrib. New Guinea (D.N.W., Tor River, *Gjellerup*).

LIPARIS (§ EULIPARIS) MABOROENSIS Schltr. Orch. D. Neu-Guinea, (1911) 186.

Var. BISTRIATA J. J. S., var. nov.

Planta minor. Folia 4-5.4 cm. longa, 2.3-3.2 cm. lata. *Inflorescentia* 1-flora. *Sepala et petala* c. 0.475-0.44 cm. longa. *Labellum* 0.56 cm. longum. *Ovarium pedicellatum* c. 0.6 cm. longum.

Manokoeari, tract to Ambani, terrestrial in "korang" forest, 800' above the sea. Fl. (green). Jan. 6187.

Distrib. N.E. New Guinea.

I think this plant is *L. maboroensis* Schltr. I have kept it apart because of the smaller flowers and the two purple lines on the labellum.

MICROSTYLIS (§ CREPIDIUM) XANTHOCHILA Schltr. in Schum. et Laut. Nachtr.

Fl. d. Schutzgeb. Südsee, (1905) 102, etc.

Manokoeari, tract to Ambani, terrestrial in high forest on "korang," 800'. Fl. (orange-green). Jan. 6188.

Distrib. N.E. New Guinea.

MICROSTYLIS (§ CREPIDIUM) GIBBSIÆ J. J. S., sp. nov.

Caulis e basi decumbente radicante ascendens, c. 11-folius. *Folia* oblique subovato-oblonga, plus minus falcata, subacuta, apiculata, minute undulata, nervis conspicuis c. 3 subtus prominentibus, c. 4.5-5 cm. longa, 1.6-1.7 cm. lata; petiolus canaliculatus, cum vagina c. 1.6-1.7 cm. longus. *Inflorescentia* erecta, laxa multiflora, pedunculo c. 5.25 cm. longo, vaginulam bracteiformem 1 gerente, rhachide 6 cm. superante. *Bracteæ* parvæ, reflexæ, oblongo- ad lanceolato-triangularæ, acutæ, ad c. 0.27 cm. longæ. *Flores* patentissimi. *Sepalum* dorsale subovato-ovale, obtusum, convexum, apice concavum, 3-nerviium, fere 0.3 cm. longum, 0.175 cm. latum. *Sepala* lateralia reflexa, oblique orbiculari-ovata, obtusa, basi convexa, superne concava, 3-nervia, c. 0.26 cm. longa, fere 0.2 cm. lata. *Petala* oblique ligulata, obtusa, 1-nervia, c. 0.25 cm. longa, 0.08 cm. lata. *Labellum* hippocrepidi-forme, fovea triangula concava incrassatione triangula lata convexa circumdata, incrassatione parva ad basin, explanatum totum c. 0.43 cm. longum, lobis lateralibus obsoletis vel subobsoletis, obtusis, lobo intermedio late triangulo, in lobos 2 oblique triangulos acutos margine interiore repandulos bifido, laciniis 4 elongatis subulatis præsertim interioribus falcatis et lobum intermedium superantibus ad bene 0.1 cm. longis exterius descrescentibus utrinque, auriculis majusculis, anguste oblique triangularibus, acutis vel acutiusculis, fere 0.2 cm. longis, basi c. 0.08 cm. latis. *Gynostemium* a dorso compressum, oblongo-quadrangulum, apice dilatatum, dorso convexum, bene 0.1 cm. longum, clinandrio concavo, auriculis divergentibus, antheram superantibus, oblongis, truncato-obtusis, intus convexis, carnosulis. *Anthera* cucullata, transverse quinquangulari-reniformis, obtusissima, 0.06 cm. lata. *Rostellum* latum, retusum. *Ovarium pedicellatum* c. 1-1.1 cm. longum.

Hab. Manokoeari, tract to Ambani, terrestrial in "korang" forest, 700'. Dec. 6192.

The nearest allies of this species are *M. pedicellaris* Rehb. f., *M. pectinata* J. J. S., and *M. wariana* Schltr., which all are characterized by the elongate pedicel.

It differs from the insufficiently described *M. pedicellaris* in the inflorescence showing a distinct naked portion at the base, in the pedicels which have 3-4 times the length of the sepals, and in the teeth of the lip; from *M. pectinata* by the more numerous and smaller leaves, smaller flowers, longer auricles of the lip, etc.; and from *M. wariana* by the more numerous smaller leaves, the differently coloured flowers, longer auricles to the lip, etc.

The leaves appear to have been coloured.

The flowers are said to be purple.

DENDROBIUM (§ CADETIA) POTAMOPHILUM J. J. S. in Bull. Jard. Buit. 2^e sér. n. viii. (1912) 18.—*Cadetia potamophila* Schltr. Orch. D. Neu-Guinea, (1912) 438.

Schouten Islands, Wiak, Bosnik, epiphytic on strand tree. Jan. 6282.

Distrib. N.E. New Guinea.

Schlechter's sketch and description suits this plant very well; the length of the spathe, however, is 1 cm., whereas Schlechter gives 0.5 cm.

Flower white, labellum veined, with purple tip.

DENDROBIUM (§ APORUM) PSEUDOCALCEOLUM J. J. S. in Bull. Dép. Agric. Ind. Néerl. n. v. (1907) 34, etc.

Manokoeari, Langgên, epiphytic on prostrate tree, overhanging sea. Jan. 6227.

Distrib. N.E. New Guinea.

Flowers mauve.

DENDROBIUM (§ APORUM) INCONSPICUUM J. J. S., sp. nov.

Caules elongati, ramosi, valde compressi, laxè flexuosi, nitidi, laxè foliati, superne valde attenuati et folia rudimentaria gerentes, parte adest 74 cm. longa, internodiis e basi apicem versus paulo dilatatis, ad c. 4 cm. longis et 0.47 cm. latis. *Folia* erecto-patentia, lateraliter compressa, lanceolato-linearìa, acuta, sicco margine superiore c. 4.7 cm., margine inferiore 5.2 cm. longa, 0.4 cm. lata; vaginae tubulosæ, valde compressæ, ensiformes, internodia æquantur. *Inflorescentiæ* e nodis caulis partis superioris, fasciculatæ, squamatæ, pedunculis brevibus, 1-floris. *Flores* parvi. *Sepalum* dorsale triangulum, obtusum, 3-nerviùm, c. 0.25 cm. longum, 0.225 cm. latum. *Sepala* lateralia lacinia oblique triangula ad pedem gynostemii decurrentia, mentum obtusum cum ovario angulum fere rectum faciens medio fere valde obtusangule incurvum fere 0.25 cm. longum formantia, marginibus anticis libera, oblique triangula, obtusiuscula, 4-nervia, c. 0.25 cm. longa, basi 0.36-0.37 cm. lata. *Petala* oblique lanceolata, acuta, 1-nervia, c. 0.26 cm. longa, 0.07 cm. lata. *Labellum* cum pede gynostemii angulum acutum faciens, supra basin et in $\frac{2}{3}$ partibus supra basin obtusangule recurvum, unguiculatum, valde dilatatum, 3-lobum, basi 3- supra basin 5-nerviùm, fascia lata longitudinali incrassato apice 3-loba, lobulo intermedio laterales bene superante basin lobi intermedii vix attingente, explanatum, c. 0.4 cm. longum, ad lobos laterales 0.35 cm. latum, ungue oblongo-quadrangulo; lobi laterales sinibus parvis a lobo intermedia separati, late trianguli, fere quadranguli, obtusi, irregulariter marginati; lobus intermedius laterales superans, transversus, late

