

Botany. — *Notes on Pteridophyta from Djambi, Sumatra.* By O. POSTHUMUS. (Communicated by Prof. J. C. SCHOUTE.)

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The following remarks are based on the Pteridophyta of a collection, which I made in the interior of the residency of Djambi (Sumatra), from July to November 1925. The plants are partly collected near Bangko, situated at the junction of the S. Mesoemai with the S. Merangin, where the latter ceases to be navigable; partly in the surroundings of the camp Selemboekoe, about 30 K.M. west of Bangko; only one specimen near Sarolangoen and two near Paoe, both situated at the S. Tembesi.

The landscape can be described as a plateau, with but a slight relief, in which, in consequence of a recent upheaval, the rivers have made deep ravines; palaeozoic strata, which are covered by tertiary and quaternary deposits of volcanic origin, come to the surface in the deepest parts.

Originally this region was covered with primary forest, continuous with that of the Barisan mountains, which are situated more westward. A considerable portion, however, in the more accessible parts, has been destroyed by the natives for their "ladangs" (not irrigated rice fields). These are left to themselves after one or two harvests have been obtained; then secondary jungle appears, or, especially during the last years, rubber plantations are planted by the natives.

The climate is aequatorial; the rainfall is rather high and almost equally distributed throughout the year. No well pronounced dry season occurs and the humidity of the air, especially in the shadow of the primary forest, is high and does not seem to be liable to much variation. This is shown in the fern-vegetation of the primary forest by the presence of Hymenophyllaceae, which are found on trees, but also on the soil, on steep, shadowy slopes, or on bigger boulders in the bed of the smaller rivers; they were never found in the secondary vegetation.

The high degree of humidity is especially favourable to reboisement. Some months after the rice-fields have been left to themselves, the young trees (bloekar) already attain a considerable height. Alang-alang (*Imperata cylindrica* Beauv.) is found only on the roads, on some clearings and in older native rubber plantations, apparently only if the vegetation is periodically burnt down. If left to itself, the (secondary) forest will come up soon.

In the following list the Ferns are arranged after the system of the Index Filicum of C. CHRISTENSEN, whose nomenclature is also followed;

the distribution of the species is mentioned as far as known to me, from the literature, which is quoted only in some cases in the discussion, and from material of the Buitenzorg herbarium.

HYMENOPHYLLACEAE.

Trichomanes bipunctatum Poiret, Encycl., VIII, p. 69, 1808.

In primary forest, covering the rocks, on shadowy humid places ; near S. Merangin, opposite to M. Djangkang, about 170 M. above sea-level : N^o. 618, 27 VII, 1925.

Tropical Asia and Africa, Polynesia.

Trichomanes hispidulum Mettenius ; Kuhn, Linnaea, XXXV, p. 389, 1868.

In primary forest, on the soil, in humid shadowy places ; near camp Selemboekoe, about 180 M. above sea-level : N^o. 613, 26 VII, 1925.

Malacca, Borneo.

Trichomanes humile Forster, Prodrôme, p. 84, 1780.

In primary forest, covering steep, humid, shadowy, rocky slopes ; near S. Merangin, opposite to M. Djangkang, about 140 M. above sea-level : N^o. 625, 27 VII, 1925.

Malay Archipelago, Formosa, N. Zealand, Polynesia.

Trichomanes singaporianum (v. d. Bosch) van Alderwerelt van Rosenburgh, Bull. Jard. Bot. de Buitenzorg, (2) XX, p. 25, 1915.

In primary forest, on moist shadowy places, on the soil or on the base of old trees ; near the camp Selemboekoe about 180 M. above sea-level : N^o. 612, 26 VII, 1925.

Malacca, Mergui islands.

Trichomanes sumatranum van Alderwerelt van Rosenburgh, Bull. dept. agric. Indes. néerl., XVIII, p. 4, 1908.

In primary forest, in shadowy, humid, places, frequent on the boulders in small rivers ; M. Karing, about 140 M. above sea-level : N^o. 604, 25 VII, 1925 ; S. Karing, about 140 M. above sea-level : N^o. 764, 24 VIII, 1925.

Sumatra, Java.

Hymenophyllum holochilum (v. d. Bosch) C. Christensen, Index Filicum, p. 36, 1905.

In the primary forest, on old trees : S. Selemboekoe, near the camp, about 180 M. above sea-level : N^o. 785, 25 VIII, 1925.

Sumatra, Malacca, Banca, Riouw, Lingga-Archipelago, Java, Borneo, Philippines, New Guinea.

Hymenophyllum subrotundum van Alderwerelt van Rosenburgh, Bull. Jardin Bot. de Buitenzorg (2) XX, p. 19, 1915.

In primary forest, epiphytic, in humid, shadowy places, forming tufts (together with *Polypodium inconspicuum* Bl.) ; S. Selemboekoe, near the camp, about 180 M. above sea-level : N^o. 786, 25 VIII, 1925 ; S. Mengkarang, about 200 M. above sea-level : N^o. 1082 bis, IX, 1925.

Sumatra.

CYATHEACEAE.

Cibotium barometz J. Smith, London Journal of Botany, I, p. 437, 1842.

Rather short three-fern ; in the primary forest on steep riverbanks ; S. Merangin opposite to M. Djangkang, about 140 M. above sea-level : N^o. 751, 21 VIII, 1925.

