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ALVIN J. COX, M. A., Ph. D.
GENERAL EDITOR

SECTION C. BOTANY

E. D. MERRILL, M. S.
EDITOR

WITH THE COÖPERATON OF

W. H. BROWN, Ph. D.; E. B. COPELAND, Ph. D.; C. F. BAKER, A. M.;
F. W. FOXWORTHY, Ph. D; R. C. MCGREGOR, A. B.

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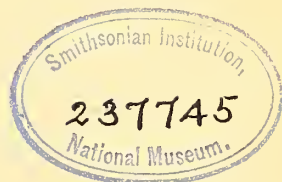
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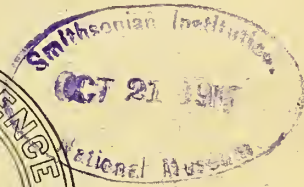
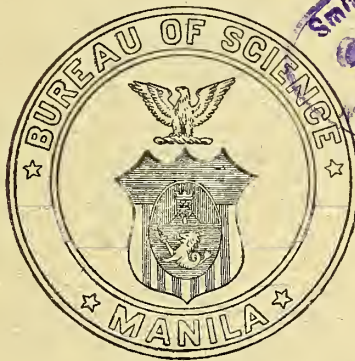
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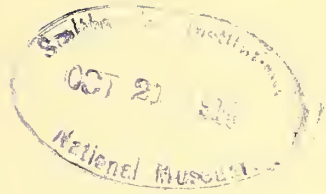
Charles Budd Robinson, Jr., A. B., Ph. D.

Pictou, Nova Scotia, October 26, 1871

Assistant Botanist, Bureau of Science

† Amboina

December the fifth, nineteen hundred and thirteen



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No. 1

NEW PAPUAN FERNS

By EDWIN BINGHAM COPELAND

(From the College of Agriculture, University of the Philippines, Los Baños, P. I.)

The following paper is based on material supplied by the Rev. Copland King of Ambasi, Papua.

CYATHEA FUSCA Baker.

King 383.

This is certainly nearly related to King's Nos. 181, 246 and 277, of which the last is the type of *C. Kingii* Rosenstock. No. 383 is merely bipinnatifid, while the others are bipinnate with lobed pinnules. The diagnosis of *C. fusca* (Malesia 3: 31) reads: "frondibus amplis bipinnatifidis; pinnulis sessilibus lanceolatis; segmentis tertiariis oblongis obscure crenulatis."

Whether we have here one polymorphous species or several closely related species cannot be determined from the material in hand.

CYATHEA (ALSOPHILA) WOODLARKENSIS sp. nov.

Trunco haud alto, vero gracile sed cum tectura densa et permanente radicum et basium stipitum 8 cm crasso; stipite pallide brunneo, pube minuta pallida transeunte et pilis validis subnigris eis Dryopteridis ferocis similibus basibus duris persistentibus vestito; fronde bifinnatifida, rhachi ut stipes; pinnis permultis sessilibus lineari-lanceolatis, usque ad 40 cm longis, 3-4 cm latis, valde attenuatis, fere ad costam pinnatifidis, costa pilosa; segmentis numerosissimis, subfalcatis, integris, obtusis, 2 cm longis, 3 mm latis, costula sparse pilosula, lamina glabra,

tenui-coriacea, inferne pallida; venis utroque latere ca. 30, omnibus simplicibus, plerisque fertilibus, soris medialibus, nudis; sporangiis paucis, castaneis.

Woodlark Island, *King* 284.

A remarkably distinct species. "Tree fern. It did not grow above the surrounding tangle of *Stenochlaena palustris* and other species."

CYATHEA SCABRISETA sp. nov.

Alsophila profunde tripinnatifida pubescentia triforme; rhachi fulva, squamulis minutis ad basin fimbriatis albis deciduis vestito, deinde nitido et propter baseos setarum hispida; setis mox deciduis, e basibus viosis ad apices albidas pallescentibus, dentibus minutissimis nigro-rubis ciliatis; inter setas descriptas aliis minoribus pallidioribus deciduis; pinna 60 cm longa, 18 cm lata, brevistipitata, abrupte acuminata, rhachi obscure sordida superne fusco-velutina, inferne minute furfuracea et sparse hispida glabrescente; pinnulis horizontalibus infimis brevipedicellatis, 2 cm latis, proximis, abrupte in caudam 1 cm longam serratam contractis, fere ad costam pinnatifidis, costa superne appressociliata, subtus squamulis albidis plerisque dissectis rarius lanceolatis fere integris vestita; segmentis 2.5 mm latis, obtusis, plerisque subfalcatis, minute serratis interdum obscure biserratis, subcoriaceis, subtus pallidis, superne atroviridibus, costa et rarius venis squamulis bullatis pallidis, et sparsius aliis sordidis angustis plerumque fissis ornatis: venis utroque latere ca. 12, fere omnibus furcatis; soris medialibus, sporangiis cum pilis brunneis multis mixtis.

Papua, without definite locality, *King*. 444.

Related to *Cyathea crinita* (Hooker).

DRYOPTERIS BIPINNATA sp. nov.

Thelypteris gregis *D. immersae*: rhizomate invisio; stipite recto, 30 cm alto, gracile sed valido, brunneo cum pede nigro, sub oculo nudo glabro, sub lente sursum rhachique dense minute pubescentibus; fronde 30 cm alta, 17 cm lata, abrupte longe acuminata, deorsum bipinnata; pinnis horizontalibus, rectis vel rarius subfalcatis, acuminatis, inferioribus brevipedicellatis haud diminutis, aliis sessilibus, costis ubique minute pallide setosis; pinnulis liberis paucis, infimis (rhachi proximis) brevipedicellatis, brevibus; segmentis pinnae multis, utroque latere 20-30, proximis, apice crenulatis aliter integris, oblique acutis, ca. 7 mm longis, 2 mm latis, papyraceis; venis subtus setis paucis brevibus obsitis, alibi glabris; venis simplicibus, utroque latere ca. 10, omnibus

saepe fertilibus; soris submarginalibus, subimmersis, parvis, orbicularibus; indusio minute dense hirsuto, persistente.

Loane, *King 407*.

Evidently near *D. Schultzei* Brause, but much smaller, axes not yellow, sori small and indusium persistent.

DRYOPTERIS ANGUSTA sp. nov.

Nephrodium gracilius gregis D. *sagittifoliae*; caudice erecto, breve, radicibus et stipitibus dense vestito; stipitibus paucis confertis, validis, 3–4 mm crassis, 3–5 cm ad aurículas infimas vel 30 cm ad pinnae foliaceas altis, deorsum paleis paucis instructis, glabrescentibus, sursum rhachibusque dense albido-pilosis, pinnis reductis sensim ad aurículas vix quam paleis majoribus decrescentibus ornatis; fronde vera lanceolata, ca. 65 cm alta, 15 cm lata, utrinque angustata, acuminata, pinnata; pinnis sessilibus, basi dilatatis, deinde ad apicem acutam integram angustatis, inframedialibus maximis horizontalibus, 75 mm longis, supra basin 1 cm latis, ca. ad mediam laminam pinnatifidis, inferioribus paullo deflexis et superioribus adscendentibus, supremis integris, pinnis pinnatifidis utroque latere ca. 40; segmentis contiguis, 2 mm latis, obliquis; lamina herbacea, minute pilosa; venis utroque latere ca. 6, fere omnibus fertilibus, 2 vel 3 anastomosantibus, simplicibus, soris medialibus; indusio parvo, pilis et glandulis ambabus deciduis ornato, sporangiis nudis.

Papua, locality not stated, *King 408*.

Differs from *D. sagittifolia* (Bl.) O. K. in being thinner, and more slender throughout.

DRYOPTERIS OBLANCEOLATA sp. nov.

Meniscium, folia simplice oblanceolata; rhizomate 2 mm crasso, paleis castaneis lanceolatis dense obtecto; stipitibus confertis, 1–3 cm altis, pilis et paleis vestitis; fronde 25–30 cm alta, 3 cm lata, acuminata, deorsum attenuata, deinde truncata, rarius auriculis parvis 1-paribus subtensa, crenata, subcoriacea, costa setacea excepta glabra; venulis ca. 6-paribus, fere omnibus et interdum venula secundaria excurrente soriferis; indusio invisum et verisimiliter carente.

Taupota, *King 394 coll. Rev. P. C. Shaw*.

A very distinct species of the *simplicifolia* group.

DRYOPTERIS UNIAURICULATA sp. nov.

D. lineatae (Bl.) C. Chr. affinis; rhizomate 3 mm crasso, lignoso, ad apicem paleis parvis lanceolatis fusco-nigris vestito; stipitibus confertis, ca. 20 cm altis, basibus nigris, sursum

fuscis, superne pilis falcatis vestitis inferne minute et sparse pilosis infra laminam auricula una minuta praeditis; fronde pinnata, segmento apicale maximo, usque ad 20 cm alto, 4 cm lato, acuminato, basi truncato vel cordato, plerumque crenato; pinnis saepius utrinque uno, alternantibus, 4–8 cm longis, 2–3 cm latis, obtusis vel acutis, basi truncatis, subcoriaceis, lamina glabra; venulis in segmento majore ca. 8-paribus, inferne minute pilosis, conspicuis; soris usque ad 7-paribus, versus costam proximis et interdum confluentibus, versus marginem distantibus, orbicularibus, indusio pilis multis centralibus substituto, sporangiis nudis.

Loane, *King* 406.

The single auricle, below the developed pinnae, is found on the four fronds sent to me, but will probably prove not to be a constant character; but the species is distinguishable from *D. lineata* in several other ways. *D. Bakeri* is very distinct. *D. mirabilis* Copel., of Borneo, is much broader, with opposite pinnae and surface minutely pustulose, as in *D. lineata*; *D. uniauriculata* has it smooth.

TECTARIA GYMNOCARPA sp. nov.

Species gregis *T. cicutariae*, venatione *Pleocnemiae* soris ut videtur nudis; stipite 35 cm alto, castaneo, deorsum paleis paucis anguste lanceolatis fere 1 cm longis vestito; fronde 30–40 cm alta et lata, deltoidea, subtripinnata; pinnis suboppositis, infimis deltoideis 15 cm latis, sequentibus biparibus apud baseos bipinnatis, sequentium paucarum segmentis serratis subacutis; venis hirsutis, lamina fere glabra, membranacea; venis secus costas fortissimas anastomosantibus, aliter liberis; soris plerisque submarginalibus, 1 mm vel ultra latis, superficialibus; indusio nullo vel fugace.

Loane, *King* 401.

In spite of the venation, this is not a near relative of *T. leuzeana*, but is near the so-called *Pleocnemia membranacea* of Beddome. Rosenstock's *P. leuzeana* var. *lobato-crenata* is described as with very hairy lamina, and his *P. membranacea* var. *novoguineensis*, as having much more reticulate veins.

TECTARIA KINGII sp. nov.

Pleocnemia parva, gracile, deltoidea; stipite 4 cm alto, castaneo, deorsum paleis anguste linearibus 1 cm longis sparsis vestito; fronde 30–35 cm alta et lata, deltoidea, tripinnata; pinnis infimis deltoideis, sequentibus 1–3-paribus profunde bipinnatifidis, superiorum profunde pinnatifidarum segmentis lanceolatis obtusis pinnatifidis deinde serratis, supremis integris; venis tomentellis, lamina superne glaberrima, inferne fere glabra; venis more

T. leuzeanae anastomosantibus; soris parvis, multis, plerisque submarginalibus; indusio persistente.

Woodlark Island, *King* 402.

Distinguished from *TECTARIA SUBAEQUALE* n. comb. (*Aspidium subaequale* Rosenstock, Fedde's Repert. 13 (1913) 176) by the form of the frond, and from this and other related species by the fine dissection of the frond. The color is that of *T. leuzeana*.

ATHYRIUM FIMBRISTEGIUM sp. nov.

Stipite alto, 5 mm crasso, atropurpureo-castaneo, glabrescente, inerme; fronde 80 cm alta. ca. 50 cm lata, tripinnatifida, rhachi furfuracea, glabrescente; pinnis alternantibus, brevistipitatis, inferioribus 25–30 cm longis, usque ad 12 cm latis, acuminatis, rhachibus praecipue in furca minute furfuraceis; pinnulis horizontalibus, brevissime stipitatis, valde acuminatis, usque ad 13 mm latis, profunde pinnatifidis; segmentis ca. 2 mm latis, subfalcatis, integris vel obscure serrulatis, obtusis vel subacutis, glabris, herbaceis; venulis simplicibus, utroque latere usque ad 8; soris costularibus, plus minus ad mediam laminam protensis, infimis exceptis simplicibus; indusio tenue, laete brunneo, lacero-lobato.

King 386, without definite locality.

A member of the *A. silvaticum* (Bl) Milde group, but the ultimate divisions much finer and sori relatively longer. *Diplazium arborescens* Sw. is reported from Kaiser Wilhelmsland (Schumann and Lauterbach; Flora der deutschen Schutzgebiete, p. 125), but is otherwise unknown from this part of the world; it has more ample ultimate divisions and light-colored axes. *Athyrium australe* (R. Br.) Presl, var. *muricatum*, is reported in the same work; it also is less finely divided and otherwise distinct.

"DIPLAZIUM BULBIFERUM Brack." ?

Loane, *King* 397; Mamba, *King* 398.

Can be separated, though not too sharply, from *Athyrium pinnatum* (Blanco) Copel., including the *D. bulbiferum* of the Philippines.

ADIANTUM KINGII sp. nov.

Stipitibus confertis, purpureo-atris, nitidis, usque ad 10 cm altis, basibus pilis atropurpureis dense vestitis; fronde ubique glaberrima, bipinnata, parte apicale usque ad 10 cm alta, pinnis pinnatis paucis; pinnulis pedicellatis, usque at 10 mm longis, 7 mm latis, infimis plerumque minoribus, trapeziformibus, vel minoribus obovatis vel suborbicularibus, coriaceis, leviter paucilobatis, marginibus basi- et rachiscopicis integris, aliis minute dentatis; venis flabellatis, liberis; soris paucis, 1–5 mm latis; indusiis plus minus 1 mm latis, duris, ad venulas sporangiferis.

Tamata, *King* 420.

POLYPODIUM SUBRETICULATUM sp. nov.

Eupolypodium, rhizomate brevi-repente, paleis laete brunneis ovato-lanceolatis dense vestito; stipitibus proximis, 1–2 cm altis, validis, setis purpureo-castaneis ca. 2 mm longis vestitis; fronde usque ad 25 cm alta et 12 mm lata, utrinque sensim attenuata, integra vel subintegra, coriacea, pilis fere nigris sparsis vestita vel in vetustate calva; venis furcatis venulis liberis, vel 2–4 ramos emittentibus et venulis hic illuc haud saepe anastomosantibus; soris irregulariter 2–3-seriatis, superficialibus, orbicularibus vel oblongis.

Taupota, *King 395*, coll. *Rev. P. C. Shaw*.

This suggests *P. congenerum* and *P. diplosorum* Christ, both of which, on the more ample fronds, have sori in plural rows or scattered. The occasional anastomosis of veins is also correlated with the ampleness of the entire frond, and is occasionally seen in the various species of the group. *Loxogramme* is a group derived from *Eupolypodium* with entire fronds; its fronds are in general more ample than in any of the parent group, and reticulate venation is a fixed character.

POLYPODIUM SHAWII sp. nov.

Eupolypodium gregis *P. obliquati* Bl., praecipue *P. multicaudo* Copel. simile; fronde forma insigniter dilatata, ca. 25 cm alta, 15 cm lata; segmentis rhachin versus sterilibus et 4–4.5 mm latis, deinde in partem intercalatam vel usque ad apicem attingentem fertilem 2.5 mm latam plus minus abrupte angustatis; soris permultis, parvis, valde immersis, ore receptaculi plano.

Taupota, *King 424*, coll. *Rev. P. C. Shaw*.

POLYPODIUM TENUISSIMUM sp. nov.

Goniophlebium verum pinnis angustissimis; rhizomate calcareo, paleis angustis sat deciduis vestito; phyllopodio 3 mm alto, valido; stipite 20 cm alto, 3 mm crasso, deorsum minute et decidue paleaceo, sursum rhachique glabris, nitidis, castaneis; fronde verosimiliter ultra 1 m alta, ca. 20 cm lata, alis acrostopis pinnarum exceptis glabra; pinnis remotis, sessilibus, basibus leviter dilatatis truncatis, usque ad 14 cm longis et maximis scilicet fronde mea carentibus, supra basin 3–5 mm latis, acuminatis, minute et argute serratis, papyraceis; venis areolam unam inconspicuam includentibus; soris parvis, immersis, permultis.

Mount Tuan, *King 391*.

An immediate relative of *P. subauriculatum* Bl., with exceedingly slender pinnae, separated by five times their own breadth. A Philippine fern called by Christ *P. subauriculatum integrum* has pinnae almost as narrow, but closer together, shorter, entire and thicker. My specimen of *P. tenuissimum*

has about 80 cm of frond with the apex missing and the lower pinnae fallen off.

POLYPODIUM GLOSSOPHYLLUM sp. nov.

Phymatodes foliis integris; rhizomate repente ca. 5 mm crasso, paleis nigris nitidis anguste lanceolatis adpressis 4 mm longis dense vestito; stipitibus ca. 1 cm altis, validibus, castaneis, nudis; fronde 60–90 cm alta, ca. 7 cm lata supra mediam latissima, utrinque angustata, apice acuta, ad basin ipsam plerumque abrupte contracta, integra, coriacea, glabra, inferne glauca; costa inferne tereta, superne plana; venis angulo lato distantibus; rectis, fere ad marginem attingentibus, 1 cm inter se distantibus; arealis primariis 4 vel 5-seriatis, haud conspicuis; soris inter venas biseriatis vel subirregulariter adspersis, plusquam 1 mm latis, rotundis, superficialibus.

Mount Gawagewa, alt. 300 m, *King 388*.

A member of the group leading to *P. musifolium* Bl., related to *P. linguaeforme* Mett., *P. mindanense* Christ and *P. neo-guineense* Copel., characterized by the glaucous nether surface and hardly acuminate tip.

POLYPODIUM SUBGEMINATUM Christ.

I have regarded this species as not sufficiently distinct from *P. Phymatodes* (Philip. Journ. Sci. 6 (1911) Bot. 89), but Mr. King satisfies me that they are different. The man in the field sees both resemblances and differences which never show in the herbarium. *P. subgeminatum* is said to be always uniform in size, while *P. Phymatodes* varies much on the same plant, both in size and in form. It does this everywhere, but the variation shown by King's specimens is remarkable, even for this species.

POLYPODIUM TENUINERVE sp. nov.

Phymatodes membranacea soris uniseriatis; rhizomate late repente, 2.5 mm crasso, paleis appressis castaneis lanceolatis 4–5 mm longis vestito; phyllopodio brevissimo; stipitibus badiis, usque ad 20 cm altis, gracilibus; fronde 35 cm alta, 20 cm lata, brevi-decurrente, ad alam angustam (ca. 2 mm latam) pinnatifida, glabra, membranacea, viride; segmentis utroque latere ca. 7, maximis fere 20 cm longis 1–2 cm latis, valde acuminatis, rhachin versus paullo angustatis, integris vel subundulatis; venis tenuibus irregularibus, areolas conspicuas non efformantibus; soris utroque latere costae uniseriatis rarissime cum soris extra-serialibus, leviter immersis, maximis 1 mm latis sed depressione minore.

Cape Nelson, *King 364*.

In the immediate group of *P. Phymatodes*, from all forms of which species it differs in texture and in the fine sori. *P. flaccidum* Christ is a coarser fern, much more decurrent, with the segments remote and connected by a very broad wing.

POLYPODIUM TUANENSE sp. nov.

Phymatodes palmato-pinnatifida, venatione *P. myriocarpi*, *P. euryphylo* affinis; rhizomate longe-repente, 4 mm crasso, basibus nigris brunneo-marginatis peltatis fere orbicularibus palearum quarum partes superiores caducae dense vestito; phyllopodio sub-nullo; stipitibus curvis, ca. 10 cm longis, 1 mm crassis, glabris; fronde glabra, papyracea, brevi-decurrente, ultra 20 cm alta et lata, in segmentum unum terminale et utroque latere 2 minora profunde pinnatifida; segmentis lanceolatis, acuminatissimis, integris, terminale ca. 2 cm, lateralibus 1–1.5 cm latis; venis seriem unam areolarum magnarum circumdantibus, aliter irregularibus et sat inconspicuis; soris minutis, irregulariter dispersis nec non praecipue in lineam submarginalem instructis, superficialibus.

Mount Tuan, *King 384*. This number is also borne by *Cyathea woodlarkensis*. I presume that this is *Drynaria acuminata* Brack., but this name is not valid for it in *Polypodium*. *P. Kingii* is broader and shorter, more coriaceous and hardly at all decurrent, and has large sori.

AGLAOMORPHA Schott

It is only two years since I revised this genus¹, including *Dryostachyum* and a new Bornean fern, and recognizing three sections, which in appearance, but not in essentials, are very distinct. In the meantime two closely related New Guinea ferns have been brought to light, which in my opinion will best be regarded as constituting still another section of *Aglaomorpha* as interpreted by me. This demands a still further modification of the generic diagnosis, to include ferns with the fronds completely dimorphous, instead of those with a specialized fertile upper portion. The alternative is to create a new genus. It seems to me to be altogether undesirable to include these ferns in *Polypodium* unless this is done with the entire group.

HOLOSTACHYUM subgenus novum

Aglaomorpha, soris pluriseriatis, frondibus sterilibus et fertilibus omnino dimorphis.

AGLAOMORPHA (HOLOSTACHYUM) BUCHANANI sp. nov.

Species *Polypodio Schlechteri* Brause (melius *Aglaomorphae*, vide infra) affinis, segmentorum marginibus parallelibus haud e basi sensim angustatis, abrupte brevi-acuminatis, segmentis fertilibus rhachin versus abrupte valde dilatatis.

Gewagewa, *King 412*. Dedicated, at Mr. King's request, to his host at Gewagewa.

¹ Philip. Journ. Sci. 6 (1911) Bot. 140.

AGLAOMORPHA (HOLOSTACHYUM) SCHLECHTERI (Brause) Copel.
comb. nov.

Polypodium Schlechteri Brause in Engl. Bot. Jahrb. 49 (1912) 54,
fig. 3, c.

Kaiser-Wilhelmsland (*Schlechter 16614*).

Brause's diagnosis shows the sori to be "magni, rotundati vel oblongi, numerosi, bi- vel triseriales in utroque costae latere". The figure shows them all round and not in evident rows. I believe the text to be the more accurate, especially since in King's plant the sori occupy the areolae, and in free fruit assume the shape of the latter.

AGLAOMORPHA HIERONYMI (Brause) Copel. comb. nov.

Dryostachyum Hieronymi Brause in Engl. Bot. Jahrb. 49 (1912) 55.

Kaiser-Welhelmsland (*Schlechter 17850*). Closely related to *Aglaomorpha pilosa* (J. Sm.) Copel.

THE ORCHIDS OF GUAM

By OAKES AMES

(From the Ames Botanical Laboratory, North Easton, Mass., U. S. A.)

COELOGYNE Lindley

COELOGYNE GUAMENSIS sp. nov.

Herba valida. Pseudobulbi usque ad 8 cm longi, circiter 3 cm in crassitudine, vaginis imbricatis tecti, bifoliati. Folia oblongi-lanceolata, acuminata, acuta, in petiolum sulcatum fastigiata, circiter 40 cm longa, usque ad 7 cm lata, nerviis 3-5, prominentibus, lamina in sicco chartacea; petiolus 5-6 cm longus, rigidus. Scapus basi nudus in pseudobulbo adulto hysternanthus, pauciflorus, 25 cm longus. Bracteae inflorescentiae conduplicatae, lanceolatae, acutae, circiter 5 cm longae, mox deciduae. Flores succedanei, ad numerum 7, circiter 4 cm longi. Pedicellus cum ovario 2 cm longus. Sepala lateralibus oblonga, acuta, carinata, 4 cm longa, circiter 7 mm lata. Sepalum dorsale simile. Petala linearia, 4 cm longa, 3 mm lata. Labellum 3-lobatum, manifeste bilamellatum, 3.5 cm longum; lobi laterales erecti, obtusi, e basi labelli usque ad apicem loborum lateralium 12 mm; lobus medius ex isthmo brevi cuneato-dilatatus, suborbicularis, 1.6 cm latus. Lamella in disco utrinque undulata, ex ipsa basi labelli in basim lobi medii, interposita lamellula integra (non undulata) medio in disco desinente. Gynostemium 2 cm longum.

In damp places, *Guam Experiment Station 195*, collected under the direction of J. B. Thompson, January, 1912.

The material on which the description is based consists of three specimens and a single flower. It appears to belong to the section *Speciosae*.

LIPARIS Richard

LIPARIS GUAMENSIS sp. nov.

Herba terrestris 60 cm alta, gracilis. Folia 3, anguste lanceolata, acuminata, acuta, membranacea in sicco, 5 ad 22 cm longa, usque ad 2.5 cm lata, ad basim vaginantia. Pedunculi elongati, 8 ad 30 cm longi. Sepala lateralibus elliptica, subacuta, late falcata, 4 mm longa, 2.5 mm lata. Sepalum dorsale lineari-oblon-

gum, obtusum, convexum, 7 mm longum, circiter 1.5 mm latum. Petala linearia, 5.5 ad 6 mm longa, convexa. Labellum valde reflexum, rigidum, crassum, oblongum, retusum, apiculatum, prope basim bicallosum, 3.5 ad 4 mm longum, 2.5 mm latum. Columna arcuata, subgracilis.

R. C. McGregor 633, hills southeast of Piti, altitude 300 meters, October, 1911. The flowers are described by the collector as pale-yellow and brown.

CALANTHE R. Brown

CALANTHE TRIPLICATA (Willem.) Ames in Philip. Journ. Sci. 2 (1907) Bot. 326.

Orchis triplicata Willem. in Usteri Ann. Bot. 18 (1796) 52.

McGregor 575, *H. L. W. Costenoble 1164*, July, 1906, common name *cebello halumtano*=wild onion.

Widely distributed in the Indo-Malayan region.

EULOPHIA R. Brown

EULOPHIA MACGREGORII sp. nov.

Aff *E. squalidae* Lindl. Herba terrestris, rhizomate tuberifero. Tubera subglobosa, circiter 2 cm in diametro, approximata. Folia lineari-lanceolata, acuta, membranacea, acuminata, plicata, 20 cm longa, usque ad 17 mm lata. Scapi erecti, circiter 30 cm longi, racemi laxi, pauciflori. Bractee inflorescentiae lineares, scariosae, usque ad 2 cm longae, pedicelli cum ovario elongati. Sepala lateralia oblonga, subfalcata, acuta, 5-nervia, 2 cm longa, 5 mm lata, subcoriacea. Sepalum dorsale subsimile, oblongi-lanceolatum, 1.8 cm longum. Petala membranacea, ovato-lanceolata, acuta, nervosa, 2 cm longa, 7.5 mm lata. Labellum subintegrum, ovatum, obtusum, glabrum, 1.9 cm longum, 1 cm latum. Calcar conicum, obtusum, 3 mm longum. Columna clavata, crassa.

R. C. McGregor 631, hills southeast of Piti, altitude 300 meters, October, 1911.

The material submitted for study consists of two specimens in flower. The smooth, subentire lip resembles very closely in outline the lip of *Eulophia squalida* Lindl. Flowers dark cream-colored.

EULOPHIA GUAMENSIS sp. nov.

Herba terrestris. Caules circiter 8 cm alti, crassi, internodii 2 ad 2.6 cm longi. Folia longepetiolata, lamina lanceolata, acuminata, acuta, plicata, 8 ad 30 cm longa, circiter 3.5 cm lata. Scapi circiter 37 cm longi, graciles, quam folia longiores. Bractee inflorescentiae lineares, scariosae, usque ad 1 cm longae. Flores numerosi. Pedicellus cum ovario 1.5 cm longus. Sepala lateralia oblongi-lanceolata, subfalcata, circiter 9 mm longa, 3 mm

lata. Sepalum dorsale oblongi-lanceolatum, acuminatum, acutum, 1 cm longum. Petala ovato-lanceolata, subfalcata, 3-nervia, 9 mm longa, circiter 3.5 mm lata. Labellum quadrilobum, ad apicem retusum, apiculatum, 7 mm longum, 12 mm latum. Ad basim labelli prope columnam callus bilobus. Calcar scrotiforme, 2 mm longus. Columna 3 mm longa.

R. C. McGregor 376, growing in thickets on hillsides at Piti, October, 1911, flowers pale-green and yellow lined inside with wine-red.

BULBOPHYLLUM Thouars

BULBOPHYLLUM GUAMENSE sp. nov.

Herba epiphytica. Pseudobulbi pyriformes, in sicco rugosi, circiter 2.5 cm longi, monophylli. Folium ellipticum vel oblongum, coriaceum, lamina 10 ad 15 cm longum, 2.6 ad 3.8 cm latum. Scapi elongati, circiter 26 cm longi. Bractee inflorescentiae deciduae, carinatae, cymbiformes, acutae, circiter 12 mm longae, quam pedicello longiores. Sepala lateraliter triangulari-lanceolata, acuminata, acuta, carinata, circiter 1.5 mm longa, as basim 5 mm lata, ad apicem cuspidate munita. Sepalum dorsale lanceolatum, 11 mm longum, ad apicem cuspidate munitum. Petala minuta, 3 mm longa, 1.5 mm lata, 1-nervia, quadrata, quadridentata, ad apicem in caudam integerrimam abrupte attenuata. Labellum crassum, lanceolatum, 1 cm longum. Columna crassa, superne 2-alata, alis utrinque in brachium erectum, acutum, productis.

R. C. McGregor 495, on trees, Upi road, October, 1911, flowers green; *H. L. W. Costenoble 1176*, September, 1906, common name *cebello halumtano* = wild onion; *Guam Experiment Station 233*, March, 1912, collected under the direction of J. B. Thompson.

BULBOPHYLLUM PROFUSUM Ames in Philip. Journ. Sci. 7 (1912) Bot. 128, 137.

McGregor 565, Upi road, on tree trunks, flowers pale-green, October, 1911. Philippines.

DENDROBIUM Swartz

DENDROBIUM (§ DESMOTRICHUM) SCOPA Lindl. Bot. Reg. (1842) Misc. 55; Ames in Philip. Journ. Sci. 6 (1911) Bot. 52.

Guam Experiment Station 307, February, 1912, epiphytic on tree trunks, collected under the direction of J. B. Thompson, color of the flowers not noted, but in dried specimens pale-yellow.

Dendrobium scopa Lindl. is a Philippine species closely related to *D. angulatum* Lindl. and *D. comatum* Lindl., from both of which it differs chiefly in the details of the labellum. It is also closely allied to *D. calopogon* Reichb. f. and *D. Hasseltii* Reichb. f. (*Xen. Orch. t. 109 I & II*), species which Kränzlin upholds but which J. J. Smith in "Die Orchideen von Jara" refers to the synonymy of *D. angulatum* Lindl. I have compared a flower of the

Guam plant with a flower from a Philippine specimen (*Lyon 110, Hb. Ames 10854*) and find that the only differences of importance are in the characters of the terminal lobe of the labellum. One of the marked peculiarities of *Dendrobium scopae* is the elongated, oblong, connecting plate between the lateral lobes and the fringed apex of the lip; this peculiarity is found in the Guam plants. However, the fringe of the labellum of the Guam plants is composed of broader, somewhat shorter, and more branched segments than the fringe of the Philippine plant used for comparison. The same difference is observable between the fringe of the lip in the Guam plant and the fringe as figured by Lindley in the colored drawing which accompanies the type of *Dendrobium scopae* Lindl.

DENDROBIUM (§ GRASTIDIUM) GUAMENSE sp. nov.

Caules conferti, 60 cm alti, ad basim teretes, prope apicem leviter complanati. Foliorum vaginae plerumque cylindratae, arte adpressae, quam internodia paulum breviores vel sublongiores, 2-3 cm longae, infra medium caulem circiter 5 mm in diametro, in longitudinem striatae, rugosae, rigidae. Folia disticha, oblongi-lanceolata, sensim angustata ad apicem, ad basim rotundata, subcoriacea, sicca multistriata, usque ad 10 cm longa, 7-15 mm lata, ad apicem inaequaliter bilobum, obtusum, vaginis persistentibus caulem obtegentibus. Racemi a caulibus foliatis orti, biflori, foliis multo breviores, squamis 4 conchiformibus chartaceis basi vestiti. Pedicellus cum ovario 6 cm longus. Sepala lateralia mentum obtusum 4 mm longum formantia, elongata, triangulari-lanceolata, e basi curvata, acuminata, prope apicem subcaudata, acuta, extus leviter carinata in medio, 12 mm longa, prope medium 2.5 mm lata. Sepalum dorsale lineari-lanceolata, ad apicem incrassatum, subcaudatum, concaviusculum, circiter 1-4 cm longum, 2 mm latum. Petala lineari-lanceolata, utrinque angustata, acuminata, acuta, subcaudata, ad basim pergracilia, circiter 12 mm longa, prope medium vix 2 mm lata, ad basim 0.5 mm lata. Labellum unguiculatum, trilobatum, lobi laterales breves, trianguli, acuti, vix 1 mm lati; lobus medius triangulari-lanceolatus, acutus, 4 mm longus, ad basim 3 mm latus, irregulariter dentatus, labellum toto ambitu ovato-lanceolatum, 9 mm longum, usque ad 4 mm latum. Labelli discus in lobo medio lineis tribus papillois; lamella satis alta, vix undulata, ab ungue labelli medium fere in discum decurrens. Stelidia gynostemii obtusa.

Guam Experiment Station 450, July, 1912, collected under the direction of J. B. Thompson.

Dendrobium guamense is closely related to *D. dactyloides* Reichb. f. A specimen preserved in the United States National Herbarium, collected by H. L. W. Costenoble, appears to be conspecific with *D. guamense*. This specimen is accompanied by a colored sketch which represents the flower as white with a yellow labellum (*Costenoble 1177*).

PHREATIA Lindley

PHREATIA (§ EUPHREATIA) THOMPSONII sp. nov.

Caules valde abbreviati, circiter 1.5 cm alta, vaginis foliorum persistentibus obtegentibus. Folia 4, disticha, vaginantia, vaginae longius persistentes, complanatae, laminae foliorum plerumque lineari-oblongae, saepe lineares, ad apicem inaequaliter bilobae, obtusae, infra medium sensim angustatae, repente sulcatae, in sicco chartaceae, 8 cm longae, 4–8 mm latae, rarissime 3 cm longae, 3 mm latae in plantae exiguae. Tota planta usque ad 12 cm alta. Racemi laterales ex axillis inferioribus, multiflori, ascendentes vel erecti, foliis multo breviores, rarissime folia aequantes. Pedunculi graciles usque ad 8 cm longi, paene usque ad basim florigeri, inter basim et bracteam floris infimi 3-bracteatus, bracteis tubularibus, acuminatis, acutis. Flores albi, minuti, 1–2 mm distantes in racemo cylindraco. Bractee inflorescentiae lanceolatae, abrupte acuminatae, 1-nervae, circiter 2 mm longae pedicellis longiores, in sicco chartaceae, dependentes. Sepala lateralia oblique triangulari-ovata, acuta, vix 1.5 mm longa, vix 1 mm lata, textura membranacea, manifeste 1-nervia, concaviuscula, mentum brevem obtusum formantia. Sepalum dorsale oblongum, acutum. Petala triangulari-lanceolata, sepalis multo minora, 1 mm longa, vix 0.75 mm lata. Labellum concaviusculum, vix unguiculatum, obovatum, ad apicem late retusum, manifeste 3-nervium. Discus glaber. Gynostemium minutissimum.

Guam Experiment Station 321, collected at Mukfuk, under the direction of J. B. Thompson, January 19, 1912, an epiphyte, growing on tree trunks; *H. L. W. Costenoble 1174*, May, 1906.

Closely related to *Phreatia minutiflora* Lindl., but in part distinguishable from it by the different habit. The short peduncles give the plant a characteristic appearance. In most of the specimens examined the tip of the raceme hardly exceeded the middle of the leaves. A few diminutive plants were collected in which the raceme about equals the leaves.

LUISIA Gaudichaud

LUISIA TERETIFOLIA Gaudich. Bot. Freyc. Voy. (1826) 427, t. 37.

McGregor 360, without flowers but undoubtedly this species, the type of which was from Guam.

Widely distributed in Malaya and Polynesia.

SACCOLABIUM Blume

SACCOLABIUM GUAMENSE sp. nov.

Herba epiphytica, carnosa. Caules circiter 6 cm longi, radicales. Folia conferta, coriacea, ad apicem inaequaliter biloba, anguste elliptica vel oblonga, 4.5–10 cm longa, 2 cm lata, in

sicco rigida, ad basim fastigiata, vix petiolata, pedunculis multo longiora, vaginis persistentibus caulem obtegentibus. Pedunculi abbreviati valde incrassati, axillares, circiter 2.5 cm longi, in sicco 2 mm in crassitudine. Bractee inflorescentiae squamiformes, 1 mm longae, pedicellis breviores. Racemi pauciflori, flores in pedunculo paene usque ad basim dispositi, circiter 8 mm in diametro, submembranacea. Sepala lateralalia ovata, acuta, extus ad apicem cuspidem munita, 4 mm longa, 2.5 mm lata. Sepalum dorsale anguste ellipticum, obtusum, concaviusculum. Petala 3-nervia, oblongi-lanceolata, 4 mm longa, usque ad 2 mm lata. Labellum saccatum, 4 mm longum, antice irregulariter et inaequaliter incrassatum. Gynostemium brevissimum.

Guam Experiment Station 203, collected under the direction of J. B. Thompson, January, 1912.

The labellum, from the material at hand, appears to have been semiglobular when fresh with the anterior margin fleshy and irregularly thickened. The interior of the labellum is smooth; at least it is free from conspicuous calli or keels.

TAENIOPHYLLUM Blume

TAENIOPHYLLUM *sp. aff. T. obtusum* Bl. ?

Costenoble 1175, May, 1906, local name *amot otdan*.

There are no flowers with the specimen in the United States National Herbarium. A colored sketch shows linear-oblong petals of a pale-greenish color, the labellum white, with an obtuse spur. A lateral view of the flower shows the lateral sepals to be triangular, at the base united with the petals and the upper sepal to form a short funnel-shaped tube. In this lateral view the spur or sac is shown to be cylindric. The peduncles are rough as are the triangular acute bracts of the zig-zag rachis. The general habit of the plant suggests *Taeniophyllum obtusum* Bl. (*T. Zollingeri* Reichb. f. *Xen. Orch. t. 77*).

AN ENUMERATION OF THE PLANTS OF GUAM

By E. D. MERRILL¹

(*From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.*)

In the year 1905 Mr. W. E. Safford published his comprehensive and valuable work entitled "The Useful Plants of Guam"² in which is discussed the island and its characteristics, geographic position, geology, meteorology, agriculture, vegetation, types of plant formations, historical notes dealing with the discovery of the island, and a lengthy discussion of its aboriginal and modern inhabitants. It is, hence, unnecessary to consider any of these matters in detail here except merely to state that Guam is the largest island of the Marianne group which extends from 20° 30' N to 13° 14' N, and from 143° 46' E to 146° 31' E; that it is of volcanic origin; that its length is about 46 kilometers, its width from 11 to 14 kilometers in the wider parts, and about 7 kilometers in the central portion; and that its present population is about 10,000 inhabitants. It is about 1,900 kilometers east of the Philippines.

The town of Agaña, the largest settlement on the island, as located by the United States Coast and Geodetic Survey, is 13° 28' 30'' N, 144° 45' E. The highest point on the island is Jumullong Manglo, in the southwestern part, which has an altitude of 391 meters.

Originally Guam was undoubtedly covered with a continuous forest of one type or another, but this has, since its settlement by man, to a large degree been destroyed. In its place are now found cultivated and fallow lands, waste places, areas covered with thickets of second growth shrubs and trees, and very large areas that are covered with coarse grasses. As in the Philippines, and in Malaya and Polynesia generally, the origin and

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² The Useful Plants of the Island of Guam with an Introductory Account of the Physical Features and Natural History of the Island, of the Character and History of its people, and their Agriculture. *Contr. U. S. Nat. Herb.* 9 (1905) 1-416, plates 1-70.

continued presence of these grass-covered areas is due primarily to man, a matter which I have previously discussed in detail.³

Mr. Safford is authority for the statement that the existing forests in Guam consist almost entirely of strand trees, such as *Hernandia*, *Terminalia*, *Artocarpus*, *Ficus*, *Calophyllum*, *Heritiera*, and *Barringtonia*, intermingled with lianas, epiphytes, and few shrubs. Recent collections in Guam, however, have added such arborescent genera as *Eugenia*, *Aglaia*, *Elaeocarpus*, *Polyalthia*, *Cynometra*, *Melochia*, *Gymnosporia*, *Flacourtia*, *Decaspermum*, and *Tarenna*. This leads one to suspect that the forest flora is really rather complex, at least in those parts of the island, toward the north end, where the original vegetation has not been so much disturbed as in the more densely populated regions. The character of the vegetation, however, has been profoundly altered by man as indicated by the very high percentage of introduced species.

Guam was discovered by Magellan on March 6, 1521, during his voyage of circumnavigation of the globe. After the foundation of the city of Manila in the Philippines, regular traffic was established between there and the west coast of Mexico, the Spanish possessions in the Pacific being governed as dependencies of New Spain. The galleons sailed annually, first from Natividad but later from Acapulco in Mexico for Manila. Guam was a port of call for all ships on the outward, but not on the return voyage. This fact is of considerable importance in connection with the matter of the early transmission of weeds and economic plants from Mexico to the Marianne Islands and the Philippines.

No comprehensive botanical exploration of Guam has ever been undertaken. The first collections were those of Thaddeus Haenke and Luis Née, botanists of the Malaspina Expedition, who were in Guam from February 12 to 24, 1792. In November, 1817, Adalbert von Chamisso, botanist of the Romanzoff Expedition, made a very short visit to Guam and collected a few plants there. A little more than a year later Freycinet's Expedition arrived and Charles Gaudichaud-Beaupre, botanist of the expedition, spent about eight months in a botanical exploration of Guam and the neighboring Islands of Rota and Tinian. Gaudichaud probably made the largest single collection to date in the botanical exploration of Guam but, as noted by Safford, on the return voyage to France his collections were saturated with sea water and badly damaged; doubtless very many of his specimens

³ Philip. Journ. Sci. 7 (1912) Bot. 149-151.

were entirely destroyed. During d'Urville's visit to Guam in 1828 in the "Astrolabe" botanical collections were made by Lesson, and during his second visit to the island in the "Astrolabe" and "Zélée" in 1839, additional collections were made by Hombron. I have found no record of any other botanical collections made in Guam since 1839 up to the time of the American occupation at the close of the last century, except a few references to Marianne Islands plants collected by Marche in 1889. Mr. Safford informs me that he made no comprehensive botanical collections during his period of residence in Guam from August, 1899, to August, 1900. Some material was collected at that time by Mr. Alvin Seale and is now deposited in the Bishop Museum at Honolulu.

The first botanical material I received from Guam was a small collection of 25 specimens made, at my suggestion, by Mr. J. B. Thompson, director of the Guam Experiment Station, November, 1910. A year later Mrs. Joseph Clemens brought to Manila a collection of 37 species collected by her in Guam during the few hours stop of the U. S. Army transport at Agaña, November 27, 1911, on which she was a passenger. In September, 1911, at the suggestion of Mr. Thompson, Mr. R. C. McGregor of the Bureau of Science went to Guam for the purpose of making botanical collections. Mr. McGregor remained there from October 2 to October 26, in that time collecting 282 numbers, most species represented by several duplicates. At the same time he trained a native collector who continued the work intermittently under Mr. Thompson's direction from November, 1911, to July, 1912; this native collector secured a total of 480 numbers. In all I have had for examination about 824 numbers of Guam plants, on which the following enumeration is primarily based.

In his "Useful Plants of Guam" Safford enumerates about 386 species, and his list includes not only the plants that are of greater or less economic use, but all species, whether useful or not, that were known by him to occur in Guam. The list is based on the comparatively small collections made by Safford, on his copious notes, on some botanical material secured from residents of Guam subsequent to his departure, and especially on the published references to Guam plants based on the collections of Haenke, Née, Gaudichaud, Hombron, Chamisso, and Lesson. Some species were admitted as representatives of the flora without the examination of Guam material; for example,

Canarium indicum. In compiling the enumeration of Guam plants given below, I have included most of those species enumerated by Safford, even when I have seen no Guam botanical material representing them. The list has been increased from about 386, enumerated by him, to about 550, not including the cellular cryptogams in either case. It is anticipated that future botanical exploration of Guam will yield many additional species, and it will not be at all surprising should the list of ferns and seed-plants eventually be greatly extended.

The flora of Guam is essentially Malayan, practically all the indigenous genera found in the island being of wide Indo-Malayan distribution and no single genus being endemic. The nearest approach to an endemic genus is *Saffordiella*, which, aside from its Guam station, is also found in the Island of Yap, in the Carolines, and which will doubtless be found later in other islands of both the Marianne and the Caroline groups. Of the total of 545 species of pteridophytes and spermatophytes found in Guam, indigenous and introduced, 462, or about 86 per cent, are also found in Malaya; while 475, or 89 per cent, are found in other parts of Polynesia and Micronesia; and 415, or about 76 per cent, in continental Asia.

As to floristic alliances, no special ones are indicated by the Guam flora as we now know it. We have, so far as known, *Lygodium semihastatum*, *Halophila ovata*, *Bulbophyllum profusum*, and *Carex fuirenoides* known only from Guam and the Philippines, and *Saffordiella bennigseniana*, *Panax macrophylla*, and *Ixora triantha* known only from Guam and the Island of Yap in the Carolines. The Philippine Archipelago and the Caroline group are the natural alliances of the Guam flora and a certain number of species confined to Guam and to one or the other of the above groups are to be expected especially in view of the fact that more than 80 per cent of the species found in Guam are also found in the Philippines and probably nearly as many extend to the Carolines.

Taking into consideration its rather isolated position, and considering also the total number of species known from Guam, the percentage of endemism is surprisingly low. But about 61 species, or only 11 per cent, are endemic, that is, confined to Guam. If, however, we exclude from consideration those species that manifestly have been introduced into Guam by man, and for a large part within the historical period, the showing is rather different. I consider that no less than 314 species, or about 58 per cent of the total number of species known from

Guam, have been introduced into the island purposely or inadvertently by man. Excluding these 314 species from consideration, the endemism is then about 27 per cent. This percentage, however, is very small when compared with that of the Philippines, where, including all introduced species, the endemism is about 40 per cent; the Philippines, however, are very much closer to other large land masses than is Guam, which, while in part explaining the richness of the Philippine flora, does not explain its high percentage of endemism in comparison to the low endemism of Guam.

From a geological standpoint Guam is undoubtedly recent, a claim that is substantiated by its very poor indigenous flora, but 225 species being known from Guam that can be considered truly indigenous, and by its very low percentage of endemism, 11 per cent, if we take into consideration the introduced species, and but 27 per cent, if we consider only the indigenous species.

It has been seen that the flora of Guam is a relatively poor one, at least so far as we at present know it, especially for an island of its size located in the rainy tropics. Its low percentage of endemism is especially noticeable in view of its rather isolated location. Both of these features are readily explained, however, on the recent origin hypothesis.

Perhaps the most interesting feature of the Guam flora is the introduced element, and as this was not discussed in detail by Safford, some attempt will here be made to analyze the constituents of the introduced flora, the origin of the species, and the time and method of their introduction. As Guam was a regular stopping place for the Acapulco-Manila galleons, for a period of nearly three hundred years, a study of the introduced element is of especial interest in view of the fact that Guam has, without doubt, served as a center of distribution for American weeds to the other islands of Micronesia and Polynesia, even as the Philippines served the same end for parts of the Malayan region and of tropical Asia. A discussion of the vegetation in relation to the weed flora may explain certain problems regarding pantropic weeds and their origin, and especially in regard to the occurrence in Polynesia of certain weeds that are generally considered to have been of American origin, but which were found in Polynesia in the last half of the eighteenth century, by the first botanists who visited this part of the world.

The introduced element in the Guam flora may be divided into four groups or time periods. The first of these is the prehistoric period, of many centuries duration, in which Guam was peopled

by its aboriginal inhabitants who introduced the economic plants, such as yams, breadfruit, bananas, coconut, certain aroids, rice, etc., that were found by the Europeans to be generally distributed in Polynesia. In the comparatively slight intercommunication between Guam and other islands during this period, doubtless many of the weeds of general Indo-Polynesian distribution which have originated in the Old World were introduced.

The second period is relatively much shorter and extends from the discovery of Guam by Magellan in 1521 to some years after the discontinuance of the Acapulco-Manila galleons in 1815. The plants introduced during this period were mainly of American origin, including such economic species as the sweet potato, maize, tobacco, tomato, cacao, maguey, chico, pineapple, arrow-root, custard apple, peanut, cassava, papaya, peppers, and various other plants of value for food, fibers, medicine, and ornamental purposes. At the same time a great many weeds of American origin were introduced including a few that are to-day found nowhere outside of tropical America except in Guam, and still others that outside of tropical America are known only from Guam and the Philippines. During this interval of about three hundred years Guam was in regular communication with Mexico, as for most of the period there was an annual ship between Acapulco and Manila via Guam. On the return voyage, however, the ships took a northern route and did not touch at this port. Ships from Manila to Guam were apparently dispatched at very irregular intervals. Undoubtedly some, perhaps many, of the weeds of oriental origin were introduced into Guam from the Philippines during this period, for such economic plants as the mango, tamarind, coffee, santol, some of the citrus fruits, the pomegranate, nipa palm, and various ornamental plants were introduced from Manila by the Spaniards.

The last "nao," as the Acapulco-Manila galleons were called, was dispatched from Manila in 1811 and from Acapulco in 1815. These were government ships, but after 1815, when they were definitely discontinued, commerce was opened to private individuals and the ports of San Blas, Mexico; Guayaquil, Ecuador; and Callao, Peru, were opened to the Manila trade. There is no doubt that Guam still continued to be a port of call for the west-bound ships from the above ports. However about 1824, with the independence of the Spanish colonies in America, this commerce practically ceased.

The third period is still shorter and extends from about 1815

to 1898, at which time Spanish control of the Philippines and Guam ceased. For a large part of this period most of the communication between Guam and the outside world was through Manila. From the standpoint of introduced species it is probably a period of comparatively few introductions, these mostly from Manila, and chiefly ornamental plants with, perhaps, some weeds. After the opening of the Suez Canal a considerable number of ornamental plants were introduced into the Philippines from Singapore, including a number of American origin, and some of these in turn were introduced into Guam from Manila.

The fourth period is the shortest and dates from the American occupation in 1898 to the present time. It has been characterized mainly by the introduction of economic species, most of which have been brought to Guam from the Hawaiian Islands, as Guam is a regular stopping place for United States Army transports between Honolulu and Manila on the outward, but not on the return voyages.

As already indicated but 61 of the total of 550 species enumerated from Guam, are, so far as is known at present, endemic. Somewhat over one-half of the total number of species, 280, or 51 per cent, are of pantropic distribution, having extended their habitat to the tropics of both hemispheres through natural causes, or have been purposely or inadvertently transmitted from one hemisphere to the other by man. In the case of 55 of those pantropic species, including some weeds whose original homes have not been determined, and such species of natural distribution, as aquatics, strand plants, etc., it is impossible to say in which hemisphere they may have originated. Of the remainder, however, 113 are definitely or fairly definitely of American origin, and 112 have probably originated in the eastern hemisphere.

Considering these 280 pantropic species from the standpoint of methods of distribution, about 50 have presumably been disseminated by natural causes, that is by wind, water, or migratory birds; 156, including the cultivated plants, have purposely been distributed by man; while about 74, mostly weeds, have been inadvertently distributed by man.

So far as the present vegetation of Guam is concerned, man has been an exceedingly important factor in the extension of the number of species found in the island. I consider that man, with his activities as a disseminator of plants, is responsible for the present occurrence in Guam of 314 of the 550 known species;

of 193 of the 471 known genera; and of 36 of the 107 known families. That is, 36 families, 193 genera, and 314 species are represented in the Guam flora only by purposely or inadvertently introduced plants. In many other families and genera, which have some indigenous representatives, the percentage of introduced species is high and of indigenous ones is low.

It is evident that Guam has occupied a very important place in the dissemination of weeds of American origin to the islands of the Pacific, both in Micronesia and in Polynesia, during the second or galleon period. We know that in this period some scores of American economic plants and weeds were introduced into the Philippines from Mexico,⁴ and we now know more definitely just how many were then introduced into Guam. That many of them were thoroughly established there over one hundred twenty years ago is proved by the fact that some were then collected in Guam by Née and by Haenke, and at a somewhat later date by Lesson, Chamisso, and Gaudichaud. Most of the species of American origin were introduced into Guam during the period of the Manila-Acapulco galleons, or before the year 1815. It is interesting to note that many of these species are now dominant in Guam in suitable habitats; that is, the open country, waste places, fallow fields, deserted clearings, along trails, etc. Then too, while most of the weeds of American origin are now found in all tropical countries, a considerable number are found outside of tropical America only in the Philippines, in the Philippines and Guam, or in Guam alone. I have elsewhere discussed this matter, so that it is unnecessary to enter into details here, but it is significant of the effect of ancient trade routes on the vegetation of a region, even when the communicating countries are separated by the breadth of the Pacific, when we find for the most part confined to Guam and the Philippines, or to one or the other of the above, such American weeds as *Malachra fasciata* Jacq., *Hyptis capitata* Jacq., (now in Java), *Hyptis spicigera* Lam., *Elephantopus mollis* HBK., *Elephantopus spicatus* Aubl., (now in Hongkong), *Ipomoea triloba* L., (now in Singapore, Java, and Mauritius), *Blechnum brownei* Nees, (now in Formosa), *Anredera scandens* Moq., *Ammannia coccinea* Rottb., *Rotala ramosior* Koehne, *Alternanthera frutescens* R. Br., *Portulaca pilosa* Linn., *Gliricidia sepium* Steud., *Schrankia quadrivalvis* Merr., *Parosela* (*Dalea*)

⁴ Merrill, E. D. Notes on the Flora of Manila with Special Reference to the Introduced Element. Philip. Journ. Sci. 7 (1912) Bot. 197-202.

glandulosa Merr., *Sida glomerata* Cav., and *Mitracarpum hirtum* DC. (also in the Society Islands). It is not at all strange, when we consider the old Acapulco-Guam-Manila trade-route, that we should find in Guam to-day certain American weeds that did not reach the Philippines, or if they did that they have not persisted here, such as *Sida glomerata*, *Mitracarpum hirtum* (also in the Society Islands), and *Ammannia coccinea*. *Mitracarpum*, a genus confined to America, was extended to Guam by the description of *Mitracarpum torresianum* Cham. & Schlecht., which is a synonym of *M. hirtum* DC.; the occurrence of a species of *Mitracarpum* in Guam was doubted by K. Schumann & Lauterbach,⁵ who surmised that the Guam record was due to a mixture of labels. That the species was actually collected in Guam by Chamisso cannot be doubted, for it still persists there and is represented in our recent collections from the island. K. Schumann⁶ had previously recorded it from the Society Islands.

In connection with a general discussion of the vegetation in and about Manila in Luzon⁷ I have already considered at length the question of those plants of pantropic distribution and its significance. In considering only those plants found in and about Manila it was found that out of a total of 1,007 species no less than 425 were of greater or less distribution in the tropics of both the eastern and western hemispheres. I came to the conclusion that of these 425 species of pantropic plants but about 90 were distributed from one hemisphere to the other by natural agencies; that about 242 were purposely transmitted and that 92 were accidentally distributed by man. As to origins, so far as this matter could be determined at the time, 177 were considered to have originated in tropical America, 138 in the tropics of the Old World, and 109 were considered doubtful as to origin, including the 90 species of presumably natural distribution and certain weeds and weed-like plants regarding whose native countries I could arrive at no definite conclusion. Very many of these weeds or weed-like plants, now of wide tropical distribution, have certainly been transmitted from one hemisphere to the other by man, but are now so ubiquitous that it is difficult or impossible, from their present distribution, definitely to determine of which hemisphere they are natives. The list includes

⁵ Fl. Deutsch. Schutzgeb. Südsee (1901) 589.

⁶ Engl. & Prantl Nat. Pflanzenfam. 4^e (1891) 146.

⁷ Philip. Journ. Sci. 7 (1912) Bot. 145-208.

such species as *Urena lobata* L., *Bidens pilosa* L., *Eclipta alba* Hassk., *Solanum nigrum* L., *Merremia umbellata* Hallier, *Hewittia sublobata* O. Ktze., *Melochia corchorifolia* L., *Abelmoschus moschatus* Medic., *Sida retusa* L., *S. rhombifolia* L., *S. acuta* Burm., *S. cordifolia* L., *Phyllanthus niruri* L., *P. urinaria* L., *Euphorbia prostrata* Ait., *E. thymifolia* L., *E. hirta* L., *Oxalis repens* Thunb., *Teramnus labialis* Spreng., *Desmodium triflorum* DC., *Gynandropsis pentaphylla* DC., *Cleome viscosa* L., *Portulaca oleracea* L., *Mollugo oppositifolia* L., *M. lotoides* L., *Amaranthus spinosus* L., *A. viridis* L., *Alternanthera sessilis* R. Br., *Comelina nudiflora* L., and numerous grasses and sedges. While some of these, such as *Portulaca oleracea* L., and some of the grasses and sedges, may have been distributed from one hemisphere to the other by natural means, there is very little doubt but that the most of them have been transmitted across the Pacific or the Atlantic by man within historical times, and in this period since the circumnavigation of the globe by Magellan in 1521. I am now inclined to the opinion that most of the species enumerated above are natives of the eastern hemisphere, but have no definite data to this effect except in the case of a few species such as *Hibiscus abelmoschus* Medic.

In my consideration of the pantropic plants found in and about Manila, I made a detailed tabulation of the species, but do not consider it necessary or expedient to make such a tabulation for the Guam plants of similar distribution. The enumeration of such plants found in Guam would, to a very large degree, simply duplicate those found in and about Manila. The Guam flora adds to the list of pantropic plants considered in my previously mentioned paper, about 24 species, nearly all of which are found in the Philippines but not in or near Manila. The additions are *Asplenium caudatum* Forst., *Nephrolepis hirsutula* Presl, *Gleichenia linearis* Clarke, *Lycopodium cernuum* L., *Psilotum nudum* Griseb., *Potamogeton lucens* L., *Fimbristylis complanata* Link., *F. puberula* Michx., *F. spathulacea* Rottb., *Chenopodium album* L., *Entada phaseoloides* Merr., *Caesalpinia glabra* Mill., *Dodonaea viscosa* Jacq., *Sida glomerata* Cav., *Ammannia coccinea* Rottb., *Ximenia americana* L., *Ipomoea gracilis* R. Br., *Cestrum diurnum* Lam., *Physalis lanceifolia* Nees, *Heliotropium curassavicum* L., *Hyptis pectinata* Pois., *Geophila herbacea* O. Ktz., *Adenostemma viscosum* Forst., and *Mitracarpum hirtum* DC. At least sixteen of the twenty-four will fall in the category of those plants that have been spread from one hemisphere to the other through natural causes. Of the remaining eight, two are

definitely natives of the eastern hemisphere, *Adenostemma viscosum* and *Chenopodium album*, while six are equally definitely of American origin, *Sida glomerata*, *Ammannia coccinea*, *Cestrum diurnum*, *Physalis lanceifolia*, *Hyptis pectinata*, and *Mitracarpum hirtum*, and with the possible exception of *Cestrum diurnum* were all accidentally introduced into Guam.

The original vegetation of the Polynesian islands is mainly of Malayan origin, and like aboriginal man, the present species of plants, or their ancestors, entered the Archipelago from the west. Most of the original food plants of the Polynesian people were carried with them from island to island in their migrations, or in their later intercommunication between islands and groups of islands, and with very few exceptions are manifestly of Asiatic or Malayan origin. The coconut is a striking exception, for this is probably of American origin.

Seemann^{*} has briefly considered the weed flora of Polynesia, but I do not agree with him in his conclusions. He states:

"Polynesia, situated as it is between three great continents, presents a most interesting problem with regard to its weeds, which, however, cannot be satisfactorily solved until the whole flora shall have been properly worked out; but we make an attempt to deal with it so far as Viti is concerned. There we have 64 species, which may be regarded as troublesome weeds. Some of these are diffused throughout the tropics; but the bulk of them (48) are common to America, only 16 being strictly confined to the Old World, principally Asia. It may be argued that several of those found in America are also common to Asia, or that Asia is their true native country; but even admitting this reduction, it must be conceded that the bulk of the weeds of Viti is of American origin, or at all events, is now found in America. This is the more singular as the majority of the species of these Islands, as far as they are not endemic, is Asiatic. Polynesia seems to have acted as a bridge by means of which the weeds of the Old World crossed over to the new, and those of the New World to the Old; and the fact that American weeds show a greater disposition than Asiatic to spread in Viti must be held to prove, if my theory be sound, that Viti is to American weeds altogether virgin ground.

Seemann confined his list of weeds strictly to those plants that are characterized by their ability to spread on land cultivated or otherwise disturbed by man, and definitely excluded all strand plants, aquatics, and marsh plants. His list of weeds, then, is not directly comparable to my list of pantropic species. Of his list of 64 species, 48 are credited by him as occurring in America, but this must now be raised to at least 50. In analyzing his list of Vitian weeds, however, I find not more than 12 that I consider to be definitely of American origin, about 32

^{*} Flora Vitiensis (1865) XVI.

that are equally definitely of oriental origin, and about 20 regarding whose origin there is at least a reasonable doubt, but which are probably for the most part natives of the Old World. I consider that the pantropic species, for the most part, at least, have been transmitted from one hemisphere to the other through the agency of man. Admitting that at least 50 of Seemann's list of Vitian weeds are now found in the tropics of both the Old and New Worlds by no means proves that these weeds have originated in America. I believe that it is safer to conclude that the most of the weeds enumerated by Seemann have originated in the Old World, that many have been introduced into the New World, and that their presence in Polynesia is due to their introduction into that region through the Polynesians themselves in their migrations from island to island before the advent of the Europeans, and, at a more recent date, by the increase in intercommunication after the advent of the Europeans in Polynesia.

That Polynesia has acted as a bridge by means of which the weeds of the Old World have passed over to the New and *vice versa* impresses me as being improbable, at least for any great number of species. That most of the pantropic weeds can be distributed over fairly long distances by the means of winds, migratory birds, and some, perhaps, by water, must be admitted, but it is hardly conceivable that the majority of them can pass unaided such a great expanse of water as the eastern Pacific. I am of the opinion that only those species are capable of being transmitted very great distances, by water, that have very special adaptations for dissemination by ocean currents, that is, floating seeds or fruits, that not only retain their buoyancy for many weeks or months, but whose seeds also retain their germinating power for equally long periods when immersed in salt water. Guppy⁹ has given considerable attention to this matter, and an examination of the lists of species whose seeds and fruits he investigated,¹⁰ as to buoyancy or non-buoyancy, shows that among all the species of pantropic weeds investigated a single one, *Eclipta alba* Hasak., has seeds that float for many months. All the other weeds and weed-like plants which he investigated have seeds or fruits that sink at once or within a day or two, those tested being in such genera as *Abrus*, *Ageratum*, *Canna*, *Phyllanthus*, *Portulaca*, *Urena*, *Argemone*, *Triumfetta*, *Tephrosia*, *Bidens*, *Cassia*, *Commelina*, *Ipomoea*, *Jussiaea*, *Sida*, and *Wal-*

⁹ Observations of a Naturalist in the Pacific 2 (1906) Seed Dispersal.

¹⁰ L. c. 529-533.

theria. Guppy has effectively proved that it is quite impossible for the average weed seed, unaided, to be transmitted by ocean currents even for short distances.

Seemann concluded that the reason why American weeds showed a greater tendency to become dominant in Polynesia than Asiatic ones was because to American weeds Polynesia is altogether virgin ground. In the first place I differ from him in that I consider the majority of the weeds enumerated to be of oriental, not American origin; and secondly, and what is of still greater importance, that if we assume the Polynesian islands originally to have been covered with continuous forests before the advent of man, then, as man has destroyed the forests, the islands, by the provision of proper habitats, would become just as much virgin territory to Asiatic as to American weeds.

Whitford¹¹ and myself¹² have argued that for the Philippines the Islands were originally entirely covered with forests of one type or another before the advent of man. It is at once manifest that a country covered with continuous forests will present no habitats, or at least very limited areas, where the sun-loving weed flora can thrive or even persist. It is also manifest to any one familiar with the forests of the Malayan region that the vegetation of the forested areas is entirely different from that of the more or less open country, and that the weeds and weed-like plants that are dominant in the settled areas are normally absent in the forests; even in second-growth forests that are only a few years old. It is argued that the present vast expanses of territory in the Philippines, including the areas in cultivation, the second growth forest, and the enormous stretches of country that are covered with coarse grasses, primarily owe their existence to the presence of man, and that man, through destructive methods of clearing the ground for agricultural purposes, has provided the proper habitats for the weeds and weed-like plants, which, when once introduced, have spread with great rapidity and have become dominant in the open areas. The presence of the vast areas of grass-covered, unproductive lands in the Philippines, as well as the second-growth forests and the cultivated areas is certainly due to the continued presence of man. It is equally certain that if man were removed the country would eventually become reforested, and this would cause the entire or

¹¹ The Forests of the Philippines. *For. Bur. (Philip.) Bull.* 10¹ (1911) 12.

¹² Notes on the Flora of Manila with Special Reference to the Introduced Element. *Philip. Journ. Sci.* 7 (1912) Bot. 148-151.

nearly entire extinction of the weeds and weed-like plants that cannot, unaided by man, compete with the indigenous vegetation.

In the Philippines, and this is probably true of the entire Malayan and Polynesian regions, the average weed cannot grow in the forested areas, and is equally excluded from the grass-covered areas, especially the vast tracts of land that are covered with the lalang or cogon grass (*Imperata cylindrica*), and other coarse forms such as *Saccharum spontaneum*, *Themeda*, etc. Few weeds are found in thickets, and those that do occur in such places are soon exterminated as the thickets develop into forested areas. In a well developed and long established "cogonal," as these grass-covered areas are called in the Philippines, practically the only species found over immense areas is the grass, *Imperata cylindrica*. In some places certain other plants are found intermixed to a slight degree, but weeds proper, that is those plants that are more or less dependent for their continued existence on land cultivated or otherwise disturbed by man, are entirely lacking or appear only along trails leading through the "cogonales." These weeds are for the most part pantropic in distribution, and are excluded by natural conditions from immense areas comprised under several types of vegetation, such as the primeval and second-growth forests, to a large degree the thickets, and the open grass-covered areas. They are dominant in fallow lands, in and about cultivated areas, along roads and trails, in deserted clearings that have recently been in cultivation, in clearings recently made, and in waste places in the vicinity of towns and dwellings. A very few thrive along the gravel bars in the beds of streams, and still fewer are found widely scattered in the grass-covered areas.

The vegetative condition of Guam, before the advent of man, was undoubtedly a continuous forest. The same is undoubtedly true of the Hawaiian Islands. In discussing this matter with Mr. J. F. Rock, botanist to the Board of Agriculture and Forestry at Honolulu, who is thoroughly conversant with the vegetation of the group and with the prevailing conditions in Hawaii, he expressed the opinion that the entire land area, except where the vegetation was temporarily destroyed by volcanic eruptions, and the peaks of the higher mountains, was, before the advent of man, quite covered with continuous forests. One great factor in the recent destruction of the forest vegetation in Hawaii has been domestic and wild cattle, goats, and horses. These, introduced by man, have destroyed the underbrush and seedlings in the forests, and above all have injured the trees by breaking

the bark, thus providing the proper habitat for the ravages of certain endemic beetles which eventually kill the trees. These beetles have increased to an enormous extent in recent years due to the increase in breeding places, in turn directly due to introduced animals, so that the forests are suffering not only from the destruction of the undergrowth and young trees by the animals themselves, but the mature trees in many cases are succumbing to insect attacks primarily due almost entirely to the injuries inflicted to the trees by animals. With these checks on the indigenous forest vegetation must be included the introduced *Lantana camara*, *Paspalum conjugatum*, and other species, which over vast areas occupy the entire country, even in the forests, and effectually check the reproduction of the native species by preventing the growth of seedlings. In some areas forest fires have also been exceedingly destructive.

In discussing the forest vegetation of the Island of Hawaii, Mr. Rock ¹³ gives us a picture of the very recent destruction of a vast forest area extending over 1,000 feet in altitude:

"Between 2,000 and 3,000 feet elevation the forest has disappeared and only stragglers of tree ferns can be found standing, though ten times as many are lying dead on the ground and overgrown with all possible weeds, which the ranchmen have imported with their grass seeds. Among them is the composite climber, *Senecio mikanioides*, an awful pest, which has become well established on Hawaii. At 3,000 feet a few *Koa* trees can be found, together with *Naoi*, and here also was found a single native palm, *Pritchardia* sp., windswept and half dead. If one considers the natural condition in which this palm flourishes, as for example in the dense tropical rain forests in Kohala, and then looks at the single plant all alone in a field of *Paspalum conjugatum*, as the accuser of man the destroyer, it stands a witness to the fact that there, surrounding it, was once a beautiful tropical jungle."

That great areas in the Hawaiian Islands were denuded of their forest covering by the natives before the advent of the Europeans must, of course, be admitted, but we are witnessing to-day in this group of islands a great and rapid decrease in the forested areas due to causes for which man is primarily responsible. What is to-day taking place in Hawaii may be applied to the past history of any of the inhabited islands in the Malayan and Polynesian regions. We have to take into consideration not only the ravages of man in preparing the land for agricultural purposes, but also the possible effects of introduced plants and animals on the vegetation, the matter of introduced insects, the question of rapid increase of indigenous

¹³ The Indigenous Trees of the Hawaiian Islands (1913) 25.

destructive insects due to disturbances of the balance of nature, and various other factors.

It is considered most probable that the islands of the whole Polynesian region, before the advent of man, like the Philippines, Guam, and the Hawaiian Islands, were entirely covered with forests, and that as a corollary none of the weeds and weed-like plants, now so abundant, were originally found in the region. If this assumption, as to the original vegetation of the group, be true, then Polynesia would be just as much a virgin territory to Asiatic weeds as to those of America. Any weed, adapted to the climatic conditions, once introduced, would thrive and multiply rapidly due to the fact that the open areas, occupied by but few species, had been prepared by man.

Guppy¹⁴ points out that the Polynesian weeds arrange themselves into two groups, the "aboriginal" weeds, comprising those that existed in the islands at the time of Captain Cook's expeditions in the latter half of the eighteenth century, and the "white man's" weeds that have since been introduced. He states regarding the 64 weeds enumerated by Seemann that at least 37 of them were found in the islands of the Pacific when the botanists of Cook's voyages, Banks, Solander, the Forsters, and Nelson, made their collections (1768-79). Guppy¹⁵ gives a list of the 37 species collected by the above botanists under the head of aboriginal weeds of which but 23 are now of rather universal distribution in the tropics of both hemispheres. The remainder are for the most part confined to, or at least natives of, the tropics of the Old World. Analyzing more in detail the 23 "aboriginal" weeds, now of pantropic distribution, according to my present knowledge of weeds, their origin, and distribution, I conclude that but 5 are manifestly of American origin, that 9 are equally definitely of Asiatic origin, and that 9 are doubtful as to origin but probably Asiatic. More in detail, I believe that *Teucrium inflatum* Willd., *Ageratum conyzoides* L., *Ipomoea bonanox* Boj., *Waltheria americana* L., and *Physalis angulata* L. are of undoubted American origin; *Cassia sophera* L., (?) *Cardiospermum halicacabum* L., *Abrus precatorius* L., *Hydrocotyle asiatica* L., *Siegesbeckia orientalis* L., *Vandellia crustacea* Benth., *Achyranthes aspera* L., *Eleusine indica* Gaertn., and *Adenostemma viscosum* Forst., to be in all probability of Asiatic origin; and in my list of species that are doubtful as to origin, but probably Asiatic, I place *Sida rhombifolia* L., *Geophila reniformis*

¹⁴ Observations of a Naturalist in the Pacific 2 (1906) 415.

¹⁵ L. c. 604.

O. Ktz., *Urena lobata* L., *Commelina nudiflora* L., *Phaseolus adenanthus* Mey. (*P. truxillensis* H. B. K.), *Bidens pilosa* L., *Eclipta alba* Hassk., *Solanum nigrum* L., and *Oxalis corniculata* L.

On my basis of origins of these pantropic weeds we have to account for the presence of but very few "American" weeds in Polynesia before the region was visited by the botanists of Cook's voyages. Many of the species enumerated by Seemann and by Guppy are either confined to the tropics of the Old World, or are of pantropic distribution originating in the Old World, and would be apt to be distributed through Polynesia by the Polynesians themselves. It is conceivable that some of the species were distributed from one hemisphere to the other by natural causes, but it is considered that a prehistoric pantropic distribution for most of the species is exceedingly improbable. In Guppy's and Seemann's lists we have to account for the presence in Polynesia, before the middle of the eighteenth century, of such species as *Ageratum conyzoides*, *Waltheria americana*, *Ipomoea bona-nox*, *Physalis angulata*, and *Teucrium inflatum* if I am correct in my deduction that these are of American origin.

Cook's voyages of discovery in the last half of the eighteenth century were by no means the first visits by Europeans to Polynesia. The seeds of such plants as those enumerated above, as well as many others, may very readily have been disseminated by some of the earlier Spanish, Dutch, English, and French explorers, such as Alvarez de Mendano (1567), Drake (1577), Cavendish (1586), Mendana de Neyra (1595), Van Noort (1598), Quiros (1605), Spilbergen (1616), Schouten and Le Maire (1615), Hermite (1625), Dampier (1686), Cowley (1685), Clipperton (1691), Rogers (1710), Roggewein (1721), Anson (1742), Byron (1764), and Bougainville (1767), who came into the Pacific from the American side with from one to several ships each. The Acapulco-Manila galleons must also be taken into consideration in the introduction of American weeds into the islands of the Pacific, the sailings of which extend over a period of approximately three hundred years from the beginning of European colonial history in Polynesia and the Philippines, a period preëminently characterized by an interchange of economic species and weeds between the eastern and western hemispheres.

We know from Captain Cook's own statements that he took with him into the Pacific live stock consisting of horses, cattle, sheep, goats, and domestic fowls for distribution to the Poly-

nesians as presents, and in connection with this matter it is well to note that at every island where a protracted stop was made the live stock was placed on shore to recuperate, and that on leaving an abundant supply of forage was collected for the subsistence of the animals in the passage from one group of islands to another. At each stopping place abundant food supplies were provided for the officers and crews of the ships, consisting of living animals, yams, fruits, rice, and other edible products. It is difficult to imagine a more ideal method of transmitting weeds and weed-like plants from one island to another than by these means. It is interesting to note in this connection that Captain Cook was by no means the first navigator to transmit living animals to the Pacific for he states that goats had been left in the Society Islands by some previous expedition.¹⁶ The practice of early voyagers taking with them live stock either for distribution, or for food during the voyage, seems to have been a very common procedure. Considering the number of expeditions to Polynesia from the American side of the Pacific, before Cook's voyages, and the long period covered, it is by no means difficult to conceive that through these early voyages a considerable number of American weeds may have been distributed to the islands of the Pacific. In fact it would be very strange if not more than the 5 or 6 indicated above were not then introduced into Polynesia. In this connection Guam must also be considered, for Guam very definitely received a number of American weeds at an early date, and these weeds, while incapable of being transmitted across the Pacific by natural means, still may very readily have been transmitted from island to island in Micronesia and so from island to island in Polynesia through such agencies as winds, migratory birds, and some, perhaps, by ocean currents. From 1521, the date of the discovery of Guam, to 1815, that island for most of the period as already indicated, was in annual communication with Mexico, and the interval from 1521 to 1768, the date of Captain Cook's first voyage to the Pacific is a comparatively long period, during which sufficient time certainly elapsed to allow certain weeds, with special means for dissemination, to become fairly widely distributed in Polynesia.

Take for example any weed of American origin that became established in Guam at an early date, or shortly after the arrival of the Spaniards in 1521. It may have reached neighboring

¹⁶ Journal of Captain Cook's Last Voyage to the Pacific Ocean on Discovery (1781) 122, 186.

islands by winds, water, or migratory birds. On the other hand it may have been transmitted from island to island inadvertently by man. Now it is conceded that intercommunication between the different groups of islands in Polynesia in prehistoric times was probably rare, and maybe for the most part accidental. Some intercommunication, however, did exist. There was probably little or no regular communication between Micronesia and Polynesia in this period, but the accidental method cannot be overlooked. Fishing and trading boats, more or less stocked with food, are frequently blown out to sea by storms, and are not infrequently cast up on distant islands. That by this method Polynesia was originally colonized admits of little doubt, and through such intercommunication some economic plants and some weeds have undoubtedly been transmitted from one group of islands to another. That such occurrences are comparatively frequent also admits of no doubt. In my first period of residence in the Philippines, five years, two cases occurred in which small native boats blown to sea in the Caroline Islands were cast up in the eastern coast of the Philippines, one in Luzon and one in Mindanao, in one case with most of the occupants surviving, in the other with most of them dead from thirst and starvation. The distance travelled by these small boats was from 860 to 1,300 kilometers. Not a typhoon season passes in the Philippines but in which small native boats are blown out to sea, frequently never being heard from, at other times picked up by passing vessels, and at other times eventually reaching distant shores. This is to-day happening all over Polynesia, and such incidents have been frequent in the history of Polynesia for at least two thousand years. As a method of distribution of plants over comparatively short distances this must certainly seriously be considered.

In connection with the weed-flora of Polynesia it is of some interest to consider the period that the islands of the Pacific have been inhabited, although this question cannot definitely be settled. What peoples, if any, were the predecessors of the Polynesians is not known. Some authorities¹⁷ place the entrance of the Polynesians into the Pacific at such a remote age that the event cannot even approximately be fixed, either by tradition or otherwise. Formander,¹⁸ however, has traced the history of the Hawaiians to the fifth century, and concludes that the Polynesian migration from the Indian Archipelago may

¹⁷ *Encycl. Brit.* ed. 11, 22 (1911) 23.

¹⁸ *An Account of the Polynesian Race* 1 (1878) 168.

approximately be assigned to the first or second centuries of our era. At any rate the absence of Sanskrit roots in the Polynesian languages indicates that the Polynesians were never in direct or indirect contact with Sanskrit peoples. It is apparently quite safe to assume that the Polynesians have occupied the islands of the Pacific for at least two thousand years, perhaps longer. This period is sufficiently long for man to have wrought great changes in the character of the vegetation of the different islands, to have destroyed the original forest over large areas, and to have provided the proper habitats for the light-loving weed-flora.

Safford's work on the flora of Guam is an alphabetic arrangement of all the species known to him from that island. There is no summary by families and genera, so that it is rather difficult to gain an adequate idea of the constituent species of the flora from an examination of his work. In nomenclature Safford's work follows the American Code which is based on strict priority and admits of no generic list of *nomina conservanda*. The idea of generic types was also applied with some surprising results, and, in at least some cases, the type adopted does not appear to me to be the logical one. For the nomenclature adopted in Safford's work Mr. W. F. Wight is primarily responsible, and is the authority for most of the changes of names included. In this rather popular work, and one that is strictly alphabetic, it is rather curious to note not only new combinations and new specific names, but also new generic names and even one new family name. It hardly seems probable, especially in view of the fact that there were available three properly constructed family names already, *Lamiaceae* (1836), *Nepetaceae* (1843), and *Salviaceae* (1879), that the new name, *Menthaceae*, proposed for the *Labiatae*, will meet with general acceptance. The proposal of the name *Menthaceae*, under these circumstances, appears to me to be entirely unwarranted, and quite at variance with the principle of priority.

In the following enumeration the nomenclature has been worked out on the basis of the International Code of Botanical Nomenclature, and accordingly the accepted generic and specific names will in some instances be found at variance with those used by Mr. Wight in Safford's work. The author is responsible for the identifications of most of the specimens cited in the present paper, the material examined, as noted above, being the collections of Mrs. Clemens, Mr. Thompson, Mr. McGregor, and a native collector working under Mr. Thompson's direction, a total of 824 numbers. For purposes of comparison I have had

not only the rich Philippine collections of the Bureau of Science, but also the extensive series of specimens from tropical Asia, Malaya, and Polynesia, belonging to that institution, including a nearly complete set of Volken's Caroline Islands plants. The *Palmae* have been examined by Beccari, the *Pandanaceae* by Martelli, some of the *Cyperaceae* by Kükenthal, the *Musci* by Brotherus, the *Hepaticae* by Stephani, the *Piperaceae* by DeCandolle, and the *Orchidaceae* by Ames. In a few other cases I have received aid in the identification of certain specimens, this assistance being acknowledged in the text under the individual species. The enumeration of the *Fungi* is the work of Mr. Paul W. Graff of the Bureau of Science. Dr. E. B. Copeland has named some of the ferns.

The first and most complete set of the botanical material from Guam is deposited in the herbarium of the Bureau of Science, and a nearly complete set has been deposited in the office of the Guam Experiment Station. The remaining duplicates have been distributed to various specialists and to institutions with which the Bureau of Science is in exchange relations. In the following enumeration the material secured through the native collector employed by the Guam Experiment Station is indicated as *G. E. S.*, followed by the number of the collection. The recent collections have yielded a total of about forty-five new species, and one new genus.

While engaged in reading the proof on this paper I received, through the kind offices of Mr. W. R. Maxon of the U. S. National Museum, and of Mr. W. E. Safford, 162 additional specimens of Guam plants for study. This material was collected in Guam by Mr. Safford, by Mr. Alvin Seale, and by Mr. H. L. W. Costenoble. This collection adds a few genera and species to the list I had prepared for publication, and these additions have been included in the present paper.

ENUMERATION OF THE SPECIES

THALLOPHYTES

FUNGI

(By P. W. GRAFF)

The few fungi known from Guam have been gathered only incidentally by collectors of other plants. The chief collection, and perhaps the only one, previously reported, was that made by Gaudichaud in 1819. Safford gives the list as follows: *Auricularia auricula-judae* (L.) Schröt., *Fomes scabrosus* (Pers.) Fr., *Polyporus kamphoeveneri* Fr. (*Polyporus mariannus* Pers.).

Polystictus sanguineus (L.) Mey., *Polystictus xanthopus* Fr. (*Polystictus saccatus* Pers.), and *Schizophyllum alneum* (L.) Schröt. To this list Saccardo adds *Hirneola ampla* (Pers.) Fr. Another short list, apparently based on the same collection, was published by K. Schumann & Lauterbach in "Die Flora der Deutschen Schutzgebiet in der Südsee" (1901). This list consists of but five names, *Auricularia auricula-judae* (L.) Schröt., *Polyporus kamphoeveneri* Fr., *Polystictus sanguineus* (L.) Mey., *P. xanthopus* Fr., and *Schizophyllum alneum* (L.) Schröt.

The following list includes an inumeration of all known species. Most of these, as one might expect from their being only incidental collections, are common and widely distributed tropical forms.

PHYLLACHORA Nitschke

PHYLLACHORA AFZELIAE Syd. in Philip. Journ. Sci. 8 (1913) Bot. 277.

On leaves of *Intsia bijuga* (Colebr.) O. Kuntze (*Afzelia bijuga* A. Gray). *G. E. S.* 324. Recently described from the Philippines.

HIRNEOLA Fries

HIRNEOLA AURICULA-JUDAE (Fr.) Berk. Outl. (1860) 289; Fr. Hym. Eur. (1874) 695.

Exidia auricula-judae Fr. Syst. Myc. 2 (1823) 321.

Tremella auricula Linn. Sp. Pl. (1753) 1157.

G. E. S. 304, McGregor 588, October, 1911.

Of very general distribution in the tropics and warmer parts of both hemispheres.

HIRNEOLA AMPLA (Pers.) Fr. Fung. Nat. (1848) 26.

Auricularia ampla Pers. ex Gaudich. in Bot. Freyc. Voy. (1826) 177.

Coll. Gaudichaud ex Saccardo Syll. Fung. 6 (1888) 765.

POLYPORUS Micheli

POLYPORUS MARIANNUS Pers. ex Gaud. Bot. Freyc. Voy. (1826) 173.

Coll. Gaudichaud.

Schumann and Lauterbach place this as a synonym of *Fomes lignosus* (Klot.) Bres. These authors make no statement of having seen or made comparisons with Gaudichaud's specimen, which is probably in the Paris Museum of Natural History. If the reduction is correct, then Persoon's name is the older. His description is, however, rather meagre and hardly more than sufficient to show a possible relationship.

FOMES Fries

FOMES LIGNOSUS (Klot.) Bres. in Hedwigia 53 (1912) 60.

Polyporus lignosus Klot. ex Fr. Epicr. (1838) 471.

Fomes kamphoeveneri Fr. Nov. Symb. Myc. (1851) 69.

Coll. Gaudichaud. Found in Tahiti, Mauritius, Australia, Philippines and Cuba.

FOMES NUBILUS Fr. Epicr. (1836-38) 491, var. **ALBO-LIMBATUS** Cooke.

G. E. S. 266; *McGregor* 589, October, 1911. Reported from Guinea and the Congo.

FOMES SCABROSUS (Pers.) Fr. Epicr. (1836-38) 469.

Polyporus scabrosus Pers. ex Gaud. Bot. Freyc. Voy. (1826).

P. fusco-badius Pers. l. c.

Coll. *Gaudichaud*.

POLYSTICTUS Fries

POLYSTICTUS AFFINIS (Fr.) Nees in Nov. Act. Acad. Nat. Cur. 13: 18, pl. 4, f. 1.

Polyporus affinis Fries Epicr. (1836-38) 447.

McGregor 590, October, 1911. Of very general distribution throughout the tropics.

POLYSTICTUS OCCIDENTALIS (Kl.) Fr. Nov. Symb. (1851) 90.

Polyporus occidentalis Kl. in Linnaea 7 (1832) 486.

G. E. S. 303. Of very general tropical distribution.

POLYSTICTUS SANGUINEUS (L.) Mey. Flor. Esseq. (1818) 304.

Boletus sanguineus L. Spec. Pl. Ed. 2 (1763) 1646.

G. E. S. 300. Universal in the tropics. It is very probable that this and *P. cinnabarinus* (Jacq.) Fr., of the temperate zones, should be considered but forms of the same species.

POLYSTICTUS XANTHOPUS Fr. Obs. 2 (1815-18) 255.

Coll. *Gaudichaud*. Found throughout the tropics.

TRAMETES Fries

TRAMETES CORRUGATA (Pers.) Bres. in Hedwigia 51 (1912) 316.

Polyporus corrugatus Pers. ex Gaud. in Bot. Frey. Voy. (1826) 172.

G. E. S. 301. Found in East India, Ceylon, Borneo, Java, Philippines, West Africa, Cuba, Brazil, and Australia.

HEXAGONIA Fries

HEXAGONIA BIVALVIS (Pers.) Bres. in Hedwigia 51 (1912) 318, var.

PULCHELLA (Lév.) Bres. in Hedwigia 53 (1912) 73.

Hexagonia pulchella Lév. in Ann. Sci. Nat. Bot. III. 2 (1844) 200.

G. E. S. 423. Reported from Java, Malacca, Mauritius, and the Philippines.

SCHIZOPHYLLUM Fries

SCHIZOPHYLLUM COMMUNE Fr. Syst. Myc. 1 (1821-32) 333.

Agaricus alneus L. Fl. Suec. (1745-55) n. 1242.

Schizophyllum alneum (L.) Schröt. ex Cohn Krypt. Fl. Schles. 3 (1887) 383.

G. E. S. 425. Distributed throughout the tropic and temperate zones.

LENTINUS Fries

LENTINUS VELUTINUS Fr. in Linnaea 5 (1830) 510.

G. E. S. 425. Reported from Cuba, Brazil, Guayana, Demerara, and the Philippines.

PHOMA Fries

PHOMA LUSITANICA Thüm. Contr. Myc. Lusit. 335.

Vicinity of Piti, *McGregor 406a*, October, 1911, on twigs of *Glossogyne tenuifolia* (Less.) Cass. Collected previously by Moller in Lusitania.

Spores $2 \times 4 \mu$ in perithecia averaging 95μ wide and 130μ high, including the projection of the ostiole.

CLADOSPORIUM Link

CLADOSPORIUM CLEMENSIAE Graff sp. nov.

Hypophyllis, caespitulis erumpentibus, fuscis; hyphis ramosis, flexuosis, septatis; hyphis fertilibus sparsis, erectis, septatis, fuscis, simplicibus, $4-5.5 \times 100-150 \mu$; conidiis concoloribus, ellipticis oblongis subcylindratisve, continuis dein 1-3-septatis, leniter constrictis, $7.5-11.5 \times 23-35 \mu$.

Found in great quantities on the under surface of the leaves, occasionally on the upper. The spots appear dark brown in color. Vegetative hyphae irregularly branching, light in color, septate. Fertile hyphae irregularly scattered, very few in a cluster, seldom more than three or four, erect, simple, fuscous, with the upper portion sometimes pale, septate with septa rather close, $4-5.5 \times 100-150 \mu$. Conidia of the same color as the darker portion of the hyphae upon which they are borne, dark brown, elliptical, oblong to subcylindrical, continuous at first then 1 to 3 septate, becoming slightly constricted at the septa, $7.5-11.5 \times 23-35 \mu$.

Agaña, *Mary Strong Clemens s. n.*, November 27, 1911, on leaves of *Eragrostis tenella* (L.) R. & S.

CLADOSPORIUM FASCICULATUM Corda Icon. Fung. Cog. (1842) 15, pl. 4, fig. 216.

Piti, *Thompson 4a*, November, 1910, on *Dactyloctenium aegyptiacum* Willd. Reported from both Europe and Asia.

BRYOPHYTES

HEPATICAЕ

Mr. Safford records four species from Guam, page 292, as follows:

Hygrolejeunea sordida (Nees) Schiffn.

Caudolejeunea recurvistipula (Gott.) Schiffn. = *Dicranolejeunea recurvistipula*.

Frullania gaudichaudii Nees & Mart.

Frullania nodulosa (R. Bl. & N.) Nees.

To this last may be added the following species, all determined by Herr F. Stephani of Leipzig, from our recent collections:

Frullania apiculiloba Steph., *McGregor 597*.

Frullania dapitana Steph., *McGregor 600*.

Frullania secundiflora Mont., *G. E. S. 193*.

Dicranolejeunea recurvistipula (Gott.), *McGregor 595*.

Radula javanica Gott., *McGregor 594*.

Thysananthus angustiformis Tayl., *McGregor 598*.

MUSCI

Mr. Safford, page 327, enumerates nine species of mosses from Guam, collected by Gaudichaud and reported by Schwaegrichen in Bot. Freyc. Voy. (1826) 226-229. In a number of cases I cannot, from the literature available here, refer these to their genera as understood to-day. The following is Safford's list:

Bartramia uncinata = *Philonotis* ?

Hypnum cupressiforme.

Hypnum delicatulum = *Thuidium*.

Hypnum recurvans Schwaegr. = *Rhaphidostegium recurvans* Jaeg.

Hypnum scaturiginum = *Ectropothecium scaturiginum* Jaeg.

Macromitrium urceolatum Schwaegr.

Neckera undulata = *Neckeropsis lepineana*.

Octoblepharum albidum Hedw.

Syrrhopodon rigescens.

From the known ranges of these species, it seems to be evident that a number are erroneously identified. The following species, all determined by Dr. V. F. Brotherus, are represented in our Guam collections:

Neckeropsis lepineana (Mont.), *McGregor* 625.

Macromitrium semipellucidum D. & M., *McGregor* 626.

Syrrhopodon revolutus D. & M., *McGregor* 623.

Thuidium plumulosum (D. & M.), *McGregor* 622.

Ectropothecium marliannarum Broth. sp. nov. (*McGregor* 627).

PTERIDOPHYTES

HYMENOPHYLLACEAE

TRICHOMANES Linnaeus

TRICHOMANES HUMILE Forst. f. Prodr. (1786) 84.

McGregor 398, *G. E. S.* 208, on trees, Upi road, and Yigo.

Hawaiian Islands to the Carolines, Polynesia, New Zealand, and Australia.

TRICHOMANES JAVANICUM Blume Enum. (1828) 224.

G. E. S. 27, damp places, banks of small streams.

Tropical Asia to the Liu Kiu Islands southward to Australia and Polynesia.

CYATHEACEAE

ALSOPHILA R. Brown

ALSOPHILA EXTENSA (Forst f.) R. Br. Prodr. (1810) 42.

Polypodium extensum Forst. f. Prodr. (1786) 83.

Alsophila haenkei Presl Rel. Haenk. 1 (1825) 68.

Cyathea marianna Gaudich. Bot. Freyc. Voy. (1826) 265.

Not represented in our collections, but described by both Presl and Gaudichaud from Guam material. The reduction of both species to *Alsophila extensa* R. Br., is after Christensen, Index Filicum.

New Guinea, Celebes, and Polynesia.

POLYPODIACEAE

ACROSTICHUM Linnaeus

ACROSTICHUM AUREUM Linn. Sp. Pl. (1753) 106; Safford 174.

G. E. S. 158, locally known as *lagngayao*.

Along the seashore, tropics of both hemispheres.

ANTROPHYUM Kaulfuss

ANTROPHYUM PLANTAGINEUM (Cav.) Kaulf. Enum. (1824) 197.

Hemionitis plantaginea Cav. Descr. (1802) 260.

G. E. S. 325, on trees, Yigo.

India to Polynesia.

ASPENIUM Linnaeus

ASPENIUM CAUDATUM Forst. f. Prodr. (1786) 80.

McGregor 573.

Tropics of both hemispheres.

ASPENIUM MACROPHYLLUM Sw. in Schrad. Journ. 1800² (1801) 52.

McGregor 535, *Mrs. Clemens s. n.*

India to the Mascarene Islands and Polynesia.

ASPENIUM NIDUS Linn. Sp. Pl. (1753) 1079.

Neottopteris nidus J. Sm. Hook. Gen. (1842) *t. 113B*.

Mrs. Clemens s. n.

Tropical Africa and Asia, to Polynesia.

ASPENIUM LASERPITIIFOLIUM Lam. Encycl. 2 (1786) 310.

McGregor 548.

Malaya to Australia and Polynesia.

ASPENIUM ADIANTOIDES (Linn.) C. Chr. Index Fil. (1905) 99.

Trichomanes adiantoides Linn. Sp. Pl. (1753) 99.

Asplenium falcatum Lam. Encycl. 2 (1786) 306.

Admitted on the authority of Safford, who records it as *Asplenium falcatum* Lam.

Tropical Asia to Australia, New Zealand, and Polynesia.

ASPENIUM MONANTHES Linn. Mant. (1767) 130.

Asplenium monanthemum Murr. Syst. ed. 14 (1784) 933.

Admitted on the authority of Safford who records it as *A. monanthemum* Linn., but there is probably some error in identification or in localization of the specimens on which the Guam record was based.

Tropical Africa and America, Hawaii.

ASPENIUM NITIDUM Sw. Syn. (1806) 84, 280.

Admitted on the authority of Safford; India to Malaya.

BLECHNUM Linnaeus

BLECHNUM ORIENTALE Linn. Sp. Pl. (1753) 1077.

McGregor 386.

Tropical Asia to Polynesia.

CHEILANTHES Swartz

CHEILANTHES TENUIFOLIA (Burm. f.) Sw. Syn. (1806) 129, 332.

Trichomanes tenuifolium Burm. f. Fl. Ind. (1768) 237.

McGregor 405.

Tropical Asia to New Zealand and Polynesia.

CYCLOPHORUS Desvaux

CYCLOPHORUS ADNASCENS (Sw.) Desv. in Berl. Mag. 5 (1911) 300;
Safford 235, pl. 47.

Polypodium adnascens Sw. Syn. (1806) 25, 222, t. 2, f. 2.

McGregor 496.

Tropical Asia to Polynesia.

DAVALLIA Smith

DAVALLIA SOLIDA (Forst. f.) Sw. in Schrad. Journ. 1800¹ (1801) 87;
Safford 256.

Trichomanes solidum Forst. f. Prodr. (1786) 86.

McGregor 377.

Malaya to northern Australia and Polynesia.

DRYOPTERIS Adanson

DRYOPTERIS CUCULLATA (Blume) Christ in Philip. Journ. Sci. 2
(1907) Bot. 194.

Aspidium cucullatum Blume Enum. (1828) 151.

McGregor 477, G. E. S. 182.

Mascarene Islands and Malaya.

DRYOPTERIS GONGYLODES (Schkuhr) O. Ktze. Rev. Gen. Pl. 2 (1891)
811.

Aspidium gongyloides Schkuhr Kr. Gew. 1 (1809) 193, t. 33.

Safford 1003, in the U. S. National Herbarium.

Pantropic.

DRYOPTERIS DISSECTA (Forst. f.) O. Ktze. Rev. Gen. Pl. 2 (1891)
812.

Polypodium dissectum Forst. f. Prodr. (1786) 812.

Safford 1003, Safford & Seale 1088.

India to Madagascar, Malaya, Australia, and Polynesia.

DRYOPTERIS PARASITICA (Linn.) O. Ktze. Rev. Gen. Pl. 2 (1891)
811.

Polypodium parasiticum Linn. Sp. Pl. (1753) 1090.

Admitted on the authority of Safford.

Warmer parts of both hemispheres.

DRYOPTERIS HAENKEANA (Presl) O. Ktze. Rev. Gen. Pl. 2 (1891)
812.

Nephrodium haenkeanum Presl Epim. Bot. (1851) 46.

The type was from the Marianne Islands, presumably from Guam, collected by Haenke. It is credited with wide distribution in Malaya and Polynesia. From the description I suspect that it is but a form of *D. cucullata*, enumerated above.

DRYOPTERIS (NEPHRODIUM) DEPAUPERATA Copel. sp. nov.

Rhizomate erecto, breve; stipitibus dense confertis, plerisque ca. 5 cm altis, stramineis, caduce paleaceis, rhachibusque pilis hyalinis minutis vestitis; fronde 20 ad 25 cm alta, 4 cm lata, utrinque angustata; pinnis alternantibus, patentibus, stipitatis, lanceolatis, obtusis, integris vel crenulatis, basi suboblique cuneatis acroscopice paullo dilatatis, herbaceis, costa pilis paucis minutis ornata, aliter glabris, inferioribus sensim abbreviatis, infimis oblongis, 5 mm longis; venis seriem unam areolarum includentibus; soris utroque latere costae uniseriatis, medialibus; indusio haud uniforme, saepius reniforme.

Guam Experiment Station 25, in damp places along river banks at Tolijuice, November, 1911; a very distinct species.

HUMATA Cavanilles**HUMATA HETEROPHYLLA** (Sm.) Desv. Prodr. (1825) 323.

Davallia heterophylla Sm. in Mém. Acad. Turin. 5 (1783) 415; Safford 295, pl. 53.

Humata pinnatifida Cav. Descr. (1802) 273.

McGregor 267.

Malaya and Polynesia. As pointed out by Safford, the genus takes its name from the town of Umata or Humata in Guam.

HYMENOLEPIS Kaulfuss**HYMENOLEPIS SPICATA** (Linn. f.) Presl Epim. (1851) 159.

Acrostichum spicatum Linn. f. Suppl. (1781) 444.

Belvisia spicata Mirb. Hist. Nat. Veg. 5 (1802?) 473.

McGregor 369.

Tropical Asia to Madagascar, Malaya, and Polynesia.

NEPHROLEPIS Schott**NEPHROLEPIS ACUTIFOLIA** (Desv.) Christ in Verh. Nat. Ges. Basel. 11 (1905) 243.

Lindsaya acutifolia Desv. Prodr. (1827) 312.

G. E. S. 463.

Tropical Africa through Malaya, Burma, etc., to Australia.

NEPHROLEPIS HIRSUTULA (Forst. f.) Presl Tent. (1836) 79.

Polypodium hirsutulum Forst. f. Prodr. (1786) 81.

McGregor 539.

Tropics of both hemispheres.

ODONTOSORIA Fée**ODONTOSORIA CHINENSIS** (Linn.) J. Sm. in Bot. Voy. Herald (1857) 430.

Trichomanes chinense Linn. Sp. Pl. (1753) 1099.

G. E. S. 122.

Tropical Asia to Madagascar and Polynesia.

ODONTOSORIA RETUSA (Cav.) J. Sm. in Bot. Voy. Herald (1857) 430.

Davallia retusa Cav. Descr. (1802) 278.

Admitted on the authority of Safford.

Malaya and Polynesia.

POLYPODIUM Linnaeus

POLYPODIUM PHYMATODES Linn. Mant. (1771) 306.

Phymatodes phymatodes Maxon ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 352, pl. 62.

Mrs. Clemens s. n., *McGregor 462*.

Tropical Africa and Asia to Australia and Polynesia.

POLYPODIUM PUNCTATUM (Linn.) Sw. in Schrad. Journ. 1800² (1801) 21.

Acrostichum punctatum Linn. Sp. Pl. ed. 2 (1763) 1524.

Microsorium irioides Fée Gen. (1850-52) 268.

McGregor 555, *Mrs. Clemens s. n.*

Tropical Africa, Asia, through Malaya to Polynesia.

SCHIZOLOMA Gaudichaud

SCHIZOLOMA ENSIFOLIUM (Sw.) J. Sm. in Hook. Journ. Bot. 3 (1841) 414.

Lindsaea ensifolia Sw. in Schrad. Journ. 1800² (1801) 77.

McGregor 408.

Tropical Africa and Asia to Polynesia.

PTERIS Linnaeus

PTERIS BIAURITA Linn. Sp. Pl. (1753) 1076.

Admitted on the authority of Safford.

Warmer parts of both hemispheres.

PTERIS QUADRIAURITA Retz Obs. 6 (1791) 38.

Admitted on the authority of Safford.

Same range as the preceding (?), with which it is frequently confused.

PTERIS TRIPARTITA Sw. in Schrad. Journ. 1800² (1801) 67.

Pteris marginata Bory Voy. 2 (1804) 192.

Admitted on the authority of Safford.

Tropical Africa and Asia to Polynesia.

TECTARIA Cavanilles

TECTARIA CRENATA Cav. Descr. (1802) 250.

G. E. S. 201.

Widely distributed in Malaya.

VITTARIA Smith

VITTARIA ELONGATA Sw. Syn. (1806) 109, 302; Safford 398.

McGregor 487.

Tropical Asia to Polynesia.

PARKERIACEAE

CERATOPTERIS Brongniart

CERATOPTERIS THALICTROIDES (Linn.) Brongn. Bull. Soc. Philom.
(1821) 186, *pl.*

Acrostichum thalictroides Linn. Sp. Pl. ed. 2 (1763) 1488.

Admitted on the authority of Safford.

Tropics of both hemispheres.

GLEICHENIACEAE

GLEICHENIA Smith

GLEICHENIA LINEARIS (Burm. f.) Clarke in Trans. Linn. Soc. Bot.
1 (1880) 428.

Polypodium lineare Burm. f. Fl. Ind. (1768) 235, *t.* 67, *f.* 2.

Gleichenia dichotoma Hook. Sp. Fil. 1 (1846) 12; Safford 283, *pl.* 50.

McGregor 479.

Warmer parts of both hemispheres.

MARATTIACEAE

ANGIOPTERIS Hoffmann

ANGIOPTERIS EVECTA (Forst.) Hoffm. Comm. Soc. Reg. Gott. 12
(1796) 29, *t.* 5; Safford 183, *pl.* 32.

Polypodium evectum Forst. f. Prodr. (1786) 81.

G. E. S. 478.

Polynesia; its other range uncertain.

SCHIZAEACEAE

LYGODIUM Swartz

LYGODIUM SCANDENS (Linn.) Sw. in Schrad. Journ. 1800² (1801)
106; Safford 314.

Ophioglossum scandens Linn. Sp. Pl. (1753) 1063.

McGregor 403.

Tropical Africa and Asia to Australia and Polynesia.

LYGODIUM SEMIHASTATUM (Cav.) Desv. Prodr. (1827) 203.

Ugena semihastata Cav. Ic. 6 (1801) 74, *t.* 594, *f.* 1.

McGregor 363.

Originally described from Philippine and Guam material, and very distinct from *Lygodium circinnatum* (Burm.) Sw., to which it has been erroneously reduced. It is probably the basis on which *Lygodium circinnatum* has been credited to Guam.

OPHIOGLOSSACEAE

OPHIOGLOSSUM Linnaeus

OPHIOGLOSSUM PENDULUM Linn. Sp. Pl. ed. 2 (1763) 1518.

Ophioderma pendulum Presl Suppl. (1845) 56.

G. E. S. 278, locally known as *leston*.

Tropical Asia to Polynesia.

LYCOPODIACEAE

LYCOPODIUM Linnaeus

LYCOPODIUM CERNUUM Linn. Sp. Pl. (1753) 1103; Safford 313.

Lycopodium marianum Willd. Sp. Pl. 5 (1810) 31.

McGregor 478.

Tropics of both hemispheres.

LYCOPODIUM PHLEGMARIA Linn. Sp. Pl. (1753) 1100; Safford 313, pl. 57.

Lycopodium mirabile Willd. Sp. Pl. 5 (1810) 11.

G. E. S. 256, locally known as *desoplana* and as *cordon de San Francisco*.
Tropical Asia to Polynesia.

SELAGINELLACEAE

SELAGINELLA Spring

SELAGINELLA BELANGERI (Bory) Spring Monog. Lycopod. 2 (1850) 242; Hieron. in Hedwigia 50: 21, 51: 270.

Lycopodium belangeri Bory in Belang. Voy. Bot. 2: no. 16, t. 2, f. 3.

G. E. S. 174, rocky places near the sea at Adilog.

Widely distributed in the Indo-Malayan region. I am indebted to Dr. G. Hieronymus for the identification of the specimen cited.

PSILOTACEAE

PSILOTUM Swartz

PSILOTUM NUDUM (Linn.) Griseb. Syst. Veg. Karaib. (1857) 130.

Lycopodium nudum Linn. Sp. Pl. (1753) 1100.

McGregor 465, *G. E. S.* 170.

Tropics of both hemispheres.

SPERMATOPHYTES

CYCADACEAE

CYCAS Linnaeus

CYCAS CIRCINALIS Linn. Sp. Pl. (1753) 1188; Safford 252, pl. 8, 14.

G. E. S. 406, *Mrs. Clemens s. n.*, locally known as *fadang*.

Widely distributed in the tropics of the Old World, especially near the seashore.

PINACEAE

This family is unknown from Guam except as represented by the introduced and cultivated *Cryptomeria japonica* D. Don, *G. E. S.* 433.

PANDANACEAE

PANDANUS Linnaeus

PANDANUS KAFU Martelli in Webbia 4 (1913) 19, t. 19, f. 1-3.

Pandanus fragrans W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 344, pl. 7, non Brongn.

McGregor 584, locally known as *kafu*. Endemic.

PANDANUS GUAMENSIS Martelli l. c. 16, t. 42, f. 4-6.

McGregor 577, 580, 582, G. E. S. 40, locally known as *akaom*.

This form was first indicated to me by Martelli as a variety of *Pandanus tectorius* Sol. It is, in all probability, the form credited to Guam by Safford (page 344) as *Pandanus tectorius* Parkinson.

PANDANUS DUBIUS Spreng. Syst. 3 (1826) 897; Safford 343.

McGregor 581, 583, locally known as *pahong*.

Near the sea, Java to the Caroline and Marianne Islands southward to the New Hebrides.

In addition to the above species, I have the following material, mostly leaf specimens, none of it in condition for determination: G. E. S. 68, cultivated, locally known as *paingot*; McGregor 547, a long-leaved sylvan species, leaves brittle; McGregor 578, locally known as *agac*, "its leaves distinguish it from the other species by having a glaucous bloom on both surfaces; the fiber plant here, said never to produce fruit" (McGregor); McGregor 579, in forests, Upi road, with very immature fruits.

Pandanus fragrans Gaudich Bot. Freyc. Voy. (1843) t. 22, f. 10, is enumerated by Martelli¹⁹ as a distinct species.

I suspect that it is the same as the species indicated by Martelli as *Pandanus kafu*, enumerated above. Gaudichaud's material was from Guam. If *Pandanus fragrans* Gaudich. be considered a valid publication, then this name has priority and should be retained.

FREYCINETIA Gaudichaud

FREYCINETIA MARIANNENSIS sp. nov. § *Oligostigma*.

Species F. maximae simillima et affinis, differt foliis brevioribus angustioribusque, haud vel obscurissime reticulatis, supra sensim angustatis, haud abrupte acuminatis, denticulis minoribus, fructibus brevioribus, circiter 1 cm longis.

Apparently scandent, robust (stems not seen). Upper and inner leaves 25 to 35 cm long, 4.5 to 6 cm wide in the lower part, gradually narrowed upward to the slenderly acuminate apex, the longitudinal nerves distinct, close, the transverse reticulations none or obscure, the midrib on the lower surface and the margins finely sharply denticulate, the lower 3 to 4 cm of the leaf without teeth. Mature leaves not seen, apparently much longer than those described. Male inflorescence: Heads 3, cylindric, about 5 cm long, 1.3 cm in diameter, their peduncles 2 to 3 cm long. Female heads, in fruit, in threes, cylindric, 11 cm long, about 4 cm in diameter, their peduncles stout, 5 cm long, about 8 mm in diameter, smooth. Fruits linear, 1 to 1.2 cm long, less than 2 mm in diameter, very numerous, crowded, longitudinally sulcate-striate, somewhat contracted below the truncate apices, the stigmas 2, rarely 3.

¹⁹ Webbia 4 (1913) 14.

Guam Experiment Station 197, Pago road, January 1912, locally known as *faniti*; Costenoble 1200, in U. S. National Museum.

A species very similar to the Philippine *Freycinetia maxima* Merr., and manifestly closely allied to that species. The fully matured leaves, however, were not collected, but the upper inner ones differ much in shape from those of *F. maxima* Merr., being gradually narrowed upward to the slenderly acuminate apex, not abruptly acuminate, nor are they inflated at the base and with broad thin margins in the basal part as in the Philippine species. The fruits are somewhat smaller.

POTAMOGETONACEAE

DIPLANTHERA Thouars

DIPLANTHERA UNINERVIS (Forsk.) Aschers. in Engl. & Prantl. Nat. Pflanzenfam. Nachtr. 1 (1897) 37; Graebner in Engl. Pflanzenreich 31 (1907) 152.

Zostera uninervis Forsk. Fl. Aeg. Arab. (1775) 159.

Halodule uninervis Aschers. in Boiss. Fl. Orient. 5 (1884) 24; Safford 290.

Diplanthera tridentata Steinh. in Ann. Sci. Nat. II 9 (1838), t. 4, f. B.

McGregor 448.

In shallow salt water, from the Red Sea and tropical East Africa to Polynesia.

POTAMOGETON Linnaeus

POTAMOGETON MARIANNENSIS Cham. & Schlecht. in Linnaea 2 (1827) 228.

Potamogeton natans Linn. var. *mariannensis* Nolte in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee (1901) 162; Graebner in Engl. Pflanzenreich 31 (1907) 45; Safford 360.

G. E. S. 231, Agaña River, January, 1912.

Duplicates of this number have been examined by both A. W. Bennett and C. H. Ostenfeld, who agree on the identification. The status of the species, however, is doubtful. Dr. Ostenfeld writes that it is certainly not a variety of *natans* where it was placed by Nolte and by Grabner and expresses the opinion that it probably belongs to the *fluitans* group in the neighborhood of *Potamogeton nodosus* Poir. (*P. fluitans* subsp. *americanus* C. & S.), and provisionally suggests that its proper place should be as a variety of *Potamogeton fluitans* Roth.

POTAMOGETON LUCENS Linn. Sp. Pl. (1753) 126, var.

Potamogeton gaudichaudii Cham. & Schlecht. in Linnaea 2 (1827) 199.

Potamogeton zizii W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 260, non Koch.

McGregor 424, in fresh water, Agaña River, October, 1911, sterile.

Duplicates of this number have been examined by both A. W. Bennett and C. H. Ostenfeld, who agree on the identity of the specimen with *Potamogeton gaudichaudii* Cham. & Schlecht. I have, however, reported the species under *Potamogeton lucens* Linn., following Mr. Bennett²⁰ who

²⁰ Ann. Conserv. Jard. Bot. Genève 9 (1905) 93.

has examined the type collection in the Delessert Herbarium at Geneva. Dr. Ostenfeld also considers the recently collected specimen to represent a small leaved form of *P. lucens* Linn., and definitely states that it is not *Potamogeton malainus* Miq. (*P. mucronatus* Presl, non Schrad.), as Graebner suggests.

RUPPIA Linnaeus

RUPPIA MARITIMA Linn. Sp. Pl. (1753) 127; Safford 365.

Growing in brackish water, *vide* Safford.

Widely distributed in all warm countries.

HYDROCHARITACEAE

ENHALUS Richard

ENHALUS ACOROIDES (L. f.) Rich. ex Chatin Anat. Pl. Aquat. (1862) 15, t. 6.

Stratiotes acoroides Linn. f. Suppl. (1781) 268.

McGregor 544, G. E. S. 457.

Widely distributed in the Indo-Malayan region in salt water.

HALOPHILA Thouars

HALOPHILA OVATA Gaudich. Bot. Freyc. Voy. (1826) 430, t. 40, f. 1.

Halophila ovalis W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 290, non Hook.

Collected in Guam by Gaudichaud, and otherwise known only from Luzon. Ostenfeld²¹ considers it to be specifically distinct from the more widely distributed *Halophila ovalis* Hook.

GRAMINEAE

MAYDEAE

ZEA Linnaeus

ZEA MAYS Linn. Sp. Pl. (1753) 871; Safford 402.

G. E. S. 103, commonly cultivated, locally known as *mais*.

A native of tropical America, now cultivated in all warm countries.

COIX Linnaeus

COIX LACHRYMA-JOBI Linn. Sp. Pl. (1753) 972; Safford 245.

G. E. S. 188, locally known as *bilen*.

Tropics of both hemispheres, probably a native of India.

ANDROPOGONEAE

DIMERIA R. Brown

DIMERIA CHLORIDIFORMIS (Gaudich.) K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee (1901) 165; Safford 257.

Andropogon chloridiformis Gaudich. Bot. Freyc. Voy. (1826) 412.

Haplachne pilosissima Presl Rel. Haenk. 1 (1828) 235, t. 38.

Dimeria pilosissima Trin. Mém. Acad. Petersb. VI 2 (1833) 336.

G. E. S. 139, in meadows.

A very characteristic species known only from Guam.

²¹ Philip. Journ. Sci. 4 (1909) Bot. 68.

DIMERIA ORNITHOPODA Trin. Fund. Agrost. (1820) 167, *t.* 14.

G. E. S. 247, on banks of streams.

India to Japan southward to Australia; the Guam specimens belong to the variety *tenera* (Trin.) Hack.

MISCANTHUS Andersson

MISCANTHUS FLORIDULUS (Labill.) Warb. ex K. Schum. & Lauterb.
Fl. Deutsch. Schutzgeb. Südsee (1901) 166.

Saccharum floridulum Labill. Sert. Austr. Galed. (1824) 13, *t.* 18.

Miscanthus japonicus Hack. in DC. Monog. Phan. 6 (1889) 107 p. p.

Xiphagrostis floridula Coville ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 400, *pl.* 69.

McGregor 391, *G. E. S.* 356, locally known as *nete* or *neti*.

Formosa to Australia and Polynesia.

In the original description of the genus *Miscanthus* four of the five species are true members of the genus, as generally interpreted. The first species given by Andersson happens to be a representative of the genus *Erianthus*, for which reason Coville would refer the genus *Miscanthus* to *Erianthus* as a synonym, and has proposed the new generic name *Xiphagrostis* for *Miscanthus* of authors, not of Andersson. If an arbitrary rule be adopted by which the first species cited must be adopted as the generic type, then Coville is correct, but I prefer to interpret the genus by the majority of the species, which in this case is clearly four to one. I have accordingly retained *Miscanthus* in the sense that Andersson manifestly intended it.

SACCHARUM Linnaeus

SACCHARUM OFFICINARUM Linn. Sp. Pl. (1753) 54; Safford 366.

G. E. S. 145, the common sugar cane, locally known as *tupo* or *tupu*.

Cultivated in all tropical countries, probably a native of south-eastern Asia.

POLLINIA Trinius

POLLINIA GLABRATA (Brongn.) Trin. in Bull. Acad. Petersb. 1 (1836) 70.

Eulalia glabrata Brongn. Bot. Duperry Voy. (1829) 93, *t.* 19.

Thompson 24.

Otherwise known from New Caledonia and the Society Islands.

ISCHAEMUM Linnaeus

ISCHAEMUM RUGOSUM Salisb. Ic. (1791) 1, *t.* 1.

G. E. S. 213.

India to Malaya.

ISCHAEMUM DIGITATUM Brongn. Bot. Duperry Voy. (1829) 70, *t.* 13,
var. **POLYSTACHYUM** (Presl) Hack. in DC. Monog. Phan. 6 (1889) 233.

Ischaemum polystachyum Presl Rel. Haenk. 1 (1830) 328.

Andropogon mariannae Steud. Synopsis (1854) 382.

The type of the variety was collected in Guam by Haenke. The species is rather common in the Philippines and extends to the Moluccas and New Hannover.

ISCHAEMUM CHORDATUM (Trin.) Hack. ex Warb. in Engl. Bot. Jahrb. 13 (1891) 260.

Spodiopogon chordatus Trin. in Mém. Acad. Petersb. VI 2 (1833) 302.

The type was from the Marianne or Caroline Islands, and the species is known also from New Guinea.

ISCHAEMUM LONGISETUM sp. nov. § *Euischaemum*.

Culmis caespitosis, circiter 50 cm alt., glabris; foliis glabris, lanceolatis, usque ad 12 mm latis; racemis binis, 6 ad 10 cm longis, crassis, articulis pedicellisque 3-angulatis, dense longe fulvo-villosis, glumis omnibus laevis, spiculis pedicellatis magnis, longe aristatis; spiculis sessilibus 7 mm longis, arista 3 ad 3.5 cm longa.

A tufted perennial grass, nearly glabrous, except the inflorescence, about 50 cm high, the culm simple, terete, 1.5 mm in diameter or less, the sheaths rather lax, overlapping, sometimes sparingly ciliate-pilose at their apices; ligule truncate, about 1 mm long; leaf-blades chartaceous, smooth, glabrous, narrowly lanceolate, 8 to 12 cm long, 7 to 12 mm wide, sharply acuminate, base gradually narrowed, sessile or subsessile, each culm with 3 or 4 leaves, the upper gradually shorter, the uppermost sheath usually leafless. Spikes 2, stout, 6 to 10 cm long, long-exserted, the rachis, rachillas, and pedicels of the sessile spikelets densely fulvous-villous with long, rather stiff hairs. Joints of the rachis and the pedicels of the spikelets distinctly 3-angled, 3 to 4 mm long, the angles all ciliate-villous, the hairs 2 to 4 mm long. Sessile spikelet lanceolate, about 7 mm long, with a very long awn. First glume coriaceous, glabrous, smooth, shining, lanceolate, about 7 mm long, 2 mm wide, margins in the lower one-half prominently inflexed, the upper one-half on the back obscurely 5- or 6-nerved, here also manifestly laterally 2-winged, or keeled, the wings or keels narrow, ciliate-hispid, acuminate, the acumen minutely divided. Second and third glumes similar to the first in texture, enclosed by it, the second up to 9 mm long, long and slenderly acuminate, the third shorter. Fourth glume hyaline, its awn 3 to 3.5 cm long, stout, scabrid, twisted, somewhat geniculate. Pedicellate spikelets with pedicels about as long as the joints of the rachis, somewhat thickened upward, 3-angled, the angles villous; callus stout, villous, nearly 1 mm long. First glume coriaceous, glabrous, smooth, shining, oblong-lanceolate, acuminate, about 6 mm long, obscurely 5- or 6-nerved in the upper part, distinctly laterally keeled. Second and third glumes similar to the first in texture, about as long but much narrower. Fourth glume hyaline, its awn slender, twisted, nearly straight, scabrid, 1.7 to 2 cm long.

R. C. McGregor 502, Cabras Island, October, 1911.

A species apparently belonging in the same group with *Ischaemum murinum* Forster, but apparently undescribed. Its rather stout, fulvous-villous spikes and its very long awns are characteristic.

ANDROPOGON Linnaeus

ANDROPOGON ACICULATUS Retz. Obs. 5 (1789) 22; Safford 183.

McGregor 421, *Mrs. Clemens s. n.*, *G. E. S.* 212.

India to China southward to Australia and Polynesia.

ANDROPOGON CONTORTUS Linn. Sp. Pl. (1753) 1045.

McGregor 418, hills back of Piti.

Widely distributed in the warmer parts of both hemispheres.

ANDROPOGON HALEPENSIS (Linn.) Brot. Fl. Lusit. 1 (1804) 89, var.

PROPINQUUS (Kunth) Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 336.

Holcus halepensis Linn. Sp. Pl. (1753) 1047.

Andropogon propinquus Kunth Enum. 1 (1833) 502.

McGregor 491, from cultivated specimens.

The species in both hemispheres, the variety from Ceylon to the Moluccas.

ANDROPOGON SORGHUM (Linn.) Brot. Fl. Lusit. 1 (1804) 88.

Holcus sorghum Linn. Sp. Pl. (1753) 1047.

McGregor 513, from cultivated specimens.

Cultivated in all warm countries.

ANDROPOGON CITRATUS DC. Cat. Hort. Monsp. (1813) 78.

Cymbopogon citratus Stapf in Kew Bull. (1906) 322, 357, cum lamina.

Andropogon nardus Safford in Contr. U. S. Nat. Herb. 9 (1905) 183, non Linn.

I have seen no Guam specimens of this grass, but from Safford's notes there is no doubt but that the plant determined as *Andropogon nardus* is *A. citratus* DC. It is widely cultivated in the Indo-Malayan region.

PANICEAE

PASPALUM Linnaeus

PASPALUM SCROBICULATUM Linn. Mant. 1 (1767) 29; Safford 347.

Paspalum kora Willd.; Presl Rel. Haenk. 1 (1830) 216.

Paspalum cartilagineum Presl l. c.

McGregor 519, *Thompson* 12.

Widely distributed in the warmer parts of both hemispheres.

PASPALUM CONJUGATUM Berg. in Act. Helvet. 7 (1772) 129, t. 8.

G. E. S. 294.

A native of tropical America, now widely distributed in both hemispheres.

(In addition to the above there is also one collection of the American *Paspalum dilatatum* Poir., *McGregor* 516, from cultivated specimens, recently introduced).

DIGITARIA Heister

DIGITARIA SANGUINALIS (Linn.) Scop. Fl. Carn. ed. 2 1 (1772) 52.

Panicum sanguinale Linn. Sp. Pl. (1753) 57.

G. E. S. 220, apparently the form described by Thwaites as the variety *australis*.

Warmer parts of both hemispheres, variable.

DIGITARIA CILIARIS (Retz.) Pers. Syn. 1 (1805) 85.

Panicum ciliare Retz. Obs. 4 (1786) 16.

G. E. S. 214.

Widely distributed in the warmer parts of both hemispheres, frequently considered merely a variety of the preceding.

DIGITARIA STRICTA Gaudich. Bot. Freyc. Voy. (1826) 409, non Roth (1821).

Panicum gaudichaudii Kunth. Rev. Gram. (1830) 385, t. 106; Safford 346.

The type of this was from Guam, and it is not otherwise known. From the descriptions available I suspect that it is but a form of some one of the closely allied species, *D. consanguinea* Gaudich., *D. microbachne* Presl, etc., and have accordingly refrained from transferring Kunth's specific name, the valid one of the species, to *Digitaria*.

DIGITARIA MARIANNENSIS sp. nov.

Planta parva, prostrata, ramosa, ciliato-pilosa; foliis anguste lanceolatis, 1 ad 2 cm longis, numerosis; ramis floriferis erectis, circiter 5 cm altis; spicis binis, 1.5 ad 2.5 cm longis, rhachibus undulatis; spiculis biseriatis, sessilibus, oblongo-lanceolatis, 2.5 mm longis, glumis 1 et 2 obsoletis, 3 plus minusve pilosis, circiter 9-nerviis, margine inflexis, dense ciliato-pilosis, 4 (floriferis) anguste lanceolatis, glabris, laevis, acuminatis.

A small, prostrate, branched, rather densely ciliate-pilose plant, the stems very slender, rooting at the nodes and sending up erect, short, simple, flowering branches about 5 cm in length, the creeping stems up to 40 to 50 cm in length, their internodes 2.5 cm long or less, glabrous. Sheaths ciliate-pilose, rather loose, mostly shorter than the internodes; ligules membranaceous, truncate, about 0.5 mm long; leaf-blades narrowly lanceolate, 1 to 2 cm long, 2.5 to 4 mm wide, acuminate, base somewhat narrowed, both surfaces ciliate-pilose with long white hairs. Spikes in pairs, somewhat exserted, slightly pubescent, 1.5 to 2.5 cm long, few-flowered, usually appressed to each other, their rachises undulate, 0.5 mm wide. Spikelets 2-seriate, sessile, closely appressed to the rachis, alternate in the undulations, oblong-lanceolate, 2.5 mm long. First and second glumes entirely obsolete. Third glume (first and only empty glume for this species) oblong-elliptic, somewhat pilose, obtuse or somewhat acute, about 2.2 mm long, 1 mm wide, 9- to 10-nerved, the

margins inflexed, thin, enwrapping the flowering glume, prominently ciliate-pilose. Flowering glume glabrous, smooth, shining, narrowly lanceolate, acuminate, about 2.5 mm long, 0.5 mm wide, the palea as long as the glume but narrower. Caryopsis oblong, 1 to 1.2 mm long.

R. C. McGregor 372, Cabras Island, October, 1911.

A most peculiar species on account of the reduction of its empty glumes, although manifestly belonging in the genus *Digitaria*. The first and second glumes are entirely obsolete, while the third enwraps the flowering glume by its thin margins. Aside from its peculiar floral character, the species is well characterized by its slender, prostrate, branched stems, which root at the nodes, its ciliate-pilose pubescence, its small leaves, and its very short spikes.

ISACHNE R. Brown

ISACHNE MILIACEA Roth in Roem. & Schult. Syst. 2 (1817) 476.

Panicum minutulum Gaudich. Bot. Freyc. Voy. (1826) 410.

Isachne minutula Kunth Rev. Gram. 2 (1829) t. 117; Safford 287.

McGregor 404, wet places, hills back of Piti.

Widely distributed, tropical Asia to Polynesia. The type of Gaudichaud's species was from Guam, and McGregor's specimen manifestly represents the same form. I can see no valid reason for considering it distinct from *Isachne miliacea* Roth, which is the older name.

PANICUM Linnaeus

PANICUM AMBIGUUM Trin. Mém. Acad. Petersb. VI 3² (1835) 243.

McGregor 488, *G. E. S. 206*.

India to the Liu Kiu Islands southward to Malaya and Polynesia.

PANICUM COLONUM Linn. Syst. ed. 10 (1759) 870.

Echinochloa colona Link Hort. Berol. 2 (1833) 209; Safford 265.