retuso-subbilobulus, cum lobulo parvo fere æquilongus triangulo obtuso in sinu, c. 0.06 cm. longus, 0.15 cm. latus. *Gynostemium* breve, c. 0.075 cm. longum, filamento subulato, auriculis subquadrangulis, 2-lobulis. *Anthera* cucullata, ambitu antice 6-angulata, apice truncata, basi 2-lobula, c. 0.07 cm. lata. *Pollinia* 4, oblonga, lateraliter compressa, interiora quam exteriora tenuiora, exteriora extus convexa, c. 0.06 cm. longa. *Stigma* profunde excavatum, quadrangulum, margine inferiore rotundatum. *Pes* gynostemii cum ovario angulum subrectum faciens, medio fere obtusangule incurvus, parte superiore quam partem inferiorem bene latiore concava cum incrassatione longitudinali verruculosa, truncatus inexplanatus c. 0.25 cm. longus. *Ovarium* 6-sulcatum, c. 0.23 cm. longum, cum pedicello c. 0.4 cm. longo, tenuiter clavatum.

Hab. Schouten Islands, Wiak, Bosnik, epiphytic on strand tree, common. Jan. 6272.

The description of *D. nycterioglossum* Rehb. f., which is said to be of Papuan origin, more or less fits this plant. As, however, the description is very poor and the exactness of the information about the origin is very uncertain, further comparison with that species is for the present useless.

The material was very poor, and especially the description of the lip wants further confirmation.

The flowers are said to be yellow.

ERIA (§ *CYLINDROLOBUS*) *RIGIDA* Bl. Mus. Bot. Lugd.-Bat. ii. 183, etc.

Var. *PAPUANA* J. J. S. in Nova Guinea, xii. (1913) 76, t. xx. 59.

Schouten Islands, Wiak, Bosnik, epiphytic on strand trees. Jan. 6276.

Though I now think that this plant is not a form of *Eria rigida* Bl., I quote it under the above name because I do not yet wholly understand Schlechter's Papuan species of this group.

Distrib. New Guinea (D.N.W., Humboldt Bay, *Gjellerup*).

Shoots, 50 m. long. Flowers with outer perianth-segments white, the inner pink.

POMATOCALPA ORIENTALE J. J. S. in Nova Guinea, xii. (1913) 101, t. xxviii. 85, etc.

Boeroe, Tifoe harbour by road to signal point, forest. Fl. (orange), Jan. 6296.

Distrib. New Guinea (D.N.W., Humboldt Bay, *Gjellerup*; D.S.W., Merauke River, nat. coll.). Kei Islands, Amboina, Obi.

SARCANTHUS BICORNIS J. J. S. in Bull. Dép. Agric. Ind. Néerl. n. xix. (1908) 35, etc.

Schouten Islands, Wiak, Bosnik, epiphytic on strand trees. Fl. Jan. 6274.

Distrib. New Guinea (D.S.W., Digul River, *Brandenhorst*; Noord River, *Versteeg*; N.E.).

Flowers with white petals and yellow labellum.

DICOTYLEDONEÆ.

CASUARINACEÆ.

CASUARINA EQUISETIFOLIA Forst. Char. Gen. Pl. Aust. 103, fig. 52.

Wariap, near, on a stony and open inundation area of the Momi River. Fr. Dec. 6126.

Distrib. N.E. & S.E. New Guinea and adjacent islands. Solomon and Marianne Islands, Polynesia, N.E. Australia, Malaya, India to E. Africa.

PIPERACEÆ. (C. DE CANDOLLE.)

PIPER BOSNICANUM C. DC., sp. nov.

Ramulis glabris lævibus; foliis sat longe petiolatis glabris, limbo ovato-rotundato basi ima æquilatera acuto apice breviter et obtusiuscule acuminato, 5-nervio, petiolo basi ima vaginante; pedunculo glabro quam petiolus brevior, spica matura quam limbus pluries brevior, rhachi hirsuta, bractæ glabræ pelta rotunda centro pedicellata, ovario libero rotundato glabro, stigmatibus ovatis brevibus, bacca ovata glabræ stipite duo pluries longiore.

Hab. Schouten Islands, Wiak, Bosnik. Fl., Fr. 6277.

Dioicum, in arboribus scandens. Ramuli spiciferi 2 mm. crassi, collenchyma in fasciculos discretos dispositum et haud libriforme, fasciculi intramedullares 1-seriati, canalis lysigenus ventralis periphericique plures. Limbi in sicco formi pellucidopunctulati, usque ad 10 cm. longi et 7 cm. lati. Petioli 1.5 cm., pedunculi 1 cm. longi. Spica matura 2 cm. longa, bractæ pelta 1 mm. diam. Stigmata 3 sessilia, bacca in vivo aurantiaca in sicco nigra 7 mm. longa et 5 mm. crassa.—Species primo ad aspectu *P. buruanum*, Miq. referens.

PIPER FORSTENII C. DC. in Prodr. xvi. i. 348; Scheffer in Ann. Jard. Buit. i. (1876) 50; Nova Guinea, viii. (1914) 1007.

Roon Island, ridge beyond Djendè, 300', scandent in forest. Fl., ♀. Jan. 6233.

Distrib. New Guinea (D.N.W., Doré, *Teysmann*; D.S.W., near Alkmaar, *von Roemer*). Amboina, Halmaheira, Philippines.

Liane, climbing up trunks of trees, with huge leaves and pendent yellow spikes, 4 dm. long and 3 cm. thick. Also abundant in the high forest round Manokoeari, but only seen there in sterile condition.

PIPER BIPUNCTATUM C. DC., sp. nov.

Ramulis glabris; foliis breviter petiolatis, limbo elliptico-lanceolato basi æquilatera acuto apice acuta, et sat longe acuminato supra glabro subtus puberulo, 5-plinervio nervo centrali nervum ascendentem utrinque opposita vel alterne mittente quorum supremus a 2–2.5 cm. supra basin solutus, nervo laterali adscendente utrinque a basi soluto, petiolo puberulo basi ima vaginante; pedunculo fere glabro petiolum superante, spica subflorete quam limbus pluries brevior, rhachi hirsuta, bractæ glabræ pelta rotunda centro pedicellata, staminibus 2, antheris ovatis 4-valvatis quam filamenta oblonga pluries brevioribus.

Hab. Schouten Islands, Wiak, Bosnik (coral), in clearings. Fl. Jan. 5709.

Dioicum, epiphytum. Ramuli spiciferi 1 mm. crassi, collenchyma in fasciculos discretos a latere valde productos dispositum et haud libriforme, fasciculi intramedullares 1-seriati, canalis lysigenus unicus centralis. Limbi in sicco membranacei usque ad 12.5 cm. longi et 3.5 cm. lati, creberrime pellucido-punctulati punctatique punctis rotundis vel oblongis. Petioli 6 mm., pedunculi 10 mm. longi. Spica subfloreus 3 cm. longa et 2.5 mm. crassa, bractea pelta 1 mm. diam.