China, Hongkong, Formosa, Sumatra, Banca, Malacca, Borneo, Moluccas.

Cyathea moluccana R. Brown ; Desvaux, Prodrôme, p. 322, 1827.

Small tree-fern, about $\frac{1}{2}$ M. high ; leaves about 3 M. long ; occurs scattered in secondary forest (about 12 years old) ; near Bangko, about 60 M. above sea-level : N^o. 481, 10 VII, 1925.

Sumatra, Malacca, Riouw, Lingga-Archipelago, Borneo, Moluccas.

Alsophila latebrosa Wallich ; Presl, Tent. Pterid, p. 62, 1836.

In native rubber plantations, which are about 8 years old ; near Bangko, about 60 M. above sea-level : N^o. 568, 18 VII, 1925.

British India, Malay Archipelago.

DIPTERIDACEAE.

Dipteris conjugata Reinwardt, Sylloge plantarum II, p. 3, 1824.

In primary forest, on steep stony slopes of the river, in shadowy or rather open places ; S. Mengkarang between doesoen Baroe and M. Koekoen, about 200 M. sea-level : N^o. 892, 19 IX, 1925.

Malacca, Malay islands, Polynesia.

POLYPODIACEAE.

Dryopteris calcarata (Blume) O. Kuntze, Revisio generum plant., II, p. 812, 1891.

In primary forest, on and between the boulders in the shadowy bed of small rivers ; S. Karing, about 140 M. above sea-level : N^o. 692, 15 VIII, 1925.

Br. India, South China, Malay Archipelago, Polynesia.

Dryopteris Dayi (Beddome) C. Christensen, Index Filicum, p. 260, 1905.

In primary forest, on the soil, in rather shadowy spots; near S. Ketidoeran Siamang, about 160 M. above sea-level: N^o. 908, 15 X, 1925.

Malacca.

Dryopteris didymosora (Parish) C. Christensen, Index Filicum, p. 262, 1905.

In native rubberplantations (about 10 years old), in which the undergrowth is now and then destroyed; scattered, in rather open places; near the camp Selemboekoe, about 180 M. above sea-level: N^o. 736, 19 VIII, 1925.

Northern India, Assam, Malacca, Borneo, Amboina, China.

Dryopteris malayensis C. Christensen, Monogr. Dryopteris, I, p. 171, 1913.

In primary forest, on the soil, in shadowy places; near doesoon Baroe (S. Merangin), about 200 M. above sea-level: N^o. 855, 4 IX, 1925

Malacca, Malay islands, Philippines.

Dryopteris salicifolia (Wallich) C. Christensen, Index Filicum, p. 290, 1905.

In primary forest, growing on rocky slopes on rather bright places near the river; M. Karing, about 140 M. above sea-level: N^o. 655, 3 VIII, 1925.

Sumatra, Malacca, Borneo.

Dryopteris sarawakensis (Baker) van Alderwerelt van Rosenburgh, Malayan Ferns, p. 200, 1909.

In primary forest, in the shadow on steep riverbanks, and between the boulders in the river-bed; M. Karing, about 140 M. above sea-level: N^o. 602, 25 VII, 1925.

Borneo.

Dryopteris truncata (Poiret) O. Kuntze, Rev. gen. Plant., II, p. 814, 1891.

In secondary forest, on rather moist, shadowy places; near Bangko, about 60 M. above sea-level: N^o. 475, 10 VII, 1925.

Br. India, Malay Archipelago, Trop. Australia, Polynesia, Madagascar.

Dryopteris unita (Linn.) O. Kuntze, Rev. gen. Plant. II, p. 811, 1891.

Along roads, on open fields and in older native rubberplantations, in which the undergrowth is destroyed now and then; along the road from Limboer to Bangko, about 50 M. above sea-level: N^o. 543, 17 VII, 1925.

Br. India, Malay Archipelago, Polynesia, Madagascar.

Dryopteris urophylla (Wallich) C. Christensen, Index Filicum, p. 299, 1905.

In native rubberplantations, scattered, on rather humid places ; near Bangko, about 60 M. above sea-level : N^o. 474, 10 VII, 1925.

Br. India, Malay Islands, Polynesia, Madagascar.

Dryopteris verruculosa van Alderwerelt van Rosenburgh, Bulletin Jardin Bot. de Buitenzorg (2) X, p. 12, 1913.

In primary forest ; near doesoen Baroe (S. Merangin), about 200 M. above sea-level : N^o. 856, IX, 1925.

Eastern-Java, Sumatra.

Didymochlaena truncatula (Swartz) J. Smith, Journal of Botany, IV, p. 169, 1841.

In primary forest ; near Soengai Manau, about 400 M. above sea-level: N^o. 946, X, 1925.

All tropical countries.

Aspidium angulatum (Willdenow) J. Smith in Mettenius, Ann. Lugd. Bat., I., p. 239, 1864.

In primary forest ; scattered on shadowy spots ; near road to S. Manau, between S. Karing and S. Selemboekoe, about 180 M. above sea-level : N^o. 845, 31 VIII, 1925.

Malacca, Borneo, Moluccas, New Guinea.

Aspidium nebulosum (Baker) C. Christensen, Index Filicum, p. 84, 1905.