Thompson 13, *McGregor 520*, *G. E. S. 146, 322*, local name *chaguan agaga*. Warmer parts of both hemispheres.

PANICUM DISTACHYUM Linn. Mant. 1 (1767) 183; Safford 345.

G. E. S. 263.

India to Malaya and Polynesia.

PANICUM ISACHNE Roth Nov. Pl. Sp. (1821) 54.

G. E. S. 126, in meadows.

Mediterranean region to India. I am at loss to account for this species in Guam unless it be an accidentally introduced plant. It is quite the same as our Indian material representing Roth's species.

PANICUM LUZONIENSE Presl Rel. Haenk. 1 (1830) 308 ?

G. E. S. 162.

The specimen is larger than the Luzon form, nearly erect, unbranched, and with slightly larger spikelets. It seems to be a luxuriant form of *P. luzoniense* Presl.

Malay Peninsula and the Philippines.

(In addition to the species above considered, there are in the collections

two recently introduced and cultivated species, *Panicum maximum* Jacq., common Guinea grass, *McGregor 490*, and *Panicum molle* Sw., *McGregor 489*).

OPLISMENUS Beauvois

OPLISMENUS COMPOSITUS (Linn.) Beauv. Agrost. (1812) 54.

Panicum compositum Linn. Sp. Pl. (1753) 57.

Thompson 14, *Mrs. Clemens s. n.*, *G. E. S. 198*.

Tropics of both hemispheres.

SETARIA Beauvois

SETARIA FLAVA (Nees) Kunth Rev. Gram. 1 (1829) 46.

Panicum flavum Nees ex Trin. Gram. Panic. (1826) 162.

Setaria glauca var. *aurea* (Hochst.) K. Sch. in K. Sch. & Laut. Fl. Deutsch. Schutzgeb. Südsee (1901) 223.

Chaetochloa glauca var. *aurea* W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 223.

McGregor 383, *G. E. S. 15*, 61.

Warmer parts of both hemispheres.

CENCHRUS Linnaeus

CENCHRUS ECHINATUS Linn. Sp. Pl. (1753) 1050.

McGregor 470.

A native of tropical America, now naturalized in other tropical regions.

STENOTAPHRUM Trinius

STENOTAPHRUM SUBULATUM Trin. in Mém. Acad. Pétersb. VI. Sci. Nat. 3 (1835) 190; Steudel Syn. (1854) 118; Safford 377.

This species was described from Guam material, but I have seen no specimens that agree with the descriptions available. For a time I considered it probable that Trinius' species was the same as *Monerma repens* Beauv., but this is apparently not the case, although the grass enumerated by Safford, judging by the native name cited, probably is *Monerma* and not *Stenotaphrum*.

Mascarene Islands to New Caledonia and the islands off the northeast coast of Australia.

ORYZAE

ORYZA Linnaeus

ORYZA SATIVA Linn. Sp. Pl. (1753) 333; Safford 339.

G. E. S. 248 (long awned variety), *274* (short awned variety), *271* (awnless variety), known respectively as *fae malaquid*, *fae guam*, and *fae papin angle*.

Cultivated in the warmer parts of both hemispheres.

AGROSTIDEAE

SPOROBOLUS R. Brown

SPOROBOLUS INDICUS (Linn.) R. Br. Prodr. (1810) 170.

Agrostis indica Linn. Sp. Pl. (1753) 63.

Thompson 7, *Mrs. Clemens s. n.*, *G. E. S. 87*.

Warmer parts of both hemispheres.

SPOROBOLUS VIRGINICUS (Linn.) Kunth. Rev. Gram. 1 (1829) 67.

Agrostis virginica Linn. Sp. Pl. (1753) 63.

G. E. S. 117, locally known as *jatopa*.

Warmer parts of both hemispheres especially near the sea.

CHLORIDEAE**CYNODON** Persoon**CYNODON DACTYLON** (Linn.) Pers. Syn. 1 (1804) 85.

Panicum dactylon Linn. Sp. Pl. (1753) 58.

Capriola dactylon O. Ktze. Rev. Gen. Pl. 2 (1891) 764; Safford 212.

G. E. S. 237, locally known as *grama*.

Warmer parts of both hemispheres.

DACTYLOCTENIUM Willdenow**DACTYLOCTENIUM AEGYPTIACUM** (Linn.) Willd. Enum. Hort. Berol. (1809) 1029; Safford 255.

Cynorosus aegyptius Linn. Sp. Pl. (1753) 72.

Thompson 4, McGregor 435, G. E. S. 161.

Warmer parts of both hemispheres.

ELEUSINE Gaertner**ELEUSINE INDICA** (Linn.) Gaertn. Fruct. 1 (1788) 8; Safford 268.

Cynosurus indicus Linn. Sp. Pl. (1753) 72.

Thompson 8, G. E. S. 23, 284.

Warmer parts of both hemispheres.

FESTUCEAE**PHRAGMITES** Trinius**PHRAGMITES KARKA** (Retz.) Trin. ex Steud. Nomen. 2 (1840) 324.

Arundo karka Retz. Obs. 4 (1786) 21.

Trichoon roxburghii W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 390.

McGregor 473.

Tropical Africa and Asia to Malaya and Australia.

ERAGROSTIS Host**ERAGROSTIS TENELLA** (Linn.) Roem. & Schult. Syst. 2 (1817) 576.

Poa tenella Linn. Sp. Pl. (1753) 69.

Eragrostis plumosa Link Hort. Berol. 1 (1827) 192.

McGregor 373, 434, Thompson 10, Mrs. Clemens s. n.

Warmer parts of both hemispheres.

ERAGROSTIS PILOSA (Linn.) Beauv. Agrost. (1812) 71; Safford 286.

Poa pilosa Linn. Sp. Pl. (1753) 68.

Admitted on the authority of Safford; widely distributed in the warmer parts of both hemispheres.

CENTOTHECA Desvaux

CENTOTHECA LATIFOLIA (Linn.) Trin. Fund. Agrost. (1820) 141.

Holcus latifolius Linn. Syst. ed. 10 (1759) 1305.

Centotheca lappacea Desv. in Nuov. Bull. Soc. Philom. 2 (1810) 189; Safford 222.

McGregor 357, Thompson 22, G. E. S. 39, 134.

Tropical Asia and Africa through Malaya to Australia and Polynesia.

HORDEAE

MONERMA Beauvois

MONERMA REPENS (Forst.) Beauv. Agrost. (1812) 117.

Rottboellia repens Forst. Prodr. (1797) 9.

McGregor 527, G. E. S. 120, along the seashore, local name *las-ága*.

Along the seashore, Ceylon to Australia and Polynesia.

BAMBUSEAE

BAMBUSA Schreber

BAMBUSA BLUMEANA Schultes f. Syst. Veg. 7² (1830) 1343.

Bambos blumeana Safford 194.

McGregor 542, locally known as *pio titoca*.

Of wide distribution in Malaya, mostly cultivated.

BAMBUSA GLAUDESCENS (Willd.) Sieb. ex Munro in Trans. Linn. Soc. 26 (1868) 89, in syn.

Ludolphia glaucescens Willd. in Ges. Naturf. Fr. Berl. Mag. 2 (1801) 441.

Bambusa nana Roxb. Fl. Ind. 2 (1832) 199.

McGregor 543, in flower.

An introduced species, a native of China; now cultivated in many tropical countries.

BAMBUSA VULGARIS Schrad. in Wendl. Collect. Pl. 2 (1810) 26, t. 47.

McGregor 541, sterile, G. E. S. 374, in flower, locally known as *pio palaoan*.

Tropics of both hemispheres.

This is unquestionably the species that Safford enumerates (p. 195) without specific name, as he cites the same native name that Mr. Thompson has recorded for the flowering specimen. At the same time it is also undoubtedly the species that Gaudichaud mentioned, as growing in Guam, under the name of *Bambusa arundinaria* Willd. My identification of the specimen has been verified by Mr. Gamble.

CYPERACEAE

CAREX Linnaeus

CAREX FUIRENOIDES Gaudich. Bot. Freyc. Voy. (1826) 412; Safford 215.

Carex densiflora Presl Rel. Haenk. 2 (1828) 214; Safford 214.

G. E. S. 279, February, 1912, in flower.

The species is known only from Guam, with a variety in the Philippines. The types of both *Carex fuirenoides* Gaudich. and *C. densiflora* Presl were

from Guam, and the latter has been reduced to Gaudichaud's species by Kükenthal. Presl's description applies very closely to the specimen cited above, so that I consider that there is no doubt but that *Carex densiflora* is an exact synonym of *C. fuirenoides* Gaudich, as the specimen cited above has been determined by Kükenthal.

CYPERUS Linnaeus

CYPERUS COMPRESSUS Linn. Sp. Pl. (1753) 46.

McGregor 381, Mrs. Clemens s. n., G. E. S. 38.

Tropics of the world.

CYPERUS DIFFORMIS Linn. Cent. Pl. 2 (1756) 6; Safford 254.

G. E. S. 45, 236.

All tropical countries.

CYPERUS FLABELLIFORMIS Rottb. Descr. Nov. Pl. (1773) 42.

G. E. S. 210, probably from cultivated specimens.

A native of Africa, now cultivated in most warm countries.

CYPERUS ROTUNDUS Linn. Sp. Pl. (1753) 45; Safford 254.

McGregor 445, 529, along roadsides.

Throughout the tropics.

CLADIUM P. Browne

CLADIUM GAUDICHAUDII W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 230.

Baumea mariscoides Gaudich. Bot. Freyc. Voy. (1826) 417.

Cladium mariscoides F.-Vill. Novis. App. Fl. Filip. (1882) 309, non Torr.

G. E. S. 258, from high land at Asan, January, 1912.

A species known only from Guam; allied to the Hawaiian *Cladium meyenii* (Kunth) Benth. & Hook. f.

Dr. Stapf of the Royal Botanic Gardens at Kew, England writes me that he has come to the conclusion that *Cladium* is better treated as restricted to the American *Cladium jamaicense* and its immediate allies, and that *Baumea* and *Vincentia* deserve generic rank, in which case this species should be known as *Baumea mariscoides* Gaudich.

CLADIUM AROMATICUM sp. nov. § *Eucladium*.

Caespitosum, tenerum, circiter 60 cm altum; foliis angustis, usque ad 40 cm longis, numerosis, in siccitate teretibus, glabris, laevis; paniculis laxis, 10 ad 25 cm longis, ramis primariis paucis, distantibus, adscendentibus; spiculis oblongo-lanceolatis, brunneis, rectis, 5 mm longis, floribus ♂ 1 vel 2; nuculis subglobosis, erostratis, sessilibus.

A densely tufted, glabrous, slender plant about 60 cm high, the stems about 1 mm in diameter, the roots, when fresh, rather strongly aromatic, the root-stock rather stout, the basal sheaths somewhat inflated, rather broad, reddish-brown. Leaves mostly basal, numerous, slender, apparently flat when fresh, involute and terete when dry, 30 to 40 cm long, less than 1 mm in

diameter, glabrous, smooth, those of the stem similar to the basal ones, usually 2 or 3, the uppermost passing into bracts. Panicles rather narrow, 10 to 25 cm long, the primary branches few, distant, 6 cm long or less, ascending. Spikelets oblong-lanceolate, compressed, brown, 5 mm long, in pairs from sheathing bracts, their pedicels 2 to 5 mm long, the bracts 3 to 5 mm long or longer, long-acuminate. Empty glumes 2, subsimilar, lanceolate, acuminate, about 3 mm long, the second one somewhat keeled and wider at the base than the first. Third and usually the fourth glume each with a perfect flower, the glumes about 3.5 mm long, 2 mm wide at the base, acuminate, fifth and sixth glumes about 3 mm long, each, or only the fifth, with a male flower. Ovary small, ovoid; style 1 to 2 mm long, the arms 3, slender, 3 mm long. Stamens 3; filaments 2.5 mm long; anthers linear-oblong, 2.5 mm long, apiculate. Young nutlet globose, sessile, apex rounded, not at all beaked, about 1 mm in diameter, somewhat verruculose.

R. C. McGregor 492, hills southeast of Piti, altitude about 300 meters.

A species manifestly allied to the Philippine *Cladium filiforme* Merr., but larger, with larger panicles, quite glabrous leaves which are not scabrid, and straight, not at all falcate spikelets.

DIPLACRUM R. Brown

DIPLACRUM CARICINUM R. Br. Prodr. (1810) 241.

G. E. S. 245, on banks of streams.

India to China southward to Australia.

ELEOCHARIS R. Brown

ELEOCHARIS CAPITATA (Linn.) R. Br. Prodr. (1810) 225; Safford 267.

Scirpus capitatus Linn. Sp. Pl. (1753) 48.

McGregor 393, *G. E. S. 74, 102*, in meadows.

Widely distributed in the warmer parts of both hemispheres.

The specimens greatly resemble certain specimens in the Herbarium of the Bureau of Science determined as *Eleocharis atropurpurea*, but in essential characters agree with the descriptions of *E. capitata*. There is very little doubt but that it is the same species that was reported from Guam by Presl²² as *Eleocharis atropurpurea*.

ELEOCHARIS PLANTAGINOIDEA (Rottb.) W. F. Wight in Contr. U. S. Nat. Herb. 9 (1905) 268.

Scirpus plantaginoides Rottb. Descr. & Ic. Pl. (1773) 45, t. 15, f. 2.

Eleocharis plantaginea R. Br. Prodr. (1810) 224.

McGregor 469, in marshes.

Widely distributed in the tropics of the Old World.

²² Rel. Haenk. 1 (1828) 196.

FIMBRISTYLIS Vahl

FIMBRISTYLIS DIPHYLLA (Retz.) Vahl Enum. 2 (1806) 289; Safford 176.

Scirpus diphyllus Retz. Obs. 5 (1789) 15.

Fimbristylis affinis Presl Rel. Haenk. 1 (1828) 191 (type from Guam).

Fimbristylis marianna Gaudich. in Freyc. Voy. Bot. (1826) 413 (type from Guam.)

G. E. S. 233, 246, *McGregor* 518, *Thompson* 6. Here I also refer *Thompson* 5, a form with a congested, subglobose inflorescence.

Widely distributed in the tropics of both hemispheres.

FIMBRISTYLIS COMPLANATA (Retz.) Link Hort. Berol. 1 (1827) 292; Safford 276.

Scirpus complanatus Retz. Obs. 5 (1879) 14.

G. E. S. 241, *McGregor* 441, 537, all forms with congested, subglobose inflorescences, but the structure of the spikelets as in typical *Fimbristylis complanata*.

Warmer parts of both hemispheres.

FIMBRISTYLIS GLOBULOSA (Retz.) Kunth Enum. Pl. 2 (1837) 231; Safford 277.

Scirpus globulosus Retz. Obs. 6 (1791) 19.

Fimbristylis torresiana Gaudich. Bot. Freyc. Voy. (1826) 413 (type from Guam).

Fimbristylis globulosa Kunth var. *torresiana* C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 (1893) 645.

I have seen no Guam specimens of this species; India to Malaya and Polynesia.

FIMBRISTYLIS MAXIMA K. Schum. Fl. Kais. Wilh. Land (1889) 24.

McGregor 494, hills southeast of Piti, altitude about 300 meters.

A species known only from Yap, Caroline Islands, and New Guinea. The Guam specimen very closely matches Volken's Yap plant, but otherwise looks like a form of *Fimbristylis schoenoides* Vahl with ample inflorescences.

FIMBRISTYLIS MILIACEA (Linn.) Vahl Enum. Pl. 2 (1806) 287; Safford 277.

Scirpus miliaceus Linn., Syst. ed. 10 (1759) 868.

Fimbristylis littoralis Gaudich. Bot. Freyc. Voy. (1826) 413.

McGregor 517, *G. E. S.* 12, *Thompson* 11, in meadows.

Widely distributed in the warmer parts of both hemispheres.

FIMBRISTYLIS SPATHACEA Roth Nov. Pl. Sp. (1821) 24; Safford 277.

Fimbristylis glomerata Nees in Linnaea 9 (1834) 290.

McGregor 374, *G. E. S.* 187.

Widely distributed in the tropics of both hemispheres.

FIMBRISTYLIS PUBERULA (Michx.) Vahl Enum. 2 (1806) 289; Safford 277.

Scirpus puberulus Michx. Fl. Bor. Am. 1 (1803) 31.

Collected in Guam by Gaudichaud, but I suspect that the identification may be wrong, although the species is credited to the warmer parts of both hemispheres.

FUIRENA Rottboell

FUIRENA UMBELLATA Rottb. Descr. & Ic. Pl. (1773) 70, t. 19, f. 3; Safford 278.

McGregor 399, October, 1911, hills southeast of Piti.

Warmer parts of both hemispheres.

KYLLINGA Rottboell

KYLLINGA BREVIFOLIA Rottb. Descr. & Ic. Pl. (1773) 13, t. 4, f. 3.

McGregor 399, G. E. S. 232.

Tropics of both hemispheres.

KYLLINGA MONOCEPHALA Rottb. 1. c. t. 4, f. 4; Safford 303.

McGregor 440, Mrs. Clemens s. n., Thompson 1, local name *chaguan lemae*.

Warmer parts of both hemispheres.

MARISCUS Gaertner

MARISCUS STUPPEUS (Forst. f.) Merr. in Philip. Journ. Sci. 3 (1908) Bot. 398.

Cyperus stuppeus Forst. f. Prodr. (1786) 89.

Mariscus albescens Gaudich. Bot. Freyc. Voy. (1826) 415.

Cyperus pennatus Lam. Ill. 1 (1791) 144; Safford 254.

Mrs. Clemens s. n., McGregor 418, along the seashore.

Tropical shores from India to Polynesia.

MARISCUS CYPERINUS (Retz.) Vahl Enum. 2 (1806) 377.

Kyllinga cyperina Retz. Obs. 6 (1891) 21.

McGregor 418, near Agaña.

Tropical Asia to Polynesia.

RYNCHOSPORA Vahl

RYNCHOSPORA CORYMBOSA (Linn.) Britton in Trans. N. Y. Acad. Sci. 11 (1892) 84; Safford 366.

Scirpus corymbosus Linn. Cent. Pl. 2 (1756) 7.

Rynchospora aurea Vahl Enum. 2 (1806) 229.

McGregor 461, in open wet places.

Widely distributed in the tropics of both hemispheres.

RYNCHOSPORA RUBRA (Lour.) Makino in Bot. Mag. Tokyo 17 (1903) 180.

Schoenus ruber Lour. Fl. Cochinch. (1790) 52.

Rynchospora wallichiana Kunth Enum. 2 (1837) 289.

McGregor 412.

Tropical Africa and Asia to Japan south to Australia and Polynesia.

SCIRPUS Linnaeus

SCIRPUS ERECTUS Poir. in Lam. Encycl. 6 (1804) 671.

G. E. S. 215, along banks of streams.

Warmer parts of both hemispheres.

SCLERIA Bergius

SCLERIA LAXA R. Br. Prodr. (1810) 240.

McGregor 493, *G. E. S.* 173.

The determination has been made from the description only, and I am not satisfied that it is correct. Australia.

SCLERIA MARGARITIFERA Willd. Sp. Pl. 4 (1805) 312.

McGregor 540.

Apparently quite the same as Volken's Yap specimen, so named. Australia and Polynesia.

TORULINIUM Desvaux

TORULINIUM FERAX (Rich.) Ham. Prodr. Pl. Ind. Occ. (1825) 15.

Cyperus ferax Rich. in Act. Soc. Hist. Nat. Paris 1 (1792) 106.

G. E. S. 305.

Warmer parts of both hemispheres.

PALMAE

ARECA Linnaeus

ARECA CATHECU Linn. Sp. Pl. (1753) 1189; Safford 187, *pl.* 35.

G. E. S. 184, 334, locally known as *pugua*.

Of prehistoric introduction in Guam; widely distributed in the Indo-Malayan region, cultivated in other tropical countries.

ARENGA Labillardière

ARENGA GAMUTO (Houtt.) comb. nov.

Saguerus gamuto Houtt. Handl. 1 (1773) 410, *t.* 4, *f.* 2.

Saguerus pinnatus Wurm. in Verh. Batav. Genoot. 1 (1779) 351; Safford 268.

Arenga saccharifera Labill. Mém. Inst. Paris. 4 (1801) 209.

Occasionally cultivated, introduced from the Philippines *fide* Safford.

Widely distributed in the Malayan region.

COCOS Linnaeus

COCOS NUCIFERA Linn. Sp. Pl. (1753) 1188; Safford 233, *pl.* 33, 34.

McGregor 570, *G. E. S.* 373, locally known as *niyog*.

All tropical countries of prehistoric introduction in Guam; probably of American origin.

COELOCOCCLUS H. Wendland

COELOCOCCLUS AMICARUM (Wendl.) W. F. Wight ex Safford in Contr.

U. S. Nat. Herb. 9 (1905) 244, *pl.* 45, 46.

Sagus amicarum Wendl. in Bot. Zeit. 36 (1878) 115.

Coelococcus carolinensis Dingl. in Bot. Centralbl. 32 (1887) 349.

G. E. S. 257.

Occasionally planted, recently introduced *fide* Safford. A native of the Caroline Islands.

HETEROSPATHE Scheffer

HETEROSPATHE ELATA Scheffer in Ann. Jard. Buitenz. 1 (1876) 162.

G. E. S. 129, 345, locally known as *palma braba*.

The material is fragmentary, and Doctor Beccari, who has examined all the Guam material, has referred it to the genus only. It seems to me to represent the same species as the common form, which is frequently found in cultivation in the Philippines, *Heterospathe elata* Scheff. The species undoubtedly has been introduced into Guam from the Philippines. Moluccas and the Philippines.

NIPA (*Nypa*) Wurm. b.

NIPA FRUCTICANS Wurm. b. in Verh. Batav. Genoot. 1 (1779) 350; Safford 335.

G. E. S. 180, locally known as *nipa*.

Introduced from the Philippines, *fide* Safford; widely distributed along tidal streams in the Indo-Malayan region.

In addition to the palms enumerated above, the following species are cultivated, all recently introduced; *Dictyosperma alba* Wendl. & Drude (*G. E. S. 92, 421*), *Latania loddigesii* Mart. ? (*G. E. S. 272, 401*), *Sabal adansonii* Guerns. (*G. E. S. 107, 344*), *Phoenix sylvestris* (Linn.) Roxb., and *Phoenix dactylifera* Linn. (Safford p. 350).

The palm flora of Guam is represented only by purposely introduced species. The coconut and the betle nut palms are of prehistoric introduction, but all the others have been introduced within historic times.

ARACEAE

ALOCASIA Necker

ALOCASIA MACRORRHIZA (Linn.) Schott in Schott & Endl. Melet. (1832) 18; Safford 179.

Arum macrorrhizum Linn. Sp. Pl. (1753) 965.

G. E. S. 100, locally known as *papao apaca*; *Costenoble 1198*, locally known as *papao atulong*.

A species of wide distribution in the Indo-Malayan region, frequently confused with *Alocasia indica* Schott, which Safford also reports from Guam. I am at the present time of the opinion that *Alocasia indica* Schott is really not specifically distinct from the older *Alocasia macrorrhiza* Schott, although kept separate in Engler's monograph and by other authors.

COLOCASIA Schott

COLOCASIA ESCULENTA (Linn.) Schott in Schott & Endl. Melet. (1832) 18.

Arum esculentum Linn. Sp. Pl. (1753) 965.

Colocasia antiquorum Schott l. c.

Caladium colocasia W. F. Wight in Contr. U. S. Nat. Herb. 9 (1905) 206.

G. E. S. 55, cultivated by the natives, locally known as *sune*.

Cultivated in all tropical countries, where native uncertain.

CYRTOSPERMA Griffith

CYRTOSPERMA CHAMISSONIS (Schott) comb. nov.

Arisacontis chamissonis Schott in Bonplandia 5 (1857) 129.

Cyrtosperma edule Schott in Bonplandia 9 (1861) 267; Engl. Pflanzenreich 48 (1911) 17.

G. E. S. 66, in wet places, Agaña, locally known as *baba*.

New Guinea to the Caroline and Marianne Islands southward and eastward to Fiji, in cultivation.

The Marianne Islands specimen collected by Gaudichaud and cited by Engler was probably from Guam; Safford records the species under its native name, *baba*, thinking it probably a species of *Alocasia*.

As to its proper specific name, if, as Engler intimates, the use of *Apereoa esculenta* Moerenhout (1837) does not constitute a valid publication, then there is no reason why the specific name *chamissonis* should not be adopted.

CALADIUM Ventanat

CLADIUM BICOLOR Vent. Jard. Cels. (1800) *t.* 30.

Costenoble 1182, locally known as *corazon de Santa Maria*; cultivated.

A native of tropical America, now cultivated in most tropical countries.

TYPHONIUM Schott

TYPHONIUM CUSPIDATUM (Bl.) Decne. Herb. Timor. (1835) 39.

Arum cuspidatum Blume Cat. Gew. Buitenz. (1823) 101.

Costenoble 1183, from behind the Government House, Agaña, locally known as *pantaki*.

India to the Philippines and Malaya, probably introduced into Guam from Manila.

FLAGELLARIAACEAE

FLAGELLARIA Linnaeus

FLAGELLARIA INDICA Linn. Sp. Pl. (1753) 333.

G. E. S. 8, local name *bejuco halom-tana*.

Tropical Asia to Malaya.

BROMELIACEAE

ANANAS Adanson

ANANAS SATIVUS Schult. Syst. 7² (1830) 1283.

Bromelia ananas Linn. Sp. Pl. (1753) 285.

Ananas ananas Karst Deutsch. Fl. (1880-83) 446; Safford 183.

Cultivated, *vide* Safford; a native of tropical America, now cultivated in all tropical countries.

COMMELINACEAE

ANEILEMA R. Brown

ANEILEMA MALABARICUM (Linn.) Merr. in Philip. Journ. Sci. 7 (1912) Bot. 232.

Tradescantia malabarica Linn. Sp. Pl. ed. 2 (1763) 412.

Aneilema nudiflorum R. Br. Prodr. (1810) 271.

G. E. S. 167, 217, in waste places.

India to the Liu Kiu Islands southward to Malaya.

COMMELINA Linnaeus

COMMELINA NUDIFLORA Linn. Sp. Pl. (1753) 41; Safford 247.

G. E. S. 115, in waste places.

In all tropical countries, where native uncertain.

COMMELINA BENGHALENSIS Linn. Sp. Pl. (1753) 41; Safford 246.

Common in grass lands, *vide* Safford.

Widely distributed in the tropics of the Old World.

CYANOTIS D. Don

CYANOTIS AXILLARIS (Linn.) D. Don Prodr. Fl. Nepal. (1825) 46; R. & S. Syst. Veg. 7 (1829) 1154.

Commelina axillaris Linn. Sp. Pl. (1753) 42.

McGregor 554.

India to China southward to tropical Australia.

CYANOTIS CRISTATA (Linn.) D. Don Prodr. Fl. Nepal. (1825) 46.

Commelina cristata Linn. Sp. Pl. (1753) 42.

Zygomenes cristata W. F. Wight in Contr. U. S. Nat. Herb. 9 (1905) 404.

Admitted on the authority of Safford's enumeration; of very wide distribution in the tropics.

ZEBRINA Schnizlein

ZEBRINA PENDULA Schnizl. in Bot. Zeit. 7 (1849) 870.

McGregor 571.

A native of tropical America, probably of recent introduction.

LILIACEAE

ALLIUM Linnaeus

ALLIUM CEPA Linn. Sp. Pl. (1753) 300; Safford 179.

The onion is frequently planted in Guam, *vide* Safford.

ALLIUM SATIVUM Linn. Sp. Pl. (1753) 296; Safford 179.

Garlic is commonly cultivated, *vide* Safford.

DIANELLA Lamarck

DIANELLA ENSIFOLIA (Linn.) DC. in Red. Lil. (1802) t. 1; Safford 256.

Dracaena ensifolia Linn. Mant. 1 (1767) 63.

McGregor 523, hills back of Piti.

India to Malaya and Polynesia.

CORDYLINE Royen

CORDYLINE TERMINALIS (Linn.) Kunth Abh. Acad. Berl. (1820) 20.

Asparagus terminalis Linn. Sp. Pl. ed. 2 (1762) 450.

Taetsia terminalis W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 382.

McGregor 385.

Cultivated in all tropical countries, probably a native of Malaya or Polynesia.

SANSEVIERIA Thunberg

SANSEVIERIA ZEYLANICA (Linn.) Willd. Sp. Pl. 2 (1799) 159.

Aloe hyacinthoides var. *zeylanica* Linn. Sp. Pl. (1753) 321.

Cordylina hyacinthoides W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 249.

Cultivated for ornamental purposes, *fide* Safford.

Probably a native of Africa, now cultivated in all tropical countries.

(The common asparagus (*Asparagus officinalis* Linn.) is represented in the collections by a single specimen, *G. E. S. 116*, from recently introduced and cultivated plants.)

AMARYLLIDACEAE

AGAVE Linnaeus

AGAVE VIVIPARA Linn. Sp. Pl. (1753) 323; Safford 176.

McGregor 576 (leaf only), *G. E. S. 473* (bulbils only).

I have followed W. F. Wight in the determination of the Guam plant as *Agave vivipara* Linn., but at the same time it appears also, from my fragmentary material, to be quite the same as *Agave cantala* Roxb. Introduced from Mexico.

CRINUM Linnaeus

CRINUM ASIATICUM Linn. Sp. Pl. (1753) 292; Safford 251.

McGregor 637, along the seashore.

An indigenous species of very wide distribution in the Indo-Malayan region.

CURCULIGO Gaertner

CURCULIGO ORCHOIDES Gaertn. Fruct. 1 (1788) 63, *t. 13*.

McGregor 438, hills back of Piti.

India to Malaya.

I suspect that this is the species reported by Safford (page 295), as *Hypoxis aurea* Lour.

HYMENOCALLIS Salisbury

HYMENOCALLIS LITTORALIS (Jacq.) Salisb. in Trans. Hort. Soc. 1 (1812) 338.

Pancratium littorale Jacq. Select. Stirp. Amer. (1763) 99; Safford 342.

McGregor 632. Introduced from Mexico.

POLIANTHES Linnaeus

POLIANTHES TUBEROSUS Linn. Sp. Pl. (1753) 316; Safford 358.

A native of tropical America, cultivated in Guam *fide* Safford.

ZEPHYRANTHES Herbert

ZEPHYRANTHES ROSEA Lindl. Bot. Reg. 10 (1824) t. 821.

Atamosco rosea Greene in Pittonia 3 (1897) 188; Safford 192.

A native of tropical America, cultivated in Guam, fide Safford.

TACCACEAE

TACCA Forster

TACCA PINNATIFIDA Forst. Char. Gen. (1776) 70, t. 35; Safford 380.

McGregor 514.

Eastern Africa to Polynesia, especially near the sea.

DIOSCOREACEAE

DIOSCOREA Linnaeus

DIOSCOREA ALATA Linn. Sp. Pl. (1753) 1033; Safford 259, pl. 48.

G. E. S. 5, 82, local names *dago*, *dago apaca*. The identifications of both specimens cited have been made by Mr. Burkill.

Widely distributed in the Indo-Malayan region in cultivation.

DIOSCOREA ACULEATA Linn. in Stickm. Herb. Amb. (1754) 23 (non Sp. Pl. (1753) 1033 ?); Safford 259, var. **TILIAEFOLIA** (Kunth)

Prain & Burk. in Elm. Leaf. Philip. Bot. 5 (1913) 1594.

Dioscorea fasciculata Roxb. Fl. Ind. 3 (1832) 801; Safford 260.

Dioscorea fasciculata var. *lutescens* F.-Vill.; Safford l. c.

Dioscorea spinosa Safford 262, pl. 49, non Roxb.

McGregor 293.

Widely distributed in the Indo-Malayan region, the tubers some times with a crown of spiny underground stems (wild forms), or without such stems (cultivated forms).

DIOSCOREA BULBIFERA Linn. Sp. Pl. (1753) 1033.

Dioscorea sativa Linn. l. c.; Safford 1033.

McGregor 396.

Widely distributed in warm countries, cultivated and wild.

Safford includes also *Dioscorea glabra* Roxb., and *D. papuana* K. Schum., as growing in Guam, but the former is more probably a misidentification for *Dioscorea bulbifera* Linn., and the latter a misidentification for *D. aculeata* Linn.

MUSACEAE

MUSA Linnaeus

MUSA PARADISIACA Linn. Sp. Pl. (1753) 1043; Safford 328.

Of prehistoric introduction, as indicated by Safford.

Cultivated in all tropical countries, where native uncertain, but probably tropical Asia.

MUSA TEXTILIS Née in Anal. Cienc. Nat. 4 (1801) 123; Safford 330.

Introduced from the Philippines, and of very local occurrence, fide Safford.

ZINGIBERACEAE

ZINGIBER Adanson

ZINGIBER OFFICINALE Rosc. in Trans. Linn. Soc. 8 (1807) 348.

Zingiber zingiber Karst. Fl. Deutsch. 1 (1905) 488; Safford 403.

Amomum zingiber Linn. Sp. Pl. (1753) 1.

Admitted on the authority of Safford; a native of tropical Asia, now cultivated in all hot countries.

ZINGIBER ZERUMBET (Linn.) Rosc. in Smith Exot. Bot. 2 (1805) 105, t. 112; Safford 403.

Amomum zerumbet Linn.

McGregor 361.

A native of tropical Asia, now widely distributed in Malaya and Polynesia.

CURCUMA Linnaeus

CURCUMA LONGA Linn. Sp. Pl. (1753) 2; Safford 252.

G. E. S. 445, with the local name *mañgo halomtano*, which, according to Safford, properly belongs to *Canna indica*.

A native of tropical Asia, now widely distributed as a cultivated plant, frequently naturalized.

CANNACEAE

CANNA Linnaeus

CANNA INDICA Linn. Sp. Pl. (1753) 1; Safford 212.

McGregor 528, along roadsides.

In all tropical countries, unquestionably a native of tropical America.

CANNA FLACCIDA Salisb. × **IRIDIFLORA** Ruiz. & Pav.

McGregor 358, 480, from cultivated specimens.

Identical with the form commonly cultivated in the Philippines known as *bandera española*; undoubtedly a hybrid between the indicated species.

MARANTACEAE

MARANTA Linnaeus

MARANTA ARUNDINACEA Linn. Sp. Pl. (1753) 2; Safford 318.

G. E. S. 3, locally known as *arorú* or *sagu*.

A native of tropical America, now widely distributed in cultivation.

DONAX Loureiro

DONAX CANNAEFORMIS (Forst. f.) Rolfe in Journ. Bot. 45 (1907) 243.

Thalia cannaeformis Forst. f. Prodr. (1786) 1.

Actoplanes cannaeformis K. Schum. in Engl. Pflanzenreich 11 (1902) 34.

G. E. S. 90, Costenoble 1152, locally known as *sanban*.

Philippines to Java and New Guinea.

ORCHIDACEAE

BULBOPHYLLUM Thouars

BULBOPHYLLUM GUAMENSE Ames supra 13.

McGregor 495, Costenoble 1164.

Endemic.

BULBOPHYLLUM PROFUSUM Ames in Philip. Journ. Sci. 7 (1912) Bot. 128, 137.

McGregor 565.

Otherwise known only from the Philippines.

CALANTHE R. Brown

CALANTHE TRIPLICATA (Willem.) Ames in Philip. Journ. Sci. 2 (1907) Bot. 326.

Orchis triplicata Willem. in Usteri Ann. Bot. 18, (1796) 52.

McGregor 575, Costenoble 1164.

Widely distributed in the Indo-Malayan region.

LIPARIS Richard

LIPARIS GUAMENSIS Ames supra 11.

McGregor 633.

Endemic.

EULOPHIA R. Brown

EULOPHIA MACGREGORII Ames supra 12.

McGregor 631.

Endemic.

EULOPHIA GUAMENSIS Ames supra 12.

McGregor 376.

Endemic.

LUISIA Gaudichaud

LUISIA TERETIFOLIA Gaudich. Bot. Freyc. Voy. (1826) 427, t. 37; Safford 311.

McGregor 311.

Widely distributed in Malaya and Polynesia, type from Guam.

NERVILIA Commerson

NERVILIA ARAGOANA Gaudich. Bot. Freyc. Voy. (1826) 422, t. 35; Safford 331.

Type from Guam, collected by *Gaudichaud*.

Malaya to Samoa.

PHREATIA Lindley

PHREATIA THOMPSONI Ames supra 15.

G. E. S. 321, Costenoble 1174.

Endemic.

COELOGYNE Lindley

COELOGYNE GUAMENSIS Ames supra 11.

G. E. S. 195.

Endemic.

SACCOLABIUM Blume

SACCOLABIUM GUAMENSE Ames supra 15.

G. E. S. 203.

Endemic.

DENDROBIUM Swartz

DENDROBIUM SCOPA Lindl. Bot. Reg. (1842) Misc. 55; Ames supra 13.

G. E. S. 307.

Otherwise known only from the Philippines.

DENDROBIUM GUAMENSE Ames supra 14.

G. E. S. 450.

Endemic.

TAENIOPHYLLUM Blume

TAENIOPHYLLUM *sp. aff. T. obtusum* Bl. ?; Ames supra 16.*Costenoble* 1175.

Perhaps this is the same species as that credited to Guam by Gaudichaud as *Vanilla fasciola* (Forst. f.) Gaudich.=*Taeniophyllum fasciola* (Forst. f. Reichb. f. in Seem. Fl. Vit. (1868) 296 (*Epidendrum fasciola* Forst. f. Prodr. (1786) 60); Safford 381.

CASUARINACEAE

CASUARINA Linnaeus

CASUARINA EUISETIFOLIA Linn. Amoen. Acad. 4 (1759) 143 (*equisetifolia*); Safford 220.*McGregor* 538, *G. E. S.* 431, locally known as *gago*.

A species of wide distribution in Malaya and Polynesia, now cultivated in many other tropical countries.

W. F. Wight credits the combination *Casuarina equisetifolia* to Stickman rather than to Linnaeus, and cites Stickman's Herbarium Amboinense (1754) as the place of publication; there is no such combination made in Stickman's paper, who cites only Rumpf's name *Casaarina litorea*, and in a footnote states "Generis proprii, singularis arbor, Equiseti Structura". In Linnaeus Amoen. Acad. 4 (1759) 143 the name appears as *Casuarina equisetifolia* with a reference to volume 3, plate 57 of Rumphius' Herbarium Amboinense.

PIPERACEAE

PIPER Linnaeus

PIPER GUAHAMENSE C. DC. Prodr. 16¹ (1869) 336; Safford 354.*G. E. S.* 387, locally known as *pupúlo aniti*.Endemic, unless identical with the Polynesian *Piper methysticum*.

PIPER BETLE Linn. Sp. Pl. (1753) 28; Safford 353, *pl.* 68.

Piper mariannum Opiz in Presl Rel. Haenk. 1 (1825) 159.

G. E. S. 190, locally known as *pupúlo*.

Throughout the Indo-Malayan region, in cultivation.

PIPER POTAMOGETONIFOLIUM Opiz in Presl Rel. Haenk. 1 (1828) 156.

Collected in Guam by Haenke, and known only from that Island, unless the plant was erroneously localized, as many of Haenke's were.

PEPEROMIA Ruiz & Pavon

PEPEROMIA PELLUCIDA HBK. Nov. Gen. et Sp. Pl. 1 (1815) 64.

G. E. S. 234.

A native of tropical America, now in most tropical countries.

PEPEROMIA GUAMANA C. De Candolle sp. nov.

Caule glabro, foliis alternis modice petiolatis glabris, limbo elliptico-lanceolato basi et apice acuto, 5-nervio; pedunculis terminalibus axillaribusque glabris petiolos superantibus, spicis adultis limbos paullo superantibus glabris densifloris filiformibus, bracteae pelta orbiculari centro breviter pedicellata, antheris ellipticis filamenta breviter superantibus, ovario emerso ovato paullo infra apicem stigmatifero, stigmate glabro, bacca globosa sessili glandulis asperulata. Caulis inferne e nodis radicans, 2 mm crassus. Limbi in sicco membranacei crebre et minute pellucido-punctulati ac parce pellucido-punctati, usque ad 3.5 cm longi et 2.5 cm lati. Petioli 5 mm, pedunculi fere 10 mm longi. Spicae adultae 3.8 cm longae.

Along the Piti-Agat road, *R. C. McGregor* 629, October, 1911, locally known as *podpod palauan*.

The diagnosis of the following species from the neighboring island of Saipan has kindly been supplied by Mr. DeCandolle:

PEPEROMIA SAIPANA C. DeCandolle sp. nov.

Caule glabro, foliis alternis modice petiolatis, limbo elliptico-lanceolato basi acuto apice obtusiusculo utrinque glabro juniore margine ciliato, 5-nervio, petiolo glabro; pedunculis terminalibus glabris petiolos fere aequantibus, spicis quam limbi paullo brevioribus glabris filiformibus densifloris, bracteae pelta orbiculari centro breviter pedicellata, antheris rotundatis filamenta fere aequantibus, ovario emerso globoso summo apice stigmatifero, stigmate glabro, bacca globosa sessili glandulis asperulata. Caulis fere 1 mm crassus. Limbi in sicco membranacei crebre et minute pellucido-punctulati ac parce pellucido-punctati, 3.3 cm longi 2 cm lati. Petioli 5 mm longi. Spicae 2 cm longae.

Marianne Islands, Saipan, *Fritz* (herb Berol.). N. v. *Popudpud*, medicinalisch; Zunge und Kopfweh.

MORACEAE

ARTOCARPUS Forster

ARTOCARPUS COMMUNIS Forst. Char. Gen. (1776) 191; Safford 189, pl. 7, 27, 36.

Artocarpus incisa Linn. f. Suppl. (1781) 411.

McGregor 428, *G. E. S.* 377, seeded variety known as *dugdug*; *G. E. S.* 171, 389, seedless variety known as *lemae*; McGregor 429, *G. E. S.* 443, seeded variety, its leaves with very narrow lobes and wide deep sinuses, known as *dugdug cahilao*.

Widely distributed, especially in cultivation, in Malaya and Polynesia, cultivated in other tropical countries.

ARTOCARPUS INTEGRIFOLIA Linn. f. Suppl. (1781) 412.

Artocarpus mariannensis Tréc. in Ann. Sci. Nat. III 8 (1847) 114, ex descr.

G. E. S. 207, locally known as *nanca*, its Tagalog name in the Philippines. A native of tropical Asia, now widely distributed in cultivation.

MORUS Linnaeus

MORUS ALBA Linn. Sp. Pl. (1753) 986.

G. E. S. 177, locally known as *seda*, the Spanish name of silk.

A native of subtemperate Asia, now cultivated in all warm countries.

FICUS Linnaeus

FICUS TINCTORIA Forst. f. Prodr. (1786) 76.

G. E. S. 67, Cabras Island, locally known as *hodda*.

Along the seashore, especially on cliffs, Luzon and (?) Formosa southward and eastward through Polynesia.

FICUS MARIANNENSIS sp. nov. § *Urostigma*.

Species *F. infectoriae* simillima et ut videtur affinis. Arbor alta, glabra, ramis ramulisque teretibus; foliis chartaceis, oblongo-ellipticis, usque ad 12 cm longis, breviter obtuse acuminatis, basi rotundatis, obscure 3-plinerviis, nervis primariis utrinque circiter 10, tenuibus, petiolo 1.5 ad 2 cm longo; receptaculis axillaribus, solitariis vel binis, subglobosis ad leviter obovoideis, 8 ad 10 mm diametro, breviter pedunculatis, bracteolis prominentibus, connatis.

A species starting as an epiphyte, eventually assuming a tree-like habit, tall, quite glabrous. Branches and branchlets terete, brownish, smooth or somewhat striate when dry. Leaves alternate, oblong-elliptic, 9 to 12 cm long, 3.5 to 5.5 cm wide, entire, somewhat brownish-olivaceous when dry, shining, of about the same color on both surfaces, smooth, the apex shortly blunt-acuminate, the base rounded, usually abruptly so, sometimes very slightly cordate, rather obscurely 3-plinerved, the

basal pair of nerves not much different from the lateral ones; lateral nerves about 10 on each side of the midrib, slender, not much more prominent than are the intervening secondary ones, anastomosing, the reticulations rather close, not punctulate; petioles 1.5 to 2 cm long; bud-scales lanceolate, acuminate, about 7 mm long. Receptacles axillary, solitary or in pairs, in the axils of leaves or on the branchlets in the axils of recently fallen leaves, apparently fleshy, globose to somewhat obovoid, 8 to 10 mm in diameter, their peduncles stout, 2 to 3 mm long, each receptacle subtended by 3 bracts which are connate by their margins below, forming an involucre about 6 mm in diameter, the lobes broadly rounded, short.

McGregor 384 (type), 400, 564, Mrs. Clemens s. n., locally known as *nunu*.

Probably as closely allied to *Ficus infectoria* as to any other species, but distinguished by its short-peduncled, somewhat larger receptacles, its petioles scarcely jointed. It greatly resembles *Ficus carolinensis* Warb., from Island of Yap, but in that species the bracts are free, not connate. This is apparently the first species enumerated by Safford, p. 275, without specific name.

FICUS SAFFORDII sp. nov. § *Urostigma*.

Arbor glabra; foliis subcoriaceis, ovatis ad oblongo-ovatis, utrinque punctulatis, usque ad 8 cm longis, basi late rotundatis, leviter cordatis, apice breviter obtuse acuminatis, nervis primariis utrinque circiter 10; receptaculis axillaribus, sessilibus, globosis, 5 ad 6 mm diametro.

A glabrous tree, size not indicated, apparently starting as an epiphyte, later assuming a tree-like form, quite glabrous. Branches and branchlets terete, dark reddish-brown, somewhat lenticellate, somewhat wrinkled when dry. Leaves alternate, subcoriaceous, smooth, entire, ovate to oblong-ovate, 5 to 8 cm long, 3 to 5 cm wide, the base broadly rounded, usually very shallowly cordate, the apex shortly and obtusely acuminate, the upper surface dark-colored when dry, slightly shining, rather densely pale-punctulate under a lens, the lower surface a little paler, slightly shining, also punctulate; primary lateral nerves about 10 on each side of the midrib, not much more prominent than are the secondary ones, the reticulations rather close, not prominent; petioles 1.5 to 2.5 cm long; bud-scales lanceolate, acuminate, about 1 cm long. Receptacles axillary, globose, sessile, 5 to 6 mm in diameter, one in each axil, on the ultimate branchlets, usually in the axils of leaves, more rarely in the axils of fallen leaves, each subtended by two broadly ovate, rounded, 2.5 to 3 mm long bracts which are nearly free, their margins slightly connate below.

R. C. McGregor 414, Cabras Island, October, 1911. *G. E. S. 251* may be referable here, or may represent a very closely allied species; the material is not in good condition.

Apparently sufficiently well characterized by its small, sessile 2-bracteate receptacles, and its comparatively broad, puncticulate leaves.

FICUS TENUISTIPULA sp. nov. § *Urostigma*.

Arbor glabra; foliis oblongis vel oblongo-lanceolatis, subcoriaceis, usque ad 8 cm longis, apice breviter obtuse acuminatis, basi rotundatis, distincte sed leviter cordatis, 3- vel obscure 5-nerviis, in siccitate brunneis, subtus obscure puncticulatis, nervis primariis utrinque circiter 8, reticulis densis, distinctis; stipulis membranaceis, usque ad 5 cm longis; receptaculis axillaribus, solitariis, sessilibus, globosis, circiter 6 mm diametro, basi 3-bracteatis, bracteis 2 ad 3 mm diametro, late rotundatis, deorsum plus minusve connatis.

A glabrous tree, apparently starting as an epiphyte. Branches terete, distinctly wrinkled when dry, grayish or reddish-gray, the internodes short, the branchlets similar but not so thick. Leaves somewhat crowded, alternate, oblong to oblong-lanceolate, subcoriaceous, rather dark-green when dry, slightly shining, smooth, of about the same color on both surfaces, the lower surface obscurely puncticulate, 5 to 8 cm long, 1.5 to 2.5 cm wide, entire, apex shortly blunt-acuminate, base very slightly narrowed, rounded, distinctly but slightly cordate, distinctly 3-nerved, sometimes with an additional pair of much shorter nerves, the margins entire; lateral nerves about 8 on each side of the midrib, rather distinct, straight, slender, anastomosing, the secondary nerves fainter, the ultimate reticulations rather dense, distinct, slightly foveolate on both surfaces under a lens; petioles 7 to 10 mm long; stipules membranaceous, deciduous, up to 5 cm long, 2 to 3 mm wide, acuminate, brown when dry, the bud-scales ovate-lanceolate, acuminate, about 8 mm long. Receptacles solitary, axillary, sessile or subsessile, globose, about 6 mm in diameter, subtended by an involucre of three broadly rounded bracts which are 2 to 3 mm in diameter and more or less connate by their margins below.

R. C. McGregor 395, Upi road, October, 1911.

A species in the *Ficus indica* group, characterized by its comparatively small, narrow leaves, its sessile, solitary, rather small receptacles, and especially by its very long, narrow, deciduous stipules.

FICUS PHILIPPINENSIS Miq. in Hook. Lond. Journ. Bot. 7 (1848) 435 ?

Safford & Seale 1014, locally known as *tagete* or *tagete*.

A species described from the Philippines, but which, rightly or wrongly, has been reduced to the Malayan *Ficus decaisnei* Steud. The same species

has been more recently described as *F. confusa* by Mr. Elmer. The Guam specimens are sterile, but agree very closely with our Philippine material.

In addition to the species enumerated above, what I take to be *Cecropia palmata* Willd. is represented in the collection (*G. E. S.* 390), from a cultivated plant at the Experiment Station; a native of tropical America, recently introduced.

URTICACEAE

BOEHMERIA Jacquin

BOEHMERIA NIVEA (Linn.) Gaudich. Bot. Freyc. Voy. (1826) 499.

Urtica nivea Linn. Sp. Pl. (1753) 985.

Boehmeria tenacissima (Roxb.) Gaudich. l. c. 500; Safford 200.

G. E. S. 205, indicated as widely distributed, but probably introduced, although Safford claims it to be indigenous.

A native of tropical Asia, now widely distributed in cultivation.

I do not consider that the differences between *Boehmeria nivea* and *B. tenacissima* are sufficiently distinct to warrant separating them. The Guam plants belongs, undoubtedly, to the latter form. See Robinson, Philippine Journal of Science 7 (1911) Botany 4.

ELATOSTEMA Forster

ELATOSTEMA STENOPHYLLUM sp. nov.

Erectum, glabrum, simplex, 15 ad 25 cm altus; foliis alternis, lanceolatis, utrinque subaequaliter angustatis, usque ad 6 cm longis, apice obtusis vel acutis, basi leviter inaequalibus, acutis, obscure 3-plinerviis, margine leviter distanter crenato-dentatis; inflorescentiis ♂ solitariis, breviter pedunculatis, subglobosis, 5 ad 6 mm diametro; floribus 4-meris.

A simple, erect, glabrous, rather slender plant 15 to 25 cm high, the stems and leaves with numerous cystoliths. Leaves alternate, lanceolate or narrowly lanceolate, chartaceous, 3 to 6 cm long, 5 to 12 mm wide, about equally narrowed at both ends, the apex blunt or acute, not at all acuminate, the base somewhat inequilateral, gradually narrowed, acute, not at all auriculate, the margins slightly and distantly crenate-serrulate; nerves 3, slender, the basal pair leaving the midrib shortly above the base, anastomosing with the distant lateral nerves above; stipules narrowly lanceolate, acuminate, 3 to 4 mm long. Staminate inflorescences axillary or in the axils of fallen leaves, solitary, their peduncles about 2 mm long, the heads depressed-globose, 5 to 6 mm in diameter, the involucre bracts green, oblong to suborbicular, about 3 mm long. Male flowers numerous, the subtending bracteoles usually 3, narrowly obovate-oblong, rounded-truncate, very obscurely ciliate at the apex; pedicels slender, 3 mm long. Calyx-lobes 4, oblong-elliptic, apicu-

late-acuminate, about 2 mm long, 1 mm wide. Anthers 4, about 1 mm long. Rudimentary style none.

Guam Experiment Station 159, November, 1911, river bank at Tolijuice, locally known as tepon agugu.

A species well characterized by its rather slender, simple, erect, stems, and its small, relatively very narrow, lanceolate leaves which are subequally narrowed at both ends, acute or obtuse, not acuminate, slightly inequilateral at the base.

ELATOSTEMA CALCAREUM sp. nov.

Erectum, glabrum, simplex, usque ad 60 m altus; foliis alternis, sessilibus vel brevissime petiolatis, membranaceis, nitidis, usque ad 15 cm longis, inaequilateraliter oblongis, leviter falcatis, basis uno latere acutis, altero auriculato-rotundatis, apice sensim plus minusve obscure acuminatis; inflorescentiis ♂ axillaribus, solitariis, depresso-globosis, 5 ad 7 mm diametro, subsessilibus vel breviter pedunculatis; floribus 4-meris, bracteolis obtusis.

Apparently erect, somewhat fleshy when fresh, the stems simple, unbranched, up to 60 cm high, the basal part somewhat decumbent. Leaves alternate, distinctly inequilateral, subfalcate, oblong, membranaceous, green and shining when dry, 10 to 15 cm long, 3 to 4 cm wide, the apex gradually and not at all prominently acuminate or merely acute, the base strongly inequilateral, one side acute, the other rounded-auriculate, the lobe about 5 mm wide, prominently 3-plinerved, the nerves reaching the apex or nearly so, anastomosing with the distant, few, lateral ones, both surfaces with numerous cystoliths, the lower surface somewhat paler than the upper; petioles very short or none; stipules linear-lanceolate, acuminate, about 5 mm long. Staminate heads axillary, solitary, depressed-globose, 5 to 7 mm in diameter, many-flowered, the peduncles 1.5 mm long or less, the heads sometimes sessile or subsessile; involucre bracts green, broadly ovate, mostly acute, 3 to 4 mm long. Bracteoles at least 5 subtending each flower, very narrowly oblong, obovate, obtuse or truncate, not spurred, minutely ciliate at their apices, about 3 mm long, 0.8 mm wide, the inner ones thinner than the outer. Flowers (buds only) 4-merous, the calyx-lobes membranaceous, elliptic, obtuse or very obscurely and shortly apiculate, 2 mm long.

R. C. McGregor 432, on damp limestone cliffs near the sea at Madqui, October, 1911.

Well characterized by its simple erect stems, its alternate, fairly ample, shining, inequilaterally-oblong, slightly acuminate leaves which are prominently inequilateral at the base.

FLEURYA Gaudichaud

FLEURYA INTERRUPTA (Linn.) Gaudich. Bot. Freyc. Voy. (1826) 497.

Urtica interrupta Linn. Sp. Pl. (1753) 985.

Schychowyska interrupta W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 371.

Safford & Seale 1063, locally known as *pahilolia*. Tropics of both hemispheres, probably a native of the Old World.

FLEURYA RUDERALIS (Forst. f.) Endl. in Ann. Wien. Mus. 1 (1836) 187, t. 19.

Urtica ruderalis Forst. f. Prodr. (1786) 66.

Schychowskyia ruderalis W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 371.

McGregor 419, Mrs. Clemens s. n.

Malay Archipelago to Polynesia.

PIPTURUS Weddell

PIPTURUS ARGENTEUS (Forst. f.) Wedd. in DC. Prodr. 16¹ (1869) 235¹⁹.

Urtica argentea Forst. f. Prodr. (1786) 65.

G. E. S. 110, locally known as *amahadyan*.

Malay Archipelago to Polynesia.

PROCRIS Commerson

PROCRIS PEDUNCULATA (Forst. f.) Wedd. in DC. Prodr. 16¹ (1869) 191.

Elatostema pedunculatum Forst. f. Prodr. (1776) 105, t. 53.

Sciophila torresiana Gaudich. Bot. Freyc. Voy. (1826) 493.

Collected in Guam by Gaudichaud; Malay Archipelago to Polynesia.

PELLIONIA DIVARICATA Gaudich. Bot. Freyc. Voy. (1826) 494; Safford 248, is without description, *vide* Weddell, and is therefore a *nomen nudum* and has no standing.

OLACACEAE

XIMENIA Linnaeus

XIMENIA AMERICANA Linn. Sp. Pl. (1753) 1193; Safford 399.

G. E. S. 375, locally known as *piut* or *piod*.

Along the seashore in the tropics of both hemispheres.

BALANOPHORACEAE

BALANOPHORA Forster

BALANOPHORA PENTAMERA Van Tiegh. in Ann. Sci. Nat. IX 6 (1907) 151.

Planta dioica, glabra, in vivo rubra, pedunculis crassis, erectis, 10 ad 15 cm alta, bracteis imbricatis, late ellipticis, concavis, rotundatis, 1.5 ad 3 cm longis; capitulis ♀ ellipsoideis, 4 ad 5 cm longis, circiter 2 cm diametro, inflorescentiis ♂ racemosis, floribus superioribus (alabastro) subsessilibus vel sessilibus, dense confertis, inferioribus pedicellatis, pedicello 1 cm longo;

sepalis 4, rariter 3, 5 mm longis, reflexis; staminibus 4 connatis, antheris 3 ad 4 mm longis.

A dioecious, rather stout plant, when fresh bright-red (McGregor), orange-scarlet (Safford), the whole plant waxy and translucent (Safford), when dry dark-brown, the peduncles and bracts shining. Roots not seen. Peduncles rather stout, including the inflorescences 10 to 15 cm high, when dry and somewhat flattened out about 1 cm wide, shining. Bracts dark-brown, imbricate, or those of the female rather scattered, broadly elliptic-concave, rounded, 1.5 to 3 cm long, coriaceous, those of the male plant about twice as large as those of the female, much closer and decidedly imbricate. Female inflorescences ellipsoid or narrowly ellipsoid, 4 to 5 cm long, about 2 cm in diameter, apex rounded, with innumerable minute flowers. Ovary narrowly ovoid, 0.3 mm long, the styles slender, 1 mm long, smaller than the rather prominent, narrowly obovoid-clavate bracteoles, the thickened parts of which are 0.4 mm in diameter, rounded, narrowed below into a slender stalk, the whole about 1 mm long. Male flowers racemose, in bud crowded in a dense ovoid head, sessile, the lower ones opening first, in anthesis pedicelled, the pedicels 8 to 10 mm long, somewhat spreading, about 1 mm thick, the upper flowers (in bud) congested and sessile when the lower ones of the same raceme are in anthesis. Calyx-lobes 4, rarely 3, reflexed, coriaceous, oblong-ovate, obtuse, somewhat keeled on the back, about 5 mm long, 2.5 to 2.8 mm wide. Anthers as many as the calyx-lobes, entirely united, the anther mass ellipsoid, 3 to 4 mm long, rounded, about 3 mm in diameter, when fresh white in contrast to the red color of the plant.

R. C. McGregor 566, staminate flowers, Piti-Agat road, October, 1911, *G. E. S. 227*, near Piti, January, 1912.

This species was very briefly characterized by Van Tieghem, but his description is very inadequate. The type was from the Marianne Islands, collected by *Marche* in the year 1889. I at first considered our Guam material to represent a distinct species, as Van Tieghem describes *Balanophora pentamera* as having usually 5-merous flowers, but sometimes with 6 or even 7 sepals, which does not agree with our specimens. The probabilities are, however, that a single species is represented, and while letting my description stand, I have adopted Van Tieghem's specific name.

ARISTOLOCHIACEAE

ARISTOLOCHIA Linnaeus

ARISTOLOCHIA ELEGANS Mast. in Gard. Chron. II 24 (1885) 301.

Occasionally cultivated, *fide* Safford.

A native of tropical America, now cultivated in many tropical countries.

POLYGONACEAE

POLYGONUM Linnaeus

POLYGONUM BARBATUM Linn. Sp. Pl. (1753) 362.

G. E. S. 17, locally known as *mamaca*.

I can see no reason for distinguishing this form from the widely distributed and somewhat variable *Polygonum barbatum* Linn. It is doubtless the species recorded by Safford p. 358, as possibly being the above species.

Tropical Asia to Malaya.

ANTIGONON Endlicher

ANTIGONON LEPTOPUS Hook. & Arn. Bot. Beech. Voy. (1841) 308, t. 69.

G. E. S. 228, locally known as *cadena de amor*.

A native of tropical America, now widely distributed in cultivation.

CHENOPODIACEAE

CHENOPODIUM Linnaeus

CHENOPODIUM ALBUM Linn. Sp. Pl. (1753) 219; Safford 224.

G. E. S. 416, a weed.

Widely distributed in the temperate and tropical regions of both hemispheres, probably originally European.

CHENOPODIUM AMBROSIODES Linn. Sp. Pl. (1753) 219; Safford 224.

G. E. S. 349, locally known as *apasotes*.

A native of Mexico, now widely distributed in the warmer parts of both hemispheres.

AMARANTHACEAE

ACHYRANTHES Linnaeus

ACHYRANTHES ASPERA Linn. Sp. Pl. (1753) 204; Safford 174.

G. E. S. 188.

A weed of wide tropical distribution, probably originating in the eastern hemisphere. It is suspected that the specimen collected in the Marianne Islands (and probably in Guam) by Gaudichaud, and reported by Moquin²⁸ as *Achyranthes fruticosa*, is *A. aspera* Linn.

AMARANTHUS Linnaeus

AMARANTHUS SPINOSUS Linn. Sp. Pl. (1753) 991; Safford 180.

G. E. S. 293, "widely distributed".

All tropical countries, where native uncertain.

AMARANTHUS TRICOLOR Linn. Sp. Pl. (1753) 989.

G. E. S. 362, local name *enmosa viaja*.

The distribution and status of this species is uncertain due to the very complicated synonymy. The Linnean designation *Amaranthus tricolor* has

²⁸ DC. Prodr. 13² (1849) 314.

priority over *Amaranthus gangeticus* L. and *A. melancholicus* L., to both of which it has been reduced by various authors. Probably in cultivation or naturalized in most tropical countries.

AMARANTHUS VIRIDIS Linn. Sp. Pl. ed. 2 (1763) 1405; Safford 181.

G. E. S. 287, local name *caletes apaca*.

All tropical countries, where native uncertain.

In addition to the above species Safford reports also *Amaranthus oleraceus* Linn., apparently collected in Guam only by Gaudichaud. It may be the form commonly cultivated by Chinese gardeners in various parts of the orient as a pot herb.

ALTERNANTHERA Forskal

ALTERNANTHERA VERSICOLOR Regel in Gartenflora (1869) 101.

G. E. S. 295, local name *cucharita*.

Apparently a recent introduction from Manila where it is commonly cultivated and where it is known by the same Spanish name. Apparently a native of tropical America.

CELOSIA Linnaeus

CELOSIA CRISTATA Linn. Sp. Pl. (1753) 205.

G. E. S. 353, native name *christangayo*.

A form so suspiciously like *Celosia argentea* Linn., that I am impressed with the idea that *Celosia cristata* Linn. is only a derived form of *C. argentea*, modified by cultivation. Cultivated in all tropical countries, undoubtedly originating in tropical America.

GOMPHRENA Linnaeus

GOMPHRENA GLOBOSA Linn. Sp. Pl. (1753) 224; Safford 284.

G. E. S. 153, 179, native names *buton apaca*, *buton agaga*.

A native of tropical countries, now cultivated or naturalized in all warm countries.

NYCTAGINACEAE

BOERHAAVIA Linnaeus

BOERHAAVIA DIFFUSA Linn. Sp. Pl. (1753) 3; Safford 201.

G. E. S. 265.

Widely distributed in the tropics of both hemispheres, probably originally American.

BOUGAINVILLEA Commerson

BOUGAINVILLEA SPECTABILIS Willd. Sp. Pl. 2 (1799) 348.

G. E. S. 337, from cultivated plants.

A native of tropical America, now cultivated in most tropical countries.

MIRABILIS Linnaeus

MIRABILIS JALAPA Linn. Sp. Pl. (1753) 177; Safford 325.

McGregor 454, *G. E. S.* 219, in gardens.

A native of Mexico, now cultivated in all warm countries.

PISONIA Linnaeus

PISONIA GRANDIS R. Br. Prodr. (1810) 422.

Pisonia inermis Forst. f. Prodr. (1786) 397, non Jacq.

Pisonia excelsa W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 356, non Blume.

G. E. S. 56 (in flower), 393 (in fruit), locally known as *amumo*.

Widely distributed in Polynesia.

This has been interpreted after Seeman Flora Vitiensis 195. The Guam plants have prominently armed fruits, while *P. excelsa* Blume as I understand it, and as it occurs in the Philippines, has unarmed ones.

AIZOACEAE

MOLLUGO Linnaeus

MOLLUGO PENTAPHYLLA Linn. Sp. Pl. (1753) 89.

Mollugo stricta Linn. l. c. ed. 2 (1762) 131.

G. E. S. 418, May 1912, in waste places.

India to Japan southward to Malaya and Polynesia.

SESUVIUM Linnaeus

SESUVIUM PORTULACASTRUM Linn. Syst. Nat. ed. 10 (1759) 1058.

Portulaca portulacastrum Linn. Sp. Pl. (1753) 446, Herb. Amb. (1754) 28.

G. E. S. 223, along the seashore, local name *chara*.

Tropical and subtropical seashores of both hemispheres.

Mr. W. F. Wight²⁴ credits the name *Sesuvium portulacastrum* to Stickman rather than to Linnaeus, citing Stickman's Herbarium Amboinense (1754), page not indicated, as the place of publication. The species appears in Stickman's paper as *Portulaca portulacastrum*, on page 28, not as *Sesuvium*. *Sesuvium portulacastrum*, however, does appear in Linnaeus' reprint of Stickman's paper,²⁵ but in this case the authority is Linnaeus, not Stickman.

PORTULACACEAE

PORTULACA Linnaeus

PORTULACA OLERACEA Linn. Sp. Pl. (1753) 445; Safford 359.

G. E. S. 226.

In all temperate and tropical regions.

PORTULACA QUADRIFIDA Linn. Mant. 1 (1767) 73; Safford 359.

McGregor 635.

Widely distributed in the tropics of the Old World.

CERATOPHYLLACEAE

CERATOPHYLLUM Linnaeus

CERATOPHYLLUM DEMERSUM Linn. Sp. Pl. (1753) 992.

McGregor 425, Agaña River.

In fresh water in the temperate and tropical regions of both hemispheres.

²⁴ Contr. U. S. Nat. Herb. 9 (1905) 373.

²⁵ Linn. Amoen. Acad. 4 (1759) 136.

MENISPERMACEAE

TINOSPORA Miers

TINOSPORA HOMOSEPALA Diels in Philip. Journ. Sci. 8 (1913) Bot. 158.

McGregor 536, G. E. S. 479.

Known only from Guam.

ANONACEAE

ANONA Linnaeus

ANONA MURICATA Linn. Sp. Pl. (1753) 536; Safford 184, pl. 33.

G. E. S. 275, 346, locally known as *laguaná*.

A native of tropical America, now cultivated in all tropical countries.

ANONA SQUAMOSA Linn. l. c. 537; Safford 185, pl. 34.

G. E. S. 365, locally known as *atis*.

Distribution the same as *A. muricata*.

ANONA RETICULATA Linn. l. c. 537; Safford 184.

G. E. S. 430, McGregor 510, locally known as *anonas*.

Distribution the same as *A. muricata*.

CANANGIUM Baillon

CANANGIUM ODORATUM (Lam.) Baill. ex King in Journ. As. Soc. Beng.

61^a (1892) 41; Koord. & Val. Boomsoort Java 9 (1903) 279; W. F.

Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 209.

Uvaria odorata Lam. Encycl. 1 (1785) 595.

Cananga odorata Hook. f. & Th. Fl. Ind. 1 (1855) 130.

G. E. S. 140, locally known as *ilang-ilang*, its Philippine name.

Of wide distribution in the Indo-Malayan and Polynesian regions, often only in cultivation. Undoubtedly introduced into Guam from the Philippines.

W. F. Wight makes the new combination *Canangium odoratum* in 1905, overlooking the fact that the transfer of the specific name to *Canangium* has been made at least twice previous to that date.

POLYALTHIA Blume

POLYALTHIA MARIANNAE (Safford) comb. nov.

Papualthia mariannae Safford in Journ. Wash. Acad. Sci. 2 (1912) 19, fig. 1, 2.

G. E. S. 209, distributed as *Orophea*, *Costenoble* s. n., *Palomo* 1180, the last two in the U. S. National Herbarium.

After an examination of the flowering material loaned to me by Mr. Safford, I can see no particular reason for considering this species other than a representative of the genus *Polyalthia*. My original Guam material consisted of fruiting specimens only, and at the time it was studied I decided that it was probably a species of *Orophea*. The flowers, however, impress me as being those of typical *Polyalthia*.

LAURACEAE .

CASSYTHA Linnaeus

CASSYTHA FILIFORMIS Linn. Sp. Pl. (1753) 35; Safford 219.

McGregor 444, G. E. S. 452.

Tropics of both hemispheres, especially near the sea.

PERSEA Plumier

PERSEA AMERICANA Mill. Gard. Dict. ed. 8 (1768).

Persea gratissima Gaertn. Fruct. 3 (1805) 222.

G. E. S. 259, in flower, February, 1912.

The avocado, recently introduced, a native of tropical America.

HERNANDIACEAE

HERNANDIA Linnaeus

HERNANDIA PELTATA Meisn. in DC. Prodr. 15¹ (1864) 263; Safford 293.

G. E. S. 65, 398, locally known as *nonag* or *nonac*.

Widely distributed along the shores of the Indian and Pacific oceans.

CRUCIFERAE

BRASSICA Linnaeus

BRASSICA JUNCEA (Linn.) Coss. in Bull. Soc. Bot. Fr. 6 (1859) 609; Safford 202.

Sinapis juncea Linn. Sp. Pl. (1753) 668.

G. E. S. 178, in gardens, local name *mostaza*.

A native of Asia, now widely distributed in all warm countries, wild or cultivated.

Safford enumerates also *Brassica napa* Linn., the turnip, and *B. oleracea* Linn., the cabbage, but states that neither thrives in Guam.

RAPHANUS Linnaeus

RAPHANUS SATIVUS Linn. Sp. Pl. (1753) 669.

G. E. S. 315, cultivated.

Cultivated in all warm countries.

CAPPARIDACEAE

CAPPARIS Linnaeus

CAPPARIS CORDIFOLIA Lam. Encycl. 1 (1785) 609; Merr. in Philip. Journ. Sci. 7 (1912) Bot. 235.

Capparis mariana Jacq. Hort. Schoenbr. 1 (1797) 109; Safford 212.

G. E. S. 280, native name *acaparas* (corruption of Spanish *alcaparro*).

An endemic form, considered by K. Schumann to be only a variety of the European *Capparis spinosa* Linn.

CLEOME Linnaeus

CLEOME VISCOSA Linn. Sp. Pl. (1753) 672; Safford 231.

McGregor 482, G. E. S. 286, locally known as *mongos paloma*.

A pantropic weed of uncertain origin.

MORINGACEAE

MORINGA Burman

MORINGA OLEIFERA Lam. Encycl. 1 (1785) 398.

Guilandina moringa Linn. Sp. Pl. (1753) 381.

Moringa moringa Millsp. Field Columb. Mus. Bot. 1 (1902) 490; Safford 327 pl. 58.

G. E. S. 320, 342, locally known as *marunggai*.

Probably a native of India, now cultivated in all tropical countries.

CRASSULACEAE

BRYOPHYLLUM Salisbury

BRYOPHYLLUM PINNATUM (Lam.) Kurz in Journ. As. Soc. Beng. 40^a (1871) 52; Safford 203.

Cotyledon pinnata Lam. Encycl. 2 (1786) 171.

G. E. S. 361, local name *siempre viva de Manila*.

In all tropical countries, probably a native of the eastern hemisphere.

ROSACEAE

This family is represented only by introduced and cultivated species, two species of the rose, reported by Safford, page 365, *Rosa indica* Linn. (*G. E. S. 327*), and *Rosa damascena* Mill. (*G. E. S. 101*). To the two representatives of the family recorded by Safford may now be added the loquat, a native of Japan, *Eriobotrya japonica* (Thunb.) Lindl., *G. E. S. 51*.

LEGUMINOSAE

MIMOSOIDEAE

ENTEROLOBIUM Martius

ENTEROLOBIUM SAMAN (Jacq.) Prain ex King in Journ. As. Soc. Beng. 66^a (1897) 252.

Mimosa saman Jacq. Fragm. (1800-09) 15, t. 9.

Pithecolobium saman Benth. in Hook. Lond. Journ. Bot. 3 (1844) 216; Safford 357.

G. E. S. 382, from cultivated specimens, first introduced by Mr. Safford.

A native of tropical America, now widely distributed in cultivation.

PITHECOLOBIUM Martius

PITHECOLOBIUM DULCE (Roxb.) Benth. in Hook. Lond. Journ. Bot. 3 (1841) 216; Safford 356.

Mimosa dulcis Roxb. Pl. Coromand. 1 (1795) 67, t. 99.

G. E. S. 262, 388, locally known as *camachili*.

A native of tropical America, now widely distributed in cultivation.

ALBIZZIA Durazzini

ALBIZZIA LEBBECK (Linn.) Benth. in Hook. Lond. Journ. Bot. 3 (1844) 87.

Mimosa lebeck Linn. Sp. Pl. (1753) 516.

G. E. S. 380, from cultivated specimens.

A native of tropical Africa or Asia, now widely distributed in cultivation.

ACACIA Willdenow

ACACIA FARNESIANA (Linn.) Willd. Sp. Pl. 4² (1805) 1083; Safford 173.

Mimosa farnesiana Linn. Sp. Pl. (1753) 521.

G. E. S. 216, locally known as *aroma*, also its common name in the Philippines.

A native of tropical America, now in all warm countries.

LEUCAENA Benth

LEUCAENA GLAUCA (Linn.) Benth. in Hook. Lond. Journ. Bot. 4 (1842) 416; Safford 308.

Mimosa glauca Linn. Sp. Pl. (1753) 520.

McGregor 455, *G. E. S.* 335, locally known as *tangan-tangan*.

A native of tropical America, now in all tropical countries.

ADENANTHERA Linnaeus

ADENANTHERA PAVONINA Linn. Sp. Pl. (1753) 384; Safford 175.

G. E. S. 354, locally known as *colales* or *culalis*.

A native of tropical Asia, now widely distributed in cultivation.

ENTADA Adanson

ENTADA PHASEOLOIDES (Linn.) comb. nov.

Lens phaseoloides Linn. in Stickman Herb. Amb. (1754) 18; Amoen. Acad. 4 (1859) 128; Safford 308, *pl.* 56.

Mimosa entada Linn. Sp. Pl. (1753) 518.

Mimosa scandens Linn. l. c. ed. 2 (1763) 1501.

Entada scandens Benth. in Hook. Lond. Journ. Bot. 4 (1842) 332.

McGregor 499, *G. E. S.* 366, locally known as *bayog*.

Widely distributed in the tropics of both hemispheres.

Under our present rules of botanical nomenclature *Lens phaseoloides* supplies the oldest valid specific name for this species, that supplied by *Mimosa entada* Linn. (1753) being invalidated by the rule forbidding duplicate binomials. The publication of *Lens phaseoloides* in 1754 is valid, the only question in regard to it being whether Linnaeus is its author, or Stickman. Mr. W. F. Wight has proposed to adopt not only the specific designation *phaseoloides*, but would also replace the generic name *Entada* by *Lens*. While strictly considered *Lens* may be the oldest generic designation, still there are very serious objections to its use as I have already pointed out.²⁹ As to the genus *Lens* the species *Lens phaseoloides* may be interpreted as its type only through a peculiar combination of circumstances.

²⁹ Philip. Journ. Sci. 5 (1910) Bot. 33.

The generic designation *Lens* (Tourn.) Linn. dates from 1735, and manifestly *Lens phaseoloides*, then entirely unknown to botanists, could not be its type. It so happens, however, that the combination *Lens phaseoloides* is the first one to be made in the genus after the establishment of binomial nomenclature. *Lens* (1735) was based on European species entirely different generically from the plant under discussion, and only our rules which state that binomial nomenclature shall commence with the publication of the *Species Plantarum* (1753), the genera to be interpreted by edition 5 of the *Genera Plantarum* (1754) permit the illogical typification of the genus *Lens* by the species *Lens phaseoloides*. If there is any need of a generic list of *nomina conservanda*, the present case should certainly be included. The author is in sympathy with the idea of generic types, but in this case the proposition to consider *Lens phaseoloides* the type of the genus *Lens* impresses me as exceedingly illogical, for the species was entirely unknown to botanists, at least under this name, until about 20 years after the genus was originally proposed.

CAESALPINIOIDEAE

CYNOMETRA Linnaeus

CYNOMETRA BIJUGA Spanoghe in *Linnaea* 15 (1841) 201; Miq. *Fl. Ind. Bat.* 1¹ (1855) 78.

McGregor 474, *G. E. S.* 44, 314.

Frequently confused with *Cynometra ramiflora* Linn., from which it is apparently specifically distinct; widely distributed in tropical Asia, extending from India to Malaya and the Caroline Islands.

TAMARINDUS Linnaeus

TAMARINDUS INDICA Linn. *Sp. Pl.* (1753) 34; Safford 383, *pl.* 66.

G. E. S. 148, 454, locally known as *camalindo*.

A native of tropical Africa, now cultivated in all tropical countries.

INTSIA Thouars

INTSIA BIJUGA (Colebr.) O. Ktze. *Rev. Gen. Pl.* 1 (1891) 192; Safford 297, *pl.* 54.

G. E. S. 323, 445, locally known as *ifil* or *ift*.

Near the sea, eastern Africa through Malaya to Polynesia.

BAUHINIA Linnaeus

BAUHINIA MONANDRA Kurz in *Journ. As. Soc. Beng.* 42³ (1873) 73.

G. E. S. 136, locally known as *mariposa*.

Probably a native of tropical America, now found in most tropical countries in cultivation. This is probably the species mentioned by Safford (p. 196), without specific name.

BAUHINIA TOMENTOSA Linn. *Sp. Pl.* (1753) 375.

G. E. S. 72, 381, locally known as *mariosa* or *flor de mariposa*.

A native of India, now widely distributed in cultivation. This is probably the second species mentioned by Safford (p. 197) as resembling the figure of *Bauhinia blancoi* in Blanco's *Flora de Filipinas*.

A third species is represented in the collection, from cultivated plants, but the material is not in condition for determination.

CASSIA Linnaeus

CASSIA ALATA Linn. Sp. Pl. (1753) 377.

Herpetica alata Raf. Fl. Tellur. (1838) 123; Safford 293.

G. E. S. 50, locally known as *acapulco*.

A native of tropical America, now in all tropical countries.

CASSIA FISTULA Linn. Sp. Pl. (1753) 377; Safford 217.

G. E. S. 402, locally known as *cañafistula*.

A native of tropical Asia, now widely distributed in cultivation.

CASSIA MIMOSOIDES Linn. Sp. Pl. (1753) 379; Safford 218.

Admitted on the authority of Safford, as it is not represented in our Guam collections; India to Japan southward to Australia.

CASSIA OCCIDENTALIS Linn. Sp. Pl. (1753) 377; Safford 218.

McGregor 483.

A native of tropical America, now a weed in all tropical countries.

CASSIA SOPHERA Linn. Sp. Pl. (1753) 379; Safford 219.

G. E. S. 49, locally known as *amot-tomaga*.

Same distribution as the preceding.

CASSIA TORA Linn. Sp. Pl. (1753) 376; Safford 219.

G. E. S. 63, *McGregor 486*, *Thompson 16*, locally known as *amot-tomaga carabao*.

Same distribution as the two preceding.

DELONIX Rafinesque

DELONIX REGIA (Boj.) Raf. Fl. Tellur. 2 (1836) 92; Safford 256.

Poinciana regia Boj. in Hook. Mag. 56 (1829) t. 2884.

G. E. S. 408, locally known as *arbol del fuego*.

A native of Madagascar, now cultivated in all tropical countries.

CAESALPINIA Linnaeus

CAESALPINIA GLABRA (Mill.) Merr. in Philip. Journ. Sci. 5 (1910) Bot. 54.

Guilandina glabra Mill. Gard. Dict. ed. 8 (1768) No. 3.

Caesalpinia bonduc Roxb. Fl. Ind. 2 (1832) 362, non *Guilandina bonduc* Linn.

G. E. S. 142, locally name *pacao*.

Tropics of the world.

CAESALPINIA CRISTA Linn. Sp. Pl. (1753) 380.

Guilandina crista Small Fl. Southeast. U. S. (1904) 591; Safford 288, pl. 51.

Admitted on the authority of Safford who cites the same native name as that given for the preceding species.

Range of the preceding species.

CAESALPINIA PULCHERRIMA (Linn.) Sw. Obs. (1791) 166.

Poinciana pulcherrima Linn. Sp. Pl. (1753) 380; Safford 358.

G. E. S. 29, 411, locally known as *caballero*.

A native of tropical America, now in all tropical countries, cultivated or wild.

CAESALPINIA SAPPAN Linn. Sp. Pl. (1753) 381.

Biancaea sappan Todaro Hort. Bot. Pan. 1 (1876) 3; Safford 198.

McGregor 365, *G. E. S.* 863.

Widely distributed in the Indo-Malayan region and in other tropical countries.

PELTOPHORUM Vogel**PELTOPHORUM INERME** (Roxb.) Naves in Blanco Fl. Filip. ed. 3, pl. 335, ex F.-Vill. Novis. App. (1880) 69.

Caesalpinia inermis Roxb. Fl. Ind. 2 (1832) 367.

Peltophorum ferrugineum Benth. Fl. Austral. 2 (1864) 279.

G. E. S. 413, origin not indicated, but probably from cultivated specimens.

Widely distributed in the Malayan region, frequently cultivated for ornamental purposes.

PAPILIONATAE**SOPHORA** Linnaeus**SOPHORA TOMENTOSA** Linn. Sp. Pl. (1753) 373; Safford 376.

G. E. S. 81, 225, along the seashore.

Tropics of both hemispheres near the sea.

CROTALARIA Linnaeus**CROTALARIA QUINQUEFOLIA** Linn. Sp. Pl. (1753) 716; Safford 251.

McGregor 557, local name *cascabeles* or *cascanetas*.

Widely distributed in the Indo-Malayan region.

CROTALARIA SALTIANA Andr. Bot. Rep. (1811) t. 648.

Crotalaria striata DC. Prodr. 2 (1825) 131.

G. E. S. 296, 419.

Widely distributed in the tropics of both hemispheres, probably a native of tropical America.

MEDICAGO Linnaeus**MEDICAGO DENTICULATA** Willd. Sp. Pl. 3 (1803) 1414.

G. E. S. 229, in meadows.

A native of Europe, now widely distributed in the north temperate zone and apparently of recent introduction in Guam.

(Mr. Safford records alfalfa, *Medicago sativa* Linn., with the statement that attempts to introduce it have been unsuccessful.)

INDIGOFERA Linnaeus**INDIGOFERA SUFFRUTICOSA** Mill. Gard. Dict. ed. 8 (1768) No. 2.

Indigofera anil Linn. Mant. 2 (1771) 272; Safford 296.

McGregor 436, hills back of Piti.

A native of tropical America, now in the tropics of both hemispheres.

INDIGOFERA TINCTORIA Linn. Sp. Pl. (1753) 751; Safford 296.

Admitted on the authority of Safford, not represented in our Guam collections; widely distributed in the tropics of both hemispheres.

TEPHROSIA Persoon**TEPHROSIA MARIANA** DC. Prodr. 2 (1825) 253.

Cracca mariana O. Ktze. Rev. Gen. Pl. 1 (1891) 175; Safford 250.

The type was from the Marianne Islands, probably Guam; the species is not represented in our collections.

SESBANIA Scopoli**SESBANIA GRANDIFLORA** (Linn.) Pers. Syn. 2 (1807) 316.

Robinia grandiflora Linn. Sp. Pl. (1753) 722.

Agati grandiflora Desv. Journ. Bot. 1 (1813) 120, t. 4, f. 6; Safford 175.

G. E. S. 168, 269, locally known as *caturay*, its Tagalog name in the Philippines.

Mascarine Islands, tropical Asia, Malaya, and Polynesia, frequently only planted.

AESCHYNOMENE Linnaeus**AESCHYNOMENE INDICA** Linn. Sp. Pl. (1753) 713; Safford 175.

G. E. S. 364.

Widely distributed in the tropics of the Old World.

ARACHIS Linnaeus**ARACHIS HYPOGAEA** Linn. Sp. Pl. (1753) 741; Safford 186.

G. E. S. 9, locally known as *cacahuete* or *cacaguate*.

A native of tropical America, now cultivated in all warm countries.

ZORNIA Gmelin**ZORNIA DIPHYLLA** (Linn.) Pers. Syn. 2 (1807) 318; Safford 404.

Hedysarum diphyllum Linn. Sp. Pl. (1753) 747.

Safford & Seale 1123.

Widely distributed in the tropics, probably a native of tropical America.

DESMODIUM Desvaux**DESMODIUM GANGETICUM** (Linn.) DC. Prodr. 2 (1825) 327.

Hedysarum gangeticum Linn. Sp. Pl. (1753) 746.

Meibomia genetica O. Ktze. Rev. Gen. Pl. 1 (1891) 196; Safford 321.

McGregor 452, *Thompson* 23, *G. E. S.* 113, *Mrs. Clemens* s. n., locally known as *tomates aniti*.

Through the tropics of the Old World, introduced in the West Indies.

DESMODIUM HETEROPHYLLUM (Willd.) DC. Prodr. 2 (1825) 334.

Hedysarum heterophyllum Willd. Sp. Pl. 3 (1800) 1201.

G. E. S. 319, locally known as *apsom* or *agsom*.

Tropical Asia to Malaya.

DESMODIUM TRIFLORUM (Linn.) DC. Prodr. 2 (1825) 334.*Hedysarum triflorum* Linn. Sp. Pl. (1753) 749.*Meibomia triflora* O. Ktze. Rev. Gen. Pl. 1 (1891) 197; Safford 321.

McGregor 506.

Widely distributed in the tropics of both hemispheres.

DESMODIUM UMBELLATUM (Linn.) DC. Prodr. 2 (1825) 325.*Hedysarum umbellatum* Linn. Sp. Pl. 2 (1753) 747.*Meibomia umbellata* O. Ktze. Rev. Gen. Pl. 1 (1891) 197.McGregor 439, *G. E. S.* 437, locally known as *palaga hilitai*.

Mascarene Islands to tropical Asia, Malaya, Australia, and Polynesia.

ALYSCICARPUS Necker**ALYSCICARPUS NUMMULARIFOLIUS** (Linn.) DC. Prodr. 2 (1825) 353.*Hedysarum nummularifolium* Linn. Sp. Pl. (1753) 746.McGregor 362, *G. E. S.* 121.

Widely distributed in the Indo-Malayan region, introduced in tropical America.

DALBERGIA Linnaeus f**DALBERGIA CONDENATENSIS** (Dennst.) Prain in Journ. As. Soc. Beng. 70² (1901) 49.*Cassia condenatensis* Dennst. Schl. zum Hort. Malabar. (1818) 32.*Dalbergia torta* Grah. in Wall. Cat. (1832) No. 5873.*G. E. S.* 75, 370.

India to China southward to Australia and Polynesia near the sea.

DERRIS Loureiro**DERRIS TRIFOLIATA** Lour. Fl. Cochinch. (1790) 433.*Derris uliginosa* Benth. Pl. Jungh. (1852) 252.

McGregor 503, along the seashore, Cabras Island.

Along the seashore, eastern Africa, India, through Malaya to Polynesia.

INOCARPUS Forster**INOCARPUS EDULIS** Forst. Char. Gen. (1776) 66, *t.* 33.*Bocoa edulis* Baill. Adansonia 9 (1868-70) 237; Safford 199.*G. E. S.* 77 in flower, 399 in fruit, locally known as *buoy*.

Malay Archipelago to Polynesia, frequently only planted.

ABRUS Linnaeus**ABRUS PRECATORIUS** Linn. Syst. Nat. ed. 12 (1767) 472.*Glycine abrus* Linn. Sp. Pl. (1753) 753.*Abrus abrus* W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 171, *pl.* 31.*G. E. S.* 135, Mrs. Clemens s. n., locally known as *calales halomtana*.

Probably a native of India, now in all tropical countries.

CLITORIA Linnaeus

CLITORIA TERNATEA Linn. Sp. Pl. (1753) 753; Safford 232.

G. E. S. 252, 135, locally known as *paokeke*.

Tropics of the world, probably a native of tropical America.

TERAMNUS Swartz

TERAMNUS LABIALIS (Linn. f.) Spreng. Syst. 3 (1826) 235.

Glycine labialis Linn. f. Suppl. (1774) 325.

G. E. S. 363, locally known as *chaguan cacaguates*.

Tropics of both hemispheres.

ERYTHRINA Linnaeus

ERYTHRINA INDICA Lam. Encycl. 2 (1785) 391; Safford 269.

G. E. S. 357, locally known as *gaogao*.

Along the seashore, tropical Asia to Malaya and Polynesia.

STRONGYLODON Vogel

STRONGYLODON LUCIDUS (Forst.) Seem. Fl. Vit. (1865-68) 61.

Glycine lucida Forst. Prodr. (1786) 51.

McGregor 553, Upi road, in forests.

Ceylon to Polynesia.

MUCUNA Adanson

MUCUNA GIGANTEA (Willd.) DC. Prodr. 2 (1825) 405.

Dolichos giganteus Willd. Sp. Pl. 2 (1801) 1041.

Stizolobium giganteum Spreng. Syst. Cur. Post. (1827) 281; Safford 378.

McGregor 556, G. E. S. 410, locally known as *bayogo dikiki*.

Near the sea, tropical Asia to Polynesia.

MUCUNA PRURIENS (Linn.) DC. Prodr. 2 (1825) 405.

Dolichos pruriens Linn. in Stickm. Herb. Amb. (1754) 23.

Stizolobium pruriens Medic. Vorles. Churpf. Phys. Ges. 2 (1787) 399; Safford 378.

Admitted on the authority of Safford; a species otherwise definitely known only from the Philippines and the Moluccas.

CANAVALIA DeCandolle

CANAVALIA LINEATA (Thunb.) DC. Prodr. 2 (1825) 404.

Dolichos lineatus Thunb. Fl. Jap. (1784) 280.

Canavalia obtusifolia DC. Prodr. 2 (1825) 404; Safford 211.

G. E. S. 127, 147, along the seashore.

Throughout the tropics along sandy beaches.

CANAVALIA TURGIDA Grah. in Wall. Cat. (1832) No. 5534; Miq. Fl.

Ind. Bat. 1^a (1855) 215.

G. E. S. 358, locally known as *ladosung tasai*.

Near the sea, India to Malaya and Polynesia.

CANAVALIA MEGALANTHA sp. nov.

Species *C. turgidae* Grah. simillima et ut videtur affinis, differt caulibus distincte lignosis, circiter 1 cm diametro, floribus majoribus, 4 ad 4.5 cm longis:

A woody vine, entirely glabrous, the stems terete, firm, 7 to 10 mm in diameter, brownish, lenticellate. Leaflets membranaceous, the terminal one broadly ovate, about 12 cm long, 10 cm wide, acuminate, base rounded, the lateral leaflets similar but strongly inequilateral, broader on one side of the midrib than on the other. Flowers rose-pink, racemose, the racemes solitary, 10 cm long or more, axillary and from the woody stems, comparatively few-flowered, flower-bearing nearly or quite to the base, the nodes swollen, the pedicels 5 mm long or less. Calyx 1.5 cm long, the upper lip considerably longer than the lower one, retuse or cleft into two broadly rounded lobes 5 to 8 mm wide, the lower lip with three, oblong-ovate, acuminate teeth about 3 mm long. Corolla rose-pink. Standard 4 to 4.5 cm long, the limb obovate, about 2 cm wide, prominently retuse; wings as long as the keel, 5 to 7 mm wide, rounded; keel curved, the petals up to 9 mm wide. Stamens all perfect. Fruit unknown.

R. C. McGregor 552, in forests, Upi road, October, 1911.

Manifestly a representative of the genus *Canavalia*, and in vegetative characters quite like *Canavalia turgida* Grah. It is distinguished by its woody stems, its short racemes which are flower-bearing to the base, and especially by its unusually large flowers.

CANAVALIA ENSIFORMIS (Linn.) DC. Prodr. 2 (1825) 404; Safford 211.

Dolichos ensiformis Linn. Sp. Pl. (1753) 725.

Admitted on the authority of Safford, who states that it is common in thickets and hedges. Tropics of the world.

CANTHAROSPERMUM Wight & Arnott

CANTHAROSPERMUM SCARABAEOIDES (Linn.) Baill. in Bull. Soc. Linn. Paris 1 (1883) 384.

Dolichos scarabaeoides Linn. Sp. Pl. (1753) 726.

Atylosia scarabaeoides Benth Pl. Jungh. (1852) 245.

McGregor 451, *G. E. S. 270*.

Mascarene Islands to India, China, and Malaya.

PHASEOLUS Linnaeus

PHASEOLUS ADENANTHUS G. W. F. Mey. Prim. Fl. Esseq (1818) 239.

G. E. S. 379, locally known as *acáncan calátun*.

Tropics of the world.

PHASEOLUS LUNATUS Linn. Sp. Pl. (1753) 724; Safford 350 (var. *inamoenus*).

McGregor 388, G. E. S. 285.

A native of tropical America, now cultivated in all warm countries.

PHASEOLUS RADIATUS Linn. Sp. Pl. (1753) 725.

Phaseolus mungo W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 350, non Linn.

G. E. S. 211, locally known as *mongos*.

Cultivated in all tropical countries.

VIGNA Savi

VIGNA LUTEA (Sw.) A. Gray Bot. Wilkes U. S. Explor. Exped. 1 (1854) 452; Safford 397.

Dolichos luteus Sw. Fl. Ind. Occ. 3 (1806) 1246.

G. E. S. 78, 415, locally known as *acáncan malulasa*.

Along the seashore in the tropics of both hemispheres.

VIGNA SINENSIS (Linn.) Endl. ex Hassk. Pl. Jav. Rar. (1848) 386; Safford 396.

Admitted on the authority of Safford who states that it is commonly cultivated in Guam. Cultivated in all warm countries.

DOLICHOS Linnaeus

DOLICHOS LABLAB Linn. Sp. Pl. (1753) 725; Safford 264.

G. E. S. 276, 412, local names *cheribilla apaca*, *chuchumeco*.

Cultivated in all tropical countries.

PACHYRRHIZUS Richard

PACHYRRHIZUS EROSUS (Linn.) Urb. Symb. Antill. 4 (1905) 311.

Dolichos erosus Linn. Sp. Pl. (1753) 726.

Cacara erosa O. Ktze. Rev. Gen. Pl. 1 (1891) 165; Safford 205.

G. E. S. 230, locally known as *hicamas*.

A native of tropical America, now in all tropical countries.

PSOPHOCARPUS Necker

PSOPHOCARPUS TETRAGONOLOBUS (Linn.) DC. Prodr. 2 (1825) 403.

Dolichos tetragonolobus Linn. ex Stickm. Herb. Amb. (1754) 23.

Botor tetragonoloba O. Ktze. Rev. Gen. Pl. 1 (1891) 162; Safford 202.

G. E. S. 130, locally known as *seguidillas*.

Widely distributed in cultivation in the Indo-Malayan region.

CAJANUS DeCandolle

CAJANUS CAJAN (Linn.) Millsp. Field Columb. Mus. Bot. 2 (1900) 53.

Cytisus cajan Linn. Sp. Pl. (1753) 739.

Cajanus indicus Spreng. Syst. 3 (1826) 248.

Cajan cajan Millsp. l. c.; Safford 206.

McGregor 370.

Cultivated in all tropical countries, introduced into Guam in 1772, *fide* Safford.

OXALIDACEAE

AVERRHOA Linnaeus

AVERRHOA CARAMBOLA Linn. Sp. Pl. (1753) 428; Safford 192, *pl.* 37.

G. E. S. 24, locally known as *bilimbines*.

A native of tropical America, now cultivated in all tropical countries.

OXALIS Linnaeus

OXALIS REPENS Thunb. Oxal. (1781) 16; B. L. Rob. in Journ. Bot. 44 (1906) 391.

Oxalis corniculata W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 341, non Linn.

G. E. S. 164, locally known as *agsom* or *apsom*.

Widely distributed in the warmer regions of both continents, frequently confused with the closely allied *Oxalis corniculata* Linn.

ZYGOPHYLLACEAE

TRIBULUS Linnaeus

TRIBULUS CISTOIDES Linn. Sp. Pl. (1753) 387; Safford 390.

Not common, *vide* Safford, and according to his information of recent introduction.

A native of tropical America, now widely distributed in the tropics of both hemispheres.

(To be concluded.)

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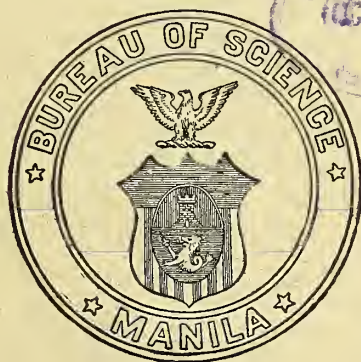
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AN ENUMERATION OF THE PLANTS OF GUAM

By E. D. MERRILL

(From the Botanical Section of the Biological Laboratory,
Bureau of Science, Manila, P. I.)

(Concluded.)

RUTACEAE

CITRUS Linnaeus

I have found it to be practically impossible to classify the material of the cultivated forms of this genus with any degree of satisfaction, and the difficulties have been well stated by Mr. Safford. There are a number of distinct forms in Guam, probably for the most part, if not all, introduced.

CITRUS DECUMANA (Linn.) Murr. Syst. ed. 13 (1774) 580; Safford 228.

Citrus aurantium var. *decumana* Linn. Sp. Pl. ed. 2 (1763) 1101.

G. E. S. 434, 41, locally known as *cahet magas*.

Throughout the Indo-Malayan region, cultivated in other hot countries.

This species I consider to be one of the very few distinct ones in the genus. I do not consider it to be at all closely allied to the orange (*Citrus aurantium* L.).

CITRUS AURANTIUM Linn. Sp. Pl. (1753) 783; Safford 226.

G. E. S. 396, *McGregor* 415, locally known as *cahet*.

Cultivated in all tropical and subtropical countries, variable in fruit characters, a native of tropical Asia.

Mr. Safford records the variety *sinensis* Linn., and the subspecies *saponacea* Safford from Guam. I cannot determine how *Citrus sinensis* can be distinguished from *C. aurantium*, and believe it to be only a form developed by cultivation. The subspecies *saponacea* is said by Mr. Safford to be wild in Guam, and to have non-edible fruits. I have seen no specimens of this form, but would suspect its alliance to be with *Citrus hystrix* rather than with *C. aurantium*.

CITRUS HYSTRIX DC. Cat. Hort. Monspel. (1813) 97.

To this species I refer *G. E. S. 42*, locally called *limon china*, a form with depressed-globose fruits, *McGregor 511*, locally called *limon ademelo*, a form with globose-ovoid fruits, and *McGregor 416*, locally called *alangha*. It is suspected that the first one, *G. E. S. 42*, is the form recorded by Safford as *Citrus bergamina* W. & A.

Citrus hystrix DC. is widely distributed in India and Malaya.

CITRUS MEDICA Linn. Sp. Pl. (1753) 782.

G. E. S. 43, locally known as *setlas*, *McGregor 417*, locally known as *limon iyat*. The former is probably typical *C. medica*, the latter has fruits quite like those of the ordinary lemon and is probably the var. *limon* Linn., recorded by Safford with the local name *limon real*.

Cultivated in all warm countries.

CITRUS NOBILIS Lour. Fl. Cochinch. (1790) 466.

Recorded from Guam by Safford.

A native of southern China, now cultivated in all warm countries.

CITRUS LIMA Lunan Hort. Jamaic. (1814) 451.

Citrus hystrix DC. var. *acida* (Roxb.) Engl. in Engl. & Prantl Nat. Pflanzenfam. 3⁴ (1896) 200.

Citrus acida Roxb. Fl. Ind. 2 (1832) 390.

The lime is recorded from Guam by Safford; I have seen no specimens from that Island. A native of tropical Asia, now in all tropical countries.

TRIPHASIA Loureiro**TRIPHASIA TRIFOLIA** (Burm. f.) P. Wils. in Torreyia 9 (1909) 33.

Limonia trifolia Burm. f. Fl. Ind. (1768) 103.

Limonia trifoliata Linn. Mant. 2 (1771) 237.

Triphasia trifoliata DC. Prodr. 1 (1824) 536; Safford 391.

McGregor 521, *Mrs. Clemens s. n.*, *G. E. S. 273*, *372*, locally known as *limon de china*.

A native of tropical Asia, now widely distributed in the tropics of the Old World, introduced in other regions.

BURSERACEAE**CANARIUM** Linnaeus

Mr. Safford records an introduced species known as *brea blanca*, but does not state that he saw specimens, taking at least a part of his data from Olive y Garcia's list of Guam trees. Mr. W. F. Wight has worked out the species as "*Canarium indicum* Stickman Herb. Amb. (1754)", to which he reduces *Canarium commune* Linn. (1767). The combination *Canarium indicum* is not made in the original edition of Stickman's paper (1754), where the species of *Canarium* are listed on pages 9 and 10, but only under the Rumphian names, although it does appear in the reprint, Amoen. Acad. 4 (1759) 143. It seems far more likely to me that the tree known as "*brea blanca*" in Guam has been introduced from the Philippines and is *Canarium ovatum* Engl. (*C. pachyphyllum* Perk.), a species allied to, but apparently distinct from *Canarium commune* Linn.

MELIACEAE

AGLAIA Loureiro

AGLAIA MARIANNENSIS sp. nov. § *Euaglaia*.

Arbor 5 ad 7 m alta, partibus junioribus inflorescentiisque dense ferrugineo-lepidotis, vetustioribus subglabris; foliis 20 ad 30 cm longis, foliolis 5 ad 9, oblongis ad oblongo-ellipticis, usque ad 15 cm longis, acutis vel obscure acuminatis, basi acutis ad rotundatis, vetustioribus subglabris vel subtus obscurissime lepidotis; paniculis folia subaequantibus; floribus 5-meris, numerosis, racemose dispositis, breviter pedicellatis, tubus stamineus liber.

A tree 5 to 7 m high, the young branchlets, leaves, and inflorescence for the most part densely brown-lepidote. Branches about 5 mm in diameter, terete, grayish or brownish, glabrous, the petiolar scars scattered, large, the growing parts densely brown-lepidote. Leaves alternate, 20 to 30 cm long, mostly 3-jugate, sometimes with two pairs of leaflets, sometimes with 4 pairs, besides the terminal leaflet, the petiole and rachis lepidote, becoming nearly glabrous. Leaflets oblong to oblong-elliptic, 10 to 15 cm long, 3 to 6 cm wide, chartaceous, when very young somewhat lepidote, in age becoming glabrous or nearly so, a few prominent scales usually persisting on the midrib and lateral nerves, the lower surface sometimes very minutely cinereous-subfurfuraceous, paler than the upper one, the apex acute or somewhat acuminate, the base acute to rounded, often inequilateral; lateral nerves 10 to 14 on each side of the midrib, distinct; petiolules 7 to 10 mm long. Panicles in the upper axils, narrowly pyramidal, often as long as the leaves, always more than one-half as long, all parts rather densely brown-lepidote. Flowers numerous, racemously arranged on the ultimate branchlets, their pedicels 0.5 to 1.5 mm long. Calyx brown-stellate-lepidote, the lobes 5, oblong-ovate, acute, 1 to 1.2 mm long. Petals 5, glabrous, orbicular to obovate, concave, 1 to 1.5 in diameter. Staminal tube quite free from the petals, very shallowly cup-shaped, glabrous, about 1 mm in diameter, 0.5 mm high, obscurely 5-toothed. Stamens 5, alternating with the teeth of the staminal tube, protruded, the anthers about 0.3 mm long. Fruit ellipsoid to obovoid, densely brown-stellate-lepidote, about 1.5 cm long and nearly as thick.

Guam Experiment Station 465, July, 1912 (type), *McGregor 546*, October, 1911, *Mrs. Clemens s. n.*, November, 1911, locally known as *mapuñao*.

A species apparently closely allied to the Malayan *Aglaia adoratissima* Blume, which it greatly resembles in appearance and vegetative characters. The very shallow staminal tube is apparently characteristic.

SANDORICUM Cavanilles

SANDORICUM KOETJAPE (Burm. f.) Merr. in Philip. Journ. Sci. Bot. 7 (1912) 237.

Melia koetjape Burm. f. Fl. Ind. (1768) 101.

Sandoricum indicum Cav. Diss. 4 (1787) 359, t. 202, 203; Safford 369.

G. E. S. 471.

Widely distributed in the Indo-Malayan region, introduced in Guam.

MELIA Linnaeus

MELIA AZEDARACH Linn. Sp. Pl. (1753) 384; Safford 322.

McGregor 446.

A native of tropical Asia, now cultivated in all warm countries.

XYLOCARPUS Koenig

XYLOCARPUS GRANATUM Koen. Naturf. 20 (1784) 2; Safford 400.

McGregor 431, Cabras Island, along the seashore.

Along the seashore, India to Malaya, Australia, and Polynesia.

MALPIGHIACEAE

GALPHIMIA Cavanilles

GALPHIMIA GLAUCA Cav. in Anal. Hist. Nat. 1 (1799) 37.

G. E. S. 277, apparently from recently introduced plants.

A native of Mexico, now cultivated in many tropical countries.

EUPHORBIACEAE

ACALYPHA Linnaeus

ACALYPHA INDICA Linn. Sp. Pl. (1753) 1003; Safford 173.

G. E. S. 80.

Tropics of both hemispheres.

ALEURITES Forster

ALEURITES MOLUCCANA (Linn.) Willd. Sp. Pl. 4¹ (1805) 590; Safford 177.

Jatropha moluccana Linn. Sp. Pl. (1753) 1006.

G. E. S. 86, 331, locally known by its Philippine (Tagalog) name *lumbang*.

India to Polynesia, introduced in tropical America.

CLAOXYLON A. Jussieu

CLAOXYLON MARIANNUM Muell.-Arg. in DC. Prodr. 15³ (1866) 783; Safford 230.

G. E. S. 7, 474, local name *cator*.

The type was collected in Guam by Gaudichaud, and the species is not known from any other region. It is very closely allied to several other species of the Malayan region.

CODIAEUM A. Jussieu

CODIAEUM VARIEGATUM (Linn.) Blume Bijdr. (1825) 606.

Croton variegatum Linn. Sp. Pl. (1753) 1199.

Phyllaurea variegata W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 352.

G. E. S. 105, from cultivated specimens.

Widely distributed in cultivation, where native uncertain, but probably Malaya or Polynesia.

EUPHORBIA Linnaeus

EUPHORBIA ATOTO Forst. f. Prodr. (1786) 36; Safford 270.

G. E. S. 131.

Along the seashore, tropical Asia to Australia and Polynesia.

EUPHORBIA GAUDICHAUDII Boiss. Cent. Euph. (1860) 7; Safford 270.

McGregor 443, *G. E. S. 378*, similar to *E. serrulata* Reinw., but more robust.

A species known only from Guam.

EUPHORBIA HETEROPHYLLA Linn. Sp. Pl. (1753) 453.

G. E. S. 97, *McGregor 471*, the former from gardens, the latter from roadsides.

A native of North America, now widely distributed in cultivation and as a naturalized plant.

EUPHORBIA HIRTA Linn. Sp. Pl. (1753) 454; Safford 271.

Euphorbia pilulifera Linn. l. c.

G. E. S. 189, *Thompson 9*, *McGregor 409*, locally known as *golondrina*.

EUPHORBIA PROSTRATA Ait. Hort. Kew. 2 (1789) 139.

G. E. S. 14.

Tropics of both hemispheres.

EUPHORBIA THYMIFOLIA Linn. Sp. Pl. (1753) 454.

G. E. S. 255.

Tropics of both hemispheres.

(*Euphorbia ramosissima* Hook. & Arn. is credited to Guam by Boissier,²⁷ but Index Kewensis is authority for the statement that the species as there interpreted by Boissier is *Euphorbia sparrmannii* Boiss.)

EXCOECARIA Linnaeus

EXCOECARIA AGALLOCHA Linn. Amoen. Acad. 4 (1759) 122; Syst. ed. 10 (1759) 1288; Safford 271.

Var. *ORTHOSTICHALIS* Muell.-Arg. in DC. Prodr. 15² (1866) 1221.

McGregor 561, *567*, *G. E. S. 392*, along the seashore.

India to Malaya and Polynesia (the species), the variety in Guam, New Caledonia, and Tonga.

The combination *Excoecaria agallocha* is not made in the original edition of Stickman's Herbarium Amboinense (1754) as claimed by Mr. Wight

²⁷ DC. Prodr. 15² (1862) 14.

in Safford's work, but simply appears under Rumpf's name *Arbor excoecans* with the additional statement: "*Dioica triandra tricocca*."

GLOCHIDION Forster

GLOCHIDION MARIANUM Muell.-Arg. in *Linnaea* 32 (1863) 65; Safford 283.

Phyllanthus gaudichaudii Muell.-Arg. var *marianus* Muell.-Arg. in DC. Prodr. 15² (1866) 300.

McGregor 459, 447, *G. E. S.* 35, 480, locally known as *chosga*.

Originally described from specimens collected in Guam by Gaudichaud, reported also from Tonga by Mueller, with a variety from Samoa.

JATROPHA Linnaeus

JATROPHA CURCAS Linn. Sp. Pl. (1753) 1006; Safford 301, *pl.* 55.

McGregor 531.

A native of tropical America, now in all tropical countries.

JATROPHA MULTIFIDA Linn. Sp. Pl. (1753) 1006; Safford 301.

G. E. S. 282, locally known as *Santa Ana*.

Distribution of the preceding.

MACARANGA Thouars

MACARANGA THOMPSONII sp. nov. § *Dimorphanthera*.

Frutex vel arbor, partibus vetustioribus glabra vel subglabra; ramulis teretibus, laevis, circiter 1 cm diametro, partibus junioribus adpresse villosis; foliis alternis, late rotundato-obovatis ad suborbicularibus, usque ad 20 cm diametro, integris, apice brevissime abrupte acuminatis, basi late rotundatis vel subtruncatis, alte peltatis, palmatim 9- vel 10-nerviis, supra glabris, nitidis, subtus pallidioribus, glandulosis; inflorescentiis ♂ axillaribus, paniculatis, usque ad 16 cm longis, ebracteatis, pubescentibus; floribus numerosis, glomeratis, sessilibus vel subsessilibus, staminibus circiter 5.

A shrub or small tree, in age nearly glabrous. Branchlets terete, smooth, glabrous, reddish-brown, about 1 cm in diameter, marked with prominent petiolar scars and the scars of fallen stipules, about 5 mm apart, the tips rather densely appressed-pubescent. Leaves more or less crowded at the ends of the branchlets, alternate, broadly peltate, subcoriaceous, broadly obovate to suborbicular, 15 to 20 cm in diameter, entire, the apex shortly and abruptly acuminate, the base broadly rounded to subtruncate, palmately 9- or 10-nerved, the nerves prominent, the lateral nerves above the basal pair about 6 on each side of the midrib, the primary reticulations prominent, subparallel, the upper surface smooth, glabrous, shining, somewhat olivaceous-brown when dry, the lower surface much paler, with

numerous, scattered, pale-yellow glands in small pits, when young more or less pubescent on the nerves and reticulations, in age nearly glabrous; petioles 10 to 14 cm long; stipules lanceolate, nearly glabrous, acuminate, 2 to 3 cm long, deciduous. Male panicles axillary, about 16 cm long, narrowly pyramidal, many-flowered, the lower branches 3 cm long or less, the upper gradually shorter, the bracts wanting. Flowers sessile or subsessile, glomerate, densely arranged on the ultimate branches. Sepals 2 or 3, oblong to obovate, 1 to 1.2 mm long, obtuse or acute, somewhat pubescent. Stamens 4 or 5; filaments 1 to 1.2 mm long; anthers 3- and 4-locellate, small, about 0.2 mm long.

Guam Experiment Station 472, no data recorded with the specimen.

The first representative of the genus to be reported from the Marianne Islands, well characterized by its very broad, widely peltate, entire, glandular, nearly glabrous leaves, and its ebracteate staminate panicles. Named in honor of Mr. J. B. Thompson, Director of the Guam Experiment Station, through whose interest much of our Guam botanical material has been secured.

MALLOTUS Loureiro

MALLOTUS MOLUCCANUS (Linn.) Muell.-Arg. in *Linnaea* 24 (1865) 185, var. **GLABRATUS** Muell.-Arg. in *DC. Prodr.* 15² (1866) 958.

Croton moluccanum Linn. *Sp. Pl.* (1753) 1005.

Echinus sp. Safford in *Contr. U. S. Nat. Herb.* 9 (1905) 265.

McGregor 402, G. E. S. 298, locally known as *alom* or *alum*.

Widely distributed in the Malayan region.

As to the propriety of retaining the above specific name for this species, there may be some doubt, for *Croton moluccanum* Linn., as to the first citation given by Linnaeus, is *Givotia rottleriformis* Griff.,²⁸ as to the second, apparently, and as to the specimen in the Linnean Herbarium it is *Mallotus moluccanus* Muell.-Arg. I have retained the Linnean species in the sense that Mueller and other authors have interpreted it.

MANIHOT Tournefort

MANIHOT UTILISSIMA Pohl *Pl. Bras. Ic.* 1 (1827) 32, *t.* 24.

Jatropha manihot Linn. *Sp. Pl.* (1753) 1007.

Manihot manihot Karst. *Deutsch. Fl.* (1880-83) 588; Safford 316.

G. E. S. 249, 250, locally known as *mendioka amarilla*, and *mendioka saipan*.

A native of tropical America, now cultivated in all tropical countries.

PHYLLANTHUS Linnaeus

PHYLLANTHUS MARIANUS Muell.-Arg. in *Linnaea* 32 (1863) 17; *DC. Prodr.* 15² (1866) 357; Safford 351.

McGregor 427, at Agaña.

A species known only from Guam.

²⁸ Trimen *Fl. Ceyl.* 4 (1898) 51.

PHYLLANTHUS NIRURI Linn. Sp. Pl. (1753) 981; Safford 351.

G. E. S. 152, locally known as *maigo lalo*.

Warmer parts of both hemispheres.

PHYLLANTHUS SAFFORDII sp. nov. § *Paraphyllanthus*.

Planta lignosa, 20 ad 30 cm alta, suberecta vel adscendentibus, ramulis parce puberulis exceptis glabra; caulibus teretibus, simplex, 3 ad 4 mm diametro; ramulis densissime confertis, usque ad 9 cm longis, tenuibus; foliis numerosis, confertis, imbricatis, distichis, oblongis, acuteis vel acuminatis, coriaceis, 5 ad 12 mm longis, penninerviis, margine valde incrassatis; floribus solitariis, 6-meris, ♂ breviter pedicellatis, staminibus 3, liberis, antheris verticaliter dehiscentibus, ♀ sessilibus, ovario glabro.

An erect or ascending, simple undershrub 20 to 30 cm high, the stems terete, unbranched, their lower parts prostrate, 3 to 4 mm in diameter, woody, dark-colored, marked with numerous scars of fallen branchlets, the branchlets densely crowded at the apices of the stems, slender, up to 50 on each plant, 6 to 9 cm long, somewhat puberulent or pubescent. Leaves numerous, crowded, distichous, imbricate, oblong, coriaceous, shining, somewhat pale when dry, 5 to 12 mm long, 1.5 to 2.5 mm wide, sharply acuminate, base obtuse, slightly inequilateral, the margins very prominently thickened, cartilaginous, both surfaces very minutely punctulate; lateral nerves about 9 on each side of the midrib, not prominent, ascending; petioles 0.2 mm long; stipules 2.5 to 3.5 mm long, filiform-acuminate from a somewhat enlarged base. Flowers of both sexes on the same plant, both 6-merous, solitary, axillary. Male flowers: Pedicels 0.5 mm long. Sepals 6, obtuse, oblong to narrowly oblong-obovate, 1 to 1.2 mm long. Glands 6, free, subglobose. Stamens 3, free or nearly so; anthers subglobose, 0.2 mm long, dehiscent vertically. Female flowers sessile, the sepals oblong, obtuse, 1.2 mm long, 0.5 mm wide. Ovary glabrous, broadly ovoid to depressed-globose, 0.5 mm long; styles 3, spreading, distinctly united at the base but not columnar, each cleft, the arms spreading, recurved, short. Disk prominent, truncate, cup-shaped or saucer-shaped, glabrous, 0.4 mm high. Capsule depressed-globose 2.2 mm in diameter, glabrous, shining, longitudinally 6-sulcate, smooth, dehiscent into three 1-celled cocci, the seeds minutely longitudinally striate.

R. C. McGregor 476, hills back of Piti, altitude about 100 meters, October, 1911 (type); *Safford & Seale 1121*, May, 1900.

Characterized by its simple, rather stout, short, woody stems, its densely

crowded branchlets, and its crowded, imbricate, minutely puncticulate, small, coriaceous leaves which have cartilaginous margins. It is dedicated to Mr. W. E. Safford, author of the "Useful Plants of Guam."

PHYLLANTHUS SIMPLEX Retz. Obs. 5 (1789) 29.

G. E. S. 143, McGregor 410, also collected in Guam by Gaudichaud, but not recorded by Mr. Safford.

Tropical Asia to Malaya and Polynesia.

PHYLLANTHUS URINARIA Linn. Sp. Pl. (1753) 982; Safford 352.

G. E. S. 108.

Widely distributed in the tropics of both hemispheres. (Mr. Safford also records *Phyllanthus nivosus* Bull. from Guam, from plants introduced by himself from Honolulu.)

RICINUS Linnaeus

RICINUS COMMUNIS Linn. Sp. Pl. (1753) 1007; Safford 364.

G. E. S. 291, locally known as *agaliya*.

In all warm countries, cultivated or wild, probably a native of Africa.

ANACARDIACEAE

ANACARDIUM Linnaeus

ANACARDIUM OCCIDENTALE Linn. Sp. Pl. (1753) 383; Safford 182.

G. E. A. 218, 368, local name *casoy*.

A native of tropical America, now widely distributed in most tropical countries in cultivation.

MANGIFERA Linnaeus

MANGIFERA INDICA Linn. Sp. Pl. (1753) 200; Safford 315.

G. E. S. 283, local name *manga*, as in the Philippines from which group it was probably introduced into Guam by the Spaniards.

MANGIFERA ODORATA Griff. Notul. 4 (1854) 417.

G. E. S. 204, near Piti, known as the "Saipan Mango," indicating its introduction from the neighboring island of Saipan. Widely distributed in Malaya.

CELASTRACEAE

GYMNOSPORIA Benth. & Hook. f.

GYMNOSPORIA THOMPSONII sp. nov.

Frutex inflorescentiis parcissime puberulis exceptis glaber, inerme; foliis ellipticis vel ovato-ellipticis, chartaceis vel subcoriaceis, obtusis vel rotundatis, basi acutis, usque ad 9 cm longis, margine distanter leviter crenatis, nervis utrinque circiter 7, tenuibus; floribus axillaribus, fasciculatis vel depauperatocymosis, 5-meris; capsulis obovoideis, 8 ad 10 mm longis, 3- vel 4-angulatis, 3- vel 4-locellatis, seminibus exarillatis.

A shrub, quite glabrous except the minutely puberulent in-

florescence. Branches unarmed, terete, grayish or brownish. Leaves elliptic to ovate-elliptic, chartaceous to subcoriaceous, 6 to 9 cm long, 3 to 6 cm wide, somewhat brownish and slightly shining when dry, the apex obtuse to broadly rounded, the base acute, margins distantly and not prominently crenate; lateral nerves about 7 on each side of the midrib, slender, anastomosing, the reticulations slender; petioles 5 to 8 mm long, sometimes minutely puberulent. Flowers mostly in axillary fascicles, sometimes in few-flowered cymes, the pedicels and axis, when present, minutely puberulent. Flowers white, 5-merous, about 6 mm in diameter, their pedicels in anthesis about 6 mm long, up to 12 mm long in fruit, jointed, few to rather many in each axil. Calyx-lobes 5, broadly elliptic, rounded, about 1 mm long, margins irregularly lacerate-ciliate. Petals oblong-elliptic, rounded, about 3 mm long, 1.7 mm wide, margins minutely crenulate. Ovary glabrous, much narrowed above, the style arms 3 or 4; cells 3 or 4; ovules two in each cell. Capsules in general obovoid, somewhat 3- or 4-angled and slightly sulcate, acute or obtuse, 8 to 10 mm long, about 8 mm wide, the seeds exarillate.

McGregor 394, 530, October, 1911, Upi road, in forests; *G. E. S. 88* (type), Apuragan; *Costenoble 1189*, July, 1906, locally known as *luluhut*.

Probably as closely allied to the Philippine *Gymnosporia spinosa* Merr. & Rolfe as to any other known form, differing in being quite unarmed and in its entirely different inflorescence, the flowers being chiefly fascicled, cymes rarely present.

SAPINDACEAE

ALLOPHYLUS Linnaeus

ALLOPHYLUS TIMORENSIS Blume *Rumphia* 3 (1847) 130.

McGregor 497, and, with some doubt, *McGregor 389*, from Cabras Island. Widely distributed along the seashore, Malaya to Polynesia.

ALLOPHYLUS HOLOPHYLLUS Radlkofer sp. nov.

Frutex; rami teretes, glabriusculi, juveniles subfusci, deincinerascentes, sparsim lenticellosi; folia 3-foliolata, mediocria, sat longe petiolata; foliola lateralia ovato-lanceolata, basi inaequalia (latere interiore angustiore breviora), breviter petiolulata, intermedia ex oblongo sublanceolata, basi subacuta petioulis longioribus insidentia, omnia obtusiuscule acuminata, integerrima, rigidiuscule membranacea, nervis lateralibus sat crebris oblique patulis, utrinque prominule reticulato-venosa, glaberrima nec nisi glandulis microscopicis clavatis inspersa, viridia, nitida, punctis pellucidis lineoliformibus crebris minutis notata; thyrsi axillares, solitarii, ad rhacheos basin ramis 2, rarius 1 tantum,

instructi (summi eramosi), folia dimidia paullo superantes, rhachi quam pedunculus paullo longiore pilis brevibus patulis dense cano-puberula, sat dense cinnamomea, cinnamomeis 2-3-floris (summis ad flores singulos reductis); flores mediocres, glabri, albi, longiuscule pedicellati, pedicellis minutim patule pubescentibus; fructus—(non suppetebant).

Rami 3-4 mm crassi. Folia petiolo 4 cm longo adjecto ca. 15 cm longa; foliola cum petiolulis 4-10 mm longis 7-11 cm longa, 3-4.5 cm lata. Thyrsi 6-7 cm longi, ramis 3-4 cm longis. Alabastra diametro 1.5-2 mm. Sepala glabra, margine glanduloso-ciliolata; petala (alabastris) suborbicularia, breviter unguiculata, intus bisquamulata, ungui squamulisque densissime villosis; discus in glandulas 4 subtruncatus productus, glaber; stamina villosa; pistillum (floris ♂) rudimentarium, bicocum, puberulum.

Guam Experiment Station 470.

Obs. Affinis *Allophylus timorensis* Bl. em., a quo differt habitu graciliori, foliolis margine integerrimis, rhachi thyrsum pedicellisque dense puberulis.

DODONAEA Linnaeus

DODONAEA VISCOSA Jacq. Enum. Pl. Carib. (1760) 19; Safford 263.

McGregor 460, G. E. S. 328.

Widely distributed in the tropics of both hemispheres.

CARDIOSPERMUM Linnaeus

CARDIOSPERMUM HALICACABUM Linn. Sp. Pl. (1753) 366; Safford 214.

Admitted on the authority of Safford, not represented in our collections. All tropical countries.

BALSAMINACEAE

IMPATIENS Linnaeus

IMPATIENS BALSAMINA Linn. Sp. Pl. (1753) 938; Safford 296.

G. E. S. 94, locally known as *camantigui*, its Tagalog name in the Philippines.

A native of India, now cultivated in various forms in all warm countries.

RHAMNACEAE

COLUBRINA Richard

COLUBRINA ASIATICA (Linn.) Brongn. in Ann. Sci. Nat. I 10 (1827) 369; Safford 246.

Ceanothus asiaticus Linn. Sp. Pl. (1753) 196.

G. E. S. 52, McGregor 507, locally known as *gososo*.

Tropical Africa, Asia, Malaya to Australia and Polynesia, near the sea.

ZIZYPHUS Tournefort

ZIZYPHUS JUJUBA (Linn.) Lam. Encycl. 3 (1789) 319; Safford 403.

Rhamnus jujuba Linn. Sp. Pl. (1753) 194.

G. E. S. 165, locally known as *manzanita*.

An introduced species in Guam; widely distributed in Tropical Asia and in Malaya, chiefly in cultivation.

Mr. Skeels²⁹ has recently proposed to take up the name *Zizyphus mauritiana* Lam. for this species, claiming that *Zizyphus jujuba* Lam. is invalidated by *Zizyphus jujuba* Mill. (1768), a matter that I am unable to check on account of lack of literature.

ELAEOCARPACEAE

ELAEOCARPUS Linnaeus

ELAEOCARPUS JOGA sp. nov. § *Dicera*.

Arbor alta, partibus junioribus inflorescentiisque exceptis glabra; foliis chartaceis, oblongis ad oblongo-ellipticis, usque ad 10 cm longis, apice obtusis, basi cuneatis, margine crenatis, nervis utrinque circiter 10, distinctis, subtus in axillis valde glandulosis; racemis axillaribus et in ramis defoliatis, 5 ad 8 cm longis; circiter 15-floris; floribus 5-meris, 1.5 cm longis, petalis usque ad medio laciniatis, subglabris; ovario 5-loculare; fructibus ovoideis, 1.5 cm longis, 1-locellatis.

A tree, from 5 to 10 m in height *vide* McGregor, but according to Perez, after Safford, yielding logs up to 14 meters in length. Branches terete, grayish or reddish-gray, with prominent scattered petiolar-scars, nearly smooth, glabrous, the branchlets sparingly appressed-pubescent with pale, shining hairs. Leaves numerous, crowded on the branchlets, chartaceous, oblong to oblong-elliptic, 6 to 10 cm long, 2 to 3 cm wide, the apex obtuse, base gradually narrowed, cuneate, margins crenate, when young both surfaces with scattered, appressed, shining hairs, becoming quite glabrous, the upper surface brownish-olivaceous when dry, shining, the lower a little paler; lateral nerves about 10 on each side of the midrib, slender, distinct, anastomosing, the reticulations distinct, the axils of the veins on the lower surface with very prominent glands; petioles 5 to 10 mm long, pubescent, becoming glabrous. Racemes numerous, axillary and on the branches below the leaves, 5 to 8 cm long, about 15-flowered, rachis, pedicels and sepals sparingly appressed-pubescent with pale hairs. Flowers white, 5-merous, about 1.5 cm long, their pedicels 8 to 12 mm long. Sepals lanceolate, acuminate, about 11 mm long, 2.5 mm wide. Petals

²⁹ U. S. Dept. Agr. Bureau Plant Industry Bull. 208 (1911) 67.

about 1.5 cm long, 5 to 6 mm wide, narrowly obovate, pubescent only on the margins in the lower one-third, the upper one-half split into 4 or 5 primary, rather narrow divisions, these in turn trifid or dichotomously divided into 3 or 4 slender laciniae, the base gradually narrowed, acute or obtuse. Stamens about 30; filaments short; anthers linear, scabrid, about 4 mm long, one cell obtuse, the other a little longer (less than 1 mm), and tipped with several short, stiff, white hairs, not apiculate. Ovary ovoid, pubescent, 5-celled; ovules several in each cell; style about 1.5 cm long somewhat pubescent below. Fruit blue, ovoid, smooth when dry, subacute or somewhat apiculate, about 1.5 cm long, the pulp scanty, the endocarp thick, 1-celled, 1-seeded.