MORACEÆ. (H. N. RIDLEY.)

FICUS INFECTORIA Roxb. Fl. Ind. iii. 550 ; Schum. & Laut. 273.

Wakdè Island, on beach. Fl. Jan. 6244.

Distrib. N.E. New Guinea. India, Burma, Malaya, and Philippines.

"A large tree with white latex."

FICUS MYRIOCARPA Miq. in Ann. Mus. Lugd.-Bat. iii. 230-296 ; Schum. & Laut. 281.

Manokoeari, in high forest, on "korang," 200-500' Fr. Jan. 6171.

Distrib. New Guinea (N.E., and adjacent islands). Amboina.

"Large forest tree, the leaves with stipules 4-5 cm. long and red receptacles. The fruiting branches are cauline, long, and are also borne on the roots."

**FICUS CELEBICA* Bl. Bijdr. 461.

Manokoeari, tract to Ambani, in high forest on "korang," 200'. Fr. Jan. 6209.

Distrib. Celebes, Malay Peninsula, and Philippines.

"A forest tree with orange-red receptacles."

**FICUS BOTRYOCARPA* Miq. Ann. Mus. Lugd.-Bat. iii. 233.

Manokoeari, in high forest on "korang." Fr. Jan. 6179.

Distrib. Celebes.

"A tree, with green receptacles borne on hollow cauline branches. When cut water came out of the figs."

FICUS BRACHIATA King in Ann. Bot. Gard. Calc. i. 106, pl. 136.

Manokoeari, common in high forests on "korang," 200-500'. Fr. Jan. 6172.

Distrib. Sumatra.

"A tree with green receptacles, 3.7 cm. across, borne on long, cauline, branching and pendent, fruiting shoots. On cutting figs open, water came out."

FICUS CONOCEPHALIFOLIA Ridl., sp. nov.

Arbor, ramis crassiusculis cortice cervino. *Folia* oblonga breviter obtuse cuspidata base rotundato cordato margine integro, superne glabra subcoriacea, subtus in nervis 7 paribus hirtis, nervis intra margines anastomosantibus, subtus minute albo-

punctata scabra, 40 cm. longa, 18 cm. lata, petiolo 12 cm. longo. *Stipulae* persistentes lanceolatae acuminatae hirtae, 2 cm. longae vel ultra. *Syncarpia* rubra globosa 2 cm. crassa (in sicco) parce hirta, bracteis 2 lanceolatis acutis dissitis in dorso. *Bractea* basales nullae. *Pedunculus* 5-1 cm. longus bracteatus. *Bractea* ad ostiolum lanceolatae acuminatae hirtae, plures erectae. *Flores masculi* ad ostiolum monandri, pedicellati, sepala 4 lanceolata subacuta, anthera reniformi magna transversim biloba. *Feminei* plerumque longe pedicellati, pistillo oblongo, stylo laterali.

Hab. Humboldt Bay, ridge behind "kampong." Fr. Jan. 6260.

A specimen of what appears also to be this species is in Herb. Brit. Mus. labelled "Java, Straits of Sunda J(oseph) B(anks)."

I cannot match this fig with anything yet described. It seems in some points to be most nearly allied to *F. Beccarii*, but the fruits in this and its allies are all borne on separate branches. The persistent and large stipules are peculiar. The leaf, which is large, has just the texture and scabrid feel, as well as the whitish dottings, of *Conocephalus*. The only figs seen contained male flowers and gall flowers, some of which have, like the male flowers, long stalks, while others are almost sessile.

URTICACEÆ.

LAPORTEA ARMATA Warb. in Engl. Bot. Jahrb. xiii. (1891) 293; Schum. & Laut. 289.

Manokoeari, undergrowth in high forest, on "korang," gregarious in damp places, 500'. Fl., ♂ ♀. 6186.

Distrib. N.E. New Guinea.

These plants, with herbaceous slender stems, 1-2 m. high, very stinging leaves, grey in colour, and green flowers, formed a colony in a small soak area on the top of the forest ridge which rises behind Manokoeari. As Warburg's description only covers the ♀ plant, that of the ♂ is appended. Inflorescence 2.5 cm. long, branched, with peduncle 7 cm. long. Flowers arranged in small sessile glomerules, 2 mm. across, on the secondary branches of the rhachis, composed of more numerous flowers than the ♀, which are mostly single in my specimens. Perianth 4-partite, 1.5 mm. across, with lanceolate-acute segments, 1.5 mm. in length, covered with a few scattered white hairs.

FLEURYA RUDERALIS (Forst.) Gaud. Voy. Uranie, 497; Schum. & Laut. 291; Scheffer in Ann. Jard. Buit. i. (1876) 48; F. Muell. Pap. Pl. 41, 59.

Schouten Islands, Wiak, Bosnik, under trees by sea-shore. Fr. Jan. 6279.

Distrib. New Guinea (D.N.W., *Teysmann*; N.E.; S.E.). Java, Marshall and Solomon Islands, Ellice and Union Group; Tahiti.

Herbaceous, with pink stems and white flowers.

PELLIONIA VANHASSELTII Gibbs, sp. nov.

Herba decumbens, glaberrima; caulis simplex, plurisulcatus. *Folia* alterna petiolata vel subsessilia, elliptico-lanceolata, basi uno latere subrotundata, altero cuneata, apice in acumen longum acutissimum sensim attenuata, infra medium integerrima, superne grosse inæqualiter obtuse-dentata, penninervia, fere æquilatera (basi excepta), viridia, carnosae, supra cystolithis linearibus haud densis, subtus pallidiora, cystolithis minutis densissime obtecta. *Flores* feminei albidii, pedicellati, laxiuscule glomerati. *Perianthium* 5-merum, persistens, segmentis apice leviter retusis, longe aristatis, setis perianthio duplo longioribus. *Staminodia* 5, parva, segmentis opposita, inflexa. *Achenium* compressum.

Hab. Manokoeari, epiphytic or terrestrial in high forest, 500'. Fr. Jan. 6168.

This plant, up to 5-4 dm. in height, more or less decumbent in habit, was found growing massed on the dead prostrate trunk of a tree, and also beneath on the ground. Leaves dark green when dried, fleshy when growing, ± 18 cm. long, including the acumen ± 3 cm. long, 4.5 mm. broad. Flower fascicles 1.5-2 cm. across. Pedicels ± 3 mm. long. Perianth-segments 2 mm. long, with mucro 3 mm. long. Staminodes ± 5 mm. long, when expanded ± 1 mm. long. Achene 1.5 mm. by 1 mm., light brown in colour.

Near *P. nigrescens* Warb., but differs in the deeply dentate leaves, with fewer veins, drying dark green in colour.

This species is named in honour of Mr. R. F. J. van Hasselt, Chief Missionary at Manokoeari, who, from long residence and perfect knowledge of Papuan dialects, enjoys the confidence of these people, and to whom I was much indebted for valuable information and help, most kindly given.

LORANTHACEÆ.

LORANTHUS VERSTEEGII Lant. in Nova Guinea, viii. (1910) 289.

Manokoeari, epiphyte on trees in clearings. Fl. Jan. 6175.