In primary forest ; near doesoen Baroe (S. Merangin) about 200 M. above sea-level : N^o. 851, IX, 1925.

Sumatra, Banca.

Aspidium singaporianum Wallich ; Hooker et Greville, Icones Filicum, pl. 26, 1827.

In primary forest ; scattered, on shadowy spots ; S. Merangin, opposite to M. Djangkang ; about 140 M. above sea-level : N^o639, 27 VII, 1925.

Sumatra, Banca, Malacca, Borneo.

Aspidium vastum Blume, Enumeratio plant. Jav., p. 142, 1828.

In primary forest, scattered on shadowy spots ; near doesoen Baroe (S. Merangin) ; about 200 M. above sea-level : N^o. 853, IX, 1925.

Br. India, Birma, Malay Archipelago.

Polybotrya appendiculata (Willdenow) J. Smith, Journal of Botany, IV, p. 150, 1841.

In primary forest, at shadowy, humid, steep, rocky slopes ; M. Karing, about 140 M. above sea-level : N^o. 606, 25 VII, 1925.

Tropical Asia.

Nephrolepis cordifolia (Linnaeus) Presl, Tentamen Pteridographiae, p. 179, 1836.

In primary forest, hanging down at steep, rather exposed, rocky slopes; S. Merangin opposite to M. Djangkang, about 140 M. above sea-level: N^o. 623, 27 VII, 1925.

Tropical countries.

Humata angustata J. Smith, Journal of Botany, III, p. 416, 1841.

In primary forest; with a long rhizome creeping on trees on rather dry spots; near M. Karing, about 160 M. above sea-level: N^o. 895, 6 IX, 1925.

Sumatra, Banca, Riouw, Lingga-Archipelago, Malacca, Borneo.

Humata heterophylla (Smith) Desvaux, Prodrome, p. 323, 1825.

In primary forest; creeping with a long rhizome on trees, scattered on rather dry places; between S. Karing and S. Selemboekoe, about 180 M. above sea-level: N^o. 844, 31 VII, 1925.

Malay Archipelago.

Humata repens (L. Fils) Diels, in Engler-Prantl, Nat. Pflanzenfam., I, abt. IV, p. 209, 1899; var. *minor* Nees.

In primary forest, scattered, on trees; near S. Ketidoeran Siamang, about 140 M. above sea-level: N^o. 761, 24 VIII, 1925.

S. China, Malay Archipelago, trop. Australia.

Davallia triphylla Hooker, Species Filicum, I, p. 162, pl. 46 A, 1846.

In higher parts of the primary forest, climbing, with a long rhizome in groups; near the road to Soengai Manau on the watershed between S. Karing and S. Selemboekoe, about 180 M. above sea-level: N^o. 843, 31 VIII, 1925.

Malacca.

Tapeinidium gracile van Alderwerelt van Rosenburgh, Malayan Ferns, p. 315, 1909.

In primary forest, on humid shadowy slopes; near the camp Selemboekoe, about 180 M. above sea-level: N^o. 778, 25 VIII, 1925.

Sumatra, Borneo, Java, Philippines, New Guinea.

Schizoloma ensifolium (Swartz) J. Smith, Journal of Botany, III, p. 414, 1841.

In native rubber-plantations, which are about 7 years old and have but little undergrowth, scattered; near Bangko, about 60 M. above sea-level: N^o. 461, 9 VII, 1925.

Tropical Africa, Asia and Australia; Polynesia.

Lindsaya decomposita Willdenow, Species plantarum, V., p. 425, 1810.
(*L. davallioides* Blume, Enumeratio plant. Jav. p. 218, 1828.)

In primary forest, in shadowy places, on the soil or on the base of old trees ; between the camp Selemboekoe and S. Karing, about 180 M. above sea-level : N^o. 825, 29 VIII, 1925 ; S. Merangin, opposite to M. Karing ; N^o. 680, 9 VII, 1925.

Trop. Asia, Australia, Polynesia.

Lindsaya lancea (Linnaeus) Beddome, Ferns Brit. Ind., Suppl. p. 6, 1876.

In primary forest, on the soil or on the base of old trees near the camp Selemboekoe, about 180 M. above sea-level : N^o. 616, 26 VII, 1925.

Trop. America, Ceylon, Malacca, Sumatra, Java, Borneo.

Lindsaya scandens Hooker, Species Filicum, 1, p. 205, pl. 63 B, 1846.

In primary forest, in humid, shadowy places, on the soil or on the base of old trees ; near the road to S. Manau, about 200 M. above sea-level : N^o. 668, 5 VIII, 1925.

Malay Archipelago.

Diplazium aequibasale (Baker) C. Christensen, Index Filicum, p. 227, 1905.

In primary forest, on shadowy, moist places ; near creeks, between the rocks ; S. Karing, about 140 M. above sea-level : N^o. 695, 15 VIII, 1925 ; S. Karing, near the S. Merangin : N^o. 607, 25 VII, 1925.

Borneo.

Diplazium bantamense Blume, Enumeratio, p. 191, 1828.

In primary forest, in shadow, on the soil ; near the S. Merangin, opposite to M. Djangkang, about 140 M. above sea-level : N^o. 638, 27 VII, 1925.

Tropical Asia, Japan.

Diplazium confertum (Baker) C. Christensen, Index Filicum, p. 230, 1925.