R. C. McGregor 533 (type), 457, October, 1911, Upi road, in forests, *G. E. S. 468*, locally known as *yoga* or *yoga*.

This is undoubtedly the species that Mr. Safford discusses (page 401), under the native name *yoga*. It is apparently a very distinct and characteristic form, but I do not know any species of the section to which it is especially closely allied. The numerous, comparatively small, obtuse, prominently glandular leaves, and the rather large flowers with nearly glabrous petals are characteristic features.

TILIACEAE

CORCHORUS Linnaeus

CORCHORUS ACUTANGULUS Lam. Encycl. 2 (1786) 104.

G. E. S. 176, McGregor 532, locally known as *bilimbines chaca*.

Widely distributed in the tropics of the Old World, introduced in the West Indies.

GREWIA Linnaeus

GREWIA MARIANNENSIS sp. nov.

Species *G. malococcae* Linn. f. simillima et affinis, differt foliis basi distincte inaequilateralibus, ramulis inflorescentiisque adpresse hirsutis, haud stellato-tomentosis.

A shrub or small tree, the branchlets, inflorescences, and the leaves on the midrib and nerves of the lower surface appressed-hirsute, not at all stellate-pubescent, although the stiff hairs are sometimes somewhat fascicled. Branches terete, slender, reddish-brown or brownish. Leaves alternate, ovate to elliptic-ovate, chartaceous, 10 to 15 cm long, 4.5 to 8 cm wide, the apex sharply acuminate, the base slightly but distinctly inequilateral, somewhat narrowed and abruptly rounded, rarely slightly cordate, the margins crenate-serrate, the upper surface quite glabrous, shining, the lower a little paler, shining, very sparingly appressed-hirsute on the midrib and lateral nerves, the lower axils prominently bearded; petioles 1.5 to 2 cm long, slightly appressed-hirsute. Inflorescence axillary, solitary or two or

three in each axil, appressed-hirsute, 2 to 3 cm long, few-flowered, usually with but three flowers which are umbellately arranged, the peduncle 1.5 cm long or less, the pedicels about one-half as long; bracteoles lanceolate, acuminate, appressed-hirsute, about 7 mm long, deciduous. Sepals 5, elliptic-oblong to oblong-lanceolate, 11 to 12 mm long, 4 to 4.5 mm wide, acute, appressed-hirsute. Petals narrowly ovate, about 3 mm long, 2 mm wide, acute, the scale suborbicular, ciliate, prominent. Stamens indefinite; anthers about 0.5 mm long; filaments 4 to 5 mm long. Ovary densely hirsute.

Guam Experiment Station 133, November, 1911, at Tumon.

A species manifestly closely allied to the Polynesian *Grewia malococca* Linn. f., and perhaps not specifically distinct. I have seen no complete description of this species, and my conception of it is based largely on a Samoan specimen so named, *Vaupel* 247.

GREWIA MULTIFLORA Juss. in Ann. Mus. Paris 4 (1804) 89, t. 47, f. 1; Safford 287.

Admitted on the authority of Safford, but his specimens should be compared with the preceding species.

Widely distributed in the Indo-Malayan region.

TRIUMFETTA Linnaeus

TRIUMFETTA SEMITRILoba Jacq. Enum. Pl. Carib. (1760) 22.

Mrs. Clemens s. n., *G. E. S.* 109, locally known as *dadangsi*.

Widely distributed in the tropics of both hemispheres, a native of tropical America.

It is strongly suspected that the species recorded by Safford (p. 393) as *Triumfetta rhomboidea* Jacq., based on the reference of *Triumfetta lappula* to Guam, by Gaudichaud, is *Triumfetta semitriloba* Jacq., and not *T. rhomboidea* Jacq.

TRIUMFETTA PROCUMBENS Forst. f. Prodr. (1786) 35; Safford 392.

Triumfetta fabreana Gaudich. Bot. Freyc. Voy. (1826) 478.

G. E. S. 85.

Islands of the Sulu Sea to Australia and Polynesia.

TRIUMFETTA TOMENTOSA Boj. Hort. Maurit. (1837) 43; Safford 393.

Credited to Guam by Safford, but the record must be considered a very doubtful one.

BOMBYCACEAE

CEIBA Gaertner

CEIBA PENTANDRA (Linn.) Gaertn. Fruct. 2 (1791) 244, t. 133, f. 1; Safford 221, pl. 42.

Bombax pentandrum Linn. Sp. Pl. (1753) 511.

Eriodendron anfractuosum DC. Prodr. 1 (1824) 479.

G. E. S. 299, native name *algodon de Manila*.

In all tropical countries, where native uncertain, but probably originating in tropical America.

MALVACEAE

ABELMOSCHUS Medicus

ABELMOSCHUS ESCULENTUS (Linn.) Moench. Meth. (1794) 617; Safford 171.

Hibiscus esculentus Linn. Sp. Pl. (1753) 696.

G. E. S. 199.

The okra is probably a native of tropical America, now cultivated in all warm countries.

ABELMOSCHUS MOSCHATUS Medic. Malv. (1787) 46.

Hibiscus abelmoschus Linn. Sp. Pl. (1753) 696.

McGregor 457, *G. E. S.* 405, locally known as *camang*.

Probably a native of tropical Asia, now in all tropical countries.

ABUTILON Tournefort

ABUTILON INDICUM (Linn.) Sweet Hort. Brit. (1826) 54; Safford 172.

Sida indica Linn. Cent. Pl. 2 (1756) 26.

G. E. S. 175, locally known as *malbas* or *matbas*.

The specimen reported from Guam as "*Sida maura* Link" (manifestly a misprint for *Sida mauritiana*) by Endlicher (Ann. Wien. Mus. 1 (1836) 132; Safford 374), belongs here. Dr. Ulbrich has kindly examined the material in the Berlin herbarium, and although not finding Chamisso's specimen, he finds other plants, so named, and indicated as "ex Herb. Link," which are the same as *Abutilon indicum* Sweet.

Probably a native of tropical Asia, now in all tropical countries.

GOSSYPIUM Linnaeus

GOSSYPIUM BRASILIENSE Macf. Fl. Jam. 1 (1837) 72; Watt Cotton Plants (1907) 295, pl. 49, 50.

Gossypium barbadense W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 285, non Linn.

G. E. S. 285, locally known as *algodon*.

From the Philippine native names and other data given by Safford there is no doubt in my mind but that the species he included as *Gossypium barbadense* is really *G. brasiliense* Macf.

GOSSYPIUM ARBOREUM Linn. Sp. Pl. (1753) 693; Safford 235.

The determination of the Guam material is probably incorrect. There are no Guam specimens in our collection agreeing with the figures and descriptions of this species, and it is quite unknown from the Philippines. *G. E. S.* 83, 397, two collections apparently representing the same species, may be the same species as the plant referred to *G. arboreum* Linn. by Safford, but I have no means of determining the fact; they represent a species quite different from *Gossypium arboreum* Linn., which I am unable to determine with satisfaction.

HIBISCUS Linnaeus

HIBISCUS MUTABILIS Linn. Sp. Pl. (1753) 694; Safford 294.

G. E. S. 260, locally known as *mapola*.

A native of tropical Asia, now in all tropical countries.

HIBISCUS ROSA-SINENSIS Linn. Sp. Pl. (1753) 294; Safford 294.

McGregor 359, 360, G. E. S. 435, single and double flowers.

A native of tropical Asia, now cultivated in all warm countries.

HIBISCUS TILIACEUS Linn. Sp. Pl. (1753) 694.

Pariti tiliaceum A. St. Hil. Fl. Bras. Mer. 1 (1825) 256; Safford 347, pl. 61.

McGregor 466, G. E. S. 332, 384, locally known as *pago*.

Along the seashore in the tropics of both hemispheres.

MALACHRA Linnaeus

MALACHRA CAPITATA Linn. Syst. ed. 12 (1767) 458.

G. E. S. 28, locally known as *pagago*.

A native of tropical America, now in all tropical countries.

MALACHRA FASCIATA Jacq. Coll. 2 (1797) 352.

G. E. S. 154, along small streams.

A native of tropical America, now very common in the Philippines. The Guam form is identical with the common Philippine *Malachra fasciata* var. *lineariloba* (Turcz.) Gürke.

SIDA Linnaeus

SIDA ACUTA Burm. f. Fl. Ind. (1768) 147; Safford 374.

G. E. S. 155, locally known as *escobilla adumelon*, the typical form, *G. E. S. 306, Thompson 25*, locally known as *escobilla papagu*, atypic.

All tropical countries, where native uncertain.

The specimens last cited, with the native name *escobilla papagu* represent a form somewhat different from typical *Sida acuta* Burm. f. Mr. E. G. Baker of the British Museum has kindly examined a duplicate of one of the specimens and informs me that in his opinion it is only a form of *Sida carpinifolia* L. (= *Sida acuta* Burm. f.).

SIDA GLOMERATA Cav. Diss. 1 (1785) 18, t. 2, f. 6; Safford 374.

Admitted on the authority of Safford who quotes Gaudichaud. It is strongly suspected, from the native name cited by Gaudichaud, *escobilla papagu*, that the form enumerated by him as *Sida glomerata* Cav., is really the form that I have above referred to *Sida acuta* Burm. f., and not Cavanilles' species.

SIDA RHOMBIFOLIA Linn. Sp. Pl. (1753) 684; Safford 375.

G. E. S. 156, 200, locally known as *escobilla dalili* and as *escobilla apaca*.

All tropical countries, where native uncertain.

THESPESIA Solander

THESPESIA POPULNEA (Linn.) Soland. ex Corr. in Ann. Mus. Paris 9 (1807) 290, t. 8, f. 2; Safford 388.

Hibiscus populneus Linn. Sp. Pl. (1753) 694.

Mrs. Clemens s. n., G. E. S. 132, 442, locally known as *banalo*, also its most common Philippine name.

Widely distributed in the tropics along the seashore.

URENA Linnaeus

URENA LOBATA Linn. Sp. Pl. (1753) 692, var. SINUATA (Linn.) Gagnep.
in Lecomte Fl. Gén. Indo-Chine 1 (1910) 414.

Urena sinuata Linn. l. c.; Safford 394.

Thompson 17, Mrs. Clemens s. n., G. E. S. 185, 221, locally known as *dadangsi*, *dadanese*, and *dadangsi apaca*.

Tropics of the World, where native uncertain. I can see no reason for considering *Urena sinuata* Linn. to be specifically distinct from *Urena lobata* Linn.

STERCULIACEAE

HERITIERA Dryander

HERITIERA LITTORALIS Dry. in Ait. Hort. Kew. 3 (1789) 456; Safford
282, pl. 52.

G. E. S. 16, 91, locally known as *ufa*.

Along the seashore, tropical Asia to Polynesia.

MELOCHIA Linnaeus

MELOCHIA ODORATA Linn. f. Suppl. (1781) 302; Forst. f. Prodr. (1786)
47.

Mrs. Clemens s. n., November 27, 1911.

New Caledonia to Polynesia.

The specimen agrees very closely with *Balansa 393* from New Caledonia, differing in a few slight characters, such as its calyces being hirsute rather than velutinous. In both the seeds are quite wingless. The type of *Melochia odorata* was from the Island of Tanna, near New Caledonia.

MELOCHIA HIRSUTISSIMA sp. nov. § *Visenia*.

Frutex, omnibus partibus dense hirsutis; foliis cordato-ovatis, coriaceis, usque ad 8 cm longis, acuminatis, basi late rotundatis cordatisque, margine dentato-serratis; floribus 8 ad 9 mm longis, capsulis ovoideis, acuminatis, non sulcatis, hirsutis, seminibus anguste obovoideis, obscure 3-angulatis, angulis rotundatis, haud alatis.

A shrub, size not indicated, densely hirsute with long, pale or brownish, more or less shining hairs. Branches terete, very dark-brown, older ones glabrous or nearly so, the younger branchlets very densely hirsute, pale-brownish or grayish-brown. Leaves cordate-ovate, coriaceous, 5 to 8 cm long, 3 to 5.5 cm wide, base broadly rounded, rather shallowly cordate or subtruncate, apex shortly acuminate or merely acute, margins rather finely serrate-dentate, both surfaces of the same color, uniformly hirsute with mostly simple, spreading, rather pale, more or less shining hairs which are for the most part on the midrib, nerves, and reticulations, the upper surface in young leaves with intermixed, softer, stellate hairs; basal nerves 3, the lateral nerves above the base usually 4 on each side of the midrib; pe-

tioles densely hirsute, 1.5 to 2 cm long. Panicles cymose, in the upper axils, forming, a terminal, leafy inflorescence, densely pale-hirsute, the peduncles 10 cm long or less, the flower-bearing parts of each cyme 5 cm long or less, the flowers rather densely disposed. Bracteoles very broadly ovate, deciduous, prominently ciliate-hirsute with long spreading hairs, acute or acuminate, 2 to 2.5 mm long, nearly as wide. Calyx somewhat campanulate, hirsute, 6 to 7 mm long, divided to below the middle into 5, oblong or oblong-lanceolate, somewhat spreading, acuminate lobes about 4 mm long, 2 mm wide. Petals membranaceous, glabrous, narrowly oblong-obovoid to obovoid-subspatulate, 8 to 9 mm long, 3 mm wide, apex truncate-rounded, narrowed in the lower one-half, the lower 3 mm 0.5 to 1 mm wide. Stamens 4 to 5 mm long; filaments thin, flat, about 1 mm wide; anthers 1.5 mm long. Ovary ovoid, densely hirsute; styles slender, about 3 mm long, hirsute below, glabrous above. Capsule at maturity ovoid, hirsute, not at all sulcate or ridged, about 7 mm long, acute or acuminate, composed of 5 cocci which dehisce ventrally, each coccus with two, terminal, slender, hirsute, 1 to 1.5 mm long awns. Seeds not at all winged, brown, smooth, narrowly obovoid, obtuse, about 3.5 mm long, 1.5 mm thick, 3-angled in cross-section, the angles rounded.

R. C. McGregor 456, hills back of Piti, altitude about 100 meters.

A species allied to *Melochia odorata* Linn. f. and to *M. aristata* A. Gray, characterized by its comparatively small, densely hirsute leaves, as well as by its densely hirsute branchlets, petioles, and inflorescences.

THEOBROMA Linnaeus

THEOBROMA CACAO Linn. Sp. Pl. (1753) 388; Safford 385, *pl.* 67.

G. E. S. 317, locally known as *cacao*.

A native of tropical America, now cultivated in most tropical countries.

WALTHERIA Linnaeus

WALTHERIA AMERICANA Linn. Sp. Pl. (1753) 673; Safford 398.

Waltheria indica Linn., l. c.

Waltheria elliptica Cav. Diss. 6 (1788) 316, *t.* 171, *f.* 2.

McGregor 407, *G. E. S. 123*, locally called *escobilla sabana*.

A native of tropical America, now in all tropical countries.

GUTTIFERAE

CALOPHYLLUM Linnaeus

CALOPHYLLUM INOPHYLLUM Linn. Sp. Pl. (1753) 513; Safford 208.

G. E. S. 186, 414, locally known as *daog* or *daok*.

Along the seashore, tropical Africa and Asia, through Malaya to Australia and Polynesia.

OCHROCARPUS Thouars

OCHROCARPUS EXCELSUS (Zoll. & Mor.) Vesque in DC. Monog. Phan. 8 (1893) 525.

Calophyllum excelsum Zoll. & Mor. Nat. Geneesk. Arch. Néerl. Ind. 2 (1845) 582; Hassk. & Zoll. in Flora (1847) 641.

Ochrocarpus obovalis Safford in Contr. U. S. Nat. Herb. 9 (1905) 335, pl. 59.

Mrs. Clemens s. n., *G. E. S.* 476.

Along the seashore, Java, Christmas Island and Borneo to New Guinea, Fiji, and the Admiralty Islands.

I can see no reason for considering *Ochrocarpus obovalis* (Miq.) Safford to be specifically distinct from *O. excelsus* Vesque. Our Guam material presents both obovate and elliptic leaves on the same branchlets. It manifestly represents quite the same species as *Ridley 68* from Christmas Island (south of Java), distributed as *Ochrocarpus ovalifolius* Anders.

BIXACEAE

BIXA Linnaeus

BIXA ORELLANA Linn. Sp. Pl. (1753) 512; Safford 199, pl. 39.

McGregor 426, *G. E. S.* 128, locally known as *achiote* or *achote*.

A native of tropical America, now found in all tropical countries.

FLACOURTIACEAE

PANGIUM Reinwardt

PANGIUM EDULE Reinw. Syll. Ratisb. 2 (1828) 12; Safford 345.

G. E. S. 73, locally known as *rawél* or *rauál*.

Widely distributed in the Malayan region.

FLACOURTIA Commerson

FLACOURTIA INTEGRIFOLIA sp. nov.

Arbor parva, inermis, dioica, inflorescentiis exceptis glabra; foliis chartaceis, integris, ellipticis, usque ad 8 cm longis, nitidis, apice late rotundatis, basi subacutis ad rotundatis, 2-glandulosis, nervis utrinque 5 vel 6, tenuibus; inflorescentiis ♂ axillaribus, parce pubescentibus, paucifloris, floribus fasciculatis vel in racemis dispositis, longe pedicellatis; sepalis 4, parce pubescentibus, 2 ad 3 mm longis.

A small, unarmed, dioecious, nearly glabrous tree, the branches terete, wrinkled when dry, brownish or grayish, somewhat lenticellate. Leaves alternate, elliptic, chartaceous, 5 to 8 cm long, 2.5 to 5 cm wide, entire, sometimes with incipient glandular teeth at the ends of the veins, the margins slightly recurved, apex broadly rounded, sometimes slightly retuse, the base subacute to rounded, with two glands at or near the insertion of the

petiole, the upper surface brownish-olivaceous when dry, shining, the lower a little paler, shining; lateral nerves 5 or 6 on each side of the midrib, distant, slender, anastomosing, the reticulations slender, fine; petioles about 5 mm long, sometimes a little puberulent. Male flowers in axillary, solitary or sometimes fascicled racemes, or the uppermost ones in fascicles, the racemes few-flowered, 1 to 1.5 cm long, slightly pubescent; pedicels 5 to 7 mm long, jointed below to the very short, 1 mm long branch, each branch bearing a single flower, and each subtended by an ovate, 1 mm long bract. Sepals 4, imbricate, ovate, somewhat pubescent, obtuse to acute, 2 to 3 mm long, 1.5 to 2 mm wide. Stamens indefinite; filaments 1 to 2 mm long; anthers broadly elliptic-ovoid, somewhat curved, 0.8 to 1 mm long.

Guam Experiment Station 466, July, 1912.

A species differing from most of those in *Flacourtia* and allied genera in its quite entire leaves. It more closely resembles certain species of *Scolopia* in facies than it does *Flocourtia*, but by definition goes in the latter genus.

CARICACEAE

CARICA Linnaeus

CARICA PAPAYA Linn. Sp. Pl. (1753) 377; Safford 215.

McGregor 335, G. E. S. 420, the common papaya.

A native of tropical America, now found in all tropical countries.

CACTACEAE

NOPALEA Salm-Dyck

NOPALEA COCHINELIFERA (Mill.) Salm-Dyck Cact. Hort. Dyck. ed. 2 (1845) 64.

Opuntia cochinelifera Mill. Gard. Dict. ed. 8 (1768) no. 6.

Opuntia sp.; Safford 338.

G. E. S. 264, locally known as *lengua de vaca*, also its common name in the Philippines.

A native of Mexico, now cultivated and sometimes spontaneous in other tropical countries.

Safford records an undetermined species of *Opuntia* from Guam, citing the same native name, which is probably *Nopalea cochinelifera*. The specimens I have examined are in flower, and the generic identification is correct.

THYMELAEACEAE

WIKSTROEMIA Endlicher

WIKSTROEMIA ELLIPTICA sp. nov. § *Euwikstroemia*.

Species *W. indicæ* affinis, differt foliis majoribus, ellipticis, vel ovato-ellipticis, usque ad 6 cm longis et 3 cm latis, utrinque

rotundatis vel apice acutis, ramulis adpresse fulvo-hirsutis, haud glabris.

A shrub, glabrous except the deciduously pubescent branchlets which are distinctly appressed-hirsute with fulvous hairs when young. Branches terete, reddish-brown, wrinkled when dry, the internodes rather short. Leaves opposite, elliptic or ovate-elliptic, chartaceous, dark-olivaceous when dry, lower surface a little paler, glabrous, 4 to 6 cm long, 2 to 3 cm wide, rounded at both ends or the apex somewhat acute; primary lateral nerves about 9 on each side of the midrib, rather distinct, the reticulations lax, rather distinct on the lower surface; petioles 2 mm long or less. Fruit ovoid, fleshy, red, about 8 mm long.

R. C. McGregor 437, October, 1911, hills back of Piti, altitude about 100 meters.

A species resembling in appearance *Wikstroemia indica* Mey., but distinguished by the characters indicated in the diagnosis. It seems to be even more closely allied to *W. rotundifolia* Decne., but its branchlets are hirsute, not puberulent.

LYTHRACEAE

AMMANNIA Linnaeus

AMMANNIA COCCINEA Rottb. Pl. Hort. Univ. Havn. Progr. Descr. (1773) 7.

G. E. S. 67, 360, 462, along small streams, locally known *astetema*.

Introduced from Mexico; widely distributed in North and South America.

LAGERSTROEMIA Linnaeus

LAGERSTROEMIA INDICA Linn. Syst. ed. 10 (1759) 1076; Safford 305.

G. E. S. 436, locally known as *melindres*.

A native of tropical Asia, now cultivated in all warm countries.

LAWSONIA Linnaeus

LAWSONIA INERMIS Linn. Sp. Pl. (1753) 349; Safford 306.

G. E. S. 340, locally known as *cinnamomo*.

A native of Africa or south-western Asia, now cultivated in all warm countries.

PEMPHIS Forster

PEMPHIS ACIDULA Forst. Char. Gen. (1776) 68, t. 34; Safford 348.

McGregor 563, G. E. S. 59, 448, along the seashore, local name *nigas*.

Eastern Africa, through tropical Asia and Malaya to Polynesia.

PUNICACEAE

PUNICA Linnaeus

PUNICA GRANATUM Linn. Sp. Pl. (1753) 472; Safford 362.

G. E. S. 79, locally known as *granada*.

A native of south-eastern Asia, now cultivated in all warm countries.

RHIZOPHORACEAE

BRUGUIERA Lamarck

BRUGUIERA CONJUGATA (Linn.) comb. nov.

Rhizophora conjugata Linn. Sp. Pl. (1753) 443, non aliorum!

Rhizophora gymnorhiza Linn. l. c.

Bruguiera gymnorhiza Lam. Illustr. 2 (1797) t. 397; Safford 202, pl. 40.

G. E. S. 339, locally known as *mañgling lahe*.

Along tidal streams on tropical shores from eastern Africa to India, Japan, and Polynesia.

If we follow the rules of nomenclature, as to priority, the acceptance of the Linnean specific name *conjugata* for this species is unavoidable, although it has only place priority over *Rhizophora gymnorhiza* in the original publication. Trimen³⁰ states: "There is no specimen in Herman's Herb., but his drawing is unmistakably this species [*Bruguiera gymnorhiza* Lam.] and it is the whole foundation for Linnaeus's *Rhizophora conjugata*, which name has been since always applied to another plant, *R. Candelaria* DC., to which this bears a strong resemblance in foliage."

Rhizophora conjugata (*R. gymnorhiza*), is not always easily distinguished from *R. eriopetala* W. & A., and various authors have by no means always described the same species under the name *Bruguiera gymnorhiza*. Blume's³¹ description of *Bruguiera gymnorhiza* applies unmistakably to typical *B. eriopetala* W. & A. I have little doubt but that the correct name for the species now going under the name of *Bruguiera eriopetala* W. & A. is *B. sexangula* (Lour.) Poir., which dates from 1790.

RHIZOPHORA Linnaeus

RHIZOPHORA CANDELARIA DC. Prodr. 3 (1828) 32; Trimen Fl. Ceyl. 2 (1894) 151.

Rhizophora conjugata Auct., non Linn.

McGregor 368, Mrs. Clemens s. n.

Along tidal streams from tropical east Africa to Polynesia.

There is apparently no question as to the validity of the above specific name for the present species. It was based on two references, the first to Rheede Hort. Malabar. 6: t. 34, the second to Rumph. Herb. Amboin. 3: t. 71, 72, of which the former must be interpreted as the type. Blume³² however, refers Rumpf's plates to *R. mucronata* Lam., and Rheede's to *R. conjugata*=*R. candelaria* DC. Rumpf's figures are unusually crude, and it is quite impossible to determine which of the two species they represent. His description seems to me to include both.

³⁰ Fl. Ceyl. 2 (1894) 154.

³¹ Mus. Bot. 1 (1849) 136.

³² Mus. Bot. 1 (1849) 133, 134.

RHIZOPHORA MUCRONATA Lam. Encycl. 6 (1804) 189; Safford 364, pl. 64.

G. E. S. 404, locally known as *mangle*.

Distribution of the preceding; readily distinguished by its much longer, several flowered peduncles.

COMBRETACEAE

TERMINALIA Linnaeus

TERMINALIA CATAPPA Linn. Mant. 1 (1767) 128; Safford 385.

McGregor 498; said by Safford to be very common, not only along the seashore but also inland, locally known as *talisai*.

Of wide distribution in the tropics of the eastern hemisphere, introduced into tropical America.

TERMINALIA SAFFORDII sp. nov. § *Catappa*.

Arbor ut videtur alta, ramulis junioribus inflorescentiis exceptis glabra vel subglabra; foliis breviter petiolatis, late obovatis, subcoriaceis, usque ad 13 cm longis, apice rotundato-truncatis vel latissime rotundatis, basi angustatis, obtusis, subtus 2-glandulosis; fructibus 1.5 ad 2 cm longis, 6 ad 8 mm diametro, oblongo-ovoideis vel lanceolato-ovoideis, glabris, acuminatis, leviter compressis, non carinatis.

A tree, size not indicated. Branches rather stout, the ultimate ones about 7 mm in diameter, glabrous, the branchlets marked with scars of fallen petioles more or less densely fulvous-pubescent. Leaves very broadly obovate, 10 to 13 cm long, 8 to 10 cm wide, subcoriaceous, the apex broadly rounded or rounded-truncate, narrowed below, the base obtuse or rounded, shining, the upper surface entirely glabrous, the lower slightly paler, glabrous, or the midrib more or less fulvous-villous, and with a gland near the insertion of the petiole on each side of the midrib; lateral nerves about 9 on each side of the midrib, rather slender, spreading, laxly anastomosing, the reticulations slender, distinct; petioles fulvous-pubescent, 10 to 12 mm long. Racemes in the upper axils, simple, in fruit up to 8 cm long, more or less pubescent. Fruits oblong-ovoid to lanceolate-ovoid, smooth, glabrous, 1.5 to 2 cm long, 6 to 8 mm wide, slightly compressed, not at all keeled or winged, acuminate, base obtuse, when dry brownish and somewhat glaucous.

Guam Experiment Station 440, July 1912, locally known as *talisai ganee*.

The foliage is somewhat similar to that of *Terminalia catappa* L., but the leaves are much smaller and relatively broader. The fruits are entirely different, somewhat resembling those of the Philippine *Terminalia edulis*. It may be most closely allied to the Polynesian *Terminalia litoralis* Seem.

LUMNITZERA Willdenow

LUMNITZERA LITTOREA (Jack.) Voigt Hort. Suburb. Calc. (1846) 39; Safford 312.

Pyrrhanthus littoreus Jack Malay Miscel. 2 (1822) 57.

Laguncularia purpurea Gaudich. Bot. Freyc. Voy. (1826) 481, t. 104.

Lumnitzera pedicellata Presl Rel. Haenk. 2 (1830) 23.

McGregor 467, Mrs. Clemens s. n., G. E. S. 333, locally known as *naña*.

The species is very widely distributed along tropical shores from India to Polynesia.

The types of both *Lumnitzera pedicellata* Presl and *Laguncularia purpurea* Gaudich. were from Guam, and I can see no reason whatever for maintaining Presl's species as a distinct one. The material cited agrees with his description, and also agrees with our ample material of *Lumnitzera littorea* (Jack) Voigt, from Malaya and from the Philippines.

LECYTHIDACEAE

BARRINGTONIA Forster

BARRINGTONIA ASIATICA (Linn.) Kurz in Journ. As. Soc. Beng. 45^a (1876) 70.

Mammea asiatica Linn. Sp. Pl. (1753) 731.

Barringtonia speciosa Forst. Char. Gen. (1776) 76, t. 38; Safford 196, pl. 38.

McGregor 560, G. E. S. 333, locally known as *puting*.

Along the seashore from Ceylon to Polynesia.

The Guam material is referable to the species described by Linnaeus as *Mammea asiatica*; that it is identical with Forster's *Barringtonia speciosa* admits of very little doubt in spite of Miers' conclusions to the contrary.

BARRINGTONIA RACEMOSA (Linn.) Roxb. Fl. Ind. 2 (1832) 634; Safford 196.

Eugenia racemosa Linn. Sp. Pl. (1753) 471.

G. E. S. 137, 224, 297, locally known as *langat*, *langasat*, and *langaasag*. Near the sea from India to Malaya and Polynesia.

MYRTACEAE

DECASPERMUM Forster

DECASPERMUM PANICULATUM (Lindl.) Kurz in Journ. As. Soc. Beng. 46^a (1877) 61.

Nelitris paniculata Lindl. Collect. Bot. (1821) 16.

McGregor 411, hills back of Piti.

Bengal to Formosa southward to Malaya and Australia, eastward to the Marianne and Caroline Islands; very closely allied to the Polynesian *Decaspermum fruticosum* Forst.

EUGENIA Linnaeus

EUGENIA JAVANICA Lam. Encycl. 3 (1789) 200.

G. E. S. 464, locally known as *macupa*.

Very widely distributed in tropical Asia and Malaya in cultivation.

EUGENIA MALACCENSIS Linn. Sp. Pl. (1753) 470.

Caryophyllus malaccensis W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 217.

Recorded by Safford, but it is suspected that the identification is erroneous, and that the plants he referred to *Eugenia* (*Caryophyllus*) *malaccensis* are *E. javanica*. Mr. Safford cites the native name *macupa* for his plant. India to Malaya and Polynesia, in cultivation.

EUGENIA THOMPSONII sp. nov. § *Jambosa*.

Ut videtur arbor alta, glabra, ramis ramulisque teretibus; foliis brevissime petiolatis, coriaceis, usque ad 18 cm longis, nitidis, oblongo-ovatis ad oblongo-lanceolatis, basi late rotundatis cordatisque, sursum angustatis, apice acutis vel obtusis, nervis utrinque circiter 10; inflorescentiis paniculatis, fasciculatis, caulifloris, 12 ad 20 cm longis; floribus plerumque in triadibus dispositis, calycibus infundibuliformibus, 8 ad 10 mm longis.

Apparently a tall tree, quite glabrous. Branches and branchlets terete, reddish-brown or sometimes grayish-red, mostly smooth. Leaves opposite, coriaceous, oblong-ovate to oblong-lanceolate, 10 to 18 cm long, 3 to 6.5 cm wide, the base rather abruptly and broadly rounded, distinctly cordate, narrowed above to the acute or obtuse apex, the margins somewhat recurved, upper surface brownish-olivaceous, shining, the lower somewhat paler, dull or but slightly shining; lateral nerves about 10 on each side of the midrib, distant, anastomosing, the reticulations lax; petioles stout, 3 mm long or less. Flowers in panicles which are fascicled on the trunk, the panicles 10 to 20 cm long, narrowly pyramidal, the lower branches 5 to 7 cm long, the upper shorter, all opposite, 3 or 4 pairs to each panicle, mostly spreading. Flowers for the most part in threes at the ends of the ultimate branchlets, their pedicels short, 1 to 3 mm long. Calyx funnel-shaped, 8 to 10 mm long, the lobes 4, very broad and short, not prominent. Petals 4, free, orbicular-reniform, rounded, 6 to 7 mm in diameter, prominently glandular. Stamens indefinite; filaments 6 to 8 mm long; anthers 1 mm long. Fruit when dry about 1.5 cm long, 1 cm in diameter, truncate, black, base rounded, ovoid-ellipsoid.

Guam Experiment Station 469, no data recorded.

A striking species on account of its fascicled, rather ample, cauline panicles, and its very shortly petioled leaves which are broadly rounded and distinctly cordate at the base, and gradually narrowed upward to the acute or obtuse apex.

EUGENIA DECIDUA sp. nov. § *Eueugenia*.

Frutex vel arbor parva, glabra vel subglabra; foliis deciduis, ovatis ad oblongo-ovatis, chartaceis, usque ad 4 cm longis, obtuse

acuminatis, basi acutis ad rotundatis, puncticulatis, nervis utrinque 6 vel 7, distantibus, tenuibus, anastomosantibus, reticulis laxissimis; floribus 4-meris, fasciculatis, axillaribus terminalibusque, longe et graciliter pedicellatis, sepalis reflexis, 4 mm longis, petalis quam sepalis duplo longioribus.

A shrub or small tree, nearly glabrous, the leaves deciduous, the new ones appearing just before or with the flowers. Branches terete, light-gray, the branchlets of the same color, slender. Leaves subfasciculate at the tips of very short branchlets, oblong-ovate to ovate, membranaceous, puncticulate, 2 to 4 cm long, 1.5 to 2 cm wide, olivaceous when dry, somewhat shining, the base acute to rounded, the apex rather broadly obscurely blunt-acuminate; nerves about 6 on each side of the midrib, very slender, obscure, anastomosing, the reticulations almost none, very lax; petioles 2 to 4 mm long. Flowers apparently white, fascicled with the leaves on the very short branchlets, axillary and terminal, their pedicels very slender, 1 to 1.5 cm long, few to rather many flowers together. Sepals 4, reflexed, rounded, somewhat pubescent, membranaceous or chartaceous, 4 mm long, 2 mm wide, the calyx-tube narrowly funnel-shaped, obscurely sulcate. Petals 4, oblong-obovate, membranaceous, apex rounded, narrowed below, 8 mm long, 4 mm wide. Stamens many, in several series; filaments slender, 3 to 6 mm long; anthers broadly elliptic, 0.8 mm long. Ovary 2-celled, ovules numerous, on the central placenta.

Guam Experiment Station 441, July, 1912, no native name known.

A species rather remotely allied to the Philippine *Eugenia loheri* C. B. Rob., well characterized by its thin leaves and their deciduous character, its long-pedicelled, fascicled or falsely fascicled flowers, its elongated, narrowly obovate-oblong petals, and its reflexed sepals.

EUGENIA PALUMBIS sp. nov. § *Eueugenia*.

Frutex, partibus junioribus calycibusque exceptis glabra; ramis ramulisque teretibus, tenuibus, brunneis; foliis subcoriaceis, in siccitate pallidis, ellipticis vel ovato-ellipticis, utrinque subaequaliter angustatis, basi acutis, apice obtusis, usque ad 5.5 cm longis, brevissime petiolatis, subtus puncticulatis, nervis utrinque circiter 6, tenuibus, obscuris; floribus axillaribus, solitariis, brevissime pedicellatis, haud 1 cm diametro.

A small shrub, quite glabrous except the younger branchlets and the calyces. Branches and branchlets slender, terete, pale-brownish, the largest ones seen but 2 mm in diameter. Leaves subcoriaceous, the very young ones membranaceous, elliptic to ovate-elliptic, 3.5 to 5.5 cm long, 1.5 to 2.5 cm wide, about

equally narrowed to the acute base and to the obtuse apex, the margins slightly recurved, when dry pale, dull or very slightly shining, uniformly colored on both surfaces, the lower surface punctulate with minute scattered glands; petioles slender, 3 mm long or less; lateral nerves about 6 on each side of the midrib, very slender, obscure, obscurely anastomosing, reticulations very lax, indistinct. Flowers axillary, solitary, their pedicels stout, about 2 mm in diameter. Calyx-tube broadly funnel-shaped, pubescent externally, short, the lobes 4, broadly ovate, rounded, chartaceous, 3 to 3.5 mm long, 3 mm wide, prominently glandular, margins, below, slightly pubescent. Stamens indefinite; filaments 2 to 3 mm long; anthers 0.7 mm long. Petals not seen.

H. L. W. Costenoble 1173 collected at Tumbun, August, 1906, locally known as *agatelang*, sheet No. 653738 U. S. National Herbarium.

A species well characterized by its small, axillary, solitary, very shortly pedicelled flowers. It is dedicated to the Reverend José Palomo, for many years a resident of Guam, who supplied Mr. Safford with much information regarding the island, as well as some botanical material.

EUGENIA COSTENOBLEI sp. nov. § *Eueugenia*.

Arbor parva (vel frutex) partibus junioribus floribusque exceptis glabra; ramis ramulisque tenuibus, teretibus, pallidis; foliis coriaceis, late ellipticis ad elongato-ellipticis, usque ad 9 cm longis, utrinque subaequaliter angustatis, basi acutis, apice acuminatis, in siccitate nitidis, supra pallide olivaceis, subtus pallidioribus, haud vel obscurissime glandulosis, nervis utrinque 7 vel 8, non prominentibus; floribus axillaribus, solitariis, longissime pedicellatis, pedicellis 2.5 ad 4.5 cm longis, apice 2-bracteolatis; floribus sub anthesin circiter 2.5 vel 3 cm diametro, calycibus tubo utrinque tomentoso.

A shrub or small tree, the young branchlets, young leaves and the flowers more or less pubescent. Branches and branchlets slender, terete, pale, the latter sometimes slightly compressed, usually appressed-pubescent. Leaves elliptic to elongate-elliptic, coriaceous or subcoriaceous, the younger ones softly pubescent, the adult ones entirely glabrous, 6 to 9 cm long, 3 to 4.5 cm wide, about equally narrowed at both ends, the base acute, the apex rather prominently but bluntly acuminate, the upper surface shining, pale-olivaceous, the lower much paler, dull, not glandular; lateral nerves 7 or 8 on each side of the midrib, not prominent, anastomosing, the reticulations lax, obscure; petioles 4 mm long or less. Flowers axillary, solitary, long-pedicelled, the pedicels usually somewhat pubescent, in age glabrous, each with a pair of lanceolate, acuminate, pubescent

bracteoles at the apex, these bracteoles about 4.5 mm long, 2.5 mm wide at the base, gradually narrowed upward, closely appressed to the calyx. Calyx-tube broadly funnel-shaped, densely tomentose outside, the limb also pubescent within, about 4 mm high, 5 mm in diameter, the lobes chartaceous, glandular, broadly elliptic-ovate, rounded, up to 8 mm long and 6 mm wide. Petals 4, deciduous, free, obliquely ovate-reniform, rounded, about 1.5 cm long. Stamens indefinite, the filaments slender, up to 12 mm long; anthers 1 to 1.2 mm long.

H. L. W. Costenoble 1172, collected at Hilaan, August, 1906, locally known as *aabang*, sheets Nos. 653736, 653737 U. S. National Herbarium.

Well characterized by its pubescent younger parts, and especially by its solitary, axillary, long-peduncled flowers, the calyx-tube being densely tomentose outside and the somewhat produced limb pubescent on the inside.

Another species of the genus, apparently also undescribed, is represented by *G. E. S.* 359, but the specimens are not quite mature.

PSIDIUM Linnaeus

PSIDIUM GUAJAVA Linn. Sp. Pl. (1753) 470; Safford 361.

McGregor 525, *G. E. S.* 347, 447, locally known as *abas*.

A native of tropical America, now widely distributed in all hot countries.

SAFFORDIELLA genus novum

Genus *Baeckea* simillima et affinis, differt fructibus carnosis, baccatis, indehiscentibus.

SAFFORDIELLA BENNIGSENIANA (Volkens) comb. nov.

Leptospermum bennigsenianum Volkens in Engl. Bot. Jahrb. 30 (1902) 470.

McGregor 475, October, 1911, hills back of Piti, altitude about 100 meters, a shrub, one meter or less in height, with white flowers.

Leptospermum bennigsenianum Volkens is rather imperfectly described, and was based on two specimens from Yap, Caroline Islands (*Volkens* 277, 370), both of which are represented in the herbarium of the Bureau of Science. In habit the plant strongly resembles both *Baeckea* and *Leptospermum*. The leaves, however, are always opposite, a character not indicated by Volkens, and a character that at once excludes the plant from *Leptospermum*. The ovary is 3-celled, with two superposed ovules in each cell. The stamens are 1-seriate, not, or at least very obscurely, arranged in groups. The flowers are solitary and each has, immediately below the calyx, two, linear, 3 to 4 mm. long bracteoles.

The striking character of the plant, and the one depended on in characterizing it as a new genus, is its soft, fleshy, berry-like fruit, which is crowned by the calyx-lobes, and which is entirely indehiscent. When mature the fruit is rather bright-red, and the pericarp is very soft and fleshy. Each contains three, subglobose, hard, seeds or seed-like cocci about

1.5 mm in diameter, embedded in the soft pulp of the berry. All species of *Leptospermum* and *Baeckea* have dry, dehiscent capsules.

The genus is dedicated to Mr. William Edwin Safford, author of the eminently useful work entitled "The Useful Plants of the Island of Guam."³³

MELASTOMATACEAE

MEDINILLA Gaudichaud

MEDINILLA ROSEA Gaudich. Bot. Freyc. Voy. (1826) 484, t. 106; Safford 320.

McGregor 500, G. E. S. 160.

This species is the type of the genus *Medinilla* and is definitely known only from Guam.

MELASTOMA Linnaeus

MELASTOMA MARIANUM Naud. in Ann. Sci. Nat. III 13 (1849) 276; Safford 322.

McGregor 430, G. E. S. 350.

Known only from Guam.

OENOTHERACEAE

JUSSIAEA Linnaeus

JUSSIAEA LINIFOLIA Vahl Eclog. Amer. 2 (1798) 32.

G. E. S. 34, locally known as titimo.

Widely distributed in the tropics of both hemispheres.

ARALIACEAE

POLYSCIAS Forster

POLYSCIAS GRANDIFOLIA Volken in Engl. Bot. Jahrb. 30 (1902) 471.

McGregor 266, at Agaña.

A species previously known only from the Island of Yap in the Carolines, and exceedingly closely allied to the Philippine *Polyscias cumingiana* (Presl) Harms (*Paratrophia cumingiana* Presl, *Panax cumingiana* Rolfe), which in turn is possibly not distinct from *Polyscias rumphiana* Harms (*Panax pinnatum* Lam.), but which can only be determined when extensive collections from Amboina are available for study. The species in facies very strongly resembles *Anompanax philippinensis* Harms, but differs in essential floral characters.

NOTHOPANAX Miquel

NOTHOPANAX FRUTICOSUM (Linn.) Miq. Fl. Ind. Bat. 1¹ (1855) 765; Safford 333.

Panax fruticosum Linn. Sp. Pl. ed. 2 (1763) 1513.

Commonly cultivated, *fide* Safford, as it is in the entire Indo-Malayan and Polynesian regions.

³³ Contributions from the U. S. National Herbarium 9 (1905) 1-416, plates 70.

NOTHOPANAX COCHLEATUM (Lam.) Miq. Fl. Ind. Bat. 1^a (1855) 766; Safford 333.

Aralia cochleata Lam. Encycl. 1 (1783) 224.

Introduced and cultivated, *vide* Safford; common in cultivation in the Indo-Malayan region generally.

NOTHOPANAX GUILFOYLEI (Cogn. & March.) Merr. in Philip. Journ. Sci. 7 (1912) Bot. 242.

Aralia guilfoylei Cogn. & March. Pl. Ornem. 2 (1874) t. 58; Safford 186.

Cultivated for its variegated foliage, *vide* Safford; cultivated in most warm countries, where native uncertain, probably Polynesia.

UMBELLIFEREAE

CENTELLA Linnaeus

CENTELLA ASIATICA (Linn.) Urban in Mart. Fl. Bras. 11^a (1879) 287; Safford 221.

Hydrocotyle asiatica Linn. Sp. Pl. (1753) 234.

Mrs. Clemens s. n., G. E. S. 46.

Widely distributed in the tropics of both hemispheres.

FOENICULUM Tournefort

FOENICULUM VULGARE Gaertn. Fruct. 1 (1788) 105, t. 23, f. 5.

Foeniculum foeniculum Karst. Deutsch. Fl. (1880-83) 837; Safford 277.

Often cultivated by the natives, *vide* Safford; cultivated in all warm countries.

Ordinary parsley (*Apium petroselinum* Linn., *Petroselinum petroselinum* Karst.; Safford 349) is occasionally cultivated, but does not thrive, *vide* Safford.

MYRSINACEAE

DISCOCALYX Mez

DISCOCALYX MEGACARPA sp. nov.

Frutex erectus, glaber, ramulis teretibus, crassis; foliis oblongo-oblongeolatis, chartaceis, usque ad 20 cm longis, acumina-
tis, basi longe angustatis, cuneatis, margine integris, utrinque
reticulatis; paniculis tenuibus, usque ad 10 cm longis, angustis,
in ramis brevibus specialibus dispositis; floribus 5-meris, 5 mm
diametro, petalis sepalisque valde glandulosis; fructibus sub-
globosis, circiter 1 cm diametro, in siccitate striatis.

An erect glabrous shrub, apparently dioecious. Branches and
branchlets terete, rather stout, marked with large petiolar scars,
somewhat brownish. Leaves alternate, chartaceous, oblong-
oblanceolate, entire, 15 to 20 cm long, 3.5 to 5.5 cm wide,
narrowed above to the somewhat acuminate apex, and gradually
narrowed from about the middle to the cuneate base, the lamina
merging gradually with the petiole, both surfaces somewhat
reticulate, shining when dry, the lower a little paler than the

upper; primary lateral nerves about 8 on each side of the midrib, rather slender, curved-ascending, obscurely anastomosing; petioles stout, 1 cm long or less. Panicles arranged near the apices of special branches, these branches up to 3 cm long, usually marked with large petiolar scars, bearing near their apices several reduced leaves and several slender panicles, the reduced leaves mostly less than 6 cm long and 1 cm wide, the panicles 5 to 10 cm long, narrow, rather many flowered. Male flowers pink or white, 5-merous, about 5 mm in diameter, their pedicels 4 to 5 mm long. Calyx 5 mm in diameter, prominently punctate, shallowly 4- or 5-lobed, the lobes not reaching the middle, broadly ovate, obtuse or rounded, glabrous. Corolla 5-lobed, the lobes united for about their lower one-fourth, elliptic-ovate to oblong-elliptic, rounded, 2 to 2.5 mm long, prominently glandular. Anthers about 1 mm long, not glandular. Rudimentary ovary about 1.5 mm long, narrowly oblong, glandular. Fruit subglobose, bright red when mature, nearly or quite 1 cm in diameter, slightly longitudinally ridged when dry.

R. C. McGregor 558, October, 1911, in forests, Upi road, locally known as *otud* or *otot*.

A well marked species more closely allied to the Philippine *Discocalyx cybianthoides* Mez than to the Marianne *D. ladronica* Mez. but very different from both. The type of the latter species may have been from Guam, as it was collected in the Marianne Islands by Gaudichaud. This is undoubtedly the plant recorded by Safford p. 295 as *Icacorea* sp.

No representative of the *Primulaceae* is known from Guam. *Lysimachia mauritiana* Lam. cited from the Marianne Islands by Pax & Knuth,³⁴ coll. Gaudichaud, may have been from Guam, but was probably from Tinian or Rota. At any rate it will probably be found in Guam.

SAPOTACEAE

ACHRAS Linnaeus

ACHRAS SAPOTA Linn. Sp. Pl. ed. 2 (1763) 470.

Sapota zapotilla Coville ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 369.

G. E. S. 76, locally known as *chico*.

A native of tropical America, now cultivated in all tropical countries.

SIDEROXYLON Linnaeus

SIDEROXYLON GLOMERATUM Volken in Engl. Bot. Jahrb. 31 (1902) 472.

G. E. S. 477.

Quite identical with Volken's species which was described from specimens collected in Yap, Caroline Islands, a duplicate of the type being in the herbarium of the Bureau of Science. Very close to *S. ferrugineum* Hook. & Arn.

³⁴ Engl. Pflanzenreich 20 (1905) 275.

OLEACEAE

JASMINUM Linnaeus

JASMINUM GRANDIFLORUM Linn. Sp. Pl. ed. 2 (1762) 9; Safford 300.

G. E. S. 369, locally known as *hasmin*.

A native of India, now cultivated in most tropical countries.

JASMINUM MULTIFLORUM (Burm. f.) Roth Nov. Sp. Pl. (1824) 6.

Nyctanthes multiflora Burm. f. Fl. Ind. (1768) 5, t. 3, f. 1.

G. E. S. 310, from cultivated plants.

A native of India, now widely distributed in cultivation.

JASMINUM SAMBAC (Linn.) Ait. Hort. Kew. 1 (1789) 8; Safford 300.

Nyctanthes sambac Linn. Sp. Pl. (1753) 6.

Cultivated, *fide* Safford; probably a native of India, now cultivated in all tropical countries.

JASMINUM MARIANUM DC. Prodr. 8 (1844) 307; Safford 300.

McGregor 562, Upi road.

A species known only from Guam.

LOGANIACEAE

GENIOSTOMA Forster

GENIOSTOMA MICRANTHUM A. DC. Prodr. 9 (1845) 27.

McGregor 524, 534.

A species known only from Guam, described from specimens collected by Gaudichaud, the record overlooked by Safford.

APOCYNACEAE

ALLAMANDA Linnaeus

ALLAMANDA CATHARTICA Linn. Mant. 2 (1771) 214.

G. E. S. 403, cultivated. Apparently recently introduced as it is not enumerated by Safford.

A native of tropical America, now cultivated in many tropical countries.

ALYXIA Banks

ALYXIA TORRESIANA Gaudich. Freyc. Voy. Bot. (1826) 451.

Gynopogon torresianus K. Schum. & Laut.; Safford 289.

G. E. S. 32, at Libugan.

A species known only from Guam, unless the Philippine *Alyxia luzoniensis* Merr. proves to be identical; the two species are very closely allied.

CARISSA Linnaeus

CARISSA GRANDIFLORA (E. Mey.) A. DC. Prodr. 8 (1844) 335.

Arduina grandiflora E. Mey. Comm. Pl. Afr. Austr. (1835-37) 190.

G. E. S. 313, a species recently introduced from the Hawaiian Islands, cultivated only. A native of South Africa.

CERBERA Linnaeus

CERBERA LACTARIA (G. Don) Ham. ex DC. Prodr. 8 (1844) 353; Valetton in Ann. Jard. Bot. Buitenz. 12 (1895) 245, t. 26, f. 1-5.

Tanghinia lactaria G. Don in Sweet Hort. Brit. ed. 3 (1839) 461.

G. E. S. 196, *McGregor* 568, along the seashore, locally known as *chuti* or *chiute*.

I have followed Valetton in holding this as a species separate from the Indian *Cerbera odollam* Gaertn., although it is not certain whether or not the distinguishing characters indicated by him are entirely constant. The abundant Philippine material distributed within the past ten years as *Cerbera odollam* Gaertn., is all referable to *C. lactaria* Ham., as interpreted by Valetton. The species appears to be distributed from eastern Malaya to Polynesia.

A strict interpretation of the generic type of *Cerbera*, that is, the first species cited by Linnaeus, would probably apply the generic appellation *Cerbera* to the plants now placed in the genus *Thevetia*. Linnaeus described three species, *Cerbera ahouai*, *C. manghas*, and *C. thevetia* in the first edition of his *Species Plantarum*; the first and last are species of *Thevetia*, while *Cerbera manghas* is in part the same as *C. odollam* Gaertn., and in part *Tabernaemontana dichotoma* Roxb. I believe that *Cerbera manghas* Linn. should be retained as the oldest name for the species commonly known as *C. odollam* Gaertn., in spite of the fact that Linnaeus' species was a mixture.

NERIUM Linnaeus

NERIUM INDICUM Mill. Gard. Dict. ed. 8 (1768) no. 2.

Nerium odorum Soland. in Ait. Hort. Kew. 1 (1789) 297.

Nerium oleander Safford in Contr. U. S. Nat. Herb. 9 (1905) 331, non Linn.?

G. E. S. 106, 391, locally known by its Spanish name *adelfa*.

A species widely distributed in the Indo-Malayan region in cultivation; the Guam specimens appear to me to be referable to *Nerium indicum* Mill. (*N. odorum* Soland.), rather than to *N. oleander* Linn.

LOCHNERA Reichenbach

LOCHNERA ROSEA (Linn.) Reichenb. Consp. (1828) 134.

Vinca rosea Linn. Syst. ed. 10 (1759) 944; Safford 310.

G. E. S. 104, 371, *McGregor* 364, cultivated in gardens, locally known by its Spanish name *chichirica*.

A native of tropical America, now widely distributed in the tropics of the world in cultivation and as a naturalized plant. To be consistent with the American code of nomenclature, the designation of this plant should be *Ammocallis rosea* (Linn.) Small, rather than *Lochnera rosea* (Linn.) Reichenb. under which name Mr. Wight recorded it from Guam.

OCHROSIA Jussieu

OCHROSIA MARIANNENSIS A. DC. Prodr. 8 (1844) 357; Safford 336.

G. E. S. 290, locally known as *langiti*.

A species known only from Guam, the above being apparently its second collection. It belongs in the section *Lactaria*. A duplicate of No. 290 has been critically compared with the type in the DeCandolle herbarium by C. DeCandolle, who writes that they are identical.

OCHROSIA OPPOSITIFOLIA (Lam.) K. Schum. in Engl. & Prantl Nat. Pflanzenfam. 4² (1895) 156.

Cerbera oppositifolia Lam. Encycl. 1 (1783) 62.

G. E. S. 125, *McGregor* 569, locally known as *fago*.

Madagascar through Malaya to the Admiralty Islands and Guam.

This species, as interpreted by K. Schumann, is of wide distribution, and has numerous synonyms. *Cerbera oppositifolia* Lam., if correctly interpreted, supplies the oldest valid specific name. It is based entirely on *Lactaria salubris* Rumph. Herb. Amboin. 2: 255, t. 84, which is also the type of *Ochrosia salubris* Blume. Valetton²⁵ has queried the correctness of K. Schumann's interpretation of *Lactaria salubris*, retaining *Ochrosia borbonica* Gmel. and *O. salubris* Blume as distinct species under the section *Echinocaryon*, and *O. oppositifolia* Lam. (as a synonym of *O. elliptica* Labill.) under the section *Lactaria*. Material from Amboina is essential in order properly to interpret *Lactaria salubris* from which *Ochrosia salubris* and *O. oppositifolia* must in turn be interpreted. While the Guam material does not agree especially well with Rumpf's figure of *Lactaria salubris* as to vegetative characters, the outline and size of the fruit agrees very well. The Guam material certainly belongs in the section *Echinocaryon*.

TABERNAEMONTANA Linnaeus

TABERNAEMONTANA DIVARICATA (Linn.) R. Br. ex Roem. & Schult. Syst. Veg. 4 (1819) 427.

Nerium divaricatum Linn. Sp. Pl. (1753) 209.

G. E. S. 395, the form with double flowers, from cultivated plants, apparently a recent introduction from Manila or from Honolulu.

Widely distributed in the tropics in cultivation, where native uncertain.

THEVETIA Linnaeus

THEVETIA PERUVIANA (Pers.) comb. nov.

Cerbera peruviana Pers. Syn. Pl. 1 (1805) 267.

Cerbera thevetia Linn. Sp. Pl. (1753) 209.

Thevetia nereifolia Juss. ex Steud. Nomencl. ed. 2, 2 (1840) 680.

Thevetia thevetia Millsp. in Field. Columb. Mus. Bot. 2: 83.

G. E. S. 124, cultivated, apparently of recent introduction as it is not recorded by Safford.

A native of tropical America, now cultivated in most tropical countries.

ASCLEPIADACEAE

ASCLEPIAS Linnaeus

ASCLEPIAS CURASSAVICA Linn. Sp. Pl. (1753) 215; Safford 191.

McGregor 464, *Thompson* 15, *Mrs. Clemens* s. n.

This pantropic weed, originating in tropical America, is apparently common in Guam.

²⁵ Ann. Jard. Bot. Buitenz. 12 (1895) 226.

DISCHIDIA R. Brown

DISCHIDIA PUBERULA Decne. in DC. Prodr. 8 (1844) 631; Safford 263.

An endemic species known only from the original collection made in the Marianne Islands, presumably in Guam, by Gaudichaud.

TELOSMA Coville

TELOSMA ODORATISSIMA (Lour.) Coville in Contr. U. S. Nat. Herb. 9 (1905) 384.

Cynanchum odoratissimum Lour. Fl. Cochinch. (1790) 166.

Pergularia odoratissima Sm. Ic. Pict. (1790-93) t. 16.

An introduced and cultivated species in Guam, *vide* Safford, as in the Philippines, known as *mil-leguas* in both places. In 1907 Mr. N. E. Brown proposed the generic name *Prageluria* for *Pergularia* auct., non Linnaeus, at that time being ignorant of the fact that Coville had already published the new name *Telosma*.

CONVOLVULACEAE

CALONYCTION Choisy

CALONYCTION ALBUM (Linn.) House in Bull. Torr. Bot. Club. 31 (1904) 591.

Ipomoea alba Linn. Sp. Pl. (1753) 161.

Ipomoea longiflora R. Br. Prodr. (1810) 591.

G. E. S. 166, along the seashore, Cabras Island, locally known as *alaihaitasi*.

Tropics of both hemispheres, near the seashore, perhaps introduced in tropical America.

IPOMOEA Linnaeus

IPOMOEA BATATAS (Linn.) Poir. in Lam. Encycl. 6 (1804) 14; Safford 297.

Convolvulus batatas Linn. Sp. Pl. (1753) 154.

G. E. S. 222, commonly cultivated.

A native of tropical America, now cultivated in all warm countries.

IPOMOEA CONGESTA R. Br. Prodr. (1810) 485; Safford 298.

McGregor 501.

Luzon to northern Australia and Polynesia.

IPOMOEA GRACILIS R. Br. Prodr. (1810) 484; House in Ann. N. Y. Acad. Sci. 18 (1908) 248.

Ipomoea denticulata Choisy in Mém. Soc. Phys. Genève. 6 (1833) 467, non R. Br.

Ipomoea choisyana W. F. Wight in Contr. U. S. Nat. Herb. 9 (1905) 298.

McGregor 449, *G. E. S.* 96, 254, local names *lagun*, *lagun tase*.

Along the seashore in the tropics of both hemispheres.

IPOMOEA HEDERACEA (L.) Jacq. Collect 1 (1786) 124.

Pharbitis hederacea Choisy Mém. Soc. Phys. Genève. 6 (1833) 440; Safford 349.

Convolvulus hederaceus Linn. Sp. Pl. (1753) 154.

Admitted on the authority of Safford, who cites *fofgu* as its local name; frequently confused with the very closely allied *Ipomoea nil* Roth.

A native of tropical America, now widely distributed in both hemispheres.

IPOMOEA PES-CAPRAE (Linn.) Roth Nov. Pl. Sp. (1821) 109; Safford 299.

Convolvulus pes-caprae Linn. Sp. Pl. (1753) 159.

McGregor 545, G. E. S. 71.

Along the seashore in the tropics of both hemispheres.

IPOMOEA REPTANS (Linn.) Poir. in Lam. Encycl. Suppl. 3 (1813) 460.

Convolvulus reptans Linn. Sp. Pl. (1753) 158, p. p.

G. E. S. 48, in wet places, local name *cancon*, which is also its Tagalog name in the Philippines.

Widely distributed in the tropics of both hemispheres.

IPOMOEA TRILOBA Linn. Sp. Pl. (1753) 161.

Ipomoea mariannensis Choisy in Mém. Soc. Phys. Genève. 6 (1833) 468; Safford 299.

McGregor 450.

A native of tropical America, introduced into Guam and the Philippines at an early date from Mexico, now also found in Singapore, Java, and Mauritius.

There is not the slightest doubt but that *Ipomoea mariannensis* Choisy, the type of which was from Guam, is quite identical with the Linnean species, and it is accordingly here reduced.

MERREMIA Dennstaedt**MERREMIA GEMELLA** (Burm.) Hallier f. ex Koord in Meded. Lands Plantent. 19 (1898) 544; Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 120.

Convolvulus gemellus Burm. Fl. Ind. (1768) 46.

G. E. S. 18, locally known as *ñyetcor*.

India to Malaya.

MERREMIA HEDERACEA (Linn.) Hallier f. in Engl. Bot. Jahrb. 18 (1894) 154.

Convolvulus hederaceus Linn. Sp. Pl. (1753) 154.

Thompson 20, November, 1910.

India to Malaya.

OPERCULINA Manso**OPERCULINA TUBEROSA** (Linn.) Meissn. in Mart. Fl. Bras. 7: 212.

Ipomoea tuberosa Linn. Sp. Pl. (1753) 160.

McGregor 551, near Agaña.

Apparently a recent introduction, as it is in the Philippines; a native of tropical America.

OPERCULINA PELTATA (Linn.) Hallier f. in Engl. Bot. Jahrb. 16 (1892) 549; Safford 338.

Convolvulus peltatus Linn. Sp. Pl. (1753) 1194.

Common in rocky places near the sea, *vide* Safford; eastern Malaya to Polynesia.

QUAMOCLIT Tournefort

QUAMOCLIT PENNATA (Desr.) Boj. Hort. Maurit. (1837) 224.

Convolvulus pennatus Desr. in Lam. Encycl. 3 (1791) 567.

Quamoclit quamoclit Britt. in Britt. & Br. Ill. Fl. 3 (1898) 22.

G. E. S. 172, locally known as *cebello del angel*.

A native of tropical America, now widely distributed in all warm countries.

STICTOCARDIA Hallier f.

STICTOCARDIA CAMPANULATA (Hallier f.) comb. nov.

Ipomoea campanulata Linn. Sp. Pl. (1753) 160.

Convolvulus tiliæfolius Desr. in Lam. Encycl. 3 (1791) 544.

Rivea tiliæfolia Choisy in Mém. Soc. Phys. Genève. 6 (1833) 407.

Argyreia tiliæfolia Wight Ic. 4 (1850) 12, t. 1358; Safford 188.

Stictocardia tiliæfolia Hallier f. in Engl. Bot. Jahrb. 18 (1893) 159.

Rivea campanulata House in Muhlenbergia 5 (1909) 72.

G. E. S. 93, local names *alalag*, *abubo*.

A species of wide distribution in the Indo-Malayan region, introduced in other tropical countries.

In adopting both the generic and specific name of this species much depends on interpretation of types, and differences in interpretation accounts for many of the synonyms cited above. Dr. House claims that the actual type of the genus *Rivea* is the same species that Hallier more recently selected as the type of the genus *Stictocardia*, but there may be a difference as to interpretation for Choisy includes in *Rivea*, in its original place of publication, more than the single species *Rivea tiliæfolia*, judging from Index Kewensis. I am, hence, content to retain *Stictocardia* in the sense that Hallier proposed it, but I do not accept his specific name *tiliæfolia*, which is antedated by *Ipomoea paniculata* Linn. Hallier²² states that the specimen in the Linnean herbarium under *Ipomoea campanulata* is *Thespesia populnea* Corr., and in this he is certainly correct. B. Daydon Jackson, Secretary of the Linnean Society, informs me that the specimen is named *campanulata* by Linnaeus himself, and that Sir J. E. Smith has pencilled on the sheet "*Hibiscus populneus* J. E. S." The species is checked off in Linnaeus' personal, interleaved copy of his Species Plantarum indicating that the specimen was in the herbarium if not before the Species Plantarum was published, at all events a very few months afterwards. However, as to the actual type, the first reference under *Ipomoea campanulata* is to *Adamboe* Rheed Hort. Malabar. 11: 115, t. 56 which is *Stictocardia tiliæfolia*=*Stictocardia campanulata*, and to which the first part of Linnaeus' description manifestly applies. The last part of the description apparently applies to *Thespesia populnea* Corr. I maintain that the species is to be typified by Rheede's figure, not by the specimen in the Linnaean

²² Meded. Rijks Herb. 1 (1910) 26.

herbarium. It is to be noted, however, that Trimen,³⁷ a very careful worker, retains the species *Ipomoea campanulata* Linn., without discussion, generically as well as specifically distinct from *Argyrea tiliaefolia* Wight.

BORAGINACEAE

CORDIA Linnaeus

CORDIA SUBCORDATA Lam. Illustr. 1 (1791) 421, No. 1899; Safford 248.

G. E. S. 151.

Eastern Africa through Malaya to Polynesia, along the seashore.

HELIOTROPIUM Linnaeus

HELIOTROPIUM INDICUM Linn. Sp. Pl. (1753) 130; Safford 291.

G. E. S. 13, 475, locally known as *berbena* or *berbana*.

A weed in all tropical countries, probably a native of the eastern hemisphere.

HELIOTROPIUM OVALIFOLIUM Forsk. Fl. Aegypt.-Arab. (1775) 38, var. **DEPRESSUM** (Cham.) comb. nov.

Heliotropium coromandelinum Retz. var. *depressum* A. DC. Prodr. 9 (1845) 542.

Heliotropium gracile R. Br. var. *depressum* Cham. in Linnaea (1829) 457.

Thompson 2, McGregor 390.

The type of the variety was from Guam, but the record was overlooked by Safford in preparing his enumeration.

HELIOTROPIUM CURASSAVICUM Linn. Sp. Pl. (1753) ¹³²291; Safford 291.

Common on sandy seashores, *fide* Safford. I have seen no Guam specimens.

HELIOTROPIUM PERUVIANUM Linn. Sp. Pl. ed. 2 (1762) 187; Safford 292.

Said by Safford to be commonly cultivated in gardens of the natives.

TOURNEFORTIA Linnaeus

TOURNEFORTIA ARGENTEA Linn. f. Suppl. (1781) 133; Safford 389.

McGregor 505.

Common along the seashores of the Indian and Pacific oceans in the tropics.

VERBENACEAE

CALLICARPA Linnaeus

CALLICARPA PAUCINERVIA sp. nov.

Species *C. erioclone* simillima et affinis, differt nervis lateralibus minus numerosis, 5 utrinque, indumento stellari, haud ramoso.

" Fl. Ceyl. 3 (1851) 221.

A shrub or small tree, the branchlets, inflorescences, and lower surfaces of the leaves very densely stellate-pubescent with pale or yellowish indumentum, the hairs simply stellate, not at all plumose-stellate. Branches terete, grayish, older ones glabrous. Leaves ovate to oblong-ovate, chartaceous to subcoriaceous, 9 to 11 cm long, 4 to 5.5 cm wide, rather abruptly narrowed below to the distinctly decurrent-acuminate base, the apex somewhat acuminate, the margins crenulate in the upper two-thirds, the upper surface, when dry, very dark-brown, shining, the reticulations impressed, rather close, ultimately glabrous except for the stellate hairs along the midrib and lateral nerves, the lower surface pale yellowish-brown or somewhat straw-colored, uniformly and densely stellate-pubescent, the glands, if present, entirely obscured by the indumentum; lateral nerves 5 on each side of the midrib, prominent, curved-ascending, anastomosing; petioles densely stellate-pubescent, 10 to 12 mm long. Cymes axillary, one in each axil, peduncled, the peduncles 7 mm long or less, dichotomously branched, the whole cyme 2 cm long and wide or somewhat less, all parts densely stellate-pubescent. Flowers numerous, rather crowded. Calyx densely stellate-pubescent, obovoid, truncate or minutely 4-toothed, base acute, about 1.5 cm long and nearly as wide. Corolla 3 mm long, glabrous, the lobes 4, broadly elliptic-ovate, rounded, about 1.3 mm long. Stamens exserted; anthers ellipsoid, waxy-glandular on the back with small yellow glands, about 1.2 mm long. Fruit depressed-globose, glabrous, 2 mm in diameter.

Guam Experiment Station 292, in rocky places at Asan, January, 1912.

A species much resembling the Philippine *Callicarpa erioclona* Schauer, and probably as closely allied to that species as to any other. It differs notably in its much fewer-nerved leaves.

CLERODENDRON Linnaeus

CLERODENDRON COMMERSONII (Poir.) Spreng. Syst. 2 (1825) 758.

Volkameria commersonii Poir. in Lam. Encycl. 8 (1808) 688.

Clerodendron nereifolium Wall. Cat. (1829) No. 1789.

Clerodendron inerme W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 231, non Gaertn.

McGregor 463, *G. E. S. 141*, 432, locally known as *lodúgao*.

The Guam species is the form named by Wallich *Clerodendron nereifolium*, which is retained by most authors as distinct from *Clerodendron inerme* Gaertn. Poiret's name is the older and is here retained. The species extends from Burma and the Malay Peninsula to southern China, Formosa, Malaya, Australia, and Polynesia.

PREMNA Linnaeus

PREMNA GAUDICHAUDII Schauer in DC. Prodr. 11 (1847) 631; Safford 360.

G. E. S. 150, 449, Captain Bisset s. n., locally known as ahgao.

Otherwise known only from the Caroline Islands (Yap, *Volkens*), originally described from Guam material.

PREMNA MARIANNARUM ^{Schauer} Gaudich. l. c. 362; ⁵³² Safford 361.

Originally described from Guam material, and known only from that island; not represented in our recent collections.

STACHYTARPHETA Vahl

STACHYTARPHETA JAMAICENSIS (Linn.) Vahl Enum. 1 (1804) 206.

Verbena indica Linn. Sp. Pl. (1753) 27.

G. E. S. 289.

A native of tropical America, now a weed in the tropics of both hemispheres.

VITEX Linnaeus

VITEX NEGUNDO Linn. Sp. Pl. (1753) 638; Safford 397.

Collected in Guam by Lesson and by Gaudichaud, recorded by Endlicher as *Vitex incisa* Lam. It is not represented in our recent collections.

VITEX TRIFOLIA Linn. Sp. Pl. (1753) 638; Safford 397.

G. E. S. 439, McGregor 379.

Along the seashore, tropical Africa and Asia to Japan and Polynesia.

Recently introduced plants of this family are common teak, *Tectona grandis* Linn. f., represented by *G. E. S. 253*, in flower and fruit, and the American *Duranta repens* Linn., represented by *G. E. S. 163*.

LABIATAE

COLEUS Loureiro

COLEUS BLUMEI Benth. Lab. Gen. & Sp. (1832) 56.

G. E. S. 60.

A native of the Malay Archipelago, now cultivated in all warm countries.

HYPTIS Jacquin

HYPTIS CAPITATA Jacq. Coll. 1 (1786) 102.

Mesosphaerum capitatum O. Ktze. Rev. Gen. Pl. 2 (1791) 525; Safford 342.

Hyptis mariannarum Briq. in Engl. & Prantl Nat. Pflanzenfam. 4^{2a} (1897) 343.

Hyptis capitata Jacq. var. *mariannarum* Briq. in Ann. Conserv. Jard. Bot. Genève 2 (1898) 225.

G. E. S. 64, Thompson 18, locally known as botones.

A native of tropical America, found in the Orient only in Guam and in the Philippines.

HYPTIS PECTINATA (Linn.) Poir. Ann. Mus. Paris 7 (1806) 474, t. 30.

Nepeta pectinata Linn. Syst. ed. 10 (1759) 1099.

Mesosphaerum pectinatum O. Ktze. Rev. Gen. Pl. 2 (1891) 525; Safford 324.

Collected in Guam by Lesson and by Gaudichaud, but not represented in our more modern collections.

A weed of tropical American origin, now widely distributed.

HYPTIS SPICIGERA Lam. Encycl. 3 (1789) 185.

G. E. S. 58.

A weed of American origin, now also widely distributed in the Philippines.

HYPTIS SUAVEOLENS (Linn.) Poir. in Ann. Mus. Paris 7 (1806) 472, t. 79, f. 2.

Ballota suaveolens Linn. Sp. Pl. (1753) 815.

G. E. S. 144, *Thompson* 19, locally known as *mumutun*.

A weed of tropical American origin, now in most tropical countries.

HYPTIS sp.

G. E. S. 183, a form allied to *Hyptis suaveolens*, but apparently different; it bears the same native name.

MENTHA Linnaeus

MENTHA ARVENSIS Linn. Sp. Pl. (1753) 577; Safford 323.

Cultivated in gardens, *fide* Safford.

A native of Europe, now cultivated in most warm countries.

OCIMUM Linnaeus

OCIMUM BASILICUM Linn. Sp. Pl. (1753) 597; Safford 336.

G. E. S. 98, in waste places.

Widely distributed in all tropical countries.

OCIMUM CANUM Sims Bot. Mag. (1824) t. 2452; Safford 336.

Collected in Guam by Gaudichaud, *fide* Safford.

Widely distributed in the tropics.

OCIMUM SANCTUM Linn. Mant. 1 (1767) 85; Safford 337.

McGregor 422.

Tropics of both hemispheres.

SOLANACEAE

CAPSICUM Linnaeus

CAPSICUM FRUTESCENS Linn. Sp. Pl. (1753) 214; Safford 214.

McGregor 522.

A native of tropical America, now distributed in all warm countries.

CAPSICUM ANNUUM Linn. Sp. Pl. (1753) 188; Safford 213.

Recorded by Safford, with the varieties *cerasiforme* Irish, and *grossum* Sendt. A native of tropical America, exceedingly variable, cultivated in all warm countries.

CESTRUM Linnaeus

CESTRUM NOCTURNUM Linn. Sp. Pl. (1753) 191; Safford 222.

G. E. S. 261, locally known as *dama de noche*.

A native of tropical America, now widely distributed in cultivation.

CESTRUM DIURNUM Linn. l. c.

Cestrum pallidum W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 223, non Lam.

McGregor 420, Mrs. Clemens s. n.

A native of tropical America, now introduced in various other tropical countries.

I have little doubt as to the correctness of the identification, for the specimens agree with a series of American forms, so named, in the herbarium of the Bureau of Science, but do not agree with our West Indian material of *Cestrum pallidum* Lam. Mr. Safford states that it is of comparatively recent introduction in Guam, but that it has been distributed all over the island by fruit eating birds. He also states that he was not quite certain as to the identity of the plant that was referred to *C. pallidum* Lam.

DATURA Linnaeus

DATURA FASTUOSA Linn. Syst. ed. 10 (1759) 932; Safford 256.

G. E. S. 19, locally known as *a las doce*.

Widely distributed in tropical Asia, Africa, Malaya, and Polynesia, said to have been introduced in tropical America.

Var. **ALBA** (Nees) C. B. Clarke in Hook. Fl. Brit. Ind. 4 (1883) 243.

Datura alba Nees In Trans. Linn. Soc. 17 (1834) 73.

G. E. S. 20, with the same native name as the preceding.

Distribution of the species, by some authors considered to be specifically distinct.

LYCOPERSICUM Hill

LYCOPERSICUM ESCULENTUM Mill. Gard. Dict. ed. 8 (1768) No. 2.

Solanum lycopersicum Linn. Sp. Pl. (1753) 185.

Lycopersicon lycopersicon Karst. Deutsch. Fl. (1880-83) 966; Safford 312.

G. E. S. 181, locally known as *tomate*.

A native of tropical America, now in all warm countries.

NICOTIANA Linnaeus

NICOTIANA TABACUM Linn. Sp. Pl. (1753) 180; Safford 331.

G. E. S. 338, locally known as *chupa*.

A native of tropical America, now cultivated in all warm countries.

PHYSALIS Linnaeus

PHYSALIS LANCEIFOLIA Nees in Linnaea 6 (1831) 473.

McGregor 512, G. E. S. 202, Mrs. Clemens s. n., locally known as *tomates caputi*.

A native of south America, introduced in Guam and in the Philippines.

PHYSALIS ANGULATA Linn. Sp. Pl. (1753) 183; Safford 353.

G. E. S. 336, McGregor 503, locally known as *tomate chaca*.

Widely distributed in the tropics of both hemispheres, probably a native of tropical America.

Mr. Safford records *Physalis minima* Linn. Sp. Pl. (1753) 183, from Guam (p. 353), under the same native name as indicated on the specimens I have referred to *P. angulata* Linn. I have seen no Guam material that I would refer to *P. minima* Linn., which is a very pubescent plant. I suspect that Mr. Safford's *Physalis angulata* is the species I refer to *P. lanceifolia*, and his *P. minima* is the species I refer to *P. angulata*.

SOLANUM Linnaeus

SOLANUM NIGRUM Linn. Sp. Pl. (1753) 186.

G. E. S. 438.

Temperate and tropical regions of both hemispheres.

SOLANUM MELONGENA Linn. Sp. Pl. (1753) 186; Safford 375.

G. E. S. 31, locally known as *berenghenas*, commonly cultivated.

Cultivated in all warm countries.

SOLANUM GUAMENSE sp. nov.

Frutex vel suffrutex erectus, ramosus, inerme, stellato-tomentosus; foliis valde inaequalibus, ovatis ad elliptico-ovatis, integris vel obscure repandis, obtusis vel acutis, minoribus 1 ad 3 cm longis, majoribus 4.5 ad 12 cm longis; inflorescentiis axillaribus extra-axillaribusque, circiter 4 cm longis, paucifloris, dichotomis, floribus 5-meris circiter 12 mm diametro, pedicellatis; fructibus carnosus, globosis, glabris, circiter 6 mm diametro.

An erect shrub or undershrub, or at least suffrutescent, branched, the branches terete, 3 to 4 mm in diameter, dark-colored when dry, older ones glabrous, the internodes short, the younger ones densely stellate-pubescent with straw-colored or grayish indumentum. Leaves exceedingly variable in size, alternate or the small ones subfasciculate, chartaceous, in general ovate to elliptic-ovate, uniformly and rather densely stellate-pubescent on the lower surface, less densely pubescent on the upper surface, the indumentum pale or straw-colored, the apex blunt or acute, the margins entire or in the larger leaves obscurely repand, the base broadly rounded to somewhat acute, usually slightly inequilateral; larger leaves 5.4 to 12 cm long, 3.5 to 8 cm wide, the lateral nerves 4 to 6 on each side of the midrib, distinct, laxly anastomosing, the petioles stellate-pubescent, 1 to 3.5 cm long; smaller leaves 1 to 3 cm long and about as wide. Inflorescence axillary and extra-axillary, stellate-tomentose, cymose, rather lax, 3 to 4 cm long, dichotomous, rather many-flowered. Flowers 5-merous. Calyx funnel-shaped, 2.5 mm long and about as wide at the throat, pubescent, the teeth

broadly ovate, less than 0.5 mm long. Corolla funnel-shaped, about 12 mm in diameter, pubescent externally, the tube about 3 mm long, the lobes oblong-ovate to ovate-lanceolate, acute or obtuse, about 5 mm long. Anthers free, oblong, blunt, 2.5 mm long; pedicels in fruit stellate-tomentose, 1 to 1.5 cm long. Calyx, in fruit, stellate-pubescent, divided at least one-half to the base into 5, ovate or oblong-ovate, acute or acuminate, 3 mm long lobes. Fruit globose, fleshy, about 5 mm in diameter, the pericarp thin, glabrous, the seeds numerous, flattened, subelliptic to somewhat reniform, about 2 mm long.

Guam Experiment Station 138, 446 (type), on rocks near the sea, Cabras Island, locally known as *berenghenas halomtana*.

The alliances of the species are not clear to me, but it apparently belongs to the group with *Solanum verbascifolium* Linn.

SCROPHULARIACEÆ

BACOPA Aublet

BACOPA MONNIERA (Linn.) Wettst. in Engl. & Prantl Nat. Pflanzenfam. 4th (1891) 77; Safford 193.

Gratiola monniera Linn. Cent. Pl. 2 (1756) No. 120.

Herpestis monniera HBK. Nov. Gen. Sp. Pl. 2 (1817) 366.

G. E. S. 10.

Tropics of both hemispheres.

BONNAYA Link & Otto

BONNAYA VERONICAÆFOLIA (Retz.) Spreng Syst. 1 (1825) 42.

Gratiola veronicaefolia Retz. Obs. 4 (1786) 8.

G. E. S. 112.

Widely distributed in tropical Asia and Malaya.

LIMNOPHILA R. Brown

LIMNOPHILA FRAGRANS (Forst. f.) Seem. Fl. Vit. (1865-73) 180.

Ruellia fragrans Forst. f. Prodr. (1786) 44.

Limnophila serrata Gaudich. Bot. Freyc. Voy. (1826) 448, t. 57, f. 2.

Ambulia fragrans Drake Fl. Polyn. Franc. (1892) 140; Safford 181.

G. E. S. 169, in wet places; *Volkens 329* from the Caroline Islands, distributed as *Lindernia scabra* Wettst., is *Limnophila fragrans*.

Luzon to Australia and Polynesia.

LIMNOPHILA INDICA (Linn.) comb. nov.

Hottonia indica Linn. Syst. ed. 10 (1759) 919.

Limnophila gratioloides R. Br. Prodr. (1810) 442.

Ambulia indica W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 181.

Collected in Guam by Gaudichaud; tropical Africa and Asia to Australia.

LIMNOPHILA SESSILIFLORA Blume Bijdr. (1826) 750 ?

G. E. S. 53, with the native name *lumut*.

Tropical Asia and Malaya.

VANDELLIA Linnaeus**VANDELLIA PYXIDARIA** (All.) Maxim. in Bull. Acad. Pétersb. 20 (1875) 449.

Lindernia pyxidaria All. Misc. Taur. 3 (1755) 178.

G. E. S. 238.

Widely distributed, southern Europe to Polynesia.

BIGNONIACEAE**CRESCENTIA** Linnaeus**CRESCENTIA ALATA** HBK. Nov. Gen. Sp. Pl. 3 (1818) 158; Safford 250.

G. E. S. 4, locally known as *hikara*, a corruption of its ancient Mexican name.

A native of western Mexico, from there introduced into Guam and the Philippines, now very rare in the latter group.

PEDALIACEAE**SESAMUM** Linnaeus**SESAMUM ORIENTALE** Linn. Sp. Pl. (1753) 634; Safford 373.

Somewhat cultivated, *vide* Safford.

A native of tropical Asia, now cultivated in all warm countries.

LENTIBULARIACEAE**UTRICULARIA** Linnaeus**UTRICULARIA BIFIDA** Linn. Sp. Pl. (1753) 26.

McGregor 380, G. E. S. 244.

Widely distributed in tropical Asia and Malaya.

UTRICULARIS NIVEA Vahl Enum. 1 (1805) 203.

McGregor 382.

India and Ceylon to southern China and Malaya.

AGANTHACEAE**BARLERIA** Linnaeus**BARLERIA CRISTATA** Linn. Sp. Pl. (1753) 636.

G. E. S. 268, February, 1912, cultivated, and apparently a very recent introduction.

India, now cultivated in many tropical countries.

BLECHUM P. Browne**BLECHUM BROWNEI** Juss. in Ann. Mus. Paris 9 (1807) 270.

G. E. S. 242, McGregor 356, Clemens s. n., apparently common.

This American species is now very common in the Philippines, and is also found in Formosa. It has been reported from the Marianne Islands,

presumably from Guam, by Nees,³⁸ but is not mentioned by Safford. One of the numerous American weeds that reached the Marianne Islands and the Philippines through the medium of the Acapulco-Manila galleons in early colonial days.

GRAPTOPHYLLUM Nees

GRAPTOPHYLLUM PICTUM (L.) Griff. Notul. 4 (1854) 139; Safford 285.

Justicia picta Linn. Sp. Pl. ed. 2 (1762) 21.

G. E. S. 312, 352, 367, forms with both the dark-purplish leaves, and with variously mottled ones. Apparently cultivated only, as in most countries where it is found.

HEMIGRAPHIS Nees

HEMIGRAPHIS COLORATA (Blume) Hallier f. in Nov. Act. Acad. Nat. Cur. 70 (1897) 204.

Ruellia colorata Blume Bijdr. (1826) 795.

G. E. S. 343, cultivated in gardens.

Undoubtedly introduced from Manila, where it is commonly cultivated. Malaya; now cultivated in other tropical countries.

ODONTONEMA Nees

ODONTONEMA NITIDUM (Jacq.) O. Ktze. Rev. Gen. Pl. (1891) 494.

Justicia nitida Jacq. Enum. Pl. Carib. (1760) 11.

G. E. S. 54, 308, 309, from cultivated plants.

Apparently of recent introduction from Manila, where it is commonly cultivated. The native name in Guam is given as *San Francisco*, a name commonly applied, in the Philippines, to various shrubs with variegated leaves. It is suspected that this is the species Safford mentions as "*Eranthemum* with dark-purple foliage," page 173. A native of tropical America, now cultivated in other tropical countries.

THUNBERGIA Linnaeus

THUNBERGIA ALATA Boj. in Hook. Exct. Fl. (1823-27) t. 177.

G. E. S. 281, apparently of recent introduction, possibly from Manila where it is not uncommon. A native of tropical Africa, now naturalized in many other tropical countries.

RUBIACEAE

BIKKIA Reinwardt

BIKKIA MARIANNENSIS Brongn. in Bull. Soc. Bot. Fr. 13 (1866) 42.

Cormigonus mariannensis W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 249.

G. E. S. 407, *McGregor* 634, rocky places near the sea.

Known only from Guam.

³⁸ DC. Prodr. 11 (1847) 466.

COFFEA Linnaeus

COFFEA ARABICA Linn. Sp. Pl. (1753) 172; Safford 244.

G. E. S. 400, McGregor 515, locally known as *café*.

A native of southeastern Asia, now cultivated in all tropical countries.

COFFEA LIBERICA Miers in Trans. Linn. Soc. 2 (1876) 171, *t. 24*; Safford 245.

G. E. S. 243.

A native of tropical Africa, recently introduced in Guam.

GEOPHILA D. Don

GEOPHILA HERBACEA (Jacq.) O. Ktze. Rev. Gen. Pl. (1891) 300; K. Schum. in Engl. & Prantl Nat. Pflanzenfam. 4⁴ (1891) 119.

Psychotria herbacea Jacq. Enum. Pl. Carib. (1760) 16.

Geophila reniformis D. Don Prodr. Fl. Nep. (1825) 136.

Carintha herbacea W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 216.

McGregor 397.

Tropics of both hemispheres.

GUETTARDA Linnaeus

GUETTARDA SPECIOSA Linn. Sp. Pl. (1753) 991; Safford 288.

McGregor 550, G. E. S. 119, Mrs. Clemens s. n., locally known as *panao*.

Along the seashore in the tropics of both hemispheres.

HEDYOTIS Linnaeus

HEDYOTIS MEGALANTHA sp. nov.

Herba erecta, ramosa, glabra, usque ad 70 cm alta, ramis ramulisque quadrangulatis, in siccitate sulcatis; foliis membranaceis vel chartaceis, oblongo-ovatis vel elliptico-ovatis, usque ad 11 cm longis, basi acutis ad rotundatis, apice breviter acuminatis, nervis utrinque circiter 6; paniculis terminalibus, foliaceis, amplis, divaricato-ramosis; floribus 4-meris, sepalis oblongo-ovatis, circiter 4 mm longis, leviter accrescentibus, persistentibus; corolla circiter 14 mm longa.

An erect, branched, glabrous, smooth herb, or apparently sometimes suffrutescent, at least 70 cm high, the stems and branches 4-angled but not winged, when dry somewhat sulcate. Leaves oblong-ovate to elliptic-ovate, membranaceous to chartaceous, mostly 9 to 11 cm long, 3 to 4.5 cm wide, those on the panicles reduced, base rounded to acute, apex shortly acuminate, both surfaces shining, greenish or yellowish-brown, the lower surface with scattered cystoliths; lateral nerves about 6 on each side of the midrib, slender, curved-ascending, reticulations very lax; petioles about 1 cm long; stipules short, broad, pectinately divided into 10 to 15, stiff, linear-oblong, 3 to 4 mm long lobes. In-

florescence a lax, divaricately branched, more or less leafy panicle terminating the stems, the upper leaves much reduced, ovate, cordate, sessile, 3 cm long or less, these subtending the branches, similar but much smaller ones subtending the branchlets, the whole inflorescence 30 cm long or more, rather lax. Flowers 4-merous, disposed in small lax or rather dense cymes at the ends of the branchlets. Calyx-tube broadly funnel-shaped, glabrous or somewhat pubescent, about 2 mm long, the lobes 4, oblong-ovate, about 4 mm long, 2 mm wide, obtuse or acute, somewhat accrescent and persistent in fruit, the whole calyx somewhat urceolate. Corolla white, the tube cylindric, 12 to 14 mm long, about 3 mm in diameter, quite glabrous but with scattered cystoliths, the lobes 4, spreading or reflexed, oblong-ovate, obtuse or acute, 3 mm long. Filaments 4 mm long, exserted; anthers 2 mm long. Style very slender, 2.5 cm long. Capsule somewhat globose or obovoid, 3 mm in diameter, crowned by the somewhat spreading calyx-lobes which are 6 mm long, 3 mm wide, subcoriaceous. Seeds black, sharply 3-angled, about 1 mm long.

R. C. McGregor 458, hills back of Piti, altitude about 100 meters, October, 1911.

A striking species on account of its comparatively large flowers, its ample, lax, divaricately branched panicles, and its large, persistent, somewhat spreading calyx-lobes.

HEDYOTIS MARIANNENSIS sp. nov.

Suffruticosa, ut videtur erecta, ramosa, glabra, ramis ramulisque teretibus vel ramulis in siccitate nigris, obscure 4-angulatis; foliis membranaceis, oblongis vel oblongo-ellipticis, nitidis, usque ad 12 cm longis, apice breviter acuminatis, basi acutis, breviter petiolatis, nervis utrinque circiter 5, tenuibus, obscuris; inflorescentiis terminalibus, pedunculatis, 6 ad 9 cm diametro, laxis vel subconfertis; floribus 4-meris; corolla circiter 6 mm longa, glabra.

An erect, somewhat branched suffrutescent or woody plant, quite glabrous, the older branches terete, grayish-brown in color, 3 to 5 mm in diameter, sometimes marked with 4, slender, longitudinal lines, the branchlets nearly black when dry, somewhat 4-angled, or with 4 lines, sometimes nearly terete. Leaves oblong-elliptic, membranaceous, shining, brownish or olivaceous when dry, of the same color on both surfaces, apex shortly and sharply acuminate, base acute; lateral nerves about 5 on each side of the midrib, slender, obscure, ascending, the reticulations very lax, not prominent; petioles 5 mm long or less, usually

somewhat winged by the decurrent lamina; stipules short, wide, ending in a prominent but stout and blunt apiculus, sometimes with two very short, obscure lateral appendages, not lacinate. Inflorescence terminal, peduncled, usually, however, with two basal branches which are scarcely longer than the peduncle of the inflorescence proper, the whole inflorescence up to 12 cm long, dark-colored or nearly black when dry, lax, or the flowers somewhat crowded, 6 to 9 cm in diameter, the bracts subtending the primary branches linear-lanceolate, acuminate, 5 to 7 mm long. Flowers numerous, 4-merous, white, quite glabrous. Calyx black when dry, the tube funnel-shaped, 1.5 mm long, with 4, short, triangular-ovate, acute, 0.5 mm long teeth. Corolla nearly black when dry, the tube 4 mm long, slightly enlarged upward, the lobes 2.5 mm long, oblong-ovate to ovate-lanceolate, acute or acuminate. Anthers oblong-lanceolate, 1.8 mm long, the filaments very short. Capsule turbinate, 3.5 mm in diameter, base somewhat acute, apex truncate, the crowning teeth not prominent.

R. C. McGregor 572 (type), Cabras Island, October, 1911, *G. E. S.* 239, January, 1912, on rocks at Asan.

A species apparently well characterized by its obscurely nerved, short-petioled leaves, its nearly entire, not at all pectinate stipules, its small calyces, and its distinctly dark color in drying.

IXORA Linnaeus

IXORA TRIANTHA Volken in Engl. Bot. Jahrb. 31 (1902) 476.

McGregor 387, 549, Mrs. Clemens s. n., G. E. S. 95, 99, 33.

Quite the same as Volken's Caroline Islands specimens, the species otherwise known only from the Island of Yap.

MITRACARPUM Zuccarini

MITRACARPUM HIRTUM (Linn.) DC. Prodr. 4 (1830) 572; Safford 325.

Spermacoce hirta Linn. Sp. Pl. ed. 2 (1762) 148.

Mitracarpum torresianum Cham. & Schlecht. in Linnaea 3 (1828) 360.

McGregor 485.

A native of tropical America, introduced into Guam through the medium of the Acapulco-Manila galleons; reported also from Samoa. The crediting of *M. torresianum* C. & S. to Guam was not due to any mixing of labels, as suggested by K. Schumann and Lauterbach.

MORINDA Linnaeus

MORINDA INDICA Linn. Sp. Pl. (1753) 176; Safford 326.

Mrs. Clemens s. n., G. E. S. 453, locally known as lada.

Tropical Asia and Africa to Polynesia.

MORINDA GLANDULOSA sp. nov.

Species *M. umbellatae* affinis, differt floribus fructibusque majoribus, foliis subtus in axillis venarum valde glandulosis.

A scandent shrub, quite glabrous except for the villous throats of the corollas, and the somewhat villous glands. Branches terete, light-gray, 3 to 4 mm in diameter, somewhat rugose or lenticillate. Leaves oblong, elliptic-oblong, or oblong-lanceolate, chartaceous to subcoriaceous, 7 to 10 cm long, 2.5 to 4 cm wide, about equally narrowed at both ends, the apex broadly acuminate, acute, or obtuse, the base acute or somewhat decurrent-acuminate, somewhat brownish-gray when dry, uniform in color and shining on both surfaces; lateral nerves about 8 on each side of the midrib, slender, arched-anastomosing, the reticulations lax, not prominent, on the lower surface each axil usually with a prominent, round to elliptic gland 1 to 2.5 mm long, villous within; petioles 1.5 to 2.5 cm long; stipules wide, truncate, about 2 mm long, deciduous. Heads laxly umbelled at the tips of the branchlets, about 4 in each umbel, sometimes additional solitary ones in the upper axils, the heads, in anthesis, 1 to 1.5 cm in diameter, rather dense, globose, their peduncles slender, 1 to 2 cm long. Flowers sessile, apparently white. Calyces densely crowded, the limbs slightly produced, truncate or minutely denticulate, about 1.5 mm in diameter. Corolla-tube cylindric, not constricted, about 2 mm long, stout, glabrous externally, with 5 or 6 lobes, the lobes elliptic-oblong, obtuse, 3 to 3.5 mm long, 1.5 to 1.8 mm wide, glabrous, the throat densely villous. Anthers narrowly elliptic-oblong, 2 to 2.3 mm long. Style 2.5 mm long, the sigmas stout, 1 mm long. Fruit fleshy, globose, when dry and somewhat flattened out, 2 to 2.5 cm in diameter, the pyrenes numerous, narrowly oblong, obtuse, 3 to 4 mm long, somewhat horny.

Guam Experiment Station 37, in fruit, November, 1911, 376 (type), in flower, March, 1912, Tumon Road.

The prominently glandular leaves are apparently characteristic.

OLDENLANDIA Linnaeus**OLDENLANDIA BIFLORA** Linn. Sp. Pl. (1753) 119.

Oldenlandia paniculata Linn. Sp. Pl. ed. 2 (1763) 1667; Safford 338.

G. E. S. 62, 114, *Thompson 2*.

Tropical Asia to Polynesia.

OLDENLANDIA CORYMBOSA Linn. Sp. Pl. (1753) 119.

G. E. S. 89.

Tropics of both hemispheres.

OLDENLANDIA ALBIDO-PUNCTATA sp. nov. § *Gonothecca*.

Species *O. pteritae* affinis, differt foliis plus minusve distincte albido-punctatis, inflorescentiis laxis, floribus haud subcapitatis, calycibus vix vel obscurissime alatis, lobis distinctis, ovatis, acuminatis, circiter 2 mm longis.

An erect, branched, glabrous, rather diffuse, annual plant 20 to 30 cm high, the stems and branches slender, terete, or the ultimate branchlets obscurely 4-angled. Leaves narrowly oblong-obovate to oblong-elliptic, 1.5 to 2 cm long, 5 to 8 mm wide, rather coriaceous, apex usually rounded, sometimes obscurely apiculate, base acute, both surfaces usually distinctly punctulate with white dots (apparently short cystoliths) the lateral nerves very slender, two or three pairs, ascending, obscure, sometimes obsolete; petioles 2 mm long or less; stipules very broad, abruptly acuminate, the acumen 2 to 3 mm long, sometimes shortly trifid. Inflorescence, the whole upper part of the plant, a lax, leafy panicle, the ultimate branchlets (peduncles) bearing the flowers 2 to 5 cm long, the flowers solitary, in pairs, or in threes, the bracteoles lanceolate, acuminate, 1 to 2 mm long, the pedicels 1 to 2 mm long, in fruit up to 3 mm long. Calyx urceolate, in anthesis 2.5 mm long, the lobes 4, ovate, acuminate, prominently reticulate, 1.5 mm long, accrescent in fruit. Corolla-tube 1.5 mm long, villous within. Anthers 0.8 mm long. Capsules somewhat compressed, obovoid, about 4 mm long and wide, narrowed below into the stipe, very obscurely 4-winged, the wings, or mere lines, in pairs, lateral, sometimes entirely absent in the upper two-thirds, and evident only in the narrowed basal part of the capsule, the persistent calyx-lobes ovate, reticulate, acuminate, 2 mm long, divided nearly to the base of the calyx-rim. Seeds numerous, somewhat angled-globose, brown, pitted, 0.4 to 0.5 mm in diameter.

R. C. McGregor 375, Cabras Island, October, 1911.

In appearance similar to *Oldenlandia biflora* Linn. (*O. paniculata* Linn.), but with much larger flowers and capsules. The structure of its flowers and capsules place it very near *Oldenlandia pterita* (Blume) Miq., but it seems to be specifically distinct in its smaller capsules, which are very obscurely or scarcely winged, and in its deeply cleft calyx-limb, the lobes extending nearly to the apex of the capsule.

MUSSAENDA Linnaeus

MUSSAENDA FRONDOSA Linn. Sp. Pl. (1753) 177; Safford 330.

Admitted on the authority of Safford. If correctly interpreted the species extends from India to Polynesia, but it seems probable that several closely allied but distinct species are involved in the present conception of *Mussaenda frondosa*. Guam material should be compared critically with Ceylon material, the type of the species being from Ceylon.

PSYCHOTRIA Linnaeus

PSYCHOTRIA MARIANA Bartl. ex DC. Prodr. 4 (1830) 522; Safford 362.

G. E. S. 36, Mrs. Clemens s. n., McGregor 526, locally known as aplokhating or aploghating.

Known only from the Marianne Islands, represented also by *Volken 41*, from the Island of Tinian, distributed as *Grumilea*.

PSYCHOTRIA MALASPINAE sp. nov.

Frutex glaber; foliis chartaceis, usque ad 9 cm longis, acuminatis, basi angustatis, acutis, oblongo-obovatis ad obovato-lanceolatis vel subellipticis, nervis utrinque circiter 8, tenuibus, anastomosantibus, in siccitate utrinque subconcoloribus nitidisque, olivaceis et plus minusve rubro-brunneis; inflorescentiis subterminalibus, brevibus, paucifloris, circiter 2.5 cm longis; fructibus circiter 7 mm longis, oblongo-obovoideis, pericarpio carnoso; pyrenis rugosis, leviter longitudinaliter carinatis, vix sulcatis.

A glabrous shrub, the branches terete, reddish-brown, the younger branchlets slender, with manifest cystoliths. Leaves chartaceous, oblong-obovate to obovate-lanceolate or subelliptic, 6 to 9 cm long, 2 to 4 cm wide, the apex distinctly acuminate, base more or less narrowed, acute, when dry olivaceous and usually more or less tinged with reddish-brown, prominently shining and of about the same color on both surfaces; lateral nerves about 8 on each side of the midrib, slender, not prominent, anastomosing, the reticulations very lax, slender; petioles 7 to 10 mm long; stipules very early deciduous. Inflorescence solitary, subterminal or in the uppermost axils, slender, few-flowered, about 2.5 cm long, the primary branches usually three only, the flowers white, sessile or subsessile in threes on the ultimate branchlets. Calyx somewhat turbinate, truncate or with 4 or 5 very minute teeth, somewhat narrowed below, about 2 mm long. Corolla (from mature buds) 3 mm long, 4-lobed, the throat villous inside. Anthers 1 mm long. Fruit 7 to 8 mm long, oblong-obovoid, smooth, the pericarp fleshy, apparently red, the apex truncate or rounded, base narrowed, acute, the pyrenes hard, plano-convex, oblong-elliptic, 6 mm long, 4 mm wide, prominently rugose, very obscurely longitudinally keeled, not at all sulcate.

McGregor 559, Upi Road, October, 1911, in flower (type); *Asinan, Costenoble 1181* (in U. S. National Herbarium), July, 1906, in fruit, locally known as *aplokhating palaoan*.

A species somewhat resembling the Caroline *Psychotria arbuscula* Volken's, the Polynesian *P. insularis* A. Gray, and the Malayan *P. viridiflora* Reinw., but quite distinct from all. It seems to be most closely allied to the latter. Dedicated to Alessandro Malaspina, commandant of the cor-

vettes "Atrevida" and "Descubierta" which comprised the Malaspina Expedition, the first scientific exploring expedition to reach Guam and the Philippines.

RANDIA Linnaeus

RANDIA RACEMOSA (Cav.) F.-Vill. Novis. App. (1880) 108; Maxim. in Bull. Acad. Pétersb. 29 (1884) 167.

Stylocoryna racemosa Cav. Ic. 4 (1797) 45, t. 368.

G. E. S. 6, Mrs. Clemens s. n., locally known as *sumac* or *sumag*.

The species is common and widely distributed in the Philippines, extending northward to the Liu Kiu Islands. Its other range is obscured by complicated synonymy, but I suspect that it is of wide distribution in the Malayan and Polynesian regions. I can see no reason for not referring here *Ridley 37*, from Christmas Island, south of Java, *Koorders 30059* from Java, both distributed as *Randia densiflora*, and *Volkens 40*, from Tinian Island, Mariannes, distributed as "*Randia* nov. spec." *Randia densiflora* (Roxb.) Benth. is certainly very closely allied, and perhaps *R. racemosa* must be reduced to that species. Equally closely allied is *Randia graffei* Reinike, of Polynesia, at least as represented by *Volkens 502* and *536* from Yap, and *Vaupel 144* from Samoa. *Stylocoryne coffaeoides* A. Gray, a widely distributed Polynesian species, should also be critically compared.

By some botanists the specific name *racemosa* would be considered to be invalidated by *Randia racemosa* Roxb., but in the uncertain state of the synonymy of our species, I prefer to make no change.

TARENNA Gaertner

TARENNA GLABRA sp. nov.

Frutex vel arbor parva, glabra; ramis teretibus, ramulis distincte quadrangulatis; foliis oblongis vel ovato-oblongis, nitidis, usque ad 12 cm longis, acutis vel obtusis, basi acutis, nervis utrinque 7 vel 8; inflorescentiis terminalibus, corymbosis, multifloris; floribus 5-meris, corollae tubo 3 ad 4 mm longo, intus villosa, extus glabra; fructibus globosis, in siccitate nigris, nitidis, seminibus circiter 16.

A shrub or small tree, quite glabrous except the corolla-tube which is villous inside. Branches terete, brownish or brownish-gray, the branchlets about as thick as the ultimate branches, distinctly 4-angled, the internodes about 1 cm long. Leaves chartaceous, oblong to ovate-oblong, 8 to 12 cm long, 3 to 4.5 cm wide, about equally narrowed to the acute or obtuse apex and to the acute base, when dry dark-olivaceous, or the upper surface nearly black, smooth and shining, the lower surface very slightly paler than the upper; lateral nerves 7 or 8 on each side of the midrib, rather prominent on the lower surface, curved, anastomosing, the reticulations slender, very lax; petioles 1 to 2 cm long; stipules very early deciduous. Inflorescence terminal, glabrous, corymbose, many-flowered, about 5 cm long, 8 cm wide, the lower branches subtended by lanceolate, leaf-like bracts (reduced

leaves). Flowers apparently white, 5-merous. Calyx cylindric, cup-shaped, glabrous, 2 mm long, about 1.5 mm in diameter, with 5, short, blunt, teeth. Corolla-tube 3 to 4 mm long, cylindric, externally glabrous, internally villous, the lobes 5, glabrous, oblong or narrowly oblong, obtuse, about as long as the tube. Anthers lanceolate, 3 mm long, exserted. Style and stigma 10 to 11 mm long. Fruit globose, black when dry, shining, pericarp somewhat wrinkled, 2-celled, about 8 seeds in each cell, the seeds irregular, more or less angular and compressed, about 2 mm long.

Guam Experiment Station 26, November, 1911, at Tolijuice.

A species manifestly allied to *Tarenna asiatica* O. Ktze., and apparently also to *Stylocoryne sambucina* A. Gray, but distinguished from both in being entirely glabrous except for the corolla-tube which is villous inside.

I have followed De Dalla Torre and Harms in adopting Gaertner's generic name *Tarenna*, for those species which have been described chiefly as *Webera* and *Stylocoryne*, but I am by no means certain that these authors are correct in their distribution of the synonyms between *Tarenna* and *Randia*. I suspect that *Cupi* Adanson is the oldest, and therefore by rules of priority, the correct generic name at least for those species of *Webera*, *Stylocoryne*, and *Tarenna* that have several ovules in each cell. It is based entirely on *Cupi* Rheede Hort. Malabar. 2: 37, pl. 23 which is the type of *Rondeletia asiatica* Linn. De Dalla Torre and Harms, however, refer *Cupi* of Adanson to *Randia*, but I do not think that Rheede's plate and description justifies this disposition of it, and consider that it is rather *Tarenna* than *Randia*. *Webera* Schreber cannot be considered, for it is invalidated by *Webera* of Hedwig, a valid genus of mosses. The genus *Cupia* DC. (1830) is typified by the first species cited, *C. corymbosa* DC., which is based on *Cupi* of Rheede, and the species is hence a synonym of *Tarenna asiatica* (Linn.) O. Ktze. King has taken exception to the generic name *Tarenna* on the basis that Gaertner described the flowers as 4-merous, rather than 5-merous, and he therefore revives the genus *Stylocoryne* Cav. for those species with 5-merous flowers and several-seeded fruits.²⁹ However, *Stylocoryne* Cavanilles is invalid, as it is a manifest synonym of the genus *Randia*. Trimen, however, considers *Tarenna zeylanica* Gaertn. to be an exact synonym of *Webera corymbosa* Willd. = *Tarenna asiatica* O. Ktze., in spite of the discrepancy in the number of floral-parts.

CUCURBITACEAE

BENINCASA Savi

BENINCASA HISPIDA (Thunb.) Cogn. in DC. Monog. Phan. 3 (1881) 513.

Cucurbita hispida Thunb. Fl. Jap. (1874) 322.

Benincasa cerifera Savi Bibl. Ital. 9 (1818) 158; Safford 197.

G. E. S. 157, locally known as *condor*.

Cultivated in the tropics of both hemispheres.

²⁹ Journ. As. Soc. Beng. 72¹ (1903) 198.

CUCURBITA Linnaeus

CUCURBITA MAXIMA Duch. in Lam. Encycl. 2 (1786) 151.

G. E. S. 22, locally known as *calamasa*.

Cultivated in all warm countries.

CUCUMIS Linnaeus

CUCUMIS SATIVUS Linn. Sp. Pl. (1753) 1012.

G. E. S. 2, *McGregor 453*, cultivated, locally known as *pepino*.

LAGENARIA Seringe

LAGENARIA LEUCANTHA (Duch.) Rusby in Mem. Torr. Bot. Club 6: 43.

Cucurbita leucantha Duch. in Lam. Encycl. 2 (1782) 150.

Cucurbita lagenaria Linn. Sp. Pl. (1753) 1010.

Lagenaria lagenaria Cockerell in Bull. Torr. Bot. Club 19 (1892) 95; Safford 304.

G. E. S. 355, 394, locally known as *tagoa*.

Cultivated in all tropical countries.

LUFFA Adanson

LUFFA CYLINDRICA (Linn.) Roem. Syn. Pepon. 2 (1846) 63.

Momordica luffa Linn. Sp. Pl. (1753) 1009.

Momordica cylindrica Linn. l. c.

G. E. S. 409, the wild form, locally known as *pachodag*.

A native of the tropics of the Old World, now wild or cultivated in all tropical countries.

MELOTHRIA Linnaeus

MELOTHRIA GUAMENSIS sp. nov. § *Solena*.

Herba scandens, monoica, glabra; foliis membranaceis, reniformi-ovatis vel suborbiculari-ovatis, usque ad 7 cm latis, basi profunde cordatis, apice acuminatis, margine distanter apiculato-dentatis, nitidis, supra punctis scabridis notatis; floribus ♂ racemosis, campanulatis, 8 ad 10 mm longis; fructibus subglobosis, glabris, circiter 1 cm diametro, seminibus compressis, crassis, elliptico-obovoideis, 4 mm longis.

A slender, climbing, glabrous, monoecious herb, the stems striate or sulcate, 1 to 1.5 mm in diameter. Leaves membranaceous, reniform-orbicular to orbicular-ovate, 6 to 7 cm wide, 6 to 9 cm long, somewhat acuminate, base deeply cordate, the sinus broad, the basal lobes very broadly rounded, the margins rather distantly apiculate-dentate, very slightly undulate between the teeth, when dry rather dark-green, the upper surface with numerous, small, whitish, scabrid dots, the lower surface not at all scabrid, showing the positions of the dots only; tendrils slender, simple, up to 15 cm in length; petioles 3 to 5 cm long. Male flowers racemose, the racemes axillary 3 to 4 cm long,

few-flowered, lax, the pedicels slender, about 5 mm long. Perianth campanulate, 8 to 10 mm long. Calyx 5 mm long, the teeth ovate, 1 to 1.5 mm long. Corolla-lobes oblong-ovate, obtuse, 5 mm long, 3 mm wide, margins slightly short-ciliate, the corolla-tube villous inside. Stamens 3; filaments glabrous 2 mm long; anthers orbicular, one about 2 mm in diameter, the other two 1.5 mm in diameter, apices rounded-truncate, short-ciliate, the connectives broad. Fruit fleshy, globose, about 1 cm in diameter, glabrous, somewhat glaucous and much wrinkled when dry. Seeds numerous, flat, thickened, elliptic-obovate, rounded, base subacute, about 4 mm long, 2 mm wide, and 0.5 mm thick, the margins obscurely thickened.

Guam Experiment Station 11, Tumon, November, 1911.

A species in vegetative characters strongly resembling *Melothria mucronata* Cogn., but not closely allied to that species. Its distinguishing characters are its being monocious, its comparatively large male flowers, its lax, few-flowered racemes, and its globose fruits. It does not appear to be very closely allied to any described species.

MOMORDICA Linnaeus

MOMORDICA CHARANTIA Linn. Sp. Pl. (1753) 1009; Safford 326.

*G. E. S. 21, McGregor 468, locally known as *almagoso*.*

In all tropical countries, cultivated and wild.

GOODENIACEAE

SCAEVOLA Linnaeus

SCAEVOLA FRUTESCENS (Mill.) Krause in Engl. Pflanzenreich 54 (1912) 125.

Lobelia frutescens Mill. Gard. Dict. ed. 8 (1768) no. 1.

Scaevola koenigii Vahl Symb. 3 (1794) 36.

Lobelia koenigii W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 310.

*McGregor 401, G. E. S. 84, local name *nanaso*.*

Mr. W. F. Wight, on the principle of generic types, has referred this species to *Lobelia*, and proposes to refer the species of *Lobelia* of modern authors to *Rapuntium*, but Mr. Wight's proposition has not been considered by Dr. Krause in his recent monograph of the *Goodeniaceae*. I have discussed the matter previously, and prefer to retain the species under *Scaevola*. Both of the Guam specimens have softly velutinous leaves.

Along the seashore, India to Polynesia.

COMPOSITAE

AGERATUM Linnaeus

AGERATUM CONYZOIDES Linn. Sp. Pl. (1753) 839; Safford 176.

McGregor 484, G. E. S. 1.

A native of tropical America, now in all tropical countries.

ADENOSTEMMA Forster

ADENOSTEMMA VISCOSUM Forst. Char. Gen. (1776) 90, t. 45; Safford 175.

Collected in Guam by *Chamisso*, *fide* Safford l. c.
A pantropic weed, its original home uncertain.

ARTEMISIA Linnaeus

ARTEMISIA VULGARIS Linn. Sp. Pl. (1753) 848; Safford 188.

McGregor 423.

A native of Europe, now widely distributed in temperate and tropical countries.

BLUMEA DeCandolle

BLUMEA MOLLIS (D. Don) Merr. in Philip. Journ. Sci. 5 (1910) Bot. 395.

Erigeron molle D. Don Prodr. Fl. Nepal. (1825) 172.

G. E. S. 341, in waste places.

India to tropical Africa, China, Malaya, and Australia.

CHRYSANTHEMUM Linnaeus

CHRYSANTHEMUM INDICUM Linn. Sp. Pl. (1753) 889; Safford 225.

G. E. S. 326, with the local name *yerba de Santa Maria*.

Widely distributed, in cultivation, in all warm countries.

COREOPSIS Linnaeus

COREOPSIS TINCTORIA Nutt. in Journ. Acad. Philadel. 2 (1821) 114.

G. E. S. 316, a cultivated form apparently referable here, of recent introduction.

A native of North America, now widely distributed in cultivation.

COSMOS Cavanilles

COSMOS SULPHUREUS Cav. Ic. 1 (1791) 56, t. 79 ?

McGregor 442, *G. E. S. 267, 348*, cultivated; apparently recently introduced.

A native of Mexico, now widely distributed in warm countries.

ECLIPTA Linnaeus

ECLIPTA ALBA (Linn.) Hassk. Pl. Jav. Rar. (1848) 528; Safford 266.

Verbesina alba Linn. Sp. Pl. (1753) 902.

G. E. S. 30, locally known as *titima*.

In all warm countries, where native uncertain.

ELEPHANTOPUS Linnaeus

ELEPHANTOPUS MOLLIS HBK. Nov. Gen. & Sp. Pl. 4 (1820) 26.

Thompson 21, *McGregor 481*, *G. E. S. 47*, in waste places.

This form with white flowers is very distinct from *Elephantopus scaber* Linn. which has purplish flowers. It is a native of Mexico, and is known in the Orient only from Guam, the Philippines, and Celebes; it occurs in all parts of the Philippines in the settled areas.

ELEPHANTOPUS SCABER Linn. Sp. Pl. (1753) 814; Safford 268.

Admitted on Safford's record which is undoubtedly correct.

Widely distributed in the tropics, a native of tropical America.

ELEPHANTOPUS SPICATUS Aubl. Pl. Guin. 2 (1775) 808; Safford 268.

G. E. S. 111.

A native of Mexico, now common in the Philippines and Guam, and found also in southern China.

GLOSSOGYNE Cassini

GLOSSOGYNE TENUIFOLIA (Less.) Cass. Dict. Sci. Nat. 51 (1857) 475; Safford 284.

Bidens tenuiflora Labill. Sert. Austr. Caled. (1824) 44, t. 45.

McGregor 406, *G. E. S.* 444, slopes back of Piti.

Southern China and Formosa southward to New Caledonia, Australia, and Fiji.

(*Lactuca sativa* Linn., the common lettuce, is admitted by Safford, but it is dependent on seeds imported from year to year and does not thrive.)

SYNEDRELLA Gaertner

SYNEDRELLA NODIFLORA (Linn.) Gaertn. Fruct. 2 (1791) 456, t. 171; Safford 380.

Verbesina nodiflora Linn. Cent. Pl. 1 (1755) 28.

Mrs. Clemens s. n., *G. E. S.* 149.

A weed in all tropical countries, originating in tropical America.

VERNONIA Schreber

VERNONIA CINEREA (Linn.) Less. in Linnaea 4 (1829) 291; Safford 396.

G. E. S. 70.

A weed of pantropic distribution, probably a native of the eastern hemisphere.

VERNONIA PATULA (Dry.) Merr. in Philip. Journ. Sci. 3 (1908) Bot. 439.

Conyza patula Dry. in Ait. Hort. Kew. 3 (1789) 184.

Vernonia chinensis Less. in Linnaea 6 (1831) 105, 674.

Vernonia villosa W. F. Wight in Contr. U. S. Nat. Herb. 9 (1905) 396.

G. E. S. 456.

India to Formosa and Malaya.

WEDELIA Jacquemont

WEDELIA BIFLORA (Linn.) DC. in Wight Contrib. (1834) 18.

Verbesina biflora Linn. Sp. Pl., ed. 2 (1763) 1271.

Wollastonia scabriuscula DC. ex Dene. in Nuov. Ann. Mus. Paris 3 (1834) 414; Prodr. 5 (1836) 547.

Stemmodontia biflora W. F. Wight in Contr. U. S. Nat. Herb. 9 (1905) 377.

Collected in Guam by *Haenke*, and reported from there by DeCandolle as *Wollastonia scabriuscula* DC.

Tropical Asia to Polynesia, especially along the seashore.

WEDELIA CANESCENS (Gaudich.) comb. nov.

Verbesina canescens Gaudich. Bot. Freyc. Voy. (1826) 463.

Wedelia chamissonis Less. in Linnaea 6 (1831) 161.

Wollastonia canescens DC. Prodr. 5 (1836) 547.

Stemmodontia canescens W. F. Wight ex Safford in Contr. U. S. Nat. Herb. 9 (1905) 377, pl. 65.

McGregor 504, G. E. S. 456.

A species manifestly allied to *Wedelia biflora* DC., but much more pubescent. Known only from Guam, but with a closely allied form in Samoa (Vaupel 96). Possibly the form that has been credited to Guam as *W. biflora* DC.

WEDELIA ARGENTEA (Gaudich.) comb. nov.

Verbesina argentea Gaudich. Bot. Freyc. Voy. (1826) 463; Safford 395.

G. E. S. 351, March, 1912.

This species is closely allied to the preceding, but is probably specifically distinct. Dr. F. Gagnepain has kindly looked up Gaudichaud's type specimens in the Paris Museum of Natural History and states that while the two species are allied they are probably distinct. He states that *Verbesina canescens* has its leaves covered with appressed hairs but the hairs sufficiently distant so that the surface of the leaf can be seen, while *V. argentea* has much more numerous hairs that entirely cover the surface; that in *V. canescens* the teeth of the leaves are larger, more sharply pointed, and the petioles much longer and more slender than in *V. argentea* which has small teeth, and short petioles. Abundant material from Guam may show intermediate characters, but so far as our material goes two closely allied species appear to be represented. The type was from Guam and the species is known only from that Island.

FUNGI FROM NORTHERN PALAWAN

By H. and P. SYDOW

(Berlin, Germany)

The fungi here recorded were collected by Mr. E. D. Merrill during the months of April and May, 1913, the dry season, in the northern part of Palawan Island, a region previously unexplored botanically. Up to the present time but a single paper dealing with the fungi of this island has been published. This was written by ourselves and entitled "Fungi from the Island of Palawan."¹ The fungi listed in this paper, however, were all gathered in the southern and central part of the island.

As will be seen from an examination of the following enumeration, the region is exceedingly rich in *Pyrenomycetes*, including *Dothideaceae* and *Microthyriaceae*, while it is poor in *Uredineae*, *Ustilagineae*, and *Discomycetes*. We wish to express our thanks to Messrs. G. Bresadola, H. Diedieke, and F. Theissen for valuable suggestions regarding critical species.

ANTHRACOPHYLLUM Cesati

ANTHRACOPHYLLUM NIGRITA (Lev.) Kalchbr.

PALAWAN, Taytay, Merrill 8850, 8904, April and May, 1913. On dead fallen branches in forest.

PANUS Fries

PANUS RUDIS Fr. (syn. *Lentinus chaetophorus* Lév.).

PALAWAN, Taytay, Merrill 8848, 8863, April and May, 1913. On rotten logs in thickets.

LENTINUS Fries

LENTINUS BAVIANUS Pat. (ut videtur, exemplar vetustum).

PALAWAN, Taytay, Merrill 8865, May, 1913. On rotten logs.

LENTINUS JAVANICUS Lév.

PALAWAN, Taytay, Merrill 8858, 8881, May, 1913. On rotten logs in forest.

LENZITES Fries

LENZITES STRIATA (Lév.) Fr.

PALAWAN, Taytay, Merrill 8727, April, 1913. On dead logs in forest.

¹ Leaflet. Philip. Bot. 5 (1912) 1533-1547.

FAVOLUS Fries

FAVOLUS CUCULLATUS Mont.

PALAWAN, Lake Manguao, *Merrill 8975*, April, 1913; Taytay, *Merrill 8758*, April, 1913. On rotten logs in forest.

GANODERMA Patouillard

GANODERMA OCHROLACCATUM (Mont.) Bres.

PALAWAN, Taytay, *Merrill 8896*, May, 1913. On dead mangrove (*Bru-guiera*) trees.

POLYSTICTUS Fries

POLYSTICTUS DISCIPES Berk. (vetustus).

PALAWAN, Taytay, *Merrill 8893*, May, 1913. On prostrate rotten logs.

TRAMETES Fries

TRAMETES STRIGATA (Berk.) Bres.

PALAWAN, Taytay, *Merrill 8846 p. p.*, April, 1913. On dead logs in thickets.

TRAMETES BADIA (Berk.) Bres.

PALAWAN, Taytay, *Merrill 8846 p. p.*, April, 1913. On dead logs in thickets.

HEXAGONIA Fries

HEXAGONIA BIVALVIS (Pers.) Bres.

PALAWAN, Lake Mangao, *Merrill 8945*, April, 1913. On dead fallen trees in forest.

HEXAGONIA APIARIA Pres. f. *Wightii* Klotzsch.

PALAWAN, Silanga, *Merrill 8922*, May, 1913. On dead logs in forest.

STEREUM Persoon

STEREUM AUSTRALE (Kalchbr.) Bres.

PALAWAN, Taytay, *Merrill 8862*, May, 1913. Terrestrial in old clearing.

SEPTOBASIDIUM Patouillard

SEPTOBASIDIUM SUBOLIVACEUM Syd. sp. nov.

Longe lateque effusum, papillas hemisphaericas vel depresso hemisphaericas majusculas 2-5 mm longas 2-4 mm latas et 1-2 mm altas formans, subolivaceum, molliusculum, haud rimosum, nec ad marginem fimbriatum, ex hyphis dilute olivaceis ramosis (ramis rectangulariter vel fere rectangulariter distantibus) 2.5-3.5 μ crassis parcissime septatis, articulis inde praelongis, compositum; hyphis basidiiferis superne pallidis, subhyalinis, 2-2.5 μ crassis; basidiis cylindraceo-clavatis, plerumque curvatis, 25-35 μ longis 6-8 μ latis, 2-4-septatis, pallide brunneolis usque subhyalinis; sporis non visis.

PALAWAN, Taytay, *Merrill 8761*, April, 1913. On living stems of *Schizotachyum*.

The fungus lives on scale insects and under every papilla of the fungus one or a few coccides are to be found.

CYATHUS Hallier

CYATHUS ELMERI Bres.

PALAWAN, Taytay, *Merrill 9075*, May, 1913. On earth, in dense bamboo thickets.

PHYSARUM Persoon

PHYSARUM BOGORIENSE Racib.

PALAWAN, Taytay, *Merrill 8916*, May, 1913. On dead leaves.

ARCYRIA Wiggers

ARCYRIA DENUDATA (L.) Sheldon.

PALAWAN, Taytay, *Merrill, 8914, 8915, 8917*, May, 1913. On dead sticks.

FULIGO Haller

FULIGO CINEREA (Schw.) Morg.

PALAWAN, Taytay, *Merrill 8913*, May, 1913. On dead leaves and sticks.

AECIDIUM Persoon

AECIDIUM BLUMEAE P. Henn.

PALAWAN, Taytay, *Merrill 8740*, April, 1913. On leaves of *Blumea balsamifera*.

AECIDIUM RHYTISMOIDEUM B. et Br.

PALAWAN, Lake Manguao, *Merrill 8969*, April, 1913. On leaves of *Diospyros discolor*; Mt. Capoas, *Merrill 9093*, April, 1913. On leaves of *Diospyros*.

USTILAGO Persoon

USTILAGO ANDROPOGONIS-ACICULATI Petch.

PALAWAN, Taytay, *Merrill, S 185*, May 10, 1913. On *Andropogon aciculatus*.

MELIOLA Fries

MELIOLA AGLAIAE Syd. sp. nov.

Amphigena, plagulas orbiculares minutas 2–4 mm latas tenuissimas atras formans; mycelio hyphis radiantibus laxiuscule ramosis septatis fuscis 6–8 μ crassis composito; hyphopodiis capitatis sat numerosis, solitariis vel saepius in longa serie perfecte oppositis bicellularibus, oblongis, 12–16 μ longis, 7–8.5 μ latis, cellula, basali brevi vel brevissima, superiore late rotundata; hyphopodiis mucronatis rarioribus, usque 18 μ longis; setis mycelicis numerosis, subrectis vel lenissime falcato-curvatis, 350–700 μ longis, inferne 7–9 μ crassis ad apicem acutis, inferne opacis, superne dilutioribus et pellucidis, septatis; peritheciis

paucis in quaque plagula, globosis, 120–150 μ diam., vix verrucosis; ascis 2–3-sporis; sporidiis oblongis, utrinque late rotundatis, non vel vex constrictis, fuscis, 34–38 μ longis, 14–17 μ latis.

PALAWAN, Taytay, Merrill 8884, May, 1913. On leaves of *Aglaia*.

MELIOLA MERREMIAE Rehm.

PALAWAN, Mt. Capoas, Merrill 9090, April, 1913. On leaves of *Merremia nymphaeifolia*; Merrill 9085, April, 1913. On leaves of *Merremia vitifolia*.

MELIOLA CANARII Syd.

PALAWAN, Taytay, Merrill 8816, April, 1913. On leaves of *Canarium*; Mt. Capoas, Merrill 9088, April, 1913. On leaves *Canarium*.

PARODIELLA Spegazzini

PARODIELLA GRAMMODES (Kze.) Cke.

PALAWAN, Taytay, Merrill 8897, May, 1913. On leaves of *Desmodium capitatum*.

BALLADYNA Raciborski

BALLADYNA MELODORI Syd. sp. nov.

Amphigena, saepius epiphylla, plagulas primitus orbiculares 3–10 mm diam. atras opacas tandem confluentes et magnam folii partem obtegentes formans; mycelio ex hyphis valde irregulariterque ramosis fuscis vel obscure brunneis 5–9 μ crassis saepius binis trinis lateraliter connatis torulosis irregularibus composito; hyphopodiis alternantibus, irregulariter distributis, continuis, globulosis usque oblongis, fuscis, 8–12 μ longis, 6–9 μ latis; setis mycelicis numerosis, erectis, rigidis, 80–110 μ longis, basi 4–8 μ crassis, apicem versus attenuatis et acutis, ad apicem 2–2.5 μ crassis, obscure brunneis, opacis, continuis; peritheciis numerosis, sessilibus vel brevissime stipitatis, globosis usque ovatis vel breviter piriformibus, 50–65 μ altis, 40–48 μ latis, nonvascigeris, pariete indistincte parenchymatico sordide olivaceo-brunneo vel sordide flavo-brunneo tenaci; ascis globosis vel subglobosis, 40–50 μ longis, 35–40 μ latis, aparaphysatis; spordiis oblongis, utrinque late rotundatis, medio 1-septatis et constrictis, levibus, primitus hyalinis, tandem olivaceo-brunneis, bi-tristichis, 17–19 μ longis, 4–4.5 μ latis.