Distrib. New Guinea (D.S.W., Noord River, *Versteeg*; Bian River, *Brandenhorst*; S.E. Sogeri Region, *Forbes* (499, Herb. Mus. Brit.)).

A very distinct plant with many long hanging shoots, 2-3 m. in length, bearing single, and sometimes binate, densely-flowered racemes in the axils of the leaves on the old wood, for about halfway down each shoot. The flowers are red at the base and yellow-green from about the middle. Some of the racemes are longer than in the type, and some shorter, and the flowers are somewhat longer; but these are no doubt variable features. In *Forbes*'s plant the leaves are narrow, as in *Brandenhorst*'s 278 (Herb. Kew.), acute, and decurrent at the base, with corollas 5 cm. long, pubescent on the outer surface.

PORTULACACEÆ.

PORTULACCA QUADRIFIDA L. Sp. Pl. ed. 1, 445 ; Hemsl. Chall. Exp. Bot. 122 ; Schum. & Laut. 309.

Island of Wakdé, in "campong," creeping under trees. Fl. (yellow).
Jan. 6247.

Distrib. N.E. New Guinea and adjacent islands. Marshall and Solomon Islands, Fiji and Vavau. Tropical Asia and Africa.

ROSACEÆ.

RUBUS MOLUCCANUS L. Sp. Pl. ed. 1, 1197 ; Scheffer in Ann. Jard. Buit. i. (1876) 23 ; Schum. & Laut. 339 ; Nova Guinea, viii. (1910) 367, (1912) 647.

Manokoeari, edge of forest. Fl., Fr. Jan. 6212.

Distrib. New Guinea (D.N.W., Doré, *Teysmann* ; D.S.W., Noord River, *Versteeg* ; Hellwig Mts., *von Roemer* ; N.E. and adjacent islands). India, Indo-China ; Malay Peninsula, Sumatra, Amboina, Borneo, Philippines.

Berries red, sweet.

LEGUMINOSÆ.

*ALBIZZIA MOLUCCANA Miq. Fl. Ind. Bat. i. 26.

Manokoeari, edge of forest, on "korang," 100'. Fr. Jan. 5738.

Distrib. Moluccas.

A fine tree with white bole and spreading crown, pinnatisect leaves with very small pinnules, and pendent white flowers, quite abundant on the edge of the high forest behind Manokoeari. Only the old pods scattered on the ground were collected, which, however, are very distinct, ± 1.4 dm. long and 2 cm. broad, with a small acumen and a membranous wing, broader on the placental suture. The small seeds are very close together, under 1 cm. apart. These characters, with the fine dissected leaves, are well shown in Koorder's 15643 ("cultivated at Buitenzorg") as may be seen in Herb. Kew.

ENTADA SCANDENS Benth. in Hook. Journ. iii. 332 ; Schum. & Laut. 346.

Manokoeari, track to Ambani, creeper in strand forest. Fl. (yellow).
Jan. 6191.

Distrib. N.E. New Guinea and adjacent islands. Tropics of both hemispheres.

TAMARINDUS INDICA L. Sp. Pl. 34.

Manokoeari, Wousi, in "kebun." Fl. Jan. 6217.

Distrib. Tropics of both hemispheres.

ALYSICARPUS NUMMULARIFOLIUS DC. Prod. ii. 353; Schum. & Laut. 277.

Island of Sorong, creeping under trees by sea-shore. Fl. (red-brown).
Jan. 6285.

Distrib. N.E. New Guinea. India, Indo-China; Malay Peninsula and Andamans, Borneo, Philippines, N.E. and N.W. Australia, Fiji. Tropical Africa and West Indies.

DERRIS ULIGINOSA Benth. in Pl. Jungh. i. 252; Schum. & Laut. 360; Valetton, Plant. pap. in Bull. Dép. Agric. Ind. Néerl. no. x. (1902) 19; Nova Guinea, viii. (1910) 379.

Manokoeari, Langgên, in mangrove association. Fl. Jan. 6229.

Distrib. New Guinea (D.N.W., Humboldt Bay; D.S.W., Etna Bay, Wichmann; Gelieb, *Brandenhorst*; N.E. and adjacent islands). South Asia to N. Australia and Polynesia.

MUCUNA KRAETKEI Warb. in Engl. Bot. Jahrb. xiii. (1891) 329; Schum. & Laut. 365; Nova Guinea, viii. (1910) 381, (1912) 652.

Manokoeari, Wousi, over trees by sea-shore. Fl. Jan. 6231.

Distrib. New Guinea (D.S.W., Alkmaar, on Noord River, *Versteeg*; N.E.).

A coast liane, with magnificent red flowers in huge interrupted inflorescences.

In the absence of leaves and fruit, determination must be uncertain; but in the shape and size of calyx, approximate measurements, and form of floral parts, with the number of ovules (5), my plant agrees with *M. Kraetkei* Warb. Warburg does not describe the inflorescence, beyond stating that it occurs often on the old wood; in that case bunches of shortish racemes, 5-17 dm. long, spring irregularly from the old wood, which is lenticellose. When the inflorescence is on young wood the racemes are long and single, as in *Versteeg's* 403 Herb. Kew.

LINACEÆ.

*DURANDEA PARVIFLORA Stapf in Hook. Icon. tab. 2822.

Manokoeari, Langgên, in open clearing. Fl. Jan. 6218.

Distrib. Solomon Islands.

A small tree with yellow flowers. The measurements of the flowers agree with the above species; also the size of the leaves and the inflorescence.

MELIACEÆ. (C. DE CANDOLLE.)

AGLAI A GIBBSIÆ C. DC., sp. nov.

Ramulis adpresse et rufescente stellato-lepidotis; foliis sat longe petiolatis 3-jugis, foliolo terminali sat longe petiolulato oblongo-obovato basi æquilatera acuto apice brevissime et obtuse acuminato, lateralibus oppositis modice petiolulatis oblongo-ellipticis basi æquilatera acutis apice breviter et obtuse acuminatis, omnibus

supra glabris subtus ad nervos haud dense stellato-lepidotis; panicula terminali folium fere æquante paullo supra basin trifida, ramis pyramidato-ramulosis, ramulis adpresse et rufescente stellato-lepidotis spicatum cymuligeris, cymulis bifloris, floribus pedicellatis; calice 5-sepalo, sepalis rotundato-ovatis subtus stellato-lepidotis supra glabris, ciliatis; petalis 5 obovatis glabris eciliatis, tubo stamineo glabro urceolato integro et margine antherifero, antheris 5 glabris subsessilibus ovatis, horizontaliter inflexis, connectivo ultra thecas obtuse producto; ovario parce stellato-lepidoto, stigmatate globoso.

Hab. Manokoeari, in forest on "korang," 300'. Fl. Jan. 6204.

Arbor. Folia alterna 36 cm. longa. Foliola in vivo obscure virescentia, in sicco firmule membranacea et creberrime pellucido-punctulata, terminale 16 cm. longum et usque ad 6 cm. latum, lateralia supera 15 cm. longa et 5.5 cm. lata, subsequentia gradatim paullo minora, nervi secundarii subrecti utrinque 10-12. Paniculae rami usque ad 18 cm. longi. Pedicelli 1 mm. longi. Flores in vivo albis. Sepala 0.5 mm. longa. Petala membranacea, 1.5 mm. longa et usque ad 1 mm. lata. Antheræ 0.75 mm. longæ.