In primary forest, on the soil, sometimes at steep, shadowy banks of the creeks ; S. Selemboekoe, about 150 M. above sea-level : N^o. 783, 25 VIII, 1925 ; S. Boekit Tinggi, near doesoen Baroe, about 140 M. above sea-level : N^o. 664, 4 VIII, 1925.

Sumatra, Borneo, Celebes.

Asplenium cymbifolium Christ, Bulletin Herbier Boissier (2) VII, p. 999, 1906.

In primary forest in shadowy places ; the rhizome vertically climbing with short internodes, leaves with broad bases, between which are numerous roots ; forming a thick mass ; near the camp Selemboekoe, about 180 M. above sea-level : N^o. 615, 26 VII, 1925.

Philippines, Singkep.

Asplenium Nidus Linnaeus, Spec. plant, II, p. 1079, 1753.

In primary forest in the shadow, scattered, on trees; in the axils of the radially arranged leaves with a mass of roots, between which humus is formed; near camp Selemboekoe, about 180 M. above sea-level: N^o. 640, 27 VII, 1925; near doesoen Baroe (S. Merangin), about 200 M. above sea-level: N^o. 1084, IX, 1925.

Tropical Africa, Asia and Australia.

Asplenium tenerum Forster Prodrumus, p. 80, 1786.

In the primary forest, on trees, in shadowy spots; B. Mangkok, near the road to S. Manau, about 200 M. above sea-level: N^o. 669, 5 VII, 1925.

Trop. Africa, Asia, Polynesia.

Blechnum Finlaysonianum Wallich; Hooker et Greville, Icones Filicum pl. 275, 1831.

In native rubber plantations, scattered in rather light spots; near Bangko, about 60 M. above sea-level: N^o. 468, 9 VII, 1925.

Sumatra, Malacca, Borneo, Java, New Guinea.

Blechnum orientale Linnaeus, Spec. plant., ed. II, p. 1530, 1753.

Between bushes, on left ladangs (dry rice-fields), in newly cleared forest, in native rubber plantations (about 7 years old), scattered; near Bangko, about 60 M. above sea-level: N^o. 467, 9 VII, 1925; N^o. 522, 15 VII, 1925.

Tropical Asia, Australia and Polynesia.

Stenochlaena aculeata (Blume) Kunze, Bot. Zeitung, p. 142, 1848.

In the primary forest, in rather humid places; rhizome vertically climbing, on trees; leaves horizontal, adpressed; these specimens belong to the form inermis, the rhizome bearing no spines; the rhizome of N^o. 902 is thicker than that of the other specimens; S. Merangin, opposite to M. Karing, about 150 M. above sea-level: N^o. 681, 9 VIII, 1925; near the S. Karing, about 180 M. above sea-level: N^o. 743, 19 VIII, 1925; S. Selemboekoe, about 150 M. above sea-level: N^o. 898, 6 IX, 1925; near the camp, about 180 M. above sea-level: N^o. 902, 903, 26 IX, 1925.

Tropical Asia.

Stenochlaena palustris (Burm.) Beddome, Ferns of Br. India, Suppl. p. 26, 1876.

In secondary jungle, along roads or in rather open places, climbing between shrubs, sometimes rather frequent; near the road from the camp Selemboekoe to Bangko, about 100 M. above sea-level: N^o. 729, 18 VIII, 1925; near doesoen Baroe (S. Merangin) about 200 M. above sea-level: N^o. 861, IX, 1925.

Tropical Asia, Australia, Polynesia.

Syngramma valleculata (Baker) C. Christensen, Index Filicum, p. 340, 1905.

In primary forest, in groups, on the soil or on the base of old trees ; near camp Selemboekoe, about 180 M. above sea-level : N^o. 617, 26 VI, 1925.

Borneo.

Ceropteris calomelanos (Linnaeus) Underwood, Bulletin Torrey Bot. Club, XXIX, p. 632, 1902.

In open places, along the roads, on clearings in the forest, on sand-banks in the rivers ; near Bangko, about 60 M. above sea-level : N^o. 514, 14 VII, 1925.

All tropical countries.

Cheilanthes tenuifolia (Burmeister) Swartz, Synopsis, p. 129, 332, 1806.

In scattered groups between alang-alang (*Imperata cylindrica* Beauv.) and along the roads ; between Bangko and the camp Selemboekoe, about 100 M. above sea-level : N^o. 719, 18 VII, 1925.

Tropical Asia, Australia, Polynesia, New Zealand.

Pteridium aquilinum (Linnaeus) Kuhn ; von Decken, Reisen, III, Bot. p. 11, 1879.

Along the roads and on clearings in the forest ; near Bangko, about 60 M. above sea-level : N^o. 516, 14 VII, 1925.

All tropical and temperate countries.

Vittaria pumila Mettenius ; Kuhn Linnaeus, XXXVI, p. 65, 1869.

In primary forest, epiphytic ; near Bangko, about 60 M. above sea-level : N^o. 588a, 20 VII, 1925.

Borneo.

Vittaria scolopendrina (Bory) Thwaites, Enum. Plant. Zeyl. p. 381, 1864.

In primary forest, on trees, in scattered groups ; S. Selemboekoe, near the camp, about 180 M. above sea-level : N^o. 767, 25 VIII, 1925.

Tropical Africa and Australia, Polynesia.