PALAWAN, Taytay, Merrill 8885 (type), May, 1913. On leaves of *Melodorum*; same locality, Merrill 8795, April, 1913. On leaves of *Melodorum*.

BALLADYNA VELUTINA (Berk. et Curt.) v. Hoehn.

PALAWAN, Taytay, Merrill 8792, 8891, April and May, 1913. Both on leaves of *Gardenia glutinosa*; Taytay, Merrill 8887 p. p., May, 1913. On leaves of *Plectronia*, in society with *Asterinella palawanensis* Syd.; Lake Manguao, Merrill 8974, April, 1913. On leaves of *Gardenia*.

DIMEROSPORINA v. Hoehnel

DIMEROSPORINA DINOCHLOAE Syd. sp. nov.

Epiphylla, maculas minutas parum perspicuas rotundatas 2–4 mm latas tandem confluentes atro-griseas formans; subiculo superficiali, parce evoluto, ex hyphis brevibus cellulos (cellulis ca. 8–12 μ longis vel latis) conidia helminthosporioidea obclavata 4–6-septata non constricta flavidulo-fuscidula 55–75 μ longa 11–14 μ lata crasse tunicata (membrana 2–3 μ crassa) generantibus composito, fusco, ubique setis numerosis erectis rectis vel vix flexuosis apice semper obtusis atro-olivaceis 100–220 μ longis 9–11 μ latis septatis (articulis 15–25 μ longis) obsito; pycnidiis numerosis, primitus globulosis, dein obovatis, stipitatis, spermatia minutissima hyalina 2 μ longa 1 μ lata includentibus; peritheciis eadem forma et magnitudine ac pycnidiis, pedicello brevi crasso 5–20 μ longo 5–10 μ lato suffultis, primitus globoso-clausis, dein obovatis, et imperfecte ostiolatis, 40–50 μ diam., contextu tenaci olivaceo-fuligineo ex cellulis 6–8 μ diam. composito; ascis sporidiis nondum maturis.

PALAWAN, Mount Capoas, *Merrill 9089*, April, 1913. On leaves of *Dinochloa scandens*; Taytay, *Merrill 8736*, April, 1913. On leaves of same host.

We regret not to have seen mature perithecia. They seem to include more than one ascus, hence we have placed the fungus in the genus *Dimerosporina*.

HENNINGSONMYCES Saccardo

HENNINGSONMYCES PHILIPPINENSIS Syd. sp. nov.

Plagulas epiphyllas opacas atras perexiguas 150–300 μ tantum latas vel etiam confluendo majores et usque 2–3 mm diam. metientes formans; mycelio superficiali, matrici arcte adnato, ex hyphis longiusculis remote septatis (articulis 20–50 μ longis) obscure olivaceo-brunneis vel atro-olivaceis parum ramosis 5–7.5 μ crassis tenuiter tunicatis composito; peritheciis ad latera hypharum mycelii sessilibus vel brevissime stipitatis, plerumque perfecte globosis et 60–70 μ diam., haud ostiolatis, contextu tenaci minute parenchymatico atro-olivaceo, setis paucis (2–6) rectis vel parum flexuosis ad apicem obtusis concoloribus vel pallidioribus plerumque 20–50 μ longis et 5–6 μ latis obsitis; ascis paucis in quoque perithecio, ellipticis, ovatis vel oblongis, subsessilibus, 45–50 μ longis, 22–25 μ latis, octosporis, paraphysatis vel indistincte paraphysatis; sporidiis tristichis vel conglobatis, oblongis, utrinque rotundatis, medio vel circa medium 1-septatis et leniter constrictis, ex hyalino brunneis, levibus, 20–25 μ longis, 7.5–8 μ latis.

PALAWAN, Taytay, Merrill 8823, April, 1913. On living leaves of *Morinda*.

Besides the mature perithesia numerous small bodies looking like hyphopodia are situated on the hyphae. We believe that these bodies represent only very young perithecia.

HENNINGSOMYCES PUSILLIMUS Syd. sp. nov.

Hypophylla, plagulas orbiculares vel irregulares 1–2 cm diam. griseo-fumosas formans; mycelio tenuissimo, ex hyphis longiusculis non vel parce ramosis remote septatis (articulis 30–50 μ longis) dilute olivaceo-brunneis tenuiter tunicatis haud hyphopodiatis 2.5–3.5 μ crassis composito; peritheciis in mycelio dense sparsis, hyphis superficialiter insidentibus, una vel pluribus hyphis suffultis, globosis vel ovato-globosis, sessilibus vel centro brevissimae stipitatis, 30–45 μ diam., haud ostiolatis, contextu tenaci obscure olivaceo-brunneo minute parenchymatico ex cellulis 4–5 μ diam. compositio, superne setis paucis (4–8) erectis rectis vel subrectis continuis apice acutis fuscis (3–5) in quoque perithecio, globosis usque ovato-globosis, crassiuscule tunicatis, 20–24 μ diam., non vel indistincte paraphysatis, octosporis; sporidiis oblongis, circa medium 1-septatis, vix constrictis, 12–15 μ longis, 3.5–4 μ latis.

PALAWAN, Taytay, Merrill 8882, May, 1913. On leaves of *Adina*.

EUTYPA Tulasne

EUTYPA BAMBUSINA Penz. et Sacc.

PALAWAN, Taytay, Merrill 8734, April, 1913. On dead *Dinorchloa scandens*. Same locality, Merrill 8762, 8770, April, 1913. On dead *Schizostachyum*; same locality, Merrill S 187, May, 1913. On dead *Schizostachyum*.

EUTYPELLA Nitschke

EUTYPELLA spec.

Stromatibus ramos plus minus aequaliter circumdantibus, rotundatis, pulvinatis, 1–1.5 mm diam., peridermio superne rupto cinctis, cortice immersis, atris; peritheciis 3–8 in quoque acervulo, globulosis, 300–450 μ diam collo brevi; ostiolis vix vel parum prominulis, distincte 4-sulcatis; ascis anguste cylindraceis, p. sp. 25–35 μ longa, 4–4.5 μ lata, octosporis; sporidiis allantoideis vel subrectis, hyalinis, in cumulo pallide flavidis, 7.5–9 μ longis, 1.5–2 μ latis.

PALAWAN, Taytay, Merrill 8871, May, 1913. On dead stems of *Desmodium umbellatum*.

We think that the fungus here described is the same as *Diatrype russodes* B. et Br., which certainly will prove to belong to *Eutypella*. However we cannot say if our identification is correct as the original description of *Diatrype russodes* is too poor, hence we do prefer not to name our specimen.

EUTYPELLA REHMIANA (P. Henn. et E. Nym.) v. Hoehn.

PALAWAN, Taytay, Merrill 8757, April, 1913. On dead stems of *Calamus*; Taytay, Merrill 8876, May, 1913. On dead *Pandanus Merrillii*; Taytay, Merrill 8898, May, 1913. On dead *Areca*.

The species is incorrectly described by Hennings, hence we give a new diagnosis of the fungus.

Stromatibus gregariis, erumpenti-superficialibus, discretis et rotundatis vel subinde pluribus aggregatis et e mutera pressione irregularibus, matricis laciniis cinctis, semigloboso-pulvinatis, 1–1.8 mm longis, 0.7–1.25 mm latis, opacis, nigris, asperulis, intus albido-flavis; peritheciis 10–30 in quoque stromate, parietibus tenuibus, plerumque globosis, 100–150 μ diam., ostiolis vix vel lenissime prominulis; ascis clavato-cylindraceutis, apice rotundatis, parte sporifera 22–28 μ longa, 5–6 μ lata, longe stipitatis, paraphysatis, octosporis; sporidiis allantoidiis, hyalinis, 8–10 μ longis, 1.5 μ latis.

PERONEUTYPELLA Berlese**PERONEUTYPELLA GRAPHIDIoidES** Syd. sp. nov.

Stromatibus sparsis vel aggregatis, forma valde irregularibus, rotundatis vel elongatis, saepe etiam trigonis vel irregularibus conflentibus, Graphidis habitum subinde aemulantibus, 0.75–2 mm longis, conflendo subinde usque 3 mm longis, cortice exteriore immersis, peridermium elevantibus ab eoque arcte cinctis, atris, ostiolis fere solis erumpentibus; peritheciis in singulo stromate numerosis (15–60), globulosis vel e mutua pressione angulatis; ostioles inter se liberis, cylindraceutis, apice rotundatis, non sulcatis, 300–800 μ longis, 100–120 μ latis ascis jam elapsis; sporidiis allantoidiis vel subrectis, hyalinis, 3.5–4.5 μ longis, 1 μ latis.

PALAWAN, Taytay, Merrill 8724, April, 1912. On dead bark of *Terminalia catappa*.

PERONEUTYPELLA COCOES Syd.

PALAWAN, Taytay, Merrill 8747, April, 1913. On dead husks of *Cocos nucifera*.

PERONEUTYPELLA ARECAE Syd. sp. nov.

Stromatibus plerumque dense gregariis, 0.5–1.25 mm diam., e basi irregulariter orbiculari subpulvinatis, immersis, epidermidem pustuliformiter elevantibus et ejusdem laciniis arcte cinctis, ostiolis fere solis erumpentibus, atris, carbonaceis; peritheciis in singulo stromate 5–20 (plerumque 8–10), 200–300 μ diam., collo pro situ plus minus longiore instructis; ostiolis inter se liberis, cylindraceutis, apice rotundatis, non sulcatis, 300–600 μ longis, rectis; ascis anguste clavatis, superne rotundatis, sub-

sessilibus, p. sp. 10–20 μ longa, 4–6 μ lata, octosporis; sporidiis irregulariter distichis vel conglobatis, allantoideis, rectis vel leniter curvatis, hyalinis, 5–7 μ longis, 1 μ latis.

PALAWAN, Taytay, Merrill 8859, May, 1913. On dead *Areca catechu* in forests.

In external appearance this species agrees entirely with *Peroneutypella Coccoes* Syd., differing only in the somewhat larger sporidia and the host.

DIDYMELLA Saccardo

DIDYMELLA ACUTATA Syd. sp. nov.

Peritheciis epiphyllis, subepidermicis, plus minus aequaliter sparsis, saepe aequali distributione folia tota obtegentibus, depresso-globosis, 120–170 μ diam., atris, epidermide quasi clypeiformiter denigratula tectis, contextu opaco poremchymatico ex cellulis 8–10 μ diam. composito; ascis variabilibus, saepe curvatis, clavatis vel subsaccatis sursum plerumque angustioribus, ad apicem incrassatis, 85–120 μ longis, 10–17 μ latis, octosporis, parcissime paraphysatis; sporidiis plerumque distichis, raro tristichis, fusioideis, medio 1-septatis, non constrictis, utrinque acutissimi acuminatis et quasi acute apiculatis, hyalinis, 28–38 μ longis 6–8 μ latis.

PALAWAN, Lake Maguao, Merrill 8953, April, 1913. On dead fallen leaves of *Orania*.

DIDYMELLA PANDANICOLA Syd. sp. nov.

Peritheciis amphigenis, aequaliter distributis, plerumque 2–4 densius aggregatis et cuticula nigrificata maculiformi tectis, applanato-globosis, 150–170 μ diam., atris; ascis cylindraceo-clavatis, subsessibus, 75–95 μ longis, 14–16 μ latis, octosporis, parcissime paraphysatis; sporidiis distichis, fusiformibus, medio 1-septatis, non constrictis, hyalinis, utroque apice seta 8–10 μ longa 1 μ lata auctis, 28–33 μ longis (sine setis), 7–8 μ latis.

PALAWAN, Silanga, Merrill 8918, May, 1913. On dead leaves of *Pandanus*.

MERRILLIOPELTIS P. Hennings

MERRILLIOPELTIS PARVULA Syd. sp. nov.

Peritheciis sparsis vel saepius laxe seriatim ordinatis, rotundatis, minutis, 0.12–0.18 mm diam., subinde fere confluentibus et substromatice positis, epidermide elevata et subinde clypeiformiter denigrata obtectis, lenticularibus, ostiolo globoso minimo prominente; ascis cylindraceis, teneris, 100–130 μ longis, 8–10 μ latis, octosporis; paraphysibus filiformibus, perpauca; sporidiis distichis vel fere distichis, fusiformibus, rectis, rarius leniter curvatis, medio 1-septatis, non constrictis, utroque apice longe acutissimis, hyalinis, 45–54 μ longis, 3.5–4.5 μ latis.

PALAWAN, Lake Manguao, Merrill 8961 (type), 8960, 8956, April, 1913. All specimens on dead fallen petioles of *Orania*.

MERRILLIOPELTIS CALAMI P. Henn.

PALAWAN, Lake Manguao, Merrill 8951 p. p., April, 1913. On dead *Calamus*.

DIDYMOSPHAERIA Fuckel

DIDYMOSPHAERIA MINUTELLA Penz. et Sacc.

PALAWAN, Taytay, Merrill 8755, April, 1913. On dead *Dinochloa scandens*; Silanga, Merrill 8933, 8941, May, 1913. On dead *Schizostachyum*.

OPHIOBOLUS Riess

OPHIOBOLUS LICUALAE Syd. sp. nov.

Peritheciis sub epidermide bullatim elevata dense aggregatis, greges 0.5–5 mm. latos et longos formantibus, haud immersis, sed epidermide tandem ab papillulis minutis perforata tectis, e basi lata obtuse conoideis, 130–160 μ altis, 60–125 μ crassis, atris, ad basim hyphis paucis circumdatis, contextu obscure fusco parenchymatico ex cellulis 6–8 μ diam. composito; ascis fasciculatis, cylindraceis, subsessilibus, filiformiter paraphysatis, 90–120 μ longis, 10–12 μ latis; sporidiis parallelis, filiformibus, rectis vel leniter curvatis, 2–4-septatis, guttulatis, hyalinis, 70–85 μ longis, 2.5 μ latis.

PALAWAN, Lake Manguao, Merrill 8946 (type), April, 1913 and Taytay, Merrill 8730, April, 1913. Both on dead petioles of *Licuala spinosa*.

ANTHOSTOMELLA Saccardo

ANTHOSTOMELLA BICINCTA Syd. sp. nov.

Peritheciis densiuscule sparsis, omnino immersis, atris, globosis, 350–425 μ diam., epidermidem atro-nitidulam leniter elevantibus, coriaceo-mollibus; ascis cylindraceis, apice obtusis, 100–125 μ longis, 13–16 μ latis, octosporis, poro jodi ope coerulescente; paraphysibus leniter mucosis; sporidiis recte monostichis, continuis, ellipsoideis, utrinque rotundatis, ex hyalino mox fuscis, centro zona latiuscula (2–4 μ lata) dilutiore vel subhyalina cinctis, praeterea strato mucoso 1.5–2.5 μ lato distinctissimo circumdatis, 15–18 μ longis, 9–10 μ latis (sine muco).

PALAWAN, Taytay, Merrill 8879, May, 1913. On dead petiole of *Caryota*.

The fungus might be considered as belonging to the *Massariaceae*, resembling *Massariopsis* (see Rehm in Annal. Mycol. 4: 269), from which it differs only in the unicellular sporidia. We place our fungus, however, to *Anthostomella*, as numerous other similar exotic species have been described under *Anthostomella*. Perhaps this genus must later be divided.

The sporidia of the new species are surrounded by a very distinct and comparatively large mucous layer. They are at first hyaline, soon becoming brownish and then showing a very distinct, clear, nearly hyaline band around the center in the same way as are often shown the conidia of *Anthostomella*.

ANTHOSTOMELLA COCOINA Syd. sp. nov.

Peritheciis plerumque dense dispositis, subinde maculiformiter confertis, immersis, epidermidem denigratam hemsphaerice elevantibus, semper tectis, modo papilla minuta poro perspicua pertusa tandem prominente globosis, glabris, atris, 200–300 μ diam.; ascis cylindraceis, apice rotundatis, 75–95 μ longis, 6–7 μ latis, octosporis; sporidiis monostichis, ellipsoideis, utrinque rotundatis vel leniter attenuatis, continuis, fuscis, exappendiculatis, 8–10 μ longis, 3.5–5 μ latis.

PALAWAN, Taytay, *Merrill 8892, 9077*, May, 1913. On dead petioles and leaf rachis of *Cocos nucifera*.

ROSELLINIA De Notaris**ROSELLINIA TRUNCATA** Syd. sp. nov.

Peritheciis in glomerulos irregulares 2–5 mm longos vel confluyendo majores sine ordine dense dispositis, rarius solitariis, subiculo copioso crasso persistenti ex hyphi fuscis septatis 3–5 μ crassis composito insidentibus, globoso-conicis, in maturitate ad verticem distincte truncatis ibique subinde etiam leniter depresso, distincte nitideque papillatis, ca. 1 mm diam. subinde binis connatis et fere confluentibus, atris, glabris, levibus; ascis jam resorptis; sporidiis oblongis, utrinque rotundatis, continuis, fuscis, 15–17 μ longis, 7.5–8.5 μ latis.

PALAWAN, Taytay, *Merrill 8782*, April, 1913. On fallen branches in forest.

ROSELLINIA COCOES P. Henn.

PALAWAN, Taytay, *Merrill 8911*, May, 1913, and Lake Manguao, *Merrill 8966*, April, 1913. On very old fallen petioles of *Orania*.

ROSELLINIA PERUSENSIS P. Henn.

PALAWAN, Taytay, *Merrill 8768*, April, 1913. On decorticated logs.

AMPHISPHAERIA Cesati et De Notaris**AMPHISPHAERIA PALAWANENSIS** Syd. sp. nov.

Peritheciis sparsis vel binis trinis coalitis, per corticem fissum prorumpentibus ab eoque cinctis, lenticulari-conoideis, atris, glabris, 1 mm diam., distincti nitiduleque papillulatis; ascis crasse cylindraceis, apice rotundatis, 170–250 μ longis, 18–25 μ latis, octosporis, copiose paraphysatis; sporidiis monostichis, ellipsoideis vel oblongo-ellipsiodeis, utrinque medio 1-septatis et constrictis, castaneo-brunneis, 30–35 μ longis, 15–16 μ latis.

PALAWAN, Taytay, *Merrill 8843*, April, 1913. On dead twigs of *Uncaria*.

MELANOMMA Nitschke et Fuckel

MELANOMMA PHILIPPINENSE Syd. sp. nov.

Peritheciis sparsis, solitariis, subsuperficialibus, e basi lata conoideis, 0.5–1 mm diam., atris, carbonaceis, distincte papillatis, glabris, opacis; ascis cylindraceis vel cylindraceo-clavatis, apice obtusis et incrassatis, 140–180 μ longis, 17–22 μ latis, octosporis; paraphysibus copiosissimis, filiformibus, 1 μ crassis; sporidiis oblique monostichis usque subdistichis, in superiore asci parte saepe recte monostichis, fusiformibus, utrinque obtuse attenuatis, primo 1-septatis, dein 3-septatis, ad septum medium tantum constrictis, dilute fuscis, 30–38 μ longis, 10–11 μ latis.

PALAWAN, Taytay, Merrill 9076 (type), May, 1913. On very old prostrate logs; same locality, Merrill 8756, April, 1913. On dead stump; Malam-paya Bay, Merrill 8940, May, 1913. On dead logs; Lake Manguao, Merrill 8955, April, 1913. On dead decorticated *Fagraea fragrans*.

NUMMULARIA Tulasne

NUMMULARIA GLYCYRRHIZA (Berk. et Curt.) Sacc.

PALAWAN, Lake Manguao, Merrill 8950, April, 1913. On dead trees in forest.

NUMMULARIA URCEOLATA Rehm.

PALAWAN, Taytay, Merrill 8731, April, 1913. On dead trees.

HYPOXYLON Bulliard

HYPOXYLON CULMORUM Cke.

PALAWAN, Taytay, Merrill 8841, April, 1913. On dead *Dinochloa scandens*; Taytay, Merrill 8912, May, 1913. On dead *Schizostachyum*; Lake Manguao, Merrill 8964. On dead *Schizostachyum*.

Sporidia 13–18 μ long, 7–9 μ broad. In the larger stromata the loculi do not always occupy all parts of them. They often leave a part of the stroma sterile and flat. The smallest stromata usually contains one loculus only. *Hypoxylon Chusquiae* P. Henn. certainly does not differ from *H. culmorum* Cke.

HYPOXYLON MARGINATUM (Schw.) Berk.

PALAWAN, Taytay, Merrill 8765, 8767, April, 1913. On fallen branches; Lake Manguao, Merrill 8965, April, 1913. On fallen branches.

HYPOXYLON SUBEFFUSUM Speg.

PALAWAN, Lake Manguao, Merrill 8978, April, 1913. On dead logs in forest.

LORANTHOMYCES v. Hoehnel

LORANTHOMYCES SORDIDULUS (Lév.) v. Hoehn.

PALAWAN, Taytay, Merrill 8990, May, 1913. On leaves of *Loranthus*.

GIBBERELLA Saccardo

GIBBERELLA CREBERRIMA Syd.

PALAWAN, Taytay, Merrill 8732, April, 1913. On living stems of *Scleria*.

PHYLLACHORA Nitschke

PHYLLACHORA CONNARI Syd. sp. nov.

Stromatibus sparsis, innatis, in utraque foliorum pagina conspiciuis, minutis, rotundatis vel angulatis, non confluentibus, 1-3 mm longis, atris, in epiphylo planis opacis, in hypophyllo ob loculos prominulos parum nitidulos rugulosos; loculis 10-40 in quoque stromate, globosis; ascis cylindraceo-clavatis, subsessilibus, 70-88 μ longis, 10-13 μ latis, octosporis; sporidiis oblique monostichis usque distichis, oblongis, utrinque rotundatis, saepe superne angustioribus, continuis, hyalinis, 16-18 μ longis, 3.5-4 μ latis.

PALAWAN, Malampaya Bay, Merrill 8936, April, 1913. On leaves of *Connarus*.

PHYLLACHORA OCHNAE Pat. et Har.

PALAWAN, Taytay, Merrill 8835, April, 1913. On leaves of *Ochna*.

PHYLLACHORA LUZONENSIS P. Henn.

PALAWAN, Taytay, Merrill 8800, 8989, 9074, April and May, 1913. On leaves of *Millettia*; same, locality, Merrill S 184, May 9, 1913. On leaves of *Millettia*; Lake Manguao, Merrill 8973, April, 1913. On leaves of *Millettia*.

PHYLLACHORA JAPENSIS (P. Henn.) Syd.

PALAWAN, Taytay, Merrill 8813, April, 1913. On leaves of *Derris*; Lake Manguao, Merrill 8968, April, 1913. On leaves of *Derris*.

Phyllachora Lagunae Rehm in Philip. Journ. Sci. 8 (1913) Bot. 396, is the same as *P. japensis*. Another synonym is *Auerswaldia derridis* P. Henn. in Hedwigia 47 (1908) 255, which is incorrectly described.

PHYLLACHORA PTEROCARPI Syd.

PALAWAN, base of Mt. Capoas, Merrill 9084, April, 1913. On leaves of *Pterocarpus indicus*.

PHYLLACHORA PONGAMIAE (B. et Br.) Petch (*Phyllachora Pongamiae* P. Henn.)

PALAWAN, Malampaya Bay, Merrill 8938, May, 1913. On leaves of *Pongamia mitis* (*P. glabra*).

PHYLLACHORA APOENSIS Syd.

PALAWAN, Taytay, Merrill 8888, May, 1913. On leaves of *Ficus*.

PHYLLACHORA INFECTORIA Cke.

PALAWAN, Lake Manguao, Merrill 8982, April, 1913. On leaves of *Ficus*.

PHYLLACHORA SPOROBOLI Pat.

PALAWAN, Malampaya Bay, Merrill 8935, April, 1913. On leaves of *Sporobolus*.

PHYLLACHORA TJANGKORREH Rac.

PALAWAN, Taytay, Merrill 8791, 9073, April, 1913. On leaves of *Dinorchloa scandens*.

MICRODOTHELLA Syd. gen. nov. Dothideacearum.

(Etym. *micro* minutus, quasi Dothideacea minuta.)

Stromata minuta, convexa, basi stromatum in epidermide sita, atra, radiatim contexta, 1-2-loculigera. Asci ovati usque oblongi, plerumque octospori, paraphysati. Sporidia elliptica vel oblonga, continua, hyalina.

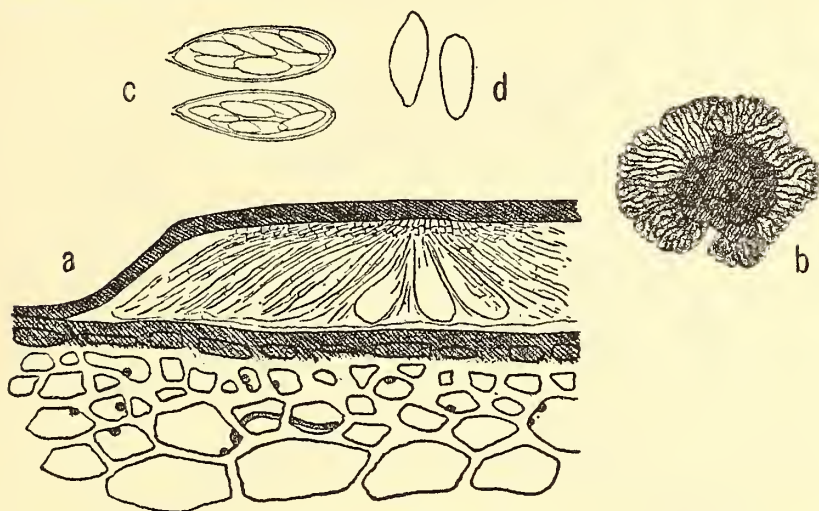


FIG. 1. *Microdothella culmicola* Syd. a, Longitudinal section through part of a stroma ($\times 370$); b, very young stroma seen from above ($\times 370$); c, two asci ($\times 370$); d, two sporidia ($\times 625$).

MICRODOTHELLA CULMICOLA Syd. sp. nov. (Fig. 1.)

Stromatibus sparsis vel hinc inde aggregatis, subinde binis confluentibus, minutis, 200-450 μ diam., rotundatis, leniter convexis, atris, cum basi in epidermide sitis in hypodermidem hyphas paucas solitarias fuscas tantum emittentibus, centro opacis, ad marginem dilute fuscis, ex hyphis radiantibus 2-3 μ latis remote septatis (articulis 10-18 μ longis) maeandrice curvatis contextis; loculis 1-2 in quoque stromate, poro rotundo 15-20 μ lato tandem apertis; ascis primitus globulosis, mox ovatis vel oblongis, apice rotundatis, sessilibus, octosporis, rarius 4-sporis, 35-55 μ longis, 18-22 μ latis, paraphysatis; sporidiis plerumque distichis, ellip-

soideis vel oblongo-ellipsoideis, continuis, hyalinis, 17–20 μ longis, 8–9 μ latis.

PALAWAN, Lake Manguao, Merrill 8952, April, 1913. On dead culms of *Ischaemum* (type); Silanga, Merrill 8932, May, 1913. On dead culms of *Chloris incompleta*.

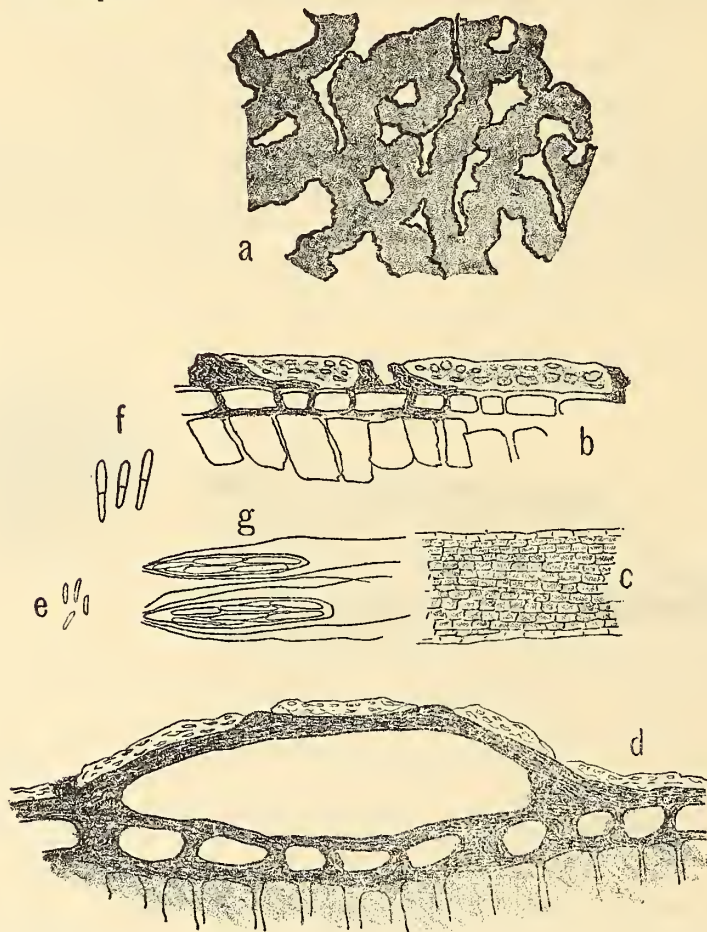


FIG. 2. *Heterodothis leptotheca* Syd. a, Longitudinal section through a stroma ($\times 160$); b, longitudinal section through a stroma ($\times 370$); c, part of the yellow-brown stroma seen from above ($\times 370$); d, longitudinal section through a stroma with loculus ($\times 370$); e, pycnidiospores ($\times 620$); f, three ascospores ($\times 620$); g, two asci with paraphyses ($\times 620$).

HETERODOTHIS Syd. gen. nov. Dothideacearum.

(Etym. *heteros* diversus et *Dothis*, pro Dothideacea.)

Stromata plana, subcrustacea, hypostromate in epidermide evoluto, heterogenee contexta, contextu partim atro opaco, partim flavo-brunneo. Loculi minuti, numerosi, discreti, e stromate atro

formati. Asci cylindranei, octospori, paraphysati. Sporidia didyma hyalina. Pycnidiosporae bacillares, continuae, hyalinae.

HETERODOTHIS LEPTOTHECA Syd. sp. nov. (Fig. 2.)

Stromatibus sparsis, quo ad formam et magnitudinem variabilibus, saepe ambitu orbicularibus et 2–6 mm diam., tenuibus, subinde valde irregularibus, planis, atris, hypostromate in epidermide evoluto et ejus cellulas dense ambiente, plus minus distincte humiliterque costatis, contextu heterogeneo, partim atro opaco indistincte celluloso, partim flavo-brunneo ex cellulis 5–8 μ longis et 3–4 μ latis regulariter seriatis composito; loculis numerosis in quoque stromate, discretis, globulosis vel applanato globulosis, minutis, 100–150 μ diam., extus nitidulis, e stromate atro formati et partibus stromatis flavo-brunnei obtectis, ascis sessilibus, cylindraneis, apice obtusis, 38–45 μ longis, 4–5.5 μ latis, octosporis; paraphysibus filiformibus, ascos longe superantibus, hyalinis, vix 1 μ crassis; sporidiis distichis, cylindraneis, utrinque obtusis, medio 1-septatis, non constrictis, hyalinis, 10–13

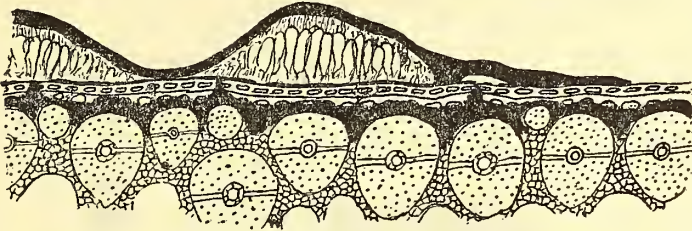


FIG. 3. *Palawania grandis* (Niessl.) Syd. Longitudinal section through a stroma with underlying hypostroma ($\times 130$).

μ longis, 2.5 μ latis; pycnidiosporis bacillaribus, continuis, utrinque obtusis, hyalinis, 4 μ longis, 1–1.5 μ latis.

PALAWAN, Taytay, Merrill 8744, April, 1913. On living leaves of *Glycosmis cochinchinensis*.

The fungus is strongly characterized by the peculiar composition of the stromata. These are very flat, usually rounded, but sometimes confluent and quite irregular in outline. A good hand lens shows that they are more or less distinctly costate on the surface. They are composed of two kinds of tissue: a yellow-brown one whose cells are arranged in regular lines, and a dark-black one surrounding the yellow stroma (b). The dark stroma portions which extend into the epidermis and fill up the space between the cells, divide and so form the loculi which remain covered by parts of the light stroma (d). On the same stromata asci- and pycnidiospore bearing loculi are to be found which do not differ from each other.

PALAWANIA Syd. gen. nov. Dothideacearum.

(Etym. ab insula Palawan.)

Stromata ascigera superficialia, minuta vel confluyendo majuscula, atra, carbonacea, intus plurilocularia, pluristratosa, radia-

tim contexta, hypostromate sub epidermide bene evoluto, per stomata erumpente et stromata ascigera formante, strato basali tenui. Loculi discreti, haud ostiolati, strato obtegente tandem poro rotundo disrumpente. Asci elliptici, sessiles, copiose paraphysati, octospori. Sporidia didyma, fusca.

PALAWANIA GRANDIS (Niessl.) Syd. comb. nov. (Fig. 3.)

Microthyrium grande Niessl. in Rebenh. Fg. eur. no. 2467.

Seynesia grandis Wint. in Hedwigia (1886) 107.

Seynesia calamicola P. Henn. et E. Nym. in Warb. Monsunia (1899) 160.

PALAWAN, Taytay, Merrill 8739, 8757, 8794, April, 1913. All on dead petioles and rachis of *Calamus*; Merrill 8808, on dead leaf-rachis of *Oncosperma horrida*; Merrill, 8872, on dead *Flagellaria indica*; Merrill 8847, on dead stems of *Drynaria quercifolia*.

We have compared the Palawan specimens with the types of *Microthy-*

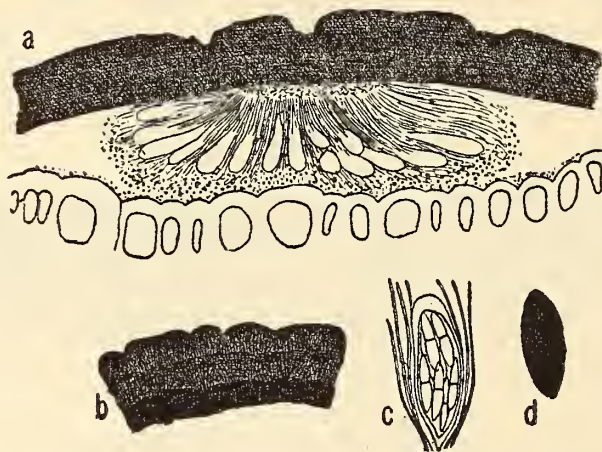


FIG. 4. *Palawania cocoës* Syd. a, Longitudinal section through a part of the superficial ascus-bearing stroma, showing one loculus ($\times 250$); b, margin of the stroma seen from above ($\times 250$); c, ascus with paraphyses ($\times 275$); d, sporidium ($\times 450$).

rium grande and *Seynesia calamicola*, and have found that all these represent the same fungus. Theissen, to whom we are much indebted for the accompanying figure of this fungus, drawn after the Palawan specimen on *Calamus*, has taken up the fungus as a doubtful *Seynesia* in Oesterr. Bot. Zeitschr. (1912) 23 extr., but because of the poor specimen seen by him at that time. *Palawania grandis* is nearly related to the following *P. cocoës*, but differs in its external appearance, and the somewhat longer and less septate (articles 8–15 μ long) hyphae.

The specimens growing on *Calamus* must be considered as typical. The forms growing on the other hosts mentioned seem not to differ.

PALAWANIA COCÔES Syd. sp. nov. (Fig. 4.)

Stromatibus ascigeris tota longitudine matrici adnatis, superficialibus, minoribus rotundatis vel oblongis et 0.3–1 mm longis, saepe plus minus confluentibus et tunc multo majoribus, usque 8

mm longis, atris, opacis, carbonaceis, pluristratosi, in medio crassis, marginem versus tenuioribus, radiatim ex hyphis fuscis $3.5\text{--}4.5\ \mu$ latis crebre septatis (articulis $6\text{--}9\ \mu$ longis) rectis vel fere rectis contextis, ad ambitum integris vel lenissime crenatis, hypostromate sub epidermide bene evoluto, strato basali tenui fusco, hypothecio fibroso; loculis in stromatibus minoribus duobus vel paucis, in stromatibus majoribus copiosioribus, discretis, haud confluentibus, non ostiolatis, sed strato obtegente tandem poro rotundo disrumpente, ascis ellipsoideis, sessilibus, apice rotundatis et incrassatis, $50\text{--}75\ \mu$ longis, $20\text{--}26\ \mu$ latis, octosporis; paraphysibus numerosissimis, hyalinis, filiformibus, sursum saepe leniter mucoso conjunctis; sporidiis distichis usque tristichis, oblongo ellipsoideis, utrinque obtusis vel leniter attenuatis, medio vel circa medium 1-septatis et leniter constrictis, ex hyalino fuscis, $22\text{--}24\ \mu$ longis, $8\text{--}10\ \mu$ latis.

PALAWAN, Taytay, Merrill 8764, April, 1913. On dead spathes of *Cocos nucifera*.

This new genus is related to *Hysterostomella* and *Polystomella*, differing from the former by the presence of paraphyses, and from the latter by the colored sporidia. The hypostroma of both species, *P. grandis* and *P. Cocoës*, consists of fuliginous, many septate hyphae running deeply in the tissue, creeping upward between the sclerenchyma bundles and forming thick effused balls beneath the epidermis. The hypostroma breaks through the stomata of the epidermis and so forms superficial ascus-bearing stromata. The latter are adnate with their whole base to the substratum. They are either small or more or less confluent and large, and are pluristratose like the shell of an oyster so that the center is very thick and carbonaceous. The margin is entire or very slightly crenate in *P. Cocoës*, and sometimes more fimbriate-dentate in *P. grandis*. The loculi have no ostioles, but the covering stratum is finally cracked and a round opening formed over them. The ripe sporidia are somewhat longitudinally plicate in *P. Cocoës*.

STIGMATODOTHIS Syd. gen. nov. Dothideacearum.

(Etym. *stigma* punctum et *Dothis*, quasi Dothideacea exigua.)

Stromata subcuticularia, exigua, 1-loculigera, carbonacea, superne pluristratose et irreguariter radiatim contexta, haud ostiolata sed superne tandem poro rotundo aperta, strato basali tenuissimo, hypostromate parco per epidermidem profunde in contextu matricis penetrante massam compactam haud formante. Asci ovato-oblongi, 8-spori. Paraphyses haud typicae, cellulosae, submucosae. Sporidia transverse pluriseptata hyalina.

STIGMATODOTHIS PALAWANENSIS Syd. sp. nov. (Fig. 5.)

Stromatibus amphigenis, sparse vel laxe gregariis, haud maculiculis, rotundatis, depresso hemisphaericis, $130\text{--}170\ \mu$ diam., atris, pro ratione facile secedentibus, sed inter cuticulam et

epidermidem ortis, tota basi in pariete exteriori epidermidis sessilibus, primitus cuticula dein rupta et plus minus evanescente obtectis, carbonaceis, superne pluristratose irregulariterque radiatim contextis, haud ostiolatis, sed tandem poro rotundo apertis, hypostromate inter epidermidis cellulas in contextu matricis profunde penetrante, strato basali tenuissimo plano brunneo; ascis ovato-oblongis, sessilibus, tenuiter tunicatis, apice rotundatis, $26-30\ \mu$ longis, $14-16\ \mu$ latis, octosporis; paraphysibus haud typicis, cellulosis, submucosis, sporidiis tristichis, clavulatis, superne rotundatis, deorsum angustioribus, transverse 3-septatis, non constrictis, rectis vel lenissime in aequilateris hyalinis, $14-17\ \mu$ longis, $3.5-4\ \mu$ crassis.

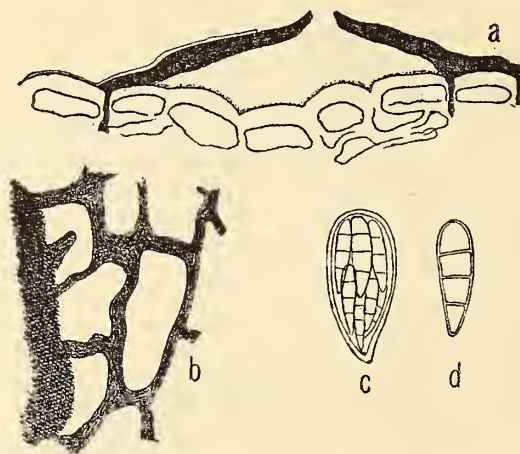


FIG. 5. *Stigmatodopsis palawanensis* Syd. a, Longitudinal section through a stroma, showing an empty loculus at the left with the cuticula above ($\times 250$); b, margin of a stroma with hypostroma creeping between the epidermal cells, seen from above ($\times 250$); c, ascus ($\times 600$); d, sporidium ($\times 250$).

PALAWAN, Taytay, Merrill 8909, May, 1913. On living leaves of *Dendrobium*.

This minute fungus can only be placed among the *Dothideaceae*. The hypostroma forms cords of brown hyphae which deeply penetrate between the epidermis cells into the tissue of the leaves, but never forming thick balls. The stromata are formed beneath the cuticula and are at first wholly covered by the cuticle which soon is ruptured and then partly falls away. It is not easy to make a good longitudinal section through a fertile stroma, as the fungus and the overlying cuticle are too brittle in this stage of development. Hence our figure shows only a section through an undeveloped stroma without asci.

ACTINODOTHIS Syd. gen. nov. Dothideacearum.

(Etym. *actin* radius et *Dothis*, quasi Dothideacea radiatim contexta.)

Stromata superficialia, orbicularia, discoidea, lenissime convexa, carbonacea, pluristratosa, radiatim contexta; 1- plurilo-

cularia (loculis discretis haud ostiolatis tandem apertis), parte marginali stromatis plano libero ex hyphis radiatibus dendritice ramosis composito, hypostromate in vel sub epidermide parce evoluto; asci ovati usque oblongi, bispori, aparaphysati; sporidia oblonga, pluriseptata, fusca.

ACTINODOTHIS PIPERIS Syd. sp. nov. (Fig. 6.)

Stromatibus epiphyllis, singulis subinde hypophyllis, sine maculis, sparsis, superficialibus, ambitu semper orbicularibus, 1.5–3 mm diam., discoideis, lenissime convexis, parte marginali

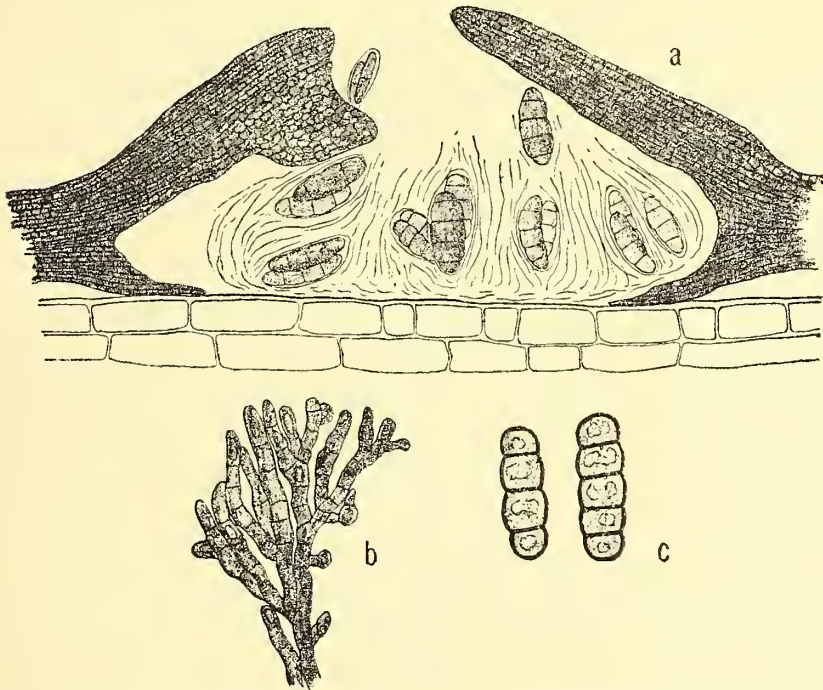


FIG. 6. *Actinodothis Piperis* Syd. a, Longitudinal section through the central part of a stroma, showing a locus ($\times 250$); b, part of the margin of the stroma ($\times 250$); c, two sporidia ($\times 475$).

plano quasi alatis, carbonaceis, opacis, radiatim contextis, centro ex hyphis crebre septatis compositis, parte marginali libero matrici haud adnato ex hyphis radiantibus valde dendriticeque ramosis (ramulis obtusis) fuscis $7-12\ \mu$ latis septatis (articulis $9-15\ \mu$ longis) composito; loculis 1 vel pluribus, sive paucis (2–4), sive copiosioribus (usque 15) in quoque stromate, discretis, haud confluentibus, non ostiolatis, sed tandem superne spertis, minutis; hypostromate in vel sub epidermide parce evoluto, filiformi, hypothecio pallido strato basali tenui brunneolo; ascis ovatis vel

oblongo-ovatis, apice obtusis, bisporis, aparaphysatis, 42–50 μ longis, 20–26 μ latis; sporidiis parallele positae, oblongis, utrinque late rotundatis, 3–4-septatis, ad septa leniter constrictis, fuscis, 33–40 μ longis, 12–15 μ latis.

PALAWAN, Taytay, *Merrill 8819* (type), April, 1913. On living leaves of *Piper*; same locality, *Merrill 8851*, April, 1913. On leaves of *Piper*; Mt. Capoas, *Merrill 9092*, April, 1913. On leaves of *Piper*.

The genus is related to *Polystomella*, differing chiefly by the pluricellular, colored sporidia and the scantily developed hypostroma.

AULACOSTROMA Syd. gen. nov. Dothideacearum.

(Etym. *aulax*=sulca et stroma.)

Stromata sub parte exteriori epidermidis evoluta, dein erumpentia, crustacea, plana, atra, peripherice in hyphas radiantes ramosas bulbillulas axillares gerentes dissoluta. Perithecia elongata, linearia, rima longitudinali aperta, radiatim contexta, nucleo mucoso. Asci subglobosi vel ovati, paraphysati, octospori. Sporidia ex hyalino fusca, didyma.

AULACOSTROMA PALAWANENSE Syd. sp. nov. (Fig. 7.)

Epiphyllum plagulas primitus minutas orbiculares mox confluentes multo majores et irregulares formans, subinde folia exteriori epidermidis evoluta, atro, grumuloso, plano, crustaceo, ad ambitum in hyphas radiantes abeunte; hyphis longiusculis, alternatim ramosis, fuscis, rectis vel irregulariter flexuosis, remote septatis, 4–5.5 μ crassis, in axillis bulbillulas irregulares vel oblongas concolores vel parum obscuriores gerentibus; peritheciis plus minus numerosis in quoque stromate, laxe vel densiuscule dispositis, ab reliquis epidermidis ruptae obtectis, linearibus, atris, 0.3–1.2 mm longis, 150–220 μ latis, rectis vel varie curvatis aut geniculatis, rima longitudinali apertis, contextu atro-fusco, marginem versus fusco ex hyphis rectis vel subrectis remote septatis (articulis 15–25 μ longis) 2.5–3.5 μ crassis ad apicem dichotomo-partitis compositis, nucleo hyalino-viridulo mucoso; ascis subglobosis, ovatis vel ovato-oblongis, sessilibus, apice rotundatis, 48–55 μ longis, 25–35 μ latis, octosporis; paraphysibus superne hyalino-viridulis 1.5–2 μ crassis, mucosis; sporidiis distichis vel tristichis aut conglobatis, ellipsoideis vel oblongo-ellipsoideis, utrinque late rotundatis, medio 1-septatis, constrictis, ex hyalino fuscis, levibus, 20–25 μ longis, 10–12 μ latis; pycnidiosporis in peritheciis similibus evolutis, sessilibus, cylindraceis, utrinque obtusis, continuis, hyalinis, 8–12 μ longis, 2–2.5 μ latis.

PALAWAN, Taytay, *Merrill S 175, 8751*, April, May, 1913. On leaves of *Pandanus Merrillii*.

At first the fungus forms small round colonies surrounded by the radiating hyphæ. The colonies soon become larger, irregular, very often confluent and spreading over the entire leaf-blade. In the larger colonies the surrounding hyphæ are only scarcely, if at all, visible, because they more or less disappear in age. The hyphæ are branched, bearing axillary bulbils the structure of which we have not been able to make out. The stromata develop beneath the outer portion of the epidermis (see fig. 2). When the stromata increase in size the epidermis is broken and pieces of it are to be

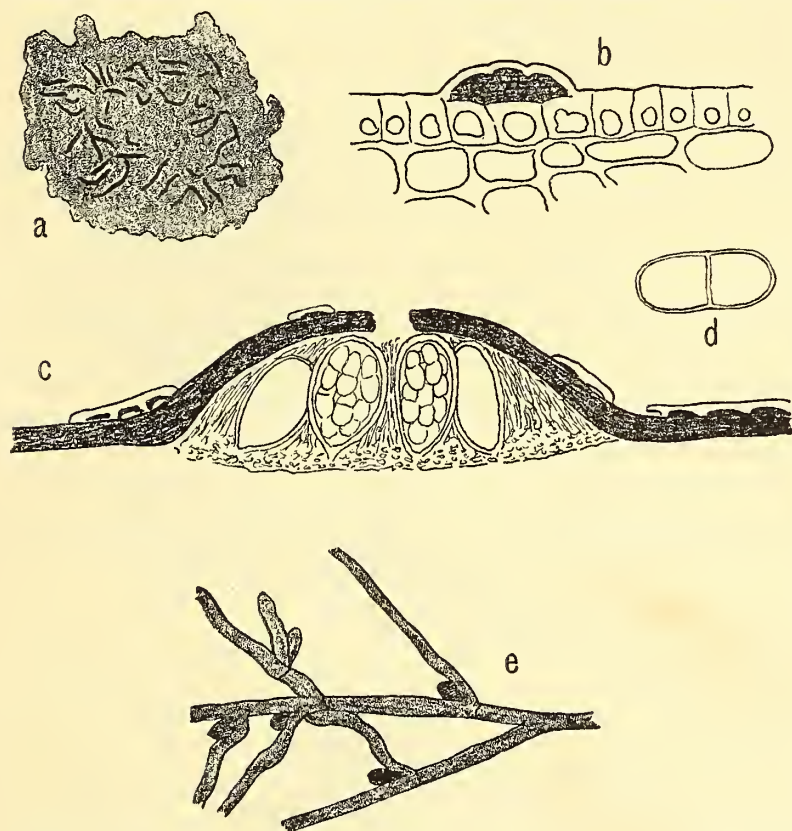


FIG. 7. *Aulacostroma palawanense* Syd. a, Stroma seen from above ($\times 5$); b, longitudinal section through a very young stroma showing its position beneath the outer layer of the epidermis ($\times 370$); c, longitudinal section through a mature perithecium ($\times 370$); d, ascospore ($\times 640$); e, branched hypha with axillary bulbils ($\times 370$).

found on the mature perithecia. The cells of the epidermis themselves are only sparsely filled with hyphal threads. The asci become blue-tinted with potassium iodide.

There are two fungi described from leaves of *Pandanus*, viz. *Aulographum Pandani* Cke. and *A. intricatum* Berk. et Br., which are similar to the Philippine fungus and seem to belong to the same genus. We have seen the types of both species, which are preserved in the Kew Herbarium. *Aulacographum Pandani* differs in having smaller perithecia which are

arranged in the midst of the stromata, while *A. intricata* has the same perithecia, but a much less developed stroma.

We have placed *Aulacostroma* among the *Dothideaceae* but it might perhaps better be considered as belonging to the *Hysteriaceae*. The limits between these two families, however, are not clear and they very much need a revision.

DICTYOTHYRIUM Theissen

DICTYOTHYRIUM GIGANTEUM Syd. sp. nov.

Peritheciis plerumque hypophyllis, sparsis, sine maculis, omnino superficialibus, sine mycelio, atris, opacis, rotundatis, 500–700 μ diam., carbonaceis, planis, centrum versus lenissime elevatis, poro rotundato distincto 25–35 μ lato instructis; contextu centrali omnino opaco obscure atro-coeruleo, peripherico laxiore dilutiore amoene coeruleo usque hyalino ex hyphis tenuissimis 1–1.5 μ latis dense ramosis et maeandrice conjunctis composito; ascis subsaccatis, ad basim latis, apicem versus plerumque angustioribus, sessilibus, crasse tunicatis (praecipue ad apicem), 90–125 μ longis, 35–45 μ latis, 2–4-sporis, copiosissime filiformiter paraphysatis; sporidiis oblongo-cylindraceis, utrinque late rotundatis, ad septum constrictis, hyalinis, intus densissime granulosis, 65–100 μ longis, 16–18 μ latis, loculis sive aequalibus, sive quoad longitudinem inaequalibus.

PALAWAN, Taytay, Merrill 8773 p. p., April, 1913. On leaves of *Memecylon lanceolatum*, in society with *Morenoella Memecyli* Syd.; same locality, Merrill 8811, April, 1913. On leaves of *Memecylon*.

MICROPELTELLA Sydow

MICROPELTELLA MERRILLII Syd. sp. nov.

Peritheciis amphigenis, sine maculis, sparsis, superficialibus, facile secedentibus, opace atro-coeruleis, lenticulari-scutatis, 250–420 μ diam. marginem versus coerulee pellucidis ibique ex hyphis 1–1.5 μ latis maeandrice denseque conjunctis contextis, praeterea margine hyalino cinctis, ostiolo distincto rotundato 20–25 μ lato; ascis fusoido-clavatis, sessilibus, aparaphysatis, 60–75 μ longis, 14–18 μ latis, plerumque octosporis; sporidiis distichis, tereti-clavulatis, apice late rotundatis, deorsum attenuatis, rectis vel leniter curvatis, 3–4-septatis, ad septa parum constrictis, hyalinis, 24–30 μ longis, 4–6 μ latis.

PALAWAN, Taytay, Merrill 8725 (type), April, 1913. On leaves of *Schefflera*; same locality, Merrill 8746, 8754, 8820, April, 1913. On leaves of *Glycosmis cochinchinensis* and *Celastrus paniculatus*.

STEPHANOTHECA Syd. gen. nov. Hemisphaeriacearum

(Etym. *stephanos* corona et *theca* ascus.)

Perithecia dimidiato-scutata, sed haud inversa, omnino superficialia, subiculo nullo, minuta, centro substipitato matrici affixa,

irregulariter radiatim contexta, ex hyphis brevissime parenchymatice septatis composita, atra. Asci ad marginem peritheciolorum tantum evoluti et in strato dilutiore siti, ovati usque oblongi, octospori, aparaphysati. Sporidia oblonga, hyalina, pluriseptata, loculis paucis longitudinaliter septatis.

STEPHANOTHECA MICROMERA Syd. spec. nov. (Fig. 8.)

Peritheciis sparsis, sine maculis, omnino superficialibus, subiculo nullo, atris, 200–300 μ diam., ambitu orbicularibus, haud

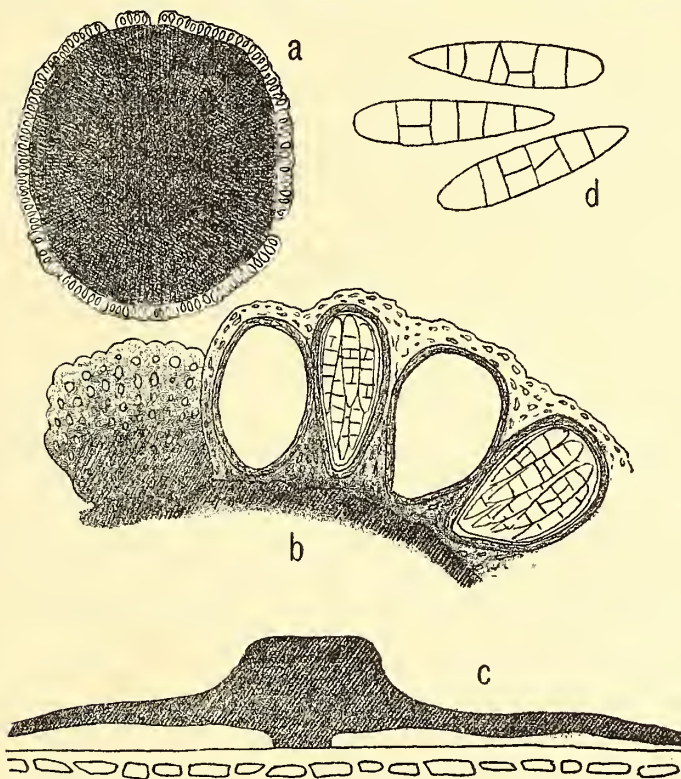


FIG. 8. *Stephanotheca micromera* Syd. a, Perithecium seen from above ($\times 110$); b, margin of the perithecium with ascus-bearing portion ($\times 560$); c, longitudinal section through the fungus ($\times 320$); d, sporidia ($\times 1200$).

inversis, centro elevato praeditis, subtus quasi brevissime crasseque pedicellatis, irregulariter radiatim contextis, contextu ex hyphis brevissime parenchymatice septatis crasse tunicatis (articulis 2–3 μ longis et 2–2.5 μ latis) obscure fuscis marginem versus dilutioribus usque subhyalinis compositio; ascis ad marginem peritheciolorum in strato diluto sitis, ovatis usque oblongis, sessilibus, superne rotundatis, 20–28 μ longis, 14–19 μ latis, octosporis, aparaphysatis, quoque asco in loculo proprio sito;

sporidiis 2–4-stichis, oblongo-clavulatis, apice late rotundatis, basim versus attenuatis, 3–5-septatis, non constrictis, cellula una alterave saepe semel verticaliter aut oblique septata, 11–16 μ longis, 4.5–5.5 μ latis.

PALAWAN, Lake Manguao, Merrill 8979, April, 1913. On living leaves of *Taxotrophis ilicifolia*.

Stephanotheca micromera represents a most peculiar fungus quite distinct from any other known to us. It forms small, black, superficial, rounded bodies provided with an elevated center above. A very small and thick foot descends from the central portion to the epidermis. The perithecia are composed of irregular radiating hyphae divided by numerous septa into many thick-walled and dark cells. Toward the margin the cells become lighter coloured. Around this dark body, which is entirely sterile, the ascus-bearing stratum is developed. This stratum is very clear and nearly hyaline. Every ascus is lying in its own cavity or chamber with a distinct fibrose-cellulose wall, hence the whole body might perhaps better be called stroma than perithecium. At first sight one might believe that the ascus-bearing portion is quite naked. However we are inclined to think that a very thin, nearly hyaline pellicle covers this portion. The young sporidia are 1-septate; somewhat later they become 3–5-septate and in full maturity many of them are irregularly and vertically or obliquely septate.

ASTERINA Lévillé

ASTERINA NODULIFERA Syd. sp. nov.

Amphigena, saepius epiphylla, plagulas minutas 2–4 mm diam. opacas formans; mycelio radiante, ex hyphis rectiusculis opposito- vel alternatim ramosis obscure brunneis opacis 6–10 μ latis non hyphopodiatis sed regulariter globoso-nodulosis (nodos 10–15 μ crassis) composito; peritheciiis inversis, in centro plagularum laxe dispositis, rotundatis, 250–340 μ diam., plano-conoideis, tandem stellatim dehiscentibus, radiatim contextis, ex hyphis brunneis subrectis vel flexuosis 3–4 μ crassis (articulis 10–14 μ longis) compositis; ascis globulosis usque ovatis, 40–55 μ longis, 38–44 μ latis, aparaphysatis; sporidiis octonis, oblongis, utrinque late rotundatis, ad septum non vel vix constrictis, totis 30–35 μ longis, levibus, ex hyalino brunneis, cellula superiore globosa 11–13 μ diam., inferiore cylindracea 20–24 μ longa et 10–12 μ lata.

PALAWAN, Taytay, Merrill 8901, May, 1913. On leaves of *Angelesia splendens*.

The species is nearly related to the Brazilian *Asterina Schroeteri* (Rehm) Theiss., from which it differs by the thicker hyphae, and the sporidia, the lower cell of the latter being only twice as long as the upper cell. *A. Couepiae* P. Henn. is also a very nearly related species which, however, has thinner hyphae and somewhat smaller sporidia and perithecia.

ASTERINA DILLENIAE Syd. sp. nov.

Epiphylla, plagulas orbiculares 2–5 mm latas atro-griseas formans; mycelio radiante, ex hyphis longiusculis ramosis obscure castaneo-brunneis regularibus remote septatis crasse tunicatis 7–9 μ latis composito; hyphopodiis haud numerosis, alternantibus vel unilateralibus, continuis, globulosis, truncatis vel breviter cylindraceis, castaneo-brunneis, rotundatis vel parum lobatis aut angulatis, 10–15 μ longis, 9–11 μ latis; peritheciis sparsis, planis, inversis, rotundatis, 140–200 μ diam., stellatim dehiscentibus, contextu subatro opaco ex hyphis 4–5 μ crassis composito; ascis globosis usque ovatis, paraphysatis, 40–60 μ longis, 35–45 μ latis, octosporis; sporidiis conglobatis, oblongis, utrinque late rotundatis, medio 1-septatis et constrictis, ex hyalino fuscis, verrucosis, 20–25 μ longis, 10–12 μ latis.

PALAWAN, Taytay, Merrill 8774, April, 1913. On leaves of *Dillenia*.

ASTERINA LOBULIFERA Syd. sp. nov.

Epiphylla, plagulas tenuissimas irregulares primitus minutas dein plus minus confluentes griseo-atras formans; mycelio ex hyphis rectis vel rectiusculis fuscis ramosis septatis 4–6 μ crassis composito; hyphopodiis numerosis, alternantibus, totis 10–16 μ longis, cellula basali plerumque brevissima vel usque ad 6 μ longa, cellula superiore grosse 2–4-lobata et 10–12 μ lata; peritheciis densiuscule dispositis, tenuibus, rotundatis, 100–140 μ diam., inversis, mox stellatim dehiscentibus, contextu ex hyphis obscure fuscis 3–3.5 μ crassis rectis crebre septatis (articulis 8–10 μ longis) regulariter strato simplici composito; ascis globosis, aparaphysatis, 25–30 μ longis, 20–25 μ latis, octosporis; sporidiis conglobatis, oblongis, utrinque rotundatis, medio 1-septatis, parum constrictis, levibus, ex hyalino fuscis, 16–18 μ longis 7–8.5 μ latis; pycnidiosporis simul praesentibus continuis, fuscis, centro zonula hyalina cinctis, 15–18 μ longis, 8–10 μ latis.

PALAWAN, Taytay, Merrill 8737, April, 1913. On leaves of *Glochidion*.

The species comes very near to *Asterina lobata* Syd. which, however, differs by its smaller hyphopodia, the flexuose hyphae, and the more conspicuous colonies.

ASTERINA PEMPHIDIROIDES Cke.

PALAWAN, Taytay, Merrill 8738, 8788, April, 1908. On leaves of *Eugenia*; summit of Mt. Capoas, Merrill 9082, April, 1913. On leaves of *Eugenia*; Taytay, Merrill S 179, May 3, 1913. On leaves of *Eugenia*.

ASTERINA ELMERI Syd.

PALAWAN, Taytay, Merrill 8801, April, 1913. On leaves of *Champereia manillana*.

ASTERINA SPISSA Syd.

PALAWAN, Taytay, Merrill 8821, April, 1913. On leaves of *Jasminum bifarium*.

ASTERINELLA Theissen**ASTERINELLA PALAWANENSIS** Syd. sp. nov.

Plagulas hypophyllas atras 0.5–1.5 cm diam., orbiculares formans; mycelio ex hyphis tenuibus 3–5 μ crassis dilute fuscis parce septatis sed copiose anastomosantibus et saepe lateraliter conjunctis flexuosis composito, hyphopodiis nullis; peritheciis sparsis, rotundatis, applanato-convexis, atris, opacis, 200–350 μ diam., ad ambitum fimbriatis, contextu opaco; ascis ovatis vel oblongis, brevissime stipitatis, 45–55 μ longis, 24–34 μ latis, octosporis; paraphysibus numerosis, ascos superantibus, 1 μ crassis; sporidiis distichis, oblongis, utrinque rotundatis, medio 1-septatis et constrictis, levibus, ex hyalino fuscis, 18–24 μ longis 7–8.5 μ latis.

PALAWAN, Taytay, Merrill 8887 p. p., May, 1913. On leaves of *Plectronia*, in society of *Balladyna velutina*.

ASTERINELLA RAMULIGERA Syd. sp. nov.

Amphigena, plagulas griseo-atras mediocres vel majusculas 0.5–3 cm latas irregulares formans; mycelio laxiusculo, ex hyphis longis fuscis 6–8 μ crassis remote septatis ramosis haud hyphopodiatis, sed cum ramulis novellis copiosis 20–30 μ longis ad apicem lobatis et hyphopodia erecta simulantibus obsitis composito; peritheciis sparsis, ambitu orbicularibus, inversis, 140–200 μ diam., non vel parum fimbriatis, stellatim dehiscentibus, contextu obscure brunneo, ex hyphis ca. 3 μ crassis crebre septatis (articulis 7–10 μ longis) composito; ascis globulosis vel ovatis, paraphysatis, tenuiter tunicatis, 35–48 μ longis, 30–40 μ latis, octosporis, sporidiis oblongis, utrinque late rotundatis, medio 1-septatis et constrictis, ubique verrucosis, ex hyalino fuscis, 20–26 μ longis, 10–12 μ latis.

PALAWAN, Taytay, Merrill 8793, April, 1913. On living leaves of *Microdesmis cascarifolia*.

ASTERINELLA CALAMI Syd. sp. nov.

Hypophylla, irregulariter distributa, magnam folii partem occupans; mycelio perparco, ex hyphis fuscis parce ramosis septatis (articulis 10–12 μ longis) 3–5 μ latis rectiusculis composito; hyphopodiis nullis; peritheciis inversis, irregulariter sparsis, planis, ambitu irregulariter rotundatis 250–420 μ diam., contextu ex hyphis toruloso-flexuosis copiose anastomosantibus fuscis 3–4 μ crassis composito, centro subatro opaco; ascis ovato-globosis, paucis tantum visis; sporidiis ellipsoideo-oblongis, utrin-

que rotundatis, medio 1-septatis et constrictis, levibus, obscure brunneis, 34–36 μ longis, 15–17 μ latis.

PALAWAN, Mount Capoas, *Merrill 9081*, April, 1913. On living leaves of *Calamus*.

Differs from *Asterina globulifera* (Pat.) by the absence of nodules in the hyphæ.

LEMBOSIA Lévillé

LEMBOSIA NERVESEQUIA Syd. sp. nov.

Amphigena, praecipue nervos sequens, plagulas atras plus minus elongatos confluentes formans; mycelio parco, ex hyphis fuscis vix septatis 5–7 μ crassis anastomosantibus flexuosis composito; hyphopodiis nullis vel saltem non visis; peritheciis densiuscule dispositis, primitus rotundatis 200–300 μ diam., dein elongatis 300–550 μ longis, 150–180 μ latis, rima longitudinali dehiscentibus, contextu centrali atro-fusco opaco, marginem versus fusco ex hyphis rectis 4–4.5 μ crassis (articulis 8–11 μ longis) composito; ascis globoso-ovatis, parce paraphysatis, 50–58 μ longis, 40–46 μ latis, octosporis; sporidiis conglobatis, ellipsoideis, utrinque late rotundatis, medio 1-septatis, vix vel leniter constrictis, minutissime verruculosi, ex hyalino sordide olivaceis, 23–26 μ longis, 12–13 μ latis.

PALAWAN, Taytay, *Merrill 8789*, April, 1913. On living leaves of *Litsea*.

LEMBOSIA INCONSPICUA Syd. sp. nov.

Epiphylla, plagulas tenuissimas vix conspicuas 2–8 mm latas formans; mycelio ex hyphis dilute fuscis dense ramosis septatis irregularibus 3–4 μ crassis composito; hyphopodiis rarissimis, continuis, brevissimis; peritheciis sparibus vel laxè aggregatis, anguste oblongis usque linearibus, plerumque 150–350 μ longis et 100–150 μ latis, subinde valde elongatis et tunc usque 1 mm longis, tenuibus, rectis vel subrectis, opace atris, rima longitudinali latiuscula apertis, contextu opaco atro ex hyphis tenuibus rectis vel subrectis ca 2 μ crassis composito; ascis ovatis, apice late rotundatis et incrassatis, sessilibus, 26–32 μ longis, 14–20 μ latis; paraphysibus copiosis, superne leniter incrassatis, obtusis, ad apicem 2–2.5 μ latis, hyalinis; sporidiis octonis, conglobatis, elongato-ovatis, levibus, ex hyalino tandem fuscis, 11–15 μ longis, 3.5–5 μ latis, loculo superiore globuloso, inferiore angustiore et longiore, ad septum non vel vix constrictis.

PALAWAN, Taytay, *Merrill S 176*, April 10, 1913. On leaves of *Guioa*.

MORENOELLA Spegazzini

MORENOELLA MEMECYLI Syd. spec. nov.

Peritheciis hypophyllis, in mycelio parcissime evoluto ex hyphis ramosis vix vel parce septatis fuscidulis 3.5–4.5 μ crassis levibus

composito haud hyphopodiato (hyphopodiis saltem non visis) insidentibus, superficialibus, primitus orbicularibus, tandem elongatis, 200–450 μ longis, 120–160 μ latis, plerumque rectis, rima latiuscula dehiscentibus, contextu opaco ex hyphis radiantibus obscure brunneis 3–3.5 μ crassis crebre septatis (articulis 7–9 μ longis) composito; ascis subglobosis vel ovatis, rarius leniter elongatis, aparaphysatis, 35–55 μ longis, 26–35 μ latis, octosporis; sporidiis oblongis, utrinque rotundatis, medio 1-septatis, leniter constrictis, levibus, ex hyalino fuscis, 20–23 μ longis, 8–10 μ latis, cellula superiore parum latiore quam inferiore.

PALAWAN, Taytay, Merrill 8773 p. p., April, 1913. On leaves of *Memecylon lanceolatum*, in society with *Dictyothyrium giganteum* Syd.

HYSTEROSTOMELLA Spegazzini

HYSTEROSTOMELLA TETRACERAE (Rud.) v. Hoehn.

PALAWAN, Taytay, Merrill 8750, April, 1913. On leaves of *Tetracera sarmentosa*.

RHYTISMA Fries

RHYTISMA LAGERSTROEMIAE Rabh.

PALAWAN, Lake Manguao, Merrill 8949, April, 1913. On leaves of *Lagerstroemia speciosa*.

ALDONA Raciborski

ALDONA STELLA NIGRA Rac.

PALAWAN, base of Mount Capoas, Merrill 9086, April, 1913. On leaves of *Pterocarpus indicus*.

PARMULARIA L  veill  

PARMULARIA JAVANICA (Pat.) Sacc. et Syd.

PALAWAN, Taytay, Merrill S 186, May 28, 1913. On leaves of *Nipa fruticans*.

GLONIUM Muhlenberg

GLONIUM BAMBUSINUM Syd.

PALAWAN, Malampaya Bay, Merrill 8939, May, 1913. On dead logs in forest; Lake Manguao, Merrill 8947, April, 1913. On rotten logs.

Many of the perithecia are 0.5–1 mm long, as in the type specimen on *Bambusa*, some, however, are up to 2 mm long.

TRYBLIDIELLA Saccardo

TRYBLIDIELLA MINDANAOENSIS P. Henn.

PALAWAN, Taytay, Merrill 8825, April, 1913. On dead branches of *Pometia pinnata*.

PHOMOPSIS Saccardo

PHOMOPSIS ARECAE Syd. sp. nov.

Pycnidiis dense sparsis, aequaliter distributis, diu epidermide tectis, tandem vertice prominulis, globosis, minutissimis, 75–100 μ diam., atris, contextu opaco indistincto ex cellulis crasse tuni-

catis composito; sporulis aliis anguste ellipsoideis vel subfusoides, utrinque attenuatis, hyalinis, plerumque guttulatis, 8–10 μ longis, 2–2.5 μ latis; aliis filiformibus, rectis vel parum curvatis, hyalinis, 18–24 μ longis, 1 μ latis.

PALAWAN, Silanga, Merrill 8930, 8934, May, 1913. On dead petioles and leaf-rachis of *Areca cathechu*.

DIPLODIA Fries

DIPLODIA COCOCARPA Sacc. var. MALACCENSIS Tassi.

PALAWAN, Taytay, Merrill 8830, April, 1913. On pericarp of mature coconut.

CENTHOSPORA Greville

CENTHOSPORA GARCINIAE Syd. sp. nov.

Stromatibus hyphophyllis, sine maculis, plerumque plus minus aequaliter sparsis, minutis, 250–400 μ diam., globoso-conicis, profunde immersis, vertice tantum prominulis, atris, intus plerumque imperfecte locularibus, subinde distincte bilocularibus; basidiis indistinctis, brevibus; sporulis bacillaribus, continuis, hyalinis, 4.5–6 μ longis, 1–1.3 μ latis.

PALAWAN, Taytay, Merrill S 177, April 22, 1913. On fallen leaves of *Garcinia*; Taytay, Merrill 8777, April, 1913. On leaves of *Garcinia*; Lake Manguao, Merrill 8943, April, 1913. On leaves of *Garcinia*.

PHELLOSTROMA Syd. gen. nov. Sphaeropsidearum.

(Etym. *phellos* suber et *stroma*.)

Stromata subsuperficialia, magna, hypoxylodea, extus atra, intus ferruginea, suberosa, oculis monostichis omnino immersis praedita, contextu hyphoso circa loculos parenchymatico. Sporulae e strato interiore loculorum hyalino oriundae, continuae, ellipsoideae vel oblongae; basidia nulla.

PHELLOSTROMA HYPOXYLOIDES Syd. sp. nov. (Fig. 9.)

Stromatibus subsuperficialibus, hypoxylodeis, magnis, sparsis vel pluribus aggregatis, primitus rotundatis et ca. 2–3 mm diam., tandem majoribus irregularibus confluyendo usque 1 cm longis et latis, saepe parum lobatis vel plicatis, 1–3 mm altis, extus atris glabris vix rugulosis, intus ferrugineis, suberosis, contextu fibroso ex hyphis fuscidulis 2.5–3.5 μ crassis, circa loculos parenchymatico ex cellulis 9–11 μ diam. composito; oculis monostichis, omnino immersis, globulosis, ovatis vel ellipticis, 130–180 μ diam., nucleo albo; sporulis e strato interiore loculorum hyalino oriundis, continuis, ellipsoides vel ellipsoideo-oblongis, utrinque rotundatis, 1–2-guttulatis, hyalinis, 7–9 μ longis, 3 μ latis; basidiis nullis.

PALAWAN, Taytay, Merrill 8894, May, 1913. On dead *Areca* in forests.

ISCHNOSTROMA Syd. gen. nov. Leptostromatacearum.

(Etym. *ischnos* tenuis et *stroma*.)

Pycnidia in stromate effuso tenui omnino superficiali radiatim contexto atro immersa vel potius ab eodem oblecta, pariete ubique evoluto, compluria in quoque stromate, minuta, intus ubique sporuligera. Sporulae filiformes, hyalinae, e strato tenui fibroso hyalino oriundae. Basidia nulla.

ISCHNOSTROMA MERRILLII Syd. sp. nov. (Fig. 10.)

Stromatibus epiphyllis, singularis subinde etiam hypophyllis, sparsis vel plus minus aggregatis, maculiformibus, orbicularibus, 1-5 mm diam., subinde confluentibus, omnino superficialibus,

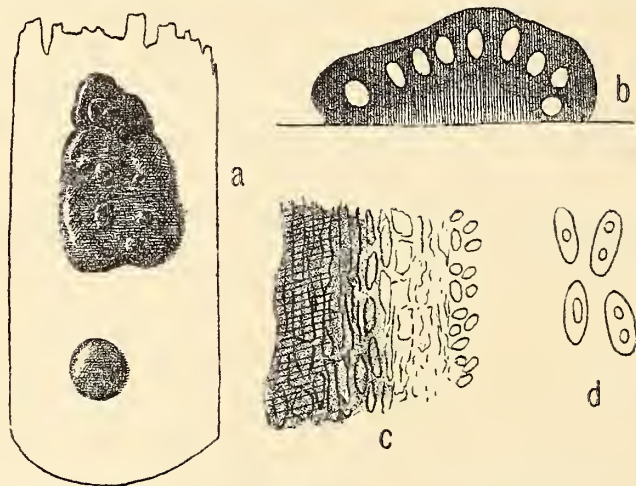


FIG. 9. *Phellostroma hypoxylodes* Syd. a, External appearance of the fungus ($\times 2$); b, longitudinal section through a stroma ($\times 10$); c, tissue of the stroma ($\times 380$); d, spores ($\times 1300$).

tenuissimis, atris, opacis, ex hyphis radiantibus rectis vel parum flexuosis remote septatis fuscis $2.5-3.5 \mu$ latis marginem versus laxioribus radiato-fimbriatis et ramosis composito; pycnidiis stromate oblectis, numerosis in centro stromatum, hemisphaericis vel depresso-globosis, $70-90 \mu$ diam., centro poro rotundo apertis, pariete ubique evoluto, ad basim ex una serie cellularum regularium dilute brunnearum composito; basidiis nullis; sporulis e strato tenui hyalino fibroso oriundis, breviter filiformibus, continuis, saepe biguttulatis, rectis vel leniter curvatis, hyalinis, $15-18 \mu$ longis, $1-1.5 \mu$ latis.

PALAWAN, Lake Manguao, Merrill S 180, April 27, 1913. On living leaves of *Talauma*.

PYCNOTHYRIUM Diedicke

PYCNOTHYRIUM PANDANI Syd. sp. nov.

Pycnidiis densiuscule sparsis, plerumque aequaliter distributis, superficialibus, orbicularibus, 300–400 μ diam., tenuibus, atris, contextu radiato, ex hyphis crebre septatis (articulis 4–6 μ longis) 4 μ crassis strato simplici composito fusco; basidiis nullis; sporulis elongatis, subfiliformibus, continuis, minute guttulatis, rectis vel subrectis, hyalinis, 15–17 μ longis, 1.5–2 μ latis.

PALAWAN, Taytay, Merrill 8766, 8844, April, 1913. Both specimens on dead leaves of *Pandanus tectorius*, on seashore.

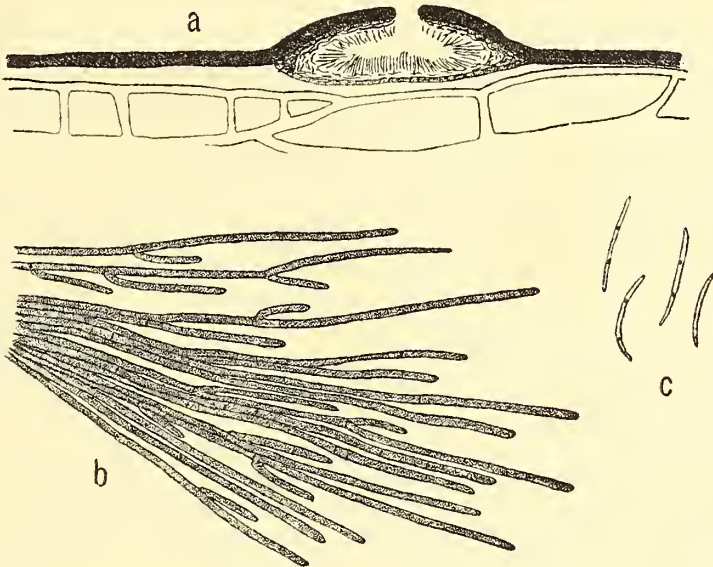


FIG. 10. *Ischnostroma merrillii* Syd. a, Longitudinal section through a stroma showing one loculus ($\times 370$); b, part of the margin of the stroma ($\times 400$); c, spores ($\times 650$).

ASCHERSONIA Montagne

ASCHERSONIA MACULARIS Syd. sp. nov.

Stromatibus epiphyllis, in maculis flavo-brunneolis usque 1 cm diam., plus minus distincte circinatim congestis, minutis, 100–200 μ diam., globulosis, margine albido alatis, ochraceis; pycnidiis omnino immersis; basidiis obtusis, 12–16 μ longis, 1.5–2 μ latis; sporulis oblongis, utrinque obtusis, continuis, hyalinis, 5–6 μ longis, 2–2.5 μ latis.

PALAWAN, Taytay, Merrill 8855, May, 1913. On living leaves of *Mischocarpus*.

COLLETOTRICHUM Corda

COLLETOTRICHUM ARECAE Syd. sp. nov.

Acervulis erumpenti-superficialibus, sparsis vel maculiformiter aggregatis, minutissimis, 100–150 μ diam., atris, rotundatis; setis sparsis, erectis vel curvatis, opace castaneis, continuis, 35–65 μ longis, ad basim 4 μ crassis, sursum angustioribus; conidiis cylindraceis, utrinque rotundatis, continuis, 12–16 μ longis, 4–5 μ latis.

PALAWAN, Lake Manguao, Merrill 8958 p. p., April, 1913. On dead leaf-sheaths of *Areca* aff. *A. cathecu*, in forests, in society with *Zygosporium oscheoides* Mont.; Silanga, Merrill 8919, May, 1913. On dead sheaths of *Areca cathecu*.

PESTALLOZZIA De Notaris

PESTALLOZZIA PALMARUM Cke.

PALAWAN, Taytay, Merrill 8743, April, 1913. On leaves of *Cocos nucifera*; Taytay, Merrill S 182, May 3, 1913. On leaves of *Cocos nucifera*.

CONIOSPORIUM Link

CONIOSPORIUM PUNCTIFORME Sacc.

PALAWAN, Taytay, Merrill 8775, April, 1913. On leaves of *Dinochloa scandens*; same locality, Merrill 8900, May, 1913. On dead leaves of *Schizostachyum*.

ZYGOSPORIUM Montagne

ZYGOSPORIUM OSCHEOIDES Mont.

PALAWAN, Lake Mangnao, Merrill 8958 p. p., April, 1913. On dead leaf-sheaths of *Areca* aff. *A. cathecu*, in forests, in society with *Colletotrichum arecae* Syd.

The specimen at hand is very well developed. It forms irregular, nearly black, often confluent, thin colonies up to 2 cm in length. The fertile hyphae are straight, brown, 35–50 μ long, at the base about 3 μ broad, tapering upward, but on the top enlarged and hyaline, usually 1-septate in the lower portion. The conidia are broadly elliptic, 10–12 μ long, hyaline or nearly so.

CERCOSPORA Fresenius

CERCOSPORA LICUALAE Syd. sp. nov.

Caespitulis sparsis, maculis effusis arescentibus insidentibus, minutis; hyphis fasciculatis, rectis, erectis, subrigidis, fuscis, pluriseptatis (articulis 15–35 μ longis), 100–180 μ longis, 4–4.5 μ crassis; conidiis acrogenis, anguste obclavatis, ad apicem subflagellatis, spurie 3–5-septatis, dilutissime olivaceis, 75–110 μ longis, 5–7 μ latis.

PALAWAN, Taytay, Merrill 8748, April, 1913. On leaves of *Licuala spinosa*.

CERCOSPORA NICOTIANAE Ell. et Ev.

PALAWAN, Taytay, Merrill 8903, May, 1913. On leaves of *Nicotiana tabacum*.

CERCOSPORINA Spegazzini

CERCOSPORINA HELICTERIS Syd. sp. nov.

Maculis amphigenis, orbicularibus, 1–4 mm diam., olivaceo-viridulis; caespitulis hypophyllis, in tomento folii absconditis, minutissimis, olivaceis; hyphis pallide olivaceo-fuscidulis, 50–70 μ longis, 4–6 μ latis; conidiis cylindraceis, utrinque obtusis vel leniter attenuatis, 3–6-septatis, non constrictis, hyalinis, 30–50 μ longis, 2.5–3.5 μ latis.

PALAWAN, Taytay, Merrill 8907, May, 1913. On leaves of *Helicteres hirsuta*.

STIGMELLA Lévillé

STIGMELLA PALAWANENSIS Syd. sp. nov.

Amphigena, saepius hypophylla, plagulas griseas primitus minutas mox confluyendo majores irregulares formans; hyphis longiusculis, dilute fuscis, ramosis, remote septatis, hyphopodia numerosa saepe conferta et saepe etiam longa serie omnino opposita semiglobosa continua concoloria 7–9 μ lata gerentibus, conidiis in ramulis acrogenis inaequaliter globosis vel subcuboideis 20–24 μ diam., cruciatim vel radiatim septatis, atrobrunneis, opacis, levibus, ex cellulis 4–8 compositis; cellulis singulis 8–10 μ diam.

PALAWAN, Taytay, Merrill 8832, April, 1913. On living leaves of *Celastrus paniculatus*.

Differs from *Stigmella manilensis* Sacc. by the thinner and longer hyphae provided with numerous hyphopodia, and by the smaller conidia.

STILBELLA Lindau

STILBELLA CINNABARINA (Mont.) Lindau.

PALAWAN, Taytay, Merrill 8878, May, 1913. On dead twigs of *Bruguiera caryophyllacea* in mangrove swamp.

EXOSPORIUM Link

EXOSPORIUM CALOPHYLLI Syd. sp. nov.

Sporodochiis sparsis, per corticem erumpentibus ab eoque fisco cinctis, rotundatis, applanato-globulosis, pulvinatis, 0.25–0.3 mm diam., atris, contextu celluloso obscure olivaceo; sporophoris brevibus, 8–14 μ longis; conidiis oblongo-fusiformibus vel subclavulatis, dilute fusciculis vel olivaceo-fuscidulis, in maturitate 3–4-septatis, constrictis, levibus, crasse tunicatis, 32–38 μ longis, 11–13 μ latis.

PALAWAN, Taytay, Merrill 8784, April, 1913. On dead twigs of *Calophyllum inophyllum*.

[Vol. IX, No. 1, including pages 1 to 96, was issued April 13, 1914.]

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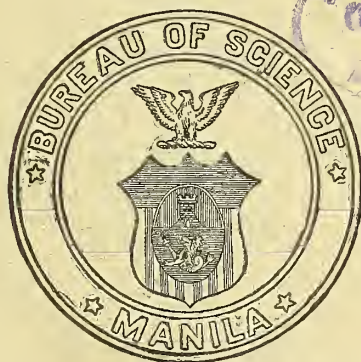
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Charles Budd Robinson, Jr.

Whereas it has occurred in the wise and unknowable providence of God that Charles Budd Robinson, M. A., Ph. D., for many years a botanist of the Bureau of Science of the Government of the Philippine Islands, should, in the peaceful pursuit of his profession and in his zealous endeavors to augment the sum of human knowledge, be struck down by the hands of ignorant and savage natives in the Island of Amboina, Dutch East Indies, and there done to death on the fifth day of December, nineteen hundred and thirteen; and

Whereas Charles Budd Robinson was held in the highest esteem by every member of this institution alike for his scientific ability and lovable personality; therefore, be it

Resolved, That we, the members of the staff of the Bureau of Science, desire to express hereby our very deep sorrow at the loss which we so keenly feel; a loss which not only bereaves us personally, but leaves the cause of science the poorer and his aged parents the more desolate because of his well-known filial attachment and care; and be it further

Resolved, That we extend to Doctor Robinson's father, mother, and sister our most sincere sympathy; and be it further

Resolved, That a copy of these resolutions be sent to Doctor Robinson's parents, a copy be engrossed and hung in the library of the Bureau of Science, copies be sent to the Bureau of Civil Service and to the archives of the Bureau of Science for file, and that they be published in the forthcoming number of The Philippine Journal of Science as evidence of the love and appreciation which we have for him and the reverence in which we shall ever hold his memory.

For the staff of the Bureau of Science.

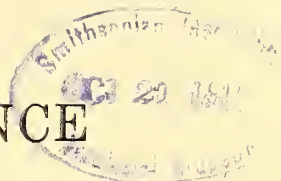
[L. S.]

ALVIN J. COX,
H. D. GIBBS,
MERTON L. MILLER,
CHARLES S. BANKS,
ELMER D. MERRILL,
JOSE GUERRERO,
Committee.

At Manila, Philippine Islands, this twenty-fourth day of February, in the year of our Lord one thousand nine hundred and fourteen.

THE PHILIPPINE JOURNAL OF SCIENCE

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CHARLES BUDD ROBINSON, JR.¹

By E. D. MERRILL

The devotees to the study of natural history can be numbered by thousands and tens of thousands, but in this day and age the thought of the possibility of violent death, in the pursuit of field work, comes to practically none of them. On June 17, 1913, Dr. C. B. Robinson left Manila for Singapore, en route to Java and Amboina, for the purpose of making a botanical exploration of the Island of Amboina. Among his many friends and associates in Manila, no one considered for a moment the question of personal danger in the undertaking, from the fact that Amboina was thoroughly known, entirely peaceful, for centuries under the control of the Portuguese and the Dutch, and was and is still thoroughly safe, so far as any country can be so considered. The news of the murder of Doctor Robinson, which flashed over the wires on the 22d of December, came as a distinct shock to all who had been in any way associated with him and to the scientific world at large.

Charles Budd Robinson, jr., was born in Pictou, Nova Scotia, October 26, 1871, and at the time of his death, December 5, 1913, was somewhat over 42 years of age. His early education was obtained in the public schools of Pictou and at Pictou Academy. In 1887 and again in 1889 he won bursaries at Dalhousie University, Halifax, and received his master's degree from this university in the year 1891. In 1897-98 he was a student at Cambridge University, and during the following year was a fellow of Christ's

¹ Abstract of an address given at a memorial meeting of the Science Club at the Bureau of Science, February 21, 1914.

College, Cambridge. From the time of his graduation from Dalhousie University to the time he entered Cambridge University he was a teacher, first in the academy at Kentville, Nova Scotia, and afterwards in Pictou Academy in his native town. On his return from England in 1899, he again took up his profession as a teacher in Pictou Academy, where he remained until 1903. In this year, he went to New York and entered Columbia University as a postgraduate student in botany, at the same time holding a position as laboratory assistant at the New York Botanical Garden. He received the degree of doctor of philosophy in botany from Columbia University in 1906, and was immediately appointed assistant curator of the herbarium at the New York Botanical Garden. His productive work as a botanist commenced with this year.

Among his duties at the New York Botanical Garden was the arrangement and determination of the large and valuable collections made by Mr. R. S. Williams in various parts of the Philippines during the years 1903 to 1905, which led to his developing great interest in Philippine botanical problems and eventually to his accepting the position of economic botanist in the Bureau of Science, in March, 1908. For more than three years he was busily engaged on various problems presented by the Philippine flora as a mere glance at the appended bibliography will show. In August, 1911, he resigned from the Philippine service and returned to New York, again accepting an appointment at the New York Botanical Garden. Our correspondence continued, however, as he retained an intense interest in everything pertaining to the Philippine flora, and this led to his accepting reappointment in the Philippine service. He returned to Manila for his second tour of duty in December, 1912.

Several times during his period of Philippine service we discussed the desirability of a thorough botanical exploration of the region to the south of the Philippines, especially on account of the rather striking floristic relationships between the Philippines and Celebes. At various times the subject of Amboina was also brought up as we had occasion to interpret Philippine species by reference to the work of Rumphius, and any botanist who has had much experience in interpreting species by Rumphius' figures alone will fully appreciate the difficulties involved.

During his absence in the United States the idea of a botanical exploration of Amboina had been taking form, and in a letter addressed to Doctor Robinson in Singapore we asked him seriously to consider undertaking the project. In April, 1913,

the proposed exploration was approved.² He had become intensely interested in the possibilities offered by the Amboina proposition, declined a very attractive offer from the New York Botanical Garden, and entered with great enthusiasm on the final work in preparation for the trip to Amboina. This involved a thorough examination of Rumphius' "Herbarium Amboinense" and the preparation of several thousand index cards, which were arranged under different heads and cross referenced, involving all the native names cited by Rumphius, the Latin names of plants to which the Rumphian figures and descriptions had been referred to by various authors, and these arranged under different heads so that everything was accessible for ready reference. To this work he devoted most of his energies for over two months, and frequently worked in the office until late at night, in order that, once in Amboina, he could determine with as little delay as possible those species that most needed attention in the field and at the same time connect his current collections with the work of Rumphius.

Both Doctor Robinson and myself considered the exploration of Amboina to be one of the most important botanical undertakings in the entire Malayan region, not that any large percentage of novelties was to be expected, but on account of the bearing that the Amboina collections would have on delimiting and definitely settling the status of many species of the older authors that were wholly or partly based on Rumphius.

Our plan for exploring Amboina was not the first one. The late Dr. J. G. Boerlage of the Botanical Garden, Buitenzorg, selected Amboina in 1900 as the scene of his first and only trip for purposes of botanical exploration in the Malay Archipelago, for the sole reason that it was a classical locality in the botany of the Archipelago and that many of the Rumphian species could not clearly be understood without material from the places in which they were originally collected by Rumphius. Doctor Boerlage's trip, like Doctor Robinson's, had a most unfortunate ending, for after about a month in Amboina he contracted a fever from which he died on August 24 at Ternate, while on his return to Java.³

Doctor Robinson arrived in Amboina on July 15, 1913, and immediately commenced his botanical exploration, utilizing the town of Amboina as a base and gradually extending his opera-

² Merrill, E. D. The Botanical Exploration of Amboina by the Bureau of Science, Manila. *Science* N. S. 38 (1913) 499-502.

³ Treub, M. *Natuurk. Tijdschr. Ned. Ind.* 60 (1901) 396-412; Verslag. 's Lands Plantent. Buitenz. 1900 (1901) 21-25.

tions to various parts of the island. At first he made trips alone, but later almost invariably took with him the Javanese assistant, Mardjoeki, supplied by the botanical garden at Buitenzorg, and usually also one or two natives of Amboina. He soon came to be widely known among the natives, who named him Tuan Doctor Kembang (literally, "the flower doctor"). His relations with both the Europeans and the natives were most cordial.

In view of the peculiar nature of his death, peculiar in that his murder was so entirely unexpected and unlooked for, it has been considered advisable to give the following data, for the most part taken from the official report prepared by the assistant resident of Amboina, Mr. Van Dissel, and submitted by the resident of Amboina, Mr. H. J. A. Raedt van Oldenbarnevelt, to his Excellency Governor-General Idenburg of the Netherlands East Indies:

Doctor Robinson left the town of Amboina on the morning of December 5, unaccompanied, for the purpose of making a botanical excursion through the country to the south of the town through Amahoesoe, Eri, Silalei, Latoe-halat, Aerlo, and Seri, back to Amboina, a distance of about 21 miles, stating that he would return that evening. His failure to return that night excited no special comment, but on the following day the native Javanese assistant, Mardjoeki, instituted a search on his own account which proved to be fruitless. The matter was, after a few days' delay, reported to the police authorities who at once instituted a most vigorous search. The general impression at first prevailed that Doctor Robinson had met with some accident, as he was, in the course of his work, in the habit of frequenting remote places. As in many parts of Amboina the ground is full of covered and hence invisible holes and crevices and as the island was considered entirely safe, so far as the natives were concerned, this belief was only natural.

The report of the disappearance of Doctor Robinson having been received with so many days' delay, the finding of the right clue was rendered difficult during the first days of the investigation by misleading and most fantastic and contradictory reports, this despite the tireless search made by the police with the active coöperation of the populace in all parts of the territory where one might expect to find the body of Doctor Robinson, for all thought of finding him alive had been abandoned. Finally, a mere chance gave rise to the suspicion that there had been foul play.

A Boetonese, who had stated that he had met Doctor Robinson, on closer examination gave contradictory replies, whereupon the magistrate who was investigating the affair suspected that the witness knew more than he had stated regarding the disappearance of Doctor Robinson. This man soon confessed that Doctor Robinson had not met with an accident, but that he had been murdered. However, due to the distance that Doctor Robinson had traveled and the difficult nature of the country, several days elapsed before the matter was completely cleared up.

Having left Amboina in the morning, Doctor Robinson arrived at noon on December 5 between the hamlets Aerlo and Seri, at a settlement of

Boetonese gardeners, which was established several years ago and which consists of about thirteen houses. This settlement is, via Seri, about 9 miles from Amboina.

A young Boetonese who had climbed a coconut tree to get some coconuts, on starting to descend, saw Doctor Robinson standing at the foot of the tree. Doctor Robinson spoke to him, but the boy, apparently frightened at seeing a European in such a remote spot and dressed in such an unusual fashion, slid down the tree and hurried to the settlement. Here he caused excitement among the people by telling them that he was being pursued by a European. Doctor Robinson, who had followed the boy, then arrived at the settlement and asked for a drink, whereupon a woman handed him a glass of water. He then left in the direction of Seri.

From certain statements made by the boy, it is to be deduced that the people of the settlement were in great fear that Doctor Robinson would do them some harm. In the Moluccas there is a current rumor that in the months of November and December, year after year, strange people wander about who for some reason must cut off a human head—the notorious *potong kalapa* (Malay for decapitator). Finally, the headman of the settlement, armed with an ax, followed Doctor Robinson, saying to one of his countrymen: "There goes a dangerous European who wants to cut off our heads; I am going to kill him."

Overtaking Doctor Robinson, as he was passing over a small bridge, he struck him down with his ax. He then called for help, whereupon five Boetonese came running up, among them the man to whom the headman had said the words above quoted, and gave the dying Robinson the finishing blows. This must have taken place at about 3 o'clock in the afternoon.

The murder having been committed on the open road, the body was, from fear of discovery, conveyed to a remote place. The natives then waited until evening, when the body was wrapped in coconut leaves, weighted with stones, and sunk in the sea at a long distance from the shore.

This misfortune would never have happened to Doctor Robinson had he been accompanied by somebody. A few months previously I personally earnestly advised Doctor Robinson not to go out alone, but I acknowledge that the reason for my advice was not the fear that he might be murdered, but that he might meet with some accident while in a remote spot, on account of the peculiar nature of the soil of Amboina.

I can well imagine how natives living in a remote spot, like the Boetonese already mentioned, and already unreasonably afraid of Europeans, should have been much frightened by the aspect of Doctor Robinson, who was dressed in khaki, who wore a felt hat, and carried a kind of a hunting knife, looking quite different from the Europeans that one meets here. According to my mind, Doctor Robinson was the victim of superstitious fear which was caused by his sudden and unexplained appearance in this remote place. The natives killed him just as they would have killed a dangerous reptile. The murder had scarcely been committed when reflection followed, and in order to cover up the traces of their deed they sunk the body in the sea without looting it.

Further the report states that all of Amboina had been deeply impressed by the sad occurrence, as Doctor Robinson had gained the affection of the entire European community; that when the criminals were brought to the town of Amboina the natives

gathered and reviled them, acting as if they desired to lynch them.

A man of great intellectual ability, broad training, and untiring energy, Doctor Robinson had already established his reputation as a painstaking and careful botanist. The long list of papers published between the years 1906 and 1914 gives but a vague idea of the actual amount of work involved in their preparation. His interest in botany was intense, and most of his other interests were subordinated to it. It would be difficult to find a man more thoroughly devoted to his work or who showed a keener interest in it. Day after day, early and late, he could be found at work, frequently working until far into the night. His entire botanical collections made in Amboina, comprising many thousands of specimens, are now at the Bureau of Science, and it is characteristic of the dead botanist and of his work that his notes were completely written up each day and that his material was carefully arranged. His progress report, written from day to day in Amboina and for the most part written late in the evening, comprises at least 115,000 words, and it is to be noted under date of November 30 that late in the evening, after having walked more than 25 miles, he was busily engaged in writing up his report for the day.

Doctor Robinson was unmarried. He is survived by his aged parents and a sister. He was particularly devoted to his parents, and this devotion seemed to be his one great interest in life other than his beloved botany. It is the irony of fate that this upright, talented, trained, and energetic man should meet his end at the hands of a few superstitious and ignorant Malays, toward whom he had only the kindest feelings.

The appended bibliography will serve to give some idea of the amount of work accomplished by Doctor Robinson in the few years that he devoted to botany as a profession.

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THE GEOGRAPHIC DISTRIBUTION OF PHILIPPINE MOSSES

By C. B. ROBINSON

(*From the Botanical Section of the Biological Laboratory, Bureau of Science, Manila, P. I.*)

Practically all collections of Philippine bryophytes, through whose determination the literature on the subject has been compiled, have been made by persons who themselves had made no special study of the groups concerned. Their interest, often none the less keen, has been derived and twofold, in order that the flora of the Islands might more perfectly be ascertained, and that light might be thrown on various questions of more general application.

Prolonged efforts, often of a highly intensive nature, have been made to solve problems relating to the higher groups of plants, and although those who are most closely in touch with this work realize perhaps better than any others how far this task is from completion, yet enough has been ascertained to permit a number of generalizations to be formulated with regard to the general relationships of the flora, so far as flowering plants and ferns are concerned.

The Archipelago consists of a very large number of islands, the two largest, Luzon and Mindanao, respectively, the most northern and the most southern of the large islands, having each an area approximately that of the State of Kentucky, or slightly more than that of Holland, Belgium, and Switzerland, taken together. The islands of second rank form an irregular row between these two, with a westward extension, the area of Samar, the most eastern and the largest of these, being about one-eighth that of Luzon. North of Luzon are two groups of much smaller islands, the Batanes and Babuyanes, whose flora has been sufficiently investigated to show that it is typically Philippine,¹ although Formosa is little more distant than the nearest point on Luzon. The Philippines link geographically with northeastern Borneo along two nearly parallel lines, one from southwestern Luzon through Mindoro, Palawan, Balabac,

¹ Merrill, E. D. On a collection of plants from the Batanes and Babuyan Islands. *Philip. Journ. Sci.* 3 (1908) *Bot.* 385-442.

and smaller islands, the other from southwestern Mindanao through a long chain of fair-sized islands, of which Basilan, Jolo, and Tawi Tawi are the most important. Unfortunately the southwestern corner of the Archipelago is still almost unknown botanically; but there is at present a strong balance of evidence to favor the view that somewhere or other there is a definite break between the floras of Borneo and of the Philippines as a whole. Statements have to be guarded, as so little is known of Borneo, but while the plants of the two regions are generally similar, there appears to be a very small percentage of specific identity. If the smaller islands near Borneo should prove to resemble it in their flora, and the trivial evidence at hand tends in that direction, it will merely prove that botanically they belong with the larger island, and that the political and botanical boundaries of the Philippines and Borneo are not the same.

Whether or not this proves to be the case, it is thoroughly established that with regard to flowering plants, there is such a thing as a definite Philippine flora, containing an unusually high percentage of endemic species; that its affinities are primarily Malayan; moreover, that there is a strong Himalayan element, especially in northern Luzon, although some of the species so considered extend also to Malaya; that there is a small but very definite Australian element; and finally a most important Pacific alliance. All of these points, except the last, have been fully discussed in papers previously published.²

If any outside area can be indicated as more nearly similar botanically to the Philippines than is any other, the present evidence is strongly in favor of Celebes. In spite of this, it is certain that mere proximity is not the only factor, for whether the determining basis be the number of identical species or the general resemblance of the flora as a whole, the Philippines come closer to the Malay Peninsula and to Java than to Borneo or Annam, to Samoa than to Formosa.

It might then be supposed that when botanical boundaries come to be drawn within the Philippines, the separate islands would be found to have quite distinctive floras. This is not

² See Rolfe, R. A. On the Flora of the Philippine Islands, and its probable Derivation. *Journ. Linn. Soc. Bot.* 21 (1886) 283-316; Merrill, E. D. New or Noteworthy Philippine Plants, V. *Philip. Journ. Sci.* 1 (1906) *Suppl.* 169-246; Merrill, E. D. The Malayan, Australian and Polynesian elements in the Philippine Flora. *Ann. Jard. Bot. Buitenz. Suppl.* 3 (1910) 277-306; Copeland, E. B. The Comparative Ecology of San Ramon Poly-podiaceae. *Philip. Journ. Sci.* 2 (1907) *Bot.* 1-76; Copeland, E. B. The Ferns of Mount Apo. *Leaflet. Philip. Bot.* 3 (1910) 791-851.

the case. It is perfectly true that hundreds of species are known each from a single island, on which there is at present every reason to believe that they are endemic; but this is equally true of localities on a single island. It appears to be well established that the general course of migration of plants and human beings into the Philippines has alike been from the southwest and the south; on the other hand, there are good reasons in discussing the floral provinces of the Philippines for starting nearly at the north.

Much of northern Luzon is highly mountainous, the so-called Mountain Province being separated from the China Sea on the west by a narrow coastal plain and terminated on the east by the valley of the Cagayan River. Very many species are known or known in the Philippines only in this region; many others occurring there are also found on the tops of the mountains farther south, such as Mariveles, Banajao, or even Apo. Still others have a more continuous distribution, following down the ranges of the eastern or the western coast or both, their range terminating at Mariveles, or in the hills of Rizal, eastern Laguna, or Tayabas, or extending still farther to the south. It is open to discussion whether such species are to be regarded as more properly belonging to the Mountain Province but with more southern extension, or whether the opposite is the case.

Apart from the Mountain Province, there are two rather distinct but by no means absolutely separate plant-provinces, in close correlation with the distribution of rain throughout the year. The eastern coast of Luzon shares with the greater part of the Visayan or central islands and with the southern islands a very equable rainfall, the dry season being comparatively short; the western side of Luzon has a prolonged dry season. The ranges of mountains forming the divide lie much nearer to the eastern coast than to the western, but are broken in various places, so that the division is far from complete. The general result is that there are two fairly definite areas of distribution in accordance with these facts, although the difference is not so great, nor the lines so sharply drawn, as in various other countries, as for instance between the northern and southern slopes of certain of the islands of the West Indies.

It has seemed to be of some general value to determine whether the facts believed to have been established for the flowering plants hold equally true for the lower groups, and for several reasons the mosses have been selected for the comparison. Thanks to the courtesy of Doctor V. F. Brotherus, who has had a wealth of material from all parts of the world for comparison,

we not only have identifications of practically all of our moss collections, except the most recent, but know the range of those species which are not confined to these Islands. There still remain a considerable number of species obtained in the Philippines by previous collectors, which are not represented in this herbarium, and as for the purposes of the present paper, the localities assigned to them are too indefinite, they are not herein considered, further than to say that what investigation has been possible regarding them indicates that if their exact localities had been specified, they would not materially affect the conclusions based on those actually at hand. The latter number 351 species, with a qualification to be considered later. It might fairly be questioned whether collections obtained by persons whom a bryologist might consider mere amateurs, form a sufficient basis for conclusions. The best answer that can be made, without entering into details, is that the facts are nowhere more definite than in the case of the species most conspicuous to the eye.

There is one very great difference between the moss and the phanerogamic floras of the Philippines. Great areas of the lower levels have been wholly or largely denuded of their original vegetation by human agencies, and the plants now found there are well nigh identical in every part of the Archipelago, and a high proportion of these must be considered as introductions, deliberate or more often accidental. Thus the investigations for the Flora of Manila³ showed that over 1,000 species of flowering plants and ferns are represented within the chosen limits. It is probable that a complete moss flora for the same area would not reach a dozen species, except for temporary and accidental introductions in association with orchids or ferns from the provinces.

Moreover, just as the phanerogamic flora of Manila is almost exactly that of every other town in the Philippines, so is the moss flora of those towns as poor as is that of Manila, except in both these groups of plants when there is primeval forest within easy access. Not only the endemic but also the indigenous elements among the flowering plants found in the vicinity of the towns are proportionally much smaller than in the Philippines as a whole. On the other hand, the entire moss flora can be considered as indigenous, *Barbula orientalis* (Willd.) Broth. being probably the only species open to suspicion. In the ulti-

³ Merrill, E. D. A Flora of Manila. 1-490. Manila, 1912; Notes on the Flora of Manila with special reference to the Introduced Element. *Philip. Journ. Sci.* 7 (1912) Bot. 145-208.

mate analysis, of course, many species must be considered to have been introduced.

One consideration that should always be kept at least subconsciously present in discussing the relationships of floras, is that a species has not necessarily had its origin in nature at the place or even in the country from which it was first described, not even if that place or country has supplied its specific name. Yet it is difficult to avoid a mental bias in this direction, above all when a species has been known for a long period of time only from the general region where it was first discovered, especially as it is practically always very difficult and usually impossible to get definite evidence as to its actual place of origin. In the case of species of mosses of wide distribution, this can only be a matter of inference.

This inevitably colors the whole of the present discussion, for the ascertained moss flora of the Philippines has multiplied fivefold in the last ten years, and among these added species are very many that have been known for long periods of time from other regions. They are thus spoken of as Malayan, or as whatever else they appear to be, and there is the less general objection to this, in that the Philippines are known to be of comparatively recent geologic origin. Yet there have originated here, so far as present knowledge permits statement, no less than five endemic genera of mosses and numerous endemic species. It is by no means impossible, therefore, that here also may be the original home of many other species, that have been first collected in or described from other groups of islands, and will herein be discussed as if they more properly belonged to the latter.

Nothing is more conspicuous to even the most careless observer, who climbs any of the higher mountains of the Philippines, than to find that at a certain elevation, differing on different mountains, the trees become more or less dwarfed, and are clothed with mosses and hepatics. This is so distinctive that this class of vegetation has received the name of "mossy forest." The lower limit of this formation depends roughly on the humidity, and is higher as a rule on the higher mountains. A very large proportion of our mosses occur within this zone; the range of others extends to sea level. They are epiphytic or terrestrial, in somewhat strong contrast to the hepatics and lichens, very few are epiphyllous, and these not truly so, extending over the surface of leaves because they happen to find them along their line of growth.

As a preliminary to detailed discussion, it is desirable to

enumerate the known and published species of Philippine mosses by families, distinguishing between those known from the Mountain Province only, those that have not been found in the Mountain Province, and those that occur both there and elsewhere within the Archipelago. For this purpose, Nueva Vizcaya was considered as within the Mountain Province, which is not true politically; but this proved to affect only a single species, *Weisia flavipes* Hook. f. & Wils., which has, however, one of the most striking areas of distribution of any of the species herein discussed. It may further be remembered that more than half of the Mountain Province collections come from Benguet, and that practically all of the remainder are from Bontoc and Lepanto.

Family.	Total species in Philippines.			Endemic.		
	Found in Mountain Province only.	Not found in the Mountain Province.	Found in both areas.	Mountain Province.	Not in Mountain Province.	Found in both areas.
Sphagnaceae	3	2	1	2		
Dicranaceae	9	8	11	3	5	2
Leucobryaceae	1	12	3		2	
Fissidentaceae	4	2	2	1	1	
Calymperaceae	1	10		1	3	
Pottiaceae	5	1	2	4	1	1
Orthotrichaceae	5	15	4	3	6	1
Splachnaceae		1			1	
Funariaceae	1		1	1		
Bryaceae	15	5	4	7	3	
Mniaceae	2	1	1	1	1	
Rhizogoniaceae		1	2			
Bartramiaceae	8	1	3	1	1	
Buxbaumiaceae		1				
Polytrichaceae	6	5	2	1	2	2
Dawsoniaceae		1				
Cryphaeaceae	2					
Prionodontaceae		1				
Cyrtopodaceae		1			1	
Ptychomniaceae	1	1			1	
Myuriaceae		2			1	
Spiridentaceae			2			
Neckeraceae	17	12	16	6	8	1
Entodontaceae	3	3	3	2	1	1
Fabroniaceae	2			1		
Hookeriaceae	3	12		3	3	
Hypopterygiaceae	2	3	1	1	2	
Rhacopilaceae	1		1			
Leskeaceae	2	4	3	2		
Hypnaceae	12	30	8	7	17	4
Leucomiaceae		1			1	
Sematophyllaceae	4	19	4	3	7	1
Brachytheciaceae	2	4		1	1	
Hypnodendraceae		5	2		3	
Total	111	164	76	51	72	13

It would be expected, and so it proves, that those species whose range within the Philippines is widest, especially if they be found alike in the Mountain Province and elsewhere, should be also the most widely distributed without the Philippines. Perhaps, rather, it may be held surprising that even among these the percentage of endemism reaches 17, while for those that are found in the Mountain Province only, or not in the Mountain Province at all, the percentage of endemism is 46 and 44 respectively. For the whole number of species considered, 351, the percentage of endemism is 39. This is in rather singular agreement with the estimate made by Mr. Merrill in the case of the flowering plants of the Philippines.⁴ The mosses, therefore, agree most emphatically with the phanerogams in that a remarkably high proportion are confined to the Philippines. High as these figures are, they are not fair to the endemic element. There are in this herbarium collections bearing 27 additional specific names, apart altogether from such as can be relegated to synonymy, and apparently except in one instance Doctor Brotherus has considered these to be new species, at least on preliminary examination. The sole exception may be a clerical error for a Malayan species not otherwise enumerated here. Should this supposed status prove correct, the percentage of endemism for Philippine mosses becomes 43; for the species confined to the Mountain Province, 48; for those not yet found in the Mountain Province, 50; for those in both regions, 18.

Considering only the 136 endemic species indicated in the above table, which are distributed amongst 78 genera in 27 families, the percentage of these found only in the Mountain Province is 37.5; not in the Mountain Province, 53; in both areas, 9.5. Should the 26 above referred to all prove new species, these percentages will become 35, 56, and 9 respectively.

Five genera are endemic, *Merrillibryum* (*Fabroniaceae*) *Elmeribryum* and *Plagiotheciopsis* (*Hypnaceae*), *Pseudorcelopus* (*Polytrichaceae*), and *Porotrichodendron* (*Lembophyllaceae*). The first two of these are known only from the Mountain Province, the third from Davao in southeastern Mindanao, the fourth from Cagayan Province in the extreme north of Luzon but not in the Mountain Province, and the last, not included in the previous summary because it has not been found by recent collectors, appears from the specific name of its only species to be from near Majajjay, Mount Banajao.

On investigating the 63 non-endemic species found both in

⁴ *Philip. Journ. Sci.* 7 (1912) *Bot.* 171.

the Mountain Province and elsewhere in the Philippines, it is at once apparent that they are very largely Malayan, but that to the west many extend to Ceylon, or to the Himalayas or other mountains of India; that a smaller number extend to Japan, or to Polynesia; and that other species have a wide or very wide distribution.

Outside of the Philippines, *Hypnodendron formosicum* Card. is known only from Formosa; *Trematodon drepanellus* Besch. only from Formosa and Japan; *Pseudospiridentopsis horrida* (Mitt.) Fleisch. only from Bhotan and Formosa; *Dicranodontium dictycon* (Mitt.) Jaeg. only from Sikkim. Every one of the other 59 species is found in at least one of the islands extending from Sumatra to New Guinea. Even if the latter island be considered to lie outside the limits of Malaya, only two species, *Spiridens longifolius* Lindb. and *Calyptothecium philippinense* Broth. would thereby be excluded. But such exclusion is not advocated here, quite the opposite, and at the other extremity of Malaya, the Peninsula would have been included, had there happened to be any species that would thereby have been added to the Malayan list. Fifteen of the remaining 57 species are not found outside of these limits, hence the exclusively Malayan element will be stated as 17. Two of these, *Trematodon acutus* C. M. and *Philonotis secunda* (Doz. & Molk.) Bryol. Jav., were known only from Java; *Warburgiella cupressinoides* C. M. only from Batjan; *Schistomitrium nieuwenhuisii* Fleish. only from Borneo. Every one of the remaining eleven is known from islands west of Celebes, but five only range to the east of that island.

Species found within the Malay Archipelago and not to the west or north of Sumatra, but which extend to New Caledonia or to Polynesia, number 7, one of which is also found in Tasmania, another in New Zealand. Five other species found in the Malay Archipelago are also in Ceylon but not elsewhere; nine others are also in India or in Ceylon and India, but with no additional distribution, except that one has been collected in Malacca. Two others range from Ceylon or southern India to Australia or Polynesia; two occur only in the Malay Archipelago and Tonkin; these other Malayan species extend to India or Ceylon, or both, and also to China; seven others with the distribution of these last are also in Japan or Formosa, one of the seven even extending to North America. The remaining seven are widely distributed in tropical and subtropical regions.

When the 60 non-endemic species found in the Mountain Prov-

ince come to be considered, their distribution proves to be quite in different proportion from that of the species more widely distributed in the Philippines, as just detailed. The habitat of the former being at once more northern and on an average more elevated than that of the latter, it would be expected that they would show more northern alliances. It must be remembered, however, with respect to elevation, that while the Mountain Province as a geographic unit is on an average of much greater height than any other large area in the Philippines, from the standpoint of moss collections the difference is definitely less, as so many of these have been obtained here only on the tops of the mountains farther south.

The actual figures obtained from these 60 species are that only 12 are exclusively Malayan, that 22 are not Malayan, while the remaining 26 are found both in Malaya and elsewhere; with this additional qualification, that in many cases among the 26 the species are more typical of regions west or north of Malaya but extend into the latter, whereas in the cases previously considered nearly all were more typically Malayan but extended to other countries.

The exclusively Malayan species are *Trematodon paucifolius* C. M., *Dicranella coarctata* (C. M.) Bryol. Jav., *Leiomela javanica* (Ren. & Card.) Broth., *Pogonatum junghuhnianum* (Doz. & Molk.) Bryol. Jav., and *Fabronia curvirostris* Doz. & Molk., these five reported outside of the Philippines only from Java; *Braunfelsia dicranoides* (Doz. & Molk.) Broth., only from Java and New Guinea; *Pohlia leptocarpa* (Bryol. Jav.) Fleisch. only from Java and Borneo; *Barbella rutilans* (Bryol. Jav.) Broth. and *Oxyrrhynchium muelleri* (Bryol. Jav.) Broth. from Java and Sumatra; while *Leucobryum scalare* C. M., *Macromitrium angustifolium* Doz. & Molk., and *Taxithelium lindbergii* (Bryol. Jav.) Ren. & Card. are of wider distribution within the Archipelago but do not exceed its limits, except that the first of the three is also reported from Singapore.

Of the 26 species found both in Malaya and elsewhere, two, *Bryum argenteum* L. and *Ceratodon stenocarpus* Bryol. Eur., have a very wide distribution, and *Anoetangium euchloron* (Schw.) Mitt. has been reported from tropical America, tropical west Africa, and Java. Five others extend to the east or south of New Guinea, and three of these five also to the west or north of Sumatra; yet only one of them, *Pilopogon exasperatus* (Brid.) Broth., seems to be widely distributed in the group, extending also to Ceylon and Hawaii. *Glyptothecium sciuroides*

(Hook.) Hampe is reported from New Zealand, Tasmania, eastern Australia, and New Guinea, but not otherwise except from Java and the Philippines. The other three have been found in Malaya only in Java, but *Trachyloma tahitense* Besch. has also been collected in Ceylon and Tahiti; *Brachymenium coarctatum* (C. M.) Bryol. Jav. in New Caledonia and New Zealand; *Philonotis turneriana* (Schw.) Mitt. in the Himalayan region, Khasia, and the Hawaiian Islands.

Of the remaining 18, *Pogonatum spinulosum* Mitt. occurs in Java and China, and *Hypopterygium ceylanicum* Mitt. in Ceylon, Sumatra, and Java. All of the others are found both in India and Malaya, and only *Philonotis mollis* (Doz. & Molk.) Bryol. Jav. fails to reach either to the Himalayan region, or to Khasia, or to both, ranging to the east as far as Java. *Calyptothecium tumidum* (Dicks.) Fleisch. has the widest distribution of these, Nepal to Ceylon and New Guinea. Taking the Himalayan region as one limit of distribution, *Trachypodiopsis crispatula* (Hook.) Fleisch. reaches Ceylon, Yunnan, and Halmahera; *Pinnatella alopecuroides* (Hook.) Fleisch. to Ceylon and Sumbawa; *Anomobryum cymbifolium* (Lindb.) Broth. to Amboina; *Sphagnum cuspidatum* C. M., *Acrocryphaea concavifolia* (Griff.) Bryol. Jav., *Papillaria fuscescens* (Hook.) Jaeg., and *Meteoriopsis reclinata* (C. M.) Fleisch. to Ceylon and Celebes, the last of these also to Formosa. *Homaliodendron ligulaefolium* (Mitt.) Fleisch. gets no farther into Malaya than Sumatra, but reaches Ceylon, Formosa, and Japan; the remaining six find their Malayan limit in Java. *Fissidens anomalus* Mont. and *F. schmidtii* Broth. extend to Ceylon, *Brachymenium exile* (Doz. & Molk.) Bryol. Jav., and *Bryum ramosum* (Hook.) Mitt. to Ceylon and Formosa; *Rhaphidostegium tristiculum* (Mitt.) Jaeg. to Ceylon and Indo-China; while *Mnium succulentum* Mitt. has not been reported from Ceylon and on the continent finds its greatest eastern extension in Assam.

Twenty-two non-endemic Mountain Province mosses are not found in any part of Malaya, and of these the species of widest distribution is that which would be least expected in the Philippines, for *Pohlia elongata* Hedw. is found in the colder regions or the mountains of Europe and North America; in the Caucasus; in the Himalayas, Yunnan, Amur region, and Japan, in Asia; in Algeria and on Kilimandjaro, in Africa; and on Kerguelen Land in the Antarctic. In the one Philippine locality where it has been collected, it is not unusual for a thin film of ice to form on standing water during the nights of the cooler months of the year, but snow is unknown there as elsewhere in

the Archipelago. It is not, however, the point of greatest elevation, even in the Mountain Province.

The next most singular case is that of *Weisia flavipes* Hook. f. & Wils., for it is otherwise known only from New Zealand, Tasmania, and eastern Australia; the genus, however, having no apparent preference for any particular quarter of the globe. Two other cases of far-reaching northern distribution are *Brothera leana* (Sull.) C. M. and *Plagiothecium neckeroideum* Bryol. Eur., both found in the Himalayas and Japan, the former also in Manchuria and North America, the latter in southwestern Austria and in Switzerland.

Trachypus humilis Lindb. is otherwise known only in Japan; *Pohlia scabridens* (Mitt.) Broth. and *Pilotrichopsis dentata* (Mitt.) Besch. only in Japan and Formosa; *Meteorium helminthocladum* (C. M.) Fleisch. in Japan, Formosa, and eastern China; and *Catharinaea flaviseta* (Mitt.) Broth. from Japan and the Himalayas.

None of the rest occur in Japan, but all are found in the mountains of India, and seven of them there only, except the Philippine locality. These are *Philonotis falcata* (Hook.) Mitt., *P. griffithiana* (Wils.) Mitt., *P. speciosa* (Griff.) Mitt., *Pogonatum nudiusculum* Mitt., *Trachypus subbicolor* C. M., *Rhacopilum schmidii* (C. M.) Jaeg., and *Stereodon deflexifolius* (Mitt.) Broth. *Bartramidula roylei* (Hook. f.) Bryol. Eur., *Ctenidium lychnites* (Mitt.) Broth., and *Pogonatum microstomum* (R. Br.) Brid. extend to Ceylon, the last of these also to Yunnan; *Fissidens areolatus* Griff. and *Leptohymenium tenue* (Hook.) Schw. from the Himalayas to Burma; and lastly *Erythrodontium julaceum* (Hook.) Par. to Mysore in one direction and to Yunnan and Tonkin in the other.

It therefore appears that among the non-endemic Mountain Province mosses, the species not found in Malaya, and those found in Malaya and elsewhere, are approximately equal in number, and that each of these is about twice as many as the purely Malayan species. In the species found both in the Mountain Province and elsewhere in the Philippines, the number of non-Malayan species was very small, and those found both in Malaya and elsewhere were two and a half times as many as those confined to Malaya.

The 92 non-endemic species which have not been found in the Mountain Province give results altogether at variance with those found only in that region, and differ from these which have been collected in both regions in one very important respect, while they are in most thorough agreement with them in

another. For the species known only from outside Malaya are but 4, those from Malaya alone are 48; and 40 are both Malayan and extra-Malayan. The purely Malayan species are over half of the total number, or 52 per cent, as contrasted with 20 and 27 per cent in the case of the Mountain Province and the more generally distributed species, respectively.

The four species which have not been found in Malaya are *Sphagnum japonicum* Warnst., known only from the most northern province of Luzon and from Japan, the Philippine form sufficiently different from the type to be considered by Warnstorf as an endemic variety; *Neckeropsis crinita* (Griff.) Fleisch., found in the Province of Nueva Ecija in Luzon, and in Assam, Ceylon, and Tonkin; *Pseudoleskeopsis decurvata* (Mitt.) Broth., from Mount Mariveles and Japan; and *Dawsonia superba* R. Br., from Mount Malindang in northeastern Mindanao, and in eastern Australia, Tasmania, and New Zealand.

It further appears from this, that if the line of demarcation of the floral provinces were artificially drawn at the latitude of Manila, every single species of this group from south of the line would have other Malayan distribution, with the sole exception of one known at present from the Australian region only.

There were also four non-Malayan species among those found both in the Mountain Province and elsewhere. In every one of these, the Philippines supply the most southern known station for the species. In the case of *Hypnodendron formosicum* Card., that limit is Mount Canlaon, in Negros; for *Trematodon drepanellus* Besch. it is Mount Abangan, in Mindoro; for *Pseudospiridentopsis horrida* (Mitt.) Fleisch., it is Zambales; for *Dicranodontium dictycon* (Mitt.) Jaeg., Mount Banajao in Luzon. It is thus apparent that among all the non-endemic species, the Australasian representative above mentioned in the only non-Malayan species found in Mindanao; that only one other non-Malayan species has been found elsewhere than in Luzon; that even if that island be included, there are only eight non-endemic non-Malayan species in the Philippines, except in the Mountain Province. Up to this point, the results are very definitely in accord with those found by Doctor Copeland for the ferns, but in the case of the latter group, there is no reversal of affinities in the Mountain Province as with flowering plants and mosses. For, in the mosses, the percentage of strictly Malayan non-endemic species is only 20, and while an additional 43 per cent are found both in Malaya and elsewhere, an attempt has already been made to show that many of these species are only secondarily Malayan. At the lowest possible estimate, 37

per cent of the Mountain Province species are not Malayan at all.

Returning to the 88 species not found in the Mountain Province which are on record from Malaya, only one, *Bryum coronatum* Schw., is found in both hemispheres; one other, *Holomitrium vaginatum* Brid., has been collected in southern and eastern Africa, Java, and Tahiti. The extreme range of the remaining 86 is from Ceylon or India to Polynesia; none of them have been found in Australia, Tasmania, or New Zealand.

Only two extend to Japan, *Homaliiodendron scalpellifolium* (Mitt.) Fleisch., otherwise known from the Moluccas to Ceylon and Tonkin, and *Leucobryum bowringii* Mitt., Himalayas and Ceylon to Celebes, also in Hongkong and Formosa. One other reaches the Liu Kiu Archipelago, *Thuidium glaucinum* Broth., whose southeastern limit is New Mecklenburg; while *Distichophyllum mittenii* Bryol. Jav. is scattered from Ceylon to Formosa and New Caledonia.