Species *A. Roemeri* C. DC. proxima, foliolis paucioribus et a nervo centrali æquilateris, sepalis subtus stellato-lepidotis, petalis obovatis ab illa discrepans.

MALPIGHIACEÆ.

TRISTELLATEIA AUSTRALASICA A. Rich. Sert. Astrol. 38, t. 15; Scheffer in Ann. Jard. Buit. i. (1875) 10; F. Muell. Pap. Pl. 36; Schum. & Laut. 387.

Manokoeari, Langgên, climber in mangrove association. Fl. (yellow), Fr. Jan. 6223.

Distrib. New Guinea (D.N.W., Andai, *Teysmann*; N.E. & S.E., and adjacent islands). Singapore, Siam, Formosa, Malaya, Philippines; to E. Australia and New Caledonia.

RYSSOPTERYS TIMORENSIS Bl. ex A. Juss. in Deless. Ic. Sel. iii. 21, t. 350; Scheffer in Ann. Jard. Buit. i. (1875) 10; F. Muell. Pap. Pl. 36; Schum. & Laut. 387.

Manokoeari, tract to Ambani, 100', clearings, scrambling in rampant upgrowth. Fl. (yellow). Jan. 6200.

Distrib. New Guinea (D.N.W., Sorong, *Teysmann*; N.E. & S.E., to adjacent islands). Malaya to Philippines and tropical Australia.

EUPHORBIACEÆ. (J. HUTCHINSON.)

MALLOTUS TILÆFOLIUS (Bl.) Müll.-Arg. in Linnæa, xxxiv. 190; Miq. in Ann. Mus. Lugd.-Bat. iv. 123; Schum. & Laut. 396.

Manokoeari, track to Ambani, tree in clearings and forest. Fl., ♂. Dec. 6202.

Distrib. New Guinea (D.S.W., *Zippelius*; N.E. and adjacent islands). Malay Archipelago; Fiji.

MACARANGA RIPARIA Engl. in Bot. Jahrb. vii. (1886) 463 ; Schum. & Laut. 397 ; Nova Guinea, viii. (1910) 235, (1912) 789 ; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 147.

Manokoeari, ridge behind "campong," common in high forest on "korang," 300'. Fl., ♀. Jan. 6177.

Distrib. New Guinea (D.N.W., Doré, *Teysmann* ; Humboldt Bay, *Gjellerup* ; D.S.W., Noord River, *Versteeg, von Roemer* ; Utakwa River, *Kloss* ; N.E. and adjacent islands). Kei Islands.

"A fine tree = 80 m. in height. Quite common."

EXCÆCARIA AGALLOCHA L. Sp. Pl. ed. 1, 1288 ; Schum. & Laut. 406 ; Nova Guinea, viii. (1910) 241.

Manokoeari, Langgên, in mangrove association. Fl., Fr., ♀. 6216.

Distrib. New Guinea (D.N.W., Humboldt Bay, *Wichmann* ; D.S.W., Merauke, *Brandenhorst* ; N.E. and adjacent islands). Brit. India, Malaya, Papuasia, Philippines, S. China, E. Australia, and Polynesia.

CELASTRACEÆ.

EUONYMUS JAVANICUS Bl. Bijdr. 1146.

Manokoeari, 200', high forest on "korang." Fl. Jan. 6182.

Distrib. Indo-China, Timor, Philippines, Kei and Aru Islands, N.E. Australia.

Tree, with greenish-white flowers.

SAPINDACEÆ.

ALLOPHYLLUS COBBE Bl. Rumphia, iii. 131.

Manokoeari, 200', creeper in clearings and on edge of forest. Fl. (white), Fr. Jan. 6203.

Distrib. India, Ceylon, Malay Peninsula, Andaman Islands, Java, Borneo, Little Kei Islands, Philippines ; Samoa and Vavau.

TILIACEÆ.

GREWIA ACUMINATA Juss. in Ann. Mus. Paris, iv. (1801) 91, t. 48 ; *cf.* Hochreutiner's Cat. Bog. Nov. i. 47, in Bull. Inst. Bot. Buit. xix. (1904) 46.

Dammar Island, on sea-shore. Fl., Fr. Jan. 6291.

Distrib. Philippines, Borneo, Java, Malay Peninsula.

Shrub, with white flowers. This plant was found growing in a clump on the edge of the beach, the forest having been cleared behind it. It agrees well with the large series at Kew of the species included by Hochreutiner with *G. acuminata*, though the leaves are larger than in the specimens seen.

FLACOURTIACEÆ.

ERYTHROSPERMUM CANDIDA Becc. *in litt.* = *Gestroa candida* Becc. Malesia, i.
184.

Manokoeari, Langgên, land edge of mangrove association. Fl. Jan.
6224.

Distrib. New Guinea (D.N.W., Ramoi, *Beccari*).

Tree with white flowers.

I am indebted to the kindness of Dr. Beccari for a specimen of his *Gestroa candida*, which proved identical with my plant. It also shows with the above some flowers with undeveloped ovaries among the more numerous ♂ ones. Dr. Beccari wrote that he now considered the plant to be an *Erythrospermum*, and on investigation I am myself inclined to the same view.

BEGONIACEÆ.

BEGONIA (PETERMANNIA) HUMBOLDTIANA Gibbs, sp. nov.

Herba glaberrima; caule erecto, ramosissimo. *Folia* petiolata, obovato-lanceolata, basi valde inæqualia (uno latere cordato, altero cuneato), apice tenuiter angust-acuminata, grosse et regulariter inciso-serrata, chartacea, supra flavo-viridula, albido punctulata, subtus dilute griseo-albida. *Inflorescentia* terminalis, quam folia brevior. *Flos* ♂ sepalis 2, roseis, orbiculari-cordatis; filamentis basi connatis. *Flores* ♀ petalis 5, inæqualibus; stylis 3, connatis, apice spiralter bifurcatis. *Fructus* 3-alatus, apice truncatus vel arcuato-obtusus.

Hab. Humboldt Bay, in high forest by stream, 300-500'. Fl. ♂ ♀, Fr. Jan. 6253.

A handsome plant, .75 m. high, growing abundantly in large clumps along the banks of the stream. Leaves \pm 12 cm. by 4.5 cm., sage-green in colour, with 2-3 white spots in more or less parallel lines between the lateral veins, which are conspicuous, 4-5 on each side of the midrib. On the margin the largest incisions vary from 1 cm. in depth and 1.5 cm. in breadth, graduating insensibly to the extreme apex. Petiole 1 cm. long. Stipules 1.5 cm. long, often unequal in size, caducous, transparently membranous in texture, and produced into long fine hair-like points. ♂ flower 6 mm. by 7 mm. (immature). ♀ flowers arising singly, opposite the upper leaves, on pedicels 1.5-1.8 cm. long, the flowers being 2 cm. long and 3 cm. across; with unequal petals, of which the largest are 1.2 cm. by 6.7 mm.; the three styles are bifid, spreading, 5 mm. long. Fruit 1.1 cm. long, 1.5 cm. across, with equal membranous wings, 4 mm. broad in the centre and 5 mm. broad at the apex of the fruit. The fruits were affected by insects and swollen out of shape in nearly all the plants seen.