Vittaria zosterifolia Willdenow, Species Plantarum, V, p. 406, 1810.

On the nodes of bamboos, growing near the S. Mesoemai, near Bangko, about 60 M. above sea-level : N^o. 532, 15 VIII, 1925.

Madagascar, tropical Asia, Polynesia.

Taenites blechnoides (Willdenow) Swartz, Synopsis, p. 24, 220, 1806.

In native rubber-plantations, scattered ; near Bangko, about 60 M. above sea-level : N^o. 453, 9 VII, 1925.

Tropical Asia, Polynesia.

Hymenolepis spicata (L. Fils) Presl, Epim. Bot., p. 159, 1849.

In primary forest; epiphytic, near M. Ketidoeran Siamang, about 140 M. above sea-level: N^o. 759, 25 VIII, 1925.

Madagascar, tropical Asia, Australia and Polynesia.

Polypodium heterocarpum (Blume) Mettenius, Fil. Hort. Lips, p. 37, pl. 25, fig. 24—25, 1856.

In primary forest, on trees; near M. Ketidoeran Siamang, about 140 M. above sea-level: N^o. 760, 25 VIII, 1925.

Sumatra, Malacca, Banca, Riouw-Lingga islands, Java, Borneo, Celebes.

Polypodium inconspicuum Blume, Enumeratio, p. 130, 1828.

In primary forest, epiphytic, on humid shadowy places; forming tufts (together with *Hymenophyllum subrotundum* v. A. v. R.); S. Mengkarang, about 200 M. above sea-level: N^o. 1082, IX, 1925.

Malay Archipelago, Philippines.

Polypodium nigrescens Blume, Enumeratio, p. 126, 1828.

In primary forest, both in rather open and shadowy places; epiphytic; near S. Mesoemai, near Bangko, about 60 M. above sea-level: N^o. 534, 15 VII, 1925; S. Merangin, opposite to M. Djangkang, about 140 M. above sea-level: N^o. 630, 27 VII, 1925.

Tropical Asia and Australia, Polynesia.

Polypodium phymatodes Linn., Mantissa, p. 306, 1771.

In primary forest, epiphytic; near doesoen Baroe, about 200 M. above sea-level: N^o. 888, IX, 1925.

Tropical Africa, Asia, Australia, Polynesia.

Polypodium revolutum (J. Smith) C. Christensen, Index Filicum, p. 559, 1906.

Epiphytic, in groups on the nodes of bamboos; bamboo bushes on a sandbank, S. Merangin, near M. Titi Meranti; N^o. 679, 9 VIII, 1925.

Sumatra, Java, Celebes, Philippines, N. Caledonia.

Polypodium Whitfordi Copeland, Phil. Journ. of Science, I, Suppl. V, p. 256, pl. 4 B, 1916.

In primary forest, on trees; S. Ketidoeran Siamang, about 140 M. above sea-level: N^o. 762, 24 VIII, 1925.

Philippines (Luzon).

Loxogramma Blumeianum Presl, Tentamen Pterid., p. 215, 1836.

In primary forest, on trees; near M. Karing, about 140 M. above sea-level: N^o. 906, 13 IX, 1925.

Tropical Africa and Asia.

Loxogramma involutum Presl, Tentamen Pterid., p. 215, 1836. (*Polypodium scolopendrinum* (Bory) C. Christensen, Index Filicum, p. 562, 1906.)

In primary forest, epiphytic, in rather shadowy places ; near doesoen Baroe (S. Merangin), about 200 M. above sea-level : N^o. 884, IX 1925; N^o. 1083, IX, 1925.

Tropical and subtropical Asia.

Cyclophorus acrostichoides (Desvaux) Presl. Epim. bot. p. 130, 1849.

On the nodes of the stems of bamboos, at the S. Mesoemai, near Bangko, about 60 M. above sea-level : N^o. 533, 15 VII, 1925.

Ceylon, Malay Archipelago, Queensland, Polynesia.

Cyclophorus angustatus (Swartz) Desvaux, Berliner Magazin. V, p. 300, 1811.

In primary forest, climbing, with a long rhizome on the stems ; near Bangko, about 60 M. above sea-level : N^o. 588, 20 VII, 1925 ; near S. Karing, about 140 M. above sea-level : N^o. 610, 25 VII, 1925 ; S. Selemboekoe, near the camp, about 180 M. above sea-level : N^o. 781, 25 VIII, 1925.

British India, Sumatra, Malacca, Riouw-Lingga islands, Banca, Borneo, Polynesia.

Elaphoglossum Beccarianum (Baker) C. Christensen, Index Filicum, p. 303, 1925.

In primary forest, on trees, in shadowy places ; near M. Ketidoeran Siamang, about 130 M. above sea-level : N^o. 909, 24 X, 1925.

Borneo.

PARKERIACEAE.

Ceratopteris thalictroides (Linn.) Brongniart, Bull. Soc. Phil., Paris, p. 186, 1821.

Water-fern ; Batang Soengai : N^o. 934, IX, 1925.

All tropical countries.

GLEICHENIACEAE.

Gleichenia linearis (Burm.) Clarke, Trans. Linn. Soc., II, Bot. I, p. 428, 1880.