Aerobryopsis lanosa (Mitt.) Broth. is the only one of the remainder to reach China; *Rhynchostegium celebicum* (Bryol. Jav.) Jaeg. and *R. menadense* (Bryol. Jav.) Jaeg. are confined to the Philippines, Celebes, and Tonkin. Three species, *Hypnoidendron reinwardtii* (Hornsch.) Broth., *Trichosteleum hamatum* (Doz. & Molk.) Jaeg., and *Syrrhopodon albo-vaginatulus* Schw. are Malayan except for an extension to Polynesia; the other six species which reach Polynesia are not only in Malaya, but also in Ceylon or India or both. These are *Leucobryum sanctum* Hampe, *Leucophanes candidum* (Hornsch.) Lindb., *Syrrhopodon muelleri* (Doz. & Molk.) Lac, *Callicostella papillata* (Mont.) Jaeg., *Thuidium plumulosum* (Doz. & Molk.) Bryol. Jav., and *Taxithelium papillatum* (Harv.) Broth. *Trismegistia rigida* (Reinw. & Hornsch.) Broth. and *Macromitrium salakanum* C. M. extend from New Caledonia to Sumatra, and to Java, respectively.

Twenty others occur in India, Ceylon, or Burma, and in one to several of the islands of the Malay Archipelago. This list comprises *Symblepharis reinwardtii* Broth., *Dicranoloma blumei* (Nees) Ren., *Leucobryum angustifolium* Wils., *Syrrhopodon ciliatus* Schw., *S. tristichus* Nees, *Macromitrium fasciculare* Mitt., *Bryum compressidens* C. M., *Racelopus pilifer* Doz. & Molk., *Myurium rufescens* (Reinw. & Hornsch.) Fleisch., *Daltonia angustifolia* Doz. & Molk., *Chaetomitrium papillifolium* Bryol. Jav., *Thuidium trachypodum* (Mitt.) Bryol. Jav., *Ectropothecium cyperoides* (Hook.) Jaeg., *Trismegistia lancifolia* Harv.) Broth., *Taxithelium nepalense* (Schw.) Broth., *Vesicularia reticulata* (Doz. & Molk.) Broth., *Meiothecium jagori* (C. M.)

Broth., *M. microcarpum* (Harv.) Mitt., *Trischosteleum boschii* (Doz. & Molk.) Jaeg., and *Hypnodendron arborescens* (Mitt.) Lindb.

There still remain 48 species, these entirely confined to the Malay Archipelago, with the exception in a very few cases of an extension into the lower end of the Malay Peninsula; these are here held to be exclusively Malayan. It is perhaps rather an index of the comparative intensity of botanical exploration than of anything else, to say that exactly one-third of these have only been collected in one island outside the Philippines, and that in ten cases that island is Java. Labuan is credited with two; and Borneo, Celebes, the Great Natunas, and New Guinea with one each. Thirty-one of the remaining thirty-two have been reported from islands west of Celebes, nineteen from Celebes or islands to the east. It is apparent from these figures that eighteen are found in both of these divisions, and that only one fails to occur west of Celebes, its actual distribution being New Guinea, Ceram, and the east coast of Luzon. This would seem to indicate that the focus of distribution lies to the west of Celebes, but the same statement is so emphatically true of botanical exploration that it may be premature to attempt a final judgment.

The following table shows concisely the contrast in the three sets of Philippine species, as developed above in greater detail.

Non-endemic Philippine mosses occurring in the Philippines in—	Also in Malaya, but not elsewhere.	Not in Malaya.	Both in Malaya and elsewhere.
Mountain Province only	12	22	26
Not in Mountain Province	48	4	40
Mountain Province and elsewhere	17	4	42
	77	30	108

It is therefore contended that the facts just detailed not merely throw light on the relationships of the Philippine flora, but afford ample justification for the segregation of the Mountain Province as an area to be treated apart from the rest of the Archipelago. Its selection was not arbitrary. The Mountain Province, as such, is a political division, created because its inhabitants, while differing amongst themselves in various ways, possess many characteristics in common which tend to differentiate them from the rest of the peoples of the Philippines, nowhere more strikingly than from their nearest neighbors. But they have preserved, acquired, or developed these differences, because the geographic difficulties of the region held them

largely isolated from the peoples of the less elevated provinces. Moreover, choice of this particular portion of the Philippines was made, because the study of flowering plants had led to the formation of certain theories regarding their distribution in the Archipelago, which were briefly stated at the beginning of this paper.

It would be entirely fair to object that exploration is not yet sufficiently advanced, and that it is probable that further investigation will modify these figures. It is freely conceded, that had there been no very obvious tendency, it would have been perilous to base conclusions on such work as has yet been done. But the results are their own justification, and while they will unquestionably be modified in scores of details, by exploration outside the Philippines as well as within them, an examination of the actual cases renders it quite as probable that the contrasts will be intensified as that they will be weakened.

So far, then, as the moss flora can be taken as a criterion, it seems clear—

1. That the percentage of endemism in Philippine species is very high.

2. That the Mountain Province is botanically a natural subdivision of the Philippines.

3. That the flora of the rest of the Philippines is overwhelmingly Malayan.

4. That the flora of the Mountain Province can not be considered strictly Malayan, but is related to it in much the same way as is that of Sikkim, Nepal, or Khasia.

It remains to be seen whether the ascertained distribution of the moss flora affords any support to two other propositions briefly stated at the outset for flowering plants; whether any species whose focus of distribution in the Philippines appears to be the Mountain Province extend to the south along definite lines, in general those of the various ranges or broken ranges of mountains; and secondly, whether floral subprovinces can be established for the rest of the Philippines.

From both of these inquiries, the species found only in the Mountain Province must be excluded, but with an important reservation. If it be well established that the great mountain mass, nearly at the north of the Islands, has a flora in rather definite contrast to that not only of less elevated areas but even of the summits of the mountain farther south, it would logically follow that it could constitute a focus of distribution, from which more adaptable species could reach other localities.

But, on this point, the data for drawing conclusions are

scanty. There are 76 species found both in the Mountain Province and elsewhere in the Philippines, but 63 of these are known outside the limits of the Archipelago, and all except four of these 63 are Malayan and therefore less in consonance with the ascertained affinities of the flora of the Mountain Province than with that of the rest of the Philippines. However, our present knowledge of the Philippine distribution of these 59 Malayan species is, that there extend to the Mountain Province from, or less likely extend from the Mountain Province to:

Eastern Luzon, but not the more southern islands.....	9
Western Luzon but not the more southern islands.....	2
Both eastern and western Luzon, but not the more southern islands....	2
Eastern but not western Luzon and more southern islands.....	8
Western but not eastern Luzon and more southern islands.....	6
Eastern and western Luzon and more southern islands.....	8
Southern islands but not in Luzon south of Mountain Province.....	24

There is some room for argument that the Philippine center of distribution of at least the first thirteen of these is the Mountain Province, but their Malayan distribution would throw suspicion on any such conclusions, and it should be more profitable to confine attention to the four non-Malayan and the thirteen endemic species found both in the Mountain Province and elsewhere.

With respect to the four, the presumption is strong that their spread has been from the north, for the ascertained areas of distribution are Formosa, Mountain Province, Canlaon; Japan, Formosa, Mountain Province, Mindoro; Bhotan, Formosa, Mountain Province, Zambales; and Sikkim, Mountain Province, Banajao, respectively. The thirteen will be listed, as in practically every case, it will be open to question whether they have migrated to the Mountain Province from more southern hills or have taken the opposite route.

Species.	Ascertained distribution outside of the Mountain Province.
<i>Braunfelsia luzonensis</i> Broth.	Zambales.
<i>Pilopogon subexasperatus</i> Broth.	Zambales, Banajao.
<i>Trichostomum subduriusculum</i> (C. M.) Broth.	Butuan.
<i>Schlotheimia wallisii</i> C. M.	Zambales, Banajao.
<i>Pogonatum albo-marginatum</i> (C. M.) Jaeg.	Zambales, Abu, Mariveles, Lanao.
<i>Pilopogon spurio-cirratum</i> Broth.	Banajao.
<i>Symphysodontella subulata</i> Broth.	Negros.
<i>Entodon longidens</i> Broth.	Apo, Lanao.
<i>Ectropothecium assimile</i> Broth.	Rizal, Maquiling, Butuan, Bukidnon.
<i>Ectropothecium micropyrus</i> Broth.	Maquiling, Butuan.
<i>Ectropothecium subintorquatum</i> Broth.	Maquiling, Canlaon, Zamboanga.
<i>Vesicularia campylotheicum</i> Broth.	Laguna.
<i>Meiotheicum attenuatum</i> Broth.	Laguna.

From a general consideration of the species of the genera concerned, as well as of the Philippine localities cited, it would appear that *Trichostomum subduriusculum* and *Entodon longidens* offer no conclusive evidence in either direction, while the three species of *Ectropothecium*, *Symphysodontella subulata*, *Vesicularia campylothecium*, and *Meiothecium attenuatum* have more likely originated farther south and thence migrated to the Mountain Province.

Similar arguments render it probable that the remaining five originated in the Mountain Province, and have spread thence to a greater or less extent, along two lines of distribution. Two are known both from Banajao and the mountains of Zambales, and it is much less probable that they passed directly from either of these to the other than that they have reached both from Benguet. Moreover, one other is known only in the Mountain Province and on Banajao; neither of the others is known from Banajao, but both occur in Zambales, one of the latter extending through what is the same and a continuation of the same range to Abu and Mariveles, and to a far-off station in Mindanao.

It is admitted that very little has been proven on this head, but it is to be remembered that nothing would be more destructive of one of the main points here sought to be established, than the discovery that any very high proportion of the species which seem to have originated in the Mountain Province had migrated to the south.

When the essential of the east-west coast theory of distribution is understood, its inherent probability will be universally conceded. For it is no more than this. Can the plants of the Philippines be divided into two physiological groups, those which can withstand a long-continued period of drought, and those which can not? Briefly, the answer is in the affirmative, but complications are at once introduced by plants which prefer the one set of conditions but tolerate the other, and by the ascertained fact that the humidity of any part of the Philippines is high even in its dry season. The facts are capable of another explanation. Both groups of plants may prefer the one set of conditions, presumably in at least most cases the more even distribution of rain. Under such conditions, the one group may be superior to the other in the struggle for existence. When confronted with less desirable conditions, that group may no longer be able to compete on favorable terms, and thus will yield supremacy to their rivals. From a purely floristic point of view, it is of little consequence which of these furnishes the better

explanation of the facts, or whether both contain elements of truth. In either case, the same species might be found in regions of quite dissimilar rain-distribution; so that the contrast between such regions, if based on the mere presence and absence of species, would have to be between plants with strong preference. It is sufficiently assured that there are certain trees, for example, that grow under both sets of conditions, but much better under one. But it is obvious that it is impossible for very definite statements to be made on this point for more than a very few of the forest species.

What the theory seeks is to establish a correlation between the rainfall and the geographic distribution of species. In northern Luzon, the narrow western coastal plain is separated from the broad Cagayan Valley and the east coast by the whole mass of the Mountain Province, but the hills taper down to the north, and the plant evidence is that in the extreme northwest, namely in at least the northern part of the Province of Ilocos Norte, there is an extension of species found on the east coast but not in the more southern provinces of western Luzon. On this point the mosses in this herbarium furnish no evidence, for not one species has yet been collected in either Ilocos Norte or Ilocos Sur, and not many in Union. Their total is probably small. Nor are there many from the Batanes Islands, nor from Cagayan, nor Isabela, but some of these have proven of considerable interest. There is nothing from the east coast until just north of the latitude of Manila, the intervening country being to-day about the least accessible region in the Philippines. Then follows the best known portion, bryologically, of eastern Luzon, Infanta, Polillo, San Antonio in Laguna Province, and especially two of the hills of the Banajao group, Banajao proper, and the lesser Banajao or Lucban. It is again to be remembered, also, that the mosses differ from the great majority of the species of flowering plants, in that the latter have been collected at all levels, whereas the former have mostly come from high elevations, especially the "mossy forest," where the humidity is great, at all seasons and on all slopes.

In practice, therefore, all that can be ascertained here is whether the mosses known from the western provinces of Ilocos (none), Union, Pangasinan (none), Tarlac, Pampanga, Bulacan, Zambales, Bataan, and Cavite seem to differ from those of Infanta, Polillo, Laguna, Tayabas, Camarines, and Albay on the east, and whether either of these groups seems to show any preference for extension into the Visayan and the southern islands, or outside the Archipelago. Rizal Province is not a

natural division, from a botanical point of view; the species from near Manila have been counted as definitely west coast; those from the northeastern part of the province have been counted as east coast when they have also been found in other localities, whether east or west; when this was their only Philippine station of record, they were omitted altogether, as were those of Nueva Ecija and Batangas (one only), this omission indicating uncertainty in the mind of the writer as to the exact point at which the dividing line should be drawn. Bryologically, Bulacan may prove to be east coast, as the hill country in its eastern part, almost uninhabited, will yield far more species should collections be made there than can the much better known and populous plain to the west.

The figures are as follows, but it should be noted that the totals do not correspond to the sum of the separate columns, for while the first three columns are mutually exclusive, the second must and the third may be included in the fourth. Also species are included in the total that do not appear in any of the other columns, for example when a species is known only from Benguet and Zambales.

	Endemic in one Philippine locality.	Only one Philippine station, but outside dis- tribution.	Extending to more southern islands within Phil- ippines.	With extra- Philippine distribu- tion and one or more Philippine stations.	Total.
Species of mosses found in the west- ern provinces above named, but not in the eastern	6	5	16	22	32
Species found in the eastern prov- inces, but not in the western	15	10	32	46	70
Species found in both eastern and western provinces			18	18	24

In view of what has previously been stated, this difference seems surprising, but while the details are much more likely to be modified by future collections than in any of the cases previously considered, it is highly probable that there will remain a very considerable number of species known only from one or the other slope.⁵ The figures do appear to argue strongly against one opinion based upon flowering plants, namely that the species of eastern Luzon are the more likely to be found in the more southern islands, and are also more likely to extend without the

⁵ See *Philip. Journ. Sci.* 6 (1911) Bot. 190, 191.

Archipelago. In view of the supposed reason for the distinction of the two floras, this is a point of some importance. Before a final opinion can be formed, it will be necessary to have fairly full collections from critical districts, such as the Angat country in Bulacan and Mount Maquiling in Laguna: the latter are being obtained.

A side result suggested but not fully stated in the above table is that the number of endemic species in the Mountain Province is nearly twice that of the rest of Luzon taken together; for the number credited to the latter consists of the 21 in the first column of the table, 6 others from Rizal and Cagayan, and a single species endemic in two adjoining localities on the eastern slope. This disproportion may not prove permanent.

It has been seen that the study of moss distribution gives the same result on all main points of inquiry as had already been held for flowering plants; but that it only partly agrees with those obtained for the ferns. So many weeds and other undoubtedly introduced species have had to be enumerated among the flowering plants that their apparent percentage of endemism has been materially lowered; so that among so-called native species the mosses really have a slightly greater tendency to extend to other regions. But as all species are taken as originating at a single point, this practically amounts to saying, that in the Philippines, natural and artificial introduction, taken together, have brought about practically identical results in the case of the groups here contrasted. Probably also the average range of the moss species is greater than that of the phanerogams, but the question hardly permits more than vague opinion.

THE GENUS *MACROGLOSSUM* COPELAND

By DOUGLAS H. CAMPBELL

(Stanford University, California, U. S. A.)

In 1909, Professor E. B. Copeland described a new Marattiaceous fern, to which he gave the name *Macroglossum Alidae*. The specimen was collected near Bau, in Sarawak, Borneo, where in February, 1913, the writer collected at the original station abundant material for a morphological study of this interesting fern. After leaving Borneo, a visit was made to Buitenzorg, and in the famous botanical garden there a single fruiting specimen of what was taken to be the same plant as *Macroglossum Alidae*, was growing. This specimen was labeled *Angiopteris Smithii* Raciborski, and inquiry showed that it was the type of that species. It had been growing in the garden for about twenty years, but its origin was unknown. It was conjectured that the plant had been sent from either Borneo or Sumatra, but no record of its origin was extant.

Material from this plant was shown to Professor Copeland who thought it was identical with the Sarawak species; but the sporangia were immature, and a careful comparison of mature sporophylls of the two plants has shown that they are not identical, although doubtless closely related. It is also evident that the genus *Macroglossum* cannot be united with *Angiopteris*. Raciborski's *Angiopteris Smithii* must therefore be transferred to the genus *Macroglossum*.¹

The two species of *Macroglossum* closely resemble each other in habit, but the Buitenzorg plant was considerably smaller than the larger specimens of *M. Alidae*. The leaves of the latter were about 4 meters in length, while those of *M. Smithii* scarcely reached 3 meters.

A comparison of *Macroglossum* with *Angiopteris* shows a number of notable differences. The habit of the plants is quite unlike, the upright simply pinnate leaves of *Macroglossum* being more numerous than the broad-spreading bipinnate leaves of

¹ *Macroglossum Smithii* (Raciborski) Campbell (*Angiopteris Smithii* Raciborski in Bull. Int. Acad. Cracov. (1902) 54).

most species of *Angiopteris*. In habit *Macroglossum* much resembles the larger species of *Danaea*, although much larger than these. In its simply pinnate leaves it also recalls *Archangiopteris*, with which it closely agrees also in the structure of the sporangium. The pinnae, which in *M. Alidae* may exceed 50 cm in length, have entire margins, while in all of the species of *Angiopteris* that were examined, the margin of the pinnules is more or less strongly serrate.

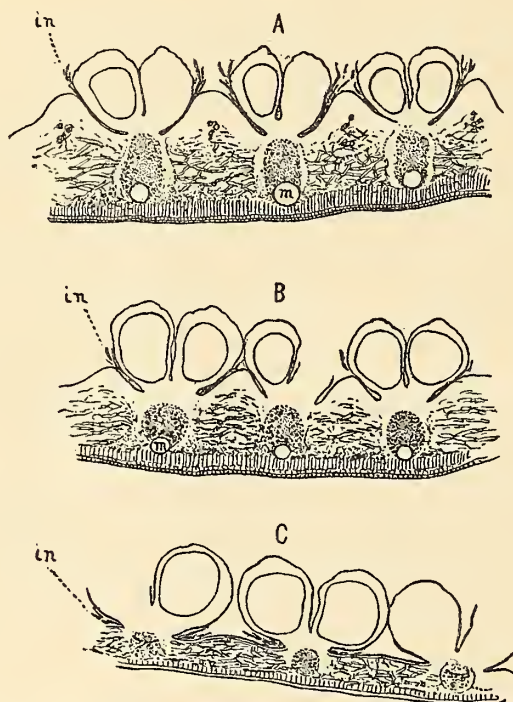


FIG. 1. A, a cross section of the leaf-lamina of *Macroglossum Alidae*, traversing three sori. $\times 25$; in, indusial hairs; m, mucilage ducts. B, a similar section of the leaf of *M. Smithii*. C, a similar section of the leaf of *Angiopteris evecta* (?).

The anatomy of the lamina is very different in *Macroglossum* and *Angiopteris*. The material of *Angiopteris* used for comparison, was a species collected at Peradeniya, Ceylon, under the name of *A. evecta*. Sections through the sori show that the lamina of the leaflet at this point is at least three times as thick in *Macroglossum* as in *Angiopteris*, although the sporangia themselves are smaller (fig. 1). The palisade tissue is extremely conspicuous in *Macroglossum*, while in *Angiopteris* it is much less developed although there is a good deal of difference in this respect in different species. Traversing each vein in *Macro-*

glossum is a conspicuous mucilage duct (m), which is wanting in the leaf of *Angiopteris*. A striking feature in *Macroglossum* is the development of a conspicuous ridge separating the elongated sori, so that the latter are sunk in a sort of trough, very much as is the case in *Danaea*. This is especially marked in *M. Alidæ*, where only the upper portion of the sporangium is free. In *Angiopteris* (fig. 1, C), the sporangia are entirely exposed.

In *Macroglossum* there is a conspicuous indusium composed of branching hairs, which form a fringe on either side of the sorus. In *M. Alidæ* these hairs reach nearly or quite to the summit of the sporangia, and are very much like those found in *Archangiopteris*.² These indusial hairs are much less developed in *Angiopteris*.

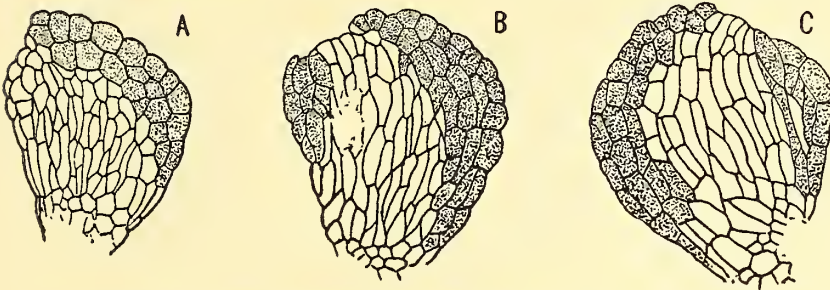


FIG. 2. Surface cells of the sporangium seen from the side; the tannin cells are shaded. A, *Macroglossum Alidæ*; B, *M. Smithii*; C, *Angiopteris*.

The elongated sorus of *Macroglossum* presents a quite different appearance from that of *Angiopteris*. On account of the submersion of the sorus between the ridges referred to, the sporangia project only slightly above the level of the leaf-surface, and they are so closely crowded as to be scarcely distinguishable, even with a lens, so that the sorus closely resembles superficially the elongated solid synangium of *Danaea*. The individual sporangia are smaller, but much more numerous than in *Angiopteris* where there are usually from 6 to 15 sporangia in each sorus. In *Macroglossum Alidæ* there may be more than 60 sporangia in the sorus.

Seen in median section (fig. 2, C) the sporangium of *Angiopteris* is nearly circular in outline, being strongly convex both dorsally and ventrally. In *Macroglossum* (fig. 2, B) a similar section is nearly pear-shaped, the sporangium being much less convex dorsally than in *Angiopteris*, and having the ventral surface almost flat.

² Christ & Giesenhagen, *Pteridographische Notizen*, Flora 86 (1899).

In both genera the superficial dorsal cells of the sporangium are dark brown in color, due to the presence of dense cell-contents which probably contain tannin, and which stain very strongly with safranine (fig. 3). In *Angiopteris* these tannin cells cover the entire dorsal surface, but in *Macroglossum Alidae* they are absent from the dorsal region for nearly half the height of the sporangium. *M. Smithii* is intermediate between *Angiopteris* and *M. Alidae* in this respect.

Similar brown cells are also found upon the inner or ventral face of the sporangium in *Angiopteris*, forming a band on each side of the line of dehiscence, and extending to the base of the sporangium. In *Macroglossum Smithii* two patches of these cells occur on either side of the line of dehiscence near the apex

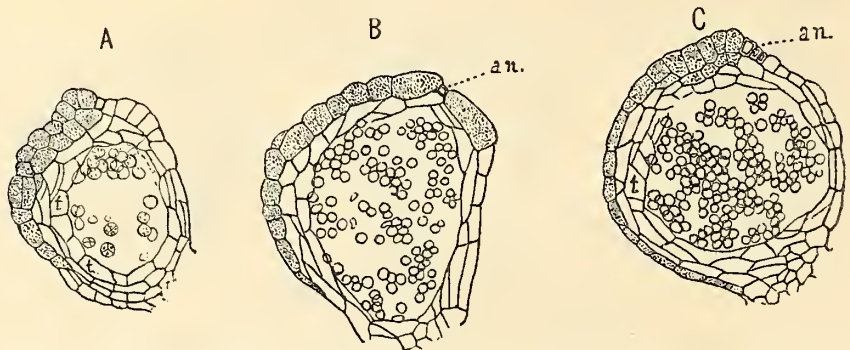


FIG. 3. A, median sections of the sporangia of *Macroglossum Alidae*; B, *Macroglossum Smithii*; C, *Angiopteris erecta* (?); an, annulus; t, tapetum. The tannin cells are shaded. \times about 75.

of the sporangium, but in *M. Alidae* they are entirely wanting on the ventral face of the sporangium. (Fig. 3, A.)

In *Angiopteris* a conspicuous annulus (fig. 4, C, an) of lignified cells occupies the apex of the sporangium. In *Macroglossum Smithii*, a similar, but much less evident annulus occurs; but in *M. Alidae*, this is almost entirely wanting.

These differences, i. e., the form and anatomy of the leaf; the structure and arrangement of the sporangia and indusium, would seem amply sufficient to separate *Macroglossum* from *Angiopteris*. Of the two species *M. Alidae* may be considered to be less specialized in regard to the sporangium. The number, arrangement and structure of the sporangia are more like *Archangiopteris* than like *Angiopteris*, and on the whole, *Macroglossum* may be considered to be most nearly related to the former genus. Like *Archangiopteris* there are suggestions of a possible relationship with *Danaea*; but the entirely separate

sporangia in both genera forbid their close association with *Danaea*, and indicate their inclusion in the family *Angiopterideae*.

The most obvious difference between *M. Alidae* and *M. Smithii* is in the number of sporangia in the sorus, this being about twice as great in *M. Alidae* where there may be upwards of 60. Some of the smaller sori in *M. Smithii* are scarcely longer than is sometimes found in *Angiopteris*. The sporangia of *M. Alidae*

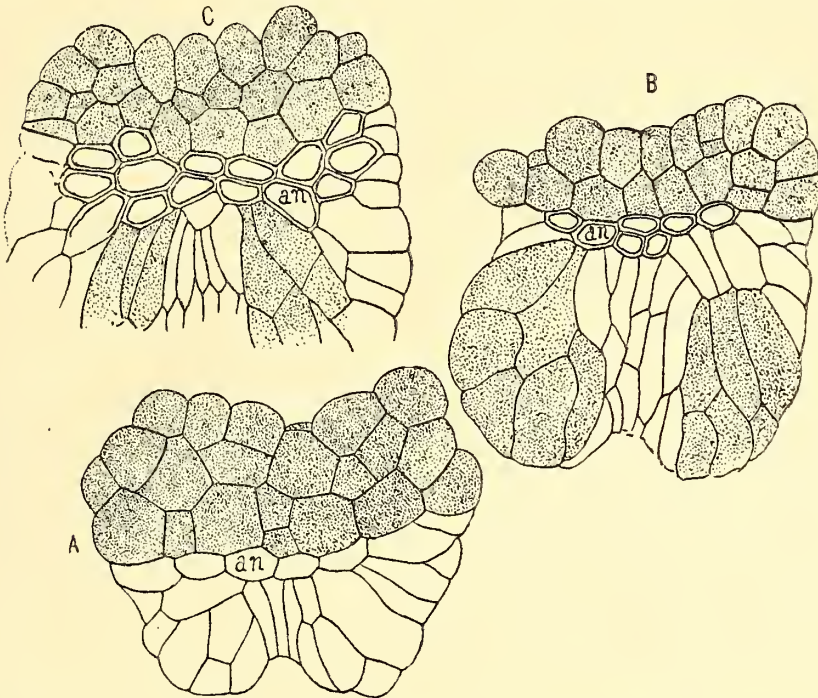


FIG. 4. Apex of the sporangium showing the annulus, an. A, *Macroglossum Alidae*; B, *M. Smithii*; C, *Angiopteris*. $\times 250$.

are somewhat smaller and more crowded, so the resemblance of the sorus of this species to *Danaea* is specially marked. (Plate I, A).

The leaf-lamina in *M. Alidae* is somewhat thicker than in *M. Smithii*, and there are in *M. Alidae* obscure pseudo-nerves between the veins, which are absent in *M. Smithii*. Finally the true annulus in the sporangium of *M. Smithii*, and the less developed indusium, distinguish it from *M. Alidae*.

EXPLANATION OF THE PLATE

PLATE I. A, part of a pinna of *Macroglossum Alidae*, about natural size;
B, C, *Macroglossum Smithii*, showing the much smaller size of
the sori.

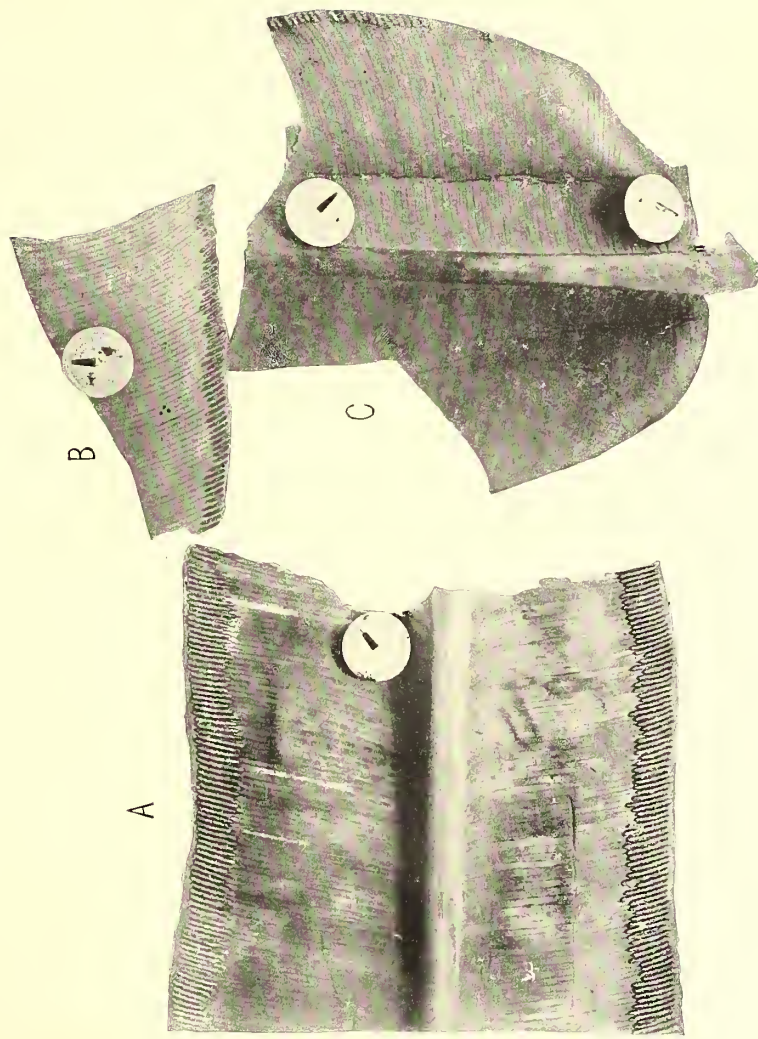


PLATE I. A, MACROGLOSSUM ALIDAE; B, C, MACROGLOSSUM SMITHII.

NEW SUMATRAN FERNS

By E. B. COPELAND

(From the College of Agriculture, University of the Philippines,
Los Baños, P. I.)

Mr. Cecil J. Brooks, to whose zeal and skill as a collector much of the recently acquired knowledge of the fern flora of Borneo is due, is now living at Lebong Tandai, Benkoelen, Sumatra. From this locality he recently sent me for determination a most interesting collection of 111 specimens from which the following fourteen are described as new. There are also a considerable number of other additions to the known flora of Sumatra. The study of the collection leaves me with the opinion that the floras of Borneo and Sumatra are much more closely related than has hitherto been supposed.

The numbers accompanying the following descriptions are those attached to the specimens by Mr. Brooks. The locality is given on all labels as "Lebong Tandai, Benkoelen."

MARATTIA CAUDATA sp. nov.

Rhachi castanea vel atrocastanea, glabra, fere laeve: pinnis suboppositis, usque ad 50 cm longis, stipitatis, stipite 4-7 cm longo; rhachi laeve, atrocastanea, exalata; pinnulis suboppositis, maximis superioribus, usque ad 15 cm longis, 12-15 mm latis, basi cuneatis, stipitatis, stipite 2-3 mm longo nigro, serratis vel deorsum integris, apice in caudam ca. 2 cm longam 1.2 mm latam sursum solummodo serratam angustatis, papyraceis, glabris; venis fere omnibus simplicibus, opacis; soris margine remotis, loculis 6-8-paribus, indusio atro-fusco.

No. 41. "In thick jungle on steep bank of stream. A large fern."

The remarkably caudate pinnules give this species a very distinct appearance.

TRICHOMANES PULCHERRIMUM sp. nov.

Rhizomate late repente, 3-4 mm crasso, dense et breviter nigro-piloso, in ala frondis quaeque frondes reductas 1 vel 2 dissectas segmentis setaceis emittente: stipite 10-20 cm alto, castaneo, glabrescente, sursum rhachique angustissime alatis;

fronde ultra 30 cm alta, oblonga, acuminata, 4-5-pinnatifida rhachi decidue puberula, castanea, lamina viride diaphana, praecipue ad costas pilis longis paucis adspersa; segmentis ultimis vix 0.5 mm latis, ad apices plerumque retusis; venis spuriiis nullis; indusio anguste turbinato-cylindrico, exalato, margine subbilabiato et paullo dilatato, receptaculo exserto.

No. 26. Scandent on base of trunks in shady jungle.

A remarkably beautiful fern; related to *Trichomanes speciosum* Willd., and superficially much like *T. aphlebioides* Christ, of New Guinea. The larger frond sent me wants the upper part; it was probably 60 cm high.

DRYOPTERIS PALEATA sp. nov.

D. Hallieri (Christ) C. Chr. affinis et similis, rhachi ubique paleis magnis lanceolatis, et indusiis persistentibus pilosis distincta; pinnis insigniter ciliatis, sterilibus 30 cm longis, 4 cm latis, fertilibus gracilioribus, apicibus venarum interdum in sinibus confluentibus.

Nos. 136, fertile, and 68, sterile, compose the type specimen.

Related to *Dryopteris Hallieri*, as already stated, and also to *D. crinipes* (Hooker) O. K., the veins of which regularly anastomose.

TECTARIA (PLEOCNEMIA vel ARCYPTERIS) OLIVACEA sp. nov.

Stipite fere 1 cm crasso, deorsum paleis filiformibus rufo-castaneis crinitis densissime vestito, sursum nitido, castaneo; fronde magna, rhachibus nitidis; pinnae infimae desunt; sequentibus ca. 60 cm longis, 20 cm latis, brevistipitatis, acuminatis, inferioribus stipitatis, basi cordato-truncatis, 1.5 cm latis, ultra mediam laminam pinnatisectis, glabris, papyraceis, superne castaneo-viridibus, subtus olivaceis; lobis falcato-oblongis, obtusis, integris; venis inconspicuis, interdum more *Pleocnemiae* seriem unam areolarum efformantibus, saepius areolas irregulares paucas margini vel sinu propiores includentibus; soris medialibus, utroque latere costulae 5-7, nudis.

No. 172.

This can easily be mistaken for *Tectaria leuzeana*, from which it differs in superficial view in the exceeding fineness of the basal scales and in the less cut pinnules; the slightly different venation is correlated with the preceding character. The naked sori would make this an *Arcypteris*, but the appearance is rather that of *Pleocnemia*.

TECTARIA (DIGRAMMARIA) ELLIPTICA sp. nov.

Stipite 50 cm alto, sordide nigro-brunneo, deorsum paleis paucis lanceolatis adperso; fronde ultra 50 cm alta, 35-40 cm lata, abrupte acuminata, apice pinnatifida, alibi bipinnatifida; pinnis 5-8-paribus, sessilibus vel superioribus adnatis, infimis quam sequentibus brevioribus et latioribus, haud deltoideis sed

potius basi basiscopica abscissa; pinnis medialibus usque ad 25 cm longis, 6 cm latis, valde acuminatis, ad partem utroque latere costae ca 1 cm latam integram lobatis, herbaceis, in sinibus minute ciliatis, aliter glabris; lobis falcatis, 5–8 mm latis, integris; venis inconspicuis, anastomosantibus, in segmentis series areolarum utroque latere costulae 1 vel 2 includentibus; soris medialibus, nudis, plus minus elongatis.

No. 81. "In shady jungle by stream."

Intermediate between *Tectaria ambigua* (Presl) and *T. gigantea* (Blume).

TECTARIA SINGAPORIANA (Wall.) Copel.

Aspidium singaporianum Wall. (1827).

No. 89.

LEPTOCHILUS OVATUS sp. nov.

Fronde sterile lata, venarum ramis prope marginem praestantioribus; frondis fertilis stipite 35 cm alto, gracile, lamina anguste ovata, vix 6 cm longa, 2.5 cm lata; aliter *L. decurrenti* Bl. similis.

No. 155. "Scandent near base of small trees, in moist shade."

ATHYRIUM BROOKSII sp. nov.

Species gregis *A. Swartzii* (Bl.) (*Diplazii Swartzii* Bl. Enum. (1828) 191) rhizomate erecto; stipitibus rhachibusque inermibus nudis stipite 20–35 cm alto; fronde 30 cm alta, ovata, pinnata, pinna terminale inciso-serrata non hastata, aliis argute grosse-serratis; pinnis suboppositis, utroque latere ca. 5, stipitatis, acuminatis, basi rotundatis haud truncatis, coriaceis, glabris, sterilibus 15 cm longis, 3.5 cm latis; venis versus sinus anastomosantibus; soris laminam fere obtegentibus.

No. 103.

A decidedly distinct member of the group of "*Diplazum proliferum*."

ASPENIUM (THAMNOPTERIS) OBLANCEOLATUM sp. nov.

Rhizomate 2 mm crasso, radicibus profunde oblecto; stipite subnullo; fronde 40–60 cm alta, 4 cm lata, anguste oblanceolata, acuta, deorsum sensim longe attenuata, glabra, viride, subcoriacea; costa utraque facie prominente, inferne obscure carinata; venis erecto-patentibus, infra marginem anastomosantibus; soris brevibus, a costa vix $\frac{1}{3}$ ad marginem protensis, indusio nitido, integro, persistente.

No. 28. "On trunk."

In form of frond approaching broad forms of *Asplenium colubrinum* Christ, from which it differs in being broader, especially upward, and in the shorter and less spreading sori.

MICROLEPIA BROOKSII sp. nov.

Pinnis infimis ca. 30 cm longis, 13 cm latis, acuminatis; pin-nulis gracili-stipitatis, deltoideo-lanceolatis, argute acuminatis; segmentis orbiculari-oblongis, rotundatis, infimo acroscopico maximo plus minus inciso excepto proximis et interdum im-bri-catis, integris, sparsius puberulentibus, aliter ut *M. trichosticha* J. Sm.

No. 105.

The peculiar form of the pinnules and segments distinguishes this from *Microlepia Speluncae* as well as from *M. trichosticha*. The latter has the pinnæ much longer but hardly wider at the base, the pinnules less dilated at the base and relatively broad above and less sharply acuminate, and the lobes narrower, farther apart and only the smaller ones near the apex entire. The enlarged base of the trichomes is not a very good distinctive character.

HUMATA INTERMEDIA C. Chr.*No. 39.*

Already published as from Borneo and Perak. The Sumatra plant is identical with one determined as this species, from Pahang.

DAVALLIA SUMATRANA sp. nov.

Rhizomate repente, ca. 7 mm crasso, dense paleaceo; stipite 50–60 cm alto, castaneo; fronde 80 cm vel ultra alta, 50–60 cm lata, vix tripinnata, apice invisâ, rhachi per 75 cm non alata; pinnis stipitatis, infimis 35 cm longis, 15 cm latis, deltoideo-lan-ceolatis, acuminatis, rhachi sursum alata, pinnis sequentibus paullo brevioribus; pinnulis stipitatis, infimis 8 cm longis, 3.5 cm latis, acuminatis, pinnatifidis; segmentis infimis ala angustis-sima connexis, pinnatifido-lobatis, lobo infimo acroscopico maxi-mo; segmentis sequentibus lineari-oblongis obtusis, serratis vel crenatis, coriaceis, glabris, olivaceis; venulis simplicibus, venulis spuriiis nullis; soris multis, haud marginalibus, immersis; indusio plerumque plus quam 1 mm lato et minus quam 1 mm alto, trun-cato, laete brunneo cum basi nigra.

No. 147. "A very large fern."

I imagine that this is the "*D. decurrens*" reported from Sumatra by van Alderwerelt, who describes the indusium as "as long as broad." The real *Davallia decurrens* of Hooker has the indusia distinctly longer than broad, and notably small. Of Hooker's figures, Sp. Fil. 1, Plate XLIV B, 2 is correct, but 3, representing a single sorus, is defective, the upper part of the indusium being gone. It is possible that *D. lobbiana* Moore is *D. suma-trana*, but it is described as very much smaller and less cut, but as bearing copious sori.

PTERIS FURCANS Baker.*No. 20. "Common on newly cut soft rock."*

Hitherto known only from Borneo. The Sarawak plants are more slender, but not otherwise distinguishable.

PTERIS BROOKSII sp. nov.

Species gregis *P. quadriaurita* pinnis ovato-lanceolatis decurrentibus anguste pectinatis; stipitibus usque ad 60 cm altis, stramineis, deorsum paleis paucis castaneis horizontalibus vestito, sursum minute furfuraceo, glabrescente; fronde 40 cm alta, 25 cm lata, pinnata cum pinna utroque latere infima furcata, rhachi sub manu molle sub lente minutissime asperula, straminea; pinnis usque ad 7 utroque latere, usque ad 16 cm longis, ca. 4 cm latis, cum cauda integra 2-3 cm longa 2 mm lata terminantibus, stipitatis cum stipite alato, fere ad costam superne setigeram pectinatis, herbaceis, laete viridibus; segmentis integris, obtusis, rectis, ca. 2.5 mm latis, proximis, glabris, medialibus vel inframedialibus longissimis, fere ad apices fertilibus; venis furcatis.

No. 96. "On rocks in deep shade."

Decidedly distinct from other forms in this very comprehensive group.

MONOGRAMMA TRICHOIDEA J. Sm.

No. 119. On smooth trunk of palm.

The published range is "The Philippines and Borneo." I have also a specimen from Pahang.

MONOGRAMMA INTERMEDIA Copel.

No. 185.

Previously known from Negros.

VITTARIA (TAENIOPSIS) SESSILIS sp. nov.

Rhizomate breve, paleis fere nigris e base 1 mm lato ovato in setam angustissimam integram 7-8 mm longam angustatis dense vestito; frondibus confertis, usque ad 35 cm altis, ca. 7 mm latis, usque ad rhizoma 2-3 mm latis, coriaceis, glabris, costa immersa; soro intramarginale, immerso; paraphysium capitibus lineari-cyathiformibus; sporis reniformibus.

No. 183.

So many species of *Vittaria* have been inadequately described that it is difficult to be certain that any apparently new form is not one of them. In *Euvittaria* it would be possible to identify this plant satisfactorily; but it is unmistakably and obviously a *Taeniopsis*, and in this group its broad base is in itself diagnostic.

PROSAPTIA SEMICRYPTA sp. nov.

Rhizomate brevirepente; stipitibus 1-2 cm altis, deorsum vel ubique nigris, minute pilosis; fronde 20-40 cm alta, usque ad 8 cm lata, deorsum abrupte angustata, costa inferne pilis sparsis caducis ornata, aliter glabra nec enim ciliata, herbacea, ad alam 0.5 mm latam pinnatifida; pinnis costam versus abrupte dila-

tatis, aliter linearibus, usque ad 4 cm longis, 2-2.5 mm latis, acutis, leviter crenatis; soris subremotis, submarginalibus, versus marginem apertis; parvis.

No. 93 (type), No. 40. On trunks and bases of trunks.

In position of sori, this is similar to *Prosaptia ancestralis* Copel. of Mindanao, but is very much more delicate and finely cut. Although it seems to me to be distinctly a *Prosaptia*, I have tried to find a name for this plant in *Polypodium*; but the only species it would seem even possibly to be is *P. brevifrons* Scort. in van Alderwerelt's Handbook, p. 600; and a diagnosis of this has never been published. *Prosaptia semicrypta* is distinct in several respects from *Polypodium repandum* Mett.

LOXOGRAMME FORBESII sp. nov.

Rhizomate 3 mm crasso, radicibus pilosissimis more Antrophyi aquam conservantibus dense oblecto; stipite 1 cm alto, nigro, valido; fronde ca. 60 cm alta, 10 cm lata, oblanceolata, acuminata, deorsum ad pedem fusco-siccam truncatam sensim angustata, integra vel minute crenulante, glabra, vix coriacea, infra pallida, costa superne tereta, subtus deorsum carinata; venis, pede sicca excepta, inconspicuis; soris multis, a costa fere ad marginem protensis, prope costam curvis.

No. 121. On trunk.

I suppose this to be Raciborski's var. *Forbesii* of *L. blumeana* Presl, but am quite unable to regard it as a variety of that species. The widened base has the same biological significance as those of *Polypodium musifolium* and *P. linguaeforme* and *Asplenium Nidus*. The texture is thinner and the veins more evident than in large forms of *L. blumeana*, and the appearance of the sori is very distinct. I have made Brooks' plant the type of the species in order to avoid any possible doubt as to the plant which the name, as a specific one, fits.

LOXOGRAMME BROOKSII sp. nov.

Species unica generis foliis vero lanceolatis; rhizomate late repente, 1 mm crasso, paleis parvis angustis vetustate deciduis vestito; stipitibus distantibus, 1 cm longis; fronde uniforme, lanceolata, 12-20 cm alta, 10-12 mm lata, infra mediam latissima, deinde utrinque angustata, valde acuminata, deorsum vix in alam decurrente, integra, coriacea; costa praecipue superne prominente; venis omnino inconspicuis, in parte majore frondis seriem unam solummodo includentibus; soris brevibus, erecto-patentibus, non imbricatis, leviter immersis nec non superne elevatis.

No. 124.

The fronds of *Loxogramme lanceolata* are usually widest above the middle; they are also much more decurrent than this plant, and have longer and broader sori, which are more elevated above the upper surface.

POLYPODIUM (PHYMATODES) CRASPEDOSORUM sp. nov.

Rhizomate repente, 1 mm crasso, paleis e basi minuta peltata anguste setiformibus, 6 mm longis, rubidis, apicem versus pallescentibus; stipitibus 4–6 cm altis, 0.5 mm crassis, glabris; frondibus subdimorphis, sterile 10–12 cm alta, 6–8 mm lata, utrinque angustata, obtusa, integra, margine angustissime cartilaginea coriacea, fertile 12–20 cm alta, ca. 4 mm lata, costa gracile, superne elevata et minute sulcata, subtus tereta; venis omnino occultis, tenuissimis, irregularibus, areolarum series 1–3 utroque latere includentibus; soris submarginalibus, leviter immersis et superne paullo praestantibus, plerisque oblongis et margini parallelis.

No. 134.

Differs from all other species known to me with sori near the margin, *Diblemma samarense*, *Polypodium revolutum*, etc., in the setaceous clothing of the rhizome, and from each species in several other respects; apparently a very distinct novelty.

PHILIPPINE BASIDIOMYCETES, II

By PAUL W. GRAFF

(From the Botanical Section of the Biological Laboratory,
Bureau of Science, Manila, P. I.)

HYMENOMYCETES

TREMELLINEAE

HIRNEOLA Fries

HIRNEOLA POLYTRICHA Mont. in Bel. Voy. Ind. Or. Crypt. 154, sub
Exidia Fr. ex Wahl. F. Nat. (1848) 26.

Exidia purpurascens Jungh. Plant. Java Crypt. (1845) 25 fig. 3.

Auricularia polytricha Sacc. Misc. 1: 12.

BATANES ISLANDS, *Bur. Sci.* 3879 *Fénix*, May-June, 1907.

Distributed through the American and Asiatic tropics and the islands of the Pacific.

GUEPINIA Fries

GUEPINIA RAMOSA Curr. in Trans. Linn. Soc. Bot. 1 (1876) 127.

LUZON, Province of Cagayan, *For. Bur.* 16824 *Curran*, March, 1909: Province of Nueva Ecija, Cabanatuan, *Bur. Sci.* 5258 *McGregor*, September, 1908: vicinity of Manila, *Merrill* 8597, February 10, 1913, on bamboo fence posts.

Previously reported from India.

GUEPINIA SPATHULARIA (Schw.) Fr. Elench. (1828) 32.

Merulius spathularia Schw. in Schr. Nat. Ges. Leip. 6: 20.

LUZON, Province of Rizal, Morong, *Bur. Sci.* 1452 *Ramos*, August, 1906.

Previously reported from the American tropics and Ceylon. Probably of general tropical distribution.

THELEPHOREAE

STEREUM Persoon

STEREUM HIRSUTUM (Willd.) Fr. Epicr. (1838) 549.

Thelephora hirsuta Willd. Flor. Ber. Prod. (1787) 397.

Auricularia reflexa Bull. Hist. Champ. France (1791-1798) 274.

Auricularia aurantiaca Schum., var. *cristulatum* Quel. Champ. Jura. 3 (1873) pl. 1, fig. 15.

LEYTE, *Wenzel* 12, September 30, 1913, on log in forest at an elevation of 60 m.

Of general tropical distribution.

CLADODERRIS Persoon

CLADODERRIS DENTRITICA Pers. ex Fr. Fung. Natal (1848) 22.

Thelephora dendritica Pers. ex Gaud. Bot. Frey. Voy. (1826) pl. 1, fig. 4;
Fr. Epicr. (1838) 536.

Actinostroma crassum Klotz. ex Meyen Beitr. Bot. (1843) 237.

Cladoderris crassa Fr. Fung. Natal. (1848) 22.

Beccariella insignis Ces. Myc. Born. (1879) 9, pl. 4.

LUZON Province of Rizal, Bosoboso, *Bur. Sci.* 1189 Ramos, July, 1906.
MINDANAO, District of Davao, Sibulan River, *Copeland*, April 27, 1904, on decaying wood.

It is very probable that *Cladoderris elegans* (Jungh.) Fr., should also be included in the list of synonyms or, at least, be classed as a variety of *C. dendritica*. There is a very slight difference between the two; the most marked one being in the presence of a greater number of warty or papillate excrescences on the hymenial folds.

Reported from Ceylon, India, Borneo, Cuba and Brazil. Probably of very general tropical distribution.

POLYPOREAE

POLYPORUS Micheli

POLYPORUS BENGUETENSIS (Murr.) comb. nov.

Coltrichia benguetensis Murr. in Bull. Torr. Bot. Club 35 (1908) 391.

Polystictus benguetensis Sacc. & Trott. Syll. Fung. 21 (1912) 312.

LUZON, Province of Benguet, *Elmer* 6047, March, 1904, on dead *Pinus insularis*; Baguio, *Merrill* 5003, October–November, 1905, on earth above prostrate logs of *Pinus insularis*.

Broken surface pileus shining golden yellow-brown, poriferous layer of the same color as the upper surface, brown and quite distinct from the flesh of the pileus. This species should be placed in the genus *Polyporus* without question.

Known only from the Philippines.

FOMES Fries

FOMES FASTUOSUS (Lév.) Cooke in Grevillea 14 (1886) 18.

Polyporus fastuosus Lév. in Ann. Sci. Nat. III 2 (1844) 190.

LUZON, Province of Nueva Vizcaya, Dupax, *Bur. Sci.* 14364 McGregor, March–April, 1912; Province of Bataan, Mount Mariveles, *Copeland* 145, January 30, 1906; Lamao, *For. Bur.* 15568 Curran, November, 1908; Province of Rizal, Antipolo, *For. Bur.* 7044 Curran, May, 1907. MINDORO, Mount Halcon, *Merrill* 6114, November, 1906. BABUYANES ISLANDS, Camiguin, *Bur. Sci.* 4171 Fénix, June–July, 1907. MINDANAO, Lake Lanao, Camp Keithley, *Clemens*, June–July, 1907.

On comparing the material in the Bureau of Science herbarium it is found that *Pyropolyporus fastuosus* (Lév.) Murr., this name having been first used and published by Murrill for Philippine material,¹ is a misnomer. The specimen given that name by him is in reality *Fomes spadiceus* (Berk.)

¹ Murrill in Bull. Torr. Bot. Club 34 (1907) 179.

Cooke. The name *Pyropolyporus fastuosus*, therefore, becomes a synonym for *Fomes spadiceus* rather than *F. fastuosus*.

Previously collected in Malacca.

FOMES KORTHALSII (Lév.) Cooke in Grevillea 14 (1886) 19.

Polyporus korthalsii Lév. in Ann. Sci. Nat. III 5 (1846) 133.

Pyropolyporus subextensus Murr. in Bull. Torr. Bot. Club 35 (1908) 413.

Fomes subextensus (Murr.) Sacc. & Trott. Syll. Fung. 21 (1912) 288.

LUZON, Province of Benguet, Pauai, *Bur. Sci.* 8732 McGregor, June, 1909. NEGROS, *For. Bur.* 19119 Curran, September, 1909, on dead *Shorea*. MINDANAO, District of Davao, Mt. Apo, *Elmer* 10646, May, 1909: Lake Lanao, Camp Keithley, *Mary Strong Clemens*, September, 1907 (cotype of *Pyropolyporus subextensus* Murr.)

The typical material of *Pyropolyporus subextensus* Murr., proves on comparison to be *Fomes korthalsii* (Lév.) Cooke rather than a distinct species.

Previously collected in Sumatra.

FOMES LAMAOËNSIS (Murr.) Sacc. & Trott. Syll. Fung. 21 (1912) 287.

Pyropolyporus lamaoënsis Murr. in Bull. Torr. Bot. Club 34 (1907) 479.

Pyropolyporus williamsii Murr. l. c. 479.

Fomes williamsii (Murr.) Sacc. & Trott. Syll. Fung. 21 (1912) 289.

LUZON, Province of Cagayan, *For. Bur.* 16710 Bacani, March, 1909: Province of Benguet, *Bur. Sci.* 12878 Fénix, November–December, 1910: Province of Rizal, Montalban, *Merrill* 5089, March, 1905; Bosoboso, *For. Bur.* 9526 Curran, February, 1908: Province of Bataan, Lamao, *For. Bur.* 15593 Curran, November, 1908, *For. Bur.* 19210, 19218 Curran, November, 1909. MINDORO, *For. Bur.* 12235 Rosenbluth, April–June, 1908; Mt. Halcon, *Merrill* 6120, November, 1906. BABUYANES ISLANDS, *Bur. Sci.* 4177 Fénix, June–July, 1907. NEGROS, Gimagaan River, *Copeland* 15, January, 1906, *For. Bur.* 19109 Curran, September, 1909. MINDANAO, District of Davao, Catalonan, *Copeland* 922, April, 1904: Lake Lanao, Camp Keithley, *Clemens*, s. n., July, 1907: Province of Agusan, Mt. Urdaneta, *Elmer* 13679, September, 1912. POLILLO, *Bur. Sci.* 10552 McGregor, October–November, 1909.

As *Pyropolyporus lamaoënsis* Murr., appears first in publication this name has precedence over *P. williamsii* Murr., though it is based on an immature specimen of the species described further on in the article under the latter name. The description, therefore, of *P. lamaoënsis* should be emended by being made to agree with Murrill's diagnosis of *P. williamsii*.

Collected only in the Philippines.

FOMES PACHYPHLOEUS Pat. in Journ. Bot. (1889) 257, pl. 8; Bres. in Bull. Soc. Myc. (1890) 41.

Elfvingia elmeri Murr. in Bull. Torr. Bot. Club 34 (1907) 476.

Ganoderma elmeri Sacc. & Trott. Syll. Fung. 21 (1912) 295.

LUZON, Province of Bataan, *For. Bur.* 19222, 19240 Curran, November–December, 1909; Moron, *For. Bur.* 6419 Curran, February, 1907, on *Parkia roxburghii*; Lamao, *For. Bur.* 15587 Curran, November, 1908, on dead *Albizia procera*; Mt. Mariveles, *Elmer* 6961, November, 1904 (Type number

of *Elfvingia elmeri* Murr.), *For. Bur.* 19253 Curran, January, 1910, on *Albizzia retusa*. CULION, Merrill 3570, December, 1902, on decaying portion of a living tree. MINDANAO, Lake Lanao, Camp Keithley, Clemens s. n., July, 1907. POLILLO, *Bur. Sci.* 10526, 10554 McGregor, October–November, 1909.

Collections of this species have been made in Cameroon and in the Fiji Islands.

FOMES ROSEO-ALBUS (Jungh.) Bres. in *Hedwigia* 53 (1912) 57.

Polyporus roseo-albus Jungh. *Plant. Jav. Crypt* (1845) 43.

Fomes mortuosus Fr. *Nov. Symb. Myc.* (1851) 64.

Polyporus endapalus Berk. in *Journ. Linn. Soc.* 13 (1873) 163.

Polyporus caliginosus Berk. in *Journ. Linn. Soc.* 16 (1878) 46.

Corioloopsis copelandi Murr. in *Bull. Torr. Bot. Club.* 35 (1908) 392.

Polystictus copelandi Sacc. & Trot. *Syll. Fung.* 21 (1912) 322.

LUZON, Province of Bataan, Lamao, *Copeland* 147, February, 1904: Province of Rizal, Bosoboso, *Bur. Sci.* 1214 Ramos, July, 1906. MINDANAO, District of Davao, *Copeland* 714, March 28, 1904 (Type number of *Corioloopsis copelandi* Murr.); Lake Lanao, Camp Keithley, *Bur. Sci.* 21319, 21320, 21321 Clemens, June, 1907.

This is a rather common species of *Fomes* in the Philippines and Murrill's *Corioloopsis copelandi* must be referred to it without question.

Reported from Malacca and other portions of the Asiatic tropics.

FOMES SPADICEUS (Berk.) Cooke in *Grevillea* 14 (1886) 20.

Polyporus spadiceus Berk. in *Ann. Nat. Hist.* I 3 (1839) 388.

Pyropolyporus fastuosus Murr. in *Bull. Torr. Bot. Club* 34 (1907) 479.

LUZON, Province of Bataan, *For. Bur.* 19233 Curran, December, 1909; Lamao, *For. Bur.* 15585 Curran, November, 1908: Province of Nueva Ecija, Cabanatuan, *Bur. Sci.* 5240 McGregor, September, 1908. MINDANAO, Zamboanga, *For. Bur.* 8972 Whitford & Hutchinson, January, 1908.

Curran 19233, named by Murrill, *Pyropolyporus fastuosus* (Lév.) Murr., proves, on an examination of the material of the same collection retained in the herbarium of the Bureau of Science, to be not *Fomes fastuosus* Lév., but *F. spadiceus* (Berk.) Cooke, or, according to Murrill's classification, should have been called *Pyropolyporus spadiceus* (Berk.). It differs from *F. fastuosus* in that the context is yellow-brown instead of brown, and is much thinner. The pore layers are also thinner and the top has a slightly dull velvety appearance rather than being shiny-velvety. There is an evident relationship between this species and *Polystictus spadiceus* (Jungh.) Fries.

Previously collected in India.

FOMES SUBCHINONEUS (Murr.) comb. nov.

Tyromyces subchioneus Murr. in *Bull. Torr. Bot. Club* 35 (1908) 406.

Polyporus subchioneus Sacc. & Trott. *Syll. Fung.* 21 (1912) 278.

MINDANAO, District of Davao, Mount Apo, *Copeland* 1074, April 20, 1904 (Cotype of *Tyromyces subchioneus* Murr.)

This species should be transferred to *Fomes* rather than *Polyporus* as was done by Saccardo and Trotter. The cotype specimen preserved in the herbarium of the Bureau of Science shows the presence of three distinct pore layers.

So far, only reported from the Philippines.

FOMES UNGULIFORMIS (Murr.) comb. nov.

Tyromyces unguiformis Murr. in Bull. Torr. Bot. Club. 35 (1908) 406.

Polyporus unguiformis (Murr.) Sacc. & Trott. Syll. Fung. 21 (1912) 277.

BALABAC, Tamburot, *Bur. Sci.* 533 Mangubat, March-April, 1906, (Cotype of *Tyromyces unguiformis* Murr.)

The cotype material of this species, like that of the preceding, has several pore layers and, hence, belongs in the genus *Fomes*.

Reported only from the Philippines.

POLYSTICTUS CERVINO-GILVUS (Jungh.) Fr. Nov. Symb. (1851) 94.

Polyporus cervino-gilvus Jungh. Flor. Crypt. Jav. (1838) 45, pl. 9.

Trametes dermatodes Lév. in Ann. Sci. Nat. Bot. III, 2 (1844) 196.

Polyporus dermatodes Lév. Bot. Voy. Bonite, (1846) 180, pl. 138, fig. 2.

Polyporus peradeniae Berk. & Br. in Journ. Linn. Soc. 14 (1875) 51.

Hexagonia vitellina Ces. in Nap. Accad. Atti 8 (1879) 8.

Coriolopsis dermatodes Murr. in Bull. Torr. Bot. Club 34 (1907) 466.

Coriolopsis melleo-flavus Murr. in Bull. Torr. Bot. Club 35 (1908) 393.

Polystictus melleo-flavus Sacc. & Trott. Syll. Fung. 21 (1912) 324.

LUZON, Subprovince of Ifugao, *Bur. Sci.* 20035 McGregor, February, 1913: Province of Nueva Vizcaya, *Bur. Sci.* 20280, 20292 McGregor, January, 1913: Province of Nueva Ecija, Cabanatuan, *Bur. Sci.* 5239 McGregor, September, 1908: Province of Rizal, Bosoboso, *Bur. Sci.* 2158 Ramos, February 1907; Jalajala, *Bur. Sci.* 11958 Robinson, October 27, 1910: Province of Bataan, Lamao, *For. Bur.* 15584 Curran, November, 1908, 19216 Curran, November, 1909. MINDORO, Bulalacao, *Bur. Sci.* 6669 Robinson, March 14-24, 1909. MINDANAO, District of Zamboanga, San Ramon, *Copeland* 492, 733, May, 1904; Zamboanga, *For. Bur.* 9238 Whitford and Hutchinson, January, 1908, on dead wood (cotype of *Coriolopsis melleo-flavus* Murr.).

The pore bearing surface of this fungus changes its color with age. In young growing specimens it is of a lemon-yellow color while later it becomes tawny or reddish brown to dull brown. The specimens described by Murrill as *Coriolopsis melleo-flavus* had been gathered while growing and were well preserved, hence his new name for the species, and his reason for creating it.

Collected previously in Borneo, Java, and Ceylon.

POLYSTICTUS DEALBATUS (B. & C.) Saccardo Syll. Fung. 6 (1888) 218.

Polyporus dealbatus B. & C. in Ann. Mag. Nat. Hist. II, 12 (1853) 432.

Polyporus mutabilis B. & C. l. c. 433.

Polyporus petaliformis B. & C. in Journ. Linn. Soc. Bot. 10 (1868) 307.

Polyporus polygrammus B. & C. l. c. 307.

Polyporus ravenelii B. & C. in Grevillea 1 (1872) 38.

Polystictus cretatus Cooke in Trans. Bot. Soc. Edinb. 13 (1878) 137.

Polyporus cervicornis Cooke in Grevillea 17 (1889) 59.

Microporellus dealbatus Murr. in Bull. Torr. Bot. Club 32 (1905) 483.

LUZON, Province of Zambales, *For. Bur.* 8203 Curran & Merritt, November-December, 1907. MINDANAO, Lake Lanao, Camp Keithley, Mrs. Clemens s. n. July, 1907.

Saccardo publishes this as *Polystictus dealbatus* but fails to give the authority for the change from *Polyporus* as published by Berkeley and Curtis.

Reported mainly from the American tropics.

POLYSTICTUS FUNALIS Fr. Epicr. (1838) 459.

Funalia funalis Pat. Tax. Hymén. (1900) 95.

LUZON, Province of Benguet, *Elmer* 6355, May, 1904, on fallen logs.

This species has also been reported from here as *Polystictus mons-veneris* Jungh. Previous collections have been made in Madagascar, Guinea, and Brazil.

POLYSTICTUS INQUINATUS Lév. in Ann. Sci. Nat. Bot. III 5 (1846) 140.

Microporellus subdealbatus Murr. in Bull. Torr. Bot. Club 34 (1907) 471.

Polystictus subdealbatus Sacc. & Trott. Syll. Fung. 21 (1912) 309.

Polystictus subdealbatus Bres. in Hedwigia 53 (1912) 65.

LUZON, Province of Bataan, Lamao, *Merrill* 3511, October, 1903, on prostrate logs (Cotype of *Microporellus subdealbatus* Murr.). MINDANAO, District of Zamboanga, Quinital, *For. Bur.* 9226 *Whitford & Hutchinson*, January, 1908.

Previously reported from India.

POLYSTICTUS MELEAGRIS (Berk.) Cooke in Grevillea 14 (1886) 79.

Polyporus meleagris Berk. in Journ. Linn. Soc. Bot. 16 (1878) 42.

Coriolus clemensiae Murr. in Bull. Torr. Bot. Club 35 (1908) 394.

Polystictus clemensiae Sacc. & Trott. Syll. Fung. 21 (1912) 318.

LUZON, Province of Cagayan, Camatauiogan, *For. Bur.* 16875 *Bacani*, February, 1909; Province of Laguna, Los Baños, *Bur. Sci.* 9670 *Robinson*, February 28, 1910, on dead wood; Paete, *For. Bur.* 9644 *Curran*, March, 1908; Province of Bataan, *For. Bur.* 19228 *Curran*, November, 1909; Lamao River, *Copeland* 185, 247, February, 1904. NEGROS, Gimagaan River, *Copeland* 10, January 6, 1904, on a decaying log. MINDANAO, Lake Lanao, Camp Keithley, *Clemens s. n.* September–October, 1907 (cotype of *Coriolus clemensiae* Murr.): Province of Surigao, Caraga, *Merrill* 5460, October 6, 1906; District of Davao, *Copeland* 458, 925, March, 1904. POLILLO, *Bur. Sci.* 6860 *Robinson*, August, 1909, *Bur. Sci.* 10539 *McGregor*, October–November, 1909. LUMBACAN, *Merrill* 5281, October 7, 1906, on dead *Calophyllum inophyllum*.

On comparison of the cotype material of *Coriolus clemensiae* Murr., with the specimens of *Polystictus meleagris* (Berk.) Cooke, in the herbarium of the Bureau of Science there can be no doubt of their being identical.

Previously collected on the Island of Aru by the Challenger Expedition.

POLYSTICTUS MURINUS (Lév.) Sacc. Syll. Fung. 6 (1888) 226.

Polyporus murinus Lév. in Ann. Sci. Nat. Bot. III 2 (1844) 185.

Coriolus murinus Pat. Tax. Hymén. (1900) 94.

Coriolus currani Murr. in Bull. Torr. Bot. Club 35 (1908) 395.

Polystictus currani Sacc. & Trott. Syll. Fung. 21 (1912) 319.

LUZON, Province of Cagayan, *For. Bur.* 16639 Curran, February, 1909, *Bur. Sci.* 7593 Ramos, March 1909: Subprovince of Ifugao, Payauan, *Bur. Sci.* 20039, 20052 McGregor, February, 1913: Province of Laguna, Los Baños, *Bur. Sci.* 9669 Robinson, February 2-8, 1910; Mt. Maquiling, *For. Bur.* 8965, Curran & Merritt, October 23-24, 1907 (Cotype of *Coriolus currani* Murr.); San Antonio, *For. Bur.* 13242 Curran, March, 1912; Paete, *For. Bur.* 9640 Curran, March, 1908: Province of Tayabas, Mauban, *For. Bur.* 9591, 9592 Curran, March, 1908; Dapdap Point, *Bur. Sci.* 13122 Foxworthy, March, 1911; Mt. Pular, *Bur. Sci.* 19398 Ramos, January, 1913. NEGROS, Gimagaan River, *Copeland* 5, January 6, 1904.

A comparison of the cotype material of *Coriolus currani* Murr., with authentically named specimens of *Polystictus murinus* Lév., discloses their identity and the necessity of reducing Murrill's species to a synonym of the latter.

Previously reported from Java.

POLYSTICTUS SPADICEUS (Jungh.) Fries Nov. Symb. Myc. (1851).

Polyporus spadiceus Jungh. Flor. Crypt. Java (1838) 54, pl. 30.

Polystictus microcycclus Zipp. ex Lév. in Ann. Sci. Nat. III, 2 (1844) 188.

Polystictus tabacinus Mont. ex Gay Hist. Fisica Pol. Chile 7 (1845) 361, pl. 7, fig. 6.

Fomes substygius B. & Br. ex Cooke Praec. Polyp. n. 522.

Polystictus xerampelinus Kalchbr. in Grevillea 4 (1876) 72.

Cycloporellus microcycclus Murr. in Bull. Torr. Bot. Club 34 (1907) 468.

Polystictus substygius Bres. in Hedwigia 53 (1912) 66.

LUZON, Province of Cagayan, *Bur. Sci.* 7594 Ramos, March, 1909: Province of Nueva Vizcaya, Dupax, *Bur. Sci.* 14371 McGregor, March-April, 1912: Subprovince of Ifugao, *Bur. Sci.* 20037 McGregor, February, 1913: Province of Benguet, Sablang, *Bur. Sci.* 12848 Fénix, November-December, 1910: Province of Rizal, *Bur. Sci.* 1860 Ramos, January, 1907, *Bur. Sci.* 13459 Ramos, February, 1911; San Isidro, *Bur. Sci.* 84 Foxworthy, January, 1906; Montalban, *Merrill* 5086, March, 1906: Province of Laguna, Mt. Maquiling, *Bur. Sci.* 15956, 15981 Graff, February 23-28, 1912; Paete, *Bur. Sci.* 10065 Ramos, July, 1909: Province of Bataan, Lamao, *For. Bur.* 15570 Curran, November, 1908; Mt. Mariveles, *Merrill* 3707, January, 1904, on prostrate logs, *Copeland* 166, January, 1906: Province of Tayabas, Mt. Malaraya, *For. Bur.* 8960 Curran & Merritt, November, 1907; Lagui-manoc, *Merrill* 4023, March, 1913. NEGROS, *For. Bur.* 13739, 19108 Curran, September, 1909, on decaying logs. NEGROS, Dumaguete, *Elmer* 10019, April, 1908. MINDANAO, District of Lanao, Lake Lanao, Camp Keithley, *Mrs. Clemens*, s. n., July-September, 1907: Subprovince of Butuan, *Weber* 1237, 1271, March-July, 1911; District of Davao, Mt. Apo, *Elmer* 10604, May, 1909: POLILLO, *Bur. Sci.* 6836 Robinson, August, 1909.

This species is exceedingly common throughout the Archipelago. Some slight variation is found in the upper surface, which may be velvety or nearly lack the short tomentum, and in the texture, which may be thin and flexible or somewhat rigid. These differences, however, are not so great but that all forms may be found in a single collection when represented by a number of specimens. From an observation of material collected in quantity and from a number of localities there can be no doubt

but that the various isolated specimens known specifically as *P. spadiceus*, *P. microcycclus*, *P. tabacinus* and *P. substygius* really belong to the same species. *P. callimorphus* Lév. is a near relative.

Previously reported from Chili, Juan Fernandez, New Zealand and Java.

POLYSTICTUS SPADICEUS (Jungh.) Fr. var. **BARBATUS** (Murr.)
comb. nov.

Cycloporellus barbatus Murr. in Bull. Torr. Bot. Club 35 (1908) 397.

Polystictus barbatus Sacc. & Trott. Syll. Fung. 21 (1912) 321.

LUZON, Province of Zambales, *For. Bur. 8208 Curran & Merritt*, November–December, 1907.

It hardly seems warranted to make a distinct species of this fungus as in microscopic and macroscopic characters the fruiting surface and context are identical with that of *P. spadiceus* (Jungh.) Fr. The distinction occurs in that the specimens of this collection, as the name given it implies, possess a long tomentose covering on the upper surface. This surface is also somewhat darker. The tomentum varies from short hairs at the outer margin, up to 3 mm in length near the place of attachment of the pileus. In typical specimens of *P. spadiceus* the upper surface varies in character from short-tomentose to smooth and appears velvety rather than hairy.

Collected only in the Philippines.

POLYSTICTUS SUBVERNIPES (Murr.) Sacc. & Trott. Syll. Fung. 21
(1912) 320.

Coriolus subvernipes Murr. in Bull. Torr. Bot. Club 35 (1908) 397.

LUZON, Province of Rizal, Bosoboso, *Bur. Sci. 2144 Ramos*, February, 1907, on *Cassia fistula* (cotype of *Coriolus subvernipes* Murr.), *Bur. Sci. 2145 Ramos*, February, 1907, on *Mangifera altissima*.

This species is published by Saccardo and Trotter as *P. subverniceps*, an error in the spelling of the specific name.

Reported only from the Philippines.

POLYSTICTUS VINOSUS Berk. in Ann. Mag. Nat. Hist. II, 9 (1852) 196.

Nigroporus vinosus Murr. in Bull. Torr. Bot. Club 32 (1905) 361.

LUZON, Province of Benguet, Sablang, *Bur. Sci. 12864 Fénix*, November–December, 1910: Province of Rizal, Bosoboso, *Bur. Sci. 2148 Ramos*, February, 1907: Province of Bataan, Mt. Mariveles, *Merrill 3695*, January 1, 1904. MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens s. n.*, June, October, 1907.

The previous collections of this fungus were made in Cuba, which specimens were made the type of Murrill's genus *Nigroporus*. This is not the same as *Polyporus badius* Jungh., as reported by Bresadola in Hedwigia 53 (1912) 54, but quite distinct. As Murrill states for the Cuban material, "the species is easily recognized by its wine-colored context." The same characterization holds true for the Philippine specimens. Besides this, in the Philippine collections, the pore surface of the young growing specimens is also of the same color; changing later to brown. The pileus of *P. badius* is considerably thicker than that of *P. vinosus* and is striate to fibrillose-striate while the latter shows no signs of striae. The pores of *P. vinosus* measure but 100 μ while those of *P. badius* are 285 μ across. Both species are well represented in the herbarium of the Bureau of Science.

TRAMETES Fries

TRAMETES ELMERI (Murr.) comb. nov.

Tyromyces elmeri Murr. in Bull. Torr. Bot. Club 34 (1907) 475.

Polyporus elmeri Sacc. & Trott. Syll. Fung. 21 (1912) 279.

LUZON, Province of Bataan, Mt. Mariveles, *Elmer 6954*, November, 1904 (cotype of *Tyromyces elmeri* Murr.).

The habit of this fungus is very similar to that of the resupinate forms of *Trametes corrugata* (Pers.) Bres.

Reported only from the Philippines.

DAEDALEA Persoon

DAEDALEA IMPONENS Cesati in Nap. Accad. Atti. 8 (1879) 7.

Funalia philippinensis Murr. in Bull. Torr. Bot. Club 34 (1907) 469.

Polystictus philippinensis Sacc. & Trott. Syll. Fung. 21 (1912) 321.

LUZON, Province of Bataan, Lamao, *Copeland 157*, January 29, 1904, *For. Bur. 19189 Curran*, November, 1909.

A slight tendency is shown in some specimens toward a *Polystictus* type of pore. The labyrinthine type, however, is usually strongly pronounced. Previously collected by Beccari in Sarawak, Borneo.

LASCHIA Fries

LASCHIA (FAVOLASCHIA) CALMICOLA P. Henn. & E. Nym. in Warburg Monsunia 1 (1899) 13.

LUZON, Province of Bataan, Lamao, *Bur. For. 20607 Curran*, December, 1909.

This material averages slightly larger than that originally described from Java, being 2.5 to 5 mm wide, 2 to 5 mm long and with a stipe 1.5 to 2 mm long and 0.5 mm thick.

AGARICINEAE

LEPIOTA Fries

LEPIOTA CEPAESTIPES (Sow.) Quél. Champ. Jura 1 (1873) 73.

Agaricus cepaestipes Sow. Engl. Fungi (1797) pl. 2.

LUZON, Manila, *Bur. Sci. 21327 Graff*, July 21, 1913, growing in grass on a lawn, *Bur. Sci. 21326 Graff*, July 23, 1913, growing at the base of a clump of bamboo.

Spores $5.5 \times 7.5 \mu$ with very large, usually single, guttulae averaging $2.5 \times 3.8 \mu$. Basidia broad clubshaped, $11.5 \times 15 \mu$, with four sterigmata, 3.8μ long. Stipe stuffed at first, later becoming hollow.

Collected previously in the warmer parts of Europe, India and Brazil.

LEPIOTA ESCULENTA (Mass.) Sacc. & Syd. Syll. Fung. 16 (1902) 2.

Chlorophyllum esculentum Mass. in Kew Bull. (1898) 135.

Lepiota chlorospora Copel. in Ann. Myc. 3 (1905) 28; Govt. Lab. Publ. 28 (1905) 143.

LUZON, Manila and vicinity, *Bur. Sci. 16814, 20979 Graff*, August, 1912, growing on lawn.

It hardly seems sufficient reason for designating *L. esculenta* and *L. chlorospora* two distinct species when there is no more difference than the

fact that the annulus was movable in the material from which the original diagnosis was written in the case of the former species and fixed in the latter. While fixed in the growing specimens it tends frequently to become loosened in the Philippine material as it dries. The specimens collected about Manila also show a considerable variation in the number of flocculent scales on the upper surface of the pileus. In some collections made they are numerous while in others they are almost entirely lacking.

First described from material collected in British Guiana. Found so far only in the American tropics and the Philippines.

LEPIOTA FUSCO-SQUAMEA Peck in Rep. State Mus. New York, 25: 50.

LUZON, Manila, *Merrill 9170*, July 24, 1913, growing in lawn.

Cap 3 to 4 cm in diameter, stipe 4 to 5 cm long and 4 mm thick, basidia 9.5 by 24.5 μ , spores 5 by 11.5 μ .

Previously collected in the United States.

LEPIOTA MANILENSIS Copel. in Ann. Myc. 3 (1905) 29; Govt. Lab. Publ. 28 (1905) 145.

LUZON, Manila, *Bur. Sci. 21325 Graff*, July 30, 1913, in grass by roadside.

Mature spores of these specimens average 7.5 by 11.5 μ , slightly larger than those of Copeland's collection but none reach the size given as the dimension of the largest found by him. The stipe is stuffed at first but may become hollow at maturity.

Reported only from the Philippines.

LEPIOTA PULCHERRIMA nom. nov.

Lepiota candida Morg. in Journ. Myc. 12 (1906) 202, non Copel.

LUZON, vicinity of Manila, *Sanchez 56*, September, 1913, growing on lawn.

Unfortunately Morgan's name is antedated by *L. candida* Copel., and, what is still more unfortunate, the type of Copeland's species has been lost. There can be little doubt but that this collection represents a form of Morgan's species, the only difference being in the size of the spores, those of the Manila specimens measuring 4.5 to 5.5 by 7 to 8 μ while Morgan's figures are 3 to 4 by 5 to 7 μ , and in the surface of the pileus and stipe which are more floccose than fibrillose. Copeland's species is described as shining, almost naked and with spores measuring 6 by 9.5 μ . The "strongly fusiform lower third of the stipe" is characteristic of both Copeland's and Morgan's specimens as well as the other material under discussion. The spores of this collection average half way between the other two in size while the surface of the pileus of *L. candida* Morg., is intermediate in character between Copeland's species and this last Manila collection. It seems possible that, could Copeland's species be reestablished, his name would be the proper one for this fungus. Until this can be done, however, it will be necessary to consider them as two distinct species.

Collected previously in the United States.

LEPIOTA REVELATA B. & Br. in Journ. Linn. Soc. 11 (1871) 510.

LUZON, Manila, *Bur. Sci. 21324 Graff*, July 24, 1913, growing on lawn.

Collected previously in Ceylon.

LEPIOTA SULPHOPENITA sp. nov.

Solitaria vel pauci-caespitosa; pileo primo globoso dein e campanulato expanso, sulphurio, minute-flocculoso, unicolor vel raro centro umbone aurantiaco-flocculoso, membranaceo-carnoso, 5 ad 6 cm diam., carne tenui sulphurio, margine striato-sulcato; lamellis liberis, sulphureis, membranaceis; stipite cylindraceo, basi elongato-bulboso praedita, sulphurio flocculosa, cavo, 8 ad 10 cm longis, 7 ad 10 mm latis; annulo membranaceo, secedente; sporis ovatis, pallide luteis, uniguttulatis, apiculatis, $5.5\ \mu$ latis, $11.5\ \mu$ longis.

Plants growing solitary or gathered in tufts of a few. Pileus at first globose, then developing from campanulate to broadly expanded, sulphur yellow, covered with fine floccose scales which may disappear in older specimens, for the most part of one color throughout, rarely found with the center of the cap of an orange color, thin-fleshy, 5 to 6 cm in diameter, margin deeply striate-furrowed, flesh yellow. Stipe cylindric with an elongate bulbous base, sulphur yellow, floccose, hollow, 8 to 10 cm long, 7 to 10 mm broad. Annulus thin and separating easily from the stipe. Spores ovate, pale yellow, uniguttulate, apiculate, 5.5 by $11.5\ \mu$.

LUZON, Manila, *Merrill 8417*, September, 1912, growing on decaying wood.

TRICHOLOMA Fries**TRICHOLOMA TENUIS** sp. nov.

Pileo carnoso, convexo, plano dein concavo, centrum badio-fusco evade circa marginem albi, margine striato-sulcato, floccoso; flocculis sparsis, badio-fuscis; carne tenue, 2 mm crassa, alba; stipite pilei concolori, carnoso-fibrilloso, solido dein cavo, 5 cm longo, basi vix incrassatulo 8 mm, medio 5 ad 6 mm; lamellis albis, adnatis, 5 mm latis; basidiis longo-clavatis, $7.5\ \mu$ latis, $38\ \mu$ longis; sporis ellipsoideis ad irreguliter ellipsoideis, $3.5\ \mu$ latis, $7.5\ \mu$ longis, uniguttulatis, hyalinis.

Plants growing solitary. Pileus fleshy, convex to expanded and concave in old specimens, odor slight, of a red-brown color in the center with striae of the same color extending outward toward a sulcate margin, in the outer half of the radius of the cap the red-brown of the center becomes diminished to white. Over the white portion are scattered a few flocculent reddish-brown scales. The cap averages about 6 cm in diameter. The flesh is thin, about 2 mm in thickness, white. Margin thin and becoming more or less irregularly lacerated. Stipe of a similar color to the center of the pileus but somewhat diluted, fleshy-

fibrous, inner portion fibrous becoming hollow at maturity, 5 cm long, diameter varying gradually from 8 mm at the base to 6 mm near the middle and 5 mm at the top. Lamellae white, varying in length, 5 mm broad at the center and rounding off at both ends; to a thin margin on the outside and being slightly adnate at the inner extremity. Basidia long, narrow, club-shaped, 7.5 by 38 μ . Spores elliptic to irregularly-elliptic, 3.5 by 7.5 μ , uniguttulate, colorless.

LUZON, Manila, *Bur. Sci.* 21660 Graff, August 5, 1913, in grass on lawn.

MARASMIUS Fries

MARASMIUS CAPILLIPES Sacc. F. Ven. Ser 5: 162.

LUZON, Manila, *Merrill* 8399, October 2, 1912, on decaying roots of *Streblus asper*.

Previously reported from Italy.

MARASMIUS ERUMPENS Mass. in Kew Bull. (1898) 119.

LUZON, Manila, *Sanchez* 57, September 5, 1913, on dead tree branches.

Previously collected in Borneo.

MARASMIUS PATOUILLARDI Sacc. & Syd. Syll. Fung. 14 (1890) 113.

Marasmius nigripes Pat. in Journ. Bot. (1897) 337, not Schw.

LUZON, Province of Bataan, Lamao, *For. Bur.* 20606 Curran, December, 1907, on dead twigs. BABUYANES ISANDS, *Bur. Sci.* 3929 Fénix, June, 1907.

Collected previously in Tonkin.

MARASMIUS SICCUS Schw. in Schrift. Nat. Ges. Leip. 6: 677, ex Fries Epicr. (1838) 382.

LUZON, Province of Laguna, Paete, *Bur. Sci.* 10066 Ramos, July, 1909.

Collected previously in the United States.

LENTINUS Fries

LENTINUS LAGUNENSIS Graff in Philip. Journ. Sci. 8 (1913) Bot. 302.

LUZON, Province of Laguna, San Antonio, *Bur. Sci.* 16839 Ramos, June, 1912, in forest; Mt. Maquiling, *Bur. Sci.* 16696 Brown, October, 1912, in forest.

This second collection of the species has all the characteristics of the first except size, the specimens averaging somewhat smaller. Height 10 to 12 cm, pileus 6 to 8 cm in diameter, stipe 5 to 6 cm high and 4 to 8 mm thick.

Known only from the Philippines.

LENTINUS MACGREGORII sp. nov. (Plate II.)

Pileis carnosio-membranaceis, lentis, infundibuliformis vel crateriformis, fuscis vel fulvis, nitidis, glabris, nudis, 6 ad 8.5 cm latis; margine acuto, involuto; stipite brevi, solido, duro, centrale vel subexcentrico, 10 ad 15 mm longo, 7 ad 10 mm crasso, melleo-albicante, annulo siccate fuligineo praedito; lamellis decurrentibus, membranaceis, inaequalibus, concoloribus;

basidiis clavatis, 5 ad 19 μ ; sporis hyalinis, 2 ad 2.6 μ , sphaeroideo-ellipsoideis.

Pileus fleshy, thin, tough, flexible, funnel shaped to crateriform, tawny to dark brown, smooth, with a shining surface, slightly fibrillose-striate, 6 to 8.5 cm in diameter. Margin acute, somewhat involute, thin. Stipe short, solid and hard, central to subexcentric, 10 to 15 mm long, 7 to 10 mm thick, yellowish, somewhat bulbous, to which part slight remnants of a veil remain attached and below which the stipe is attenuated into a root-like prolongation. Lamellae decurrent, membranaceous, unequal, of the same color, as the stipe. Basidia clavate, 5 by 19 μ . Spores hyaline, 2 by 2.6 μ , round-ellipsoid.

LUZON, Province of Nueva Vizcaya, vicinity of Dupax, *Bur. Sci.* 14374 *McGregor*, March–April, 1912.

LENTINUS PRAERIGIDUS Berk. in Hook. Kew Gard. Journ. 6 (1854) 132.

Lentinus kurzianus Berk. & Curr. in Trans. Linn. Soc. Bot. 1 (1876) 120, pl. 20, fig. 2.

BABUYANES ISLANDS, Camiguin, *Bur. Sci.* 4179 *Fénix*, June–July, 1907.

LUZON, Province of Nueva Vizcaya, vicinity of Dupax, *Bur. Sci.* 14373 *McGregor*, March–April, 1912: Province of Zambales, Subic, *For. Bur.* 7028 *Curran*, May, 1907: Province of Rizal, Mt. Paimlan, *Bur. Sci.* 13466 *Ramos*, February 3, 1911, on dead tree; Montalban, *Merrill* 5094, March, 1906: Province of Bataan, Lamao, *For. Bur.* 19232 *Curran*, December, 1909; Mt. Mariveles, *Merrill* 3703, 3710, January 1, 1904, *Bur. Sci.* 16765 *Graff*, April, 1912. MINDANAO, Subprovince of Butuan, *Weber* 1264 March–July, 1911.

Previously collected in India.

LENTINUS STRIGOSUS (Schw.) Fr. Elench. 1 (1828) 47.

Agaricus strigosus Schw. in Schrift. Natur. Ges. Leip. 1 (1822) 89.

Panus rudis Fr. Epicr. (1836–1838) 398.

PALAWAN, Taytay, *Merrill* 8848, 8863, April and May, 1913, on rotten logs in thickets. MINDANAO, District of Cotabato, Pollok Harbor, *Cope-land* 330, March 2, 1904.

Collected previously in the United States, Cuba, Guinea, Ceylon, and Madagascar. Probably to be found growing throughout the tropics.

LENTINUS WOODII Kalchbr. in Grevillea 9 (1881) 136.

LUZON, Manila, *Bur. Sci.* 16851 *Schultze*, September 14, 1912, growing on lawn.

Previously collected in Natal.

NAUCORIA Fries

NAUCORIA PEDIADES Fr. Syst. Myc. 1 (1821) 290; Hym. Eur. (1874) 260.

Agaricus pusillus Schaeff. Fung. Bav. Pal. Ic. (1762–1774) pl. 203.

Agaricus pumilus Pers. Myc. Eur. 3 (1822–1828) 163.

Agaricus arvalis Fr. Epicr. (1836–1838) 197.

Agaricus semiorbicularis Vent. Stud. Micol. (1842) 467, pl. 442, fig. 1.

LUZON, Manila, *Copeland 1358*, July 2, 1904, growing on lawn, *Bur. Sci. 22007 Graff*, December 21, 1913, *Bur. Sci. 22008 Graff*, December 27, 1913, growing on lawn.

Found in Europe, Abyssinia, Ceylon, Australia, Siberia and the United States.

NAUCORIA SEMIORBICULARIS (Bull.) Quél. *Champ. Jur.* 1 (1873) 132.

Agaricus longipes Scop. *Flora Carn.* (1760-1772) 446.

Agaricus semiorbicularis Bull. *Hist. Champ. France* (1791-1798) 467, *pl. 422, fig. 1.*

MINDANAO, District of Zamboanga, San Ramon, *Copeland 773*, May 27, 1904, growing in sand near the sea.

Collected in Europe, northern Africa, India and the United States.

GALERA Fries

GALERA SILIGINEA Fr. *Obs. Myc.* 2 (1815-1818) 168; *Hym. Eur.* (1874) 267.

Agaricus foraminulosus Bull. *Hist. Champ. France* (1791-1798) 304, *pl. 535, fig. 1.*

Agaricus tener Pers. *Syn. Met. Fung.* (1801-1808) 386.

Agaricus pilosellus Pers. *l. c.* 387.

LUZON, Manila, *Merrill 8405*, July 29, 1912.

Previously collected in Europe, Ceylon, and northern India.

AGARICUS Linnaeus

AGARICUS BOLTONI Copel. in *Ann. Myc.* 3 (1905) 27; *Govt. Lab. Publ.* 28 (1905) 144.

MINDANAO, District of Davao, *Copeland 433*, April, 1904, growing in meadows.

This number is Copeland's type material and is in the herbarium of the Bureau of Science. The species has only been collected in the Philippines.

AGARICUS LUZONENSIS sp. nov.

Pileo carnoso, convexo-expanso, centro badio, 7 ad 9 cm diam.; margine tenuo, albo, fibrilloso; fibrillis badiis, minutis; carne albo; stipite solido, fibrilloso, albo vel albo-brunneo, 9 cm longo, 6 ad 9 mm crasso, basi subbulboso, levi supra annulo flocculoso; annulo membranaceo, certo in parte superiore; lamellis albis, 6 mm latis, obtusis, margine laceratis; basidiis clavatis, 5.5 μ latis, 9 μ longis; sporis brunneis, ellipticis, 2.5 ad 3 μ latis, 5 ad 5.5 μ longis, guttulatis.

Plants solitary, odor slight. Pileus fleshy, convex to expanded, clothed completely, except for the solid red-brown center, with delicate red-brown fibrils, the outer two-thirds showing the white flesh of the cap between, soft, smooth, with a thin margin, 7 to 9 cm in diameter. Flesh white, 5 mm thick. Margin with, usually, remnants of the membrenaceous veil attached. Stipe varying in diameter from 9 mm just above the

slightly swollen base to 6 mm at the insertion into the pileus, long, solid, fibrous throughout, white to light brown, smooth except above the annulus where it is slightly flocculent. Annulus well up on the stipe, membranaceous, persistent. Lamellae white but appearing very dark at the maturity of the fungus because of the color of the ripe spores, 6 mm broad, both ends obtuse, margin minutely notched and showing the white color of the gills even at maturity. Basidia club-shaped, 5.5 by 19 μ . Spores dark brown, small, elliptic, 2.5 to 3 by 5 to 5.5 μ , often uniguttulate.

LUZON, Manila, *Bur. Sci.* 21661 Graff, August 7, 1913.

AGARICUS PERFUSCUS Copel. in *Ann. Myc.* 3 (1905) 28; Govt. Lab. Publ. 28 (1905) 145.

LUZON, Manila, *Copeland* 1353, June 25, 1904, growing on lawn.

A comparison of the date of collection with the date of publication of the species leads one to think that this collection may be Copeland's type material. There is nothing on his label, however, to indicate this. The material agrees very nicely with his description and there can be no doubt but that the species is a good one.

The species has only been collected in the Philippines.

STROPHARIA Fries

STROPHARIA RADICATA sp. nov.

Pileo carnosus, compacto, ex hemisphaerico expanso, glabro, subviscido, fulvo, margine demum substriato, 2.5 ad 3.5 cm latis; lamellis adnatis, mollis, ex albido nigro-fuscentibus; stipite aequali, gracili, flexuoso, albido-fusco, striato, farcto subinde demum fistuloso, 3.5 ad 6.5 cm longo, 3 ad 4 mm lato, attenuato radicato, radicis 1 ad 2.5 cm longis; annulo membranaceo, plus minusve persistente; sporis ellipsoideis, e flavido-vel purpureo-brunneis, 6.5 ad 7.5 μ latis, 7.5 ad 9.5 μ longis.

Pileus fleshy, from subglobose to expanded, smooth, somewhat viscous and shiny, tawny with occasionally a reddish-brown center, margin becoming at length slightly sulcate-striate, 2.5 to 3.5 cm in diameter. Gills soft and pliant, adnate, changing from pale to dark brown. Stipe cylindrical, slender, flexible, fibrous, light brown, striate, at first stuffed but soon becoming hollow, 3.5 to 6.5 cm long, 3 to 4 mm in diameter, the lower end attenuated into a root-like growth from 1 to 2.5 cm long. Annulus membranaceous, persisting usually but occasionally at length falling away. Spores ellipsoid, changing as they ripen from yellow- to purple-brown, 6.5 to 7.5 by 7.5 to 9.5 μ .

LUZON, vicinity of Manila, *Merrill* 8390, October 3, 1912, growing in beach sand.

COPRINUS Persoon

COPRINUS CONFERTUS Copel. in Ann. Myc. 3 (1905) 25; Govt. Lab. Publ. 28 (1905) 142.

LUZON, vicinity of Manila, *Copeland s. n.*, June 23, 1909, on horse dung. This species has only been collected in the Philippines.

COPRINUS DELIQUESCENTS (Bull.) Fr. Epicr. (1838) 249; Elench. Fung. 1 (1828) 43; Hym. Eur. (1874) 327.

Agaricus deliquescens Bull. Hist. Champ. France (1798) pl. 558, fig. 1; Weinm. Hym. Gast. Petro. (1836) 273.

LUZON, Manila, *Merrill 8391*, July 29, 1912.

Collected in southern Europe.

COPRINUS FIMBRIATUS B. & Br. in Journ. Linn. Soc. 11 (1871) 561.

LUZON, Manila, *Bur. Sci. 21329 Jones*, July 24, 1913, on dead leaf bases of *Cocos nucifera*.

Previously collected in Ceylon.

COPRINUS FLOS-LACTUS sp. nov.

Solitariis vel agregatis; pileo hemispherico dein plano-expanso, 2.5 ad 4 cm lato, brunneo-flos-lacto, plicato-sulcato, floccis sparsis praeditis, margine integro vel late fisso; lamellis griseis dein nigris, a stipite leviter adherentibus, dein libris, 3 mm latis, obtusis; stipite tenaci cylindraceo, 2.5 ad 3.5 cm longo, 3 ad 4 mm crasso, lucidulo-albo, cavo, fibrilloso, basi incrassato; sporis ovoideo-pyriformibus, atro-brunneis, levibus, 3.5 ad 5.5 μ latis, 7.5 ad 11.5 μ longis, vacuolatis; basidiis clavatis, 9 μ latis, 23 μ longis; sterigmatibus 4 μ longis.

Plants solitary to gregarious. Pileus hemispheric, with age becoming flatly expanded, 2.5 to 4 cm in diameter, a light creamy brown in color, remnants of a universal veil remain as a few scattered floccose scales, sulcate, the margin entire at first but splitting later. While young the cap is crisp and brittle, crumbling on being handled, and on becoming mature tends more toward drying up than deliquescing. Lamellae pale-gray at first, later changing through grayish-brown to dark brownish-black and black. The darkening begins first at the margin of the pileus and slowly advances toward the center, edge of the gills usually remaining conspicuously white even at maturity, slightly adherent to the stipe at first then becoming free after the pileus has become expanded, 3 mm broad at the broadest part, somewhat obtuse at either end. Stipe cylindrical and of an equal diameter throughout, 2.5 to 3.5 cm long, 3 to 4 mm thick, shining white, hollow, fibrillose, with an unthickened base. Spores from ovoid to pyriform, very dark brown at maturity,

smooth, 3.5 to 5.5 by 7.5 to 11.5 μ , vacuolate, usually with a single vacuole. Basidia clavate, 9 by 23 μ . Sterigmata 4 μ long.

LUZON, vicinity of Manila, *Bur. Sci. 22003 Graff* (type), December 21, 1913, on recently burned over ground, *Bur. Sci. 22005 Graff*, December 22, 1913, on ground containing a quantity of coal ashes, *Bur. Sci. 22004 Graff*, December 26, 1913, on burned over ground.

COPRINUS NEBULOSUS Zoll. in Flora (1847) 305.

LUZON, Manila, *Bur. Sci. 22006 Graff*, December 20, 1913, on moist soil.

Pileus from 1.5 to 2 cm in diameter when expanded, gills adnate, stipe 5 to 7 cm long and 1 to 1.5 mm thick, spores 6.5 to 9 by 11.5 to 13 μ , dark brown.

COPRINUS PLICATILIS (Curt.) Fr. Epicr. (1836-1838) 252; Hym. Eur. (1874) 331.

Agaricus plicatilis Curt. Flor. Lond. (1828) pl. 200.

Agaricus striatus Bull. Hist. Champ. France (1798) 552.

Agaricus pulcher Pers. Syn. Fung. (1801) 404.

LUZON, Manila, *Brown & Graff s. n.*, February 4, 1912, growing on horse dung.

This fungus has been reported previously from tropical Africa.

COPRINUS STERCORARIUS Fr. Epicr. (1836-1838) 251; Hym. Eur. (1874) 330.

LUZON, Manila, *Brown & Graff s. n.*, February 4, 1912, on horse dung.

Previously collected in Europe, Tasmania, Victoria, New South Wales, and Queensland.

PANAEOLUS Fries

PANAEOLUS PAPILIONACEUS (Fr.) comb. nov.

Agaricus papilionaceus Fr. Syst. Myc. 1 (1821) 301.

Agaricus equinus Alb. & Schw. Consp. Fung. Lus. (1805) 3.

Agaricus campanulatus L. Fl. Suec. 2 (1755) 1213.

Agaricus carbon Batsch Elench. Fung. (1783) 6.

Agaricus varius Pers. Icon. Desc. Fung. (1800) 40.

Panaeolus campanulatus Berk. Outl. Br. Fung. (1860) 175.

LUZON, Province of Cagayan, Aparri, *For. Bur. 17143 Curran*, March, 1909, growing on carabao dung: vicinity of Manila, *Merrill 5008*, September, 1905, growing on lawn.

Of wide tropic and subtropic distribution. Reported from North America, Australia, Borneo, Ceylon, Madagascar and northern Africa.

GASTEROMYCETAE

NIDULARIACEAE

CYATHUS Haller

CYATHUS MONTAGNEI Tul. in Ann. Sci. Nat. III 1 (1844) 70.

Cyathus byssisedus Tul. l. c.

Nidularia byssisedus Jungh. in Verh. Bat. Genoot. Kunst. Vett. 17 (1838).

Cyathus elmeri Bres. in Hedwigia 51 (1912) 324.

LUZON, Manila, *Bur. Sci.* 16805 Graff, October, 1912, on decaying bamboo: Province of Laguna, Mount Maquiling, *Baker* 511, coll. *Raimundo*, December 1, 1912. LEYTE, Province of Leyte, Palo, *Elmer* 7229, January, 1906 (cotype of *C. elmeri* Bres.). PALAWAN, Taytay, *Merrill* 9075, May, 1913, on earth in dense bamboo thickets.

This species has been previously collected in Cuba, South America, Australia, Borneo, Java, and Ceylon.

CYATHUS PLICATUS (Fr.) Tul. in *Ann. Sci. Nat.* III 1 (1844) 76.

Nidularia plicata Fr. in *Linnaea* 5 (1830) 523; Berk. in *Hook. Lond. Journ. Bot.* 2 (1843) 639.

Cyathus poeppigii Tul. in *Ann. Sci. Nat.* III 1 (1844) 77.

Cyathus plicatulus Poepp. *Plant. Cubenses Exs.* n. 47.

Cyathus sulcatus Kalch. in *Grevillea* 10 (1881) 107.

LUZON, Manila, *Bur. Sci.* 5285 McGregor, October 26, 1908, *Merrill* 6685, July 1909, *Bur. Sci.* 16847 McGregor, July 10, 1910. MINDORO, Alag River, *Merrill* 5594, November, 1906. PANAY, Iloilo, *Copeland* 33, January 2, 1904, on dead bamboo. NEGROS, Gimagaan River, *Copeland* 34, January 6, 1904. POLILLO, *Bur. Sci.* 10532 McGregor, October–November, 1909.

Collected in North and Central America, Brazil, North and Central Africa and Natal.

LYCOPERDACEAE

TYLOSTOMA Persoon

TYLOSTOMA EXASPERATUM Mont. in *Ann. Sci. Nat.* II 8 (1837) 362.

Schizostoma exasperatum Lév. in *Ann. Sci. Nat.* III 5 (1846) 165.

LUZON, Province of Benguet, Pauai, *Bur. Sci.* 8716 McGregor, June, 1909, at an altitude of about 2,100 m.

Spores echinulate, 6 to 10 μ , averaging a little larger than those described by Montagne. It is very evident, though this specimen is not quite mature, that it belongs to the group *Schizostoma*, as limited by Ehrenberg.

Previously the collections of this species have been limited to the West Indies.

GEASTER (Micheli) Fries

GEASTER HYGROMETRICUS Pers. *Syn. Fung.* (1801–1808) 135; Fr. *Syst. Myc.* 3 (1832) 19.

Geaster medius Mich. *Nov. Pl. Gen.* (1729) 220, *pl.* 100, *fig.* 5.

Lycoperdon stellatum Scop. *Flora Carn.* 2 (1760–1772) 489.

Geaster vulgaris Corda *Icon. Fung.* 5 (1837–1842) 64, *pl.* 4, *fig.* 42.

LUZON, Province of Bataan, Lamao, *Copeland* s. n., August, 1904, *For. Bur.* 13555 Alvarez, August, 1909.

Of very general distribution.

GEASTER SACCATUS Fr. *Syst. Myc.* 3 (1832) 16.

Lycoperdon coronatum Plum. *Des. Plant. Amer.* (1793) *pl.* 169, *fig.* 9.

Geaster capensis Thüm. *Mycoth. Univ.* (1875–1884) no. 715.

NEGROS, Gimagaan River, *Copeland* 32, January 6, 1904, growing on soil in the forest.

Collected previously in North and South America, Cuba, Ceylon, Australia, Tasmania, and Africa. It is evidently of very general distribution throughout the tropics and the warmer temperate regions.

BOVISTELLA Morgan

BOVISTELLA ASPERA (Lév.) Lloyd in Mycol. Notes 23 (1906) 285.

Bovista aspera Lév. in Ann. Sci. Nat. III 5 (1846) 162.

Lycoperdon asperum Speg. in Ann. Mus. Nac. Buenos Aires II 3 (1899) 195.

LUZON, Manila, *Bur. Sci.* 21659 Graff, September 12, 1913, growing among moss on stone walls.

Peridium 8 to 15 mm broad. Spores globose, 4 μ in diameter, with slender appendages which vary in length from 6 to 10 μ . Capillitium long and branching, 4 μ wide, tapering toward the ends. Spores and capillitium olive to olive-yellow at maturity.

Previously collected in Brazil and Chili.

CALVATIA Fries

CALVATIA LILACINUM (Mont. & Berk.) comb. nov.

Bovista lilacina Mont. & Berk. in Hook. Lond. Journ. Bot. 4 (1845) 64.

Lycoperdon lilacinum Speg. in Ann. Mus. Nac. Buenos Aires, II 3 (1899) 110.

LUZON, Manila, *Copeland* 1352, June 10, 1904, growing on a lawn. MIN-DANAO, District of Zamboanga, Zamboanga, *Copeland* 332, March 1, 1904, growing in a meadow.

Probably of very general tropic and subtropic distribution as the species has been reported from North and South America, Central and South Africa, Siberia and Ceylon.

LYCOPERDON Tournefort

LYCOPERDON PUSILLUM Batsch Elench. Fung. 2 (1789) 228; Fr. Syst. Myc. 3 (1832) 33.

Lycoperdon furfuraceum Schaeff. Fung. Bav. Palat. Icon. 3 (1770) pl. 294.

Lycoperdon bovista Bolt. Hist. Fung. (1788-1791) pl. 117, fig. C.

Lycoperdon cepiforme Bull. Champ. France (1791-1798) pl. 435, fig. 2, non Chev.

Bovista pusilla Pers. Syn. Fung. (1801) 138.

Lycoperdon pratense Schum. Enum. Plant. Sael. 2 (1803) 193.

Lycoperdon polymorphum Vitt. Mon. Lycop. (1842) 183, pl. 2, fig. 8.

Globaria furfuracea Quél. Champ. Jura. 3 (1873) 370, pl. 3, fig. 6.

Utraria furfuracea Quél. Enchir. (1886) 241.

Lycoperdon todayense Copel. in Ann. Myc. 3 (1905) 25; Govt. Lab. Publ. 28 (1905) 141.

LUZON, Manila, *Bur. Sci.* 11003 Brown & Graff, December 5, 1911, growing on lawn, *Merrill s. n.*, January, 1904, on earth, *Copeland* 1351, April 12, 1904, on lawn. *BASILAN, Bur. Sci.* 9981 Robinson, June 12, 1910.

There is no distinction, in *Lycoperdon todayense* Copel., sufficient to warrant a specific separation from the much described *L. pusillum* Batsch. The separation of the fertile gleba from the sterile base seems to be more or less constant in the Philippine material but is not a character of sufficient importance, all other things being equal, to warrant the creation of a new species.

From the localities in which this fungus has been collected it is evidently of very general tropic and subtropic distribution. It has been collected in North America, Europe, South Africa, Siberia, Ceylon and Java.

SCLERODERMA Persoon

SCLERODERMA VULGARE Fr. Syst. Myc. 3 (1832) 46.

Lycoperdon majus Vail. Bot. Paris (1727) 122, pl. 16, fig. 8.

Lycoperdon cervinum Bolt. Hist. Fung. (1788-1791) 116.

Lycoperdon aurantium Bull. Champ. France (1791-1798) 158.

Scleroderma aurantium Pers. Syn. Fung. (1801) 153.

Scleroderma citrinum Pers. l. c. 153.

Lycoperdon tessulatum Schum. Enum. Plant. Sael. 2 (1803) 191.

Scleroderma squamatum Chev. Fl. Gen. Paris (1827) 357.

BABUYANES ISLANDS, Camiguin, *Bur. Sci.* 4174 *Fénix*, June-July, 1907.
LUZON, Province of Bataan, Mt. Mariveles, *Merrill* 3689, January 1, 1904, on damp earth.

Previously reported from North America, Europe, Algiers, Australia, and New Zealand.

DESCRIPTION OF THE PLATE

(Photograph by Cortes)

PLATE II. *Lentinus macgregorii* Graff sp. nov. *Bur. Sci.* 14374 *McGregor*
(Type).

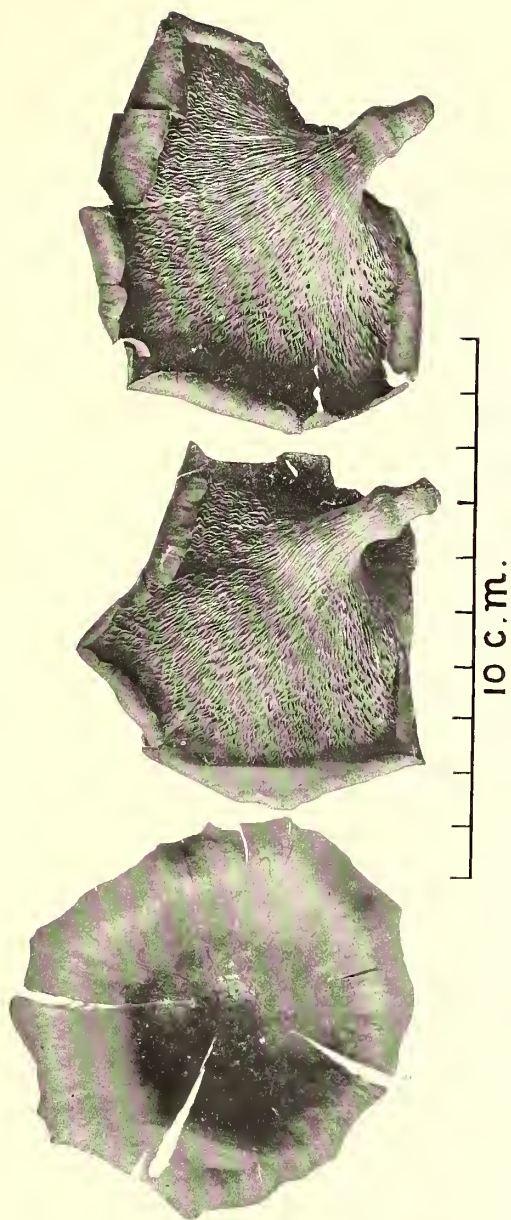


PLATE II. LENTINUS MACGREGORII GRAFF.

A NEW SPECIES OF ROTTBOELLIA

By F. TRACY HUBBARD

(Cambridge, Mass., U. S. A.)

In a small collection of grasses made near Taytay, northern Palawan, May 15 to 31, 1913, and sent to me through the courtesy of Mr. E. D. Merrill, there was an extremely interesting and rather anomalous new species of *Rottboellia*. After a critical study of the material I was unable to convince myself as to its generic status so I sent a specimen of it to Mrs. Agnes Chase of the Department of Agriculture at Washington, D. C., who was noncommittal in her reply; consequently I sent a specimen to Dr. E. Hackel who pronounced it a "distinct new species, somewhat anomalous in the genus *Rottboellia*." I beg to express my thanks to both specialists.

ROTTBOELLIA TRIFLORA sp. nov.

Perennis, ad basin plicata, aliquando caespitosa, 30 ad 50 cm altitudine, radicibus fibrosis. Culmi basin versus vaginis imbricatis plus minusve obtecti, foliis breviores vel ea superantes, canaliculati, infra nodos dense barbato pubescentes aliter glabri, ramis floriferis 3-7-nis. Vaginae inferiores breviter adpresseque pubescentae, superiores aliquando subglabrae, ad folii junctionem cum annulo pubescente munitae, marginibus ciliatis. Ligula fibrillosa, circa 2 mm longa. Folia erecta, inflorescentiis breviora vel saepe eas superantia, rigidiuscula, linearia, longe acuminata, basin versus conduplicata et angustata aliter plana, 12 ad 30 cm longa, 3 ad 9 mm lata; lamina subtus glabra vel saepe breviter pubescens, supra glabra. Racemi cylindracei, 3.5 ad 6 cm longi, circa 2 ad 3 mm in diametro, graciliter pedicellati, flavidi-viridi vel sordide violascentes. Articuli recte disjunctes, disjunctis apice foramine profunde excavatis, in parte inferiora racemi trispiculati cum spiculis duobus sessilibus hermaphroditis a spiculo libere pedicellate sterile et valde reducto separatis, in parte superiori racemi normaliter bispiculati, articuli spiculis sessilibus breviores, glabri. Spiculae sessiles 3.5 ad 5 mm longae, 1.5 mm latae, rhacheos cavum apice superantes, cum callo annuliformi dense breviter barbato; gluma prima acuta marginibus, paullum incurvatis, dorso cum pilis rigidulis

e tuberculis distinctis orientibus instructa, intus plurinervis; gluma secunda paullo brevior, elliptico-ovata, chartacea, marginibus ciliolatis; lemma sterile vacuum, hyalinum, gluma secunda circa aequans; lemma fertile et palea hyalina quam lemma sterile breviora. Spiculae pedicellatae ad squamas duas membranaceas circa 0.5 mm longis reductae.

Only collection seen, near Taytay, northern Palawan, Philippine Islands, May 15-31, 1913, *G. Ledesma*. Type in herb. Hubbard, duplicate type deposited in the Gray Herbarium, in the United States National Herbarium, in the Herbarium of the Bureau of Science, and in the Herbarium of Dr. Edward Hackel.

Rottboellia triflora belongs in the subgenus *Coelorhachis* of Hackel's treatment of *Rottboellia*¹ and is allied to *R. glandulosa* Trin. but is very distinct in the 3-spikeleted internodes of the lower portion of the racemes. Doctor Hackel in his letter to me, in regard to the position of this species in the genus, says: "The new species seems to have the same relation to the older ones (especially *Rottboellia glandulosa*), as has *Ophiurus laevis* Benth. (*O. perforatus* Trin.) to *O. monostachyus* Presl, and others. In *Ophiurus laevis* the disposition of the spikelets is, at least in the lower part of the spike, the same as in your new *Rottboellia*, and the only difference consists in the pedicels of the rudimentary spikelets being adnate to the rachis. *Ratzeburgia* differs from your new *Rottboellia* chiefly in the thin rachis of the compressed spike. Your new species points to the view that the differences between *Rottboellia*, *Ophiurus*, and *Ratzeburgia* are of less weight than we thought."

¹ DC. Monog. Phan. 6 (1889) 278-313.

NEW OR NOTEWORTHY AQUATIC PLANTS

By C. H. OSTENFELD

(Copenhagen, Denmark)

In a miscellaneous collection of aquatic and subaquatic plants submitted to me by the Bureau of Science, the following novelties were found. The bulk of the collection was from the Philippines, but it contained also a set of the aquatic plants collected by the late Dr. C. B. Robinson in the vicinity of Nha-trang, Annam, Indo-China, in March, 1911. A single species is based on the Annam material, the others being Philippine.

HYDROCHARITACEAE

OTTELIA Persoon

OTTELIA PHILIPPINENSIS sp. nov.

Planta submersa mediocris, 6 ad 15 cm alta. Foliorum petioli laminis longiores. Laminae ovatae vel cordato-ovatae, 4 ad 7 cm longae, 2 ad 3.5 cm latae, apicibus obtusiusculis. Flores foliis breviores, petiolis 2 ad 7 cm longis. Spatha ca. 2 cm longa, oblonge ovata, fructifera ovata, alis bene evolutis usque 5 mm latis crispis ornata. Sepala oblonge obovata, obtusa, ca. 7 mm longa, nervis obsoletis. Petala alba. Stamina stigmataque ca. 6 mm longa. Semina dense hirsuta ut in *O. alismoidi*.

Differt ab *O. alismoidi* statura minore, foliorum laminis ovatis, ab *O. japonica* spathae alis latis crispisque etc.

LUZON, Province of Nueva Vizcaya, Dupax, *Bur. Sci.* 11414 *McGregor*, March, 1912 (type in the Herbarium of the Botanical Museum of Copenhagen, cotype in the Herbarium of the Bureau of Science, Manila), locally known as *tangila* and used as a potherb. MINDORO, Bulalacao, *Bur. Sci.* 6679 *Robinson*, March, 1909.

CALDESIA Parlatore

CALDESIA SAGITTARIOIDES sp. nov.

Caules floriferi 10 ad 20 cm alti, erecti, verticillatim racemosi, foliis aequilongi vel breviores. Foliorum nutantiorum laminae late ovatae, 1.5 ad 1.8 cm latae, 2.5 ad 3 cm longae, acutiusculae, 7-nerviae; foliorum emersorum laminae hastatae vel late sagittiformes, 1.8 ad 2 cm latae, 2 ad 3 cm longae, 9-11-nerviae; lobi

basilares 1 ad 2.5 cm longi, divergentes, angusti acutique. Sepala subrotunda, marginibus membranaceis. Petala alba (?), sepalis longiora. Stamina 6. Ovaria 9, oblique obovata vel obovato-reniformia, dorso costis obtusis subtuberculatis instructa, unispermia; stylus ovario subaequilongus, usque 1 mm longus, erectus. Fructus maturi ignotus.

Differt a *C. parnassifolia* cui proxima prasertim foliis hastatis sagittiformibus, ovariis costis subtuberculatis.

INDO-CHINA, Annam, Nha-Trang and vicinity, *C. B. Robinson 1168*, March 11-26, 1911 (type in the Herbarium of the Botanical Museum of Copenhagen, cotype in the Herbarium of the Bureau of Science, Manila).

NAJADACEAE

NAJAS Linnaeus

NAJAS FOVEOLATA A. Br., var. *AURICULATA* var. nov.

A typo differt foliorum dentibus majoribus, vaginis longius auriculatis, spathis apice paullulum laceratis.

LUZON, Provinces of Albay-Camarines, *For. Bur. 12262 Curran*, June, 1908 (type in the Herbarium of the Botanical Museum of Copenhagen, cotype in the herbarium of the Bureau of Science, Manila).

POTAMOGETONACEAE

POTAMOGETON Linnaeus

POTAMOGETON NIPPONICUS Makino Ill. Fl. Japan 1 (1891) 2, t. 56; Graebn. in Engl. Pflanzenreich 31 (1907) 89.

This rare species seems to be represented by specimens collected by Mary Strong Clemens in Lake Lanao, Mindanao, No. 215, February, 1906, s. n., April, 1906. The specimens are sterile, however, and accordingly the identification is not absolutely certain. Mr. A. W. Bennett agrees with the above identification of the material.

NEW OR NOTEWORTHY PHILIPPINE PLANTS

By E. D. MERRILL¹

(From the Botanical Section of the Biological Laboratory,
Bureau of Science, Manila, P. I.)

The tenth paper under the above title consists of the descriptions of new species in the following families: *Gramineae*, *Cyperaceae*, *Moraceae*, *Loranthaceae*, *Olacaceae*, *Hernandiaceae*, *Rutaceae*, *Meliaceae*, *Buraceae*, *Celastraceae*, *Icacinaceae*, *Sterculiaceae*, *Theaceae*, *Dilleniaceae*, *Lecythidaceae*, *Flacourtiaceae*, *Araliaceae*, and *Ebenaceae*. The genus *Worcesterianthus* of the *Olacaceae*, is proposed as new, while the genera *Buettneria* and *Firmiana* are new to the Philippine flora. A few species of older authors have been recorded from the Archipelago for the first time and a few changes in nomenclature are proposed. A total of eighty-six species are described as new. The last number of the series appeared in the year 1912.²

GRAMINEAE

ISACHNE R. Brown

ISACHNE CONFERTA sp. nov.

Planta parva, prostrata, ramosa, ramis floriferis erectis vel suberectis, 6 ad 8 cm longis; foliis numerosis, lanceolatis, acuminate, circiter 2 cm longis, subtus leviter pilosis, supra scabridis; paniculis exsertis, angustis, 1 ad 2 cm longis, vix 5 mm latis, ramis paucis, erectis, 4-1-floris; spiculis confertis, circiter 1.8 mm longis, plus minusve purpureis; glumis sterilibus tenuiter 7- vel 9-nerviis, supra leviter hispidis; glumis fertilibus ellipsoideis vel elliptico-oblongis, inferioribus glabris, 1.6 mm longis, superioribus $\frac{1}{3}$ brevioribus, apice minute ciliatis.

A small, slender, prostrate, branched plant, rooting at the nodes, the flowering branches erect or suberect, 6 to 8 cm long. Sheaths rather lax, longer than the internodes, glabrous; ligule a ring of short white hairs. Leaves lanceolate, about 2 cm long, 2.5 to 3 mm wide, narrowed to the acute base and the acuminate

¹ Associate Professor of Botany, University of the Philippines.

² *Philip. Journ. Sci.* 7 (1912) *Bot.* 259-357.

apex, the lower surface somewhat pilose with scattered white hairs, the hairs arising from minute papillae, the upper surface at first papillate and sparingly pilose, becoming scabrid. Panicles exserted above the upper leaves, the peduncles 1.5 cm long or less, narrow, 1 to 2 cm long, less than 5 mm wide, the branches appressed, the lower ones 6 mm long or less and usually 4-flowered, the upper ones shorter, the uppermost usually bearing solitary spikelets. Spikelets crowded, about 1.8 mm long, more or less tinged with purple. Empty glumes about 1.8 mm long, slenderly 7- or 9-nerved, slightly hispid externally in the upper part, obtuse. Flowering glumes two, the lower one elliptic-oblong, obtuse, quite glabrous, 1.6 mm long, the upper one ellipsoid, slightly ciliate near the apex, usually about one-third shorter than the lower one.

LUZON, Province of Laguna, Dahican River back of San Antonio, *Bur. Sci.* 14914 Ramos, June, 1912, on stones along the river.

A rather characteristic species, distinguishable by its very narrow, dense panicles. It is perhaps most closely allied to *Isachne pauciflora* Hack., but is distinguished by its narrow leaves and glabrous flowering glumes.

DIMERIA R. Brown

DIMERIA CILIATA sp. nov.

Caespitosa, erecta, vaginis foliisque pilis longis albis mollibus instructis; racemis digitatis vel subfasciculatis, 4 ad 6, tenuibus, usque ad 12 cm longis, rhachibus circiter 0.7 mm latis, triangularibus, glabris vel leviter pubescentibus; spiculis 4 mm longis, glumis I et II carinatis, carinis longe ciliato-pilosis.

A densely tufted, erect, perennial grass 50 to 80 cm high, the culms slender, the sheaths and leaves rather densely clothed with long, soft, white hairs, some longer (5 mm) and somewhat stiffer ones intermixed with the shorter and softer ones, the nodes bearded. Leaves linear-lanceolate, acuminate, base slightly or not narrowed, 8 to 15 cm long, 3 to 4 mm wide, softly ciliate-pilose on both surfaces; ligule about 1 mm long, truncate. Inflorescence long-exserted, of 4 to 6 digitate or fasciculately arranged racemes, the racemes slender, 7 to 12 cm long, at first pale, soon turning pale-brownish, the rachis 3-angled and somewhat flattened, about 0.7 mm wide, glabrous or slightly pubescent, the internodes 2 to 4 mm long. Spikelets 4 mm long; first glume somewhat boat-shaped, keeled, 4 mm long, acute or obtuse, prominently ciliate-pilose with long white hairs on the keel; second glume similar but lanceolate, and also prominently ciliate-pilose on the keel; third glume shorter, hyaline, the awn slender, about 10 mm long.

PALAWAN, Taytay, in open swampy places at sea level, *Merrill 9320*, May 28, 1913.

A species allied both to *Dimeria chloridiformis* K. Schum. & Lauterb., of the Marianne Islands, and to the Indian *Dimeria fuscescens* Trin., differing from the former in its smaller spikelets and narrower, not ciliate rachises, and from the latter in its prominently ciliate-pilose sheaths and leaves and its prominently ciliate-pilose keels of the empty glumes.

ISCHAEMUM Linnaeus

ISCHAEMUM GLAUDESCENS sp. nov. § *Euischaemum*.

Species *I. aristato* affinis, differt planta majoribus, 1 ad 3 m longis, plus minusve glaucescens, racemis usque ad 15 cm longis, spiculis majoribus, 8 mm longis, glumis I spiculae sessilis in $\frac{3}{4}$ inferiore prominente transverse rugosis, rugis 4 vel 5, elevatis.

A rather coarse, wiry, perennial grass reaching a height of from 1 to 1.5 m, the stems long-prostrate, scarcely or only slightly branched, reaching a total length of from 2 to 3 m, about 5 mm in diameter, hard, more or less glaucous under the sheaths. Leaves narrowly lanceolate to linear-lanceolate, glabrous, 15 to 20 cm long, about 1 cm wide, acuminate, base gradually narrowed, acute or obtuse, not at all cordate; sheaths about as long as the internodes, rather loose; ligule truncate, 2 to 3 mm long. Racemes two, closely appressed, 12 to 15 cm long, long-exserted, the joints of the rachis about 6 mm long, 3-angled, bearded on the outer angle. Sessile spikelets about 8 mm long, lanceolate; first glume coriaceous, 8 mm long, 2 mm wide, glabrous, somewhat glaucous, acuminate, margins incurved throughout, borders in upper part minutely scabrid, the dorsal part in the lower one-half with 4 or 5 prominent transverse ridges; second glume coriaceous, lanceolate, acuminate, keeled, 7 mm long; third glume hyaline, lanceolate, acuminate, 7 mm long; fourth glume similar to the third, a little shorter, cleft to the middle, bearing in the cleft a twisted, geniculate, 12 to 13 mm long awn. Anthers 3 mm long. Pedicellate spikelets dimidiate, their pedicels 2.5 mm long, stout, 3-angled, bearded on the outer angle, the first glume lanceolate, 8 mm long, 3 mm wide, acute or acuminate, coriaceous, one side rather broadly winged, the wing short ciliate-toothed; second glume somewhat lanceolate, 6 to 7 mm long, acuminate, the remaining ones somewhat shorter, hyaline.

PALAWAN, Lake Manguao, *Merrill 9453*, April 23, 1913, gregarious along the more or less swampy grassy borders of the lake in the openings of narrow valleys, with or without streams of water, areas submerged during periods of high water in the lake, altitude about 50 meters. The grass is abundant in suitable habitats, and is utilized by the crocodiles in build-

ing their nests. One nest examined by members of our party, containing numerous eggs, consisted of a large mound made entirely of sand and this grass very closely packed.

The species is manifestly allied to *Ischaemum aristatum* Linn., but differs in so many characters that it has been considered advisable to treat it as a distinct form.

ISCHAEMUM PUBESCENS sp. nov. § *Euischaemum*.

Species *I. aristato* affinis, differt foliis pilosis, spiculis paullo minoribus, glumis 1 spiculæ sessilibus utrinque nodulis 2 obscuris praeditis, dorso parce piloso.

An erect perennial grass about 1 m high, the sheaths and leaves rather softly pilose with long white or pale hairs, the nodes rather densely ciliate-bearded, the internodes, under the sheaths, somewhat glaucous, about 3 mm in diameter. Leaves narrowly lanceolate, 10 to 18 cm long, 8 to 12 mm wide, acuminate, base of the upper ones truncate, of the lower ones narrowed, margins scabrid, both surfaces softly pilose with scattered, long hairs; sheaths rather lax, pilose; ligule brown, cleft, somewhat pubescent, 2 to 3 mm long. Racemes binate, closely appressed, 8 to 10 cm long, long-exserted, rather prominently white-ciliate, the joints 3-angled, bearded on all angles, 4 mm long. Sessile spikelets oblong, obtuse, about 5 mm long, 1.8 mm wide, the callus bearded; first glume coriaceous, obtuse, margins inflexed throughout, with two, broad, obscure undulations (scarcely nodules) near each side in the lower part, the back usually with very few, scattered, ciliate hairs; second glume lanceolate, acuminate, somewhat keeled, 5 mm long; third and fourth glumes hyaline, the fourth cleft to the middle, bearing in the cleft a geniculate, somewhat twisted, scabrid awn about 13 mm long. Pedicellate spikelets dimidiate, 5 to 6 mm long, the pedicels stout, 2 mm long, bearded; first glume widely winged on one side, springly ciliate-pilose on the back, smooth, the wing obscurely denticulate.

DUMARAN, *Bur. Sci.* 21639 *Escritor*, August, 1913.

Similar to *Ischaemum aristatum* Linn., and manifestly allied to that species. It is characterized, however, by its prominently pilose leaves and sheaths, its white-ciliate racemes, and the first glume of the sessile spikelets with very obscure marginal undulations which can scarcely be called nodules; the very short rachis-joints, and the bearded callus is also characteristic.

CYPERACEAE

ELEOCHARIS R. Br.