This species is distinct in the very regular and finely graduated serrate incisions of the leaves, with their parallel rows of white markings.

LYTHRACEÆ.

PEMPHIS ACIDULA Forst. Char. Gen. Pl. 68, t. 34 ; F. Muell. Pap. Pl. 43-59 ; Schum. & Laut. 460.

Wakdè Island, growing thickly on coral-reef on coast, where washed by sea. Fl. (white), Fr. Jan. 6246.

Distrib. New Guinea (N.E. & S.E., and adjacent islands). Strand plant distributed from Polynesia to E. Africa.

Shrub, prostrate, to 3 m, in height, where beyond the spray.

MELASTOMACEÆ. (E. G. BAKER.)

OTANTHERA NOVO-GUINEENSIS Bak. f. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 50.

Island of Roon, near the road round the Bay, growing in the open. Fl., Fr. Jan. 6238.

Distrib. New Guinea (D.S.W., Utakwa, near to Mt. Carstensz, *Kloss*). "Small shrub, with white flowers and red fruit."

MEDINILLA RHODORHACHIS Bak. f., sp. nov.

Planta epiphytica, ramis 4-gonis vel levissime 4-alatis ad nodos barbatis ad *M. speciosam* Blume accedens. *Folia* sessilia, opposita, oblonga vel elliptica, apice breviter acuminata, basi cordata, 5-plinervia, costa subtus conspicua. *Flores* 4-meri in paniculam dispositi. *Panicula* folio breviora. *Pedicelli* stricti. *Bractea* parvæ. *Calycis tubus* campanulatus limbo subtruncato. *Petala* alba staminibus paullo longiora. *Staminum connectivus* postice breviter calcaratus, antice bicalcaratus. *Fructus* ignotus.

Hab. Schouten Islands, Wiak, Bosnik, epiphytic on strand tree. Flowers white; rhachis pink. Fl. Dec. 6275.

Leaves (ex sicc.) $\pm 2-3$ dm. long and 7.5-13 cm. broad. *Calyx* ± 3.5 mm. long. *Petals* ± 6 mm. long. *Anthers* 3-3.5 mm. long.

The distinguishing features of this epiphyte are the oblong or elliptical, acuminate, 5-plinerved, sessile leaves, the panicle of small, white, 4-merous flowers, the calyx being ± 3.5 mm. long. The anthers are shortly spurred anteriorly and posteriorly.

ARALIACEÆ.

POLYSCIAS SORONGENSIS Gibbs, sp. nov.

Frutex parvus, glaberrimus. *Folia* pedicellata, stipulata, imparipinnata, 5-6-juga, rhachis cylindrica, longitudinaliter striata; foliola opposita, graciliter pedicellata, obovato-lanceolata vel oblonga, acuta, basi obliqua rotundata, apice sensim acuminata, subintegerrima tenuiter membranacea. *Panicula* pedunculata nunc bipedata, racemuli umbellati pedunculi secundarii verticellati vel oppositi. *Flores* parvi, breviter pedicellati, pedicelli sub flores articulati, apice in calyculum minimum expansi. *Calyx* repando-5-dentatus. *Petala* 5, apice leviter cohærentia. *Stamina* 5,

filamentis brevibus. *Discus* planus. *Styli* 2 distincti, elongati. *Ovarium* biloculare. *Fructus* ignotus.

Hab. Island of Sorong, under strand trees. Fl. Feb. 6287.

A small shrub ± 2 m. high. The petioles of the leaves are 1.2 dm. in length, with adnate stipules 1.7 cm. long. The dried leaves are light green in colour, the largest being 4.8 dm. by 3.1 dm.; the largest foliole is 1.7 dm. by 5 cm.; the margins can hardly be described as serrate, but show subulate teeth, ± 1 mm. long and 1.2 cm. apart; petiolules ± 1.3 cm. long. The inflorescence is umbellate-racemose, ± 5.1 dm. by 4 dm., including peduncle 2.5 dm. long, which is subtended by 2 bracts; the secondary peduncles arise in the axils of 2 bracts, and bear pairs of bracts up the axis, which bear single flowers or small lateral umbels, or may dichotomise, bearing 2-4 umbels; the umbels show an involucre of minute bracts and are ± 1 cm. across. The flowers are green, on pedicels 2 mm. long; petals broad at the base and thickened at the apex, 2.5 mm. long; anthers oblong, almost sessile, 2 mm. long; styles 1.2 mm. long; ovary 1.5 mm. long.

MYRSINACEÆ.

MÆSA RACEMOSA (K. Sch.) ; Mez in Pflanzenreich, iv. 236, Myrsin. (1902) 43; Schum. & Laut. 492.

Island of Wakdê, on beach. Fl., Fr. Jan. 6243.

Distrib. N.E. New Guinea.

Shrub or epiphyte, with white flowers and berries.

ÆGICERAS FLORIDUM Roem. et Schult. Syst. iv. (1819) 512; A. Rich. Voy. Astrol. ii. 57, t. 21; Scheffer in Ann. Jard. Buit. i. (1876) 33.

Manokoeari, Langgên, mangrove association, on sea-edge. Fl., Fr. Jan. 6228.

Distrib. New Guinea (D.N.W., Jobi Island, *Barclay*; Gedê Island, Dorê Bay, *Teysmann*). Kei Islands, Amboina, Sumbawa, Philippines.

Small compact shrub with white flowers.

ASCLEPIADACEÆ.

SARCOLOBUS RETUSUS K. Sch. Fl. Kais. Wilhelmsl. 109; Schum. & Laut. 509; Valetton in Bull. Dép. Agric. Indes Néerl. no. x. (1907) 49.

Manokoeari, Langgên, twiner in mangrove association. Fl. Jan. 6220.

Distrib. New Guinea (D.N.W., Humboldt Bay, *Wichmann*; N.E.). Ternate, Timor.

Creeper on trees and on ground. Yellow-green flowers with ciliate petals. Schumann notes that this plant is very poisonous.

CONVOLVULACEÆ. (A. B. RENDLE.)

IPOMŒA DENTICULATA Choisy in Mém. Soc. Phys. Genève, vi. (1833) 447.

Island of Sorong, creeping under trees by beach, covering ground and plants. Fl. (purple), Fr. Jan. 5740.

Distrib. N.E. New Guinea and adjacent islands. Seychelles to Polynesia and Australia.

BORAGINACEÆ.

TOURNEFORTIA ARGENTEA L. f. Suppl. 133; F. Muell. Pap. Pl. 59; Schum. & Laut. 519.

Wakdè Island, a small tree along the sea-shore. Fl., Fr. Jan. 6242.

Distrib. New Guinea (N.E.; S.E. and adjacent islands). Tropical Australia, Polynesia, Malaya and India to Mascarene Islands.

Small tree 10 m. high, leaves silvery from white pubescence, with white flowers and green fruit.

VERBENACEÆ.

CALLICARPA ERIOCLONA Schauer in DC. Prod. xi. 643; Miq. Fl. Ind. Bat. ii. (1856) 889; Scheffer in Ann. Jard. Buit. i. (1876) 41.