Along the roads, between shrubs, on clearing in the forest ; near Bangko, about 60 M. above sea-level : N^o. 517, 14 VII, 1925 ; near camp S. Selemboekoe, about 180 M. above sea-level : N^o. 765, 25 VIII, 1925.

Trop. countries.

SCHIZAEACEAE.

Lygodium circinnatum (Burm.) Swartz., Synopsis Filicum, p. 153, 1806.

Along the roads and between shrubs, near the camp Selemboekoe, about 160 M. above sea-level: N^o. 727, 18 VIII, 1925; near M. Karing, about 140 M. above sea-level: N^o. 603, 25 VII, 1925; near doesoen Baroe (S. Merangin) about 200 M. above sea-level: N^o. 860, IX, 1925.
Tropical Asia, Queensland.

Lygodium flexuosum (Linn.) Swartz, Schraders Journ., p. 106, 1801.

Between alang-alang (*Imperata cylindrica* Beauv.) on open places; along the road to Bangko, about 180 M. above sea-level: N^o. 717, 718, 18 VIII, 1925.

Tropical Asia, Queensland.

Lygodium salicifolium Presl, Suppl. Tent. Pterid., p. 102, 1845.

In native rubber-plantations, near Bangko, about 60 M. above sea-level: N^o. 464, 9 VII 1925.

Tropical Asia.

MARATTIACEAE.

Angiopteris evecta Hoffmann, Commentatio Soc. Reg. Gött., XII, p. 29, pl. 5, 1796.

Between shrubs (secondary jungle) near the river-banks; S. Tembesi near Sarolangoen, about 40 M. above sea-level: without number, 1 VII, 1925.

Tropical Asia.

OPHIOGLOSSACEAE.

Helminthostachys zeylanica (Linn.) Hooker, Gen. Filicum, pl. 47, 1840.

Near doesoen Baroe (S. Merangin), about 200 M., above sea-level: N^o. 867, IX, 1925.

Tropical Asia and Australia.

LYCOPODIACEAE.

Lycopodium cernuum Linnaeus, Species plantarum, I, p. 1103, 1753.

In native rubber-plantations, about 7 years old, without undergrowth, scattered in rather shadowy places; near Bangko, about 60 M. above sea-level: N^o. 466, 7 VII, 1925.

Tropical and subtropical countries.

Lycopodium Phlegmaria Linnaeus, Species plantarum, I, p. 1101, 1753.

At the margin of the primary forest, epiphytic, pendulous; near the road to S. Manau near the camp Selemboekoe; about 180 M. above sea-level: N^o. 796, 26 VIII, 1925.

Tropical Asia and Australia.

Lycopodium pinifolium Blume, Enumeratio, p. 264, 1828.

In primary forest, epiphytic, pendulous ; near M. Ketidoeran Siamang, 140 M. above sea-level : N^o. 910, 24 X, 1925.

Malay islands, New Guinea.

PSILOTACEAE.

Psilotum complanatum Swartz, Synopsis, p. 414, pl. 4, fig. 5, 1806.

In primary forest, hanging down from below a nest-fern, *Asplenium Nidus* ; S. Karing, about 140 M. above sea-level : N^o. 821, 28 VIII, 1925.

Tropical and subtropical countries.

SELAGINELLACEAE.

Selaginella alopecuroides Baker, Handbook Fern Allies, p. 77, 1887.

On shadowy places, near the water side ; S. Lesing, near Paoe, about 30 M. above sea-level : N^o. 1006, X, 1925.

Borneo.

Selaginella atroviridis Spring, Monographie, II, p. 124, 1848.

In primary forest, on the soil or on the rocky slopes of small rivers, in shadowy places ; M. Karing, about 140 M. above sea-level : N^o. 644, 1 VIII, 1925 ; path to Ds. Baroe (S. Merangin), about 180 M. above sea-level : N^o. 666, 4 VIII, 1925.

Tropical Asia.

Selaginella convolvens van Alderwerelt van Rosenburgh, Bulletin Jard. Bot., Buitenzorg XI, p. 23, 1913.

In primary forest, on humid rocky slopes, in shadow ; M. Karing, about 140 M. above sea-level : N^o. 605, 25 VII, 1925.

Tropical Asia.

Selaginella involvens Hieronymus, Hedvigia, L. p. 2, 1911.

In primary forest, on humid rocky slopes, in shadow ; M. Karing, about 140 M. above sea-level : N^o. 609, 25 VII, 1925.

Tropical Asia.

Selaginella phanotricha Baker, Handbook Fern Allies, p. 109, 1887.

In primary forest on the soil or on the base of old trees in shadow ; S. Selemboekoe, about 180 M. above sea-level : N^o. 772, 25 VIII, 1925.

Borneo.

Selaginella plana Hieronymus in Engler-Prantl, Nat. Pflanzenfam. I. abt. IV, p. 704, 1900.

In primary forest, on rather open, rocky places ; also in native rubber-plantations ; near Bangko, about 60 M. above sea-level : N^o. 458, 9 VII, 1925 ; S. Merangin, opposite to M. Djangkong, about 140 M. above sea-level : N^o. 619, 27 VII, 1925.

Tropical Asia.

Selaginella Willdenowii Baker, Handbook Fern Allies, p. 93, 1887.

On shadowy places, near the water side ; S. Lesing, near Paoe, about 30 M. above sea-level : N^o. 1009, X, 1925.