ELEOCHARIS ACICULARIS (L.) R. & S. *Syst.* 2 (1817) 154; Clarke in Hook. f. *Fl. Brit. Ind.* 6 (1893) 628, et in *Journ. Linn. Soc. Bot.* 36 (1903) 225.

LUZON, Benguet Subprovince, Baguio, Merrill 7665, May, 1909, on seepage slopes about rice paddies, altitude about 1,450 m.

Not previously reported from the Philippines, an additional distinct northern type in the flora of northern Luzon. Widely distributed in North America, throughout Europe and northern Asia, extending southward only in China.

FIMBRISTYLIS Vahl

FIMBRISTYLIS CAPITULIFERA sp. nov. § *Trichelostylis*.

Planta perennis glabra, subrigida, usque ad 40 cm alta; foliis numerosis, angustis, culmo brevioribus; spiculis omnibus sessilibus, capitato-congestis, capitulis umbellato-dispositis; glumis numerosis, 5-nerviis, oblongis, subobtusis, marginibus latis, scariosis; nucibus compressis vel plano-convexis, minutissime striatis, circiter 0.7 mm longis; stylo trifido.

A glabrous, somewhat rigid, apparently densely caespitose, glabrous, perennial plant 20 to 40 cm high. Leaves very numerous, sheathing the bases of the stems, subrigid, flat or nearly so, 1 to 2 mm wide, 8 to 18 cm long. Culms terete, striate, exserted, rather slender. Inflorescence umbellate, consisting of a central sessile head and from 3 to 6 peduncled ones, each head with from 10 to 20 sessile, densely disposed spikelets 3 to 6 mm in length. Glumes numerous, oblong, about 2 mm long, somewhat keeled, closely 5-nerved in the median portion, with broad, somewhat scarious and thin margins, apex somewhat obtuse, usually apiculate. Nut obovate, brown, about 0.7 mm long, somewhat compressed or plano-convex, not trigonous, minutely striate; style glabrous, slender, about 2 mm long, 3-fid.

BATANES ISLANDS, Batan, *Bur. Sci.* 3575 *Fénix*, *Bur. Sci.* 10203 *McGregor*, *Bur. Sci.* 3171, 3172, 3173 *Mearns*. BABUYANES ISLANDS, Babuyan Islands, *Bur. Sci.* 3926 *Fénix*. Camiguin Island, *Bur. Sci.* 4042 *Fénix* (type).

This species was previously recorded by me under the name of *Fimbristylis spathacea* Vahl, to which it does not seem to be closely allied. It is well characterized by its spikelets being all sessile and disposed in dense heads, the central head sessile, the others peduncled; the rays of the umbel vary from 1 to 4 cm in length. The species belongs in the section *Trichelostylis*, and is probably as closely allied to *Fimbristylis junciformis* Kunth as to any other species. It differs from Kunth's species in its much smaller umbels, the spikelets much more numerous in each head, none of them being solitary, and in the style being quite glabrous, not villous below the fork.

FIMBRISTYLIS PALUDOSA sp. nov. § *Trichelostylis*.

Densissime caespitosa, erecta, glabra, efoliosa, 60 ad 100 cm alta, culmis distincte 3- vel 4-angularibus; umbellis decompositis, 2 ad 4 cm longis; spiculis numerosis, ovoideis, 2.5 ad 3.5 mm longis, brunneis, glumis usque ad 10, ovatis, acutis vel obtusis,

obscure carinatis; nucibus obovoideis, triangularibus, laevibus vel obscurissime transverse lineatis; stylo 3-fido.

A densely caespitose, leafless, perennial plant 0.6 to 1 m high from stout rhizomes, the lower parts of the culms with 3 or 4 rather loose, imbricate sheaths, the lower ones ovate to oblong-ovate, 1 to 2 cm long, the upper one up to 10 cm long, the mouth oblique, with a broad, brown, membranaceous margin. Culms prominently 3- or 4-angled, rather stiff. Inflorescence terminal, 2 to 4 cm long, open, umbellately decompound, subtended by one or two, lanceolate, acuminate, leaf-like, 1 cm long bracts. Spikelets numerous, not fascicled, usually one sessile median one and two lateral pedicelled ones on each ultimate branchlet, 2.5 to 3.5 mm long, brown, ovoid, the pedicels scabrid; glumes 10 or fewer, brown, ovate, acute or obtuse, obscurely keeled. Stamens 3. Nut obovoid, 3-angled, white, 0.8 to 1 mm long, smooth or very obscurely transversely lineate; style-arms 3.

LUZON, Benguet Subprovince, Baguio, *Williams 1239* (type), May, 1904, *Elmer 6497*, June, 1904, *Phil. Pl. 551 Merrill*, June, 1911.

Apparently a very characteristic species allied to *Fimbristylis miliacea* Vahl, *F. quinquangularis* Kunth, etc., but differing in its leafless stems, large rhizomes, smooth or nearly smooth nuts, and other characters.

FIMBRISTYLIS PINETORUM sp. nov. § *Trichelostylis*.

Erecta, glabra, culmis e rhizomate crasso, solitariis, gracilibus, 20 ad 40 cm altis, basi foliosis; foliis paucis, subsetaceis, usque ad 13 cm longis; inflorescentiis simpliciter umbellatis; spiculis paucis, 3 ad 7, brunneis, oblongo-ovoideis, 6 ad 11 mm. longis; nucibus obovoideis, verruculosus, albidis, 1 ad 1.2 mm longis, obscure triangularibus; stylo trifido.

A solitary, erect, slender, perennial plant from stout, woody rhizomes, the rhizomes clothed with membranaceous, lanceolate, usually brownish scales or sheaths, usually about 1 cm long. Culms striate, 20 to 40 cm high, the base with several imbricate leafless sheaths, and at or near the base 2 to 4 leaf-bearing sheaths, the sheaths oblique, their margins membranaceous, the leaves linear or setaceous, involute when dry, 1 to 1.5 mm wide, 4 to 13 cm long. Inflorescence usually a simple umbel, rarely compound, 2 to 3 cm long, the subtending bract lanceolate, acuminate, usually less than 1 cm long. Spikelets oblong-ovoid, brown, many-flowered, 6 to 11 mm long, 3 to 7, one sessile, the others mostly slenderly pedicelled, the pedicels 1 to 2 cm long. Glumes ovate, concave, keeled, glabrous, acute to obtuse, often retuse, the margins thinner and paler. Stamens 3. Nut white, obovoid, 1 to 1.2 mm long, obscurely 3-angled, apex broadly

rounded or subtruncate, verruculose, not at all reticulate. Style-arms 3.

LUZON, Benguet Subprovince, Baguio, *Merrill 7664* (type), *Phil. Pl.*, 558 *Merrill*, June, 1911, scattered on slopes among various grasses in thin pine forests, altitude about 1,550 m.

A species apparently well characterized by its solitary, not at all caespitose stems, woody rhizomes, narrow leaves, usually simple inflorescence of few spikelets, and verrucose, not at all reticulate, white, obscurely triangular nuts. It is allied to *Fimbristylis monticola* Steud., and to *F. pierotii* Miq., of India, the latter extending to Japan.

MAPANIA Aublet

MAPANIA PALUSTRIS (Hassk.) F.-Vill. Novis. App. (1882) 309; C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 (1894) 681.

Pandanophyllum palustre Hassk. in Tijdschr. Nat. Vereen. Ned. Ind. 10 (1843) 119; Boeck. in Linnaea 37: 138; Kurz in Journ. As. Soc. Beng 38: 78.

Lepironia palustris Miq. Ill. Fl. Archip. Ind. (1871) 63, t. 25.

MINDANAO, Agusan Subprovince, Waloe, in muddy places along small streams in forests, *Merrill 7298*, October, 1910.

Except for F.-Villar's previously unverified record, not before reported from the Philippines; Malay Peninsula and Archipelago.

There is some doubt as to the proper specific name for this plant, for Clarke, *l. c.*, states that Hasskarl's description calls for a bifid style and 3 to 5 spikelets, which does not apply to *Mapania palustris*; however, these statements may have been based in part on erroneous observations. Miquel definitely states that the number of spikelets in a head is variable, and his drawing shows a 2-cleft style. It is not clear, that in case *Mapania palustris* is distinct from *Pandanophyllum palustre* Hassk., why the specific name is retained, for if not based on Hasskarl's description, then it was based on a later one under the same name by Boeckler or Kurz. It seems only reasonable to suppose that Boeckler and Miquel were familiar with type or typical material of Hasskarl's *Pandanophyllum palustre*, and under the circumstances it seems best to retain the specific name *palustris*, at least until opportunity is had to examine Hasskarl's type. Incidentally Clarke credits Bentham with authorship of the combination *Mapania palustris*; this is incorrect, for Bentham did not make the actual transfer, but only indicated *Pandanophyllum* to be a synonym of *Mapania*. F.-Villar appears to be the first to make the actual transfer of the species.

MAPANIA GRACILLIMA Kükenthal & Merrill sp. nov.

Rhizoma breve, lignosum, crassum. Culmi laterales scapiformes, 5–10 cm alti, gracillimi, obtusanguli, striati, asperi, basi vaginis nonnullis lanceolatis fuscis nervosis tecti et in medio vagina unica aequali obsiti. Folia culmos longe superantia, 4–5 mm lata, plane utrinque attenuata, marginibus aculeato-scabra, coriacea, glaucescentia. Spica parva, primo lineari-ellipsoidea demum ovata, densa, 5 mm longa, 4 mm lata, bracteae squamiformes. Spiculae haud numerosae oblongae. Squamae late

ovatae, apice rotundatae, rufae. Squamellae 4 squama longiores, 2 exteriores navicularis in carina valde setulosae. Nux ellipsoideo-lageniformis, 2 mm longa, medio turgidula, straminea, laevis, sessilis, erostrata. Stylus brevissimus. Stigmata 3 vel 4.

MINDANAO, District of Zamboanga, Sax River Mountains back of San Ramon, *Merrill 8205*.

Omnium *Mapaniarum* gracillima, foliis pro ratione angustissimis spicaque minima ab omnibus affinibus bene distinguenda. Squamellas non nisi 4 observari, sed forsitan 6 adsunt, quarum duae jam elapsae.

SCHOENUS Linnaeus

SCHOENUS FALCATUS R. Br. Prodr. (1810) 232; Benth. Fl. Austral. 7 (1878) 372; Clarke ex Hemsl. in Journ Linn. Soc. Bot. 36 (1903) 261.

LUZON, Province of Zambales, *Bur. Sci. 5036 Ramos*, December, 1907.

Not previously reported from the Philippines; tropical Australia and Queensland, Borneo, and Formosa.

The specimens differ from the species, as described by Benth, in having somewhat smaller panicles, and in some of the flowering-glumes being distinctly retuse. A distinct Australian type, the fifth species of the genus to be found in the Philippines.

SCIRPIODENDRON Zippel

SCIRPIODENDRON GHAERI (Gaertn. f.) comb. nov.

Chionanthus ghaeri Gaertn. f. Fruct. 1 (1788) 190, t. 29, fig. a-e; Boerl. in Journ. Linn. Soc. Bot. 31 (1896) 246.

Scirpiodendron costatum Kurz in Journ. As. Soc. Beng. 38² (1869) 85; Clarke in Hook. f. Fl. Brit. Ind. 6 (1904) 684; Merr. in Philip. Journ. Sci. 2 (9107) Bot. 422.

Scirpiodendron sulcatum Miq. Ill. Fl. Archip. Ind. (1871) 65, pl. 28.

LUZON, Province of Cagayan, Abulug River, *For. Bur. 19612 Curran*, January, 1911. POLILLO, *Bur. Sci. 10249 McGregor*, October, 1909. PALAWAN, San Antonio Bay, *Merrill 5257*, October, 1906; Taytay, *Phil. Pl. 1295 Merrill*. MINDANAO, District of Zamboanga, Malasugat, *Merrill 8114*, December, 1911.

Chionanthus ghaeri Gaertn. f., which was described and figured from detached fruits alone, remained a doubtful species until the year 1896, when Boerlage was able to determine its identity from examination of the original material used by Gaertner in describing and figuring it. Gaertner's name is by far the earliest one for the species, and there is no reason why it should not be adopted.

MORACEAE

ARTOCARPUS Forster

ARTOCARPUS OVATIFOLIA sp. nov.

Arbor circiter 40 m alta, stipulis parce brevissime pubescentibus exceptis glabra; foliis coriaceis, ovatis, integris, usque ad 30 cm longis, acutis vel breviter acute acuminatis, basi acutis

vel subrotundatis, nervis prominentibus, utrinque circiter 8; stipulis membranaceis, caducis, lanceolatis, 10 cm longis; fructibus globosis vel subglobosis, circiter 6 cm diametro (immaturis), anthocarpiis numerosissimis, apicibus subovoideis, obtusis, vix 2 mm longis, dense ceraceo-furfuraceis.

A tree about 40 m high, glabrous or nearly so. Branches dark reddish-brown, smooth, the ultimate ones nearly 1 cm in diameter, marked with slender annular rings less than 1 cm apart. Leaves ovate, coriaceous, glabrous, 10 to 30 cm long, 7 to 20 cm wide, entire, the apex acute or very shortly and acutely acuminate, or apiculate-acuminate, base acute or somewhat rounded, both surfaces slightly shining, of about the same color and somewhat brownish when dry; lateral nerves about 8 on each side of the midrib, prominent, spreading, curved only near their tips, the ultimate reticulations slender, subparallel; petioles 3 to 5 cm long; stipules caducous, lanceolate, acuminate, membranaceous, 10 cm long, outside sparingly pubescent with very short, somewhat appressed hairs. Flowers unknown. Immature fruits globose or subglobose, about 6 cm in diameter (immature), composed of very numerous, slender anthocarps, the projecting tips of the anthocarps ovoid or subovoid, about 2 mm long, rounded or obtuse, about 2 mm in diameter, densely covered with waxy-furfuraceous scales.

LUZON, Province of Laguna, San Antonio, in forests, *Bur. Sci.* 15040 (type), 20530 Ramos, June, 1912, February, 1913, fruits yellow.

A very characteristic species, manifestly, however, in the same group as *Artocarpus communis* Forst. In texture and venation the leaves resemble those of Forster's species, but are always quite entire. In being almost glabrous the present species differs also from *Artocarpus communis* Forst. The waxy-furfuraceous tips of the anthocarps is characteristic.

FICUS Linnaeus

FICUS CAMARINENSIS sp. nov. § *Urostigma*.

Arbor alta, glabra, ramis ramulisque rugosis; foliis alternis, oblongo-ellipticis, subcoriaceis, nitidis, laevis, usque ad 23 cm longis, integris, apice abrupte tenuiter acute acuminatis, basi rotundatis, 3-plinerviis, nervis lateralibus utrinque 10 ad 12, subpatulis, prominentibus, anastomosantibus; petiolo 2.5 cm longo; receptaculis axillaribus, solitariis, sessilibus, ellipsoideis, in siccitate brunneis, 3 ad 3.5 cm longis, bracteis 3, reniformibus, 3 mm longis, 5 mm latis.

A tall tree, quite glabrous except the bud-scales which are appressed-hirsute. Branches and branchlets prominently rugose when dry, somewhat lenticellate, with distinct stipular scars, the latter 5 to 6 mm in diameter. Leaves alternate, subcoriaceous,

brown and shining when dry, smooth, oblong-elliptic, 14 to 23 cm long, 7 to 11 cm wide, entire, 3-plinerved, base rounded, apex abruptly and usually slenderly acutely acuminate, the acumen 1.5 to 2 cm long; primary lateral nerves prominent, spreading, straight, 10 to 12 on each side of the midrib, anastomosing near the margin, the reticulations rather lax, anastomosing between each two lateral nerves into less distinct secondary nervs; petioles 2.5 cm long; bud-scales lanceolate, acuminate, 1.5 cm long, appressed-hirsute. Receptacles axillary, solitary, sessile, ellipsoid, brown when dry, smooth or somewhat warted, 3 to 3.5 cm long, 2 to 2.5 cm in diameter, the apex rounded, the umbilicus distinct. Basal bracts 3, reniform, brown, coriaceous, 3 mm long, 5 mm wide. Gall flowers numerous, their perianth segments usually 3, about 2 mm long. Male flowers few and chiefly near the orifice, anthers 1 mm long.

LUZON, Province of Camarines, Niog, *Phil. Pl.* 1547 Ramos, December 17, 1913, locally known as *balete*.

A species well characterized by its large, ellipsoid, sessile, solitary, axillary receptacles. Its alliance is apparently with *Ficus forstenii* Miq. (*F. vidaliana* Warb.) from which it differs in its much larger receptacles and larger leaves.

FICUS PRODUCTA sp. nov. § *Sycidium*.

Frutex erectus, circiter 2 m altus, foliis utrinque ramulisque scaberulis; foliis alternis, subcoriaceis, usque ad 18 cm longis, oblongis ad oblongo-obovatis vel ovato-ellipticis, aequilateralibus, basi 3-nerviis, acutis vel obtusis, apice longe tenuiter caudato-acuminatis, margine irregulariter grosse dentatis vel dentato-serratis, haud lobatis, in siccitate subviridis, nervis utrinque circiter 8, subtus cum reticulis valde prominentibus; receptaculis axillaribus, solitariis vel in paribus dispositis, subglobosis vel leviter obovoideis, scabridis, pedunculatis, 8 ad 10 mm diametro.

An erect shrub about 2 m high, scabrid. Branches terete, slender, pale-brownish when dry, glabrous, the branchlets scabrid. Leaves alternate, rather prominently scabrid in both surfaces, otherwise glabrous, oblong to oblong-obovate or even ovate-elliptic, 12 to 18 cm long, 4 to 7 cm wide, equilateral, the base shortly 3-nerved, acute or obtuse, the apex rather abruptly long and slenderly caudate-acuminate, the acumen 2 to 3.5 cm long, narrow at the base, entire, acute or apiculate, the margins rather coarsely dentate or dentate-serrate, not lobed, the teeth irregular, mostly 5 mm apart or more, both surfaces when dry somewhat greenish, shining, scabrid, the lower very slightly paler than the upper; lateral nerves about 8 on each side of the midrib, very prominent on the lower surface, anastomosing, the reticula-

tions very prominent, the lower surface more or less punctulate; petioles about 1 cm long, scabrid. Receptacles orange-red, scabrid, solitary or in pairs, axillary, subglobose to somewhat obovoid, 8 to 10 mm in diameter, their peduncles 5 to 7 mm long, scabrid, the apical bracts small, ovate, about 1 mm long, the wall of the receptacle ciliate-hispid inside. Perfect female flowers numerous, the perianth-segments narrowly lanceolate, obtuse or acute, membranaceous, about 2 mm long, prominently ciliate-hispid in the upper part, one about twice as broad as the other three and cleft to about the middle, the narrower three often somewhat spatulate. Ovary ovoid-ellipsoid, obtuse, subequilateral, about 1.2 mm long, the styles distinctly lateral, 1.2 to 1.8 mm long.

MINDANAO, Subprovince of Butuan, Veruela, C. M. Weber 1132 (type), June 19, 1911, in thickets; Talacogon, Bur. Sci. 1131 Weber, July 20, 1911, among *abacá* plants.

A species in the *ulmifolia* group, but with equilateral leaves which are abruptly, long and slenderly caudate-acuminate, and with somewhat smaller receptacles than in *F. ulmifolia* Lam., under which name the specimens were distributed. Its closest ally is *Ficus euphlebia* Merr., which has less prominently acuminate, more distinctly and closely toothed leaves which are acute or merely obtuse at the base, not rounded; in the present species the interior of the receptacle and the perianth-segments are also prominently ciliate-hispid with stiff white hairs.

FICUS GRANDIDENS sp. nov. § *Covellia*.

Arbor circiter 6 m alta, ramulis adpresso-hirsutis exceptis glabra; foliis oblongis vel late oblongis, subcoriaceis vel chartaceis, usque ad 23 cm longis, glabris, laevis, nitidis, acuminatis, basi acutis, margine grosse irregulariter sinuato-lobato-dentatis, dentibus vel lobis 1 vel 2 utrinque; receptaculis obovoideis, pedunculatis, in fasciculis densis hemisphericis caulinis dispositis.

A tree 5 to 6 m high, quite glabrous except the appressed-hirsute younger branchlets. Branches terete, smooth, grayish-brown, the ultimate ones about 4 mm in diameter. Leaves oblong or broadly oblong, subcoriaceous or chartaceous, glabrous, smooth, 14 to 23 cm long, 5 to 11 cm wide, narrowed more or less at both ends, apex acuminate, base acute, the margins very coarsely sinuate-lobed or -toothed, the lobes or teeth 1 or 2 on each side, obtuse or acute, the upper surface shining, dark-colored when dry, the lower surface slightly shining, paler; nerves 5 or 6 on each side of the midrib, prominent, usually brownish when dry, anastomosing, the reticulations distinct, rather slender; petioles 1 to 2 cm long; stipules lanceolate, acuminate, 10 to 12 mm long, subpersistent. Fruits fascicled on stout protuberances on the

trunk, forming very dense, hemispheric masses 8 to 10 cm in diameter. Receptacles obovoid, often more or less compressed-angular by pressure of contiguous ones, 10 to 12 mm in diameter, green, glabrous or nearly so, the umbilicus about 3 mm in diameter; peduncles slender, 1.5 to 2 cm long, with three small bracteoles at the apex. Fertile female flowers numerous, their pedicels up to 1.5 mm in length; perianth short, sheathing the pedicel below, truncate, about 1 mm long. Ovary ovoid, 1.5 mm in diameter; style lateral.

MINDANAO, District of Zamboanga, Sax River Mountains back of San Ramon, *Merrill 8089*, November 28, 1911, in forests, altitude about 800 m.

A species manifestly closely allied to *Ficus rubrovenia* Merr., and very similar to that species, differing in its somewhat appressed-hirsute, not glabrous, branchlets, and its very coarsely lobed-toothed, not merely undulate leaves.

FICUS RIVULARIS sp. nov. § *Eusyce*.

Frutex circiter 4 m altus ramulis minute puberulis exceptis glaber; foliis alternis, lanceolatis vel anguste lanceolatis, leviter falcatis, usque ad 25 cm longis, utrinque angustatis, apice longe tenuiter caudato-acuminatis, basi acutis, integris, subcoriaceis, laevis, subtus albido-punctatis, nervis utrinque circiter 20; receptaculis axillaribus, solitariis, obovoideis, 1 ad 1.5 cm diametro, pedunculatis, bracteis circiter 2 mm longis.

An erect, nearly glabrous shrub about 4 m high. Branches terete, slender, reddish-brown, glabrous, the younger branchlets somewhat puberulent. Leaves alternate, subcoriaceous, lanceolate to narrowly lanceolate, 12 to 25 cm long, 1.5 to 3 cm wide, somewhat falcate, narrowed at both ends, the apex very slenderly caudate-acuminate, the acumen up to 4 cm in length, minutely apiculate, the base equilateral, usually acute, rarely slightly obtuse, minutely cucullate on the upper surface, the margins quite entire, somewhat revolute, the upper surface smooth, glabrous, shining, rather pale or somewhat olivaceous when dry, the lower surface somewhat paler, or brownish, distinctly white-punctulate under a lens; lateral nerves about 20 on each side of the midrib, rather distinct, anastomosing, the ultimate reticulations distinct, angular, about 1 mm in diameter; petioles 5 to 10 mm long; membranaceous, deciduous, linear-lanceolate or narrowly lanceolate, acuminate, 1.5 to 2 cm long. Receptacles axillary, solitary, obovoid, 1 to 1.5 cm in diameter, glabrous, somewhat narrowed at the base into a very short pseudo-stalk, their peduncles slender, 5 to 10 mm long, with three, ovate, obtuse, 2 mm long bracts at the summit. Gall flowers very numerous, in general obovoid, sessile or shortly pedicelled, about 2.5

mm long, the perianth brown, chartaceous or coriaceous, irregularly 3-lobed, the lobes short, the perianth itself glabrous, about 2 mm in diameter.

LUZON, Province of Cagayan, *For. Bur.* 17806 Curran (type), January, 1912, *Bur. Sci.* 7399 Ramos, March, 1909: Province of Tayabas, Piapi, *For. Bur.* 10134 Curran, March, 1908, all the specimens indicated as growing on the banks of rivers, and from their "stenophyllous" leaves, apparently in places subject to submergence in times of floods or high water.

The specimens have been previously referred to *Ficus linearifolia* Elmer, with which they have very little relationship, except some resemblance in leaf-form, and manifestly the present species belongs in an entirely different section from Elmer's species. The very narrow, entire, slenderly caudate-acuminate, somewhat falcate leaves which are white-punctulate beneath are characteristic.

FICUS LAGUNENSIS sp. nov. § *Eusyce*.

Frutex scandens, glaber, vel ramulis parcissime ciliato-hirsutus; foliis alternis, ovatis vel oblongo-ovatis, coriaceis, in siccitate plus minusve brunneis, usque ad 20 cm longis, acuminatis, basi late cordatis, integris; nervis utrinque circiter 7, subtus cum reticulisque valde prominentibus; receptaculis axillaribus, solitariis vel fasciculatis, obovoideis, glabris, pedunculatis, circiter 7 mm diametro.

A scandent shrub, the young branchlets sometimes emitting rootlets, glabrous or nearly so. Branches terete, brown, wrinkled when dry, glabrous or with few scattered long hairs. Leaves alternate, coriaceous, ovate to oblong-ovate, 10 to 20 cm long, 5 to 10 cm wide, entire, the apex acuminate, the base broadly rounded, cordate, the upper surface glabrous, shining, the nerves impressed, the lower surface very prominently reticulate, glabrous or with very scattered hairs along the midrib and primary nerves; lateral nerves 7 on each side of the midrib, very prominent, the anastomosing, primary reticulations subparallel; petioles 1.5 to 3 cm long, somewhat ciliate-pubescent or glabrous; stipules lanceolate, acuminate, deciduous, about 1.5 cm long. Receptacles axillary, solitary or fascicled, obovoid, glabrous, smooth, about 7 mm in diameter, their peduncles 5 to 8 mm in length.

LUZON, Province of Laguna, Dahican River, back of San Antonio, *Phil. Pl.* 1123 Ramos, September 17, 1912, in forests.

A species very similar to and manifestly closely allied to *Ficus propinqua* Merr., and to *Ficus villosa* Bl., perhaps even too closely allied to the former to be distinguished as a true species. Its glabrous receptacles and leaves distinguish it from Blume's species, while from the Philippine *F. propinqua* it is distinguishable by its longer peduncled, obovoid, not globose receptacles, its glabrous or nearly glabrous leaves, and its only slightly hirsute branchlets.

FICUS WEBERI sp. nov. § *Sycidium*.

Frutex circiter 4 m altus, ramulis stipulis et subtus foliis ad nervos plus minusve brunneo-hirsutis; foliis alternis oppositisque, oblongo-ovatis ad obovato-oblongis, chartaceis, 10 ad 20 cm longis, acuminatis, basi acutis, truncatis, vel leviter cordatis, subaequilateralibus vel leviter inaequilateralibus, nervis utrinque circiter 10; stipulis anguste lanceolatis, acuminatis, usque ad 3 cm longis; receptaculis axillaribus, sessilibus, ovoideis, subglabris, circiter 1.5 cm longis, basi 3-bracteatis.

An erect shrub about 4 m high. Branches terete, brown, hirsute with spreading brownish hairs. Leaves alternate, a few also opposite, chartaceous, brown and slightly shining when dry, paler beneath, oblong-ovate to obovate-oblong, 10 to 20 cm long, 6 to 10 cm wide, the upper surface smooth and glabrous, the lower hirsute with spreading, scattered, brown or pale hairs along the midrib and lateral nerves, apex rather slenderly and abruptly acuminate, base acute but more often truncate or slightly cordate, usually somewhat inequilateral, one side sometimes acute and the other rounded, margins slightly crenulate; nerves about 10 on each side of the midrib, prominent, the reticulations rather lax; petioles hirsute, 1 to 3 cm long; stipules narrowly lanceolate, long-acuminate, 2 to 3 cm long, hirsute on the back, subpersistent. Receptacles green, axillary, sessile, ovoid, about 1.5 cm long, glabrous or nearly so, the base with three, triangular-ovate to ovate-lanceolate, acuminate, 3 to 5 mm long bracts. Male flowers not seen.

MINDANAO, Butuan Subprovince, Veruela, *Weber 1002*, in second growth forests, June 19, 1911.

A species probably most closely allied to *Ficus carpenteriana* Elm., but differing from that species in its much broader leaves, nearly glabrous receptacles, and other characters.

FICUS WORCESTERI sp. nov. § *Sycidium*.

Arbor parva, erecta, glabra, circiter 4 m alta, ramulis teretibus; foliis alternis, circiter 20 cm longis, chartaceis, in siccitate pallidis, utrinque leviter scabridis vel laevis, concoloribus, equilateralibus, apice abrupte subcaudato-acuminatis, basi acutis vel obtusis, 3-nerviis, margine integris vel leviter obscure undulatis, nervis utrinque circiter 10, distinctis; petiolo 1.5 ad 4 cm longo; receptaculis axillaribus, solitariis vel fasciculatis, pedunculatis, subglobosis, aurantiacis, 1 cm diametro.

A small, erect, glabrous tree about 4 m high, the branches terete, smooth, somewhat straw-colored. Leaves alternate, chartaceous, very slightly scabrid on both surfaces or smooth, slightly

shining, of the same color on both surfaces when dry, and rather pale-yellowish-green, about 20 cm long, 8 to 10 cm wide, oblong, the apex rather abruptly subcaudate-acuminate, the acumen 1 cm long, the base equilateral, acute or obtuse, shortly 3-nerved, the margins entire or slightly and obscurely undulate; lateral nerves about 10 on each side of the midrib, prominent, straight, somewhat anastomosing, the reticulations subparallel, distinct, rather lax; petioles 1.5 to 4 cm long. Receptacles axillary, solitary or somewhat fascicled, orange-red when mature, globose, about 1 cm in diameter, their peduncles 8 to 10 mm long, ebracteolate or with small bracteoles near the base.

CAVILLI ISLAND, Sulu Sea, Merrill 7178, September 24, 1911.

Common in thickets near the sea on both Cavilli Island, and the neighboring smaller islet known as Arena Island. Apparently allied to *Ficus ulmifolia* Lam., *F. blepharostoma* Warb., and similar forms, distinguishable at once by its smooth or nearly smooth leaves. Dedicated to the Honorable Dean C. Worcester, formerly Secretary of the Interior of the Philippine Government, to whom I am indebted for opportunity botanically to explore Cavilli Island.

FICUS HEMICARDIA sp. nov. § *Sycidium*.

Arbor parva, erecta; foliis oblongis, brevissime petiolatis, scabris, inaequilateralibus, 10 ad 30 cm longis, valde oblique cordatis, uno latere angustatis altero latissime rotundatis; receptaculis ovoideis vel subglobosis, circiter 11 mm diametro, hispidis, pedunculatis, solitariis vel binis in axillis foliorum vel in ramis vel caulis fasciculatis.

An erect tree, apparently of small size. Branches terete, light-gray, glabrous. Leaves varying greatly in size, 10 to 30 cm long, 3 to 11 cm wide, oblong, very harsh and scabrous on both surfaces, not pubescent, somewhat shining when dry, oblong, strongly inequilateral, margins coarsely dentate, apex rather prominently acuminate, base very strongly obliquely cordate, one side very much narrower than the other, narrowly rounded, the other broadly rounded, the sinus narrow; petioles stout, 5 mm long or less; lateral nerves very prominent as are the coarse reticulations, 6 or 7 on each side of the midrib above the base, the basal nerves radiating, the narrow side of the leaf usually with one, the broad side with four. Receptacles ovoid or subglobose, about 11 mm in diameter, hispid with scattered, spreading, white, bristle-like hairs, solitary or in pairs in the axils of the leaves, or solitary or fascicled on the larger branches and on the trunk near its base, the peduncles hispid, about 4 mm long, with 2 or 3, ovate, acute, 1.5 mm long bracts near the apex. Male flowers not seen. Fertile female flowers pedicelled, the

perianth lobes hyaline, equaling or a little longer than the ovary which is about 1.1 mm in length; style sublateral, 1.5 mm long.

MINDANAO, Butuan Subprovince, Mount Hilong-Hilong, *Weber 1001*, March 11, 1911, altitude about 130 m, on rocky slopes near streams.

The species is allied to *Ficus fiskei* Elm., differing in its short-petioled, differently shaped leaves and hispid fruits, and also to *F. odorata* Merr., differing from that species especially in its smaller fruits that are not densely hirsute. It is one of the most strongly marked species of the genus known from the Philippines, well characterized by its harsh, inequilateral, prominently and obliquely cordate, subsessile leaves. The receptacles are borne in the axils of the leaves on the ultimate branches, on the large branches below the leaves, and on the trunk of the tree near its base, a varied distribution that is quite unusual in the genus, although occasionally one finds the allied *Ficus odorata* Merr. with most of its receptacles in the leaf-axils, and a few supplementary ones near the base of the trunk.

FICUS CAMIGUINENSIS sp. nov.

Species *F. paucinerviae* Merr. similis et ut videtur affinis, differt foliis majoribus, receptaculis minoribus glabris.

A small tree about 6 m high. Branches terete, wrinkled and brownish when dry, the ultimate ones about 5 mm thick. Leaves alternate, somewhat crowded at the ends of the branchlets, chartaceous or thinly coriaceous, subelliptic or elliptic-ovate, greenish and shining when dry, narrowed to the acute or obtuse base, the apex shortly and slenderly caudate-acuminate, the acumen 1 cm long or less, 14 to 22 cm long, 8 to 13 cm wide, entire, the upper surface glabrous, the lower one more or less white-ciliate on the nerves and reticulations; basal nerves a single pair, extending to about the middle of the leaf, straight, prominent; lateral nerves above the basal pair 4 or 5 on each side of the midrib, ascending, straight, prominent, the reticulations distinct, subparallel; petioles ciliate-pubescent, 3 to 4.5 cm long; stipules caducous, ovate or ovate-lanceolate, 5 to 8 mm long, densely appressed-pubescent, the stipular scars prominent. Receptacles mostly in pairs in the axils of fallen leaves, sometimes solitary, sometimes somewhat fasciculate, numerous, their peduncles 4 to 8 mm long, with three prominent bracts at the apex or somewhat below the apex, glabrous, yellow, globose, about 8 mm in diameter.

CAMIGUIN DE MINDANAO, in mossy forests probably above an altitude of 1,200 m, *Phil. Pl. 1197 Ramos*, March 24, 1912.

Apparently a distinct species, at least not matched in our extensive collections. I have also been unable to refer it to any of the numerous Malayan species of which the descriptions are available here. It is similar to *Ficus paucinervia* Merr. (*F. integrifolia* Elm.), apparently closely allied to it, and certainly belongs to the same section of the genus.

LORANTHACEAE

LORANTHIS Linnaeus

LORANTHUS LUCIDUS sp. nov. § *Dendrophthoe*.

Frutex parasiticus, subscandens, glaber, ramis ramulisque teretibus; foliis oppositis vel suboppositis, usque ad 12 cm longis, breviter petiolatis, oblongo-ovatis ad lanceolatis, utrinque valde nitidis, longe acute acuminatis, basi late rotundatis cordatisque rariter subobtusis; inflorescentiis terminalibus et in axillis superioribus, 5 ad 10 cm longis, floribus 6-meris, circiter 1.6 cm longis, in triadibus dispositis, lateralibus pedicellatis, intermedio sessile, triadibus racemose dispositis.

A parasitic shrub, apparently somewhat scandent along its host, glabrous, the branches stout, terete, gray, slightly lenticellate, the younger ones somewhat reddish-brown, smooth. Leaves opposite or subopposite, coriaceous, oblong-ovate to lanceolate, normally 8 to 12 cm long, 3.5 to 5 cm wide, broadly rounded and prominently cordate at the base, exceptionally lanceolate, 1.5 to 3 cm wide, and subobtuse at the base, prominently shining on both surfaces, gradually narrowed upward to the long and sharply acuminate apex; lateral nerves 6 to 8 on each side of the midrib, slender, indistinct; petioles 3 to 7 mm long. Inflorescence terminal and in the uppermost axils, 5 to 10 cm long, the axis and lateral branches gray, obscurely furfuraceous, composed of racemosely disposed triads. Lateral branches of the panicles (peduncles of the triads), spreading, 1 cm long or less, each bearing a central sessile fertile flower, and two lateral flowers, each flower subtended by a broadly ovate, acute or acuminate bracteole as long as the calyx, the pedicels of the lateral flowers 4 to 5 mm long. Flowers 6-merous. Calyx subcylindric, 3 mm long, truncate, the rim not produced, very minutely and obscurely 6-denticulate. Corolla about 1.3 cm long, the basal part somewhat inflated, about 3 mm in diameter, the lobes united for the lower 2 mm, narrow, very slender upward, the reflexed part above the insertion of the stamen spatulate, 5 mm long. Filament very slender, 3 mm long; anther narrowly oblong, continuous, 2 mm long. Fruit very soft and fleshy, ovoid, about 8 mm long.

LUZON, Province of Laguna, San Antonio (Dahican River), *Bur. Sci.* 16647 Ramos, September 16, 1912, parasitic on *Worcesteranthus*, in forests.

A species in the same group with *Loranthus ahernianus*, *L. acuminatissimus*, *L. saccatus*, and *L. ovatifolius*, differing from the first three in its very much smaller flowers, and other characters, and from the latter in its very different vegetative and floral characters.

LORANTHUS FRAGILIS sp. nov. § *Dendrophthoe*.

Frutex parasiticus, glaber, ramis ramulisque crassis, teretibus, fragilis; foliis late ovatis, crasse coriaceis, nitidis, usque ad 15 cm longis, ovatis, sessilibus vel subsessilibus, obtusis, basi late rotundatis vel leviter cordatis; inflorescentiis in axillis superioribus, floribus omnibus sessilibus, 6-meris, pallide flavidis, circiter 2.4 cm longis, in triadibus brevissime pedunculatis racemose dispositis.

A species in the alliance with *Loranthus secundiflorus* Merr., and *L. mindanaensis* Merr., distinguished at once by its sessile or subsessile, broadly rounded or subcordate leaves. Branches up to 1 m in length, stout, terete, smooth and shining when dry, grayish-brown, very brittle when fresh, branches 1 cm in diameter breaking very readily. Leaves ovate, subopposite, thickly coriaceous, pale greenish-olivaceous when dry, shining, 9 to 15 cm long, 5.5 to 9 cm wide, apex rounded or obtuse, base broadly rounded or somewhat cordate, sessile or subsessile, the lateral nerves not prominent, 6 or 7 on each side of the midrib. Inflorescence in the upper axils, usually fascicled, about 4 cm long, the flowers 6-merous, all sessile in triads on very short peduncles which are racemously disposed. Flowers pale-yellow, their subtending bracts broadly ovate, obtuse, 1 mm long, the peduncles bearing the triads of flowers very stout, about 2 mm long. Calyx oblong-ovoid, truncate, 3.5 to 4 mm long. Corolla about 2 cm long, the petals 6, united for the lower 2 to 3 mm, the reflexed parts of the petals above the insertion of the anthers 5 mm long. Filaments 1.5 long; anthers continuous, linear, 2.5 mm long.

PALAWAN, Taytay, on *Vernonia* in forests at sea level, May 31, 1913, Merrill 9248.

A species well characterized by its brittle stems, its thickly coriaceous leaves, which are almost fleshy and very brittle when fresh, and which are sessile or subsessile, broadly rounded or somewhat cordate at the base. Its inflorescence is of the type found in *Loranthus secundiflorus* Merr., and *L. mindanaensis* Merr., that is, the flowers sessile in triads, the triads shortly peduncled and racemously disposed.

LORANTHUS LEYTENSIS sp. nov. § *Dendrophthoe*.

Frutex parasiticus, inflorescentiis puberulis exceptis glaber; foliis oppositis, alternis, vel subverticillatis, petiolatis, crassissime coriaceis, oblongis, usque ad 6 cm longis, acutis, nervis lateralibus obsoletis. Inflorescentiis axillaribus, pedunculatis, floribus 5-meris, circiter 3.3 cm longis, in triadibus umbellatim dispositis.

A stiff, parasitic shrub, glabrous except the inflorescence, the branches stout, reddish-brown or grayish, terete, the ultimate branchlets about 3 mm in diameter, the nodes often thickened,

the internodes not elongated. Leaves opposite, alternate, or somewhat whorled at the lower nodes, thickly coriaceous, opaque, oblong, 4 to 6 cm long, 1.5 to 3 cm wide, acute, the base rounded, obtuse, or acute, usually brownish when dry, slightly or not at all shining, the lateral nerves obsolete; petioles about 1 cm long. Inflorescence axillary, solitary, umbellate, the peduncles about 2 cm long, all parts more or less gray-puberulent, each peduncle bearing about 8, umbellately arranged, 5 mm long, primary branches, each branch bearing at its apex a triad of one middle sessile flower and two lateral, very shortly pedicelled flowers, each flower subtended by a broadly ovate, concave, obtuse, 1 to 1.5 mm long bracteole, the pedicels of the lateral flowers 2 mm long or less. Flowers 5-merous, reddish or yellowish, about 3.3 cm long. Calyx 3 mm long, puberulent, truncate, the limb scarcely produced. Corolla cylindric in bud, the lobes quite united below, forming a 4 mm long tube, the reflexed parts of the lobes above the insertion of the stamens narrowly oblong, obtuse, 5 to 6 mm long, 1 mm wide. Filaments 4 mm long; anthers continuous, oblong, 1.5 mm long.

LEYTE, Mount Ibuni back of Dagami, *Bur. Sci.* 15243 Ramos, August 22, 1912, growing in the tops of trees.

A species in the same group with *Loranthus haenkeanus* Presl, and manifestly closely allied to that species. It is distinguishable by its very much smaller, differently shaped leaves.

LORANTHUS HOPEAE sp. nov. § *Dendrophthoe*.

Frutex inflorescentiis minute puberulis exceptis glaber; ramis ramulisque teretibus, bi- vel trichotomis, rigidis; foliis oppositis, crasse coriaceis, sessilibus, ovatis, in siccitate pallidis, nitidis, usque ad 9 cm longis, apice rotundatis, basi late cordatis; inflorescentiis axillaribus, solitariis, brevibus, paucifloris; floribus extus puberulis, 5-meris, circiter 17 mm longis.

A parasitic shrub usually less than 50 cm in length, glabrous except the minutely grayish-puberulent inflorescence. Branches and branchlets terete, stiff, brownish or grayish, smooth, di- or trichotomously branched, more or less divaricate, the ultimate branchlets about 2 mm in diameter. Leaves opposite, sessile, ovate, thickly coriaceous, pale and equally shining on both surfaces when dry, smooth, 5 to 9 cm long, 4 to 6 cm wide, apex broadly rounded, base broadly cordate, often prominently so; lateral nerves 5 or 6 on each side of the midrib, very obscure or nearly obsolete. Inflorescence solitary, axillary and at the nodes, minutely puberulent, 2.5 cm long or less, with few, usually 4, lateral branches which are less than 1 cm in length, each bearing at its apex 2 or 3 sessile flowers, the bracteoles puber-

ulent, reniform, about 2.5 mm wide, 1.5 mm long, rounded. Flowers 5-merous, orange, the tips of the petals glaucous. Calyx cylindric, 5 mm long, puberulent, the limb slightly produced, very obscurely crenulate or entire. Corolla 12 mm long, puberulent externally, slightly inflated, cylindric, the lobes united for the basal 3 to 4 mm, forming a tube, the reflexed part above the insertion of the anthers oblong, obtuse, 2.5 mm long. Anther lanceolate, sessile, 2 mm long.

MINDANAO, District of Zamboanga, coast opposite Olutanga Island, *For. Bur.* 13297 Foxworthy, De Mesa, & Villamil, May 18, 1912, on *Hopea* sp., altitude about 20 meters.

A very characteristic species, recognizable by its opposite, sessile, coriaceous leaves which are rounded at the apex and cordate at the base, its few-flowered, axillary, puberulent inflorescences, and puberulent flowers. In leaf-form it is quite similar to *Loranthus merrillii* Elm., but is entirely different in its inflorescence.

LORANTHUS DEMESAE sp. nov. § *Dendrophthoe*.

Frutex glaber, ramis ramulisque teretibus; foliis oppositis, sessilibus, coriaceis, nitidis, usque ad 10 cm longis, ovatis vel late elliptico-ovatis, apice acutis vel leviter acuminatis, basi rotundatis, reticulatis; nervis utrinque circiter 10, tenuibus; inflorescentiis axillaribus, solitariis, brevibus, paucifloris; floribus circiter 2 cm longis 6-meris; corolla inflata, infra cylindrica, supra acute 6-angulata.

A glabrous parasitic shrub the branches and branchlets terete, brownish or somewhat grayish, smooth. Leaves opposite, sessile, coriaceous, shining when dry, brownish-olivaceous, of about the same color on both surfaces, 6 to 10 cm long, 4 to 6 cm wide, the apex acute or somewhat acuminate, the base rounded; lateral nerves about 10 on each side of the midrib, slender, not prominent, the reticulations rather fine, the lateral nerves anastomosing near the margin. Inflorescence axillary, solitary, few-flowered, the rachis 5 mm long or less, the flowers 2 or 3 (rarely more?). Calyx oblong-cylindric, truncate, 3 mm long, 1.8 mm in diameter. Corolla red, about 18 mm long, much inflated, 6 mm in diameter, the lower one-half cylindric, the upper part sharply and prominently 6-angled, the tube two-thirds to three-fourths as long as the corolla, the lobes about 4 mm wide at the base, narrowed to the insertion of the anthers and there 2 mm wide, thence gradually narrowed to the acute or obtuse apex, the reflexed portion above the insertion of the anthers 5 to 6 mm long, lanceolate. Anthers oblong, 2 mm long, much more slender than are the thick, cylindric, 2.5 mm long filaments.

MINDANAO, District of Zamboanga, Talisay, on tall trees, altitude 40 to 50 meters, *For. Bur. 13788 Foxworthy, DeMesa, & Villamil*, June 19, 1912.

A species well characterized by its ovate, sessile leaves which are acute or acuminate at the apex and rounded at the base, by its axillary, very short, few-flowered inflorescences, and its much inflated corollas which are cylindric below and sharply and prominently 6-angled above.

LORANTHUS LAGUNENSIS sp. nov. § *Dendrophthoe*.

Frutex glaber; foliis coriaceis, ovatis vel oblongo-ovatis, brunneis, oppositis, breviter petiolatis, usque ad 11 cm longis; floribus 6-meris, sessilibus, circiter 1.7 cm longis, in fasciculis axillaribus vel lateralibus dense confertis, fasciculis vix involu-cratis, circiter 8-floris.

A glabrous shrub, the branches very stout, rough, brownish or grayish, the ultimate ones about 5 mm in diameter, lenticel-late. Leaves opposite, thickly coriaceous, ovate to oblong-ovate, 6 to 11 cm long, 3.5 to 6.5 cm wide, brown when dry and some-what shining on both surfaces, the lower a little paler than the upper, the apex obtuse, the base usually acute; lateral nerves about 7, very obscure or subobsolete, the reticulations entirely obsolete; petioles stout, about 5 mm long. Inflorescence of solitary, sessile, axillary or at the nodes, very dense, non-in-volucrate fascicles, about 8 flowers in each fascicle. Flowers sessile, subtended by a solitary bracteole which is reniform, rounded, about 2 mm wide and 1.5 to 2 mm long. Calyx globose or ovoid, 2 mm long, truncate. Corolla about 1.5 cm long, the tube 1.5 mm long, the lobes 6, linear, narrow, the reflexed part above the insertion of the stamens thick, obtuse, 4 mm long. Anthers linear-lanceolate, acuminate, sessile, 3.5 mm long.

LUZON, Province of Laguna, Dahican River back of San Antonio, *Bur. Sci. 15064 Ramos*, June, 1912, host not indicated.

A species apparently in the group with *Loranthus haenkeanus* Presl, in spite of the differences in the characters of the inflorescence in the species. If the fascicles were involucrate the species might well be placed in the section *Lepiostegeres*, but there is quite no indication of an involucre in the material examined.

LORANTHUS FENICIS sp. nov. § *Dendrophthoe*.

Frutex parasiticus, inflorescentiis exceptis glaber, ramis ramu-lisque teretibus; foliis alternis, ovatis, opacis, crasse coriaceis, usque ad 10 cm longis, acutis vel acuminatis, basi late rotundatis, nervis utrinque circiter 5, obscuris vel obsoletis; pedunculis solitariis, axillaribus, floribus umbellatim dispositis; floribus 5-meris, circiter 3.3 cm longis, extus puberulis, in triadibus dispositis, omnibus sessilibus.

A species manifestly allied to *Loranthus haenkeanus*, differing

in its few-flowered umbels and in its flowers all being sessile, the lateral ones of each triad not pedicelled. Branches stout, terete, grayish or reddish-brown, the branchlets grayish-brown, terete, rather slender, the internodes 1 to 3 cm long. Leaves alternate, thickly coriaceous, opaque and rather pale or brownish when dry, ovate, 5 to 10 cm long, 3.5 to 6 cm wide, the apex acute or acuminate, the base broadly rounded; lateral nerves usually about 5 on each side of the midrib, obscure, sometimes obsolete; petioles about 8 mm long. Umbels solitary, in the axils of leaves on the larger branches, gray-puberulent, the peduncles about 1.5 cm long, the primary umbellately arranged branches few, about 6 mm long, each bearing at its apex a triad of three sessile flowers, the subtending bracteoles triangular-ovate, acute, 2.5 mm long, puberulent. Calyx pubescent, narrowly obovoid, 4 mm long, the limb slightly produced, obscurely and broadly 5-toothed. Corolla puberulent, in bud cylindric, the tube about 6 mm long, the lobes 5, about 1.5 mm wide, the part above the insertion of the stamens narrowly oblong, 6 to 7 mm long, 1.5 mm wide, acute. Filaments 4 to 5 mm long; anthers continuous, oblong, obtuse, 2 to 2.5 mm in length.

MINDANAO, District of Davao, Baganga, *Bur. Sci.* 15852 *Fénix*, August 20, 1912, the flowers green and purplish.

LORANTHUS MARITIMUS sp. nov. § *Dendrophthoe*.

Frutex epiphyticus inflorescentibus exceptis glaber; ramis ramulisque teretibus; foliis alternis oppositisque, oblongis, in siccitate pallidis, utrinque concoloribus, opacis, usque ad 8 cm longis, petiolatis, nervis obsoletis vel subobsoletis; inflorescentibus e ramis vetustioribus, pedunculatis, umbellato-subcapitatis, pedunculatis; floribus circiter 3.3 cm longis, 5-meris.

A parasitic shrub glabrous except the inflorescence. Branches stout, terete, reddish-brown, the branchlets terete, slender, grayish, the ultimate internodes 2 mm in diameter or less, up to 3 cm in length, frequently much shorter. Leaves oblong, alternate, opposite or subopposite, coriaceous, uniformly pale when dry, opaque, 5 to 8 cm long, 1.5 to 3 cm wide, the apex rounded or obtuse, the base acute; midrib prominent below, frequently evanescent below the apex, the lateral nerves entirely obsolete or very faint and about 3 on each side of the midrib, ascending; petioles about 5 mm long. Inflorescence from the larger branches, lateral, not axillary, scattered along the internodes, the peduncles 1.5 to 2 cm long, all parts gray-puberulent. Primary branches umbellately arranged at the apex of the pedun-

cle, 3 mm long or less, stout, rather numerous, each bearing a terminal triad of 3 sessile flowers, the three bracteoles broadly ovate, obtuse, 1.5 mm long, connate below, the persistent calyces after the fall of the corollas appearing like a rather lax globose head. Calyx puberulent, narrowly obovoid, truncate, 3.5 mm long, the limb very slightly produced. Corolla cylindric in bud, 3 cm long, purplish and green, puberulent externally, the lobes 5, united below and forming a cylindric tube about 6 mm long, the lobes about 1 mm wide below, the reflexed part above the insertion of the stamens linear-oblong, obtuse, 7 mm long, 1 mm wide. Filaments 6 mm long; anthers continuous, oblong, obtuse, 2.4 mm long.

MINDANAO, Province of Surigao, Tamano, *Bur. Sci.* 15824 *Fénix*, August 16, 1912, on trees along the seashore.

A species manifestly in the same group with *Loranthus haenkeanus* Presl, but only distantly allied to that species. It is characterized by its inflorescences being scattered along the older branches, not axillary, rather dense, and its flowers all sessile, the two lateral ones not at all pedicelled as in most of the forms in this group.

LORANTHUS ALTERNIFOLIUS sp. nov. § *Lepiostegeres?*

Frutex glaber, ramis ramulisque teretibus, tenuibus, brunneis, internodiis elongatis; foliis alternis, usque ad 11 cm longis, anguste oblongis ad oblongo-lanceolatis, subcoriaceis, nitidis, petiolatis, apice obtusis, basi acutis; floribus 6-meris, axillaribus, fasciculatis, sessilibus, 2 cm longis, fasciculis in alabastro in bractea solitaria inclusis.

A glabrous shrub, the branches elongated, slender, terete, smooth or somewhat striate, dark-brown when dry, the internodes 3 to 9 cm long, the ultimate branchlets 1.5 mm in diameter. Leaves subcoriaceous, brittle when dry, olivaceous, of about the same color and shining on both surfaces, 7 to 11 cm long, 2 to 3 cm wide, narrowly oblong to oblong-lanceolate, the apex rounded, the base gradually narrowed, acute; lateral nerves very slender, obscure or subobsolete, 6 or 7 on each side of the midrib; petioles 1 to 1.5 cm long. Flowers in sessile, axillary, solitary fascicles at the nodes, 9 sessile flowers in each fascicle, in bud entirely enveloped by a single, brown, coriaceous or subcoriaceous bract, which bursts irregularly and falls at anthesis. Bracteoles subtending the flowers one to each calyx, orbicular or reniform, about 2 mm long. Calyx 2 mm long and about 2.5 mm in diameter, truncate. Corolla yellow, 6-merous, 18 mm long, cylindric, slightly gibbous, more or less inflated, the lobes united below forming a 5 mm long tube, the free portions 2 mm wide

below, gradually narrowed upwards to the acute apex, the parts above the insertion of the anthers lanceolate, 5 mm long. Anther sessile, linear-lanceolate, acuminate, 4 mm long.

MINDANAO, District of Zamboanga opposite the Island of Olutanga, in forests, altitude 30 meters, *For. Bur. 13295 Foxworthy, DeMesa, & Villamil*, May 17, 1912.

A characteristic species probably belonging in the section *Lepiostegeres*, although the involucre enclosing the buds is composed of a single bract. Its comparatively narrow leaves which are rounded or obtuse at the apex and acute at the base, as well as its 9-flowered, axillary, sessile fascicles are its distinguishing features.

LORANTHUS WORCESTERI sp. nov. § *Macrosolen*.

Glaber, ramis ramulisque teretibus, griseis; foliis oppositis, sessilibus, anguste oblongis ad late ovatis, nitidis, obtusis, basi obtusis, late rotundatis, vel distincte late cordatis, nervis utrinque 4 ad 8, laxis, irregularis, tenuibus; inflorescentiis axillaribus, pedunculis solitariis (vel fasciculatis), 3 ad 5 mm longis, 2-floris, floribus sessilibus, 6-meris, circiter 2 cm longis.

A glabrous, parasitic shrub, the branches and branchlets terete, glabrous, light-gray, the bark slightly wrinkled when dry. Leaves opposite, sessile, exceedingly variable in size, narrowly oblong to broadly ovate, 6 to 11 cm long, 2 to 7 cm wide, pale when dry, shining on both surfaces, the apex obtuse or rounded, the base obtuse, broadly rounded, or broadly and distinctly cordate; nerves 4 to 8 on each side of the midrib, slender, irregular, anastomosing, the reticulations lax. Peduncles axillary, solitary or few in each axil, 3 to 5 mm long, each bearing at its apex two sessile flowers, each flower subtended by an ovate, obtuse, 3 mm long bract and two similar but smaller, free, orbicular, 1.5 mm long bracteoles. Calyx cylindric, about 7 mm long, the limb produced about 1.5 mm, slightly spreading, thin, truncate. Corolla pink and yellow, the lobes 6, very slightly united below, the buds cylindric, in anthesis more or less swollen above the base, lobes 6, about 1.5 cm long, 2.5 mm wide above the base, then narrowed to 1.5 mm at the insertion of the anthers, the produced part above the anthers narrowly oblong, obtuse or acute, very thick, 6 to 7 mm long, about 1.8 mm wide and thick. Anthers sessile, linear, 5 mm long.

MINDANAO, Bukidnon Subprovince, near Sumilao, *Bur. Sci. 15673 Fénix*, August, 1912.

A species with much the floral and inflorescence characters of *Loranthus geminatus* Merr., but not closely allied to that species, being at once distinguishable by its very diversely shaped sessile leaves. Named in honor of the Honorable Dean C. Worcester, formerly Secretary of the Interior of the Phil-

ippine Government, through whose invitation I was able to send a collector with him on his southern trip of inspection in 1912.

LORANTHUS ELMERI sp. nov. § *Macrosolen*.

Frutex parasiticus, glaber, ramis ramulisque teretibus; foliis oblongo-ovatis, crassissime coriaceis, oppositis, breviter petiolatis, usque ad 14 cm longis, sursum angustatis, obtusis vel obscure acuminatis, basi acutis, nervis lateralibus obscuris, utrinque circiter 7; racemis brevissimis, paucifloris, axillaribus, solitariis vel fasciculatis, haud 1 cm longis; floribus 6-meris, circiter 1.8 cm longis, basi bracteis bracteolisque 2 ornatis, pedicellis circiter 1.5 mm longis.

A parasitic shrub, quite glabrous, the branches and branchlets gray or grayish-brown, stout, terete. Leaves opposite, very thickly coriaceous, oblong-ovate, 8 to 15 cm long, 3.5 to 5 cm wide, brownish-olivaceous when dry, the upper surface shining, narrowed upward to the acute or obscurely acuminate apex, the base acute; lateral nerves very faint, about 6 on each side of the midrib; petioles stout, 4 to 8 mm long. Inflorescence of axillary, solitary and fascicled, very short, few-flowered racemes, the racemes 1 cm long or less. Flowers 6-merous, their pedicels 1 to 1.5 mm long, each bearing at its apex one, broadly ovate, acute, 1.5 mm long bract and two smaller but similar bracteoles which are usually more or less connate. Calyx ovoid, about 3 mm long, truncate. Corolla 1.5 cm long, the tube about 6 mm long, 3.5 mm in diameter, somewhat inflated and obscurely angled, the lobes 6, rather abruptly narrowed, about 1 mm wide below the insertion of the stamen, the reflexed parts thickened upward, 7 mm long, acute or obtuse; filament about 3.5 mm long; anther continuous, 2 mm long.

PALAWAN, Mount Pulgar, *Elmer 12749* (type), 13138, March and May, 1911, both distributed as *Loranthus mirabilis* Huerk & Muell.-Arg., a species that is quite different and which belongs in an entirely different section.

The alliance of *Loranthus elmeri* is with *L. ampullaceus* Roxb. It is readily distinguished, however, by its very short racemes.

LORANTHUS SERIATUS sp. nov. § *Heteranthus*.

Frutex parasiticus glaber, ramis ramulisque teretibus, internodiis elongatis; foliis oppositis, breviter petiolatis, oblongo-ovatis, coriaceis, opacis, usque ad 12 cm longis, apice breviter obtuseque acuminatis, basi acutis, nervis lateralibus obscuris, circiter 6 utrinque, subobsoletis; floribus 5-meris, circiter 2.5 cm longis, in triadibus breviter pedunculatis dispositis, triadibus

in ramis seriatim dispositis et ad nodos fasciculatis; petalis intus ad basim ligulatis.

A parasitic glabrous shrub, the branches and branchlets terete, reddish-brown, smooth except where the flowers are borne, the internodes 10 to 15 cm long, the ultimate branchlets about 2 mm in diameter. Leaves opposite, coriaceous, oblong-ovate, 8 to 12 cm long, about 5 cm wide, greenish-olivaceous on both surfaces when dry, not shining, the apex shortly and obtusely acuminate, the base acute, sometime a little decurrent; lateral nerves slender, very obscure, nearly obsolete, about 6 on each side of the midrib; petioles 3 to 5 mm long. Flowers red, 5-merous, the peduncles of the double triads stout, 2 mm long, fascicled at the nodes and also numerous ones seriatly arranged, along one side of the branches along the internodes. Flowers 6 on each peduncle, sessile in two triads, each flower subtended by a reniform-orbicular, rounded, obscurely pubescent, 2 mm long bracteole. Calyx cylindric, 3.5 to 4 mm long, the limb produced about 1 mm, truncate, minutely ciliate-pubescent. Buds cylindric. Petals 5, free, 1.8 mm wide below, 1.5 mm wide above, 2 to 2.2 cm long, the reflexed part above the insertion of the stamens 6 to 7 mm long, each petal with a membraneous, reflexed, ovate, obtuse, 1 mm long, ligule-like organ on the inner side attached about 3 mm above the base. Filaments about 2 mm long; anthers continuous, linear, 3 to 4 mm long.

MINDANAO, District of Zamboanga, Mount Pulongbato, *Bur. Sci.* 16424 Reillo, September 28, 1912.

A very characteristic species, distinguishable by its peculiarly arranged flowers, the flowers sessile in double triads on very short peduncles which are fascicled at the nodes and serially arranged along one side of the internodes. The peculiar ligule-like growth on the inner surface of the petals shortly above the base is characteristic, both of the present species and of the very similar and closely allied *Loranthus cauliflorus* Merr. *Loranthus seriatus* is distinguished from *L. cauliflorus* by its very obscurely veined leaves and its flowers in double triads, that is, 6 flowers in two triads sessile at the apex of each peduncle, not with three flowers only as in the latter species.

LORANTHUS FALCATIFOLIUS sp. nov. § *Heteranthus*.

Frutex scandens, glaber, ramulis teretibus; foliis oppositis, usque ad 16 cm longis, brevissime petiolatis, oblongo-lanceolatis, leviter falcatis, coriaceis, opacis, acuminatis, basi acutis vel obtusis, nervis utrinque circiter 8, obscuris, subobsoletis; floribus 5-meris, ad nodos fasciculatis, sessilibus, circiter 2.5 cm longis, alabastro cylindraceo.

A scandent, parasitic, glabrous shrub, the stems long-climbing on the host, the branches and branchlets terete, the latter reddish-

brown or grayish, 3 mm in diameter or less, the internodes 5 to 8 cm long. Leaves opposite, subsessile or very shortly petioled, oblong-lanceolate, 10 to 16 cm long, 3 to 6 cm wide, somewhat falcate, not shining, coriaceous, the apex acuminate, the base obtuse or acute, brownish or greenish when dry; lateral nerves subobsolete, about 8 on each side of the midrib, very obscure; petioles 2 mm long or less. Flowers 5-merous, axillary, sessile, fascicled, 12 or less at each node, red below, yellow above, the buds rather slender, cylindric, outside very obscurely pubescent with very short scattered hairs. Calyx 3.5 to 4 mm long, straight or somewhat curved, the limb produced about 2 mm, membranaceous, somewhat spreading, truncate, margins minutely ciliate-pubescent. Petals 5, quite free, 1.5 mm wide below, very slightly narrowed upward, the apex obtuse, the reflexed portion above the insertion on the stamens linear-oblong, about 8 mm long, 1 mm wide. Filaments 4 mm long; anthers continuous, linear, 2 mm long.

MINDANAO, Bukidnon Subprovince, Sumilao, on trees in forests, *Bur. Sci.* 15746 *Fénix*, August 3, 1912.

A species well characterized by its scandent habit, its opposite, subsessile, subfalcate, obscurely nerved, coriaceous leaves, and its quite sessile, axillary, fascicled flowers. It is perhaps as closely allied to *Loranthus cuernosensis* Elm. as to any other species, but is very different from that form.

LORANTHUS MEDINILLICOLA sp. nov. § *Heteranthus*.

Frutex scandens, parasiticus, inflorescentibus exceptis glaber; ramulis teretibus, tenuibus; foliis verticillatis, lanceolatis vel ovato-lanceolatis, coriaceis, acuminatis, usque ad 10 cm longis, nervis utrinque 4 vel 5, obscuris; inflorescentibus axillaribus, solitariis, pedunculatis, subumbellatis, paucifloris; floribus 4-meris, circiter 3 cm longis.

A slender, nearly glabrous, scandent, parasitic shrub, the branches and branchlets rather slender, terete, light-gray or brownish, mostly smooth, the ultimate branchlets 2 mm in diameter or less. Leaves whorled, usually 4 at each node, the internodes 4 to 8 cm long, the leaf-blades coriaceous, lanceolate or oblong-lanceolate, 6 to 10 cm long, 1 to 3.4 cm wide, narrowed below to the acute base and above to the rather slenderly acuminate apex, rather dull when dry; lateral nerves 4 or 5 on each side of the midrib, slender, obscure, ascending; petioles 4 to 8 mm long. Inflorescence axillary, solitary, the peduncle slender, 1.5 to 2 cm long, sparingly pubescent, bearing at its apex 4 or more subumbellately arranged branchlets, each branchlet bearing two, spicately arranged, sessile flowers, the branchlets pubescent, about 4 mm long. Flowers sessile, 4-merous, bright yellow

above, reddish toward the base, about 3 cm long, the basal bracteole narrowly ovate, 1 mm long or less. Calyx narrowly funnel-shaped, pubescent, about 3 mm long, the throat about 2.5 mm wide, the limb produced, truncate, obscurely 4-toothed. Petals 4, entirely free, about 2.8 cm long, 2 mm wide, pubescent externally. Filaments 5 to 6 mm long; anthers continuous, narrowly oblong, obtuse, 3.5 mm long. Fruit not seen, said by the collector to be white.

Luzon, Subprovince of Ifugao, Mount Polis, *Bur. Sci.* 19842 *McGregor*, February 10, 1913, on *Medinilla*.

Apparently most closely allied to *Loranthus acutus* Engl., but with much larger flowers than that species. It also resembles *L. polillensis* C. B. Rob., in some respects, but has smaller leaves, and more numerous, pubescent flowers.

OLACACEAE

WORCESTERIANTHUS genus novum

Flores unisexuales. Calyx parvus, 5-dentatus, vix auctus. Petala 5, angusta, puberula. Fl. ♂: Petala valvata. Stamina petala duplopluria, alternatim inaequalia, filamentis gracilis; antherae orbiculari-ovoidae, rimis intus dehiscentibus. Ovarium rudimentum cylindricum, elongatum, puberulum. Fl. ♀: Petala imbricata. Stamina vel staminodia nulla. Ovarium ovoideum, glabrum vel basi pubescens, 2-loculare, loculis 1-ovulatis, ovula pendula. Stigma sessile, breviter 2-lobata. Drupa ovoidea vel subovoidea, 2-locellata, carne crasse coriacea vel sublignosa, putamine crustaceo. Arbor dioica, parva, glabra vel subglabra. Folia alterna, ovata vel oblongo-ovata, penninervia, integerrima. Flores parvi, axillari, breviter pedicellati, ♂ numerosi, ♀ subso-litari.

WORCESTERIANTHUS CASEARIOIDES sp. nov.

Arbor parva, usque ad 12 m alta, partibus junioribus floribus-que exceptis glabra; foliis alternis, glabris, ovatis ad oblongo-ovatis, chartaceis, in siccitate nitidis, pallidis, usque ad 15 cm longis, basi acutis vel subrotundatis, apice acuminatis, nervis utrinque circiter 5, distantibus, laxe anastomosantibus, prominentibus; floribus parvis, 5-meris, ♂ circiter 3 mm longis ♀ paullo longioribus; fructibus solitariis, glabris, circiter 1.5 cm longis, acutis.

A small tree reaching a height of about 12 m, glabrous except the young branchlets and the flowers, dioecious. Branches gray, terete, slender, the young ones very obscurely angled, the growing tips finely grayish-puberulent. Leaves alternate, exstipulate.

ovate to oblong-ovate, chartaceous, 9 to 15 cm long, 4 to 7 cm wide, entire, the base slightly inequilateral, acute or somewhat rounded, the apex blunt-acuminate, the acumen broad, short, both surfaces shining when dry, rather pale and of about the same color, or the upper surface somewhat olivaceous; lateral nerves about 5 on each side of the midrib, very prominent on the lower surface, curved or curved-ascending, distant, prominently looped-anastomosing, the reticulations fine, distinct; petioles about 5 mm long. Flowers greenish-white, small, axillary, shortly pedicelled, the males numerous fascicled, the females solitary or subsolitary. Male flowers: Calyx shallowly cup-shaped, about 1.3 mm long, somewhat pubescent, shallowly and acutely 5-toothed, the teeth broad. Petals 5, free, valvate, alternating with the calyx-teeth, narrowly oblong, puberulent on both surfaces, acute or obtuse, about 3 mm long, 1.2 mm wide. Stamens 10, all fertile, 5 long ones alternating with 5 short ones, inserted in a single row on the rather obscure, ferruginous-pubescent disk; longer filaments 2.3 mm long, the shorter ones 1.5 mm long, glabrous, slender; anthers broadly ovoid or orbicular-ovoid, 0.5 mm long. Rudimentary ovary stout, cylindric, puberulent, 2.5 mm long, truncate. Female flowers 5-merous, solitary or subsolitary, their pedicels 2 mm long. Calyx about as in the males. Petals lanceolate, puberulent, imbricate, acute or somewhat acuminate, about 4 mm long, 1.6 mm wide. Rudimentary stamens or staminodes wanting. Ovary ovoid or narrowly ovoid, glabrous except the ferruginous-pubescent base, narrowed above to the sessile stigma, 2-celled, each cell with a solitary apical ovule. Stigma 2-lobed, curved or spreading, sessile, about 2 mm long. Fruit ovoid, acute, about 1.5 cm long, glabrous, the pericarp thick, very coriaceous or almost woody, the putamen crustaceous, 2-celled, cells 1-seeded. Mature seeds not seen.

LUZON, Province of Laguna, between San Antonio and Paete, *Bur. Sci.* 14943 (type), 16541 *Ramos*, the former with male flowers, June, 1912, the latter with nearly mature fruits and few female flowers, September, 1912: Province of Cagayan, *For. Bur.* 18436 *Alvarez*, February, 1909, in fruit.

This apparently represents a very distinct generic type, and one previously not described. It belongs in the Tribe *Olaceae*, and apparently near *Ximenia* Plum., and *Scorodocarpus* Becc., although not at all closely allied to either. The alternate leaves, dioecious flowers, the males fascicled and the females solitary, the 10 stamens, 5 short ones alternating with 5 longer ones, and the absence of staminodes or reduced stamens in the female flowers are distinguishing characters.

The first specimen received, in fruit, was tentatively referred by me to the *Olaceae*, but later was transferred to the *Flacourtaeae*, but with no further attempt to determine it, on account of the similarity of its

leaves to a specimen named *Erythrospermum phytolaccoides* Gardn., in the Herbarium of the Bureau of Science. The next collection received, with male flowers, that I have made the type, was hurriedly determined and erroneously referred to *Casearia solida* Merr., which in leaf-characters and in the position and size of its flowers it rather closely resembles; the duplicates of this number were distributed as *Casearia solida* Merr. The next collection yielded female flowers and nearly full grown, but immature, fruits, and a study of all the available specimens shows that it is well worthy of being described as a new genus. There appears to be nothing in the *Olacaceae* that very closely approaches it, although there is no doubt whatever in my mind but that it properly belongs in this group.

The genus is dedicated to the Honorable Dean C. Worcester, for many years Secretary of the Interior of the Philippine Government, in recognition of his interest in and great services to the advancement of the scientific work in the Philippines.

HERNANDIACEAE

HERNANDIA Linnaeus

HERNANDIA OVIGERA Linn. Amoen. Acad. 4 (1757) 125; Meissn. in DC. Prodr. 15¹ (1864) 262; F.-Vill. Novis. App. (1880) 182.

MINDANAO, District of Zamboanga, Mount Pulongbato, *Bur. Sci.* 16442 Reillo, Sept. 20, 1912. CAMIGUIN DE MINDANAO, *Bur. Sci.* 17424 Ramos, April, 1912.

This species was based on *Arbor ovigera* Rumph. Herb. Amboin. 3: 103, pl. 123, and is characterized by its leaves not being peltate. In other respects it is very similar indeed to *Hernandia peltata* Meissn., and it seems to be doubtful whether or not the two are really distinct. In the Philippines *Hernandia peltata* Meissn., is common and widely distributed along the seashore, and this seashore form apparently always has peltate leaves, although sometimes but slightly so, as in *Copeland 1331* from the strand at Tagalaya, Davao, Mindanao. At any rate, if the type of *Hernandia sonora* L. be interpreted as the American species, which seems to be the logical course to follow, *H. ovigera* L. is the oldest name for the oriental form, should *H. peltata* Meissn. and *H. ovigera* L. be united. *Hernandia ovigera* L. has already been reported from the Philippines by F.-Villar, but the record has not previously been verified.

Both specimens cited above are from the interior forests, not from the coast; *Hernandia peltata* Meissn. is confined to the beach forests.

Malay Archipelago, Java to Amboina.

ILLIGERA Blume

ILLIGERA MEGAPTERA sp. nov.

Frutex scandens, inflorescentiis exceptis glaber; foliis 3-foliolatis, foliolis oblongo-ovatis ad ovato-ellipticis, coriaceis, nitidis, usque ad 15 cm longis, breviter acuminatis, basi late rotundatis, integris, nervis utrinque 5 vel 6, prominentibus; fructibus 3.5 cm longis, cum alis 10 ad 12 cm latis.

Scandent, glabrous except the inflorescence, the stems terete, at least 5 mm diameter, dark-colored when dry, striate.

Leaves 3-foliolate, their petioles 9 to 12 cm long. Leaflets oblong-ovate to elliptic-ovate, coriaceous, entire, 13 to 15 cm long, 8 to 9 cm wide, apex shortly acuminate, base broadly rounded, pale-olivaceous when dry, both surfaces equally shining; lateral nerves 5 or 6 on each side of the midrib, prominent, the reticulations distinct; petiolules 1.5 to 2 cm long. Flowers not seen, the infructescence at least 20 cm long, subferruginous-pubescent, the mature fruits 3.5 cm long, including the wings 10 to 12 cm wide, the wings brown, shining, elliptic-ovate, broadly rounded, firmly chartaceous to subcoriaceous, 3.5 to 4 cm wide.

MINDANAO, Butuan Subprovince, *Bur. Sci.* 21511 *Escritor*, August, 1913, locally known as *cabacaba*.

Very characteristic on account of its relatively large leaflets and its very large fruits, the broad long wings being rather remarkable.

ILLIGERA RETICULATA sp. nov.

Frutex scandens, subglaber; foliis 3-foliolatis, foliolis coriaceis, late ovatis, acuminatis, basi rotundatis vel leviter cordatis, usque ad 11 cm longis, nervis utrinque 5 vel 6, subtus cum reticulis prominentibus; fructibus 3.5 cm longis, 3-alatis, alis lateralibus coriaceis, nitidis, late ovatis, rotundatis, circiter 4 cm longis, altero 1 ad 1.5 cm longis latisque.

A scandent shrub, nearly glabrous (flowers unknown). Leaves 3-foliolate, the petioles about 8 cm long; leaflets broadly ovate, coriaceous, about 11 cm long, slightly acuminate, entire, base rounded or somewhat cordate, pale when dry, the lower surface bearded in the axils; lateral nerves 5 or 6 on each side of the midrib, prominent, the reticulations lax, also prominent; petiolules 2 cm long. Panicles ample, in fruit glabrous. Fruits about 3.5 cm long, 3-winged, the lateral wings broadly ovate, coriaceous, rounded, shining, about 3.5 cm long and 3 cm wide, the other one much reduced, 1 to 1.5 cm long and wide and confined to the lower one-half of the fruit, the opposite side with a mere keel, not at all winged.

LUZON, Province of Laguna, Mount Maquiling, *For. Bur.* 7761 *Curran & Merritt*, October 24, 1907, on trees, open cogon slopes, altitude 160 meters.

A species well characterized by its prominently reticulate leaves and its comparatively large, 3-winged fruits, the lateral wings very large, the other very much reduced, and the fourth represented by a mere ridge or keel.

ILLIGERA ELLIPTIFOLIA sp. nov.

Frutex scandens inflorescentiis exceptis glaber; foliis trifoliolatis, foliolis ellipticis, 7 ad 13 cm longis, utrinque rotundatis, in siccitate pallidis, nitidis, nervis utrinque circiter 6; infructescentiis laxis, amplis, circiter 20 cm longis, dense olivaceo- vel

subferrugineo-pubescentibus; fructibus junioribus circiter 3 cm longis, bialatis, alis chartaceis, circiter 2 cm longis, ovatis, rotundatis.

A scandent shrub, glabrous except the inflorescence. Stems terete, about 5 mm in diameter, nearly black when dry. Leaves 3-foliolate, the petioles up to 12 cm long; leaflets entire, subcoriaceous, elliptic, 7 to 13 cm long, 4 to 7.5 cm wide, rounded at both ends, pale and somewhat shining when dry, the petiolules 1 to 2.5 cm long; lateral nerves about 6 on each side of the midrib. Inflorescence lax, subpyramidal, about 20 cm long, the branches few, scattered, the lower ones up to 9 cm long, all parts rather densely olivaceous- or subferruginous-pubescent with short hairs. Flowers unknown. Fruits (immature) about 3 cm long, 2-winged, the wings rather thin, ovate, rounded, about 2 cm long.

MINDANAO, Agusan Subprovince, in forests along streams southeast of Nasipit, altitud about 20 meters, *For. Bur. 20571 Miranda*, September, 1913.

Well characterized by its lax, rather densely pubescent panicles, its two-winged fruits, and its elliptic leaflets.

ILLIGERA CARDIOPHYLLA sp. nov.

Frutex scandens, glaber (floribus ignotis); foliis 3-foliolatis, foliolis late ovatis, coriaceis, 9 ad 12 cm longis, base late rotundatis cordatisque, apice late, abrupte, obtuse acuminatis; fructibus 3 cm longis, 4-alatis, alis coriaceis, late rotundatis, glabris, lateralibus 3.5 cm longis, ceteris triplo brevioribus.

A scandent glabrous shrub (flowers unknown). Branches terete, black when dry, 4 to 5 mm in diameter. Leaves 3-foliolate, the petioles 8 to 10 cm long; leaflets broadly ovate, coriaceous, 9 to 12 cm long, nearly or quite as wide, olivaceous and somewhat shining when dry, base broadly rounded, rather prominently cordate, apex abruptly, shortly, and obtusely acuminate; lateral nerves 5 to 6 on each side of the midrib, the reticulations lax, not prominent; petiolules 1.5 to 2 cm long. Panicles in fruit 15 cm long, glabrous or nearly so; fruits glabrous, 4-winged, about 3 cm long, the lateral wings coriaceous, rounded, broadly ovate, about 3.5 cm long, the other two about one-third as long as the lateral, ones.

BABUYANES ISLANDS, Camiguin, *Bur. Sci. 4082 Fénix*, June 28, 1907, in thickets near old clearings.

The characteristic features of this species are its broadly ovate, rather prominently cordate leaves and its comparatively large, 4-winged fruits.

(To be concluded)

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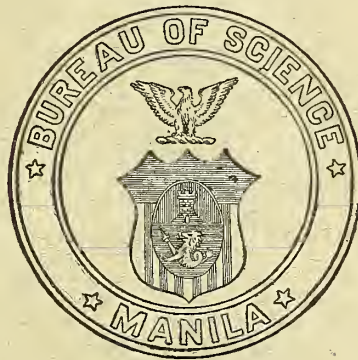
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NEW OR NOTEWORTHY PHILIPPINE PLANTS, X

By E. D. MERRILL *

(From the Botanical Section of the Biological Laboratory, Bureau of
Science, Manila, P. I.)

(Concluded)

RUTACEAE

ATALANTIA Correa

ATALANTIA MARITIMA sp. nov.

Species *A. distichae* (Blanco) Merr. affinis, differt foliis ellipticis haud prominente acuminatis, margine leviter crenulatis vix integris.

An unarmed shrub or small tree 2 to 6 m in height, glabrous except the inflorescence, or the younger branchlets sometimes slightly pubescent. Branches terete, slender, usually reddish-brown when dry, the branchlets greenish or straw-colored and more or less angled or compressed near the nodes. Leaves alternate, subcoriaceous or coriaceous, elliptic to ovate-elliptic, shining, rather pale when dry and of nearly the same color on both surfaces, 5 to 10 cm long, 2.5 to 6 cm wide, subequally narrowed at both ends, the base acute, the apex obtuse and distinctly retuse, not gradually narrowed to an acumen, the margins above distinctly but distantly crenulate, not entire, glandular-punctate beneath; lateral nerves very numerous, close; petioles 5 to 10 mm long. Panicles axillary and terminal, 3 to 6 cm long, pubescent, many-flowered, narrow, the lower branches 2 cm long or less, the panicles usually larger in fruit and up to 11 cm in length. Flowers 5-merous. Calyx pubescent, cup-shaped, about

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3 mm in diameter, 5-lobed, the lobes orbicular-reniform, rounded, about 2 mm long and somewhat wider than long, pubescent. Petals 5, about 6 mm long, glandular-punctate, oblong-obovate, rounded. Stamens 10, 2-seriate; filaments flattened, free, the longer ones about 5 mm long, the shorter 4 mm in length; anthers ovoid, rounded at both ends, 1.3 mm long. Disk annular, surrounding the base of the ovary. Ovary glabrous, ovoid or globose; style thick, cylindric. Fruit globose, yellow, glabrous, about 8 mm in diameter, fleshy, with a single seed.

APO ISLAND, Mindoro Strait, *Bur. Sci.* 178 *Bermejos* (type), November, 1905. TICA0, *For. Bur.* 1060 *Clark*, May, 1904. PANAY, Capiz, *Copeland* 107, January, 1904. BOHOL, Tagbilaran, *Bur. Sci.* 1278 *McGregor*, July, 1906. MINDANAO, District of Zamboanga, Port Banga, *For. Bur.* 9469, 9270 *Withford & Hutchinson*, February, 1908. PALAWAN, *For. Bur.* 3796 *Curran*, February, 1906, *Bur. Sci.* 623 *Foxworthy*, March, 1906.

The species is manifestly closely allied to *Atalantia disticha* (Blanco) Merr., from which it may be easily distinguished by its very differently shaped leaves which are not gradually narrowed upward to an acuminate apex and which are distinctly crenulate, not entire. All the specimens are indicated as growing in thickets or forests at the edge of the beach, on beach-cliffs, or near mangrove swamps. The Visayan name in Ticao is indicated by Clark as *carucabagao*.

CLAUSENA Burmann

CLAUSENA GRANDIFOLIA sp. nov.

Frutex 2 ad 3 m altus, vix aromaticus, glaber vel subglaber; foliis usque ad 40 cm longis, foliolis 11 ad 15, chartaceis vel subcoriaceis, 9 ad 15 cm longis, oblongo-ovatis ad oblongis, inaequilateralibus, acuminatis; paniculis circiter 20 cm longis angustis, leviter pubescentibus; floribus parvis, 5-meris; fructibus globosis, carnis, 7 ad 10 mm diametro.

A shrub 2 to 3 m high, glabrous except the slightly puberulent younger parts and the inflorescence, not aromatic. Branches terete, stout, brownish-gray. Leaves alternate, 25 to 40 cm long, the petioles and rachis minutely puberulent, becoming glabrous; leaflets 11 to 15, alternate, oblong-ovate to oblong, the larger ones up to 15 cm long and 6 cm wide, the smaller ones about 10 cm long and 3 to 4 cm wide, those in the upper part of the rachis longer than the lower ones, chartaceous to subcoriaceous, strongly inequilateral, entire, acuminate, base rounded to acute, rather pale, shining, and of about the same color on both surfaces when dry; lateral nerves 7 to 9 on each side of the midrib, prominent, distant, irregular, anastomosing, the reticulations lax; petiolules about 3 mm long. Panicle terminal, narrowly pyramidal, about 20 cm long, somewhat puberulent, the lower

branches 7 cm long or less, the upper gradually shorter. Flowers apparently numerous, somewhat crowded at the apices of the branchlets, 5-merous, the pedicels very short. Calyx shallow, 1.5 mm in diameter, 5-lobed, lobes broadly ovate, acute. Petals 5, imbricate, elliptic-ovate, 2.5 mm long, glandular, glabrous. Stamens 10, somewhat 2-seriate; anthers oblong, 1 to 1.2 mm long, much longer than the filaments which are somewhat enlarged below. Ovary cylindric, prominently rugose, glabrous, 5-celled. Fruit globose, fleshy, up to 1 cm in diameter, with from 1 to 3 seeds; seeds about 7 mm long, the cotyledons thick, plano-convex.

PALAWAN, Mount Capoas, *Merrill 9544*, April 21, 1913, on talus slopes, steep forested ridge, altitude about 800 meters.

A species well characterized by its unusually large leaves and leaflets.

EVODIA Forster

EVODIA LAXIRETA sp. nov.

Frutex vel arbor parva, glabra; foliis 3-foliolatis, foliolis coriaceis vel subcoriaceis, nitidis, anguste oblongo-obovatis, usque ad 12 cm longis, 3 ad 5 cm latis, obtusis, basi sensim angustatis, cuneatis; nervis lateralibus utrinque circiter 10, prominentibus, reticulis laxis, distinctis; inflorescentiis in axillis superioribus, anguste paniculatis, circiter 5 cm longis; coccis 1 vel 2, ovoideis vel ellipsoideis, circiter 4 mm longis.

A shrub or small tree, quite glabrous (flowers not seen); branches terete, pale-brownish, shining, rather stout, wrinkled when dry. Leaves 3-foliolate, the petioles 2.5 to 5 cm long; leaflets narrowly oblong-obovate, coriaceous or subcoriaceous, when dry prominently shining and of about the same color on both surfaces, 9 to 12 cm long, 3 to 5 cm wide, entire, the apex obtuse, below gradually narrowed to the acute or cuneate base; lateral nerves about 10 on each side of the midrib, prominent, anastomosing, the reticulations lax, the nerves and reticulations about equally prominent on both surfaces; petioles about 1.5 cm long. Panicles solitary, in the upper axils, narrowly pyramidal, about 5 cm long, shortly peduncled, the branches few, the lower ones 1.5 cm long or less. Fruit of 1 or 2 cocci, the cocci ovoid to ellipsoid, rounded, about 4 mm long.

MINDANAO, Bukidnon Subprovince, *Bur. Sci. 21407 Escritor*, July 27, 1913, locally known as *pamintang gubat*.

Thus species may prove to belong to the genus *Melicope* when the flowers are known. In general it resembles *Melicope triphylla* (Lam.) Merr., but differs in its thicker leaves which are prominently and laxly reticulate on both surfaces.

EVODIA CAMIGUINENSIS sp. nov.

Arbor parva partibus junioribus inflorescentiisque villosis; foliis trifoliolatis, foliolis anguste oblongis, anguste oblongo-ovatis, vel oblongo-oblancoelatis, utrinque angustatis, apice acuminatis, usque ad 9 cm longis, nitidis, glabris, vel subtus ad costa parce villosis; inflorescentiis axillaribus, paniculatis, pallide subdense villosis, quam folia multo brevioribus.

A small tree, the branches light-gray, shining, glabrous, subterete or very obscurely 4-angled, the younger parts slightly villous. Leaves 3-foliolate, their petioles 1 to 3.5 cm long, sparingly villous, becoming nearly glabrous, glandular; leaflets narrowly oblong, narrowly oblong-obovate or oblong-oblancoelate, chartaceous or submembranaceous, green and shining when dry, of nearly the same color on both surfaces, 6 to 9 cm long, 1.5 to 3 cm wide, narrowed at both ends, the apex rather distinctly acuminate, the base acute, the upper surface quite glabrous, the lower one glabrous or slightly villous along the midrib, prominently glandular-punctate with very numerous, small, dark-colored glands; petiolules 3 to 5 mm long; lateral nerves about 12 on each side of the midrib, very slender, anastomosing, distinct but not prominent. Panicles axillary, narrowly pyramidal, rather prominently villous-pubescent with pale hairs, 5 to 7 cm long, open, rather lax, the branches spreading, the lower ones 2 cm long or less, the upper ones gradually shorter. Female flowers: Pedicels 1.5 to 2 mm long, pubescent. Sepals 4, oblong-ovate obtuse, pubescent, about 1.2 mm long. Petals 4, oblong, obtuse, about 2.4 mm long, 1.2 wide. Stamens 4, very slender, 1 mm long. Ovary densely villous; style slender, 1.5 mm long, villous below. Male flowers and fruits not seen.

CAMIGUIN DE MINDANAO, *Bur. Sci.* 14664 Ramos, April, 1912.

A species distinguishable by its rather narrow leaflets, but more especially by its open, narrowly pyramidal panicles which are prominently villous with pale hairs. It has somewhat the appearance of the Asiatic *Evodia pteleaefolia* (Champ.) Merr., but is quite distinct from that species.

EVODIA VILLAMILII sp. nov.

Arbor alta, glabra, gemmis inflorescentiisque exceptis glabra; foliis 3-foliolatis, foliolis subcoriaceis, oblongis ad oblongo-ellipticis, usque ad 22 cm longis, in siccitate pallidis, breviter acuminatis, basi angustatis, plus minusve decurrento-acuminatis, subsessilibus vel brevissimè petiolulatis, nervis utrinque circiter 20, prominentibus; inflorescentiis axillaribus, 5 ad 8 cm longis, breviter pedunculatis, dense multifloris, floribus rosaceis, 4-meris, circiter 5 mm longis.

A tree about 20 m high, glabrous except the buds and the inflorescence. Branches stout, olivaceous. Leaves opposite, their petioles 5 to 10 cm long, the leaflets 3, oblong to oblong-elliptic, or sometimes narrowly elliptic-obovate, subcoriaceous, pale and somewhat shining when dry, 15 to 22 cm long, 6 to 12 cm wide, the apex somewhat acuminate, the acumen short, the base narrowed, usually somewhat decurrent-acuminate, sessile or the petiolules very short; lateral nerves about 20 on each side of the midrib, prominent. Inflorescence of solitary, axillary, densely many flowered, peduncled, somewhat pubescent cymes 5 to 8 cm long, 6 to 11 cm in diameter, all parts more or less gray-pubescent. Flowers pink, their pedicels pubescent, 5 mm long. Sepals 4, orbicular-reniform, rounded, 1.5 mm in diameter. Petals 4, pink, ovate to ovate-elliptic, acute, 5 mm long, 3 mm wide, appressed-pubescent inside. Stamens 4; filaments 6 to 7 mm long, glabrous, the upper 1 mm much narrowed and abruptly inflexed; anthers versatile, oblong, 2 mm long. Ovary deeply 4-lobed, densely villous, the cells 2-ovuled; style glabrous, 6 mm long; stigma punctiform. Cymes in fruit about 7 cm in diameter, rather dense, the cocci cartilaginous, about 5 mm long, the seeds jet black, shining, ellipsoid, about 3 mm long.

LUZON, Province of Laguna, Mount Maquiling, *For. Bur.* 20653 (type), 20880 Villamil, October, 1913, February, 1914, in forests, altitude 300 to 350 meters, the former in flower, the latter in fruit and from the same tree; also *C. F. Baker* 449, November, 1912, detached inflorescence only.

A very striking species not closely allied to any other known Philippine form, readily recognizable by its short, dense, hemispheric, many flowered, short-peduncled cymes, the flowers retaining their pink color long after being dried.

EVODIA TERNATA (Blanco) comb. nov.

Orixa ternata Blanco Fl. Filip. (1837) 62, ed. 2 (1845) 45, ed. 3, 1: 84.

Evodia robusta F.-Vill. Novis. App. (1880) 34, non Hook. f.

Evodia triphylla Merr. in Philip. Journ. Sci. 1 (1906) Suppl. 68, non DC.

For this Philippine form that has been confused with two different species, *Evodia robusta* Hook. f. and *E. triphylla* DC., it appears necessary to establish a new name, for it is apparently a distinct and valid species. I have rather arbitrarily typified the species by Blanco's *Orixa ternata*, transferring his specific name to the proper genus. It is, however, impossible definitely to determine whether or not the material referred here, and below described, is really the species Blanco described, due to his imperfect description. So far as his description goes, it applies, not only in the characters ascribed by him to the species, but also in its time of flowering. It is, moreover, the only form known to me to which Blanco's *Orixa ternata* can be referred. F.-Villar's reduction of *Orixa ternata* to *Evodia robusta* Hook. f. is manifestly incorrect, for the latter species does not occur in the Philippines. The following description is typified by *Leiberg* 6133.

A shrub or small tree 2 to 4 m high, glabrous except the inflorescence and the younger parts. Branches rather stout, smooth, more or less compressed, usually brownish when dry, the growing tips more or less pubescent. Leaves opposite, 3-foliolate, their petioles 4 to 9 cm long; leaflets chartaceous, 10 to 18 cm long, 5 to 9 cm wide, elliptic, oblong, or oblong-obovate, of about the same color on both surfaces, shining when dry, olivaceous or yellowish-brown, the apex distinctly acuminate, the base acute; lateral nerves about 15 on each side of the midrib, rather slender, distinct, anastomosing; petiolules 3 to 8 mm long. Panicles axillary, narrowly pyramidal, slightly pubescent, about 9 cm long, the branches distant, spreading, the lower ones about 2 cm long on staminate inflorescences, on female ones, in fruit, the panicles up to 15 cm long, and the lower branches 5 cm in length. Male flowers: Pedicels short. Sepals 4, slightly pubescent, orbicular-ovate, obtuse, about 1 mm long. Petals 4, elliptic-oblong, acute, 2.5 mm long, about 1.5 mm wide, glabrous. Stamens 4; filaments 2.5 to 3 mm long; anthers elliptic-oblong, 1.2 mm long. Rudimentary ovary densely villous. Female flowers not seen. Cocci subellipsoid, 5 mm long, the shining black seeds 2.5 to 3 mm in diameter.

LUZON, Province of Bataan, Mount Mariveles, *Leiberg* 6133, July, 1904, with ♂ flowers, *For. Bur.* 2055 Borden, *For. Bur.* 1474 Ahern's collector, both in fruit, August, 1904: Province of Rizal, *Bur. Sci.* 13601 Ramos, August, 1911, in fruit: Province of Cagayan, Claveria, *Bur. Sci.* 10732 McGregor, August, 1909, with immature ♂ flowers.

The species is perhaps as closely allied to *Evodia glabra* Blume as to any other, but has quite different leaves and venation. It resembles quite closely the Asiatic material referred to *Evodia pteleaefolia* (Champ.) Merr., but is specifically distinct.

EVODIA SUBCAUDATA sp. nov.

Species quoad foliis inflorescentiisque *E. ternatae* (Blanco) Merr. simillima differt foliolis subcaudato-acuminatis, nervis lateralibus magis numerosis, floribus hermaphroditis.

A shrub or small tree the branches, branchlets, inflorescences, petioles and lower surfaces of the leaflets on the midribs and lateral nerves rather softly pubescent with short grayish hairs. Branches and branchlets terete, or the tips of the latter a little compressed. Leaves opposite, 3-foliolate, their petioles 4 to 9 cm long, those of the same pair of leaves unequal in length. Leaflets membranaceous, oblong to oblong-elliptic, or obovate-elliptic, subequally narrowed to the acute base and to the slenderly subcaudate-acuminate apex, the acumen 1 to 1.5 cm long, the terminal leaflet up to 15 cm long and 6 cm wide, the lateral ones

somewhat smaller, all entire, the upper surfaces smooth, glabrous, shining, the lower slightly paler, pubescent on the midrib and lateral nerves, minutely glandular-punctate; lateral nerves 17 to 20 on each side of the midrib, prominent, anastomosing, the reticulations slender, rather lax; petiolules 2 to 3 mm long. Panicles axillary, pubescent, solitary, about 8 cm long, narrowly pyramidal, the lower branches 2.5 cm long or less, densely many flowered. Flowers 4-merous, perfect, their pedicels 1 to 1.2 mm long, the bracteoles less than 0.5 mm in length. Sepals ovate, acute, pubescent, about 0.8 mm long. Petals oblong, obtuse or acute by the inflexed tips, 2 mm long. Stamens 4; filaments 2 mm long, the oblong anthers 1 mm in length. Ovary depressed-globose, 4-lobed, minutely pubescent, the cells 1-ovuled; style 2 mm long.

MINDANAO, Butuan Subprovince, *Bur. Sci.* 15922 *Fénix*, August, 1912.

A species quite similar in general appearance to the Philippine *Evodia ternata* (Blanco) Merr., redescribed above, and probably most closely allied to that form, differing in some vegetative details, much more pubescent, more slenderly acuminate leaflets with more numerous nerves, and especially in its perfect, not dioecious flowers. As to the Asiatic forms it is apparently most closely allied to *Evodia pteleaefolia* (Champ.) Merr., but is abundantly distinct.

LUNASIA Blanco

LUNASIA MOLLIS sp. nov.

Species *L. amarae* affinis, differt partibus junioribus inflorescentiis foliisque subtus molliter stellato-pubescentibus.

A shrub or small tree, the branchlets stout, yellowish-brown, densely stellate-pubescent with short, yellowish-brown hairs, the same type of indumentum on the inflorescence, petioles, and lower surfaces of the leaves. Leaves oblong-obovate, subcoriaceous, 18 to 24 cm long, 6 to 10 cm wide, entire, the upper surface green, shining, glabrous except for the more or less stellate-pubescent midrib, the lower surface pale, rather densely stellate-pubescent, prominently glandular-punctate, the apex rounded, obtuse, or very obscurely, broadly, and obtusely acuminate, narrowed below to the abruptly rounded base; lateral nerves 15 to 17 on each side of the midrib, prominent, spreading, anastomosing, the reticulations rather lax; petioles 4 to 5 cm long; inflorescence a very narrow panicle, solitary, axillary, densely stellate-pubescent, 7 to 15 cm long, none of the branches (in young bud) exceeding 1 cm in length, but perhaps longer in age. Young buds densely stellate-pubescent, globose. Open flowers and fruits not seen.

CEBU, Limusan, *Bur. Sci.* 11026 *Ramos*, on dry hills, March 14, 1912.

This proposed new species, although represented by immature material, certainly belongs in the genus *Lunasia*, and is so different from our common

and variable *Lunasia amara* Blanco, that I have no hesitation whatever in describing it as new. *Lunasia amara* Blanco is distinctly lepidote, not at all stellate-pubescent. *L. mollis* may be more closely allied to *L. babuyanica* than to *L. amara*, for *L. babuyanica* is more or less stellate-pubescent, although not all to the degree of *L. mollis*; there are also vegetative differences.

LUNASIA OBTUSIFOLIA sp. nov.

Species *L. amarae* affinis differt foliis apice late rotundatis vel obtusis, vix acuminatis, baseque distinct cordatis vix acutis.

A shrub, the young branches, petioles, and inflorescence densely pale-lepidote. Leaves oblong-obovate, membranaceous, shining, of nearly the same color on both surfaces or the lower one a little paler than the upper when dry, 8 to 17 cm long, 4 to 8 cm wide, entire or the upper part very obscurely undulate, the apex broadly rounded or obtuse, narrowed from about the middle or somewhat above to the distinctly cordate base, the base 1 to 1.5 cm wide, the lobes rounded, the sinus narrow, shallow, both surfaces with few, scattered, pale, lepidote scales when young, in age glabrous or nearly so, glandular-punctate; lateral nerves up to 15 on each side of the midrib, spreading, prominent, slenderly anastomosing, the reticulations slender, lax, not prominent; petioles 3 to 6 cm long. Male panicles up to 30 cm in length, narrow, their branches few, the lower ones up to 3 cm in length, the flowers straw-yellow, in scattered, small, globose heads. Sepals about 0.5 mm long. Petals oblong-ovate, acute or acuminate, about 2 mm long. Filaments about 0.5 mm long. Female flowers and fruits not seen.

BOHOL, Tagbilaran, on beach cliffs, *Bur. Sci.* 1273 McGregor, July 12, 1906.

A species decidedly similar to and manifestly very closely allied to *Lunasia amara* Blanco, differing in its broadly rounded or obtuse, not acuminate leaves which are also distinctly cordate and not acute at the base; another distinguishing character is its elongated male panicles, some of which greatly exceed the leaves in length, while in *Lunasia amara* Blanco the panicles are shorter than the leaves.

LUNASIA MACROPHYLLA sp. nov.

Species *L. amarae* affinis, differt foliis multo majoribus, usque ad 45 cm longis, coriaceis, integerrimis, nervis usque ad 45 utrinque.

A shrub about 2 m high, the younger parts, petioles, and inflorescence densely pale-lepidote. Leaves pale when dry, coriaceous, shining and of about the same color on both surfaces, the upper surface glabrous, minutely and obscurely beaded along the reticulations, the lower surface very sparingly lepidote, the apex

prominently acuminate, narrowed from the upper two-thirds to the acute or abruptly obtuse base, the margins quite entire; lateral nerves, at least on larger leaves, up to 45 on each side of the midrib, very prominent, faintly anastomosing near the margins, the reticulations slender, not very prominent; petioles stout, thickened at their apices, about 10 cm long. Male panicles axillary, in young bud narrow, spike-like, the linear bracts about 5 mm long. Open flowers and fruits not seen.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9299 Whitford & Hutchinson*, January 7, 1908, in dipterocarp forests, altitude about 50 meters.

A species distinguishable by its very large, quite entire, coriaceous leaves which have about 45 pairs of very prominent lateral nerves.

LUNASIA NIGROPUNCTATA sp. nov.

Species *L. amarae* simillima et affinis, differt foliis subtus valde nigro-punctatis, capsulis vix rostratis.

A shrub about 4 m high, the branches, branchlets, petioles, and inflorescences densely pale-lepidote, somewhat shining. Leaves subcoriaceous, oblong-oblancoate to narrowly obovate-oblancoate, 22 to 25 cm long, 5.5 to 6.5 cm wide, rather gradually narrowed from above the middle to the acute or somewhat obtuse base, the apex broadly blunt-acuminate, the margins irregularly undulate or slightly repand, the upper surface dark-olivaceous when dry, shining, glabrous, or with scattered lepidote scales along the midrib, the lower surface much paler, with scattered lepidote scales, and with numerous, black, shining, round glands which are distinct to the naked eye, 1 to 4 glands to each ultimate reticulation; lateral nerves about 25 on each side of the midrib, prominent, anastomosing; petioles 5 to 6 cm long. Inflorescences axillary, solitary, apparently narrowly paniculate, in fruit 6 cm long or less. Capsules usually of three cocci, by abortion sometimes reduced to two, rarely to one, densely lepidote, pale, shining, the individual cocci obovoid, base rounded, apex truncate, about 12 mm long, 9 to 10 mm wide across the top, concentrically wrinkled when dry, the outer corner scarcely rostrate, or very shortly so.

LUZON, Province of Tayabas, Baler, *Bur. Sci. 21188 Escritor*, June, 1913.

A species manifestly closely allied to *Lunasia amara* Blanco which it strongly resembles, but from which it differs in its rather remarkable black glandular-punctate leaves and in its scarcely rostrate capsules. In *Lunasia amara*, while the leaves are glandular-punctate, the glands are never black and shining as in the present species, while the capsules are very prominently rostrate on the upper outer angle of each coccus.

LUNASIA AMARA Blanco Fl. Filip. (1837) 783.

This species is common in forests and of very wide distribution in the Philippines. It is exceedingly variable in its vegetative characters, but seems to be decidedly constant in floral and fruit characters. The normal form has nearly entire leaves, usually distinctly, often prominently, acuminate. In his original description Blanco describes the leaves as "serpenteadas," which is best translated as undulate, and many of our specimens show this character. The extreme repand form, however, is so distinct, that were no intergrades present most botanists would not hesitate to describe it as new. I had even written up a diagnosis of the form as a new species, but distinct intergrades being present, and no characters other than vegetative ones being detected by which to distinguish the forms, I have considered it best to indicate the repand-leaved type as a variety.

Var. REPANDA var. nov.

A typo differt foliis prominente undulato-repandis vel repandis.

LUZON, Province of Cagayan, *Bur. Sci.* 7828 Ramos: Province of Nueva Vizcaya, *Bur. Sci.* 11264, 11184 McGregor, *For. Bur.* 14876 Darling, *For. Bur.* 15825 Curran & Merritt. MINDANAO, District of Davao, *Bur. Sci.* 15842 Fénix, August, 1912 (type).

The first two specimens cited have very large leaves, up to 45 cm in length, but the others have medium-sized or small leaves, those on the type being less than 15 cm in length.

LUVUNGA Hamilton

LUVUNGA SCANDENS (Roxb.) Hamilt. in Wall. Cat. (1832) no. 6382.

Limonia scandens Roxb. Fl. Ind. 2 (1832) 380.

PALAWAN, Malampaya Bay, Binaloan, *Merrill* 9405, May, 1913, forested slopes, altitude 20 meters.

India to the Malay Peninsula and Indo-China; new to the Philippines.

MELIACEAE**AGLAIA** Loureiro

AGLAIA BERNARDOI sp. nov. § *Euaglaia*.

Arbor alta partibus junioribus subtus foliolis inflorescentiisque dense stellato-pubescentibus; foliis circiter 70 cm longis; foliolis circiter 15, oblongis, membranaceis vel chartaceis, acuminatis, basi cordatis, usque ad 15 cm longis, supra glabris, subtus densissime brunneo-stellato-pubescentibus; paniculis juvenilibus quam folia multo brevioribus, floribus numerosis, sessilibus, in ramulis glomeratim dispositis.

A tree reaching a height of 20 meters, the younger parts, inflorescence, petioles, rachis, and lower surfaces of the leaves densely stellate-pubescent with pale-brownish hairs, or sometimes ferruginous in color. Ultimate branches terete, 8 to 10 mm in diameter. Leaves alternate, about 70 cm long, the leaflets about 15, oblong, membranaceous or chartaceous, 10 to 15 cm

long, 3.5 to 5 cm wide, acuminate, base cordate, the upper surface brown when dry, strongly shining, glabrous or slightly stellate-pubescent along the midrib; lateral nerves straight, parallel, distinct, 20 to 27 on each side of the midrib; petiolules pubescent, about 3 mm long. Panicles axillary, when young less than one-half as long as the leaves, peduncled, stellate-pubescent, about 25 cm long, the primary branches less than 4 cm long, densely many flowered, the flowers glomerate. Flowers 5-merous, sessile, the buds globose, 1.5 mm in diameter, the calyx densely stellate-pubescent externally. Petals 5, orbicular, glabrous, rounded, about 1 mm long. Staminal tube depressed-globose, free from the petals, truncate, the anthers inserted at the base, reaching the orifice but hardly protruding, 0.6 mm long.

LUZON, Province of Cagayan, Gattaran, in open forests, altitude about 20 meters, *For. Bur. 15205 Bernardo*, May 27, 1912.

A species manifestly belonging in the group with *Aglaia argentea* Blume, but entirely distinct from that species in its floral, vegetative, and indumentum characters.

AGLAIA TRUNCIFLORA sp. nov. § *Euaglaia*?

Arbor circiter 18 m alta ramulis inflorescentiis petiolis subtus foliisque ad costa dense stellato-tomentosis; foliis imparipinnatis, foliolis 7, ellipticis vel oblongo-ellipticis, usque ad 25 cm longis, subcoriaceis, basi obtusis vel subrotundatis, apice abrupte subcaudato-acuminatis, nervis utrinque circiter 17; paniculis caulinis, circiter 25 cm longis, fructibus ellipsoideis, circiter 2 cm longis.

A tree about 18 m high, the branches, branchlets, inflorescence, petioles, rachis, petiolules, and midribs on the lower surfaces of the leaflets densely stellate-tomentose with brown hairs, not at all lepidote. Branches terete, the ultimate ones about 4 mm in diameter. Leaves alternate, rather distant, about 45 cm long; leaflets 7, the lower pair less than one-half as large as the upper ones, ovate, the others elliptic to oblong-elliptic, up to 25 cm long, and 10 cm wide, rather pale-brownish when dry, the upper surface glabrous and slightly shining, the lower surface of the same color, nearly glabrous except for the stellate-tomentose midribs, the base obtuse or rounded, the apex abruptly subcaudate-acuminate, the acumen narrow, blunt, about 1.5 cm long; lateral nerves about 17 on each side of the midrib, very prominent on the lower surface, obscurely anastomosing, the reticulations lax, indistinct; petiolules stout, about 8 mm long. Panicles from the trunk, stellate-tomentose, 20 to 25 cm long. Flowers not seen (5-merous). Fruit ellipsoid, brown when dry, minutely

stellate-tomentose with brown hairs, rounded at both ends, about 2 cm long, the persistent calyx with 5 short teeth.

LEYTE, Dagami, in forests along streams, Mount Ibuni, *Bur. Sci.* 15232 Ramos, August 21, 1912.

A species probably allied to *Aglaia cauliflora* Koord., of Celebes, which is inadequately described. The Philippine form agrees with Koorders's species in the peculiar character of its cauline inflorescence, which although not uncommon in other genera of the *Meliaceae*, is exceedingly rare in *Aglaia*. It differs in its stellate-tomentose, not lepidote, indumentum, its smaller leaves, 7 instead of 5 leaflets, and slightly larger fruits.

DYSOXYLUM Blume

DYSOXYLUM ROSTRATUM sp. nov. § *Eudysoxylum*.

Arbor alta, partibus junioribus inflorescentiisque brunneo-puberulis exceptis glabra; foliis alternis, circiter 40 cm longis; foliolis 10, alternis, oblongis, coriaceis, nitidis, rectis, subaequalateralibus, acuminatis, in siccitate brunneis, nervis utrinque 8 ad 11, subtus valde prominentibus, reticulis obscuris, tenuibus, laxis; inflorescentiis brunneo-puberulis, paniculatis, multifloris, in axillis superioribus, circiter 20 cm longis; floribus 4-meris, circiter 7 mm longis, petalis glabris, liberis; tubo utrinque villosus; ovario pubescente; fructibus 1-ocularibus, ad 4 cm longis, valde inaequalateralibus, apice lateraliter rostratis.

A tall tree, the younger parts and the panicles appressed brown-puberulent, otherwise glabrous. Branchlets less than 1 cm in diameter, brown, wrinkled, the older parts glabrous. Leaves alternate, about 40 cm long, the rachis at first puberulent, soon entirely glabrous; leaflets 10, alternate or subalternate, oblong, coriaceous, brown when dry, straight, subequilateral or entirely equilateral, the apex rather prominently acuminate, the acumen blunt, the base rounded to acute or somewhat decurrent, the upper surface shining when dry, the lower slightly paler, also shining; lateral nerves 8 to 11 on each side of the midrib, prominent on the lower surface, impressed on the upper surface, not anastomosing, the reticulations very slender, lax, obscure, often nearly obsolete; petiolules 1.5 to 2 cm long, when young grayish-puberulent. Panicles in the upper axils, forming a subterminal inflorescence, all parts brown-puberulent, about 20 cm long, oblong in outline, the lower branches 5 to 7 cm in length, the flowers numerous, white, racemosely arranged on the ultimate branchlets, 4-merous, their pedicels 2.5 to 4 mm long. Calyx disk-shaped or shallowly saucer-shaped, about 3 mm in diameter, irregularly but often rather prominently 4-toothed, some of the teeth often apiculate-acuminate. Petals 4, entirely free, glabrous, about 7 mm long, 2.5 mm wide, obtuse. Staminal-tube

somewhat villous on both surfaces, cylindric, 6 mm long, 10-toothed, the teeth distinct, short. Anthers 10, sessile, included, about 1 mm long. Disk cup-shaped, villous, about 1.5 mm high. Ovary ovoid, somewhat pubescent, the style glabrous, about 2.5 mm long. Fruit in general obovoid, falcate, 3 to 4 cm long, 2 to 2.5 cm in diameter, 1-celled, with a single large seed, the tip of the fruit projecting laterally as a stout, more or less strongly recurved beak 1 to 1.5 cm long.

LUZON, Province of Laguna, Papot, near San Antonio, *Phil. Pl.* 1473 *Ramos* (type), February 26, 1913, in forests; Dahican River, *Bur. Sci.* 16552 *Ramos*, September, 1912, in fruit.

Apparently in the same group with *Dysoxylum alliaceum* Blume. The inequilateral, 1-seeded, rostrate fruit is very characteristic.

DYSOXYLUM EUPHLEBIUM sp. nov. § *Eudysoxylum*.

Arbor alta, glabra, ramulis crassis, 1 ad 1.5 cm diametro; foliis 20 ad 40 cm longis, circiter 7-jugis, alternis, foliolis alternis vel supoppositis, coriaceis, nitidis, oblongo-ovatis, late obtuse-que acuminatis, inaequilateralibus, plus minusve falcatis, usque ad 12 cm longis, nervis utrinque circiter 9, valde prominentibus, reticulis obsoletis; paniculis ramosis, anguste pyramidatis, dense multifloris, folia subaequantibus, terminalibus; floribus 4-meris, circiter 8 mm longis, petalis glabris, tubo libero, utrinque villosa, ovario pubescente.

A tall tree, entirely glabrous except the staminal tube and the ovary. Branchlets stout, terete, brownish, much wrinkled, 1 to 1.5 cm in diameter, marked with very large petiolar scars. Leaves alternate, 20 to 40 cm long, about 7-jugate, the rachis and petiole brown and somewhat longitudinally rugose when dry. Leaflets thickly coriaceous, oblong-ovate, more or less falcate, inequilateral, 8 to 12 cm long, 3 to 6 cm wide, apex shortly and bluntly broad-acuminate, base rounded to acute, brownish-olivaceous when dry, the upper surface very strongly shining, the lower of about the same color but dull; lateral nerves about 9 on each side of the midrib, very prominent on the lower surface, not anastomosing, the reticulations obsolete; petiolules about 5 mm long. Panicles in the uppermost axils forming a terminal inflorescence, the individual ones narrowly pyramidal, often as long as the leaves, the branches spreading, the lower ones about 8 cm long, densely many-flowered, the flowers crowded, shortly pedicelled or subsessile, 4-merous. Calyx disk-like or shallowly saucer-shaped, obscurely toothed, about 3 mm in diameter. Petals 4, oblong, obtuse, 8 mm long, 3 mm wide, glabrous, quite free. Staminal-tube cylindric, 7 to 8 mm long, somewhat villous inside and outside, truncate. Anthers 10, sessile, 0.8 mm long,

included. Disk cylindric, truncate, about 1.5 mm high, villous. Ovary sparingly appressed-pubescent; style glabrous, 7 mm long. Fruit (immature) globose or obovoid, about 3 cm in diameter.

LUZON, Province of Laguna, Gumihan, near San Antonio, *Phil. Pl.* 1404 Ramos (type), February 27, 1913, in forests; between San Antonio and Paete, *Bur. Sci.* 15102 Ramos, June, 1912.

A species manifestly in the group with the Malayan *Dysoxylum alliaceum* Blume, but differing from that and allied forms in many characters. The strongly shining leaves, with prominent primary nerves and entirely obsolete reticulations, and the densely flowered panicles are characteristic. The dried flowering specimens have a strong, very disagreeable odor that is characteristic of various parts of many species in the genus.

TURRAEA Linnaeus

TURRAEA MEMBRANACEA sp. nov. § *Euturraea*.

Arbor parva, circiter 5 m alta; foliis membranaceis, ovatis vel oblongo-ovatis, utrinque angustatis, acuminatis, usque ad 9 cm longis, nervis utrinque circiter 7, vetustioribus glabris vel subglabris; racemis axillaribus, brevissimis, paucifloris; floribus 5-meris, circiter 2.5 cm longis, tubo apice 10-laciniato, ovario glabro, 5-loculare; fructibus 5-locellatis, valvis valde recurvatis, crassissime coriaceis, 12 mm longis.

A small tree 4 to 5 m high, deciduous, the branchlets, young leaves, and inflorescence more or less pubescent, in age nearly glabrous. Branches slender, terete, glabrous, brown or reddish-brown, the branchlets gray-pubescent. Leaves simple, alternate, membranaceous, ovate to oblong-ovate, subequally narrowed to the acute base and to the acuminate apex, 5 to 10 cm long, 2 to 4 cm wide, when young slightly pubescent on both surfaces, at least on the midrib and nerves, in age nearly or quite glabrous, slightly shining; lateral nerves about 7 on each side of the midrib, prominent; petioles about 1 cm long, pubescent. Racemes axillary, very short, pubescent, few-flowered, the flowers appearing with the new leaves, the rachis of the racemes 5 mm long or less. Flowers yellowish-white, their pedicels slender, 2 cm long. Calyx cup-shaped, about 3 mm long, pubescent, 5-toothed, the teeth ovate-acute, about 1.5 mm long. Petals 5, free to the base, 2 to 2.3 cm long, linear, above somewhat narrowly spatulate, below 1 mm wide, near the apex 3 to 3.5 mm wide, glabrous. Staminal-tube glabrous, slender, 2.5 cm long, laciniate-lobed at the apex, the lobes thin, linear, acuminate, about 2 mm long, alternating with the anthers; anthers subsessile, attached apparently at the very apex of the tube, 1.8 mm long. Ovary ovoid, 5-celled; cells 2-ovuled; style slender, exerted 6 to 7 mm beyond the end of the staminal-tube; stigma about 2 mm in diameter.

Fruit before dehiscence apparently ovoid, glabrous, splitting into 5 valves, the valves strongly recurved, very thickly coriaceous, almost woody, ovate to oblong-ovate, acute or acuminate, about 1.2 cm long, longitudinally keeled along the inside and grooved along the back. Seeds obovoid, black and shining when dry, about 6 mm long.

LUZON, Province of Rizal, Bosoboso, *Bur. Sci.* 977 Ramos (type), June, 1906, in flower: Province of Pampanga, Mount Arayat, *Merrill* 3913, October, 1904, *For. Bur.* 9619 Zschokke, October, 1907, both in fruit.

This is in all probability the form that has been credited to the Philippines by several authors as *Turraea pubescens* Hellen. The Philippine record was based on *Vidal* 1654 from Marinduque, which I have examined in the Kew Herbarium, and which I have noted as being matched by two of the specimens cited above as well as by *Loher* 4643 from Arayat. At the time the Kew material was examined it was noted that the Philippine material differed from *T. pubescens* Hellen., in its differently shaped leaves, glabrous ovary, and larger, quite different fruit. I now have a specimen of *Turraea pubescens* in the herbarium of the Bureau of Science, Cochinchina, *Pierre* 2772, which confirms the above notes. The fruits are remarkably different both in texture and in shape, the valves being merely coriaceous and not reflexed. It is quite evident from the material at present available that the Philippine form is specifically very distinct from the one found in southeastern Asia, and that *Turraea pubescens* Hellen. does not extend to the Philippines.

TURRAEA PALAWANENSIS sp. nov. § *Euturraea*.

Suffrutex parvus, circiter 20 cm altus, erectus, partibus junioribus pubescentibus; foliis membranaceis, oblongis, usque ad 10 cm longis, irregulariter lobatis vel undulato-lobatis, costa nervisque subtus pubescentibus; racemis paucifloris; floribus 4 ad 4.5 cm longis.

A species similar and allied to *Turraea humilis* (Blanco) Merr., and *T. pumila* Benn. An undershrub about 20 cm high, the woody parts slender, reddish-brown, glabrous or slightly pubescent, not or but sparingly branched, the growing parts gray-pubescent. Leaves alternate, oblong in general outline, membranaceous, 5 to 10 cm long, 2 to 4.5 cm wide, the apex obtuse, the base decurrent-acuminate, the margins irregularly lobed or undulate lobed, the lobes usually 3 on each side, the upper surface glabrous or nearly so, the lower one very slightly paler than the upper and more or less pubescent on the midrib and lateral nerves; lateral nerves 4 or 5 on each side of the midrib, prominent, usually forked, the reticulations very lax; petioles 2 cm long or less, pubescent. Racemes axillary, solitary, 3-flowered or less, pubescent. Flowers white, 4 to 4.5 cm long, the bracts linear, 2 to 3 mm long. Calyx pubescent, the lobes 5, linear, acuminate, pubescent, 6 to 8 mm long, about 1 mm

wide. Corolla slender and tube-like below, the tube-like portion about 3 cm long and 2 mm in diameter, the lobes 5, oblong, narrowed at both ends, about 1.5 cm long, 6 mm wide, acute, narrowed below into the long and slender claws that make up the tube-like part. Staminal tube slender, glabrous, exerted from the tube-like part of the corolla about 1.5 cm, the reflexed laciniae at its apex 9 or 10, linear, acuminate, 4 mm long. Filaments filiform, inserted inside the tube, the oblong anthers sparingly hispid, just exerted, about 1.5 mm long, blunt at both ends, the apex obliquely apiculate. Ovary ovoid, pubescent, 5-celled; ovules 2 in each cell; stigma depressed-globose, 0.5 mm in diameter.

PALAWAN, San Miguel, near the seashore, *Bur. Sci.* 15563 *Fénix*, July 10, 1912.

A species very similar to and manifestly allied to both *Turraea humilis* (Blanco) Merr., and to *T. pumila* Benn., differing from both in its larger flowers. The latter species was described from Javan specimens, and is at present unknown outside of that island unless the Philippine *T. humilis* proves to be identical. Both F.-Villar and myself have considered the Philippine and Javan plants to be identical, the former reducing Blanco's *Plagianthus humilis* to *Turraea pumila* Benn., while I retained Blanco's specific name as the valid one, it being the older. It seems, judging from Bennett's description of *T. pumila*, that his species is not the same as the Philippine one described by Blanco as *Plagianthus humilis* and which I have transferred to *Turraea* as a valid species. *Turraea humilis* (Blanco) Merr. is known only from Luzon, and it is exceedingly local and rare. It is represented by the following specimens:

LUZON, Province of Rizal, San Juan del Monte, near Manila, *Merrill* 6232, June, 1908: Province of Laguna, San Antonio, *Bur. Sci.* 14994 *Ramos*, June, 1912.

The leaves are 3 to 6 cm long, ovate or elliptic-ovate, undulate but not lobed, and the flowers are 3 to 3.5 cm in length.

WALSURA Roxburgh

WALSURA VILLAMILII sp. nov.

Species distinctissima ap omnibus adhuc cognitarum differt filamentis haud $\frac{1}{4}$ connatis, foliis 7-foliolatis.

A tree about 13 m in height, nearly glabrous, or the inflorescence and younger parts very sparingly pubescent, the growing parts distinctly brownish-puberulent. Branches glabrous, brownish-olivaceous, lenticellate. Leaves 7-foliolate, about 50 cm long, the petiole 10 to 15 cm in length, brown when dry. Leaflets oblong to oblong-lanceolate, coriaceous, entire, glabrous, 15 to 20 cm long, 3 to 5.5 cm wide, the apex slenderly subcaudate-acuminate, the base acute, the upper surface, when dry, pale-greenish-olivaceous, shining, the lower one glaucescent, the

prominent nerves and slender reticulations brown; lateral nerves about 16 on each side of the midrib, very prominent on the lower surface, somewhat curved, anastomosing near the margins; petiolules 2 to 5 mm long. Panicles terminal and in the upper axils, brown when dry, very slightly pubescent, in fruit up to 40 cm long. Immature fruits obovoid, 1 to 1.5 cm long, externally densely covered with a short, dense, brownish-purple indumentum, the persistent petals oblong, pubescent, 4 mm long. Staminal tube very short, 0.5 mm long or less, the filaments flattened, ciliate-pubescent, about 1.5 mm long, obtuse, the anthers 0.5 mm in length.

MINDANAO, District of Zamboanga, near Margosatubig, in hill forests, *For. Bur.* 13764 Foxworthy, DeMesa, & Villamil, May 11, 1912, altitude about 120 meters, and locally known to the Moros as *sasá*.

A very distinct and characteristic species, readily distinguished from all previously described ones by its 7-foliolate leaves and its short staminal tubes.

BUXACEAE

BUXUS Linnaeus

BUXUS RIVULARIS sp. nov. § *Eubuxus*.

Frutex circiter 1 m altus, glaber; foliis coriaceis vel subcoriaceis, lanceolatis, usque ad 5 cm longis, utrinque subaequaliter angustatis, apice acute acuminatis, basi acutis; racemis axillariibus, solitariis, 1 ad 2 cm longis.

A shrub about 1 m high, glabrous, the branches slender, light-gray, terete, the branchlets distinctly angled. Leaves lanceolate, 2.5 to 5 cm long, 5 to 12 mm wide, rather pale when dry, of about the same color and slightly shining on both surfaces, subequally narrowed to the acute base and to the sharply acuminate apex, subsessile or very shortly petioled, often a little falcate; nerves very faint, anastomosing in a distinct marginal nerve. Racemes axillary, solitary, 1 to 2 cm long, glabrous, male flowers below, the terminal flower usually female, the pedicels about 3 mm long, the bracteoles ovate, acute, 1 mm long. Male flowers: Outer two sepals lanceolate, acuminate, about 2.2 mm long, 1 mm wide, the inner two as long but ovate or oblong-ovate, acute, 1.5 mm wide. Filaments about 2.5 mm long. Rudimentary ovary depressed-globose, entire. Female flowers at the end of the raceme bearing the male flowers. Bracteoles linear-lanceolate, the outer 2 sepals ovate, a little longer than the inner four which are broadly ovate, acute, 2.2 mm long, slightly ciliate-pubescent, all slightly accrescent in fruit, persistent, and about 3 mm long. Ovary glabrous. Young fruit ovoid, glabrous, 5

to 6 mm long, crowned by the prominent styles and recurved stigmas.

LUZON, Province of Tayabas, Guinatacutan, *Bur. Sci.* 13169 Foxworthy & Ramos, March, 1911, on rocks along the river, altitude 75 to 100 meters, the flowers white and greenish.

A most characteristic species, recognizable by its small size and its lanceolate, sharply acuminate leaves. The narrow leaves have doubtless been developed to meet the exigencies of its habitat, for the plant undoubtedly grows in situations subject to overflow during heavy rains. It has almost exactly the habit and appearance of *Atalantia linearis* (Blanco) Merr., and *Eugenia mimica* Merr., which grow in similar habitats, and in fact in making the preliminary identifications of the Guinatacutan collection, the specimens were referred to *Atalantia linearis*.

Stenophylly, due to habitat, is not as highly developed in the Philippines as in the neighboring Island of Borneo, and aside from the widely distributed *Homonium riparia* Lour., we have the endemic species *Atalantia linearis* Merr., *Eugenia mimica* Merr., *Buxus rivularis* Merr., and *Ficus rivularis* Merr., and doubtless others remain to be noted. The rather numerous Bornean forms have been considered by Beccari.³

BUXUS PACHYPHYLLA sp. nov.

Arbor glabra; foliis crassissime coriaceis, nitidis, oblongis, usque ad 11 cm longis, 3 ad 5.5 cm latis, basi acutis vel acuminate, apice acute acuminatis, margine valde revolutis; capsulis axillaribus, solitariis, breviter pedunculatis, ovoideis, circiter 1 cm longis.

A glabrous tree, size not indicated. Branches terete, pale-olivaceous, the branchlets slender, somewhat sulcate on two sides. Leaves oblong, very thickly coriaceous, 9 to 11 cm long, 3 to 5.5 cm wide, narrowed below to the acute or somewhat acuminate base and above to the sharply acuminate apex, the margins strongly recurved, both surfaces shining, the lower usually a little paler than the upper; lateral nerves slender, up to 30 on each side of the midrib, irregular, sometimes rather indistinct and confused with the secondary ones and the reticulations; petioles 5 to 7 mm long. Peduncles solitary, axillary, in fruit 5 mm long or less, with numerous, spreading bracteoles, the lower ones smaller than the upper. Flowers not seen. Capsules ovoid, about 1 cm long, solitary, smooth, somewhat glaucous-purple when dry.