Manokoeari, track to Ambani, common on the edge of forest and in clearings, 200'. Fl., Fr. Jan. 6205.

Distrib. New Guinea (D.N.W., Lesson; Mansinam Island, Doré Bay, Teysmann). Philippines.

This plant is distinguished from *C. cana* L. by the large, more lanceolate, irregularly serrate leaves, with very white pubescence underneath, and white flowers with longer exerted stamens. *C. repanda* K. Sch. & Warb. is possibly a synonym of this plant.

PREMNA NITIDA K. Sch. Fl. Kais. Wilhelmsl. 120; Schum. & Laut. 523.

Manokoeari, common in clearings and round foot-hills. Fl., Fr. 6163.

Distrib. N.E. New Guinea.

A tree with white flowers and black fruit. Also seen along the beach to Wariap.

CLERODENDRON LINDAWIANUM Laut. in Schum. & Laut. Nachtr. Fl. d. Schutzgeb. Südsee, 372.

Var. GLABRIOR Gibbs. Tota planta manifeste glabrior.

Humboldt Bay, in high forest on range above river, 400'. Fl., Fr. Jan. 6264.

Distrib. (of type). New Guinea (D.S.W., Mt. Carstensz, Kloss; N.E.; S.E. [Forbes, Soger region, Brit. Mus.]).

A small tree with conspicuous white flowers and black fruit.

I cannot separate this plant from Lauterbach's species, which is evidently very widely distributed. In my specimen the leaves are glabrous, with the

exception of the veins, which are pubescent on both surfaces; the tomentum on peduncles, pedicels and calyx is also much reduced.

VITEX TRIFOLIA L. f. Suppl. 293; F. Muell. Pap. Pl. 86; Schum. & Laut. 524; Valetou in Bull. Dép. Agric. Indes Néerl. no. x. (1907) 51.

Dammar Island, on seashore. Fl., Fr. 6290.

Distrib. New Guinea (D.S.W., Merauke, Koch; N.E.; S.E. and adjacent islands). South Asia through Malaya and Japan, and through New Guinea to New Caledonia.

ACANTHACEÆ. (S. MOORE.)

HEMIGRAPHIS REPTANS T. And. ex Hemsl. Bot. Voy. 'Challenger,' i. iii. 173; Schum. & Laut. 543; Valetou in Bull. Dép. Agric. Indes Néerl. no. x. (1907) 58.

Manokoeari, common undergrowth in forest, up to 500'. Fl., Fr. Jan. 6160.

Distrib. New Guinea (D.N.W., Tobadi, Wichmann; N.E. and adjacent islands). Aru Islands, Amboina, Philippines; New Hebrides and New Caledonia.

Small creeping plant with white flowers and glossy fleshy leaves. Also seen on the lower foot-hills of the Arfak range near Wariap.

HEMIGRAPHIS DORENSIS S. Moore, sp. nov.

Erecta, circa 25 cm. alt. *Caule* sparsim ramoso glabrescente. *Ramis* paucifoliatis puberulis. *Foliis* petiolatis oblongo-vel ovato-lanceolatis, obtusis, basi obliquis obtusisque vel rotundatis, margine dentatis vel dentato-crenatis, nonnunquam fere integris supra pilis brevibus strigillosis appressis inspersis subtus in nervis puberulis. *Spicis* abbreviatis paucifloris, subsessilibus pedunculatisve. *Bracteis* oblanceolatis obtusis ciliatis. *Calycis* bracteas subæquantis segmentis juxta basin solummodo connatis linearibus acutis ciliatis. *Corolla* calyce duplo longiore extus glabra hujus tubo superne amplificato lobis posticis quam antici plane latioribus. *Filamentis* inclusis glabris. *Ovario* oblongo, apice pilosulo. *Stylo* inferne pilosulo. *Ovulis* pro loculo 6.

Hab. Track to Ambani in "korang" forest, 300'. Fl. 6189.

Leaves 2.5-8 cm. long, 1.5-3 cm. broad, membranaceous, on lower side pale. Petioles 5-22 mm. long, slightly pilose. Spikes up to 2 cm. long, without counting the filiform peduncle of equal length. Bracts \pm 8 mm. long. Calyx 9 mm. long. Corolla white, 14 mm. long; tube in the lower part 1.25-2 mm., at the throat 5 mm. wide; front lobes obovate, 5 mm. broad; hind lobes rotundate, 6.5 mm. broad. Filaments—longer 3.5 mm. long, shorter barely 1 mm.; anthers 1.5 mm. long. Staminodium 0. Ovary 3 mm. long. Style 10 mm., stigma front lobe 2.5 mm. long.

This is nearest to *H. caudigera* S. Moore, which has larger caudate leaves, longer bracts, &c.

*ASYSTASIA INTRUSA Bl. Bijdr. 796.

Sorong Island, under trees by beach. Fl. Jan. 6286.

Distrib. Aru Islands, Little Kei Islands, Timor Laut, Java, and Malay Peninsula.

·25-·50 m. high, with reddish-brown pink flowers.

*PERISTROPHE JALAPPÆFOLIA Nees in DC. Prod. xi. 494.

Manokoeari, near Genbela, common undergrowth in secondary strand forest. Fl., Fr. Jan. 6216.—Manokoeari, in high forest, common undergrowth on "korang," 200-500'. 6161.

Distrib. Java.

Herbaceous plant, ·50 m. high, with white flowers. Also seen on the foot-hills of the Arfak range.

RUBIACEÆ. (TH. VALETON.)

BIKKIA GRANDIFLORA Reinw., var. TENUIFLORA Val., var. nov.

Folia petiolata, elliptica, obtusa, basi acuta vel euneata, tenuiter coriacea, nervis lateralibus utrinque circa 5 tenuibus haud prominentibus. *Pedunculi* medio cupulatum bracteolati. *Calycis* lobi ensiformes acuti, calycem cylindricum æquantés. *Corollæ* tubus elongatus strictus, tenuis, versus limbum sensim ampliatus. *Corollæ* lobi trigoni, basi dilatati, longiores quam lati. *Capsula* cylindrica, lineis elevatis 8 pertensa, calycis lobis accrescentibus coronata.

Leaves 135 mm. long, 60 mm. broad. Petiole 15-20 mm. long. Calyx-lobes 15 mm. long, 3 mm. broad. Corolla-tube 17 mm. long, base 3 mm., apex 7 mm. broad. Corolla 105 mm. long; lobes 20 mm. long, base 14 mm. broad.

Island of Wakdê, shrub, 8 m. high, growing in masses behind the coral rocks of seashore. Fl. (white, sweet-scented). Jan. 6245.

Distrib. (of the species). Moluccas (type-specimen of Reinw. in Herb. Lugd.-Bat.), Kei Islands, Aru Islands, S.W. New Guinea, Palau Islands, Tahiti.

The species is characterized by the large, sword-like, curved calyx-lobes and the triangular acute corolla-lobes, which are longer than broad. The variety differs from the type in the very narrow corolla-tube.

OPHIORRHIZA INSULARIS Val., sp. nov.