Tropical Asia.

The collection which is described on the preceding pages, represents the fern-flora of a relative small district only, in the hilly part east of the Barisan Mountains. Though therefore the conclusions derived from its study have not general value for the fern flore of Sumatra as a whole, still some remarks may be made here.

The analysis of the vegetation of a rather small district, in which the conditions are not differing very much, has, to a certain degree, some advantages to the study of the flora of a country, like Sumatra, as a whole. The circumstances governing the distribution of plants, find also their expression in the relation of the flora of a small district with that of other countries.

From the 74 species of Ferns, the majority (two thirds) is found throughout the Malay Archipelago in the plains and the lower regions of the mountains ; not only on Sumatra, Malacca, Borneo, Celebes and the Moluccas, but also on Java ; many of them are also known from British India, China and N. Australia, some of them occur in Madagascar and Polynesia, a number even in nearly all tropical countries.

From the remaining 22 species the known distribution is the following :

Sumatra, Malacca, Borneo, Celebes and the Moluccas :

Cibotium Barometz (Linn.) J. Smith (also known from Formosa, Hongkong, China).

Cyathea moluccana R. Brown (also known from Assam).

Dryopteris didymosora (Parish) C. Christ. (new for Sumatra ; also known from Assam Br. India and S. China).

Aspidium angulatum (Willd.) J. Smith (known from New Guinea).

Cyclophorus angustatus (Swartz) Desvaux (also known from Br. India and Polynesia).

Cibotium barometz has not been mentioned from Java in the literature, neither were specimens from not-cultivated plants from this island present in the Buitenzorg herbarium ; it has been collected, however by TEYSMANN on the mount Radjabasa in the S. E. part of Sumatra, on the point nearest to Java (specimen in the Buitenzorg herbarium). *Cyclophorus angustatus* has been mentioned with doubt from Java by RACIBORSKY ¹⁾; this statement has never been confirmed.

Sumatra and the Philippines :

Asplenium cymbifolium Christ. (new to Sumatra, already known from Singkep) ²⁾.

Polypodium Whitfordii Copeland (new to Sumatra).

¹⁾ RACIBORSKI, Pteridophyta von Buitenzorg, 1898, p. 100.

²⁾ VAN ALDERWERELT VAN ROSENBURGH, Bull. Jard. Bot. de Buitenzorg (3) V, 1922, p. 184.

Sumatra, Malacca, Borneo :

Trichomanes hispidulum Mettenius (new to Sumatra).

Dryopteris salicifolia (Wall.) C. Chr.

Aspidium singaporianum Wallich.

Humata angustata J. Smith.

Sumatra, and Borneo (N.-W. and N. Borneo) :

Dryopteris sarawakensis (Baker) v. A. v. R. (new to Sumatra).

Diplazium aequibasale (Baker) C. Chr. (new to Sumatra).

Diplazium confertum (Baker) C. Chr. (also known from Celebes)¹⁾.

Syngramma valleculata (Baker) C. Chr. (new to Sumatra).

Vittaria pumila Mett. (new to Sumatra).

Elaphoglossum Beccarianum (Baker) C. Christ. (new to Sumatra).

Sumatra and Malacca :

Trichomanes singaporianum (v. d. Bosch) v. A. v. R. (new to Sumatra).

Dryopteris Dayi (Beddome) C. Chr. (new to Sumatra).

Davallia triphylla Hooker (new to Sumatra).

From Sumatra only are known :

Hymenophyllum subrotundum v. A. v. R.

Aspidium nebulosum (Baker) C. Chr. (also from Banca).

Thus we see a rather high number of species which are found rather far eastward, but appear to be absent on Java ; on the contrary only two species of the collection are known from Java and Sumatra, only :

Trichomanes sumatranum v. A. v. R.

Dryopteris verruculosa v. A. v. R.

These species are both rare on Java ; *Trichomanes sumatranum* has been found once near Buitenzorg²⁾ ; *Dryopteris verruculosa* once near Srigontjo at the south coast, S. of Bantoer (Malang)³⁾ ; the specimens of the later species differ slightly from those gathered in Bencoolen (Lebong Tandai) and in Djambi.

From the Ferns, 20 species occurred in secondary vegetation ; except *Cyathea moluccana* and *Dryopteris didymosora* they all belonged to the species, which Sumatra has in common with Java, and which are found also throughout the Malay Archipelago, sometimes even far without ; even *Cyathea moluccana* and *Dryopteris didymosora*, which have not been found on Java, have a rather large distribution, from British India and Assam to the Moluccas.

¹⁾ C. CHRISTENSEN, Svensk. bot. Tidskr., XVI, 1922, p. 93.

²⁾ VAN ALDERWERELT VAN ROSENBURGH, Bull. Jardin Bot. de Buitenzorg (3) V, 1922, p. 226.

³⁾ VAN ALDERWERELT VAN ROSENBURGH, Bull. Jard. Bot. Buitenzorg, XI, 1913, p. 12; id., (3) II, 1920, p. 150.

In addition to the above remarks concerning the secondary vegetation, the following can be said concerning the species, which are found nearly throughout the whole Archipelago, also on Java.