LUZON, Province of Tayabas, Mount Cadig near Guinayangan, *Bur. Sci.* 20828 Escritor, March 9, 1913.

Well characterized by its very thickly coriaceous leaves, and its solitary, few, short-peduncled fruits.

³ Nelle Foreste di Borneo (1902) 524.

BUXUS LOHERI sp. nov.

Arbor glabra; foliis lanceolatis, coriaceis, usque ad 6 cm longis, utrinque angustatis acuminatisque, in siccitate brunneis, nitidis, margine revolutis, nervis primariis utrinque 15 ad 20, tenuibus, obscuris; capsulis terminalis axillaribusque, solitariis vel binis, circiter 1 cm longis; pedunculo circiter 1 cm longo.

A glabrous tree, size not indicated. Branches terete, pale-gray or somewhat brownish, the younger branchlets slender, dark reddish-brown, somewhat angled or sulcate. Leaves lanceolate, thickly coriaceous, 4.5 to 6 cm long, 1.5 to 2 cm wide, when dry brownish and shining on both surfaces, the lower surface usually a little paler than the upper, about equally narrowed and acuminate at both ends, the margins strongly revolute; lateral nerves slender, not prominent, in fact often indistinct, 15 to 20 on each side of the midrib, irregular, usually more or less confused by the secondary ones. Flowers unknown. Capsules ovoid, about 1 cm long, solitary or in pairs, terminal and in the leaf-axils, the peduncles about 1 cm long, each with several scattered bracteoles, the calyx, in fruit, about 7 mm in diameter, the lobes 5, broadly ovate.

LUZON, Province of Rizal, Montalban, *Loher 6857*, February, 1905.

A species probably as closely allied to *Buxus rolfiei* Vid. as to any other species, but distinguished by its narrow, brown, lanceolate, much smaller, obscurely nerved leaves.

CELASTRACEAE**GYMNOSPORIA** Bentham & Hooker**GYMNOSPORIA NITIDA** sp. nov.

Frutex vel arbor parva, glabra, inermis; foliis ellipticis ad oblongo-obovatis, coriaceis, supra valde nitidis, usque ad 7 cm longis, apice obtusis vel rotundatis, basi acutis, margine crenulatis; capsulis anguste obovoideis vel oblongo-ellipsoideis, circiter 1.5 cm longis, valvis crassissimis.

A shrub or small tree, quite glabrous, unarmed. Branches pale-gray, slender, somewhat wrinkled and shining when dry. Leaves rather thickly coriaceous, elliptic to oblong-obovate, 4 to 7 cm long, 2 to 3.5 cm wide, the upper surface strongly shining when dry, the lower much duller, apex obtuse or rounded, base acute, margins crenulate; lateral nerves about 8 on each side of the midrib, slender, not prominent, rather laxly anastomosing; petioles 8 to 10 mm long. Inflorescence axillary, apparently cymose, in fruit up to 3 cm long. Flowers unknown. Capsules

narrowly obovoid to oblong-ellipsoid, about 1.5 cm long, 8 to 10 mm in diameter, rounded at the apex, the valves 3, very thick.

LUZON, Province of Pangasinan, Salasa, *For. Bur. 11836 Domingo*, November 20, 1912.

Well characterized by its strongly shining leaves and its very thick capsule-valves. Not closely allied to *Gymnosporia spinosa* Merr. & Rolfe, the only other known Philippine species.

EUONYMUS Linnaeus

EUONYMUS VIBURNIFOLIUS (Juss.) comb. nov.

Aegiphila viburnifolia Juss. in Ann. Mus. Paris 7 (1806) 76; Walp. Repert. 4 (1844-48) 124; Schauer in DC. Prodr. 11 (1847) 655.

Euonymus philippinensis Merr. in Philip. Journ. Sci. 3 (1908) Bot. 238.

Jussieu's species has long been a doubtful one, for manifestly it could not belong in the genus *Aegiphila* which is confined to tropical America. The type, *Commerson*, in Herb. Mus. Paris, was from the Philippines. The original specimen was examined and photographed by the late Dr. C. B. Robinson in November, 1911, and from an examination of the photograph and notes I am now able definitely to refer the species to the *Celastraceae*, and very definitely to the species I described a few years ago as *Euonymus philippinensis*.

ICACINACEAE

MIQUELIA Meissner

MIQUELIA RETICULATA sp. nov.

Scandens, partibus junioribus subtus foliis inflorescentiisque leviter breviter hirsutis; foliis oblongis, chartaceis, usque ad 17 cm longis, in siccitate pallidis, nitidis, apice tenuiter acuminatis, basi rotundatis leviter cordatisque, nervis lateralibus circiter 6, subtus cum reticulis laxis valde prominentibus; floribus ♀ umbellatis, 4-meris, 3.5 mm longis.

A scandent, apparently woody plant, the branchlets terete, pale when dry, slender, sparingly hirsute with short hairs. Leaves oblong, entire, 14 to 17 cm long, 4 to 6 cm wide, pale and somewhat shining when dry, the upper surface smooth and glabrous, the lower prominently reticulate and sparingly hirsute, the apex slenderly and prominently acuminate, somewhat narrowed below to the rounded and slightly cordate base; basal nerves 3 pairs, the lower two pairs very short, the lateral nerves above the base 5 or 6 on each side of the midrib, anastomosing, very prominent on the lower surface, the reticulations lax, prominent; petioles pale, 1.5 to 8 cm long, very sparingly hirsute. Female flowers umbellate, on slender, axillary, simple peduncles at anthesis about 3 cm long, elongated in fruit, about 10 in each umbel, the pedicels sparingly pubescent, slender, 6 to 8 mm long. Calyx very minute or nearly obsolete. Petals 4,

oblong, 3.5 mm long, 1.2 mm wide, slightly pubescent outside, apex acute or obtuse, more or less inflexed. Staminodes none. Ovary oblong-ovoid, somewhat hirsute, 2 mm long; stigma shallowly cup-shaped, about 1.3 mm in diameter. Fruit narrowly ovoid, somewhat compressed, about 2 cm long, 1.3 cm wide, wrinkled when dry, the pseudostipe about 8 mm long, the persistent petals recurved, pulp scanty, the endocarp crustaceous, coarsely foveolate.

CAMIGUIN DE MINDANAO, Panatayuan, *Bur. Sci.* 14674 Ramos, March 28, 1912, in forests, the flowers greenish-yellow.

Quite distinct from our other Philippine species, *Miquelia cumingii* Baill., and readily recognizable by its prominently reticulate leaves and its sparse pubescence of short, pale, hirsute hairs.

PLATEA Blume

PLATEA PHILIPPINENSIS sp. nov.

Platea latifolia Merr. in *Philip. Journ. Sci.* 1 (1906) Suppl. 58, non Blume.

Species *P. latifoliae* Bl. affinis, differt foliis minoribus, basi acutis, partibus junioribus inflorescentiisque ferrugineo-lepidotis, vix tomentosis, fructibus minoribus.

A dioecious tree 8 to 20 m high, the branches terete, nearly black when dry, glabrous, the branchlets densely lepidote, the scales minute, older ones pale, the younger ones ferrugineous. Leaves oblong-ovate, coriaceous 7 to 12 cm long, 2.5 to 6.5 cm wide, the apex rather prominently acuminate, the base acute, the upper surface dark-colored when dry, glabrous, somewhat shining, the lower pale, densely lepidote; lateral nerves 10 to 12 on each side of the midrib, prominent on the lower surface, darker colored than the surface itself, usually anastomosing; petioles 2 to 3 cm long, more or less lepidote. Male panicles 3 to 6 cm long, narrow, interrupted, the rachis, branches, and calyces ferruginous-lepidote, the scales somewhat ciliate, not tomentose, the lower branches 2 cm long or less, the upper ones reduced to fascicles of flowers. Flowers sessile, glomerate, numerous, the buds globose or depressed-globose. Calyx about 2 mm in diameter, the sepals nearly free, ovate, acute, about 1 mm long. Petals narrowly ovate or ovate-lanceolate, slightly united at the base, glabrous, 2.5 to 3 mm long. Anthers broadly elliptic, about 1.2 mm long. Male racemes axillary, solitary, about 2 cm long, 3- to 5-flowered, ferruginous-lepidote, the pedicels very stout, 2 to 3 mm long. Calyx somewhat cup-shaped, the lobes very broadly ovate or orbicular-ovate, about 2.5 mm long, 3 mm wide. Ovary densely stellate-lepidote, the

thick and short style as broad as the ovary, glabrous. Fruit narrowly ovoid, gradually narrowed upward to the acute or obtuse apex, 2.5 to 3 cm long, apparently black when mature, the pulp scanty, the endocarp hard, deeply longitudinally pitted and sulcate.

LUZON, Province of Bataan, Mount Mariveles, *Elmer 6835*, November, 1904, in fruit; *For. Bur. 2098 Borden*, November, 1904, in fruit; *Whitford 1202* (type), March, 1905, with pistillate flowers. LEYTE, Dagami, *Bur. Sci. 15242 Ramos*, August, 1912, in fruit. CAMIGUIN DE MINDANAO, *Bur. Sci. 14651 Ramos*, March, 1912, with staminate flowers. NEGROS, Cuernos Mountains, *Elmer 9777*, March, 1908, with staminate flowers.

The material from Mount Mariveles, consisting of specimens with pistillate flowers and fruits, was originally referred by me to the Javan *Platea latifolia* Blume, to which the Philippine form is manifestly closely allied. On receipt of staminate material all the specimens were reexamined with the result that it has been considered advisable to describe our local form as a distinct species. The original description of *Platea latifolia* Blume Bijdr. (1826) 647 is quite inadequate, and the later one by Miquel Fl. Ind. Bat. 1: 793 is also too short. Koorders,⁴ however, gives an excellent and detailed description of the Javan species of the genus, on which my conception of *Platea latifolia* Blume is based. Sterile specimens from Java are also in the herbarium of the Bureau of Science. *Platea philippinensis* grows in forests at and above an altitude of 900 meters.

STERCULIACEAE

FIRMIANA Marsigli

FIRMIANA MERRITTII sp. nov.

Arbor alta; foliis orbiculari-ovatis vel late ovatis, acuminatis, integris, basi latissime rotundatis, profunde et anguste cordatis, vetustioribus glabris, usque ad 18 cm longis; folliculis 8 ad 9 cm longis, circiter 4 cm latis, inflatis, chartaceis, laxe reticulatis, tarde dehiscentibus.

A large tree, reaching a height of 30 m and a trunk diameter of 90 cm, deciduous. Leaves broadly ovate to orbicular-ovate, coriaceous or thickly chartaceous, in maturity glabrous, up to 18 cm long and about as wide, entire, the apex acuminate, the base very broadly rounded, deeply and narrowly cordate, palmately 7- or 9-nerved, the reticulations distinct; petioles 20 cm long. Follicles inflated, tardily dehiscent, narrowly oblong-ovate, base acute, apex obtuse, 8 to 9 cm long, 4 cm wide, the valves laxly reticulate, glabrous or nearly so, thickly chartaceous, not membranaceous or coriaceous, each containing 1 or 2 seeds.

MINDORO, Igsoro River, west coast, *For. Bur. 8555 Merritt*, February 4, 1908, in forested river flats, altitude about 10 meters.

⁴ Meded. 's Lands Plantent. 33 (1900) 156.

The first species of the genus to be found in the Philippines, and remarkable among the few members of the genus in its very tardily dehiscent follicles. In my material, which consists of fallen leaves and follicles, the seeds are nearly mature, yet the follicles scarcely show a sign of opening.

MELOCHIA Dillenius

MELOCHIA UMBELLATA (Houtt.) comb. nov.

Visenia umbellata Houtt. Handl. 8 (1777) 309.

Wisenia indica Gmel. Syst. 2 (1791) 515.

Melochia arborea Blanco Fl. Filip. (1837) 524.

Melochia indica A. Gray ex F.-Vill. Novis. App. (1880) 29; K. Sch. in Engl. Bot. Jahrb. 9 (1887) 209.

This widely distributed and much-named plant has a peculiarly complicated synonymy, and for the last twenty years has been considered by many botanists, after K. Schumann, under a specific name that was neither published by the original author Houttuyn under *Visenia*, as *V. indica*, and was never transferred to *Melochia*, as *M. indica*, by A. Gray until the transfer was made by F.-Villar and K. Schumann and wrongly credited to Gray. Houttuyn in 1777 published the species as *Visenia umbellata*, and this is apparently the oldest valid specific name. Gmelin seems to have made the first use of the specific name *indica*, for he publishes it as *Wisenia indica* with a reference to Christmann and Panzer's German edition of Houttuyn's work Vol. 6 (1780), where, however, the species appears as *Visenia umbellata*. Gmelin, then, simply proposed a new specific name, *indica*, to replace that proposed by Houttuyn. Hasskarl⁵ seems to have been the first author to credit the combination *Visenia indica* to Houttuyn, which he later repeated in his *Platae Javanicae Rariores*, from whence it passed into Miquel's *Flora Indiae Batavae* and other works. K. Schumann manifestly took up the specific name from Miquel.

Asa Gray never published the combination "*Melochia indica* (Houtt.) A. Gray" in the Botany of the Wilkes Expedition as credited to him by K. Schumann⁶ but simply indicates that: "*Visenia* cannot be generically distinguished from *Melochia*." K. Schumann was, hence, in error both in taking up the specific name *indica*, and in crediting its transfer to *Melochia* to A. Gray. *Visenia umbellata* Houtt. seems to supply the correct specific name, under *Melochia*, for this very common and widely distributed species, and is accordingly here taken up.

Fernandez-Villar is the first author actually to make the combination *Melochia indica*, but his publication of the combination has been entirely overlooked by later authors, and does not appear in Index Kewensis. In the Novissima Appendix to the third edition of Blanco's *Flora de Filipinas* (1880) 29 the name *Melochia indica* appears, but is erroneously credited to A. Gray on the authority of Bentham & Hooker f. Gen. Pl. 1 (1862) 224. Bentham & Hooker f., however, do not make the transfer, but simply state: "*Cetera omnia Riedleiae conveniunt et monente Grayo Viseniam pro sectione Melochiae potius quam genere proprio habemus.*"

Other synonyms of this species are: *Visenia tomentosa* Miq., *Riedleia tiliaefolia* DC., *R. velutina* DC., *Glossospermum velutinum* Wall., *G. cor-*

⁵ Tijdschr. Nat. Gesch. 12 (1845) 122.

⁶ Engl. Bot. Jahrb. 9 (1887) 209.

datum Wall., *Aleurodendron album* Reinw., *Melochia velutina* Bedd., and *Hypericum pentandrum* Blanco.

I am indebted to Sir D. Prain, director, Royal Gardens, Kew, for references from the publications of Houttuyn and Gmelin, which are not available in Manila, and for a memorandum covering the case as to the oldest specific name for the species.

BUETTNERIA Linnaeus

BUETTNERIA ECHINATA Wall. Cat. (1829) no. 1149; Gagnep. in Lecomte Fl. Gén. Indo-China 1 (1911) 520.

MINDORO, near Calapan, *Bur. Sci.* 21268 *Escritor*, July, 1913.

The identification has been made after Gagnepain, the Mindoro specimen agreeing well with *Pierre 3746* from Tay-ninh, Cochinchina, so named by Gagnepain, and with his description of the species. Masters refers the Wallichian species with doubt to *Buettneria crenulata* Wall., while Gagnepain cites the latter as a synonym of *B. echinata*. The genus is new to the Philippines.

Nepal and Burma to Indo-China.

THEACEAE

ADINANDRA Jack

ADINANDRA ROSTRATA sp. nov.

Arbor circiter 30 m alta partibus junioribus exceptis glabra; foliis subcoriaceis, nitidis, oblongo-ovatis vel oblongo-ellipticis, integris, usque ad 14 cm longis, utrinque angustatis, apice acuminatis, basi acutis vel decurrento-acuminatis, nervis utrinque circiter 14, tenuibus; fructibus axillaribus, solitariis, longe pedunculatis, ovoideis, 1.5 cm longis, longe caudato-rostratis.

A tree about 30 m high, glabrous except the branchlets (flowers not seen). Branches terete, brownish, glabrous, the branchlets sparingly pilose, the tips rather densely so. Leaves entire, subcoriaceous, the younger ones thinner, oblong-ovate to oblong-elliptic, 8 to 14 cm long, 3.5 to 6.5 cm wide, narrowed at both ends, the apex acuminate, the base acute or decurrent-acuminate, shining, of about the same color on both surfaces and somewhat yellowish when dry; lateral primary nerves about 14 on each side of the midrib, slender, anastomosing, the reticulations rather lax; petioles 5 to 10 mm long. Flowers not seen. Fruits axillary, solitary, their peduncles 4 cm long, the persistent sepals suborbicular to subreniform, coriaceous, glabrous, rounded, about 8 mm wide, the outer ones somewhat smaller than the inner, the fruit ovoid, about 1.5 cm long, 1.2 to 1.4 mm thick, glabrous, prominently caudate-rostrate, the beak 1 to 1.4 cm long, 3-celled, the pericarp thick. Seeds two or three in each cell, about 6

mm long, flattened, reddish-brown, obovate, shining, the cotyledons hippocrepiform.

LUZON, Province of Laguna, Dahican River, *Phil. 1567 Ramos*, September 13, 1912, in forests.

A species characterized by its few, comparatively large seeds, in which it differs from most species in the genus. It is possible that when flowers are known it will be necessary to transfer the species to some other genus, but in general appearance and in all characters, perhaps other than the seed, it is apparently an *Adinandra*.

ADINANDRA MAQUILINGENSIS sp. nov.

Arbor parva, ramulis foliisque junioribus pilosis, vetustioribus glabris vel subglabris; foliis coriaceis, 3.5 ad 6 cm longis, nitidis, oblongo-ellipticis ad oblongo-obovatis breviter acuminatis, basi acutis, margine in $\frac{1}{2}$ superiore crenulato-denticulatis, nervis utrinque circiter 12, tenuibus; sepalis 5, subaequalibus, oblongo-ovatis, obtusis, 8 mm longis; ovario leviter piloso, 5-loculare.

A tree about 12 m high, the very young branchlets and young leaves rather softly pilose with appressed hairs, the older parts glabrous or nearly so. Branches terete, very dark-gray or nearly black, rather smooth, the branchlets brownish. Leaves coriaceous, 3.5 to 6 cm long, 1.5 to 2.5 cm wide, oblong-elliptic to oblong-obovate, the base acute, the apex shortly acuminate, the margins in the upper one-half crenulate-denticulate, below entire, both surfaces shining, the lower a little paler than the upper, yellowish-green when dry; lateral nerves about 12 on each side of the midrib, slender, distinct but not prominent, about equally evident on both surfaces, anastomosing; petioles 3 to 5 mm long. Flowers axillary, solitary, the pedicels stout, curved, glabrous, about 2 cm long. Sepals subequal, oblong-ovate, 8 mm long, 5 mm wide, obtuse, somewhat appressed-pubescent. Petals and stamens not seen. Very immature fruit ovoid, 7 mm long, 5-celled, sparingly pilose, the style 8 mm long. Ovules very numerous in each cell, apparently but few developing into seeds.

LUZON, Province of Laguna, Mount Maquiling, in forests on the upper slopes, altitude probably about 1,000 m, *Bur. Sci. 13650 Ramos*, September, 1911, from the Batangas side of the mountain.

A species well characterized by its comparatively small leaves.

ADINANDRA CORIACEA sp. nov.

Arbor glabra; foliis integris, oblongo-ellipticis, coriaceis, 12 ad 15 cm longis, basi acutis, apice latissime breviter obtuse acuminatis, nervis utrinque circiter 15, distinctis, tenuibus, petiolo circiter 1 cm longo; fructibus brunneis, ovoideis, laevis, apiculatis, circiter 1.5 cm longis, 2-locellatis; seminibus 10 ad

12, planis, anguste ovoideis, utrinque sulcatis, nitidis, 6 mm longis; sepalis persistentibus, margine leviter ciliatis.

A glabrous tree, size not indicated. Branches terete, reddish-brown or grayish, smooth. Leaves coriaceous, entire oblong-elliptic, 12 to 15 cm long, 4 to 6.5 cm wide, subequally narrowed at both ends, the base acute, the apex very broadly, shortly, and bluntly acuminate, the upper surface pale-olivaceous when dry, the lower brownish, paler, both slightly shining and very minutely punctulate, glabrous; lateral nerves about 15 on each side of the midrib, slender, rather distinct, about equally prominent on both surfaces, anastomosing, forming a double row of arches, the reticulations lax, indistinct; petioles stout, about 1 cm long. Flowers not seen, the pedicels in fruit stout, 2 to 2.5 cm long, the persistent calyx lobes coriaceous, at first apparently somewhat pubescent, becoming quite or nearly glabrous, the outer two smaller than the inner three which are more or less reniform, entire or nearly so, somewhat reniform or very broadly rounded-ovate, about 8 mm wide, margins deciduously ciliate, in age glabrous or nearly so. Fruit ovoid, about 1.5 cm long, smooth, brown, somewhat shining, entirely glabrous, 2-celled, the pericarp rather thick, dry and brittle in texture. Seeds 10 to 12, brown, shining, flattened, narrowly obovoid, rounded at the apex, about 6 mm long, longitudinally grooved along the middle of both faces.

LUZON, Province of Laguna, Cavinti, *For. Bur.* 19667 *Racelis*, August, 1912.

A species manifestly closely allied to the Malayan *Adinandra acuminata* Korth., from which it differs in its differently shaped, very broadly and obtusely acuminate, more numerous nerved leaves, longer petioles, and other characters.

ADINANDRA LOHERI sp. nov.

Arbor, gemmis petalis staminibusque exceptis glabra; foliis ellipticis, coriaceis, usque ad 10 cm longis, basi decurrento-acuminatis, apice late rotundatis ad brevissime late acuminatis, margine crenulatis vel denticulato-crenulatis, subtus obscurissime glanduloso-maculatis, nervis utrinque tenuibus, distinctis, circiter 15; floribus 5-meris; sepalis glabris; petalis extus in partibus medianus villosis, 1.8 cm longis; staminibus circiter 50, leviter hirsutis; ovario 5-loculare, glaber.

A tree, quite glabrous except the vegetative buds and some parts of the flowers. Branches terete, grayish or dark-colored, the young branchlets reddish-brown, the vegetative buds pale-villous. Leaves coriaceous, elliptic, 6 to 10 cm long, 3.5 to 5

cm wide, the apex broadly rounded to broadly and shortly obtuse-acuminate, base somewhat decurrent-acuminate, margins crenulate or crenulate-denticulate, the upper surface smooth and shining, dark-olivaceous when dry, the lower surface paler, brown, obscurely glandular-maculate; lateral nerves about 15 on each side of the midrib, slender, distinct, anastomosing, more prominent on the lower than on the upper surface; petioles 5 to 7 mm long. Flowers 5-merous, axillary, solitary, the peduncles glabrous, curved, stout, about 2 cm long. Calyx glabrous, the lobes orbicular to orbicular-reniform, broadly rounded, coriaceous, concave, about 7 mm long, 6 to 8 mm wide, margins sometimes slightly ciliate, not glandular. Petals obovate, broadly rounded, about 1.8 cm long, 1.3 cm wide, the exposed median portions of the back rather densely appressed-pubescent with pale hairs otherwise glabrous. Stamens about 50; filaments 4 to 8 mm long, slightly hirsute; anthers oblong-lanceolate, acute or acuminate, slightly hirsute, 4 mm long. Ovary ovoid, glabrous, narrowed upward into the glabrous style, 5-celled, the ovules indefinite.

LUZON, Province of Rizal, Oriud, *Loher 5604*, December, 1905.

A characteristic species, apparently allied to *Adinandra lamponga* Miq., but differing in many details. It is well characterized, among the Philippine forms, by being nearly glabrous, the only pubescent parts being the very small vegetative buds, the median parts of the petals, outside, and the stamens.

ADINANDRA MACGREGORII sp. nov.

Arbor circiter 15 m alta, plus minusve villosa; foliis coriaceis, ellipticis ad oblongo-ellipticis, usque ad 10 cm longis, supra nitidis, gabris, subtus adpresse villosis, basi acutis ad subrotundatis, apice breviter acuminatis, margine distincte minuteque glanduloso-denticulatis, nervis utrinque 12 ad 15, distinctis; sepalis extus villosis, petalis late ellipticis, rotundatis, circiter 1.4 cm longis; staminibus 35, antheris parce villosis; ovario 4-loculare, dense pallide villoso.

A tree about 15 m in height, the buds and growing branchlets very densely appressed-villous with pale hairs, the petioles, lower surfaces of the leaves, and flowers less densely villous. Branches terete, grayish, glabrous. Leaves coriaceous, elliptic to oblong-elliptic, 5 to 10 cm long, 2.5 to 4 cm wide, apex shortly acuminate, base somewhat rounded to somewhat acute, margins very minutely glandular-denticulate, the upper surface olivaceous when dry, glabrous and shining, the lower much paler, with scattered, more or less appressed, pale hairs; lateral nerves

12 to 15 on each side of the midrib, slender, distinct, anastomosing, about equally evident on both surfaces; petioles densely villous, 3 mm long. Flowers axillary, solitary, 5-merous, their peduncles stout, curved, somewhat villous, about 2.5 cm long. Sepals about 1 cm long, 7 mm wide, coriaceous, ovate, acute or slightly acuminate, glabrous inside, outside somewhat densely appressed-villous with pale, short hairs, the margins minutely glandular-denticulate. Petals broadly elliptic to elliptic-ovate, rounded, not at all retuse, 1.4 cm long, 1 cm wide, externally appressed-villous in the exposed median parts, inside and the broad margins externally glabrous. Stamens 35; filaments glabrous, 4 to 5 mm long; anthers lanceolate, acuminate, 5 mm long, very sparingly villous with long stiff hairs on the back. Ovary ovoid, densely villous, 4-celled, the ovules indefinite; style stout, about 8 mm long, widened below to the ovary, prominently villous except near the glabrous apex, cleft into four 1.5 to 2 mm long arms, the stigmas capitate.

LUZON, Benguet Subprovince, Pauai, *Bur. Sci.* 8425 McGregor, June, 1909, in forests, altitude above 2,100 m.

A species manifestly allied to *Adinandra elliptica* C. B. Rob., but distinguishable at once by its much larger flowers, as well as by numerous details in vegetative and floral characters.

ADINANDBA NIGRO-PUNCTATA sp. nov.

Arbor circiter 10 m alta, subglabra; foliis coriaceis, ellipticis ad oblongo-obovatis, 4 ad 7 cm longis, nitidis, basi acutis, apice late acuminatis vel obtusis, minute retusis, margine minute glanduloso-denticulatis, subtus glandulis minutis sparsis nigris instructis, nervis utrinque circiter 7; sepalis 5, subaequalibus, ellipticis, glabris; staminibus circiter 50, densissime hirsutis; ovario glabro, 5-loculare.

A tree about 12 m in height, glabrous except the flowers and the growing tips of the branchlets. Branches stout, terete, reddish-brown, glabrous, the terminal buds pubescent. Leaves coriaceous, elliptic to oblong-obovate, 4 to 7 cm long, 1.5 to 3 cm wide, the base acute, the apex very broadly and shortly blunt-acuminate, sometimes merely obtuse, usually minutely retuse, margins very obscurely and minutely glandular-denticulate, in the lower part quite entire, the upper surface somewhat olivaceous when dry, strongly shining, usually minutely verruculose, the lower surface a little paler, with small, scattered, black glands; lateral nerves about 7 on each side of the midrib, slender, not prominent, about equally evident on both surfaces; petioles 5 mm long. Flowers axillary, soli-

tary, white, their pedicels glabrous, stout, about 2 cm long. Sepals subequal, glabrous, elliptic, broadly rounded, usually somewhat retuse, 10 mm long, 8 mm wide. Petals broadly elliptic, about 1.8 cm long, 1 to 1.3 cm wide, coriaceous broadly rounded, slightly retuse, the median exposed parts very densely pale-hirsute, otherwise glabrous. Stamens about 50; filaments 5 mm long, densely hirsute; anthers ovate-lanceolate, somewhat acuminate, 4 mm long, densely hirsute. Ovary glabrous, ovoid, 5-celled, ovules very numerous in each cell; style glabrous, 12 mm long, the stigma minute, subcapitate.

LEYTE, Dagami, in forests, *Bur. Sci. 15355 Ramos*, August 13, 1912.

A characteristic species, distinguishable by its rather large flowers which are glabrous except for the densely hirsute median parts of the petals externally and the stamens, subequal broadly elliptic petals, subequal broadly elliptic sepals, and its vegetative characters; the scattered, minute, black glands on the lower surface are characteristic.

DILLENACEAE

DILLENIA Linnaeus

DILLENIA MONANTHA sp. nov. § *Wormia*.

Arbor glabra, usque ad 12 m alta; foliis coriaceis, ellipticis ad obovato-ellipticis, usque ad 12 cm longis, obtusis, acutis, vel latissime breviter acuminatis, basi acutis, decurrentibus, margine subintegris vel distanter irregulariter dentatis, nervis utrinque 6 ad 8; floribus flavidis, in axillis superioribus, solitariis, circiter 10 cm diametro, sepalis extus cinereo-pubescentibus; carpellis 5, leviter hirsutis; staminibus interioribus quam exterioribus multo longioribus, antheris poro terminalibus dehiscentibus.

A glabrous tree reaching a height of 12 m, the branches terete, rugose, reddish-brown or grayish. Leaves alternate, coriaceous, rather pale when dry, shining, elliptic to elliptic-obovate, 8 to 12 cm long, 5 to 8 cm wide, the apex subacute, obtuse, or broadly and shortly acuminate, the base acute, the lamina decurrent on the petiole as narrow wings, the margins subentire to distantly dentate; lateral nerves 6 to 8 on each side of midrib, curved, anastomosing, distinct; petioles stout, narrowly decurrent-winged, 1 to 1.5 cm long. Flowers solitary in the upper axils, yellow, about 10 cm in diameter, their peduncles 2 to 4 cm long. Sepals 5, elliptic to elliptic-obovate, rounded, concave, coriaceous, 1.5 to 2 cm long, 1 to 1.4 cm wide, outside more or less cinerous-pubescent. Petals yellow, obovate, membranaceous, about 5 cm long, 3.5 cm wide. Stamens very numerous, the interior ones up to 1.8 cm long, the exterior ones gradually shorter, the outermost

8 to 10 mm long, the anthers opening by terminal pores. Carpels 5, slightly hirsute, 7 mm long, oblong, subcylindric; styles 5, about 1 cm long; ovules about 16, 2-seriate. Fruit not seen.

PALAWAN, Taytay, *Merrill 9237* (type), flowering from April 10 to June and probably later, 1913; Malampaya Bay, *Bur. Sci. 21555 Escritor*, August, 1913, *For. Bur. 4518 Curran*, June 21, 1913. DUMARAN, *Bur. Sci. 21642 Escritor*, August, 1913. CULION, *Bur. Sci. 15647 Fénix*, July 11, 1913.

This species is common at low altitudes in northern Palawan, growing in thin, second growth forests, and in and along the borders of open *cogonales*, that is, areas occupied by the cogon or lalang grass (*Imperata cylindrica*). It is, perhaps, most closely allied to the Malayan *Dillenia pulchella* (Jack) Gilg, and among the Philippine species to *Dillenia sibuyanensis* (Elm.) (*Wormia sibuyanensis* Elm.). Its solitary flowers, together with its somewhat decurrent laminae and its few carpels are striking differential characters.

LECYTHIDACEAE

BARRINGTONIA Forster

BARRINGTONIA PTERITA sp. nov.

Arbor parva, glabra; foliis ad apices ramulorum plus minusve confertis, oblanceolatis, sessilibus vel subsessilibus, usque ad 40 cm longis, acuminatis, basi sensim angustatis; racemis circiter 70 cm longis, pendulis; fructibus oblongis, 6 cm longis, longitudinaliter 4-alatis.

A small glabrous tree, 10 m high *vide* Ramos. Branches terete, the ultimate ones about 6 mm in diameter, above with rather prominent petiolar scars. Leaves somewhat crowded at the ends of the branchlets, oblanceolate, 20 to 40 cm long, 4 to 8 cm wide, entire, rather pale when dry, somewhat shining, chartaceous, the apex rather sharply acuminate, gradually narrowed from above the middle to the base, the base 1 cm wide or less, then abruptly acute or rounded, the petiole none, or stout and 4 mm long or less; lateral nerves about 20 on each side of the midrib, rather prominent on the lower surface. Racemes pendulous, about 70 cm long, the flowers unknown. Fruit oblong or narrowly oblong, 6 cm long, 1.5 to 2.5 cm wide, the base acute the pedicels about 1 cm long, the persistent sepals crowning the apex about 1 cm in length, the four angles longitudinally winged, the wings subcoriaceous, about 5 mm wide.

LUZON, Province of Laguna, Dahican River back of San Antonio, *Bur. Sci. 15121 Ramos*, June, 1912.

A species manifestly allied to *Barringtonia racemosa* Blume, but at once distinguishable by its prominently longitudinally 4-winged fruits, in this character differing from all the previously known Philippine species. *Elmer 9168* from Lucban, Tayabas Province, is undoubtedly a small leaved form of the same species; it was distributed as *Barringtonia racemosa* Blume.

FLACOURTIACEAE

HYDNOCARPUS Gaertner

HYDNOCARPUS CAULIFLORA sp. nov. § *Euhydnocarpus*, *Oliganthera*.

Arbor parva inflorescentiis exceptis glabra; foliis late oblongis, chartaceis vel tenuiter coriaceis, usque ad 30 cm longis, nitidis, acuminatis, basi late cordato-rotundatis, nervis utrinque circiter 15, valde prominentibus, petiolo vix 1 cm longo; inflorescentiis fulvo-villosis, usque ad 15 cm longis, anguste paniculatis vel racemosis, caulinis.

A small tree, glabrous except the inflorescence. Branches slender, terete. Leaves alternate, broadly oblong, chartaceous or thinly coriaceous, of the same color and shining on both surfaces when dry, 23 to 30 cm long, 9 to 12 cm wide, the base broad, rounded, somewhat cordate, the apex shortly acuminate; lateral nerves about 15 on each side of the midrib, very prominent, somewhat curved, anastomosing near the margin, the primary reticulations rather lax, the ultimate ones slender, rather dense; petioles stout, 5 to 8 mm long. Inflorescence of very narrow raceme-like panicles or of simple racemes fascicled on the trunk, 5 to 15 cm long, densely fulvous-villous. Male flowers: Pedicels stout, villous, 3 mm long, the subtending bracteole densely villous, narrowly oblong, 2 mm long. Sepals 5, free, concave, villous, rounded, about 5 mm long. Petals 5, free, imbricate, thinner than the sepals, elliptic, rounded, 3 mm long, somewhat appressed-pilose on the back, the basal scale cleft, the lobes reflexed, about 1 mm long. Filaments villous-bearded, 1.5 mm long. Anthers ovoid, 1 to 1.2 mm long. Rudimentary ovary villous, small. Female flowers and fruits not seen.

MINDANAO, District of Cotabato, Lebak, *For. Bur.* 11799 Whitford, March, 1912, in dipterocarp forests at low altitudes.

A very characteristic species, its inflorescence looking more like that of *Ryparosa* than of *Hydnocarpus*. The structure of its flowers, however, place it in *Hydnocarpus*. It is strongly characterized by its broadly oblong leaves which are prominently nerved and broadly rounded-cordate at the base, and especially by its cauline inflorescence.

XYLOSMA Forster f.

XYLOSMA LUZONENSIS (Presl) comb. nov.

Prockia luzonensis Presl Rel. Haenk. 2 (1835) 94.

Xylosma cumingii Clos. in Ann. Sci. Nat. IV. 8 (1857) 252; F.-Vill.

Novis. App. (1880) 13; Vid. Phan. Cuming. Philip. (1885) 94, Rev. Pl. Vasc. Pilip. (1886) 49.

LUZON, without definite locality, *Haenke* in Herb. Prague (type): Province of Cagayan, *For. Bur.* 17114 Curran, *For. Bur.* 18506 Alvarez, *For.*

Bur. 14758, 14748 *Darling*: Province of Ilocos Norte, *Cuming* 1250: Province of Ilocos Sur, *Cuming* 1123: Province of Nueva Vizcaya, *For. Bur.* 15844 *Curran & Merritt*: Benguet Subprovince, *Elmer* 6423: Province of Pangasinan, *For. Bur.* 8376 *Curran & Merritt*: Province of Zambales, *Bur. Sci.* 5042 *Ramos*, *Merrill* 2916: Province of Rizal, *For. Bur.* 1893 *Ahern's collector*: Province of Tayabas (Principe), *Merrill* 1018.

This species appears to be common and widely distributed in northern Luzon. The specimens cited above show considerable variation but are all apparently referable to a single species. Presl's description was based on at least two specimens, one in flower, and one in fruit. The type in the herbarium of the Museum des Königreichs Böhmen at Prague, consists of a fruiting and a flowering specimen mounted on the same sheet, and is, at least in part, identical with the later *Xylosma cumingii* Clos. The earliest name is here adopted.

XYLOSMA SULUENSIS sp. nov.

Frutex glaber circiter 5 m altus; ramulis pallidis, foliis oblongo-ovatis vel oblongo-lanceolatis, chartaceis, nitidis, basi acutis, apice acuminatis, margine integris, usque ad 18 cm longis; racemis axillaribus, solitariis, glabris, quam petiolo paullo longioribus, paucifloris; fructibus globosis, 6 ad 8 mm diametro.

A glabrous shrub about 5 m high, the branches and branchlets slender, terete, very pale, with few, scattered lenticels. Leaves oblong-ovate to oblong-lanceolate, entire, 9 to 18 cm long, 3.5 to 6 cm wide, chartaceous, shining and of about the same color on both surfaces, when dry brownish-olivaceous, the base acute, the apex acuminate, gradually narrowed upward from below the middle, the base often with one or two small glands on the margins near the insertion of the petiole; lateral nerves slender, ascending, about 10 on each side of the midrib; petioles 8 to 10 mm long. Racemes axillary, solitary, glabrous, 2 cm long or less, few-flowered. Flowers unknown. Fruits usually about five to each raceme, globose, 6 to 8 mm in diameter, crustaceous when dry, smooth, crowned by the very short style, their pedicels 3 to 4 mm long, the subtending bracteoles ovate-lanceolate, 1.5 mm long or less. Seeds 4, black, concave, about 4 mm wide.

UBIAN ISLAND, Sulu Archipelago, *Merrill* 5398, October 12, 1906, in thickets back of the beach.

A species well characterized by its entire leaves with are considerably larger than are those of our other species, *Xylosma luzonensis* (Presl) Merr.

FLACOURTIA Commerson

FLACOURTIA EUPHLEBIA sp. nov.

Frutex spinosus circiter 4 m altus subtus foliis ad nervos dense pubescentibus; foliis oblongis, subcoriaceis, usque ad 18 cm longis, basi acutis vel rotundatis, apice breviter acuminatis, margine distincte crenato-serratis; nervis utrinque circiter 10,

valde prominentibus, anastomosantibus; fructibus subovoideis, circiter 1 cm longis, in siccitate circiter 7-sulcatis.

A spiny shrub about 4 m high, the younger branchlets, petioles, and nerves on the lower surfaces of the leaves more or less pubescent. Branches terete, reddish-brown or brown, glabrous, lenticellate, the younger ones with solitary or paired, sharp, nearly straight, 5 to 10 mm long spines subtending each leaf, or the spines often scattered along the branchlet. Leaves oblong, subcoriaceous, brownish when dry and of about the same color on both surfaces, 12 to 18 cm long, 5 to 8 cm wide, the base acute or somewhat rounded, usually with a pair of glands near the insertion of the petiole, the apex rather abruptly and shortly acuminate, margins, except near the base, distinctly crenate-serrate, the midrib and lateral nerves on the lower surface, and in younger leaves on the upper surface, rather densely brown-pubescent; lateral nerves about 10 on each side of the midrib, very prominent on the lower surface, straight, looped-anastomosing near the margin; petioles pubescent, becoming nearly glabrous in age, stout, 4 to 12 mm long. Flowers unknown. Fruit ovoid, fleshy, edible, acid, about 1 cm long, black, when dry, and rather distinctly 7-sulcate.

MINDANAO, District of Davao, Todaya, *Williams* 2572, April 4, 1905.

The specimen has been identified as *Flacourtia montana* Grah., which species, to a certain degree, it resembles. It is, however, entirely different in its leaf-venation, and does not agree with any previously described species of the genus so far as I am able to determine. It is remarkable for its very prominently veined leaves.

RYPAROSA Blume

RYPAROSA CAULIFLORA sp. nov.

Species *R. longipedunculatae* Boerl. similis et ut videtur affinis, differt foliis majoribus, usque ad 35 cm longis, late oblongo-ovatis, apice late rotundatis, nervis utrinque circiter 9.

A shrub or small tree, apparently glabrous except the more or less puberulent inflorescence. Branches terete, brownish when dry. Leaves alternate firmly chartaceous, broadly oblong-ovate, up to 35 cm long and 17 cm wide, shining when dry, the upper surface brownish-olivaceous, the lower surface pale and somewhat glaucous, the base acute, the apex broadly rounded; nerves 9 on each side of the midrib, curved-ascending, prominent, the reticulations distinct, rather lax; petioles about 9 cm long, geniculate above. Inflorescence apparently racemose, the racemes solitary, springing from the trunk or from the larger branches, up to 35 cm in length, cinereous-puberulent.

Flowers unknown. Immature fruits globose, wrinkled when dry, subglobose, 1 to 1.5 cm in diameter, gray-puberulent externally.

TINAGO ISLAND, *Ahern 416*, collected by *Quadras* between February and May, 1901, locally known as *bunganon*.

The species above described was previously determined by me as *Ryparosa longipedunculata* Boerl., but comparison with authentic material from specimens cultivated in the Botanical Garden at Buitenzorg, show that it is a species quite different from that, although probably closely allied to it.

CASEARIA Jacquin

CASEARIA BREVIPES sp. nov. § *Pitumba*.

Arbor parva, glabra; foliis oblongis vel late oblongo-lanceolatis, chartaceis vel subcoriaceis, in siccitate brunneis, usque ad 20 cm longis, subintegris vel distanter minuteque glanduloso-denticulatis, utrinque angustatis, apice longe acuminatis, basi acutis vel subrotundatis, brevissime petiolatis, nervis utrinque 8 ad 10; floribus axillaribus, fasciculatis, 5-meris, pedicellatis. Staminibus 10, staminodeis oblongis, apice capitatis, dense ciliatis.

A small tree, quite glabrous, the branches prominently zigzag, terete, grayish, rather slender. Leaves oblong to broadly oblong-lanceolate, 14 to 20 cm long, 4 to 7 cm wide, subentire or with widely scattered, minute, gland-like, obscure teeth, chartaceous to subcoriaceous, when dry somewhat brownish, the upper surface slightly shining, the lower a little paler, narrowed at both ends, the base acute or somewhat obtuse, rarely somewhat rounded, equilateral, the apex rather long-acuminate, the acumen blunt; lateral nerves 8 to 10 on each side of the midrib, rather prominent on the lower surface, somewhat curved-ascending, anastomosing near the margin, the reticulations distinct; petioles stout, 2 to 3 mm long. Flowers axillary, few, fascicled, on thickened, prominent, axillary tubercles, 5-merous. Pedicels glabrous, up to 3 mm long, jointed, each subtended by two broadly ovate bracteoles about 1 mm long. Sepals 5, broadly elliptic, rounded, concave, glabrous, membranaceous, 3 to 4 mm long. Stamens ten, 3 mm long, the tubular part about 1 mm long, glabrous, the free parts of the filaments and the anthers each about 1 mm long, the ten, alternating, free staminodes oblong, shorter than the stamens, the apical parts suborbicular-capitate, densely ciliate. Ovary narrowly ovoid, about 2 mm long, narrowed upward to the sessile or subsessile capitate stigma, glabrous, or with very few scattered hairs. Fruit unknown.

BASILAN, *Bur. Sci. 16113 Reillo*, August 31, 1912, along streams.

The species is well characterized by its leaves being narrowed at both

ends, prominently acuminate at the apex and usually acute at the base, the distant, minute, gland-like marginal teeth, the very short petioles, and the subcapitate tips of the staminodes.

CASEARIA LOHERI sp. nov.

Arbor parva, 4 ad 6 m alta, partibus junioribus floribusque exceptis glabra; foliis chartaceis, oblongo-ovatis ad obovatis, usque ad 18 cm longis, breviter petiolatis, in siccitate brunneis, integris, basi rotundatis, apice late acuminatis, nervis utrinque 5 vel 6; floribus axillaribus, fasciculatis, paucis, 5-meris, extus leviter hirsutis. Staminibus 10.

A small tree 4 to 6 m high, quite glabrous except the flowers and the growing tips of the branchlets which are sparingly hirsute with short, appressed hairs. Branches slender, terete, smooth, grayish. Leaves chartaceous, oblong-ovate to obovate, 8 to 18 cm long, 4 to 8 cm wide, entire, the upper surface rather dark-brown or olivaceous-brown when dry, slightly shining, the lower somewhat paler, the base usually broad, rounded, sometimes subacute, equilateral or nearly so, the apex with a short, broad acumen; lateral nerves 5 or 6 on each side of the midrib, distant, rather prominent on the lower surface, curved or curved-ascending, anastomosing, the reticulations distinct; petioles 4 to 7 mm long. Flowers 5-merous, axillary, fascicled and few or subsolitary, their pedicels very short, jointed, the subtending bracteoles 2, reniform or very broadly ovate, somewhat connate, broadly acuminate, externally somewhat pubescent with short hairs. Sepals 5, elliptic, rounded, slightly pubescent externally, concave, 3.5 to 4 mm long. Stamens 10, their filaments united below with the alternating staminodes, the tubular part glabrous, 0.8 mm long, the free parts of the filaments slender, glabrous, 1.4 mm long; anthers oblong-ovate 0.8 mm long. Alternating staminodes shorter than the stamens, oblong, obtuse, 1 to 1.2 mm long, glabrous externally, prominently ferruginous-hirsute at the apex. Ovary ovoid, 1.2 mm long, ferruginous-hirsute in the upper one-half, narrowed to the subsessile or sessile capitate stigma. Fruit ovoid or ellipsoid, glabrous, fleshy, reddish when mature, 2 cm long, the valves coriaceous. Seeds about 15, obliquely obovoid, about 5 mm long, externally densely covered with roundish, distinct, pale dots. Aril thin, submembranaceous, 8 to 10 mm long, enveloping the seed, the upper part more or less lacerate.

LUZON, Province of Rizal, San Isidro, *Bur. Sci.* 13525 Ramos (type), August, 1910, in forests, *Bur. Sci.* 1851 Ramos, January, 1907, in fruit; Oriud, *Loher* 6215.

A species manifestly allied to *Casearia fuliginosa* Blanco, but readily distinguishable by its fewer-nerved leaves. In *C. fuliginosa* Blanco the nerves are usually about 10 on each side of the midrib, in *C. loheri* 5 or 6 on each side. The type was from Rizal Province, not from Laguna Province as distributed.

CASEARIA SUBCORDATA sp. nov. § *Pitumba*.

Arbor parva partibus junioribus floribusque exceptis glabra; foliis coriaceis, oblongis, nitidis, in siccitate brunneis, usque ad 15 cm longis, breviter acute acuminatis, basi abrupte subtruncato-cordatis, leviter inaequalibus, margine serratis, nervis utrinque circiter 12; floribus axillaribus, fasciculatis, ut videtur numerosis, 5-meris, tenuiter pedicellatis; fructibus anguste ovoideis vel ellipsoideo-ovoidis, 1 ad 1.4 cm longis, acutis, in siccitate leviter 6-sulcatis.

A small tree, nearly glabrous except the younger parts. Branches terete, lenticellate, grayish-brown or reddish-brown, glabrous, the younger branchlets distinctly hirsute with short hairs. Leaves oblong, coriaceous, 8 to 15 cm long, 3.5 to 5.5 cm wide, the base abruptly and somewhat obliquely subtruncate-cordate, the sinus shallow, the basal lobes broadly rounded, the apex shortly but rather sharply acuminate, the margins regularly and rather finely serrate throughout, brown when dry, the upper surface strongly shining, the lower a little paler, shining, glabrous or when young with few short hairs on the lower surface; lateral nerves about 12 on each side of the midrib, prominent, somewhat curved, anastomosing, the reticulations fine, distinct; petioles 5 to 8 mm long, the younger ones slightly pubescent. Flowers 5-merous, axillary, fascicled, their pedicels slender, 3 to 6 mm long, slightly pubescent. Sepals 5, oblong-ovate, glabrous or nearly so, coriaceous, obtuse, 3 mm long slightly accrescent and persistent in fruit, somewhat hirsute on the median portion inside. Stamens apparently 10; filaments 0.5 mm long; anthers a little longer; staminodes shorter than the stamens, densely ciliate-hirsute. Ovary narrowly ovoid, glabrous, narrowed upward to the short style, the stigma capitate. Fruit narrowly ovoid to ovoid-ellipsoid, 1 to 1.4 cm long, glabrous, numerous, 2 to 6 or more in each axil, shallowly longitudinally 6-sulcate when dry, acute; valves thickly coriaceous. Seeds about 12 in each fruit, smooth, brown, somewhat inequilaterally obovoid or oblong-obovoid, 4 mm long; aril fleshy, about 5 mm long, quite inclosing the seeds, irregularly lacerate and divided. Peduncles of the fruits about 1 cm long.

MINDANAO, Bukidnon Subprovince, *Bur. Sci.* 15698 *Fénix*, August, 1912.

A species manifestly very closely allied to *Casearia polyantha* Merr.,

which it greatly resembles, but distinguishable by its leaves being truncate-cordate at the base. Its leaf-form is somewhat similar to that of *C. cinerea* Turcz., and *C. grewiaefolia* Vent., but these two species are at once distinguished by their pubescence. *G. truncata* Bl., is also apparently closely allied.

ARALIACEAE

BOERLAGIODENDRON Harms

BOERLAGIODENDRON HETEROPHYLLUM sp. nov.

Arbor erecta, ramosa, circiter 5 m alta, glabra; foliis palmatim 3- ad 7-foliolatis, foliolis valde inaequalis, oblongo-obovatis vel late oblongo-lanceolatis, acuminatis, inferioribus vix 12 cm longis, superioribus usque ad 35 cm longis, acuminatis, lobatis dentatisque, basi sensim angustatis; umbellis densis, floribus subcapitato-dispositis, 4-meris.

An erect, branched tree about 5 m high, glabrous, the trunk about 8 cm in diameter. Leaves chartaceous, palmately 3- to 7-foliolate, or sometimes some of the leaves very deeply 3-parted, the lobes extending almost to the base; leaflets very unequal in size, when 5 or 7 are present the lower two usually 12 cm long or less, the upper ones larger, the middle one up to 35 cm in length, oblong-obovate to broadly oblong-oblongeolate, acuminate, usually lyrate-lobed, dentate, the lobes broadly ovate, acuminate, the base gradually narrowed, the petiolules of the middle leaflets up to 3 cm in length, of the others gradually shorter; petioles 10 to 25 cm long, the basal part with four or more somewhat pectinate crests. Umbels terminal, about 30 terminating each branch, forming a dense cauliflower-like inflorescence, the peduncles 10 to 15 mm long, each with two lanceolate, 8 to 10 mm long bracts at the apex subtending the two lateral branches. Central head of each peduncle almost sessile, subcapitate, of numerous sterile flowers, their pedicels 3 to 4 mm long, the ovaries ellipsoid, about 3 mm long. Lateral two umbels about 1 cm in diameter, dense, subcapitate, their peduncles 8 to 10 mm long. Flowers numerous, sessile or subsessile, 4-merous. Petals 2 mm long. Anthers about 1 mm long.

MINDANAO, Butuan Subprovince, Mount Hilong-Hilong, *Weber 1126*, March 29, 1911, in forests, altitude about 550 m.

A species most closely allied to *Boerlagiodendron clementis* Merr., of Mindanao, but at once distinguished by its leaves being palmately compound.

SCHEFFLERA Forster

SCHEFFLERA OBOVATA sp. nov. § *Euschefflera*, *Heptapleurum*.

Frutex epiphyticus, inflorescentiis exceptis glaber; foliis palmatim 5- ad 7-foliolatis, foliolis subcoriaceis, nitidis, obovatis,

integris, basi angustatis, acutis, apice abrupte caudatis, nervis primariis utrinque 5 vel 6, quam secundariis reticulisque haud magis distinctis; inflorescentiis terminalibus, racemis circiter 8, racemose dispositis, circiter 15 cm longis, fructibus 5-locellatis,

An epiphytic shrub, glabrous except the inflorescence. Branches terete, grayish, striate when dry. Leaves alternate, their petioles 6 to 7 cm long, inflated and clasping at the base, the leaflets 5 to 7, palmately arranged; leaflets obovate, subcoriaceous, 5 to 8 cm long, 2 to 4 cm wide, entire, narrowed gradually to the acute or cuneate base, the apex abruptly and prominently acuminate, the acumen stout, 5 to 8 mm long, acute, the upper surface shining, the lower dull, of about the same color; lateral nerves 5 or 6 on each side of the midrib, the basal ones sharply ascending, distinct but not more prominent than are the secondary ones and the reticulations, all equally prominent on both surfaces; petiolules 1.5 to 2.5 cm long, those of the outer leaflets somewhat shorter than of the middle ones. Inflorescence terminal, sparingly furfuraceous-pubescent with short pale hairs, the rachis short, about 2 cm long, stout. Racemes usually about 8, 12 to 15 cm long, bearing numerous fascicled fruits, the pedicels slender, 3 to 4 mm long, usually 2 or 3 fruits in each fascicle. Fruits reddish-yellow when fresh, glabrous, ellipsoid, when dry prominently longitudinally 5-sulcate, 5-celled, crowned by the 5, round, sessile stigmas.

LUZON, Province of Laguna, Dahican, *Phil. Pl.* 1108 Ramos, September 27, 1912.

A species manifestly allied to *Schefflera caudata* Vid. (*S. acuminatissima* Merr.) from which it differs especially in its quite differentially shaped, much smaller leaves.

Additional material from the same province (*Bur. Sci.* 10001, 10973 Ramos), the specimens in flower, is very similar to the species above described, but in both the flowers are in racemously disposed umbels, while in the type of *S. obovata* the flowers are merely fascicled, not at all umbellate.

SCHEFFFLERA DEMESAE sp. nov. § *Euschefflera*.

Frutex scandens, glaber; foliis alternis, palmatim 5-foliolatis, foliolis chartaceis, usque ad 24 cm longis, integris, nitidis, apice breviter acuminatis, basi rotundatis, nervis tenuibus, utrinque usque ad 25, petiolulis valde inaequalibus; inflorescentiis terminalibus, pedunculatis, floribus 5-meris, racemosis, racemis elongatis, subumbellatim dispositis.

A scandent glabrous shrub, the stem reaching a diameter of about 3 cm, purplish, the ultimate branches terete, about 5 mm in diameter, striate when dry, grayish or brownish. Leaves

palmately 5-foliolate, their petioles inflated at the base, about 5 cm long. Leaflets oblong to elliptic-oblong, chartaceous, shining, 15 to 24 cm long, 7.5 to 9.5 cm wide, entire, the apex shortly acuminate, the base rounded; lateral nerves slender, about 25 on each side of the midrib, the reticulations distinct; petiolule of the central leaflet 7 cm long, of the next two inner leaflets 2.5 to 3 cm long, of the outer leaflets about 1 cm long. Inflorescence terminal, peduncled, the peduncle up to 15 cm long, usually with two distant, ovate bracts, the lower one 5 mm long, the upper one twice as long. Branches of the inflorescence subumbellately disposed near the apex of the peduncles, usually 6, slender, about 30 cm long, many-flowered. Flowers racemously disposed, usually fascicled at the nodes, few in each fascicle, pale-green, their pedicels about 6 mm long. Calyx short, truncate, somewhat disk-like. Petals 5, oblong-ovate or ovate, acute, appendaged at the apex inside, 3 mm long, 3-nerved. Filaments 2 mm long; anthers broad, about 1.3 mm long. Fruit not seen.

MINDANAO, District of Zamboanga, Siay River, *For. Bur. 13396 Foxworthy, DeMesa, & Villamil*, May 29, 1912, on river banks, known to the Moros as *canonucan*.

Apparently a very distinct species, characterized by being quite glabrous; by its peduncled inflorescence, with its elongated subumbellately disposed primary branches; and its 5-foliolate, entire, ample leaves with their very unequal petiolules.

SCHEFFLERA CAUDATIFOLIA sp. nov. § *Euschefflera*.

Frutex scandens, glaber, ramis ramulisque teretibus; foliis palmatim 5-foliolatis, foliolis subcoriaceis, nitidis, oblongis ad oblongo-lanceolatis, usque ad 10 cm longis, utrinque angustatis, basi acutis, apice longe tenuiter caudato-acuminatis; floribus racemosis, 5-meris, racemis subterminalis, solitariis vel binis, tenuibus, usque ad 13 cm longis.

A scandent shrub, quite glabrous, the branches and branchlets terete, when dry light-gray, wrinkled. Leaves scattered, palmately 5-foliolate, their petioles 4 to 8 cm long, inflated at the base; leaflets oblong to oblong-lanceolate, 5 to 10 cm long, 2 to 3.4 cm wide, subequally narrowed to the acute base and to the slenderly caudate-acuminate apex, entire, the acumen straight or falcate, up to 2 cm long, the upper surface subolivaceous, shining, the lower shining, paler than the upper; lateral nerves 5 or 6 on each side of the midrib, rather distinct, anastomosing; petiolules 1 to 2 cm long. Inflorescence terminal, of one or two rather slender racemes, the racemes up to 13 cm long. Flowers 5-merous, solitary, in pairs, or somewhat fascicled, their pedicels

about 4 mm long. Calyx small, less than 2 mm in diameter. Petals 5, oblong-ovate, about 2.5 mm long, 1.5 mm wide, blunt, inflexed-keeled at the apex inside. Anthers about 1.5 mm long. Fruit 4 to 5 mm long, about 2.5 mm in diameter, oblong, longitudinally 5-sulcate, apparently somewhat fleshy when fresh, brown when dry.

LUZON, Province of Camarines, Mount Isarog, *Bur. Sci.* 20062 Ramos, November 8, 1913, on forested slopes.

Probably most closely allied to *Schefflera obovata* Merr., but with quite different leaflets.

SCHEFFLERA CRASSIFOLIA sp. nov. § *Euschefflera*.

Frutex scandens, glaber; foliis palmatis, foliolis 6, oblongis, coriaceis, nitidis, acuminatis, usque ad 18 cm longis, subtus pallidis, nervis reticulisque valde prominentibus; racemis 3 ad 6 in ramulis junioribus plus minusve confertis, usque ad 35 cm longis; floribus fasciculatis vel solitariis, pedicellatis, 5-meris; fructibus ellipsoideis, longitudinaliter 5-sulcatis, 5 ad 6 mm longis.

A scandent shrub, quite glabrous, or the very young parts sometimes slightly furfuraceous. Branches terete, lightly-gray, striate or wrinkled when dry. Leaves palmately compound, scattered, their petioles 5 to 10 cm long, inflated at the base, clasping the stem. Leaflets 6, oblong, thickly coriaceous, 10 to 18 cm long, 3.5 to 7 cm long, entire, the base rounded to subacute, apex rather abruptly and prominently acuminate, the acumen straight or somewhat falcate blunt, up to 2 cm long; upper surface olivaceous, prominently shining, the veins and reticulations distinct, the lower surface pale, grayish-yellow, the veins and reticulations very prominent, the lateral nerves about 10 on each side of the midrib, spreading, anastomosing; petiolules about 3 cm long. Inflorescence terminal, the racemes 3 to 6, arranged near the apices of the branchlets, the individual racemes up to 35 cm long, dark-brown when dry. Flowers numerous, fascicled and solitary along the racemes, their pedicels 3 to 4 mm long. Fruits apparently somewhat fleshy, when dry brown, ellipsoid, 5 to 6 mm long, about 4.5 mm in diameter, longitudinally 5-celled.

LUZON, Province of Camarines, Sagnay, on trees in damp forests, *Bur. Sci.* 22152 Ramos, December 15, 1913 (type): Province of Albay, Adumoy hills, *For. Bur.* 12384 Curran, June, 1908, locally known as *caranglang*.

A species well characterized by its palmately 6-foliolate leaves, the leaflets very thick and with prominent nerves and reticulations, and its elongated racemes which are somewhat crowded at the apices of the branchlets. Its alliance seems to be with *Schefflera clementis* Merr., but the flowers are all in strict racemes, not in racemously arranged umbels.

EBENACEAE

MABA Forster

MABA EUPHLEBIA sp. nov.

Frutex vel arbor parva (ex Ramos 3 m alta); foliis alternis, breviter petiolatis, oblongis, usque ad 33 cm longis, acuminatis, basi rotundatis, supra glabris subtus parce pubescentibus; nervis utrinque circiter 12, distantibus, valde prominentibus; floribus paucis, sessilibus, bracteolatis, fasciculatis, axillaribus; staminibus 12; corolla circiter 1.5 cm longa, extus dense fulvo-hirsuta.

A shrub or small tree (3 m high ex Ramos), the branchlets and lower surfaces of the leaves somewhat pubescent, the flowers densely so, otherwise glabrous. Branches slender, terete, brown or grayish. Leaves subcoriaceous or thickly chartaceous, oblong, 20 to 33 cm long, 7 to 9 cm wide, somewhat shining when dry, the upper surface olivaceous, glabrous, the lower pale-brownish, distinctly pubescent on the midrib and nerves, the base somewhat narrowed, rounded, the apex acute or acuminate; lateral nerves about 12 on each side of the midrib, very prominent, curved, distinct, anastomosing, the reticulations lax, prominent; petioles stout, pubescent, about 3 mm long. Flowers few, 2 or 3, rarely more, in axillary, sessile fascicles, each flower subtended by three ovate to ovate-lanceolate, acuminate, hirsute, about 3 mm long bracteoles. Calyx about 5 mm long, slightly hirsute, cup-shaped, 3-lobed, the lobes broadly ovate, acute or acuminate, one about as long as the calyx-tube. Corolla in nearly mature bud about 1.5 cm long, cylindric, 3 mm in diameter below, narrowed above, outside very densely hirsute-pubescent with appressed fulvous hairs. Stamens 12, in three series, the anthers linear-oblong, 2 to 3 mm long, the filaments of the inner series about 2 mm long, of the outer series about 6 mm long, flattened. Female flowers and fruits not seen.

LUZON, Province of Tayabas, Tagcauayan, in forests, altitude about 90 meters, *Bur. Sci.* 13335 Ramos, March 15, 1911.

A very characteristic species, distinguishable by its comparatively large, prominently nerved leaves which are pubescent beneath, and its few, axillary, fascicled, sessile flowers. It is, perhaps, most closely allied to *Maba venosa* King & Gamble, of Singapore, but is entirely distinct from that species as described.

DIOSPYROS Linnaeus

DIOSPYROS TRIFLORA sp. nov.

Arbor parva, floribus exceptis glabra, ramis ramulisque tenuibus, teretibus; foliis oblongis, usque ad 23 cm longis, subcoriaceis, supra nitidis, acuminatis, basi acutis, leviter decurrento-

acuminatis, vel subrotundatis, eglandulosis, nervis utrinque circiter 9, tenuibus, haud prominentibus; inflorescentiis ♂ axillaribus, solitariis, pedunculatis, circiter 2 cm longis, 3-floris; floribus 5-meris, calycibus cylindraceis, 6 mm longis, leviter 5-dentatis; corolla extus dense pubescens; staminibus 10.

A small tree, glabrous except the flowers. Branches and branchlets slender, terete, smooth, the latter black, the former black when dry. Leaves oblong, subcoriaceous, 12 to 23 cm long, 4 to 9 cm wide, the apex distinctly acuminate, the acumen blunt, the base acute, somewhat decurrent-acuminate, or somewhat rounded, eglandular, the upper surface very smooth and strongly shining when dry, the lower surface of nearly the same color but duller; lateral nerves 8 to 10 on each side of the midrib, slender, not prominent, loosely anastomosing, the reticulations not prominent, lax; petioles about 8 mm long. Male inflorescences axillary, solitary, about 2 cm long, the peduncles 5 to 10 mm long, each bearing three, subumbellately arranged, pedicelled flowers, ebracteolate. Male flowers 5-merous, their pedicels pubescent, 2 to 3 mm long, the calyx, in bud, cylindric, black when dry, slightly pubescent, about 6 mm long, 2 to 2.5 mm in diameter, the base obtuse, somewhat narrowed, the apex truncate and slightly 5-toothed, the teeth acute, 0.5 mm long or less. Corolla (in young bud) narrower than the calyx, externally densely gray-pubescent, the tube apparently short, the lobes elongated, imbricate. Stamens 10, in two series, the anthers lanceolate, acuminate, up to 3 mm long (immature). Female flowers and fruit not seen.

BALABAC, Cape Melville, *Bur. Sci.* 15652 *Fénix*, July 18, 1912, along trails at low altitudes.

A species well characterized by its 3-flowered, peduncled, solitary inflorescences, and its cylindric and truncate, obscurely 5-toothed calyces. It is apparently allied to the Malayan *Diospyros truncata* Zoll. & Mor., but has a peduncled, not fasciculate inflorescence, and quite differently shaped leaves.

DIOSPYROS FASCICULIFLORA sp. nov.

Arbor parva subtus foliis junioribus ramulis floribusque exceptis glabra, ramis ramulisque teretibus; foliis chartaceis vel subcoriaceis, oblongis vel oblongo-lanceolatis, usque ad 20 cm longis, utrinque angustatis, acuminatis; nervis lateralibus circiter 12, subtus valde prominentibus, arcuato-anastomosantibus, reticulis laxis, distinctis; floribus 4-meris, ferrugineo-pubescentibus, solitariis vel fasciculatis in axillis defoliatis vel in ramis infra foliis, calycibus post anthesis brevibus, rotatis, circiter 12 mm diametro; ovario 4-loculare, dense hirsuto; fructibus 4-locel-

latis, globosis vel globoso-obovoideis, circiter 2 cm diametro, seminibus 4, albumine vix ruminato.

A small tree, glabrous except for the flowers, the younger branchlets, and the lower surfaces of young leaves. Branches and branchlets terete, slender, dark-gray or brownish-black when dry, wrinkled, lenticellate, the younger branchlets somewhat ferruginous-pubescent. Leaves oblong, chartaceous or subcoriaceous, 12 to 20 cm long, 3.5 to 8 cm wide, narrowed at both ends, the apex rather sharply acuminate, the base acute, eglandular, the upper surface smooth and shining when dry, brownish or olivaceous, the lower surface usually much paler, slightly shining, when young rather softly pubescent or puberulent, often becoming glabrous or nearly so; lateral nerves about 12 on each side of the midrib, very prominent, arched-anastomosing, the reticulations lax, prominent; petioles up to 1 cm in length. Female flowers solitary or fascicled in the axils of fallen leaves, or fascicled on rather prominent protuberances on the branchlets below the leaves, 4-merous, sessile or very shortly and stoutly pedicelled. Calyx densely ferruginous-pubescent, the tube very short, broad, the lobes immediately after flowering orbicular-reniform, rounded, densely ferruginous-pubescent on both surfaces, about 3 mm in diameter, soon accrescent, spreading, reniform, 5 mm long and 8 mm in diameter, often recurved, thickly coriaceous. Corolla and stamens not seen. Ovary ovoid, densely ferruginous-pubescent, 4-celled. Fruit apparently fleshy, globose or obovoid-globose, when dry about 2 cm in diameter and often grayish, the pericarp glabrous, wrinkled, the coriaceous calyx-lobes persistent at the base of the fruit. Seeds 4, one in each cell, 12 to 15 mm long, about 1 cm wide and thick, the albumen hard but scarcely bony, smooth, whitish or yellowish when dry, not at all ruminant.

BASILAN, *Bur. Sci.* 16101 Reillo, August, 1912 (type).

I refer also to this species the following material: LUZON, without definite locality, *Loher* 6562, in fruit: Province of Tayabas, *Bur. Sci.* 10283 Curran, in fruit. CEBU, Asturias, *For. Bur.* 6450 Everett, in fruit. MINDANAO, District of Zamboanga, San Ramon, *Hallier*, in fruit. The only recorded native name is the Cebuano *panangtilong*.

DIOSPYROS MIRANDAE sp. nov.

Arbor circiter 30 m alta inflorescentiis exceptis glabra; foliis crasse coriaceis, oblongis, nitidis, utrinque concoloribus, usque ad 12 cm longis, acuminatis, nervis utrinque circiter 10, tenuibus, vix prominentibus, reticulis densis; floribus ♀ 5-meris, axillaribus, in racemis brevibus paucifloris dispositis; calycibus in

alabastra obovoideis, 6 mm diametro, crassissime coriaceis, longitudinaliter plicatis, lobis reniformibus; ovario 10-locellato.

A dioecious tree about 30 m high, glabrous except the inflorescence. Branches terete, grayish, lenticellate. Leaves alternate, thickly coriaceous, oblong, 8 to 12 cm long, 3 to 5 cm wide, shining and of about the same color on both surfaces, base rounded or subacute, apex shortly acuminate; lateral nerves about 10 on each side of the midrib, slender, not prominent, anastomosing, the reticulations slender, dense; petioles about 5 mm long. Female flowers in short, axillary, solitary, few-flowered, pubescent, spike-like racemes, the whole about 2 cm long. Flowers 5 or less in each raceme, their pedicels very stout, jointed, pubescent, about 2 mm long. Calyx in bud, just before anthesis, obovoid, pubescent, about 6 mm long and wide, with 5 reniform, rounded lobes, very thickly coriaceous, 3 mm long and 6 mm wide, the lobed portion longitudinally plicate or folded-plicate, star-shaped in cross-section, pubescent inside. Corolla-tube 6 mm long, 2.5 mm wide, cylindric, basal part glabrous, pubescent above, the lobes broadly ovate, spreading in anthesis, 5, pubescent on both surfaces, about 5 mm long, acute. Ovary ovoid, densely appressed-pubescent, narrowed upward into the thick style, ovary and style about 5 mm long, 10-celled. Staminodes 5, inserted at the base of the corolla, the sterile anthers linear, about 2 mm long.

MINDANAO, District of Cotabato, southeastern ridge of Mount Glan, *For. Bur.* 18752 *Miranda* (type), *For. Bur.* 14248 *Tarrosa*, June 6 and May 25, 1912, in forests, altitude 90 to 125 meters, locally known to the Moros as *bantulinay*.

A species well characterized by its peculiar calyx which is somewhat of the type of that of *Diospyros affinis* Thw. The flowers are said to be white and fragrant, and the heart-wood is described as black.

DIOSPYROS PLICATA sp. nov.

Arbor dioica, 8 ad 25 m alta, partibus junioribus inflorescentiisque exceptis glabra; foliis junioribus pubescentibus, vetustioribus glabris, oblongis, usque ad 18 cm longis, coriaceis, nitidis, subtus pallidioribus, acuminatis, nervis utrinque circiter 12, distantibus, patulis, distinctis, anastomosantibus; floribus ♀ axillaribus, fasciculatis, dense fulvo-pubescentibus, 5-meris, sepalis in anthesis breviter connatis, longitudinaliter plicatis et horizontaliter undulato-plicatis, accrescentibus et 2.5 cm longis.

A tree 8 to 25 m high. Branches terete, slender, nearly black when dry, the growing parts, the young leaves, and the flowers appressed-pubescent. Leaves oblong, coriaceous, 12 to 18 cm

long, 2.5 to 8 cm wide, shining on both surfaces, the lower somewhat paler than the upper, the apex blunt-acuminate, the base acute or rounded; nerves about 12 on each side of the midrib, spreading, distant, prominent on the lower surface, looped-anastomosing, the reticulations very lax, distinct; petioles 3 to 8 mm long. Female flowers 5-merous, axillary, in few-flowered fascicles, densely fulvous-pubescent. Calyx in bud densely pubescent, the sepals oblong-lanceolate, longitudinally folded or plicate, the reflexed margins very prominently horizontally undulate-plicate, free nearly to the base. Corolla cylindric, 6 mm long in bud, densely pubescent. Ovary densely appressed-hirsute, narrowly ovoid, 5- or 6-celled. Young fruit narrowly ovoid, obtuse, pubescent, about 1 cm long (very young) quite free from the accrescent, involucre-like calyx. Accrescent calyx-lobes ovate, somewhat foliaceous, coriaceous, slightly pubescent, 2.5 cm long, free except at the very base, folded back longitudinally and also prominently horizontally undulate-plaited, forming an ovoid involucre surrounding but free from the fruit, this accrescent calyx 5 cm in diameter when spread.

MINDANAO, District of Zamboanga, near Margosatubig, *For. Bur.* 13281 Foxworthy, DeMesa, & Villamil, May 11, 1912 (type), in hill forests, altitude about 120 meters, specimens with young fruit: District of Cotabato, Cablacan, *For. Bur.* 14901 Tarrosa, May, 26, 1912, near the seashore; Buluan Point, *For. Bur.* 18284 Miranda, May 27, 1912, the last two with young flowers.

A very striking species, well characterized by its accrescent calyx which is quite free from the fruit, and which is longitudinally folded or plicate and at the same time very prominently horizontally undulate-plicate. Its leaves are very similar to those of our common *Diospyros pilosanthera*, to which, however, it is not otherwise at all closely allied.

THE POTAMOGETONS OF THE PHILIPPINE ISLANDS

By ARTHUR BENNETT
(Croydon, England)

Through the kindness of Mr. E. D. Merrill I have been enabled to examine the representatives of the genus *Potamogeton* belonging to the herbarium of the Bureau of Science. This has enabled me to add one species to the flora. For the sake of convenience I have considered the species in the order that they appear in Ascherson and Graebner's monograph of the family.¹ I have also noted the species of surrounding countries in the hope that they may eventually be found in the Philippines. Those species which have actually been found in the Archipelago I have indicated with an asterisk.

1. **POTAMOGETON JAVANICUS** Hassk. in Act. Soc. Ind.-Neerl 5¹ (1856) 26.

Potamogeton heterophyllus Ham. in Wall. Cat. (1831) no. 5181.

Potamogeton tenuicaulis F. Muell. Frag. Phyt. Austral. 1 (1858) 90 244; 7 (1865) 217.

Potamogeton hybridus Hook. f. & Th. (non Michx.).

Potamogeton parvifolia Buchenau in Abh. Naturw. Ver. Bremen 7 (1880) 32.

JAVA, *Forbes 104!* FORMOSA, *Oldham 881,637!* COREA, *Wilford 968!* CHINA, *Maingay 170!*

INDIA, Khasia Hills, 6,000 ft. alt.! Himalaya, 7,000 ft.! Sikkim 9,000 ft.! AFRICA! AUSTRALIA!

Although Doctor Schinz and I have considered these all to belong to one species, at the present time I am in doubt as to whether or not this is true. The figure of the fruit given by Ascherson & Graebner² certainly does not belong to *Potamogeton javanicus* Hassk. but may have been drawn by mistake from *P. orientalis* Hägst. Hasskarl in his description says "fructus drupacei viridi subrotunda 3-cristata.....cristis lateralibus minus promunalis 2 gibbis, intermedia sinuata 3-4 gibba." Buchenau has "Fructus.....dorso carinati, basi bituberculata", and Mueller "carpidis.....dorso tricarinatus et repando-denticulatis."

But in the species of *Potamogeton* with tubercled fruits, the variation in this character is great; for instance the range of variation from *P. tri-*

¹ Engl. Pflanzenreich 31 (1907) 1-184.

² L. c. 47, fig. 14 C.

choides Cham & Schlecht. to *P. condylocarpus* Tausch may be quoted, and on this Schumann in *Flora Brasiliensis* 3* (1894) 709 very rightly puts stress, showing that care is needed and that slight differences must be taken into account, not as specific, but as endemic, or edaphic variations, and especially this has to be considered in the Australian species of the genus.

2. **POTAMOGETON CRISTATUS** Regel & Maack Fl. Ussur. (1861) 9, t. 10, f. 3-6.

Potamogeton hybridus Makino (non Michx.) Ill. Fl. Japan 2 (1891) t. 55.

CHINA! MANDSCHURIA! JAPAN! FORMOSA, *Faurie* 528!

The most extraordinary fruited species of the genus.

- *3. **POTAMOGETON TEPPERI** A. Benn. in Journ. Bot. 25 (1887) 178.

LUZON, Subprovince of Benguet, Trinidad, *Topping* 45, January, 1903, growing in a small lake; Baguio and vicinity, *Bur. Sci.* 14110 *Robinson*, May, 1911, *Elmer* 5952, April, 1904, common about margins of a small pond. CHINA, Province of Yunnan, *Abbé Delavay* ex M. *Franchet*! AUSTRALIA, Cygnet River, at Knicks, *O. Tepper*!

The description of *Potamogeton Tepperi* needs revision: Stem 18 to 24 inches long, sparingly branched. Leaves, lower, 3 to 4½ inches long by ¾ to 1½ in. wide; petioles 1½ inches long with 7 principal nerves and 10 secondary ones. Upper leaves suborbicular. Stipules 1½ to 2 inches long, persistent to time of flowering, acute, with numerous nerves.

As indicated below there are two species confused, or combined, under the name *P. Tepperi*. The original plant belongs to the Australian series of thick leaved species in the floating leaves; some are almost leathery in consistence while the others placed under *P. Tepperi* are like the European species, thin leaved and the nerves generally semiexposed.

4. **POTAMOGETON INDICUS** Roxb. Fl. Ind. ed. Wall. 1 (1820) 471.

Potamogeton Roxburghianus Roem. & Schult. Syst. Veg. Mant. 3 (1827) 367.

SUMATRA, *Teysmann* in herb. Buchenau, Bremen! JAPAN, *Faurie* in herb. Boissier 7530! INDIA! THIBET! UPPER BURMA! ASSAM!

- *5. **POTAMOGETON ANGUSTIFOLIUS** Berchtold & Presl Rostlinar 2 (1821) 19.

Potamogeton Zizii Mert. & Koch ex Cham. & Schlecht. in *Linnaea* 2 (1827) 202.

Potamogeton heterophyllus Schreb. var. *latifolius* Mert. & Koch Deutch. Fl. ed. 3 (1823) 845.

Potamogeton lucens L., var. *heterophyllus* Fries Nov. Fl. Suec. ed. 2 (1828) 34.

LUZON, Subprovince of Benguet, Trinidad, *Loher* 1597 in herb. Kew.!

KASMIR, *C. B. Clarke* 29139! HIMALAYA, *Strachy* & *Winterbottom*! CHINA, Yunnan, *Abbé Delavay* in herb. Paris! UPPER BURMA, *Abdul Khalil* ex Dr. Prain! EUROPE! N. AMERICA! CUBA! MADAGASCAR?

* 6. **POTAMOGETON MALAINA** Miq. Ill. Fl. Arch. Ind. (1871) 46.

Potamogeton mucronatus Presl Epim. Bot. (1851) 245, non Schrad.

Potamogeton japonicus Franch. & Sav. Enum. Pl. Jap. 2 (1879) 15
nomen solus.

Potamogeton Wrightii Morong in Bull. Torr. Bot. Club. 13 (1886)
158, t. 59.

Potamogeton lucens Vidal Phan. Cuming. Philip. (1885) 155 (*Cuming*
1381).

Potamogeton heterocarpus Maxim. in herb. et in litt.

LUZON, "*Cuming 1381*, July, 1839, Prov. Albay" herb. Prague! Province of Sorsogon, For. Bur. 12249 Curran! June, 1908, specimen poor but probably belongs here: Province of Laguna, Lake Bay R. S. Williams 2041! July, 1905, Merrill 5107! March, 1906, Bur. Sci. 11892 Robinson & Ramos! October, 1910. MINDANAO, Lake Lanao, Mrs. Clemens 515, 448!

Distribution: BORNEO, *Motley 671*! CELEBES, *Teysmann ex Miquel l. c.*, *Koorders 1895* in herb. Vienna! JAVA, *Zollinger 3278, 3778, 3784*! CHINA, Yunnan, *Delavay 1887*, herb. Paris.! FORMOSA, *Henry 1203a*! LIEN CHAU, *Graves* in herb. Hance 22226! LIUKIU, *C. Wright 320*! COREA, *Faurie 219* (1906), 690 (1901)! MANDSCHURIA, *Litwinow 1646, 2377, 3350*! JAPAN, *Franchet et Savatier 209*! *Maximowicz* "iter secundum"! INDIA, Bengal, *Hamilton*; *Kashmir*, *Schlagilweil 4615*!

Graebner in Das Pflanzenreich gives "*Cuba, Wright No. 3714*", but my specimen under than number is *P. angustifolius* Bercht. & Presl, and "*Jamaica, MacFayden No. 44*", this I have not seen but I doubt it belonging to *P. Malaina*; it is more likely to be *P. occidentalis* Sieber. The specimens referred to *P. malaina* from Guatemala, Morong in "Pl. Gaut. 3, 1893 (J. Donnell Smith)" are *P. lucens* L. var. *Floridanus* A. Benn.; Dr. Hance in Journ. Bot. (1885) 329, A. Bennett l. c. (1890) 298, (1891) 154, Bull. Herb. Boiss. (1895) 254, Journ. Linn. Soc. Bot. 36 (1903) 194. *Potamogeton Gaudichaudii* Cham. et Schlecht. in Linnaea 2 (1827) 199 which I formerly queried as *malaina*, is a *lucens* form, but certainly not *angustifolia* Bercht. & Presl (*P. Zizii* C. & S.) as considered by W. F. Wight in Contr. U. S. Nat. Herb. 9: 360.

7. **POTAMOGETON SUMATRANUS** Miq. Fl. Ind. Bat. Suppl. (1860-61) 259, 597.

"Sumatra occid. in fossis prope Padang et prope Padang Pandjang, in lacu Singkara" *Teysmann* leg., Vienna herb.!, *Zollinger 1891*. "In Stooten Padang, W. R. Sumatra leg. *Teysmann* No. 1139, herb. Sulp. Kurz." Herb. Bogor.

An obscure species. *Zollinger's* specimen at Vienna has one flower spike only; the structure and shape of the leaves are much as in *P. lucens*, but in shape the leaves are very different from those of *P. malaina*.

8. **POTAMOGETON CRISPUS** Linn. I have seen specimens from Sumatra, but failed to note in what collection.9. **POTAMOGETON OXYPHYLLUS** Miq. Ann. Mus. Bot. Lugd-Bat. 3 (1867) 161.

This occurs in Japan! and Corea!

- * 10. **POTAMOGETON MAACKIANUS** A. Benn. in Journ. Bot. 42 (1904) 74.

Potamogeton serrulatus Regel & Maack in Regel Tent. Fl. Ussur. (1861) 139, non Schrader, nec. Opiz.

Potamogeton crispus Linn var. *serrulatus* Schrad. "Japan" ex Science College, herb. Kew.!

Potamogeton Robbinsii Oakes var. *japonicus* A. Benn. in Bull. Herb. Boiss. 4 (1896) 257.

MINDANAO, Lake Lanao, Camp Keithley, Mrs. Clemens 216, February, 1906, growing with *P. malainus*.

Distr. USSURI, Regel & Maack! MANDSCHURIA, Taladschao, Litwinow 3346! COREA, Nai piang, Faurie 693! July, 1901. CHINA, Yangtsee River, Warburg 5940 teste Graebner. FORMOSA, Warburg 10712, teste Graebner. JAPAN, Faurie 10712, No. 44, 43 (1897)! Hakone 1883, herb. Kew.

The Asiatic representative of the North American *P. Robbinsii* Oakes! The species stands apart from any other, except *P. Robbinsii* Oakes, to which it is the nearest. The fruits are much alike in facies, but the leaves are quite different. The nerves are mostly 5 (against 18 to 24 in *P. Robbinsii*) and the structure of the leaf is totally different. In *P. Robbinsii* the marginal and central nerves are continued to the apex, but in *P. Maackianus*, on the contrary, the central nerve alone extends to the apex, the secondary nerves stop short, form an arch at the end, but the leaf is drawn in and continued beyond to an obtuse end.

- * 11. \times **POTAMOGETON PHILIPPINENSIS** nova hybrid=*P. malainus* \times *maackianus*.

MINDANAO, Lake Lanao, Camp Keithley, Mary Strong Clemens, April, 1906.

A duplicate of this specimen previously examined by Dr. Ostenfeld and myself was thought to come nearest to *P. nipponicus* Makino, a Japanese species, but on receipt of the original specimen from the Bureau of Science and a comparison of it with Makino's species, it became evident that it could not be so named. Both the supposed parents grow in Lake Lanao, and, short of the actual production of the hybrid by cultivation, I think it can only be so referred. Traces of both species are plainly visible, and of the two, it is doubtless nearer to *P. malainus*. The very peculiar intricate branching of the upper part, with the stipules, shows characters of *P. Maackianus*. There are no flowers or fruit with the specimen. The habit is between that of *malainus* and that of *Maackianus*. Stems branching, and, toward the top, much branched with stiff, densely arranged patent leaves, with extremely short internodes, the stipules filling up the spaces. Lower leaves linear-lanceolate, the apex with a point drawn out about 8 mm, 4 cm long, 8 to 15 mm wide. Here and there a leaf shows an approach to the apical condition of those of *P. Maackianus*. Leaves on the crowded upper branches 3 cm long, 6 mm wide, mostly incurved and simi-rigid. Stipules persistent but mostly frayed. Leaves 5-nerved, with a strong mid-nerve.

- * 12. **POTAMOGETON PUSILLUS** Linn. Sp. Pl. (1753) 127.

LUZON, Subprovince of Benguet, Baguio, Elmer 5951, in shallow stagnant water, common where found.

The nearest recorded stations seem to be FORMOSA, Faurie 530 pp. (1903);

COREA, *Faurie* 224 (1906); JAPAN, many localities; CHINA, Chihli, *David* 1916. Also in Europe, Africa, and North America, but not recorded from Australia, New Zealand, or Polynesia.

* 13. **POTAMOGETON PERVERSUS** A. Benn. sp. nov.

Caulis simplex, 1.5 ad 2.5 dm altus. Folia submersa inferora 1 dm longa et 1 ad 3 cm lata, 11-nervia, basi et apice angustata; superiora lanceolata vel ovato-lanceolata. Folia natantia ovata vel ovato-lanceolata, basi angustata, 13- ad 16-nervia, ca. 7 cm longa et 3 cm lata, coriacea, longipetiolata (ca. 4-10-5 cm longa). Stipulae deciduae. Pedunculi 5-7 cm longa. Spicae 2-3 cm longae, densae. Fructus semi-obvali, ventre convexae cum bulla centralis, dorso semicircularis, carina media subacuta, lateralibus indistinctus, carinae intermedius striatus, drupa compressa cum dua bulla, bullae connectiva cum striae.

Habit of the European *P. polygonifolius* Pourr., but the fruit very different. Four habitats in Australia given for *P. Tepperi* must for the present remain uncertain as there is not sufficient material to say to which of the two species, now separated, they belong; but Mr. Teppers's original specimens are well matched by the Philippine ones, and this material also shows more definitely the lower leaves. For some time I have realized that two species have been confounded under *P. Tepperi*, but the want of fruiting specimens with so many so-named, especially the Japanese specimens, has been a bar to separate them. But keeping to the original specimens from Mr. O. Teppers, it proves to be a far rarer species than I had supposed, while the numerous other specimens placed under it seem to conform to one general type, and I now make this a separate species. *P. Tepperi* seems to be one of the species that by their much thickened leaves, form a small section of the genus nearly confined to Australia, but occurring in Malaya, and more rarely in China; with perhaps an outlier in Mauritius, but the specimens from Mauritius are too poor to so refer with any certainty. Many Australian specimens want the lower leaves, hence they have been simply referred to *P. natans*, although in fruiting characters they are not allied to that species. Gradually as more perfect specimens are collected we shall be able to deal with them in a more definite manner.

An extension of this species may eventually have to be made to North America. Dr. Morong, Bull. Torr. Bot. Club 13 (1886) 145 describing *P. Curtissii* from Florida remarks: "Mr. Curtiss also sent what appears to be a peculiar form of *P. natans*. It looks exactly like specimens in the Torrey herbarium³ from India, which are labelled *P. natans* var." These are Hooker and Thompson's Khasia Hills plant and are *P. perversus*! And I believe that Dr. Small's *P. Floridanus*⁴ is the same plant, but in writing to Dr. Small he told me that there were no duplicates; so it must remain an open question until specimens can be compared.

Distribution: CHINA, Pekin, *Bretschneider* 778! Ichang, *Henry* 2366,

³ Bull. Torr. Bot. Club 13 (1886) 156.

⁴ Fl. S. E. U. S. (1903) 37.

3602 ! Hokiang, *Faber* 314 ! FORMOSA, *Oldham* 636 ! MANDSCHURIA *Litwinow* 2445 ! 3351 ! INDIA, Khasia, *Hooker & Thomson* ! Kasmir, *C. B. Clarke* ! SIBERIA "ad ostium fl. Lena" *Maack* ! JAPAN, Aomori, *Faurie* ! Hitroyoshi, *Faurie* 4305 ! (Many other Japanese specimens which are too poor to name may belong to this species.) COREAN ARCHIPELAGO, *Oldham* 824 ! PHILIPPINE ISLANDS, LUZON, Subprovince of Bontoc, *Vanoverbergh* 209, 2684, eight specimens on three sheets, altitude 1,290 meters, the Igorot name *ibas*.

POTAMOGETON POLYGONIFOLIUS Pourr. Act. Toul. 3 (1788) 325.

JAVA, *Zollinger* 3784, teste *Graebner* in *Pflanzenreich* 1907.

This is the only record I have of it from Malaya and I should not be surprised if it were *P. perversus*. I have not seen the specimens. *Hooker Fl. Brit. Ind.* 6 (1893) 566 gives for this "Singapore ? Wallich." Specimens of *P. polygonifolius* under the name of *P. elegans* Wall. No. 5178 are labelled "Singapur?" in Wallich's herbarium!

Of the species of restricted distribution *P. Maackianus* extends north to 46°; *P. malainus*, north to 46°; and *P. Tepperi*, to 17° 30'.

ENUMERATION OF PHILIPPINE BASIDIOMYCETES

By G. BRESADOLA and H. SYDOW
(*Trient, Austria, and Berlin, Germany*)

LENZITES Fries

LENZITES PLATYPHYLLA Lév.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci.* 16041 Brown, February, 1912: Province of Rizal, *Bur. Sci.* 12469 Ramos, February, 1911. MINDANAO, Butuan Subprovince, *C. M. Weber* 1240, March-July, 1911.

LENZITES PALISOTI Fries.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci.* 15951 Graff, February, 1912. MINDANAO, Butuan Subprovince, *C. M. Weber* 1282, March-July, 1911: District of Zamboanga, *Bur. Sci.* 15820 *Fénix*, August, 1912. PALAWAN, *Bur. Sci.* 15622 *Fénix*, July, 1912.

LENZITES STRIATA Sw.

LUZON, Province of Rizal, Antipolo, *Ramos S.* 73, October, 1912.

POLYPORUS Micheli

POLYPORUS OSTREIFORMIS Berk.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1253, 1284, March-July, 1911.

POLYPORUS DURUS Jungh.

LUZON, Province of Tayabas, Dapdap Point, *Bur. Sci.* 13121 *Foxworthy and Ramos*, March, 1911.

POLYPORUS ZONALIS Berk.

LUZON, Manila, *Sanchez* 29, August, 1913: Province of Laguna, Mount Maquiling, *Bur. Sci.* 16045 Brown, February, 1912.

POLYPORUS RHODOPHOEUS Lév.

LUZON, Province of Nueva Vizcaya, *Bur. Sci.* 14354, 14369 *McGregor*, March-April, 1912: Province of Laguna, Mount Maquiling, *Bur. Sci.* 15936 Graff, *Bur. Sci.* 16043, 16061 Brown, February, 1912.

POLYPORUS NILGHERIENSIS Mont.

LUZON, Province of Rizal, *Bur. Sci.* 13468 Ramos, February, 1911.

POLYPORUS LUTEO-UMBRINUS Romell.

PALAWAN, *Bur. Sci.* 15627 *Fénix*, July, 1912.

POLYPORUS RAMOSII (Murr.) Bres.

LUZON, Province of Nueva Vizcaya, vicinity of Dupax, *Bur. Sci.* 14356 *McGregor*, March-April, 1913.

POLYPORUS RUBIDUS Berk.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci.* 16024 Graff, February, 1912.

POLYPORUS GRAMMOCEPHALUS Berk.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1225, March–July, 1911.

POLYPORUS BICOLOR Jungh.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci.* 16055 Brown, February, 1912. MINDANAO, Butuan Subprovince, *C. M. Weber* 1267, 1269, March–July, 1911.

POLYPORUS BICOLOR Jungh. f. *resupinata*.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1239, March–July, 1911. PALAWAN, *Bur. Sci.* 15611 *Fénix*, July, 1912.

FOMES (Fries) Cooke**FOMES MELANOPORUS** (Mont.) Cke.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci.* 16037 Brown, February, 1912.

FOMES EXOTEPHRUS (Berk.) Bres.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci.* 16009 Graff, *Bur. Sci.* 16036 Brown, February, 1912.

FOMES PECTINATUS (Kl.) Gillet.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci.* 15931, 16011 Graff, February, 1912. MINDANAO, Butuan Subprovince, *C. M. Weber* 1265, March–July, 1911.

FOMES SCALARIS Berk.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1270, March–July, 1911.

FOMES WILLIAMSII (Murr.) Bres. (*Fomes lamaensis* Murr.)

LUZON, Province of Tayabas, Kabibihan, *Bur. Sci.* 13155 Foxworthy and Ramos, March, 1911: Province of Laguna, Mount Maquiling, *Bur. Sci.* 16035 Brown, February, 1912.

FOMES VELUTINUS Bres. nova forma **MICROCHAETA** Bres. (in *F. tenuissimum* Murr. *transiens*.)

Differt a typo setulis minoribus (15–21 μ longis, 5–7 μ latis), sporis pallidioribus, stramineis (3–3, 5 μ longis, 2, 5–3 μ latis) et hyphis pilei etiam angustioribus (2–3 μ latis).

MINDANAO, Butuan Subprovince, *C. M. Weber* 1246, March–July, 1911.

FOMES KORTHALSII (Lév.) Cke. (*Pyropolyporus subextensus* Murr.)

LUZON, Province of Nueva Vizcaya, vicinity of Dupax, *Bur. Sci.* 14364 R. C. McGregor, March–April, 1912.

Setulae fulvae, 21–30 μ longae, 6–7, μ latae. Hyphae pilei 2–4 μ crassae, hymenii 1, 5–3, 5 μ crassae.

FOMES ALBO-MARGINATUS (Lév.) Cke.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1258, March–July, 1911.

FOMES SEMITOSTUS (Berk.) Cke., forma juvenilis.

MINDANAO, Butuan Subprovince, *C. M. Weber 1218*, March–July, 1911.

FOMES WEBERIANUS Bres. et P. Henn., forma juvenilis.

LUZON, Province of Rizal, *Bur. Sci. 13467*, *M. Ramos*, February, 1911.

The specimens agree very well with the type, but the fungus undoubtedly is only a form of *Polystictus tabacinus* Mont., hence no *Fomes*.

FOMES LIGNOSUS (Kl.) Bres.

MINDANAO, Butuan Subprovince, *C. M. Weber 1287*, March–July, 1911.

FOMES PACHYPHLOEUS Pat.

LUZON, Province of Nueva Vizcaya, vicinity of Dupax, *Bur. Sci. 14375* *McGregor*, March–April, 1912.

GANODERMA Karsten

GANODERMA AUSTRALE (Fr.) Pat.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci. 16028* *Brown*, February, 1912.

GANODERMA TORNATUM (Pers.) Bres.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci. 16033*, *16039* *Brown*, February, 1912: Province of Nueva Vizcaya, vicinity of Dupax, *Bur. Sci. 14376* *McGregor*, March–April, 1912.

GANODERMA SUBTORNATUM Murr.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci. 16025* *Graff*, February, 1912. PALAWAN, *Bur. Sci. 15631* *Fénix*, July, 1912.

GANODERMA AMBOINENSE (Lam.) Pat.

NEGROS, *Bur. Sci. 13731*, *19118* *Curran*, September, 1909. MINDANAO, Butuan Subprovince, *C. M. Weber 1274*, March–July, 1911. POLILLO, *Bur. Sci. 10534* *McGregor*, October–November, 1909.

PORIA Persoon

PORIA CRYPTACANTHA Mont.

MINDANAO, Butuan Subprovince, *C. M. Weber 1268*, March–July, 1911.

POLYSTICTUS Fries

POLYSTICTUS AFFINIS (Nees) Fr.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci. 15954* *Graff*, February, 1912: Province of Nueva Vizcaya, vicinity of Dupax, *Bur. Sci. 14367* *R. C. McGregor*, March–April, 1912. MINDANAO, Butuan Subprovince, *C. M. Weber 1220*, March–July, 1911.

POLYSTICTUS LUTEUS (Bl. et Nees) Fr.

MINDANAO, Butuan Subprovince, *C. M. Weber 1263*, March–July, 1911.

POLYSTICTUS FLABELLIFORMIS Kl. (forma stipite consueto breviori.)

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci. 15933* *Graff*, February, 1912.

POLYSTICTUS NEPHELODES Lév.

LUZON, Province of Laguna, Mount Maquiling, *For Bur.* 8963 Curran and Merritt, October, 1907.

POLYSTICTUS SQUAMAEFORMIS (Berk.) Cke., forma **FUSCATA**.

LUZON, Province of Bataan, Lamao River, *Copeland* 177a, February, 1904.

POLYSTICTUS BRUNNEOLUS (Berk.) Fr.

LUZON, Province of Tayabas, Dapdap Point, *Bur. Sci.* 13122 Foxworthy and Ramos, March, 1911.

POLYSTICTUS XANTHOPUS Fr.

PALAWAN, *Bur. Sci.* 15620 *Fénix*, July, 1912.

POLYSTICTUS SUBDEALBATUS (Murr.) Bres.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1219, March, 1911.
Est tantum forma junior *P. elongati* Berk.

POLYSTICTUS MELEAGRIS (Berk.) Cke.

LUZON, Province of Laguna, San Antonio, *For. Bur.* 13242 Curran, March, 1912.

POLYSTICTUS TABACINUS Mont.

LUZON, Province of Rizal, *Bur. Sci.* 13459 Ramos, February, 1911; Province of Laguna, Mount Maquiling, *Bur. Sci.* 15956 Graff, February, 1912.

POLYSTICTUS VELLEREUS Berk.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1275, March-July, 1911.

POLYSTICTUS ATYPUS Lév.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1262, March-July, 1911.
MINDORO, Puerto Galera, *Graff* S30, June, 1912.

POLYSTICTUS CROCATUS Fr.

LUZON, Province of Nueva Vizcaya, vicinity of Dupax, *Bur. Sci.* 14355 McGregor, March-April, 1912.

POLYSTICTUS OCCIDENTALIS (Kl.) Fr.

LUZON, Manila, *Sanchez* 28, August, 1912.

POLYSTICTUS MEYENII Kl.

PALAWAN, *Bur. Sci.* 15614 *Fénix*, July, 1912.

POLYSTICTUS CONFUNDENS Ces., forma juvenilis.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1227, 1248, March-July, 1911.

POLYSTICTUS POLYZONUS Pers.

LUZON, Nueva Ecija, Cabanatuan, *Bur. Sci.* 5244, 5248, McGregor, September, 1908.

POLYSTICTUS SPADICEUS (Jungh.) Cke.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1214, 1276, March-July, 1911. LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci.* 15981 Graff, February, 1912.

POLYSTICTUS ABIETINUS (Dicks.) Fr., forma **PALLIDA**.

LUZON, Bontoc Subprovince, *Vanoverbergh 1117*, February–March, 1911, on bark of *Pinus insularis*.

POLYSTICTUS FLOCCOSUS (Jungh.) Fr., forma **SUBRESUPINATA**.

MINDANAO, Butuan Subprovince, *C. M. Weber 1259*, March–July, 1911.

POLYSTICTUS MONS-VENERIS Jungh.

LUZON, Province of Nueva Vizcaya, vicinity of Dupax, *Bur. Sci. 14365 McGregor*, March–April, 1912.

TRAMETES Fries

TRAMETES MUELLERI Berk.

MINDANAO, Butuan Subprovincia, *C. M. Weber 1260*, March–July, 1911. LUZON, Province of Cagayan, *Bur. Sci. 7581 Ramos*, March, 1909; Province of Nueva Vizcaya, *For. Bur. 15824 Curran and Merritt*, December, 1908.

TRAMETES INCANA Lév.

MINDANAO, Butuan Subprovince, *C. M. Weber 1260*, March–July, 1911. LUZON, Province of Bataan, Mount Mariveles, *Graff S157, S158*, November, 1912.

TRAMETES CORRUGATA (Pers.) Bres.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci. 16027 Graff, Bur. Sci. 16062 Brown*, February, 1912.

TRAMETES CINNABARINA (Jacq.) Fr.

MINDANAO, District of Zamboanga, *Bur. Sci. 15819 Fénix*, August, 1912.

TRAMETES PALEACEA Fr., forma *minor*.

LUZON, Nueva Ecija, Cabanatuan, *Bur. Sci. 5247 McGregor*, September, 1908.

TRAMETES ASPERA (Jungh.) Bres., forma in *Trametem strigatam transiens*.

LUZON, Manila, *Sanchez 26, 27*, August, 1912, *Merrill S34*, September, 1912.

TRAMETES STRIGATA (Berk.) Bres.

LUZON, Manila, *Bur. Sci. Magno S81*, December, 1909. MINDANAO, District of Zamboanga, *Bur. Sci. 15816 Fénix*, August, 1912.

DAEDALEA Persoon

DAEDALEA FLAVIDA Lév., forma **POLYPOROIDEA**.

MINDANAO, District of Zamboanga, *Bur. Sci. 15821 Fénix*, August, 1912.

DAEDALEA PRUINOSA Lév., forma **TRAMETOIDEA**. (*Hexagonia glabra* Lév.)

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci. 16015 Graff*, February, 1912.

DAEDALEA LURIDA Lév. (*Daedalea subconfragosa* Murr.)

MINDANAO, Lake Lanao, Camp Keithley, *Clemens "V"*, July, 1907.

ELMERINA Dresadola**ELMERINA CLADOPHORA** (Berk.) Bres.

LUZON, Province of Rizal, Jalajala, *Bur. Sci.* 11925 Robinson, October, 1910.

ELMERINA SETULOSA (P. Henn.) Bres.

LUZON, Subprovince of Benguet, Sablang, *Bur. Sci.* 12322 Fénix, November-December, 1910.

HEXAGONIA Fries**HEXAGONIA THWAITESII** Berk. (*Hexagonia cyclophora* Lév.)

PALAWAN, *Bur. Sci.* 15610 Fénix, July, 1912.

GLOEOPORUS Montagne**GLOEOPORUS CONCHOIDES** Mont. (*Thelephora dolosa* Lév.)

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci.* 15952, 15972 Graff, *Bur. Sci.* 16063 Brown, February, 1912.

LASCHIA Fries**LASCHIA MINIMA** Jungh.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1229, March-July, 1911.

IRPEX Fries**IRPEX FLAVUS** Kl.

LUZON, Province of Rizal, Antipolo, *Ramos* S74, S75, October, 1912.

CLADODERRIS Persoon**CLADODERRIS ELEGANS** (Jungh.) Fr. (Forma in *Clad. infundibuliformen transiens*.)

MINDANAO, Butuan Subprovince, *C. M. Weber* 1283, March-July, 1911.

STEREUM Persoon**STEREUM PURPUREUM** Pers.

LUZON, Bontoc Subprovince, *Vanoverbergh* 1117, February-March, 1911.

STEREUM NOTATUM Berk., forma *resupinato-pileata*.

LUZON, Province of Nueva Vizcaya, vicinity of Dupax, *Bur. Sci.* 14357 McGregor, March-April, 1912.

LLOYDELLA Bresadola**LLOYDELLA AFFINIS** (Lév.) Bres. (*Stereum Mellisii* Berk.)

MINDANAO, Butuan Subprovince, *C. M. Weber* 1228, March-July, 1911.

VELUTICEPS Cooke**VELUTICEPS PHILIPPINENSIS** Bres.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1279, March-July, 1911.

HYMENOCHAETE Lévillé

HYMENOCHAETE SUBFERRUGINEA Bres. et Syd. sp. nov.

Pileo dimidiato, sessili, coriaceo-submembranaceo, 2.4 cm diam., ferrugineo, subtenui, marginato, sericeo-velutino, zonis angustis concoloribus; hymenio obscure ferrugineo; setulis numerosissimis, tereti-acuminatis, 40–60 μ longis, basi 8–9 μ latis, 30–35 μ prominentibus, fulvis; hypis contextus 3–4 μ crassis; basidiis clavatis; sporis non visis.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci.* 15946 Graff, February, 1912.

HYMENOCHAETE SUBPURPURASCENS (Berk. et Br.) Bres. (*Stereum subpurpurascens* Berk. et Br.)

POLILLO, *Bur. Sci.* 10545 McGregor, October–November, 1909.

HYMENOCHAETE ATTENUATA Lév.

LUZON, Province of Rizal, *Bur. Sci.* 13464 Ramos, February, 1911.

HYMENOCHAETE RHEICOLOR (Mont.) Lév.

LUZON, Province of Laguna, Mount Maquiling, *Bur. Sci.* 15948 Graff, February, 1912.

HYMENOCHAETE DEFLECTENS Bres. et Syd. sp. nov.

Longe lateque effusa, resupinata, fusco-ferruginea, levis, crassiuscula; hyphis contextus 3–4 μ crassis; setulis sparsis, variabilibus, flavidis vel flavo-fulvis, 45–65 μ longis, basi 6–8 μ latis; ad apicem obtusis; basidiis clavatis; sporis continuis, 8–10 μ longis, 4–5 μ latis.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1286, March–July, 1911.

HYMENOCHAETE AMBOINENSIS P. Henn.

LUZON, Province of Rizal, *Bur. Sci.* 13462 Ramos, February, 1911.

HYMENOCHAETE PELLICULA Berk. et Br.

LUZON, Province of Rizal, *Bur. Sci.* 13460 Ramos, February, 1911.

HYMENOCHAETE CROCICREAS Berk.

MINDANAO, Butuan Subprovince, *C. M. Weber* 1261, March–July, 1911.

SEPTOBASIDIUM Patouillard

SEPTOBASIDIUM SUBOLIVACEUM Syd.

LUZON, Province of Rizal, *Bur. Sci.* 13465 Ramos, February, 1911, on bamboo stems.

SEPTOBASIDIUM SUFFULTUM (Berk. et Br.) Bres. (*Thelephora suffulta* Berk. et Br.)

MINDANAO, Butuan Subprovince, *C. M. Weber* 1249, March–July, 1911.

PTERULA Fries

- PTERULA PUSIO (Berk.) Bres., forma major. (*Clavaria pusio* Berk.)
MINDANAO, Butuan Subprovince, C. M. Weber 1230, March-July, 1911.

AURICULARIA Bulliard

AURICULARIA LOBATA Sommerf.

LUZON, Province of Rizal, Antipolo, Ramos S128, October, 1912.

AURICULARIA RUGOSISSIMA (Lév.) Bres. (*Phlebia rugosissima* Lév.)

LUZON, Province of Rizal, Antipolo, Ramos S76, October, 1912.

HIRNEOLA Fries

HIRNEOLA AFFINIS (Jungh.) Bres.

LUZON, Province of Laguna, Mount Maquiling, Bur. Sci. 15934 Graff, February, 1912.

HIRNEOLA AURICULA-JUDAE (L.) Berk.

PALAWAN, Bur. Sci. 15608 Fénix, July, 1912.

HIRNEOLA PORPHYREA (Lév.) Fr.

LUZON, Province of Nueva Vizcaya, vicinity of Dupax, Bur. Sci. 14358 McGregor, March-April, 1912.

GUEPINIA Fries

GUEPINIA SPATHULARIA (Schw.) Fr.

MINDANAO, Butuan Subprovince, C. M. Weber 1244, 1250, March-July, 1911.

LYCOPERDON Tournefort

LYCOPERDON VANDERYSTII Bres.

LUZON, Manila, Merrill "X," January, 1904.

GEASTER Micheli

GAESTER MIRABILIS Mont.

LUZON, Province of Benguet, Sablang, Bur. Sci. 12850 Fénix, November-December, 1910. MINDANAO, Bukidnon Subprovince, Bur. Sci. 15714 Fénix, August, 1912.

CORA Fries

CORA PAVONIA Web. et Mohr.

LUZON, Benguet Subprovince, Baguio and vicinity, Bur. Sci. 14107 Robinson, May, 1911.

CORA? GYROLOPHIA Fr.

LUZON, Province of Laguna, Mount Banajao, Merrill 7540, February, 1911.

PLANTAE WENZELIANAE, II

By E. D. MERRILL *

(From the Botanical Section of the Biological Laboratory, Bureau of Science,
Manila, P. I.)

The first paper of this series was published in November, 1913¹ in which twenty-eight species were proposed as new. One of these, *Scleria trigona* Merr., has been indicated to me by the Rev. G. Kükenthal, to whom a specimen was sent, as being identical with *Scleria motleyi* C. B. Clarke, the type of which was from Borneo, but the species also credited to the Philippines in its original place of publication²; *Scleria trigona* Merr. should then be reduced to *S. motleyi* C. B. Clarke.

During the past year Mr. Wenzel has prosecuted his field work with energy, extending his numbered series to somewhat over 900. The material, submitted to me for identification, has presented a high percentage of novelties, and accordingly this second paper of the series has been prepared. The present paper contains the descriptions of forty-three species, proposed as new, with notes on several previously described ones. The genera *Kunstleria* of the *Leguminosae* and *Nothophoebe* of the *Lauraceae*, are credited to the Philippines for the first time. A representative of the peculiar monotypic genus *Trigonopleura*, of the *Euphorbiaceae* is in the collection, which on further study may prove to be specifically distinct from the Malaya Peninsula species; a specimen of this has been sent to Kew for comparison with the type.

ZINGIBERACEAE

ALPINIA Linnaeus

ALPINIA WENZELII sp. nov. § *Hellenia*.

Planta glabra, usque ad 90 cm alta; foliis 5 ad 8, lanceolatis, tenuiter acuminatis, usque ad 13 cm. longis, 1.6 cm latis; pani-

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¹ Philip. Journ. Sci. 8 (1913) Bot. 363-390.

² L. c. 2 (1907) Bot. 104.

culis circiter 10 cm longis, floribus parvis, vix 1 cm longis, glabris, bracteis vix 1 mm longis, labellum bis bifidum.

A slender, glabrous, perennial plant up to 90 cm in height, the stems, including the sheaths, less than 5 mm in diameter. Leaves 5 to 8 on each plant, chartaceous, lanceolate, up to 13 cm long, 1.6 cm wide, the apex slenderly acuminate, base acute; sheaths loose; ligule obtuse, about 3 mm long. Panicles slightly exserted, glabrous, about 10 cm long, the basal branch up to 3 cm long, the others much shorter. Flowers rather numerous, white and flesh-colored, the bracts about 1 mm long, caducous. Ovary quite glabrous, globose, the calyx-tube above the ovary cylindric, 5 mm long. Corolla-tube as long as the calyx, the lobes elliptic, rounded, about 5 mm long. Lip 3 mm long, twice bifid, the central cleft extending nearly to the base, the lateral ones much shorter, the outer lobes 1.2 mm wide, the inner ones 0.4 mm wide, all obtuse. Stamen about 5 mm long, the anther 2.5 mm long, connective not produced.

LEYTE, Dagami, in forests, altitude 500 meters, C. A. Wenzel 623, March 11, 1914.

A species closely allied to *Alpinia brevilabris* Presl, differing in its smaller flowers, glabrous ovary, and much smaller panicles and leaves.

FAGACEAE

CASTANOPSIS Spach

CASTANOPSIS GLABRA sp. nov.

Arbor parva, inflorescentiis exceptis glabra; foliis lanceolatis ad oblongo-lanceolatis, subcoriaceis, usque ad 14 cm longis, integris, utrinque angustatis, basi acutis, apice longe late acuminate, in siccitate pallidis, utrinque valde nitidis, nervis utrinque circiter 10, subtus prominentibus, reticulis tenuibus, obscuris; inflorescentiis axillaribus, spiciformis, 15 ad 20 cm longis, pubescentibus; fructibus junioribus obovoideis, dense cinereo-pubescentibus.

A tree about 7 m high, quite glabrous except the inflorescence. Branches dark reddish-brown, terete, rather slender, even the ultimate branchlets quite glabrous. Leaves lanceolate to oblong-lanceolate, 10 to 14 cm long, 2.5 to 4 cm wide, entire, subequally narrowed to the acute base and to the rather long-acuminate apex, the acumen rather broad, blunt, prominently shining on both surfaces, the upper pale or pale-greenish, the lower much paler than the upper; lateral nerves about 10 on each side of the midrib, prominent on the lower surface, curved-ascending, obscurely anastomosing, the reticulations obscure;

petioles glabrous, about 8 mm long. Inflorescence spike-like, solitary, axillary, 15 to 20 cm long, somewhat cinereous-pubescent, the pistillate flowers scattered, sessile or on very short pedicels. Very young fruits obovoid, densely cinereous-pubescent, about 7 mm in diameter, densely covered with short, spine-like processes 2 mm long or less, which, at maturity, are probably greatly elongated as in many other species of the genus.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 737, May 25, 1914, in forests, altitude about 500 meters.

Apparently most closely allied to *Castanopsis philippensis* Vid., differing especially in its much larger leaves, which are entirely glabrous, and their more numerous nerves.

MORACEAE

CONOCEPHALUS Blume

CONOCEPHALUS DIFFUSUS sp. nov.

Frutex epiphyticus, subscandens, inflorescentiis exceptis glaber; foliis coriaceis, usque ad 22 cm longis, ovatis ad oblongo-ovatis, integris vel leviter undulatis, acuminatis, basi subacutis vel obtusis, nervis utrinque circiter 12, valde prominentibus; stipulis 4 cm longis, coriaceis, persistentibus, navicularibus, 2-carinatis; inflorescentiis ♀ axillaribus pedunculatis, dichotomis, circiter 16 cm longis, usque ad 25 cm latis, ramulis junioribus parce furfuraceo-pubescentibus; capitulis numerosis, 5 mm diametro, globosis.

An epiphytic, subscandent shrub, glabrous except the inflorescence, the branches terete, grayish-brown, about 8 mm in diameter. Leaves ovate to oblong-ovate, coriaceous, dark-colored when dry, slightly shining, 15 to 22 cm long, 9 to 13 cm wide, margins entire or slightly undulate, base acute, obtuse, or sometimes somewhat rounded, apex rather abruptly short-acuminate, the lower surface with cystoliths along the ultimate reticulations, the upper minutely and rather densely verruculose; lateral nerves 12 on each side of the midrib, straight, anastomosing near the margins, the reticulations slender; petioles 4 to 6 cm long; stipules boat-shaped, falcate, coriaceous, persistent, about 4 cm long, 2-keeled. Staminate inflorescence diffuse, axillary, solitary, peduncled, dichotomously branched, about 16 cm long, up to 25 cm wide, the younger parts somewhat furfuraceous-pubescent, the younger inflorescences with subcoriaceous, orbicular, deciduous bracts up to 1 cm in diameter which enclose the heads. Heads very numerous, in fruit about 5 mm in diameter, each with from 15 to 20, somewhat compressed, narrowly ovoid, acute,

glabrous achenes about 2 mm long, the stigmas obscurely penicillate.

LEYTE, Buenavista, near Jaro, in forests, *C. A. Wenzel 857*, in forests, altitude about 500 m, fruits pink.

A species in the same group with *Conocephalus acuminatus* Tréc., but with larger, more numerous nerved leaves, and more ample inflorescence. It is also apparently allied to the species of *Conocephalus* described by Weddell, from staminate specimens, as *Procris grandis*, but that species has the leaves rounded or subcordate at the base.

Var. **OBTUSUS** var. nov.

A typo differt foliis orbiculari-ovatis, apice obtusis vel rotundatis, vix acuminatis.

Same locality, *C. A. Wenzel 908*, June, 1914.

ANONACEAE

OROPHEA Blume

OROPHEA WENZELII sp. nov.

Arbor parva partibus junioribus floribusque exceptis subglabra; foliis chartaceis, oblongis, nitidis, usque ad 12 cm longis, tenuiter acuminatis, basi acutis, nervis utrinque adscendentibus, utrinque 7 ad 9, subtus prominentibus; inflorescentiis axillaribus, paucifloris, 1 ad 1.5 cm longis, leviter pubescentibus; floribus parvis, petalis exterioribus sepalisque reflexis, petalis interioribus circiter 6 mm longis, longe unguiculatis, patulis.

A tree about 6 m high, the younger parts and inflorescence more or less pubescent. Branches slender, terete, reddish-brown, the branchlets, petioles, inflorescences and leaves on the midrib and lateral nerves beneath sparingly pubescent with brownish hairs. Leaves oblong to oblong-elliptic, chartaceous, pale-olivaceous when dry, shining, the upper surface glabrous, base acute, apex rather slenderly acuminate; lateral nerves 7 to 9 on each side of the midrib, prominent, rather sharply ascending, anastomosing, the reticulations slender, subparallel; petioles 2 to 3 mm long. Flowers in depauperate cymes or frequently solitary, the cymes 1 to 1.5 cm long, somewhat pubescent; pedicels about 5 mm long, with a single broadly ovate, 1.5 mm long bracteole at about the middle. Sepals broadly ovate, acute, pubescent, 1.5 mm long, generally reflexed. Outer three petals ovate-elliptic, 4 mm long, strongly reflexed, obtuse or acute, somewhat pubescent outside and near the apex inside; inner three petals about 6 mm long, somewhat spreading, long-clawed, the claw glabrous, about 3 mm long and 1 mm wide, the limb thickened, ovate, about 2.2 mm wide, puberulent in the upper

one-half on both surfaces. Stamens 6, less than 1 mm long. Carpels 6, pubescent, about 1 mm long.

LEYTE, Buenavista, near Jaro, in forests, altitude about 500 meters, *C. A. Wenzel* 682, May 18, 1914.

Apparently most closely allied to *Orophea unguiculata* Elm., distinguished by its differently shaped leaves, and more numerous, ascending nerves.

LAURACEAE

BEILSCHMIEDIA Nees

BEILSCHMIEDIA LEYTENSIS sp. nov.

Arbor glabra, usque ad 20 m alta; foliis oppositis, coriaceis, nitidis, oblongo-ovatis vel oblongo-ellipticis, usque ad 13 cm longis, obtusis vel obscure obtuse acuminatis, basi acutis, nervis utrinque circiter 8, subtus distinctis; paniculis pseudo-terminalibus, usque ad 9 cm longis, floribus circiter 4 mm longis; fructibus anguste obovoideis, 2 ad 2.5 cm longis, apice rotundatis vel minute apiculatis.

A glabrous tree reaching a height of about 20 meters, the branches terete, gray or brownish, the terminal buds oblong-ovoid, swollen below, narrowed above into a stout, acuminate beak, dark-brown, usually about 1 cm long. Leaves opposite, coriaceous, sometimes subcoriaceous, shining, oblong-ovate or elliptic-ovate, 9 to 13 cm long, 3.5 to 5.5 wide, obtuse or shortly and obtusely acuminate, base acute, margins usually slightly revolute; lateral nerves about 8 on each side of the midrib, distinct, anastomosing, the reticulations rather close, distinct; petioles 7 to 17 cm long. Panicles in the uppermost axils, pseudo-terminal, few, comparatively few-flowered, about 9 cm long. Flowers yellow, 4 mm long, their pedicels about 4 mm long, racemosely or subumbellately disposed on the ultimate branchlets. Perianth-tube funnel-shaped, about 1.5 mm long, the lobes elliptic-oblong, obtuse, about 2.5 mm long, 1.2 mm wide, the inner three a little narrower than the outer ones. Fertile stamens 9, in three rows, the outer 6 with introrse anthers, the inner three with extrorse ones, all anthers 2-celled, the innermost row reduced to subsessile or very shortly stalked, broadly ovoid, acute staminodes about 1 mm long and wide. Ovary narrowly ovoid, glabrous, narrowed upward into the short style, the ovary and style about 1.8 mm long. Fruit narrowly obovoid, dark-brown, shining, smooth, 2 to 2.5 cm long, 1 to 1.4 cm in diameter, narrowed below, the apex rounded, often with a small apiculus.

LEYTE, Dagami, *C. A. Wenzel* 183, 501 (type), the former in fruit, June, 1913, the latter with flowers and fruit, September, 1913; *For.*

Bur. 11693 Whitford, with very young fruits. NEGROS, Faraon, *For. Bur.* 13561 Meyer & Foxworthy, August, 1909, in fruit.

A characteristic species, perhaps best recognizable by its peculiar terminal buds which are present on all the specimens examined.

LITSEA Lamarck

LITSEA WENZELII sp. nov.

Species *L. luzonicae* affinis, differt foliis angustioribus, subtus albidis vel griseo-albidis, glabris, apice acuminatis, umbellis fasciculatis, distincte pedicellatis.

A shrub about 5 m high, glabrous except the ferruginous-pubescent inflorescence, the younger branchlets sometimes slightly pubescent. Branches terete, slender, reddish-brown, smooth. Leaves opposite, oblong-lanceolate, subcoriaceous, 9 to 15 cm long, 2.5 to 4 cm wide, subequally narrowed to the acute base and the acuminate apex, the upper surface pale-greenish when dry, shining, the lower nearly white or grayish-white, quite glabrous; lateral nerves 9 to 12 on each side of the midrib, curved upward, prominent on the lower surface, anastomosing; petioles about 1 cm long. Umbels axillary, fascicled, 3-flowered, the peduncles up to 4 cm long and with the bracts ferruginous-pubescent; bracts broadly ovate to obovate, 2.5 mm long. Calyx-tube 2.3 mm long, the pedicels about 1 mm long, the lobes 5, oblong-ovate, acuminate, 1 mm long. Ovary glabrous.

LEYTE, Dagami, C. A. Wenzel 626, March 12, 1914, in forests, altitude about 500 meters.

Minfestly closely allied to *Litsea luzonica* (Bl.) F.-Vill., from which it is readily distinguished by its leaves being white or grayish-white beneath and entirely glabrous.

NOTHOPHOEBE Blume

NOTHOPHOEBE MALABONGA (Blanco) comb. nov.

Ajovea malabonga Blanco Fl. Filip. (1837) 233.

Laurus hexandra Blanco l. c. ed. 2 (1845) 222, ed. 3, 2 (1878) 52, non Willd. nec Spreng.

Iteadaphne confusa F.-Vill. Novis. App. (1880) 181, non Blume.

LUZON, Province of Laguna, Mount Maquiling, *For. Bur.* 20486 Villamil: Province of Camarines, Ragay, *For. Bur.* 22662, 22637 Alvarez, March, 1913. MINDORO, *For. Bur.* 4103 Merritt, May, 1906. LEYTE, Buenavista, near Jaro, Wenzel 803, April, 1914. NEGROS, Bais, *For. Bur.* 11242 Everett, April, 1908.

This species is closely allied to *Nothophoebe umbelliflora* Blume, and many of the specimen cited above were placed under that name in the herbarium. It seems, however, to be sufficiently distinct, and accordingly Blanco's name is adopted for the Philippine form. There is no doubt as to the identity of Blanco's species as the material agrees with his description in all essential characters and in Laguna it is still known as *malabonga*.

ROSACEAE

PYGEUM Gaertner

PYGEUM PUBESCENS sp. nov.

Species *P. glanduloso* similis et affinis, differt foliis subtus distinct pubescentibus, nervis utrinque magis numerosis, utrinque 8 vel 9, spicis multo brevioribus, 2 ad 3 cm longis.

A tree reaching a height of 10 m, the branches terete, dark reddish-brown, slender, glabrous, obscurely lenticellate, the younger ones densely brown-pubescent. Leaves entire oblong-ovate to oblong, chartaceous to subcoriaceous, 10 to 15 cm long, 4 to 6.5 cm wide, green or brownish when dry, the upper surface somewhat shining or dull, glabrous except for the pubescent midrib and lateral nerves, the lower surface paler, rather uniformly pubescent with scattered hairs, the midrib and nerves more densely pubescent than the surface otherwise, the apex obtuse to acuminate, the base acute the rounded, with two prominent glands, one on each side of the midrib, projecting on the upper surface, appearing as a small opening on the lower; lateral nerves about 8 on each side of the midrib, prominent; petioles pubescent, 4 to 7 mm long; stipules oblong-ovate, pubescent, about 5 mm long, deciduous. Inflorescence of dense, axillary, solitary, pubescent spikes or spikelike racemes, 2 to 3 cm long. Flowers sessile or subsessile, crowded, each subtended by a reniform, pubescent bracteole about 1.5 mm wide. Calyx-tube funnel-shaped, about 3 mm long, densely pubescent, with 10 similar or subsimilar lobes which are oblong, 1.5 mm long, densely pubescent. Stamens 20, the filaments 2 to 4 mm long. Ovary densely pubescent, narrowly ovoid, narrowed upward into the 3.5 mm long style. Fruit very broadly ovoid, about 12 mm in diameter, somewhat apiculate, sparingly pubescent.

LEYTE, Dagami, C. A. *Wenzel* 18, 39, 217, 331, 333 (type), May to July, 1913, in forests, altitude about 60 meters. SAMAR, Gandara, *For. Bur.* 12835 *Rosenbluth*, February, 1909.

Manifestly closely allied to the more northern *Pygeum glandulosum* Merr., differing in its pubescent, more numerous nerved leaves and in its short spikes. Its closest extra-Philippine ally appears to be the Malayan *Pygeum parviflorum* Teysm. & Binn.

LEGUMINOSAE

KUNSTLERIA Prain

KUNSTLERIA PHILIPPINENSIS sp. nov.

Frutex alte scandens, partibus junioribus subtus foliis ad costa nervisque inflorescentiis plus minusve ferrugineo-pubescentibus;

foliis usque ad 20 cm longis, foliolis 5, ovatis ad oblongo-ovatis, 5 ad 12 cm longis, subcoriaceis, nitidis, acuminatis, basi rotundatis vel leviter cordatis, nervis utrinque circiter 5, prominentibus; inflorescentiis paniculatis, terminalibus, quam folia longioribus; floribus 7 mm longis; leguminibus oblongis, 8 ad 12 cm longis, 2 cm latis, chartaceis, apice subrotundatis, extus adpresse ferrugineo-pubescentibus.