Herba sublignosa, tomentosa puberula, in sicco fusca, caules incano-puberuli, glabrescentes. *Stipulæ* abortivæ vel californis et puberæ seca tricula nulla. *Folia* petiolata, vulgo æqualia, summa interdum valde disparia, elliptica vel obovata vel ovato-elliptica, apice obtusa vel obtusissima vel rotundata, basi cuneato-acuminata ad longe in petiolum producta, membranacea, in sicco visca, supra dense punctulato-scabrida, subtus parce tomentosa, nervi laterales utrinque 9-12, vene laxè obscure reticulatæ. *Inflorescentia* pedunculata foliis multo brevior, incano-puberula semel vel bis dichotoma vel subtrichotoma, ramis elongatis multifloris secundifloris.

Flores brevi pedicellati. *Calyx* 5-lobus, lobis dentiformibus parvis. *Corolla* apice 5-cristata, crista brevi rotundata; tubus brevis latus fauce dense hirsuto lobi tubo æquilongi. *Ovarium* dense tomentosum. *Stylus* glaber. *Capsulæ* ad ramos secundæ, breviter pedicellatæ, scaberulæ.

Leaves 75–100 mm. long or shorter, 40–45 mm. broad. Petiole 15 mm. long. Peduncle 10–20 mm. long. Fruiting-branches 5.5 cm. long.

Hab. Schouten Islands, Bosnik, Wiak, under strand trees on "korang." Small plant ± 2 dm. high. Fl. (white), Fr. Jan. 6284.

Collected also by Gjellerup in 1911.

GEOPHILA RENIFORMIS Don, Prodr. Fl. Nepal. 136; Schum. & Lant. 584; Nova Guinea, viii. (1911) 485; Ridl. in Trans. Linn. Soc. ser. 2, Bot. ix. (1916) 77.

Manokoeari, common creeping undergrowth in forest. Fl., Fr. 6181.

Distrib. New Guinea (D.S.W., Etna Bay, Koch; Utakwa River, Kloss; N.E. & S.E. and adjacent islands). Cosmopolitan in Tropics.

AMARACARPUS WICHMANNI Val., sp. nov. (*A. cuneifolius* Val., var., in Nova Guinea, viii. (1912) 769 et (1911) 502, p. p.)

Fruticulus ramis bilateralibus, horizontaliter expansis, ramulis haud regulariter pinnatis, potius quasi dichotomis. *Rami* abbreviati, secus ramulos oppositi et alterni; omnes grosse rufo-villosi. *Stipulæ* minutæ, ovatæ, longe 2-aristatæ, rufo-hirsutæ. *Folia* subsessilia, obovato-cuneata, acuta vel obtusa, basi crasse membranacea, siccando supra glaucescentia, subtus fusca, glabra, costa media prope basin cum petiolo pulverulento-villosula, nervi laterales utrinque 4 cum costa prominuli, ante marginem arcuatim conjuncti. *Flores* in apice ramorum abbreviatorum sessiles, nunc 3 glomerati, bracteis et stipulis setaceis suffulti. *Calyx* cum ovario glabro, campaniformis, lobis 4 ovatis, acutis, recurvis, ciliatis. *Corolla* breviter tubulosa, limbo subpatulo, tubo circa æquilongo, lobis oblongis crassis, tubus circa antheras fauce sessiles barbatus. *Stylus* corollæ æquilongus. *Drupa* calyce parvo coronata, pyrenæ semiobovoidæ, ventre plano, dorso profunde 3–4 sulcæ tricostatæ.—*Ramuli* nunc 50–300 mm. longi, brachyblastis 10–25 mm. longis dense obsessi. *Folia* secus ramos subpersistencia, in apice ramorum abbreviatorum sæpe 4-verticillata, 8–20 mm. longa, 6–9 mm. lata. *Flores* 7 mm. longi; corolla 4.5 mm. longa. *Drupæ* 3–5 mm. longæ, pyrenæ 2.5 mm. latæ.

Hab. Manokoeari, common undershrub in forest. Fl., Fr. Jan. 6185.

Distrib. New Guinea (D.N.W., Wichmann).

"Shrub, 1–1.50 m. Branches dorsiventral, symmetrical; white flowers. Also abundant at Warèn up to the foot-hills of the Arfak."

MYRMECODIA PULVINATA Becc. Malesia, ii. 103.

Manokoeari, epiphytic in high forest, 300'. Fl. (white), Fr. (red). Jan. 6197.

Distrib. New Guinea (D.N.W., Andai, Beccari).

CUCURBITACEÆ.

ZANONIA MACROCARPA (Bl.) Cogn. in Bull. Herb. Bois. i. 612 ; Schum. & Laut. 589.

Manokoeari, liane, everywhere in forest. Fr. Jan. 5746.

Distrib. New Guinea (N.E. and S.E.). Java, Borneo.

The most conspicuous plant seen along the coast in the lower forest. It obliterates whole trees with dense walls of verdure, while the huge fallen fruits, rotting on the ground, are the most striking objects in the forest. The seeds, with transparent wings about 10 cm. across, often fill the air, lazily borne on the breeze, like great butterflies, for which, indeed, I took them at first in the distance.

GOODENIACEÆ.

SCÆVOLA NOVO-GUINEENSIS K. Schum. in Bot. Jahrb. ix. (1887) 222 ; Schum. & Laut. 594 ; Nova Guinea, viii. (1912) 693.

Manokoeari, common scrambler on edge of forest, clearings, and young jungle. Fl. (yellow), Fr. Jan. 6199.

Distrib. New Guinea (D.N.W., Humboldt Bay, *Gjellerup* ; N.E.).

Apparently flowers all the year round.

COMPOSITÆ. (S. MOORE.)

WEDELIA BIFLORA DC. in Wight, Contrib. 18 ; Schum. & Laut. 600 ; Nova Guinea, viii. (1910) 337.

Manokoeari, Genbela, common everywhere in open clearings and on beach. Fl., Fr. Jan. 6201.

Distrib. New Guinea (D.S.W., Noord River, Biwak Island, *Versteeg, von Roemer* ; N.E. and adjacent islands). Common strand plant in the Tropics.

EXPLANATION OF THE PLATES.

PLATE 1.

- Fig. 1. *Araucaria Beccarii* with *Pteridium aquifolium* in foreground ; vicinity of ♀ lake.
 Fig. 2. Rafts made of three palm-trunks tied together, used by the Alfueros on both the Angi lakes.

PLATE 2.

- Fig. 3. Vegetation of marsh by ♀ lake, looking S.W.; Koebré Mt. in the background. *Baeckea frutescens* ←.
 Fig. 4. Vegetation of forest by ♀ lake, looking N.W.; Koebré in background. *Myrmedoma arfakiana* on extreme branches of tree ←, with *Phyllocladus hypophyllus* and *Libocedrus arfakensis* →.

PLATE 3.

- Fig. 5. *Araucaria Beccarii* ←, with *Podocarpus papuanus* and *Polyscias* sp. in centre; *Pteridium aquilinum* in foreground; vegetation of forest by ♀ lake.
 Fig. 6. Vegetation of Koebré ridge, showing *Myrmedoma arfakiana*, 1.50 m. high, flowering ←, with tuber cut in longitudinal section →.

[Photographs are reproduced by kind permission of Mr. A. E. Pratt.]

PLATE 4.

- Fig. 7. *Thysanosoria dimorphophylla* Gepp. Apical portion of plant, $\frac{1}{2}$ nat. size.

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