When comparing the flora of Java and Sumatra, one is struck by the fact, already mentioned by MIQUEL¹⁾, that a number of plants, which in Java are known at rather high altitudes only, occur in Sumatra also in the plains. This is already stated for the Ferns by RACIBORSKY²⁾, who remarks that the lowest localities of many species are found on Sumatra at a lower level than on Western Java; on Mid Java (Tegal) they are found at a still higher altitude.

This is also demonstrated for some of the ferns mentioned above; the bulk of the species which Sumatra has in common with Java occurs there in the plains too; but a number of them are known in Java only from localities situated at a higher altitude than those on Sumatra; from these forms the following list is given; the numbers in brackets placed behind the names indicate the altitude of the lowest localities on Java of the species, which are known to me.

Hymenophyllum holochilum (v. d. Bosch) C. Christ. (900 M.).

Trichomanes sumatranum v. A. v. R. (750 M.).

Dipteris conjugata Reinwardt (900 M.).

Dryopteris calcarata (Blume) O. K. (500 M.).

Didymochlaena truncatula (Swartz) J. Sm. (700 M.).

Tapeinidium gracile v. A. v. R. (900 M.).

Lindsaya decomposita Willd. (800 M.).

Lindsaya lancea (Linn.) Bedd. (600 M.).

Lindsaya scandens Hooker (800 M.).

Diplazium bantamense Blume (1000 M.).

Asplenium tenerum Forst. (500 M.).

Blechnum Finlaysonianum Wallich (1000 M.).

Polypodium heterocarpum (Blume) Mett. (900 M.).

Polypodium inconspicuum Blume (1650 M.).

Polypodium revolutum (J. Sm.) C. Christ. (450 M.).

This difference is probably chiefly due to the fact, that the rainfall is here more equally distributed throughout the year than on Java³⁾. There generally the plains have a more pronounced dry season than most of the mountainous parts. If the above supposition be true, we might expect these forms to occur on Java also in those parts of the plains or in hilly districts where the rain is equally distributed in the way: in the remote western parts of the Preanger Residency (near the Wynkoopsbaai), in the Eastern

1) MIQUEL, Flora van Sumatra, 1860, p. 38.

2) RACIBORSKI, Farne von Tegal, 1899, p. 235.

3) The importance of this fact, more especially for the culture of tea on Java, has been demonstrated by BACKER and VAN SLOOTEN, Theeonkruiden, 1924, p. 13; map on p. 12.

part of the Preanger, near the South coast (W. of Tjidoelang), and on the southern slope of the Smeroe. The flora of these regions, however, is hardly known.

From the above mentioned species only two, *Blechnum Finlaysonianum* and *Polypodium revolutum* occur, in Djambi, in the secondary vegetation. They belong, however, to the group, which contains nearly all ferns which may occur in the secondary vegetation. This phenomenon can be explained by the supposition that the lesser resistance against drought is here the limiting factor. Then the species can not live on Java in the temporary rather dry plains in the secondary vegetation, where usually rather much resistance is necessary, especially in the young plants. The extremes of these conditions are for the plants more important than the total amount of the rainfall during longer periods.

The fern-flora of Java is rather well known, relatively much better than that of Borneo and Sumatra. The bulk of the species, mentioned above, are found throughout the whole Archipelago and even far without. We see that from the remaining species Sumatra has only some rare ones in common with Java; the other ones are not found on Java, but, however, have a rather large extension in eastward direction.

The same phenomenon is even valid for genera e.g. for *Dipteris*, *Matonia*, *Syngamma*, *Lecanopteris* and some families of higher plants. The species, which Java and Sumatra have in common, are found throughout the Archipelago; but those species with a more restricted distribution are found in Sumatra and Malacca, Borneo only.

The conclusions got by the analysis of this collection of ferns gathered in a rather small district in the hilly part of the lowlands of Mid Sumatra, are in accord with those derived from the study of the distribution both of several groups of higher plants and of the fauna. Though Sumatra and Java are separated only by the rather narrow straits of Sunda, their flora and fauna appear to be much more different than the flora and fauna of Sumatra and Malacca, even more different than the flora and fauna of Sumatra and Borneo.

For the discussion of this fascinating subject the reader may be referred to the paper of Dr. H. J. LAM ¹⁾, who has checked the conclusions, derived from the distribution of the fauna with those of some groups of plants especially the Sapotaceae. The above conclusions are in accord with his. Also there the Sunda straits appears to be a boundary of primary importance; even more than the "line of Wallace". The line through the straits of Sunda is identical with the western part of the line of "Van Kampen", that is the eastern boundary of the area of many animals, among which most large mammals ²⁾. The supposition that this boundary really is the straits of Sunda and not, for instance, is situated some hundred

¹⁾ *Annales Jard. Bot. Buitenzorg*, XXXVII, p. 33—49, 16 pl.

²⁾ *l.c.*, p. 42.

miles towards the north, is supported by the occurrence of some plants in the southern Lampongs which have not been found in Java. From the literature may be cited here: *Anisoptera marginata* Korthals (from Sumatra, Malacca and Borneo) found near Tandjoeng Karang, near Telok Betoeng¹); from the Ferns the occurrence of *Cibotium barometz* J. Sm. on the Radjabasa, mentioned above. Further collecting in these districts will doubtless give valuable information concerning these questions.

¹) VAN SLOOTEN, Bull. Jardin Bot. de Buitenzorg (3) VIII, 1926, p. 7.

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