A woody vine reaching a height of 30 m, younger part, nerves on the lower surface of the leaves, inflorescence, and pods more or less brown- or ferruginous-pubescent with short hairs. Branches terete, brown, glabrous. Leaves pinnate, alternate, 12 to 20 cm long, petioles, rachis, and petiolules somewhat pubescent; leaflets 5, exstipellate, ovate to oblong-ovate, subcoriaceous, when dry pale, shining, entire, apex somewhat acuminate, base rounded, sometimes obscurely cordate, 5 to 12 cm long, 3 to 6 cm wide; lateral nerves about 5 on each side of the midrib, prominent, somewhat curved-ascending, anastomosing, reticulations prominent, lax; petiolules 5 to 9 mm long. Panicles terminal, rather narrow, 25 cm long or more, dark brown-pubescent, many flowered. Flowers pink, rather crowded on the ultimate branchlets, 7 mm long, their pedicels not fascicled, nodes not thickened, the bracteoles oblong-ovate, acuminate, 1.8 mm long, the pedicels about as long as the bracteoles. Calyx pubescent, 3.5 to 4 mm long, the upper two teeth nearly united, forming one broad somewhat cleft tooth, the other three narrowly ovate, acute, 1.5 mm long. Standard 7 mm long and wide, orbicular-reniform, rounded, base somewhat cordate, the claw 2 mm long, narrowed downward; wings equaling the standard, claw slender, 2 mm long, limb oblong, 2.2 mm wide, obtuse, base with a decending, somewhat incurved auricle, the opposite margin somewhat ciliate; keel as long as the standard, the limb oblong-ovate, somewhat falcate, petals somewhat connate, base auricled on one side. Vexillary filament free, 4 mm long, the other 9 all fertile, united for the lower 5 mm, the free parts alternating long and short; anthers 0.5 mm long. Ovary pubescent, sessile or nearly so, pubescent, including the style 6 mm long, the style curved; ovules 2. Pods strap-shaped, chartaceous, thin, 6 to 16 cm long, 2 cm wide, apex broad, somewhat rounded, the valves somewhat reticulate, prominently pubescent with dark-brown, short, somewhat shining hairs; seeds 2, flat, thin, 2 cm long, 1 cm wide (immature), situated in the middle part of the pod, not near the ends.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 818, 836 (type), the former in bud, the latter with mature flowers, in forests, altitude about 500 m, June, 1914. BASILAN, *Bur. Sci.* 16114 Reillo, September, 1912, in fruit.

The genus is new to the Philippines. So far as known there are five species in the Malay Peninsula, one extending to Sumatra, and apparently a few undescribed forms in Borneo.

DERRIS Loureiro

DERRIS LEYTENSIS sp. nov. § *Aganope*.

Frutex scandens partibus junioribus inflorescentiisque breviter adpresse hirsutus exceptis glaber; foliis 3-foliolatis, foliolis oblongo-ovatis, subcoriaceis, acutis vel obtusis, basi obtusis ad rotundatis, usque ad 11 cm longis, in siccitate pallidis, nervis utrinque 7, prominentibus; paniculis axillaribus terminalibusque, folia subaequantibus, multifloris; floribus albis, circiter 7 mm longis; fructibus ignotis.

A scandent shrub reaching a height of 15 m, the branches terete, brown, glabrous, the younger ones more or less appressed-hirsute with short brownish hairs. Leaves 3-foliolate, the petioles 4 to 5 cm long, the basal part somewhat thickened, gray, the rest brown; petiolules gray, 5 to 7 mm long; leaflets exstipellate, oblong-ovate, subcoriaceous, shining, pale when dry, 6 to 11 cm long, 2.5 to 5.5 cm wide, acute or obtuse, base acute to rounded; lateral nerves 7 on each side of the midrib, prominent on the lower surface, curved-ascending, anastomosing, the reticulations slender. Panicles terminal and in the upper axils, about as long as the leaves, many-flowered, the branches few, distant, spreading, all parts appressed-hirsute with short brownish hairs. Flowers white, about 7 mm long, their pedicels 1 to 1.5 mm long. Calyx cup-shaped, somewhat pubescent, 3 mm long and wide, the upper two teeth more or less connate, the lower three small. Standard orbicular, 7 mm wide, the claw 1 mm long, apex retuse, base subacute, not callose; wings equaling the standard, narrowly oblong-obovate, rounded, the limb 5 mm long, 2.5 mm wide, claw slender, 2.5 mm long, base obscurely auricled on the broader side; keel equaling the claw, petals slightly coherent, the claw 3 mm, the limb 4 mm long, 2 mm wide, obscurely auricled at the base on one side. Vexillary filament free throughout, 3 mm long, the others united for the lower 2 to 3 mm, glabrous. Ovary sessile, oblong, pubescent, including the style 7 mm long; ovules 2; style pubescent below, glabrous above, more or less curved.

LEYTE, Buenavista, near Jaro, in forests, altitude about 500 m, C. A. Wenzel 841, June 5, 1914.

A species of the section *Aganope*, leaflets 3, exstipellate, standard not callose at the base, the vexillary filament free throughout. It is best characterized by its 3-foliolate leaves, and its alliance seems to be with *Derris palawanensis* Elm.

RUTACEAE

EVODIA Forster

EVODIA CRASSIFOLIA sp. nov.

Arbor parva, inflorescentiis exceptis glabra; foliis 3-foliolatis, foliolis coriaceis, oblongis, nitidis, usque ad 18 cm longis, integris, basi acutis, apice rotundatis, obtusis, vel obscure late obtuseque acuminatis, nervis utrinque 9 ad 13, subpatulis, distinctis, anastomosantibus; paniculis axillaribus, 9 ad 14 cm longis, dense multifloris; floribus albis, confertis, circiter 3 mm longis.

A small tree, entirely glabrous except the younger parts of the inflorescence. Branches stout, smooth, terete or somewhat compressed, pale yellowish-brown. Leaves 3-foliolate, their petioles 5 to 9 cm long; leaflets coriaceous, brownish or pale-olivaceous when dry, shining on both surfaces, 10 to 18 cm long, 4.5 to 7.5 cm wide, rounded, acute, obtuse, or broadly and shortly blunt-acuminate at the apex, base acute, of the central leaflet equilateral, of the lateral ones somewhat inequilateral; lateral nerves 9 to 13 on each side of the midrib, prominent, anastomosing, somewhat spreading, the reticulations evident on both surfaces; petiolules 5 to 8 mm long. Panicles axillary, solitary, 9 to 14 cm long, mostly pyramidal, the lower branches up to 6 cm long, spreading or ascending, glabrous except the ultimate branches and branchlets which are more or less pubescent. Flowers very numerous, white, densely crowded at the apices of the ultimate branchlets, the pedicels pubescent, 2 to 3 mm long. Sepals broadly ovate, rounded, 1 mm long. Petals ovate, obtuse or acute, 2.5 cm long. Stamens 4; filaments 3 to 3.5 mm long; anthers 1.2 mm long. Ovary densely pubescent, ovoid; style cylindric, stout, about as long as the ovary.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 699 (type) 715, April, 1914, in forests, altitude about 500 meters.

A species characterized by its comparatively thick leaflets, its ample, densely many flowered panicles, and in being entirely glabrous except the younger parts of the panicles, the pedicels, and the ovaries. It approaches several other Philippine forms in some characters, but does not appear to be particularly closely allied to any known to me.

MELICOPE Forster

MELICOPE NITIDA sp. nov.

Frutex 5 m altus partibus junioribus inflorescentisque leviter pubescentibus exceptis glaber; foliis trifoliolatis, foliolis chartaceis vel subcoriaceis, oblongo-obovatis vel elliptico-obovatis utrinque valde nitidis, usque ad 15 cm longis, basi acutis, apice rotundatis ad abrupte late obtuseque acuminatis; nervis utrinque 11

ad 14, prominentibus, anastomosantibus, reticulis laxis, distinctis; paniculis axillaribus, solitariis, numerosis, pyramidatis, ut videtur multifloris, usque ad 9 cm longis leviter pubescentibus; coccis ellipsoideis, 3 ad 3.5 mm longis.

A shrub about 5 m high, the younger parts and the panicles slightly pubescent, otherwise glabrous. Branches terete, light-gray. Leaves 3-foliolate, the petioles 3 to 5 cm long; leaflets chartaceous or subcoriaceous, oblong-obovate to elliptic-obovate, 9 to 15 cm long, 4 to 7 cm wide, entire, both surfaces strongly shining, rather pale when dry, the apex rounded to abruptly, shortly, and obtusely acuminate, base somewhat narrowed, acute, equilateral; lateral nerves 11 to 14 on each side of the midrib, prominent, anastomosing, the reticulations lax, prominent on the lower surface; petiolules 7 to 10 mm long. Panicles axillary, solitary, numerous, pyramidal, up to 9 cm long, the lower branches spreading, about 5 cm long, the upper ones gradually shorter, apparently densely flowered. Flowers unknown. Fruits numerous, mostly consisting of a single coccus, sometimes of two which are slightly united at the base, the cocci ellipsoid, brownish-olivaceous, rounded, 3 to 3.5 mm long, the seeds globose, black, shining.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 822, in forests, altitude about 500 meters, June 3, 1914.

A characteristic species distinguishable by its strongly shining, prominently and laxly reticulate leaflets. This was originally described as an *Evodia*, but Wenzel 1002, in flower, received just as the last proof was being read, is identical with the type and is a *Melicope*.

BURSERACEAE

CANARIUM Linnaeus

CANARIUM WENZELII sp. nov. § *Choriandra*.

Species *C. villosa* affinis, differt ramulis, petiolis, subtus foliolis paniculisque ferrugineo-pubescentibus, foliolis coriaceis, majoribus.

A tree about 20 m high, the branchlets, petioles, and inflorescence densely ferruginous-pubescent with short hairs which are more or less deciduous, with similar ones on the midrib and nerves of the leaflets on both surfaces. Branches terete, the ultimate ones 5 to 7 mm in diameter, longitudinally striate, pale-brownish, not marked with scars of fallen leaves. Leaves alternate, about 40 cm long, the petiole and rachis densely ferruginous-pubescent, the stipules persistent, rather thick, linear-oblong, curved, acuminate, entire, 1 cm long or less. Leaflets coriaceous, oblong to elliptic-oblong, usually 7, opposite or sub-

opposite, the median and upper ones elliptic to oblong-elliptic, 17 to 25 cm long, 7 to 9 cm wide, the lower ones relatively shorter and broader, entire, prominently acuminate, the base rounded, usually somewhat inequilateral, the upper surface sparingly short-pubescent with ferruginous hairs on the midrib and lateral nerves, pale-greenish, the lower surface slightly paler, more brownish, the pubescence more evident and extending to the reticulations, the midrib and lateral nerves brown in contrast to the yellowish-green lower surface; lateral nerves very prominent on the lower surface, about 18 on each side of the midrib, curved-anastomosing close to the margin, the primary reticulations subparallel, prominent, brownish; petiolules densely brown-pubescent, about 1.5 cm long. Panicles in the upper axils, narrowly pyramidal, up to 35 cm in length, densely brown-pubescent, the branches few, scattered, the lower primary ones up to 15 cm in length. Flowers 4 mm long, sessile, more or less glomerate or fascicled on the short ultimate branchlets, sometimes irregularly spicate. Calyx densely ferruginous-pubescent, 2.5 mm long, divided one-half to the base into three, broadly ovate lobes. Petals 3, free, obovate to subelliptic, 3.5 mm long, 2 to 2.5 mm wide, thick, somewhat ferruginous pubescent outside in the lower part. Stamens 6, free, inserted outside of the disk, their filaments 2 mm long; anthers oblong, 1.2 mm long. Disk prominent, thick, glabrous below, villous on the top, usually obscurely lobed. Perfect flowers and fruits not seen.

LEYTE, Dagami, C. A. Wenzel 351 (type), 392, August, 1913, in forests, altitude about 30 meters.

A species manifestly in the alliance with *Canarium villosum* F.-Vill. (*C. cumingii* Engl.), but readily distinguished by its rather dense, dark-brown indumentum which is composed of short hairs. It is even closer allied to *Canarium clementis* Merr., in which species, however, the indumentum entirely covers the entire lower surface of the leaflets.

CANARIUM PAUCINERVIUM sp. nov.

Arbor circiter 17 m alta, ramulis foliis inflorescentisque plus minusve hirsutis; foliis circiter 30 cm longis, foliolis 7, ellipticis ad oblongo-ovatis, integris, usque ad 13 cm longis, acuminatis, basi acutis, nitidis, subtus ad costa nervisque dense hirsutis, nervis lateralibus utrinque circiter 8, prominentibus; infructescentiis terminalibus, paniculatis, circiter 20 cm longis, fructibus 2.5 cm longis, acutis, trigonis, in siccitate valde rugosis, parce hirsutis.

A tree about 17 m high, the branches terete, lenticellate, brown, the ultimate ones about 5 mm in diameter, brown-pubescent and with scattered stiff hairs. Leaves alternate, about 30 cm long,

petioles, rachis, petiolules, nerves and midribs of the leaflets on the lower surface densely ferruginous-hirsute with spreading hairs; leaflets 7, firmly chartaceous or subcoriaceous, elliptic to oblong-ovate, shining, 8 to 13 cm long, 5 to 6 cm wide, entire, when dry pale-olivaceous, the upper surface glabrous except for the somewhat pubescent midrib, base acute, apex rather abruptly subcaudate-acuminate, the acumen slender, blunt, about 1 cm long; lateral nerves about 8 on each side of the midrib, prominent on the lower surface, curved, anastomosing, the reticulations lax, prominent; petiolules 5 mm long; stipules deciduous, not seen. Panicles terminal, about 20 cm long in fruit, brown-puberulent and with scattered hirsute hairs, the primary branches few, unbranched. Flowers not seen, apparently few, racemously arranged on short pedicels. Persistent calyx-lobes ovate, acute, 2.5 mm long, coriaceous, ferruginous-pubescent. Fruit 2.5 cm long about 1.5 cm in diameter, ovoid in outline, acute, prominently trigonous, when dry prominently wrinkled and with few, scattered, ferruginous, stiff hairs.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 825, June 3, 1914, in forests, altitude 500 m.

Apparently belonging in the same group with *Canarium ahernianum* Merr., differing in its indumentum, its shorter leaves, fewer leaflets, and much fewer lateral nerves.

MELIACEAE

AMOORA Roxburgh

AMOORA CUPULIFERA sp. nov.

Arbor circiter 15 m alta, inflorescentiis puberulis; foliis circiter 75 cm longis, foliolis circiter 8, oblongo-ellipticis, coriaceis, in siccitate pallidis, nitidis, usque ad 30 cm longis, breviter acuminatis, nervis utrinque circiter 16, prominentibus; inflorescentiis paniculatis, circiter 45 cm longis; floribus 5-meris, calycibus cupulatis, 8 mm longis, truncatis, petalis extus pubescens, intus glabris, 2 cm longis, liberis; tubo cylindraceo, 1.5 cm longo, 5-lobato; discus nullus.

A tree about 15 m high, the inflorescence, petioles, and to a slight degree the lower surfaces of the leaflets gray-puberulent. Leaves ample, about 75 cm long, the rhachis minutely gray-puberulent; leaflets about 8, oblong-elliptic or oblong, 25 to 30 cm long, 9 to 11 cm wide, coriaceous, pale and somewhat shining when dry, the upper surface quite glabrous, the lower much paler and minutely puberulent on the midrib and lateral nerves, the apex shortly acuminate, the base rounded or somewhat acute;

lateral nerves about 16 on each side of the midrib, prominent, scarcely anastomosing, the reticulations lax, obscure; petiolules stout, 1.5 to 2 cm long, opposite. Inflorescence narrowly paniculate, up to 45 cm long, gray-puberulent, the branches distant, the lower primary ones 7 cm long or less, the upper gradually shorter, the flowers racemosely arranged. Flowers white, 5-merous. Calyx cylindric-cup-shaped, about 8 mm long and 7 mm in diameter, truncate, slightly contracted at the mouth, outside densely gray-puberulent. Petals 5, about 2 cm long, 3.5 to 4 mm wide, thick, in anthesis somewhat recurved, densely appressed-pubescent outside, glabrous within, acute, keeled-thickened and somewhat appendiculate at the apex inside. Staminal-tube cylindric, about 1.5 cm long, 4 mm in diameter, the basal 4 to 5 mm glabrous, somewhat angled and narrower than the pubescent upper part, appressed-pubescent inside, 5-lobed, lobes oblong, 3.5 mm long, 2 mm wide, truncate, alternating with 5, linear, 2.5 mm long teeth. Anthers 5, inserted at the base of the cleft between the large lobes, sessile, oblong, 3.8 mm long, included. Disk none. Ovary narrowly ovoid, pubescent, gradually narrowed upward to the cylindric, pubescent style, the style and ovary 15 mm long; stigma capitate; ovary 2-celled.

LEYTE, Dagami, C. A. Wenzel 311, August 3, 1913, in forests, altitude about 60 meters.

A very characteristic species of the section *Pseudoguarea*, entirely different from all other Philippine forms. The entire, truncate, cup-shaped calyx, the large leaves, the 5-lobed staminal-tube, and the 2-celled ovary are characteristic features.

DYSOXYLUM Blume

DYSOXYLUM PALLIDUM sp. nov. § *Eudysoxylum*.

Arbor circiter 20 m alta, inflorescentibus exceptis glabra; foliis alternis, circiter 40 cm longis, foliolis circiter 9, in siccitate pallidis, coriaceis, ovatis ad oblongo-ovatis, inaequilateralibus, acuminatis, usque ad 13 cm longis, nervis utrinque 7 vel 8, prominentibus, reticulis obsoletis; inflorescentibus axillaribus, usque ad 15 cm longis, simplex vel leviter ramosis; floribus 4-meris, circiter 12 mm longis, petalis liberis, extus pubescentibus; ovario pubescens, tubus stamineus liber.

A tree about 20 m high, glabrous except the inflorescence. Branches terete, gray, the ultimate ones 5 mm in diameter. Leaves alternate, up to 40 cm long; leaflets alternate, pale when dry, about 9 to each leaf, coriaceous, alternate, ovate to oblong-ovate, inequilateral, 7 to 13 cm long, 4 to 7 cm wide, acuminate,

base rounded to acute, or rounded on one side and acute on the other; lateral nerves 7 or 8, prominent, the reticulations obsolete; petiolules about 1 cm long. Inflorescence axillary, 15 cm long or less, stout, unbranched or with one or two short branches 1.5 cm long or less, brown when dry, the younger parts slightly pubescent. Flowers 4-merous, about 12 mm long, on short stout petioles. Calyx subcylindric, truncate, 4 mm long and wide, pubescent externally. Petals 4, free, narrowly oblong, obtuse, 12 mm long, 3 mm wide. Staminal-tube cylindric, glabrous, 10 mm long, 3 mm in diameter, mouth slightly crenulate, quite free; anthers 8 or 9, inserted near the apex, 2 mm long, included. Disk cylindric, 5 mm long, 2 mm in diameter, the mouth somewhat ciliate-pubescent, otherwise entirely glabrous. Ovary and style continuous, cylindric, 10 mm long, pubescent; stigma capitate; ovary 4-celled.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 771, May 28, 1914, in forests, altitude about 500 meters, flowers flesh-colored.

A species well characterized by its coriaceous, pale, prominently nerved leaflets in which the secondary veins and reticulations are entirely obsolete. It apparently belongs in the group with *Dysoxylum latifolium* Blume according to the arrangement of C. DeCandolle.

DYSOXYLUM WENZELII sp. nov. § *Eudysoxylum*.

Arbor circiter 10 m alta, pubescens; foliis alternis, usque ad 35 cm longis, foliolis 9 vel 11, oblongis, pallidis, usque ad 11 cm longis, breviter obtuse acuminatis, base acutis, inaequilateralibus subtus ad costa nervisque molliter pubescentibus; inflorescentiis axillaribus, solitariis, racemiformis, usque ad 9 cm longis; floribus cylindraceis, 9 mm longis, brevissime pedicellatis, 4-meris, petalis pubescentibus, tubus stamineus liber, glaber, ovario hirsuto.

A tree about 10 m high, pubescent. Branches terete, 7 mm in diameter, grayish-olivaceous, glabrous, the younger ones pubescent. Leaves alternate, up to 35 cm long, the petioles, rachis and leaflets rather softly pubescent with grayish hairs; leaflets 9 or 11, oblong, 9 to 11 cm long, 3.5 to 4.5 cm wide, the apex broadly and shortly acuminate, base acute or acuminate, strongly inequilateral, both surfaces pale-grayish when dry, the upper more or less pubescent on the midrib and nerves, the lower softly pubescent. Inflorescence solitary, spiciform, axillary and from the axils of fallen leaves, 7 to 9 cm long, pubescent, rather many flowered, the branchlets 3 mm long or less, each bearing usually three flowers, the pedicels pubescent, very short. Flowers 4-merous, 9 mm long, flesh-colored. Calyx shallow, broadly

4-toothed, pubescent. Petals 4, free, pubescent outside, 3 to 3.5 mm wide, obtuse. Staminal tube cylindric, 7 mm long, glabrous, truncate, the stamens 8, inserted below the apex, the anthers sessile, less than 1 mm long. Disk shallow, glabrous, crenulate, 1.5 mm high, about 2 mm in diameter, free. Ovary hirsute; style 5 mm long, hirsute below, glabrous above.

LEYTE, Jaro, C. A. Wenzel 642, March 21, 1914, in forests, altitude about 500 meters.

In C. DeCandolle's arrangement this species falls in the group with *Dysoxylum pallens* Hiern and *D. flavescens* Hiern, but is apparently not closely allied to either. In general aspect it is nearest to the Philippine *Dysoxylum pyriforme* Merr., but has an entirely different inflorescence and flowers.

EUPHORBIACEAE

APOROSA Blume

APOROSA LEYTENSIS sp. nov.

Arbor circiter 7 m alta, ramulis inflorescentiisque dense pubescentibus; foliis chartaceis vel subcoriaceis, usque ad 15 cm longis, oblongis ad elliptico-oblongis vel lanceolato-oblongis, tenuiter acuminatis, basi rotundatis, integris, subtus ad costa nervisque pubescentibus, nervis utrinque 8 vel 9, prominentibus; inflorescentiis ♂ et ♀ axillaribus, fasciculatis vel subsolitariis, usque ad 4 cm longis, spicatis, ovario densissime hirsuto.

A dioecious tree about 7 m high, the branches terete, glabrous, pale-brown, the branchlets pubescent. Leaves oblong to elliptic-oblong or even oblong-lanceolate, chartaceous or subcoriaceous, 10 to 15 cm long, 3.5 to 6.5 cm wide, entire, apex rather slenderly acuminate, base rounded, rather pale when dry, shining, the lower surface pubescent on the midrib and lateral nerves; lateral nerves 8 or 9 on each side of the midrib, prominent, anastomosing, the reticulations distinct; petioles pubescent, about 8 mm long. Staminate and pistillate inflorescences axillary, spicate, densely pale ferruginous-pubescent, up to 4 cm long, fascicled or sometimes subsolitary. Female flowers 4-merous, the calyx teeth broadly ovate, acute, 1 mm long, the ovary narrowly ovoid densely pale-pubescent, the flowers shortly pedicelled, the subtending bracteoles up to 1.2 mm long and 3 mm wide.

LEYTE, Jaro, C. A. Wenzel 614 (type) female flowers, 587 male flowers (very young), March and February, 1914, in forests, altitude 500 to 600 meters.

Apparently most closely allied to *Aporosa microcalyx* Hassk., among the Philippines species, differing in its more slenderly acuminate leaves which are quite entire, and in its very much longer spicate or spike-like inflorescences.

CYCLOSTEMON Blume

CYCLOSTEMON ELLIPSOIDEUS sp. nov.

Frutex circiter 3 m altus, glaber; foliis aequilateralibus, vel subaequilateralibus, integris, oblongis, chartaceis, nitidis, usque ad 13 cm longis, obtusis vel obscure acuminatis, basi acutis, breviter petiolatis; nervis lateralibus utrinque circiter 5, distantibus, tenuibus; fructibus junioribus ellipsoideis, axillaribus, solitariis, apice rotundatis, 2-locellatis, parce breviter adpresse hirsutis, pedicellatis, pericarpio coriaceo.

A shrub about 4 m high, quite glabrous except the fruits (flowers unknown). Branches slender, terete, light-gray. Leaves equilateral or subequilateral, oblong, chartaceous, rather pale when dry, shining and of the same color on both surfaces, 9 to 13 cm long, 2.5 to 4.5 cm wide, narrowed upward to the obtuse or obscurely acuminate apex and below to the acute base, entire; lateral nerves about 5 on each side of the midrib, distant, slender, curved-ascending, anastomosing, the reticulations lax; petioles 2 to 3 mm long. Flowers unknown. Fruits axillary, solitary, ellipsoid, when young (seeds undeveloped) the pericarp coriaceous, externally slightly appressed-pubescent with short hairs, rounded at both ends, 2-celled, about 1 cm long; pedicels about 4 mm long.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 828, in forests, altitude about 500 m, June 3, 1914.

A species characterized by its ellipsoid, pedicelled fruits, its thin pericarp, and its equilateral or nearly equilateral, entire leaves. It seems to be most closely allied to *Cyclostemon gitingensis* Elmer, but its fruits are entirely different from those of that species.

RHAMNACEAE

VENTILAGO Gaertner

VENTILAGO MULTINERVIA sp. nov.

Frutex scandens, inflorescentiis exceptis glaber; foliis subcoriaceis, oblongis, integris, nitidis, usque ad 12 cm longis, obtusis, subsessilibus vel breviter petiolatis, basi plerumque leviter inaequilateralibus, obtusis, nervis utrinque circiter 10, prominentibus; paniculis terminalibus, usque ad 22 cm longis, leviter pubescentibus, pauciramosis; floribus circiter 3 mm diametro, petalis obcordatis; fructibus circiter 3.5 m longis, 8 mm latis, leviter pubescentibus.

Scandent, reaching a height of 15 m, glabrous except the inflorescence. Branches dark-brown, terete, glabrous. Leaves oblong, subcoriaceous, pale when dry, shining, 7 to 12 cm long,

2.5 to 5 cm wide, entire, apex obtuse, base usually slightly inequilateral, obtuse, subsessile or shortly petioled; lateral nerves about 10 on each side of the midrib, prominent on the lower surface, the reticulations slender, subparallel; petioles 2 mm long or less. Panicles terminal, each consisting of few elongated branches, up to 22 cm in length, distinctly pubescent or puberulent with short brownish hairs. Flowers numerous, green, solitary or somewhat fascicled, externally pubescent, the pedicels 1 to 1.5 mm long. Calyx 3 mm in diameter, base acute, teeth triangular, acute, 1.2 mm long. Petals obcordate, 1 mm long, base cuneate. Filaments about 1 mm long, the anthers less than half as long. Young fruit densely pubescent, when mature or nearly so, including the wing, 3.5 cm long, 8 mm wide, brown, densely pubescent in the lower part, less pubescent above, the wing thin, brown when dry, the styles persistent as a minute, cleft apiculus.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 849, in forests, altitude about 500 meters.

A species well characterized by its rather numerously nerved, oblong, entire leaves. It is not closely allied to any other Philippine form so far collected.

VITACEAE

TETRASTIGMA Planchon

TETRASTIGMA TRIFOLIOLATUM sp. nov.

Frutex scandens, inflorescentiis parciissime pubescentibus exceptis glaber; foliis 3-foliolatis, foliolis subcoriaceis, in siccitate brunneis, ellipticis ad oblongo-ellipticis, acuminatis, usque ad 20 cm longis, margine irregulariter dentatis, nervis utrinque circiter 8, reticulis obsoletis vel subobsoletis; infructescentiis axillari-bus, circiter 7 cm longis, fructibus junioribus circiter 1.5 cm longis.

A scandent shrub, glabrous except the inflorescence, the branches dark-colored when dry, terete, lenticellate. Leaves 3-foliolate, their petioles about 12 cm long; leaflets subcoriaceous, brown when dry, slightly shining, elliptic to oblong-elliptic, 14 to 20 cm long, 7 to 10 cm wide, base acute, apex rather prominently acuminate, margins irregularly and rather coarsely toothed in the upper one-half; lateral nerves about 8 on each side of the midrib, slender, distinct, the reticulations obsolete or nearly so; petiolules of the lateral leaflets 3 to 4 cm long, of the terminal one, including the prolongation of the rachis 8 cm. Infructescence axillary, cymose, very slightly pubescent, the

immature fruits oblong, 1.3 to 1.5 cm long, somewhat inequilateral, blunt.

LEYTE, Dagami, C. A. *Wenzel* 544, February 6, 1914, in forests, altitude about 500 meters.

A species well characterized by its 3-foliolate leaves and its ample leaflets.

ELAEOCARPACEAE

ELAEOCARPUS Linnaeus

ELAEOCARPUS WENZELII sp. nov. § *Ganitrus*.

Arbor circiter 20 m alta, partibus junioribus inflorescentiisque exceptis glabra; foliis subcoriaceis, glabris, nitidis, oblongis ad oblongo-ovatis, breviter acuminatis vel obtusis, basi acutis, usque ad 15 cm longis, nervis utrinque circiter 12, subtus in axillis glandulosis; racemis e axillis defoliatis, circiter 8 cm longis; floribus 5-meris, circiter 7 mm longis, petalis usque ad medio fissis, laciniis circiter 14; ovario 5-loculare.

A tree about 20 m high, glabrous except the younger parts and the inflorescence. Branches terete, dark-colored, glabrous, the very young parts somewhat puberulent. Leaves subcoriaceous, oblong to narrowly oblong-obovate, 10 to 15 cm long, 4 to 6 cm wide, the apex shortly acuminate, base acute, margins distantly and obscurely crenulate, when dry pale-olivaceous, shining, the lower surface paler than the upper and with prominent glands in the axils of the lateral nerves; lateral nerves about 12 on each side of the midrib, prominent; petioles about 1 cm long. Racemes solitary, numerous, in the axils of fallen leaves, about 8 cm long, appressed-pubescent with short gray hairs. Flowers yellow and white, numerous, 5-merous, their pedicels about 8 mm long, sparingly pubescent. Sepals 5, oblong, lanceolate, acute or somewhat acuminate, somewhat pubescent, 5.5 to 6 mm long, 1.8 mm wide. Petals 5, 7 mm long, 3 mm wide, narrowed below, divided for the upper one-half into about 14, slender lacinae, these more or less irregular, sometimes in pairs, the lower one-half somewhat pubescent along the back near the base, and along the margins, otherwise glabrous. Stamens about 30, the anthers linear, scabrid, 3 to 4 mm long, one cell slightly longer than the other and with a tuft of few, short hairs. Ovary densely pubescent, 5-celled; style 5.5 mm long, slightly pubescent in the lower part.

LEYTE, Dagami, C. A. *Wenzel* 365, July 13, 1913, in forests, altitude about 60 meters.

Closely allied to *Elaeocarpus ramiflorus* Merr. of Luzon, differing in its larger flowers and its broader leaves.

ELAEOCARPUS DOLICHOPETALUS sp. nov. § *Ganitrus*.

Arbor alta, subglabra; foliis oblongis ad oblongo-lanceolatis, chartaceis, usque ad 13 cm longis, utrinque subaequaliter angustatis, leviter acuminatis, margine crenatis, supra glabris, nitidis, subtus parcellissime adpresse pilosis vel glabris, nervis utrinque 9 vel 10, prominentibus; racemis numerosis, e ramulis defoliatis, 5 ad 7 cm longis, leviter albido pilosis; floribus 5-meris, circiter 1.5 cm longis, sepalis petalisque extus leviter adpresse pilosis; ovario 5-loculare.

A tall tree, 35 m high *vide* Wenzel, subglabrous. Branches terete, lenticellate, dark-colored when dry, the branchlets appressed pubescent with short hairs. Leaves oblong to oblong-lanceolate, 10 to 13 cm long, 3 to 4 cm wide, chartaceous, about equally narrowed at both ends, apex slightly acuminate, base slightly decurrent-acuminate, margins crenate, the upper surface olivaceous when dry, glabrous, shining, the lower somewhat paler, glabrous, or with few, scattered, appressed, obscure, pilose hairs; lateral nerves about 9 on each side of the midrib, prominent, anastomosing, the axils not glandular; petioles 1 to 1.5 cm long. Racemes numerous, on the branches below the leaves, solitary from the axils of fallen leaves, 5 to 7 cm long, appressed-pilose with white, shining, scattered hairs. Flowers 10 to 15 in each raceme, white, 5-merous, about 1.5 cm long, their pedicels about 1 cm long. Sepals lanceolate, acuminate, 10 to 11 mm long, 2 mm wide, outside slightly pubescent with scattered white hairs, margins densely puberulent. Petals about 15 mm long, 3 to 3.5 mm wide, back in the lower one-third sparingly appressed pubescent with shining white hairs, margins densely pubescent, the upper two-fifths cut into 4 or 5 primary divisions, these narrow and bifid or trifid. Stamens about 30; anthers linear, scabrid, 4 to 5 mm long, one cell slightly longer than the other and terminated by a bristle. Disk densely gray-pubescent. Ovary densely pubescent, 5-celled; style glabrous, 1.3 cm long.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 897, June 13, 1914, in forests, altitude about 500 meters.

This species much resembles *Elaeocarpus wenzelii* Merr., but has much larger flowers. The rather long, comparatively narrow petals are characteristic.

ELAEOCARPUS AFFINIS sp. nov. § *Dicera*.

Species *E. argenteo* similis et ut videtur affinis, differt racemis tenuibus, paucifloris, pedunculis longioribus tenuioribusque, rachibus subglabris, floribus minoribus.

A tree about 10 m high, white glabrous except the inflorescence. Branches terete, brownish. Leaves numerous, rather crowded,

coriaceous, oblong to elliptic-oblong, 4 to 7 cm long, 2 to 3 cm wide, shining, apex blunt-acuminate, base acute, margins coarsely crenate; lateral nerves 5 to 7 on each side of the midrib, prominent, anastomosing, the axils with prominent glands; petioles 6 to 15 mm long. Racemes axillary, solitary, up to 7 cm in length the rachis slender, glabrous or only slightly pubescent, usually about 10-flowered. Flowers 5-merous, 5 to 6 mm long, their pedicels slender, appressed-pubescent with scattered, shining, white hairs, 5 to 7 mm long. Sepals lanceolate, obscurely acuminate, 5.5 mm long, 1.6 mm wide, appressed pubescent with scattered shining hairs. Petals as long as the sepals, slightly wider, the upper one-third cleft into 6 or 7 slender divisions, the lower one-half densely silvery pubescent on the back, margins densely pubescent, inside pubescent along the median line below. Stamens 15; anthers oblong, cells blunt, scabrid, about 2 mm long. Ovary ovoid very densely silvery pubescent, 2-celled.

LEYTE, Masaganap near Jaro, C. A. Wenzel 788, in forests, altitude about 600 meters.

In vegetative characters very closely resembling *Elaeocarpus argenteus* Merr., but quite different from that species in its inflorescence and flowers.

ELAEOCARPUS MOLLIS sp. nov. § *Dicera*.

Arbor parva subtus foliis partibus junioribus inflorescentiisque molliter pubescentibus; foliis subellipticis, firmiter chartaceis, usque ad 10 cm longis, basi acutis, apice breviter late obtuseque acuminatis, nervis utrinque 6 vel 7, prominentibus; racemis axillaribus, circiter 3 cm longis, plerumque 6-floris; floribus 5-meris, circiter 6 mm longis; ovario 2-loculare; fructibus 2 ad 2.5 cm longis, obovoideo-ellipsoideis, 1-locellatis.

A tree 6 to 8 m high, rather prominently and softly pubescent with short spreading hairs. Branches terete, brown, glabrous, the younger ones softly pubescent. Leaves subelliptic, firmly chartaceous, 6 to 10 cm long, 2.5 to 5 cm wide, entire or with distant obscure teeth, about equally narrowed to the short, blunt, broadly acuminate apex and to the acute base, the upper surface olivaceous when dry, pubescent on the midrib and nerves, the lower surface paler softly pubescent with scattered, spreading, short hairs; lateral nerves 6 or 7 on each side of the midrib, prominent, anastomosing, the axils sometimes bearded; petioles pubescent, 1 to 1.5 cm. long. Racemes solitary, axillary, pubescent with short spreading hairs, about 3 cm long, usually 6-flowered, the pedicels 5 to 7 mm long. Flowers 5-merous, 5 to 6 mm long. Sepals oblong, acute, about 5 mm long, 1.2 mm wide, ciliate-pubescent with short spreading hairs. Petals 6

mm long, the lower part about 1 mm wide, ciliate on the margins, glabrous on the back, the median line inside also ciliate, the upper part glabrous, the upper 2 mm cleft into 6 or 7 primary, slender divisions, these usually bifid. Stamens 15; anthers oblong, obtuse, scabrid, the anthers narrowed below, 2 mm long. Ovary densely pubescent, ovoid, 2-celled; style 3 mm long, ciliate in the lower one-half, glabrous above. Fruit obovoid-ellipsoid to cylindric-ellipsoid, base usually narrowed, apex rounded; smooth, the pericarp thin, 2 to 2.5 cm long, about 1 cm in diameter, the endocarp bony, rugose, 1-celled.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 698 (type), April, 1914, in flower; near Dagami, Wenzel 416, September, 1913, in fruit, in forests, altitude 60 to 500 meters.

This species is closely allied to *Elaeocarpus villosiusculus* Warb., of the Philippines, with which the latter number cited above was at first identified. It differs, however, in its less acuminate leaves and especially in its sepals not being densely pubescent. It is also allied to *Elaeocarpus teysmannii* Koord. & Valetton, of Celebes, but does not approach that species as closely as does *E. villosiusculus* Warb.

TILIACEAE

TRICHOSPERMUM Blume

TRICHOSPERMUM LEYTENSE sp. nov.

Arbor parva, circiter 8 m alta, ramulis junioribus foliis inflorescentisque plus minusve pubescentibus; foliis oblongis, chartaceis, aequilateralibus, usque ad 14 cm longis, prominente acuminatis, margine serrulato-denticulatis, basi rotundatis, 3-nerviis, supra glabris vel subglabris, subtus leviter pubescentibus; nervis lateralibus adscendentibus, utrinque 5 vel 6; infructescentibus axillaribus terminalibusque, paniculatis, circiter 8 cm longis; fructibus 2-valvis, compressis, plus minusve inflatis, circiter 1.5 cm longis, 2 ad 2.5 cm latis, extus dense ciliato-pilosis.

A tree about 8 m high, the younger parts, leaves, and inflorescence more or less pubescent. Branches glabrous, terete, very dark reddish-brown or nearly black when dry, the younger branchlets, inflorescence, and petioles rather densely pubescent with short, pale-brownish hairs. Leaves oblong, chartaceous, equilateral, 9 to 14 cm long, 3.5 to 6 cm wide, prominently and rather slenderly acuminate, base broadly rounded, 3-nerved, margins uniformly and distinctly serrulate-denticulate. The upper surface somewhat shining, brownish when dry, glabrous or with few hairs along the midrib and lateral nerves, the lower surface paler, the midrib, nerves, and reticulations more or less

pubescent; lateral nerves, including the basal pair, 5 or 6 on each side of the midrib, prominent, rather sharply ascending, nearly straight; petioles about 1 cm long; panicles axillary and terminal, in fruit about 8 cm long, densely pubescent with short brownish hairs. Fruits subreniform, 2-celled, base truncate, apex slightly apiculate, compressed but at the same time distinctly inflated, about 1.5 cm long, 2 to 2.5 cm wide, the valves coriaceous densely and softly pubescent with shining brownish hairs of two types, short, rather densely matted ones, intermixed with very numerous, long, appressed-spreading, shining ones. Seeds 1.5 to 2 mm long, with numerous, long, shining, pale hairs.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 837, June 5, 1914, in forests, altitude about 500 m.

A species characterized by its leaves which are entirely or nearly glabrous above and comparatively slightly pubescent beneath, and its 2-valved, compressed, densely pubescent fruits which are distinctly inflated. It may belong in the genus I have previously designated as *Halconia*, which, perhaps, should be merged with *Trichospermum*.

DILLENIACEAE

TETRACERA Linnaeus

TETRACERA PHILIPPINENSIS sp. nov.

Frutex scandens ? vel arbor, partibus junioribus inflorescentisque plus minusve pubescentibus; foliis leviter scaberulis, elliptico-ovatis, coriaceis, in siccitate pallidis, fragilis, nitidis, usque ad 12 cm longis, acutis vel leviter acuminatis, basi rotundatis vel subacutis, nervis utrinque 11 ad 13, valde prominentibus, margine integris vel sursum obscure subundulato-crenulatis; paniculis terminalibus, amplis, 20 ad 25 cm longis; carpellis 3, glabris.

A scandent shrub or a tree, the branches terete, minutely scabrid, dark-brown, younger ones sparingly appressed-hirsute. Leaves coriaceous, pale, shining and brittle when dry, somewhat scabrid on both surfaces, elliptic-ovate, 8 to 12 cm long, 3.5 to 6 cm wide, entire, or near the apex obscurely undulate-crenulate, apex acute or somewhat acuminate, base rounded to subacute, margins sometimes slightly decurrent along the petioles, the lower surface punctulate; lateral nerves 11 to 13 on each side of the midrib, very prominent; petioles 1.5 to 2 cm long. Panicles terminal, ample, 20 to 25 cm long, sparingly appressed-hirsute. Flowers green and white. Sepals 5 or 6, the outer two much smaller than the inner ones, subcoriaceous, ciliate on the margins, the inner ones elliptic-obovate, concave, rounded, 6 mm long. Petals membranaceous, obovate, 5 to 6 mm long, deciduous.

Stamens 3 to 4 mm long. Carpels 3, narrowly ovoid, narrowed upward into the style, glabrous, including the style 4 mm long.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 812, June 2, 1914, in forests, altitude about 50 meters, said by the collector to be a tree 15 m high with the trunk about 50 cm in diameter although the specimens look as though they were from a vine rather than from a tree. It is characterized by its rather numerously nerved, entire or nearly entire leaves, its ample panicles, and its glabrous carpels, three carpels in each flower. The leaves are glandular-punctulate on the lower surface.

SAURAUIA Willdenow

SAURAUIA WENZELII sp. nov.

Frutex circiter 5 m altus, leviter adpresse setosus, partibus junioribus minute farinosus; foliis coriaceis, oblongo-obovatis vel oblongo-ellipticis, usque ad 27 cm longis, subcaudato-acuminatis, basi rotundatis vel leviter cordatis, nervis utrinque circiter 17; inflorescentiis paniculatis, plus minusve foliaceis haud bracteatis; floribus cymosis, confertis, circiter 1.5 cm diametro, ovario 3-locellato.

An erect shrub about 5 m high, the branchlets, inflorescence, petioles, and to a slight degree the leaves with scattered, appressed setae, the younger parts somewhat farinose, otherwise nearly glabrous. Leaves oblong-obovate, or oblong-elliptic, coriaceous, somewhat olivaceous when dry, shining, the lower surface a little paler than the upper, the latter entirely glabrous except for few, appressed, scale-like setae on the midrib and nerves, the lower surface glabrous except for similar scales, 15 to 27 cm long, 7 to 9 cm wide, rather slenderly subcaudate-acuminate, base somewhat narrowed, rounded, or slightly cordate, often a little inequilateral, the margins minutely setose-denticulate; lateral nerves about 17 on each side of the midrib, prominent; petioles stout, about 1.5 cm long, appressed-setose. Inflorescence a pseudo-terminal, somewhat leafy panicle from the upper axils, about 15 cm long, appressed-setose and somewhat farinose, composed of few, (about 5) alternate, long peduncled, many-flowered, rather congested cymes intermingled with more or less reduced leaves, the leaves on the main rachis up to 7 cm long, in the partial inflorescence taking the place of bracts and 1 cm long or less. Flowers numerous, white, numerous in each partial inflorescence which is from 3 to 4 cm in diameter, the individual flowers in anthesis about 1.5 cm in diameter. Sepals orbicular-obovate, rounded, about 5 mm in diameter. Petals broadly obovate, about 6 mm in diameter, rounded, somewhat united below. Stamens about 20, 1-seriate; filaments 2 mm long, the anthers a little shorter. Ovary depressed-ovoid, glabrous,

about 2.5 mm in diameter, 3-celled; style-arms 3 or 4, about 2 mm long, united for the lower 1 mm.

LEYTE, Dagami, C. A. *Wenzel 324*, July, 1913, in forests, altitude about 60 meters.

A comparatively well characterized species on account of its few, appressed, more or less scale-like setae, its leaves otherwise glabrous, and its peculiar inflorescence, the few, partial, many-flowered, cymose inflorescences being arranged in a more or less leafy panicle.

THEACEAE

ADINANDRA Jack

ADINANDRA LEYTENSIS sp. nov.

Arbor circiter 17 m alta, partibus junioribus floribusque exceptis glabra, ramulis in siccitate distincte verruculosus; foliis coriaceis, subellipticis, usque ad 8 cm longis, obtusis, basi acutis vel decurrento-acuminatis, margine obscure denticulatis, utrinque obscure verruculoso-puncticulatis; nervis utrinque circiter 12, reticulis distinctis; floribus circiter 3 cm diametro, sepalis 6, interioribus gradatim majoribus, crasse coriaceis, 2 ad 8 mm longis, petalis 5, late ovato-ellipsoideis, coriaceis, circiter 15 mm longis, rotundatis; staminibus circiter 50.

A tree about 17 m high, glabrous except the very youngest parts and the flowers. Branches terete, brown, glabrous, the terminal buds appressed-hirsute, the younger branchlets distinctly verruculose as are also the midribs of the leaves on the lower surface. Leaves alternate, coriaceous, subelliptic, 5 to 8 cm long, 2.5 to 4 cm wide, brownish or subolivaceous when dry, somewhat shining, apex rounded or sometimes merely obtuse, base narrowed, acute or decurrent-acuminate, margins obscurely denticulate, both surfaces minutely and obscurely puncticulate or verruculose-puncticulate; lateral nerves about 12 on each side of the midrib, rather prominent, anastomosing, the reticulations distinct; petioles 5 mm long or less. Flowers solitary, axillary, white, about 3 cm in diameter. Sepals usually 6, thickly coriaceous, outer two 3 to 4 mm long, rounded, inner gradually larger, innermost orbicular, rounded, 7 to 8 mm in diameter, somewhat pubescent, concave. Petals 5, broadly elliptic-ovate, appressed pubescent externally, coriaceous, about 15 mm long, 12 mm wide, concave. Stamens about 50, the filaments united into a 4 mm long tube, more or less hirsute; anthers hirsute, lanceolate, acute or acuminate, 5 mm long. Ovary ovoid, glabrous, the ovules rather few; style stout, about 6 mm long, slightly hirsute.

LEYTE, Masaganap, near Jaro, C. A. *Wenzel 760*, May 27, 1914, in forests, altitude about 600 m.

The alliance of this species is apparently with *Adinandra loheri* Merr., of Luzon, differing in its more hirsute stamens, more prominently reticulated leaves, and verruculose branchlets and midribs. The leaves also, at least when young, present on the lower surface very scattered, short hairs.

GUTTIFERAE

GARCINIA Linnaeus

GARCINIA OLIGOPHLEBIA sp. nov. § *Eugarcinia*.

Arbor glabra, circiter 8 m alta; foliis oblongo-obovatis ad late oblongo-oblongeolatis, usque ad 7 cm longis, acuminatis, basi angustatis, cuneatis, nervis utrinque circiter 8, adscendentibus; floribus ♂ axillaribus, fasciculatis, sessilibus, 4-meris, circiter 3 mm longis, rubris; antheris 4, longitudinaliter dehiscentibus, ovarii rudimento nullo.

A glabrous dioecious tree about 8 m high, the branches terete, brownish, the younger ones greenish-brown. Leaves subcoriaceous, oblong-obovate to broadly oblong-oblongeolate, 4 to 7 cm long, 1.5 to 3 cm wide, rather abruptly acuminate, base gradually narrowed, cuneate; lateral nerves about 8 on each side of the midrib, ascending, rather more prominent on the upper than on the lower surface; petioles 1 cm long or less. Male flowers axillary, fascicled, sessile, red, 3 to 7 in a fascicle, about 3 mm long. Calyx-lobes ovate-elliptic to obovate, 2 mm long, the inner two somewhat narrower than the outer. Corolla about 3 mm long. Anthers 4, subsessile, 1 mm long, longitudinally dehiscent, 2-celled, the rudimentary ovary none.

LEYTE, Jaro, C. A. Wenzel 632, March 15, 1914, in forests, altitude about 500 meters.

A species similar to and very closely allied to *Garcinia rubra* Merr., differing manifestly in its smaller, fewer-nerved leaves.

BEGONIACEAE

BEGONIA Linnaeus

BEGONIA MEGACARPA sp. nov. § *Petermannia* ?

Herba glabra, monoica, caulibus scandens, radicanibus, leviter ramosis; foliis in siccitate membranaceis, suboblique late ovatis, acuminatis, margine repandis, basi late truncatis vel subcordato-truncatis, leviter inaequalateralibus, usque ad 15 cm longis; floribus fasciculatis, magnis; capsulis obovoideis vel turbinatis, subaequaliter 2-alatis, basi acutis, apice subrotundato-truncatis, circiter 3 cm longis.

A glabrous, epiphytic, scandent, sparingly branched herb,

monoecious, the stems brown when dry, emitting numerous roots along the lower side, the internodes 3 to 5 cm long. Leaves alternate, when dry brownish-green, slightly shining, membranaceous, subobliquely broadly ovate, 8 to 15 cm long, nearly as wide, shortly acuminate, margins repand, sometimes also sparingly denticulate, the base broadly truncate or subcordate-truncate, slightly inequilateral; basal nerves about 6; petioles up to 8 cm long; stipules brown, persistent, ovate to oblong-ovate, 1.5 to 2 cm long. Flowers pink and white, in the upper axils, fascicled, numerous male and few female ones in the same fascicle, the former short-pedicelled, the latter apparently long-pedicelled, the fascicles subtended by several large, persistent, brown, bracts. Male flowers: Sepals 2, membranaceous, broadly elliptic-ovate, about 12 mm long, 10 mm wide. Petals none. Stamens about 30, on an elongated torus; anthers narrowly elliptic-oblong, obtuse, 2 mm long, their filaments shorter. Female flowers not seen. Capsules obovoid to turbinate, subequally 3-winged, about 3 cm long, including the wings about 2 cm wide, the apex rounded-truncate, the base acute, dehiscent near the wings, the placentae cleft, ovulate on all sides; peduncles slender, up to 3 cm long.

LEYTE, Dagami, climbing on shrubs in forests, altitude about 60 meters, *C. A. Wenzel 457*, September, 1913 (type). MINDANAO, Butuan Subprovince, Bunauan, *E. H. Taylor*, September, 1913.

A very characteristic species well distinguished by its scandent habit, its fascicled, comparatively large flowers, and its unusually large capsules. It has no close allies among the Philippine species.

BEGONIA LEYTENSIS sp. nov. § *Diploclinium*.

Planta scandens, glabra, ramosa, tenuis; foliis usque ad 4 cm longis, subaequalateralibus, ovatis, chartaceis, acuminatis, basi rotundatis ad subacutis, 5-nerviis, margine denticulatis; inflorescentiis axillaribus, dichotomis, paucifloris, bracteis ♂ orbicularibus, usque ad 9 mm diametro; capsulis suborbicularibus, late rotundatis, circiter 1.4 cm diametro, subaequaliter 3-alatis.

A slender, monoecious glabrous, branched, scandent plant, the stems creeping along the trunks of trees, when dry reddish or reddish-brown. Leaves small, ovate, chartaceous when dry, apparently fleshy when fresh, the base subequilateral, rounded to somewhat acute, apex acuminate, margins with small, distant teeth, base usually 5-nerved, reticulations obsolete or nearly so; petioles slender, 1 cm long or less; stipules brown, lanceolate, acuminate, about 6 mm long. Inflorescence axillary, staminate and pistillate similar, borne on the same plant, few-flowered, the

rachis short, dichotomously branched. Male flowers few, pink, the bracts orbicular, membranaceous, 9 mm in diameter, in pairs, bracteoles similar and a little smaller, deciduous. Sepals 2, in nearly mature buds reniform, somewhat cordate, 5 mm long, 6 mm wide. Stamens about 40; anthers obovoid, 0.8 mm long. Female flowers about 1.5 cm in diameter, the segments 5, elliptic to obovate, rounded; styles 3, dichotomous, the arms spirally twisted, 2 to 3 mm long. Capsules suborbicular in outline, 1.4 cm in diameter, subequally 3-winged, broadly rounded at both base and apex, not at all truncate.

LEYTE, Jaro, C. A. Wenzel 580, February 11, 1914, on trees in forests, altitude about 500 meters.

A close ally of *Begonia aequata* A. Gray and *B. lagunensis* Elmer, but with rather longer petioles and thicker leaves than the former, and larger leaves than the latter, the capsules suborbicular, not at all truncate or subtruncate as in those species.

MYRTACEAE

EUGENIA Linnaeus

EUGENIA WENZELII sp. nov. § *Syzygium*.

Arbor alta, glabra; foliis subellipticis, coriaceis, utrinque subaequaliter angustatis, basi acutis, apice obtuse acuminatis, subtus verruculoso-punctulatis, nervis lateralibus tenuibus, obscuris; inflorescentiis terminalibus, paniculatis, usque ad 8 cm longis; floribus in triadibus dispositis, sessilibus, circiter 1.5 cm longis, calycis tubo sub anthesin deorsum valde angustatis plus tarde incrassatis, margine 5-dentatis, dentibus obtusis.

A tall tree, the trunk 2 m in diameter, entirely glabrous. Branches terete, brown, the branchlets grayish-brown, rather slender. Leaves opposite, coriaceous, rather pale when dry, subelliptic, 5 to 8 cm long, 3 to 4 cm wide, subequally narrowed to the acute base and to the short, broad, blunt acumen, the lower surface verruculose-punctulate; lateral nerves very slender, obscure, the primary ones scarcely more distinct than the secondary, rather densely arranged; petioles 5 to 8 mm long. Inflorescence terminal and in the upper axils, cymose-paniculate, up to 8 cm long, the flowers sessile, disposed in triads on the ultimate branchlets. Flowers in anthesis slender, 12 to 15 mm long, the calyx limb cupshaped, 4 mm in diameter, with 5 rather prominent, blunt, thick teeth, abruptly narrowed into the long pseudostalk, this in anthesis 1.5 mm in diameter or less, after anthesis much thickened, 1.5 cm long, 5 to 6 mm in diameter in the upper third, gradually narrowed to the acute base. Petals

united, forming a calyptra about 3 mm in diameter which falls as a whole; filaments very short.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 770, May 28, 1914, in forests, altitude about 500 meters.

A very large tree, its height indicated by Mr. Wenzel as 60 meters, the trunk 2 meters in diameter. Its alliance is with *Eugenia claviflora* Roxb., *E. rosenbluthii* C. B. Rob., etc., but it is well characterized by its elongated flowers, the pseudo-stalk in anthesis narrow, abruptly enlarged at the apex by the spreading calyx-limb, in young fruit thickened, and gradually tapering to the acute base.

EUGENIA PUNCTICULATA sp. nov. § *Jambosa*.

Arbor glabra, 10 ad 15 m alta; foliis coriaceis, oppositis, oblongis, usque ad 22 cm longis, subtus valde puncticulatis, acuminatis, basi acutis, nervis prominentis, utrinque circiter 12, irregularibus, prominente arcuato-anastomosantibus; paniculis terminalibus axillaribusque, pyramidatis, paucifloris, circiter 10 cm longis; floribus in anthesis circiter 7 cm diametro, petalis obovatis, circiter 1.3 cm longis.

A glabrous tree 10 to 15 m high, the branches terete, light-gray or somewhat brownish, slender. Leaves opposite, oblong, coriaceous, slightly shining when dry, the lower surface a little paler than the upper and prominently puncticulate, 13 to 22 cm long, 5 to 8 cm wide, the base acute, the apex rather prominently acuminate; lateral nerves about 12 on each side of the midrib, rather irregular, very prominent on the lower surface, some of the secondary ones nearly as prominent as the primary ones, arched-anastomosing and forming an irregular, submarginal nerve about 5 mm from the margin of the leaf, the reticulations slender, rather distinct; petioles about 1.5 cm long. Panicles terminal, rarely also lateral, pyramidal, open, comparatively few-flowered, about 10 cm long, the ultimate branchlets with from one to three flowers each, the pedicels mostly less than 1 cm long. Calyx in bud obovoid, about 1.5 cm long, narrowed below into a short pseudostalk, ebracteolate, jointed with the pedicels, the lobes 4, concave, coriaceous, reniform or orbicular-reniform, in anthesis spreading, about 1 cm wide. Petals white, obovoid, about 1.3 cm long. Stamens very numerous, the filaments 3 to 4 cm in length.

LEYTE, Dagami, C. A. Wenzel 384 (type), 369, August, 1913, in forests, altitude about 60 meters.

Among the numerous Philippine species apparently most closely allied to *Eugenia lutea* C. B. Rob., but differing from that species in many characters. Its prominently puncticulate leaves is an evident differential character.

MELASTOMATACEAE

MEDINILLA Gaudichaud

MEDINILLA MINIATA sp. nov. § *Eumedinilla*.

Frutex epiphyticus circiter 2 m altus, glaber, ramulis crassis, 4-alatis, nodis dense setosis; foliis oppositis, sessilibus, coriaceis, oblongo-ovatis ad obovato-subellipticis, usque ad 33 cm longis, abrupte acuminatis, basi angustatis, 13-plinerviis, nervis prominentibus, arcuato-adscentibus, reticulis obsoletis vel subobsoletis; paniculis terminalibus, longe pedunculatis, partibus floriferis circiter 10 cm longis, pyramidatis, ramis verticillatis, inferioribus circiter 4 cm longis, superioribus gradatim brevioribus; bracteis rubris, persistentibus, elliptico-ovatis, acutis, chartaceis vel subcoriaceis, circiter 4 cm longis; floribus 5-meris, confertis; calycibus cupulatis, subtruncatis, circiter 6 mm longis; petalis inaequalateraliter oblongis vel oblongo-ovatis, obtusis, 15 mm longis, 5 mm latis; staminibus 10, subaequalibus, antheris lanceolatis, acuminatis, 8 and 9 mm longis.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 653, May 12, 1914, in forests, altitude about 500 m, May 12, 1914.

A species manifestly allied to *Medinilla magnifica* Lindl., but with smaller, much denser panicles, smaller bracts, and larger flowers. From the allied *M. teysmannii* Miq., it differs in its large persistent bracts and much smaller panicles.

SYMPLOCACEAE

SYMPLOCOS Jacquin

SYMPLOCOS PHANEROPHLEBIA sp. nov. § *Bobua*.

Arbor circiter 10 m alta subtus foliis ad nervis petiolis inflorescentisque plus minusve hirsutis vel pubescentibus; foliis oblongis, chartaceis, usque ad 11 cm longis, acuminatis, basi rotundatis, serrato-crenatis, nervis utrinque circiter 6, subtus valde prominentibus, arcuato-anastomosantibus; inflorescentiis axillaribus, brevibus, paucifloris, floribus subfasciculatis vel in racemis brevibus dispositis; staminibus circiter 25, ovario 3-loculare.

A tree about 10 m. high, the branchlets, inflorescence, and lower surface of the leaves more or less hirsute or pubescent. Branches brownish, terete, pubescent, becoming glabrous or nearly so. Leaves chartaceous, green when dry, oblong, 8 to 11 cm long, 2 to 4 cm wide, apex acuminate, base rounded, margins serrate-crenate, the teeth somewhat glandular, the upper surface glabrous, shining, the lower a little paler, sparingly hirsute on

the midrib and nerves, the lateral nerves 6 on each side of the midrib, impressed on the upper surface, very prominent on the lower, looped-anastomosing, the reticulations lax, rather prominent; petioles 5 mm long or less. Flowers white, rather crowded in axillary, short racemes, the whole inflorescence 1.5 cm long or less, pubescent. Calyx-lobes broadly ovate, obtuse, about 1.5 mm long. Petals glabrous, elliptic-ovate, rounded, 3 mm long. Stamens about 25, their filaments nearly free, glabrous, 3 to 4 mm long. Ovary 3-celled. Fruit ovoid, glabrous, green, about 8 mm long, crowned by the persistent calyx-tube and teeth.

LEYTE, Dagami and Jaro, in forests, altitude about 500 meters, *C. A. Wenzel* 552 (type), 736, February 6 and May 25, 1914.

A species resembling and apparently allied to the Malayan *Symplocos fasciculata* Zoll. but its flowers in short, crowded, fascicled, axillary racemes, not in true fascicles.

SYMPLOCOS MEGABOTRYS sp. nov. § *Bobua*.

Arbor circiter 25 m alta, inflorescentiiis exceptis glabra; foliis subcoriaceis, oblongo-ellipticis, usque ad 20 cm longis, nitidis, acuminatis, basi acutis ad rotundatis, margine crenatis, nervis utrinque 8 vel 9; paniculis folia aequantibus, axillaribus terminalibusque, partibus junioribus pubescentibus; sepalis petalisque pubescentibus, staminibus circiter 100, ovario 3-loculare.

A tree about 25 m high entirely glabrous except the inflorescence. Branches and branchlets terete, reddish-brown, smooth, glabrous. Leaves subcoriaceous, oblong-elliptic, 13 to 20 cm long, 5 to 8 cm wide, shining, brown or yellowish-green when dry, the apex acuminate, base acute to rounded, margins crenate; lateral nerves 8 or 9 on each side of the midrib, prominent; petioles 1.5 to 2.5 cm long. Flowers in ample panicles, the panicles axillary and terminal, numerous, as long as the leaves, the branches up to 12 cm in length, the younger parts appressed cinereous-pubescent, the bracteoles oblong, pubescent, 3 to 4 mm long. Calyx 3 mm in diameter, pubescent, the lobes broadly-ovate, obtuse, about 1.5 mm long. Petals elliptic-oblong, rounded, 4.5 mm long, pubescent on both surfaces. Stamens about 100, somewhat pentadelphous, glabrous. Ovary 3-celled.

LEYTE, Dagami, *C. A. Wenzel* 298, June 30, 1913, in forests.

The specimens are in young flower with numerous immature buds somewhat crowded near the ends of the branchlets, and few mature flowers. The species is most closely allied to *Symplocos patens* Presl and *S. floridissima* Brand, but is readily distinguished from both by its numerous, unusually long panicles and glabrous branchlets.

LOGANIACEAE

GENIOSTOMA Forster

GENIOSTOMA BREVIPES sp. nov.

Arbor parva, circiter 7 m alta, ramulis junioribus parce puberulis; foliis oblongis, chartaceis, usque ad 11 cm longis, subtus parce puberulis, basi acutis ad subacutis, apice breviter acuminatis, nervis utrinque circiter 6; fructibus axillaribus, obovoideis vel subglobois, circiter 7 mm diametro, subsessilibus vel breviter pedunculatis.

A tree about 7 m high, except for the somewhat puberulent branchlets and the lower surfaces of the leaves glabrous, the branches terete, slender, light-gray. Leaves oblong, pale-greenish when dry, slightly shining, 8 to 11 cm long, 2.5 to 4 cm wide, the base somewhat rounded to subacute, the apex shortly acuminate; lateral nerves about 6 on each side of the midrib, slender, distinct on the lower surface, obscurely anastomosing, the reticulations lax; petioles about 3 mm long. Flowers not seen. Fruit axillary, fascicled, obovoid to subglobose, dark-colored when dry, about 7 mm in diameter, the seeds reddish-yellow; peduncles 2 mm long or less, the persistent calyx-lobes about 1.5 mm long.

LEYTE, Dagami, C. A. Wenzel 441, September 16, 1913, in forests, altitude about 60 meters.

Among the Philippine species most closely allied to *Geniostoma philippinense* Merr., but in that species the leaves are larger and usually turn dark-colored in drying, while the pedicels are much longer.

APOCYNACEAE

PARSONSIA R. Brown

PARSONSIA APOENSIS (Elm.) comb. nov.

Aganosma apoensis Elm. Leaf. Philip. Bot. 4 (1912) 1445.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 722, May 20, 1914, in forests, altitude about 500 m.

The type of this species is *Elmer 11719* from Mount Apo, Mindanao, and an examination of this number shows the plant to be a typical *Parsonsia*, belonging in the group of those species in which the filaments are straight, not twisted around the style. The species, which is apparently distinct, is here transferred to its proper genus. It is further characterized by having verticillate leaves, most or all of the other species in the genus having opposite leaves.

VERBENACEAE

CLERODENDRON Linnaeus

CLERODENDRON WENZELII sp. nov.

Frutex circiter 1.5 m altus, hirsutus; foliis ovatis ad oblongo-ovatis, chartaceis, usque ad 15 cm longis, acuminatis, basi cordatis, margine distanter denticulatis, supra parce hirsutis, subtus hirsutis glandulosisque; inflorescentiis terminalibus, paniculatis, paucifloris, calycibus 1.5 cm longis, inflatis, extus pilis longis atro-purpureis crispatis obtectis; corolla circiter 2 cm longa.

A shrub about 1.5 m high, most parts prominently hirsute. Branches terete, pale-brownish, rather densely hirsute. Leaves chartaceous or subcoriaceous, ovate to somewhat oblong-ovate, 9 to 15 cm long, 5 to 9 cm wide, greenish-olivaceous, slightly shining, rather sharply acuminate, base cordate, margins distantly denticulate, the upper surface with scattered, long, weak shining hairs, the lower surface rather densely hirsute on the midrib, nerves and reticulations and with numerous, minute, shining, yellow glands; lateral nerves about 8 on each side of the midrib, prominent, the reticulations distinct; petioles 2 to 6 cm long, densely hirsute. Panicles terminal, few-flowered, 10 cm long or less, peduncled, all parts rather densely covered with dark-purple, crisped, spreading hairs, the bracts linear, 1 cm long or less, the bracteoles similar, smaller. Flowers white. Calyx somewhat inflated, oblong-ovoid, 1 cm long, at anthesis about 8 mm in diameter, the lobes lanceolate, acuminate, about 8 mm long. Corolla-tube cylindric, 2 cm long, 2 mm in diameter, glabrous below, above with scattered hairs, the lobes spreading, elliptic to obovate, rounded, 8 to 9 mm long, outside sparingly hirsute. Exserted parts of the filaments as long as the corolla-lobes.

LEYTE, Jaro, C. A. Wenzel 627, March 12, 1914, in forests, altitude about 500 meters.

A species allied to *Clerodendron cumingianum* Schauer, but with an open, few-flowered panicle, distinctly larger calyx which is covered with dark-purple crisped hairs, and the corolla-tube less than twice as long as the calyx.

GESNERIACEAE

CYRTANDRA Forster

CYRTANDRA WENZELII sp. nov. § *Polynesiae*.

Frutex 2 m altus subtus foliis ramulis junioribus inflorescentisque fusco- vel ferrugineo-tomentosus; foliis oblongo-lanceolatis, in paribus subaequalibus, usque ad 8 cm longis, utrinque

angustatis, acuminatis, margine irregulariter undulato-dentatis vel subintegris, nervis utrinque 5 vel 6, subtus valde prominentibus; inflorescentiis axillaribus, pedunculatis, bracteatis, 3-floris, floribus circiter 3 cm longis, calycis lobis longe caudato-acuminatis.

A shrub about 2 m high, closely allied to *Cyrtandra curranii* Kränzl., from which it differs in its much smaller leaves. Branches gray, subterete, glabrous, the younger ones, the lower surface of the leaves, and the inflorescence prominently brown or ferruginous-tomentose. Leaves in equal pairs or one of each pair somewhat smaller than the other, oblong-lanceolate, firmly chartaceous, 5 to 8 cm long, 1.3 to 3 cm wide, subequally narrowed to the acute base and to the acuminate apex, margins obscurely undulate-toothed or subentire, the upper surface dark-colored when dry, glabrous, the lower surface with dark-brown nerves and primary reticulations; petioles 5 to 10 mm long. Inflorescence axillary, ferruginous-tomentose, 3-flowered, but one flower developing at a time or the two lateral ones imperfect, the peduncles about 1.5 cm long, dark-brown, pubescent, the bracts ovate, tomentose, about 12 mm long, prominently acuminate. Flowers white, about 3 cm long. Calyx tomentose, 2 to 2.3 cm long, inflated, the lobes lanceolate, long and slenderly caudate-acuminate, tomentose, 1.5 to 1.7 cm long. Corolla 3 to 3.2 cm long, the lower 9 mm cylindric, 3 mm in diameter, then rather abruptly inflated, the larger lobes suborbicular, about 1 cm in diameter. Disk cylindric, glabrous, truncate, 2 mm high. Filaments 9 mm long, the connective glandular; anthers 2 mm long. Ovary densely tomentose; style prominently capitate-glandular; stigma 2-cleft. Young fruit narrowly ovoid, 1 cm long, hirsute.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 665, May 15, 1914, in forests, altitude about 500 meters.

Closely allied to *Cyrtandra curranii* Kränzl. which it much resembles, differing in its much smaller leaves and smaller flowers.

RUBIACEAE

NAUCLEA Linnaeus

NAUCLEA WENZELII sp. nov.

Species valde peculiaris, foliis subtus ad nervos ramulis junioribus pedunculisque pubescentibus, floribus 6-meris, calycis lobis aciculatis, 2 mm longis, persistentibus; frutex 5 m altus, myrmecophilus; foliis coriaceis, late ellipticis ad obovatis, usque ad 17 cm longis, abrupte subcaudato acuminatis, nervis utrinque circiter 8, cum reticulis valde prominentibus; capitulis solitariis, globosis, circiter 3 cm diametro.

A shrub about 5 m high, the younger branchlets, the peduncles, and the lower surfaces of the leaves more or less pubescent. Branches terete, pale-gray, sometimes compressed at the nodes, the uppermost internodes sometimes hollow, perforated, somewhat enlarged, and the abode of ants. Leaves coriaceous, broadly elliptic to obovate, 13 to 17 cm long, 8 to 12 cm wide, brownish-olivaceous, shining, the upper surface glabrous, with prominently impressed nerves and reticulations, the lower surface pubescent with scattered hairs, apex abruptly caudate-acuminate, the acumens obtuse, 1.5 to 2 cm long, rather slender, the base acute or abruptly decurrent-acuminate; lateral nerves about 8 on each side of the midrib, very prominent as are the primary reticulations; petioles stout, 1.5 to 2 cm long. Heads terminal, solitary, their peduncles 3 to 4 cm long, prominently brown-pubescent, the heads in anthesis and in fruit globose, about 5 cm in diameter, the heads of persistent calyces after the corollas have fallen 1.5 cm in diameter. Calyx tube about 3 mm long, with 6 linear-acicular, acuminate, stiff, persistent, 2 mm long lobes. Corolla white, glabrous, 11 mm long, the tube very slender, widened in the upper part, the lobes 6, pubescent, oblong, obtuse, 2 mm long. Style 2 cm long; stigma globose, 1 mm in diameter. Capsules 6 mm long, apices pubescent. Seeds numerous, including the two lacinate wings, nearly 3 mm long. Bracts of the heads on the peduncles at or below the middle, brown, broadly ovate, obtuse, 1.5 cm long.

LEYTE, Dagami, C. A. Wenzel 348, July 10, 1913, in forests, altitude about 60 meters.

A most striking species, well characterized by its very prominently nerved and reticulate leaves, in this character differing from all Philippine species, in its somewhat pubescent leaves and its pubescent peduncles, and especially in its 6-merous, not 5-merous flowers, it being the only species of the genus known to me with 6-merous flowers. In its seed characters it is also aberrant in *Nauclea*, both wings being lacinate.

PLECTRONIA Linnaeus

PLECTRONIA WENZELII sp. nov.

Arbor circiter 17 m alta, *P. monstrosae* similis et affinis, differt subtus foliis inflorescentisque parce pubescentibus, nervis lateralibus magis numerosis, utrinque circiter 8.

A tree about 17 m high, nearly glabrous except the sparingly pubescent lower surfaces of the leaves and the more distinctly pubescent inflorescences. Branches terete, reddish-brown, smooth, glabrous, the branchlets usually somewhat compressed at the nodes, very slightly pubescent with scattered hairs. Leaves membranaceous, 12 to 15 cm long, 6 to 8 cm wide, elliptic-

ovate to oblong-ovate, rather dull when dry, pale-olivaceous, nearly uniform in color on both surfaces, acuminate, base rounded, the upper surface glabrous, the lower with few, scattered, deciduous hairs; lateral nerves about 8 on each side of the midrib, prominent, the reticulations lax; petioles about 1 cm long; stipules early deciduous (not seen). Cymes axillary, solitary, up to 5 cm long, dichotomously branched, many-flowered, distinctly pubescent. Flowers white, their pedicels pubescent, 2 to 3.5 mm long. Calyx between cup-shaped and urceolate, 2 mm long and wide, the tube pubescent, the limb thin, produced, obscurely 5-toothed. Corolla-tube 2.5 mm long, the lobes 5, oblong-ovate, somewhat acuminate, 4 mm long, obscurely glandular-punctate with elongated dashes, the throat villous. Anthers sessile, 2.5 mm long. Style about 3 mm long; stigma ellipsoid, 1.8 mm long.

LEYTE, Dagami, C. A. Wenzel 399, August 30, 1913, in forests, altitude about 60 meters.

A species similar to and manifestly closely allied to *Plectronia monstrosa* Rich., from which it differs in its pubescent cymes and slightly pubescent leaves, and in its more numerous lateral nerves.

TIMONIUS DeCandolle

TIMONIUS TRICHOPHORUS sp. nov.

Arbor parva subtus foliis petiolis ramulis junioribus inflorescentiis valde ciliato-hirsutis; foliis chartaceis, usque ad 12 cm longis, obovatis, obtusis ad rotundatis, basi angustatis, acutis vel obtusis, nervis utrinque circiter 10, prominentibus; inflorescentiis axillaribus, tenuibus, solitariis, circiter 4 cm longis, longe pedunculatis, furcatis, floribus spicatum dispositis, inflorescentiis sub fructu valde elongatis.

A tree about 7 m high, prominently ciliate-hirsute with long, spreading, pale or brownish hairs. Branches terete, glabrous, brown, the branchlets, petioles, inflorescence, and lower surfaces of the leaves, especially on the midrib and lateral nerves, prominently ciliate-hirsute. Leaves obovate, chartaceous, 6 to 12 cm long, 5 to 9 cm wide, shining, the lower surface paler than the upper, apex obtuse to rounded, narrowed below to the acute or obtuse base; lateral nerves about 10 on each side of the midrib, prominent; petioles very densely ciliate-hirsute, 8 to 15 mm long. Inflorescence axillary, slender, about 4 cm long, the slender peduncles in anthesis about 2 cm long, densely hirsute, bearing at the apex two divaricate branches 2 cm long or less, these branches bearing a series of short pedicelled flowers along the upper side, pedicels and calyx very densely ciliate-hirsute with

long, spreading, pale hairs. Calyx truncate, about 3.5 mm long. Inflorescence elongated, slender, the peduncles up to 4 cm long, the branches nearly as long, slender. Fruits ovoid or somewhat ellipsoid, about 6 mm long, apparently somewhat fleshy when fresh, somewhat longitudinally striate or sulcate, with few scattered hairs, the apex very densely hirsute, 15- to 20-celled.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 994, June 13, 1914, in forests, altitude about 500 m.

A species strongly characterized by its numerous, long, spreading, pale or brownish, ciliate-hirsute hairs. It is entirely different, in this character, from all other Philippine species known to me.

WILLIAMSLIA Merrill

WILLIAMSLIA CAUDATA sp. nov.

Frutex 2 ad 3 m altus, glaber; foliis usque ad 15 cm longis, lanceolatis vel oblongo-lanceolatis, valde caudato-acuminatis, basi obtusis ad rotundatis, chartaceis vel subcoriaceis, nervis utrinque 10 ad 12, valde prominentibus; floribus solitariis, axillaribus, sessilibus; calycibus circiter 5 mm longis, 4- vel 5- dentatis; petalis 6, patulis vel subreflexis, lanceolatis, 5 mm longis.

A shrub 2 to 3 m high, entirely glabrous except for the throat of the corolla and for few scattered hairs on the calyx and stipules. Branches terete, brown or olivaceous, rather slender, the young branchlets usually verruculose when dry, greenish. Leaves lanceolate to oblong-lanceolate, chartaceous to subcoriaceous, 10 to 15 cm long, 3 to 6 cm wide, gradually narrowed upward to the long and slender caudate-acuminate apex, base rounded to obtuse, when dry pale or pale-greenish, somewhat shining; lateral nerves 10 to 12 on each side of the midrib, very prominent on the lower surface, curved-ascending, anastomosing; petioles 1 to 1.5 cm long; stipules linear to linear-oblong, 1.5 to 2 cm long, blunt. Flowers white, sessile, axillary, solitary, 6-merous, the basal involucres two, the upper one much larger than the lower and as wide as the calyx cup-shaped to somewhat urceolate, about 5 mm long, with 4 or 5 broad teeth. Throat of the corolla densely villous; petals spreading or somewhat reflexed, lanceolate, acuminate, about 8 mm long. Immature fruits glabrous, ovoid-urceolate, about 8 mm long.

LEYTE, Buenavista, near Jaro, C. A. Wenzel 686, May 18, 1914 (type); also Wenzel 7, June, 1913, from near Dagami. In forests, altitude 60 to 500 meters.

Closely allied to *Williamsia sablanensis* (Elm.) Merr., with which species Wenzel 7 was previously identified. The leaves, however, are very different in shape, prominently caudate-acuminate, and the flowers are 6-merous.

[Vol. IX, No. 3, including pages 191 to 292, was issued June 27, 1914.]

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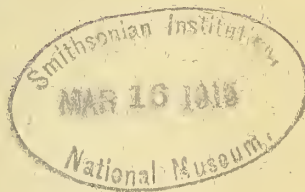
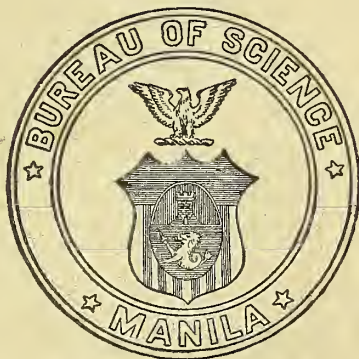
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C. BOTANY

VOL. IX

SEPTEMBER, 1914

No. 5

THE PIONEER VEGETATION OF TAAL VOLCANO

By FRANK C. GATES

*(From the College of Agriculture, University of the Philippines,
Los Baños, P. I.)*

Eight plates

INTRODUCTION

The classic illustration of the redevelopment of vegetation on volcanic islands is of course Krakatoa. This island has been visited by various botanists during the thirty years since its last eruption, so that the history of its vegetation is well known. While Taal may offer less of interest than does Krakatoa, it is important because of the short lapse of time since its latest eruption and because of its ready accessibility.

Taal Volcano is a low mountain, rising from the middle of Bombon Lake in longitude $120^{\circ} 59'$ east and latitude $14^{\circ} 2'$ north. Bombon Lake, frequently called Taal Lake, occupies a basin about 22 kilometers long and 14 kilometers wide, in Batangas Province, Luzon, and is some 63 kilometers south of the city of Manila. Near the middle of the lake are a few islands, mostly of very small size. The largest of these islands, known as Volcano Island or Taal Island, is about 7 kilometers long and 5.5 kilometers wide. It is the location of the active crater of the volcano. The surface of the island is very rugged and the active erosion is rapidly making it more so. In addition to the large crater in the center of the island smaller craters are present around it.

The latest eruption of Taal culminated on January 30, 1911, and resulted in the entire destruction of the villages on the



island as well as some of those on the mainland, with a loss of about 1,400 lives. Ashes, pumice, small stones, and acid vapors were thrown across the lake to the mainland, devastating the country to the west and southwest of the volcano. Ashes were thrown over large areas of surrounding country, resulting in the defoliation of the vegetation not otherwise affected. Several illustrated accounts of this eruption have been published.¹

Since the disaster of 1911, residence on the island has been forbidden. It is visited regularly, however, by the Filipino fishermen of the neighboring shores and frequently has been explored by tourists. The new vegetation has been virtually uninfluenced by man and is still in virgin condition.

From the summit of Mount Maquiling, at an altitude of 1,010 meters, 34 kilometers to the northeast, no evidence of vegetation was apparent in September, 1912, but a year later the uniform ashy color was relieved by areas of grayish green in the apparent center of the island and extending in tongues from the shore toward the crater rim.

Knowing that the original vegetation was destroyed, it is of considerable interest to place on record an account of its condition after three years of development. The following trips were made to the volcano: October 24–26, 1913, in company with Dr. H. A. Gleason and Mr. B. E. Quick, then visiting from the University of Michigan, and Mr. J. C. Rundles of the College of Agriculture, by way of Bañadero; December 19–23, 1913, in company with E. Quisumbing, V. Sulit, and A. Damo, students of the College of Agriculture, as collectors, by way of Pansipit; and April 17–22, 1914, with E. Quisumbing, N. Catalan, and V. Sulit by way of Bañadero.

Mainland vegetation.—The rain of ashes and stones, the presence of acid vapors, as well as the mechanical effect of the rush of wind and of tidal waves, all combined to kill the vegetation to the ground over wide areas. This was most severe on the western and southern sides of Bombon Lake and least so on the northeastern side.² In the latter place defoliation was the most prominent result. The vegetation which has since developed, although largely pioneer and rather poor in species, is

¹ Saderra Masó, Miguel. The Eruption of Taal Volcano, January 30, 1911. Weather Bureau, Manila (1911) 1–45, Pls. I–VII. English and Spanish.—Pratt, Wallace E. Philip. Journ. Sci. 6 (1911) Sec. A 63–85, Pls. I–XIV, figs. 1–3.—Martin, Charles. Philip. Journ. Sci. 6 (1911) Sec. A 87–91, Pls. I–VII.—Worcester, Dean C. National Geographic Magazine 23 (1912) 313–367.

² See the map in article by Worcester, cited in footnote 1.

more diverse than that of the island. Around the shore are the customary swamp and strand associations, followed by parang³ shrubs, particularly *Acacia farnesiana*,⁴ and later by a number of trees. Near the shore, especially on the south and west, are large groves of bamboo.

TAAL ISLAND

In October, 1913, the volcano island, itself, was not devoid of vegetation, but vegetation was very restricted, occurring only near the shore and part way up some of the slopes.

The physiography of the main body of the island is of unusual interest. As it is entirely covered with a deposit of loose ashes and mud and is unprotected by a covering of vegetation, the heavy tropical rains, which amount to from 1,750 to 2,000 mm per year, run off with great rapidity. The amount and diversity of erosion is enormous. The formation of sharp drainage systems, the development of gorges, and the deposition of fans and deltas have proceeded to a remarkable degree. The steeper slopes of the ridges are scarred with small vertical fissures, which quickly concentrate the rain water in the valleys below. In rushing to the lake the rain water scours out deep cañons. Of a number of these cañons that were explored the following account, taken from a letter written by Doctor Gleason, is typical:

Beginning as a narrow channel about a meter wide and deep, with flat bottom and vertical sides, it followed a sinuous course for over a kilometer to its mouth. As small lateral tributaries joined it, it increased in size until it became 50 meters wide with vertical turreted walls, 25 meters high. At intervals the depth is suddenly increased by abrupt drops of 1 to 4 meters, and there the cañon walls may approach each other until one's shoulders touch both sides as he passes through. It is noteworthy that in such places the width of the cañon is always greatest at the bottom, indicating a rapid growth of the stream system. At the mouth of such a system it broadens out into a huge fan, in some cases half a kilometer across, piled with boulders at its head, with smaller debris in the middle, while at the lake shore the deposits are of sand, fine gravel and pumice.

There are scores of such embryonic river systems, large and small, on the island. The inner face of the crater is similarly eroded.

Between the drainage channels, which are perfectly dry ex-

³ A local Philippine term indicating thickets and second growth forests.

⁴ The identifications of the seed plants were either made or verified by Mr. E. D. Merrill, botanist in the Bureau of Science, Manila, P. I.; those of the ferns by Dr. E. B. Copeland of the College of Agriculture, Los Baños, P. I.

cept during rains, the ridges may rise as high as 150 meters. They are covered with ash and mud, although in many places the erosion has uncovered the original soil or has exposed layers of coarse cinders or rock.

The active crater is in the center of the island. It is about 2.3 kilometers long and 1.7 kilometers wide at the top. More than half of the bottom is occupied by a lake, whose elevation is about 2.5 meters above sea level, the same as that of the surrounding Lake Bombon. The water of the crater lake is clear, although dark colored, and salty. Its temperature decreased from about 37° C. in October, 1913, to about 32° in April, 1914. Swimming in it, although much like salt water bathing, was of course more exciting. Very little steam, if any, arose from the lake in either October or December, 1913, but in April, 1914, some steam was noticed arising from a few places along the shore of the lake, as well as from small vents in the north crater wall, both inside and outside the crater. From certain points on the crater rim sulphurous odors are noticeable, but none were detected in the bottom of the crater. Steep precipitous walls formed the boundary of the crater on all sides. At the foot of the walls, especially on the east side, large quantities of ash and mud have been washed down and have accumulated. The crater rim is highest on the south and north sides with altitudes of 304 and 230 meters, respectively. Nearly all of the west side is low, the minimum elevation being about 95 meters. There are other low points on the east side.

Radiating from the crater rim are steep ridges. The slopes are about as steep as ashes can maintain. This is steeper than in sand dunes, on account of the adhesive properties of some of the constituents of the ash. At the corners of the island are peaks, which were former centers of eruptive activity, in the case of Mount Binintiang Malaki, as late as 1707.

Previous to the eruption of 1911, the region outside of the crater was vegetated from the strand to the rim of the crater. The vegetation could all be summed up as trees, parang, grassland, and culture in various combinations. Some trees over 75 cm in diameter were present even on the crater slope. Within the crater a tree of *Ficus indica* was present. A number of barrios were located along the shore, particularly in the northern part of the island and in their vicinity a number of cultivated plants are even yet to be found.

During the eruption of 1911 the ground was entirely denuded of vegetation, virtually all of which was completely destroyed.

In a very limited number of well protected places the root systems of a very few plants escaped death.

With so thorough a sterilization of the soil, before vegetation could reappear the excess of acid had to be leached out of the soil and seeding accomplished. How much or how soon seeding took place is not known, but no vegetation appeared during the dry season immediately after the eruption. During the first rainy season the protected parts of the northeastern and northwestern areas began to recover. A few stumps sprouted and various seeds grew, producing a heterogeneous mixture in which tree species soon became dominant.

Vegetation began to make its appearance in earnest, on the island as a whole, in the rainy season of 1912. In the extreme southern and in the northern parts, the strand became inhabited first with *Ipomoea pes-caprae* and a little later often also with *Canavalia lineata*. Later in the same rainy season, grass sprang up over wide areas on the north slope above the shore and extending upward to about 150 meters. The grass appeared over most of the area at about the same time, and with no opposition, rapidly became established and spread in all directions. Not long after, shrubs and trees, particularly those distributed by birds, made their appearance in isolated spots and spread rapidly both with and into the grass.

By December, 1913, vegetation was quite well established on the northern side of the island to an altitude of about 175 meters. It consisted largely of grass—entirely dense at lower altitudes, but thinning and opening out above—parang, and trees. Over most of the vegetated areas parang was at least incipiently present, but in the northeastern and the northwestern regions it was best developed and had already driven out a considerable amount of grass. At this time there were no plants within the crater and but one very small patch at a place on the rim. At the southern end of the island, the strand was fairly well developed. Grass and a little parang were present on Mount Binintiang Munti; but between it and the crater, as well as in the eastern and the western parts of the island, the ground was without vegetation.

By April of the following year great strides were visible in the vegetation. On the northern slope virtually all of the ground except the crests of ridges and the bottoms of the valleys was vegetated. The proportion as well as the distribution of parang and trees had materially increased. Grass had continued its invasion to the crater rim. Although not yet abund-

ant, its presence on the rim and below it inside the crater demonstrated that it could live there. To the northeast and to the northwest trees and parang were rapidly gaining over the grass. At the southern end of the island both grass and parang had spread, although they were far from being dense or widely distributed. Eastward and westward of the crater, vegetation had put in an appearance and was very sparingly present near the shore on the sides of gullies.

Bananas were present in October, 1913, in the vicinity of the former towns, Pirapiraso and Binintiang, and by the following April were becoming abundant and spreading, while other cultivated plants had appeared in isolated patches. In October, 1913, a few clumps of bamboo were present in some of the ravines on both sides of Mount Pirapiraso in the northeastern region. They were slightly more abundant in December, but by April, 1914, they had increased considerably in size and were reappearing in other localities both in the northeastern and northwestern regions.

It is logical to expect that this development will go on, faster on the northern than on the southern sides, until the slopes are covered with vegetation, characteristically by trees and shrubs on the sides of ridges, while the crest is more likely to be occupied with grass, at least for some time to come, although ultimately even the crests should become forested. The development of the standard dipterocarp forest for these altitudes in this region is possible, although very improbable, for accidents in the shape of eruptions are likely to intervene before it has had a sufficiently long time to develop. Dipterocarps are present on Mount Maquiling, 34 kilometers to the northeast, but seeding takes place during the southwest winds. Even during a typhoon in June, 1914, dipterocarp seeds were carried less than 0.5 kilometer from a parent tree on the grounds of the College of Agriculture.

REGIONAL DESCRIPTION

Mount Binintiang Munti, a low peak at the extreme southern end of Taal Island, is characterized by abundant rock outcrop. Very round-crested steep ridges of what appears to be cooled lava extend into the lake. The vegetation of the crests of these ridges is very similar to that of the strand, even at elevations considerably above lake level. Long runners of *Ipomoea pes-caprae* spread over the crest of the ridge and extend upward to elevations greater than 25 meters. While *Canavalia lineata* is not absent, it is conspicuously less abundant. *Wedelia biflora* and *Vernonia cinerea*, a weed, occasionally are present. At

the water front the lake has cut back the ridges so that steep bluffs, exhibiting tilted strata, are very prominent. The faces of these bluffs are quite generally plantless, except as vines may hang over from the top. Between the ridges, steep narrow gullies have been worn down to the lake where they may form pockets. In December, 1913, the sides of most of these gullies were vegetated with coarse grasses, *Saccharum spontaneum* and *Themeda gigantea*, sometimes present in sufficient quantity to form a nearly closed stand. On steeper slopes were isolated bunches of *Themeda*. A few common weeds were present in interstices in the grass areas, while the coming of parang or wooded conditions was heralded by the presence of a few clumps of *Ficus indica* and of *Tabernaemontana subglobosa* just below the crests of ridges. By April, 1914, the density had greatly increased and *Antidesma rostratum* and *Eugenia jambolana* had put in their appearance.

The vegetation of the pockets next to the lake was characteristically a jumble of convolvulaceous vines, together with *Momordica ovata* and *Canavalia lineata*. With these vines there might also be a few weeds. Where the beach had been built up as a spit in front of the bluffs, *Ipomoea pes-caprae* extends from the pockets and occupies a normal strand position. Very rarely does this *Ipomoea* respond to the encroaching grass by growing up into it as other convolvulaceous vines generally do.

On the north side, this peak is a high point in a rim which nearly surrounds a shallow basin, which except for a dozen clumps of *Saccharum* and two stools of *Themeda* is plantless; the slopes are essentially so, a few clumps of *Saccharum* and an occasional shrub of *Ficus indica* or *Psidium guajava* at the heads of small gullies, representing the progress in revegetation.

Mount Binintiang Munti is connected with the main body of Taal Island by a wide peninsula, across which is placed Mount Saluyan, a short ridge somewhat over 50 meters high. On its moderately gullied sides were relatively very few plants in October, 1913—*Saccharum spontaneum*, *Acacia farnesiana*, and *Ficus indica*. Their density was noticeably increased by the following April, by which time *Tabernaemontana subglobosa* and *Morinda bracteata* had also appeared. On the side away from the volcano are a few stumps of large trees, blown over and buried, but now being exposed as the mud is being washed away.

North of this ridge is the outlet valley of a basin, separated from the crater by a razor-back part of the rim and bordered by steep ridges. A lake may be present during a rainy period.

Many colored rocks are strewn over the floor. The presence of a few dead stumps indicates a former vegetation, but at present the basin is plantless.

Near the shore of Bombon Lake were a few strand plants and a little farther back an occasional clump of *Saccharum spontaneum*. By April, 1914, the strand flora and especially the flora of the area just back of the strand showed increased development. In addition to *Saccharum*, there were shrubs as follows: *Acacia farnesiana* (1), *Tabernaemontana subglobosa* (several), *Ficus indica* (several), *Wendlandia luzoniensis* (1), *Morinda bracteata* (very few), *Semecarpus cuneiformis* (1), and a hemiparasitic vine, *Cassytha filiformis*.

In December, 1913, the whole slope east and southeast of the crater was plantless, presenting a gully-worn rugged surface from the rim of the crater to the lake. By April, 1914, however, a number of plants were established on the strand and extended a short way up the sides of the gullies. On the strand was *Ipomoea pes-caprae* and back of it, in addition to the clumps of *Saccharum*, were *Ficus indica* (several), *Acacia farnesiana* (several), *Tabernaemontana subglobosa* (several), *Pandanus tectorius* (2), *Eugenia jambolana* (2), *Trema amboinensis* (1), and a vine, *Rourea erecta* (1). Higher were a few clumps of *Saccharum*, well scattered to be sure, but exhibiting considerable advance over the four months previous. As yet shrubs were not present, and the upper slopes to the very rim of the crater were plantless.

Northeastward from the crater runs a depression between two high ridges. In December, 1913, this valley as well as the ridge on each side was plantless. A narrow precipitous divide separates this valley from a basin 75 meters below. On this divide in December, 1913, were a few well scattered plants, including *Saccharum spontaneum*, *Themeda gigantea*, *Ficus indica*, and two clumps of *Pandanus tectorius*. By April, 1914, considerable plant development had taken place. On the ridges, particularly the western one, Mount Pinag-Ulbuan, there were a number of plants, some being present clear to the summit (250 meters). There were more grasses in point of number of individuals, but most of the vegetational appearance was given by the shrubs, *Ficus indica*, *Morinda bracteata*, *Wendlandia luzoniensis*, and *Acacia farnesiana*.

The basin, formerly an eruptive center, is now the flat bed of a lake during the rainy season. With the exception of a very few bunches of *Saccharum* it was plantless. The walls have but little vegetation. It consists of bunches of *Saccharum* with

a few bushes of *Ficus indica* and *Morinda bracteata*; and, on rock ledges near the basin level, some ferns, *Onychium siliculosum* and *Pteris longifolia*, and a few plants of *Vandellia crustacea*.

North of this crater and north of Mount Pinag-Ulbuan is a valley in which the work of erosion is very strikingly well developed. Except the deltal fan at the lake, the floor of the valley is plantless. On its southern slope, which is an outside slope of the crater, the vegetation was very sparse in December, 1913, and reached only one-third of the way to the crater rim. By April, 1914, the vegetation, although by no means dense, was more abundant and extended clear to the rim of the crater. Clumps of *Saccharum*, but particularly, scattered bushes of *Acacia farnesiana*, *Ficus indica*, *Morinda bracteata*, *Trema amboinensis*, *Tabernaemontana subglobosa*, and *Wendlandia luzoniensis*, gave a characteristic appearance, which is shown in Plate VII, fig. 1.

Toward the north, vegetation on Mount Mataas-na-golod consisted nearly entirely of *Saccharum* in October, 1913, in clumps about two-thirds of the way to the top. By December it had reached the top, but still was not dense except at low elevations. By April, 1914, the entire western, eastern, and northern slopes of this peak were covered with a closed stand of *Saccharum*, except the very crest which was largely bare. On its southern slope *Saccharum* was by all odds the characteristic plant, but there it did not begin to occupy nearly all of the available space. Shrub and even tree invasion into the *Saccharum* was progressing rapidly, especially on the north and northeast sides. The more conspicuous were *Acacia farnesiana*, *Antidesma ghesaembilla*, *Psidium guajava*, *Wrightia laniti*, *Cordia myxa*, *Tabernaemontana subglobosa*, *Macaranga tanarius*, *Bridelia stipularis*, *Ficus nervosa*, *Albizia procera*, and *Callicarpa blancoi*. A few convolvulaceous vines were represented but *Momordica ovata* was more commonly present.

Between Mount Mataas-na-golod and Mount Ragatan, farther to the northeast, is a long divide, with its steeper slope toward the south. This slope was rather densely vegetated with grass and invading parang, which is true of the whole of Mount Ragatan. South of this, on the deltal flat mentioned above, vegetation was very scanty, consisting of a few clumps of *Saccharum* on higher places in the flat and the regular strand plants near Lake Bombon.

A long, rather low divide extended northeastward from Mount Ragatan to Mount Bignay. All of this region, which may

be called the Northeast Cape, is vegetated, mostly with rather dense vegetation, the densest at present on the island. The divide between the former towns, Pirapiraso and Bignay, is covered with two grasses, *Imperata cylindrica koenigii* and *Saccharum spontaneum*. This grass vegetation continues up the crests of ridges to the peaks. The valleys or gullies and the steeper slopes in general are more likely to be vegetated with parang with the tree species quite well developed. A few of the commoner species are: *Trema amboinensis*, *Pithecolobium dulce*, *Bridelia stipularis*, *Cordia myxa*, *Casearia cinerea*, *Acacia farnesiana*, *Macaranga tanarius*, *Wrightia laniti*, *Tabernaemontana subglobosa*, *Callicarpa blancoi*, *Ficus hauili*, *Mallotus moluccanus*, *Melicope triphylla*, *Allaeanthus luzonicus*, *Moringa oleifera*, *Litsea glutinosa*, *Alstonia scholaris*, *Ficus ulmifolia*, and *Streblus asper* among the shrubs and trees; *Dioscorea luzonensis*, *Dioscorea bulbifera*, *Streptocaulon baumii*, *Momordica ovata*, *Lygodium japonicum*, *Abrus precatorius*, *Tournefortia sarmentosa*, *Rourea erecta*, and *Celastrus paniculata* among the vines; and a few herbaceous weeds, such as *Synedrella nodiflora*, *Erigeron linifolius*, *Triumfetta bartramia*, *Ageratum conyzoides*, and *Ricinus communis*. In some of the ravines on the west, but particularly on the east, sides of Mounts Pirapiraso and Bignay clumps of bamboo, *Bambusa blumeana*, were present in October, 1913, but became much more abundant by April, 1914.

Successions are going on rapidly and the grass is as rapidly being driven from the crests of the ridges by the invading parang and trees. The northeast slopes are steep, but are well wooded, having the highest genetic development found on the island. At the shore the ridges terminate in bluffs. With the sinking of the shore during the eruption many trees became partially submerged. Their tops had been torn away by the force of the eruption and the jagged stumps have been the germinating ground of several bird-distributed seeds of both *Ficus indica* and *Macaranga tanarius*. The flats between the bluffs are largely *Phragmites*-swamps, now badly overgrown with vines and rapidly giving way to woody plants. A hemiparasite, *Cassytha filiformis*, in some places along the shore completely loads down the *Phragmites*. Below in the shade its stems are green, but in the sunlight they are a typical *Cuscuta*-yellow.

The northern slope of Mount Ragatan is very largely parang with a large admixture of grass. The region back of the bay has a strand flora, quite diversified in species, including *Ipomoea pes-caprae*, *Canavalia ensiformis*, *Canavalia lineata*, *Vigna lutea*,

Ipomoea triloba, *Ipomoea pes-tigridis*, *Wedelia biflora*, besides many weeds, *Ricinus communis*, *Heliotropium indicum*, *Vernonia cinerea*, *Bulbostylis barbata*, *Datura alba*, and *Scoparia dulcis*. Back of this is a widespread *Phragmites* association, developed above the level of the lake and rapidly being invaded by shrubs, *Acacia farnesiana* and *Gliricidia sepium*, as well as by the grass *Saccharum*. Farther back the vegetation is largely grass with invading shrubs. When the slope begins to be pronounced the amount of grass is much less in proportion to the amount of woody vegetation. At the foot of the slope are a number of bananas, relics of former cultivation.

West from Mount Mataas-na-golod to Mount Balantoc is the north central region, an area essentially vegetated with grass, nearly all of which is *Saccharum spontaneum*, into which many shrubs and vines have already come and are rapidly becoming more numerous, so much so that many ridges which in October, 1913, were apparently nothing but grass, in April of the following year presented a very decided shrubby appearance. Two large deltal flats occur in this part of the island, both of them sparingly vegetated with the *Phragmites* association. The development of the strand is very poor, but considerable débris, together with algae, *Vallisneria*, *Pistia*, and *Ceratophyllum*, is continually washed up during the northeast monsoon. In October, 1913, the vegetation in this region had spread only about two-thirds of the way to the crater rim and was very scattered above one-half way up. By December, in addition to the clumps of *Saccharum* found at one spot on the crater rim, there were other clumps near the rim and the vegetation was denser. By April, 1914, there were a considerable number of scattered clumps of *Saccharum* on the outer slope clear to the rim. Clumps were frequent above two-thirds of the way up (125 meters). Lower down the clumps had become so close that they gave the appearance of closed vegetation which shrubs and trees were rapidly invading. In this region was found a single palm tree, *Arenga*, and the uncommon moraceous *Artocarpus nitida*.

The north and northeast slopes of Mount Balantoc were largely wooded, although plenty of grass, here *Themeda gigantea*, was mixed with the woody species. The slopes terminate at the lake in abrupt bluffs, which are rapidly being eroded by the lake. The sinking of the coast has given the lake a better chance to eat away the bluffs. The vegetation of the eroding bluffs is essentially of trees; that of the face is virtually nil; while at

the bottom it is very heterogeneous, here frequently existing where it has fallen only until the next typhoon. Some strand plants are found in pockets at the shore and some wet ground beach and meadow plants, such as, *Panicum repens*, *Cynodon dactylon*, and *Wedelia biflora*, seem to be flourishing in spite of the general unfavorable habitat.

Mount Balantoc is a large horseshoe-shaped ridge, highest (125 meters) farthest east, lying between Mount Binintiang Malaki and the crater. On the side exposed to the violence of the eruption, the vegetation at the present time is largely grass with a few shrubs, such as, *Acacia farnesiana*, *Cordia myxa*, *Trema amboinensis*, and *Tabernaemontana subglobosa*. Where not so exposed, the vegetation consists largely of vines, *Strep-tocaulon baumii*, *Momordica ovata*, *Celastrus paniculata*, in addition to convolvulaceous ones; shrubs and small trees, such as *Cordia myxa*, *Albizzia procera*, *Tabernaemontana subglobosa*, *Acacia farnesiana*, *Trema amboinensis*, *Eugenia jambolana*, *Psidium guajava*, *Macaranga tanarius* and *Antidesma ghesaembilla*; with rather a small amount of grass in the open places. On the crest of the ridge are a number of dead trees, blown over and pointing away from the crater. This is particularly noticeable on the northern side of the horseshoe. A meager representation of the weed association, containing *Erigeron linifolius*, *Ageratum conyzoides*, *Pterocaulon cylindrostachyum*, and *Waltheria americana*, may also be present on the crest of the ridge.

Within the area thus partly encircled, the vegetation is fairly well developed and contains a number of fair-sized trees. In addition to the woody species mentioned above are *Semecarpus cuneiformis*, *Sterculia foetida*, *Oroxylum indicum*, *Casearia cinerea*, *Wrightia laniti*, and *Morinda bracteata* as well as several banana plants.

Forming the northwest corner of Taal Island is a peak, Mount Binintiang Malaki, whose summit, somewhat over 250 meters, is, with the exception of the southern part of the crater rim, the highest point on the island. The slopes of this peak are decidedly steep and are precipitous on the eastern side. With such steep slopes the gullies are relatively shallow. An arc-shaped ridge, of which the summit is the highest place, partly encloses a small basin, the former eruptive center. The soil of this peak differs from the rest of the island in being somewhat reddish. The occurrence of *Bulbostylis barbata*, *Vandellia pusilla*, *Polanisia viscosa*, and a species of *Oldenlandia*

around small flats on the back of the summit ridge is suggestive of the strand, although located far above it. Over the greater part of the slopes, and always on the steeper ones, a coarse grass, *Themeda gigantea*, with open well-spaced clumps gives the characteristic appearance. On the sides of the gullies, bushes may frequently be present and on the northwestern side, away from the crater, trees of *Sterculia foetida*, *Oroxylum indicum*, *Albizia procera*, *Acacia farnesiana*, *Pithecolobium dulce*, and *Wrightia laniti*, up to 4 or 5 meters in height, occur. The general vegetation is dense, especially nearer the level of Lake Bombon. A number of large tree trunks are strewn about on the northwestern side of the peak, which in the apparent absence of any (termites) still remain intact.

The low divide (30 meters) which separates this peak from one end of the horseshoe, Mount Balantoc, contains even now remnants of the effects of the eruption in the presence of overturned clumps of bamboo and the corner posts of houses. In October, 1913, but three clumps of bananas were seen in this part of the island and not even a single live clump of bamboo. In December, while no bamboos were seen, bananas were a little more plentiful and some were in fruit, but in April, 1914, bananas were fairly abundant and indicated quite well the positions of many of the former houses, while a number of clumps of bamboo had grown to nearly their normal height along two of the drainage channels not far from the former town, Panipihan.

To the west on the shore of Lake Bombon and at the foot of Mount Binintiang Malaki, the strand was rather well developed and a back strand association, *Sesbania*, was present.

Between Mount Balantoc and the crater there are two basins which almost merge into one. Before the last eruption these were two low craters whose bottoms were below sea level, but now they are filled to a higher level. Water is retained after each rain until it evaporates. The lakes are salty. Around them no living plants were found, although seeds were very abundant both along the shore and along the stream courses leading into them. The seeds of *Themeda gigantea*, *Saccharum spontaneum*, *Acacia farnesiana*, and *Streptocaulon baumii* were recognizable, and those of many other species were present. The region between these lakes and the crater was exceedingly scantily vegetated with very well scattered plants of *Saccharum spontaneum* and *Ficus indica* and with two clumps of *Miscanthus sinensis*.

The region to the west was plantless even to the shore in

December, 1913, but in April, 1914, there were beginnings of the development of the strand associations near the shore. A short distance from the water on the sides of two gullies were half a dozen clumps of *Saccharum*.

South of this, including all the land west of the crater clear to the shore, and southwest of the crater from a short distance south of the low ridge south of Mount Balantoc quite to the southwest corner, the land was plantless through December, 1913. Even by April, 1914, there was but the most meager representation of *Saccharum* in the vicinity of Gunao Point and near the shore south of Mount Tabaro. This was the region of severest devastation.

The walls of the crater in the center of the island are very steep, although seldom rising sheer from the bottom to the top. In many places strata are clearly shown, especially in wet weather. For geological treatment the reader is referred to Adams.⁵ The foot of the crater wall is everywhere hidden by the masses of ash and mud which have been washed down. The accumulation of this wash is considerable in the eastern part of the crater.

The rocky floor of the crater is plantless, as were also the walls through December, 1913, but in April, 1914, at several places on the north wall, especially on ledges within the crater rim even 15 meters from the top, were well developed clumps of *Saccharum*, perfectly normal as far as could be seen from the distance necessarily intervening. Lower on another rock ledge on the north crater wall was a bush of *Ficus indica*, apparently about 1 meter in radius. No other plants were found, but there were many swallows' nests and kingfishers were frequently seen. It is demonstrated that plants can grow inside the crater, although their present distribution is very limited.

THE STRUCTURE OF THE VEGETATION

Considering dynamic ecology more in detail, the revegetation of the island is proceeding along two main genetic lines, depending on the drainage of the soil. A dry ground genetic series revegetates the shore with strand plants; it revegetates the slopes first with grasses and later with shrubs and trees. The second revegetates the damp ground of low places with marsh plants, mostly herbaceous in nature. The associations belonging to the former series inhabit the ash slopes and the uplands in general, while those of the latter are limited to the low areas

⁵ Philip. Journ. Sci. 5 (1910) Sec. A 57-116.

near the lake and to some of the deltal flats at the ends of stream channels.

A third genetic series is very poorly represented in the waters of Lake Bombon surrounding the island.

THE AQUATIC GENETIC SERIES

This series in which aquatic plants tend to build up the bottom of a body of water is very poorly represented in the immediate vicinity of the volcano at the present day. Prior to the 1911 eruption it was present in the water around the island, particularly along the north coast. Along the coast of the mainland near Bañadero it is now plentiful and typical.

THE VALLISNERIA ASSOCIATION

The *Vallisneria* association, completely destroyed around the island by the eruption, reappeared within a year in the water along the western part of the north shore at the foot of bluffs. In December, 1913, the association was well represented along the coast at the foot of Mount Balantoc, by well-spaced, small, very red seedlings of *Vallisneria gigantea*. In most of the sheltered coves along the north shore, broken leaves of this species are washed up on the shore. Four months later, the patch of *Vallisneria* had increased materially in size and density. In it were a few plants of *Ceratophyllum demersum* and plants of a floating aroid, *Pistia stratiotes*, caught by their leaves in shallow water. At this time, there were cast upon the shore all along the north coast and about one-third way down the east coast quantities of *Vallisneria*, as well as plants of *Ceratophyllum*, *Pistia* and *Lemna*, and seeds of *Sterculia foetida*. The mechanical action of the water, however, was too great for the establishment of the association. A single small plant of *Jussieua repens*, a floating or rooted aquatic, was found in one of the sheltered bays.

The associations which normally succeed this are entirely lacking. The transition between associations of the aquatic series and the marsh or dryland series is as yet noncontiguous.

THE MARSH GENETIC SERIES

This series of associations, inhabiting wet ground in progressively drier stages to dry ground, is clearly indicated in a few places on the island, but nowhere is well developed. For the most part, it occurs at the mouths of deep ravines on deltal flats which are formed just behind the low narrow shore ridge pushed up by the waves or in coves along the faces of bluffs.

The ground is wet on account of its close proximity to the water table level of Lake Bombon. Later on, more associations may become established, but at present only the following can be satisfactorily recognized and none of them are particularly well developed:

THE CYNODON ASSOCIATION

This association of grasses, which grows along the shore, sometimes down into the water, is fairly well represented in a few places at the foot of bluffs in the western part of the north shore. It is sparingly present in the bays in the northeast region and is indicated in a few other places along the shores of the northern parts of the east and the west coasts.

With the dominant species, *Cynodon dactylon*, may occasionally be associated *Dactyloctenium aegyptium*, *Mariscus stuppeus*, and *Ricinus communis*, while to a limited extent *Panicum repens* and *Phragmites vulgaris* may be present as invaders.

THE PANICUM REPENS ASSOCIATION

At the foot of the bluffs on the north coast, sometimes projecting into the water, is a poor representation of this moist ground grass association. With it may occur *Wedelia biflora* and in one instance *Vernonia cinerea* and a few seedlings of *Muntingia calabura* were observed. This association is apparently not making much headway for it is subject to being washed away by the lake during storms, to being buried as a result of erosion of the bluffs, and to being shaded out of existence by *Phragmites* in flats or by shrubs at the foot of the bluff.

THE PHRAGMITES ASSOCIATION

This association of tall marsh grass is represented by plants of *Phragmites vulgaris*, openly disposed. Nowhere has the typical dense growth been attained. Very few plants are to be found associated with it where the ground is wet to the surface. This is probably due to the thorough control of the ground by the very extensive root system possessed by *Phragmites*. On slightly higher ground invasion into the fairly open above-ground growth of *Phragmites* is not difficult, as the abundance and diversity of species testifies. These are *Wedelia biflora*, *Ricinus communis* (many), *Ipomoea triloba*, *Portulaca oleracea*, *Canavalia ensiformis*, *Sida acuta*, *Triumfetta bartramia*, *Mariscus stuppeus*, and *Leucas javanica* as well as seedlings of *Trema amboinensis*, *Macaranga tanarius*, *Acacia farnesiana*, and *Muntingia calabura*. Long above-ground runners from plants of

Phragmites, radiating in all directions but particularly along the shore, are tending toward its rapid establishment, but the presence of seedlings of trees, undoubtedly established, bespeak the probable early elimination of the *Phragmites* association in these situations.

On the deltal flats, the individual plants of *Phragmites* are widely spaced, yet secondary species are so nearly absent that successional tendencies are hardly indicated. It is possible for the ground to become dominated by *Phragmites* or by *Acacia farnesiana*, which is very abundant in the immediate vicinity, or in the case of a lowering of the water table level by *Saccharum spontaneum*, the most abundant plant on the island.

Thus the three years since the eruption have resulted in only a poor representation of this series of associations in spite of the fact that there is a large amount of apparently suitable ground. The excellent drainage developed in the mud and ashes probably has considerable to do with this.

THE DRYGROUND GENETIC SERIES

In this series belong the associations which vegetate the drained ground. On this island they are far in the ascendency. Four formations can easily be recognized, namely, the strand, the grassland, the shrub, and the tree formations, all normal to the Philippine area in the Indo-Malayan plant province.

THE STRAND FORMATION

THE IPOMOEA PES-CAPRAE ASSOCIATION

This well-known association has been described previously for a sea coast locality in the Philippines by Whitford.⁶ Although the strand on Taal is a fresh water habitat, the structure of the vegetation is essentially similar to that of the salt water strand. The two dominant species of this association on Taal Island are *Ipomoea pes-caprae* and *Canavalia lineata*. These are so similar in growth form and color that it is impossible to distinguish between them at a distance unless they are in flower. The plants trail over the ground for long distances, sometimes more than 45 meters, rooting freely at the nodes. They tend to extend into the water and maintain a sharp tension line with the limit of severe mechanical injury by storm waves. In this respect *Ipomoea* is hardier than *Canavalia*. Landward the

⁶ Whitford, H. N., The Vegetation of the Lamao Forest Reserve, Philip. Journ. Sci. 1 (1906) 666.

limit is usually other vegetation, but in case there is no other vegetation, *Canavalia* tends to extend inward away from the water to a very much greater extent than *Ipomoea*, which is usually confined to the shore. Exceptions occurred on the lava ridges of Mount Binintiang Munti, where *Ipomoea* spread a considerable distance from the shore, and in a few places on the eastern side of the island, where unaccompanied with *Canavalia*, *Ipomoea* spread back several meters and attained an altitude of about 30 meters on the mud slope.

The ridges which separate the low deltal flats from Lake Bombon are sometimes vegetated with this association but more frequently are bare. Except in extremely sheltered coves or bays, secondary species were absent from this association. In the bay near Pirapiraso, where *Ipomoea* was barely holding its own, there were many secondary species, most of which were weeds, as *Ricinus communis*, *Datura alba*, *Bulbostylis barbata*, *Eleusine indica*, *Wedelia biflora*, *Amaranthus spinosus*, *Ipomoea pes-tigridis*, *Ipomoea triloba*, *Hewittia sublobata*, *Eclipta alba*, *Leucas javanica*, *Portulaca oleracea*, *Heliotropium indicum*, *Scoparia dulcis*, *Polanisia viscosa*, *Dactyloctenium aegyptium*, *Citrullus vulgaris*, *Digitaria consanguinea*, and seedlings of *Acacia farnesiana*. These were all jumbled together, as though many seeds had started to grow at one time, but the typical adjustments had not yet taken place.

Over much of the area little successional relationship was exhibited in relation to this association, for the areas occupied by other plant associations were noncontiguous with that occupied by this one. The *Ipomoea* association, therefore, was limited in extent only by the physiological requirements of the individual plants. Where the shore was narrow and the upward slope abrupt, this association was succeeded by the cogon association, whose grasses quickly shaded the *Ipomoea* out of existence. *Canavalia* responded for a while by growing up into the grass, but ultimately gave way also.

THE SESBANIA STRAND ASSOCIATION

A back strand association, which also occurs along Lake Bay to the northeast, is present along the west coast of Taal Island at the foot of Mount Binintiang Malaki and, to a more limited extent near the foot of Mount Balantoc. Although not extensive it is entirely normal, consisting of open bushes of *Sesbania canabina*, with no secondary species here represented. It is readily and rapidly invading the *Ipomoea pes-caprae* association back

of the line of ordinary storm-wave action, although it has not yet acquired sufficient density to eliminate *Ipomoea*. Meager evidence of further successional relations indicates the development of the *Themeda* consocieties of the cogon association, or of the *Acacia* consocieties of the parang. The extreme intolerance of *Sesbania* makes this association very easy to replace by shading.

The presence of two plants of *Pandanus tectorius* in the back strand of the southeastern region and one of *Erythrina indica* near Pirapiraso is all that there is at present to indicate the development of the *Pandanus* strand association, one which is quite common on the seacoast strand elsewhere in the Philippines, but no other strand associations were indicated.

THE COGONAL OR GRASSLAND FORMATION

THE COGON ASSOCIATION

This association of grasses in one or another of its consocieties is the most widespread association on the island, although almost nowhere does it reach its normal density. As this association is characterized by certain species of grasses, nearly any one of which may develop to the exclusion of the others in a given area, the whole association is easily divided into consocieties, based on the specific identity of the grass which dominates. On Taal Island three of the consocieties of this association are definitely represented, namely, the *Saccharum spontaneum*, the *Themeda gigantea* and the *Imperata cylindrica* consocieties, while there is a suggestion of a fourth, the *Miscanthus* consocieties, in a very few places. On the devastated slopes the first two of these have appeared, the first in greatest abundance, while the third has made its appearance in the ridges and valleys of the northeast cape, where the devastation was not so severe.

The Saccharum spontaneum consocieties.—The light, silky-haired, wind-distributed seeds abundantly produced by *Saccharum spontaneum* were widely distributed over Taal Island by the northeast monsoon. The sides of ridges, particularly those facing to the northeast, were first vegetated, the sweep of the wind and the lack of water preventing seeds from lodging on the backs or the crests of ridges and the wash of water after rains preventing them from remaining in the drainage channels. From these many centers of dispersal, vegetative reproduction, together with the plants from the excessively abundant crop of seeds produced on the island in 1913, is fast obliterating the striking relation of seeding to exposure to wind.

From ash-buried rhizomes one would have expected the ap-

pearance of a dense stand, even at first, but the grass appeared in definite, well-separated bunches, by whose development an ordinary stand is being built up. This is taking place measurably faster at lower elevations, as one would naturally expect, with the chance to obtain more water through seepage. Investigation of the root system of a number of plants of *Saccharum* seemed to indicate that they were of recent origin and could not have been developed previous to the eruption.

At higher altitudes *Saccharum* forms compact, somewhat dwarfed bunches, widely separated on the sides of the ridges near the heads of drainage channels. At lower elevations the bunches occur nearer together until a fairly dense stand occupies the lower slopes, yet even in these places the great growth activity has not yet succeeded in obliterating the bunch-grass habit and covering the ground.

The outposts of *Saccharum* in both directions indicate that the consociation is tending to spread both up the ash slope to the crater rim and out on the flats close to the level of Lake Bombon. As the ground is so open, it can readily do this and real competition for the ground has hardly begun. Secondary species, at best very few in this consociation, are even fewer here on Taal, being more frequently represented by *Desmodium triflorum* than by any other. In the ecological center of the area occupied by this consociation the association of grasses is closed against ecologically inferior species by the dense growth of the grass. Any other species growing there must do so in successful competition against the grass. Quite naturally such species would be most likely to be shrubs or trees. Such are present, nowhere yet in very great numbers in most parts of the island, but thoroughly well scattered and thriving.

As an invading association it has virtually no plants to contend with, only the edaphic conditions of the situation. Working toward the crater rim there is no competition and it is merely a matter of time until the invasion of the slopes is entirely accomplished. On the flats, where the soil is nearly water-soaked, *Saccharum* occupies only little ridges or higher spots in the flat. In wet ground it cannot displace *Phragmites*, and consequently reaches its limit. Everywhere else *Saccharum* is the most important pioneer species in the open ashy ground. Ultimately it should be replaced by shrubs or trees, but for a long time it will remain represented as part of a mixture, ecologically inferior to the shrubs and trees, but on the ground ready to take advantage of any opening afforded.

The Themeda gigantea consociates.—*Themeda gigantea* is a bunch-grass of fair size, nowhere spreading into a "sod" grassland. The area occupied by this species is not nearly so extensive as that occupied by *Saccharum*. Where the two grasses occur together, the structure of the vegetation is so open that there is no visible competition between them. Its distribution on Taal is rather limited; it occurs in greatest abundance on the steep slopes of Mount Binintiang Malaki, but is found also on Mount Balantoc on ridges radiating from the crater toward the northwest and in the rocky soil of the lake exposure of Mount Binintiang Munti. It occupies areas which have not been severely devastated.

The plant itself forms bunches by the development of many buds from the central rootstock or a very few very short horizontal ones. The leaves which are about 0.5 meter in length are closely 2-ranked at the base. The many, open, loose, tall (from 1.5 to 2 meters) flower stems which develop in December, after the rainy season, give the area the appearance of the *Sorghastrum nutans* bunch-grass prairie in the northeastern Illinois sand-dune region. The bunches are rather well spaced, with from 1 to 1.5 meters of open ground between them. Even with this space between the bunches, when they grow on very steep slopes it appears from a little distance as if the entire ground were covered with grass. Apparently this makes a very open association, but this open association may be due largely to the extensively developed fibrous root system. Good control of the space is also evidenced in the scantiness of secondary species.

The association is best developed on the southern and western sides of Mount Binintiang Malaki, preferring the steeper, more rocky slopes, where it is very frequently associated with reddish rocks and iron in the soil. Apparently the consociates is in a relatively static condition, for it does not appear to be invading the open ground stretching out from the foot of Mount Binintiang Malaki, although the top of this peak has been reached. A heavy crop of seeds was set in December, 1913, but results are not yet in evidence. The seeds are too large to be widely distributed by ordinary winds, but were found in large numbers in April, 1914, along stream courses and around the salt lake south of Mount Balantoc.

Succession into *Themeda* is progressing, particularly on the northern slopes of Mount Binintiang Malaki, where conditions are much milder than those on the southern slopes. A number

of shrubs and trees, especially *Albizzia procera* and *Sterculia foetida*, have come in. It appears that the parang and tree species will keep on increasing in number and importance and will come to occupy a great deal of the ground now dominated by *Themeda*. Unless a dense mountain forest should develop, however, it seems improbable that *Themeda* will be driven from the steepest slopes for a long time.

The Imperata cylindrica consocias.—The third of the important consocias represented on Taal Island is dominated by cogon or lalang grass, *Imperata cylindrica koenigii*. This grass is very abundant on the mainland in all directions from the volcano, and its very light, very numerous seeds are so easily carried to the island that it is a wonder that this consocias is not extensively present on the island, instead of being so limited in distribution. Although a few individuals of this grass species occur in a number of habitats on the island, as an association its distribution is limited to the region back of the bay near Pirapiraso. Previous to the eruption this grass was fairly abundant in the parang land. The area that it now occupies, barring fires, will become parang in the near future, but at present there are some areas that are characteristically grass. The consocias occupies the crests of ridges for the most part, although it is well developed in the wide, shallow valley reaching back from Pirapiraso, in land that was more or less in cultivation previous to the eruption.

The structure of the association is in every way typical of its normal appearance, that is, a compact close "sod" development of grass covering the ground, excluding species ecologically inferior and often ecologically superior ones also. In the grassland, especially toward the edges are shrubs and small trees, which clearly indicate the fate of this association under undisturbed dynamic conditions. In case of the frequent occurrence of fires, this association can maintain itself against the shrubs and trees, which otherwise will soon come to dominate. Fires may be set more or less willfully either by tourists or fishermen.

The only open ground within reach of this association is the beach and the flats, which this association does not ordinarily invade. Therefore, in so far as the least devastated region of the volcano is concerned, this consocias is occupying virtually its maximum area. Further area can be gained only through accident to the woody vegetation. In the absence of disturbance the area of this consocias will gradually decrease, possibly to

zero, but more likely not quite so far, as there will be several situations where the grass can hold forth in the parang.

The Miscanthus consociates of mountain cogon.—The development of this mountain consociates is only indicated above 160 meters by the presence of a few isolated clumps of *Miscanthus sinensis* near the crests of a few of the ridges near the crater rim. The plants are dwarfed and exhibit other xerophytic adaptations.

WOODY PLANTS

Vegetation in which the tree type of growth form prevails is naturally to be expected, sooner or later, over the greater part of the island. Whitford, dealing with the vegetation of the Lamao reserve, has grouped both the trees and the shrubs under the head of a single association, entitled by him the *Bambusa-Parkia* formation, consisting of a climax type and a parang type, the parang type generally derived from the other by reduction, brought about by disturbing human influences. He also recognized that the parang might be a developmental stage from open ground to the *Bambusa-Parkia* association.

On Taal Island, where only developmental stages are present, many characteristically parang species are present and well defined successions indicate that the parang can be logically considered an association.

THE PARANG OR SHRUB-SMALL-TREE FORMATION

THE PARANG ASSOCIATION

This large, heterogeneous, much diversified, conglomerate association is a natural one to succeed grass. It is already present in many localities and actively progressing everywhere. The association readily splits into a number of consociates, each dominated by a single species. Although at first they seem quite distinct, many intergradations and mixtures soon take place, so that separating them as associations would but needlessly complicate matters. Essentially the association consists of shrubs and small trees; the latter may develop to the exclusion of the others in the course of time. Vines, both woody and herbaceous, may be present in considerable numbers, but herbaceous plants are of minor importance. A number of families are represented in parang, but particularly the *Euphorbiaceae*, *Leguminosae*, *Moraceae*, and the *Apocynaceae*, in many of whose species, except those of the *Leguminosae*, latex is present. Birds play an important part in the distribution of the seeds of most

of these plants. As most birds frequent land which already has vegetation rather than bare ground, the parang species are more likely to be found growing in previously vegetated areas, in spite of the fact that the bare ground seems entirely suitable. Once the seeds actually effect ecesis, which may often be difficult in the dense grass, it does not take long for them to dominate. Height development in either shrubs or trees cuts off light from the grass, to which the grass can respond by growing somewhat higher, but soon reaches its limit and has to give way. The fact that grass dies down to the ground in the unfavorable season, while shrubs and trees retain their elevation, makes the struggle all the more one-sided. Generally grass can get into a place quicker and obtain a readier start and so comes to occupy the ground; but, barring fires, it cannot hold forth forever where conditions are favorable for the development of higher vegetation.

On the slopes of Taal the opportunities for shrub ecesis are rather great for the grass is in general not dense, and over large areas decidedly not so. Still most of the invading parang species do not obtain a foothold in this ground, but seem to prefer to wait until the grass becomes established and then drive it out. So shrubs become established in many different places and furnish many centers of distribution for further invasion of the grassland. With the establishment of shrubs, larger numbers of birds visit the area and the number of vines increases very decidedly. In the room afforded under the shrubs when the grass has been driven out, certain herbaceous plants find their way and thus the parang association is built up.

As this association now exists on Taal Island it is largely in the distribution stage, that is, mostly as isolated plants with here and there little groups. In the northeastern part of the island, where devastation was least severe, the vegetation obtained an earlier start and succession is rapidly replacing both the grass and the parang with species of the *Bambusa-Parkia* association, so that at present a large part of the ridges and most of the valleys are vegetated with woody plants to the exclusion of the grass. On some of the edges of the ridges even trees from 5 to 6 meters in height have had time to develop. Establishment of tree covering is going on very much faster with the island uninhabited, as fire—the greatest accident that normally occurs—is kept at a minimum, thus giving the shrubs a chance.

Greater detail of the parang association follows under the separate consocieties recognized.

SHRUB CONSOCIES

The Ficus indica consocies.—This consocies of the parang association occurs in the ash of the recently vegetated parts of the volcano. It appeared during the second rainy season after the appearance of *Saccharum*. At present, while it seems to follow *Saccharum*, in about as many other places it invades the open ground. The particular topographical habitats that seem most suitable for it are the heads of ravines and the steep slopes of drainage channels, especially near their source. The seeds are normally avevectant, yet one sometimes wonders just how they came to be lodged in the particular situations where they are often found. The seedling develops into a bushy shrub, from 1 to 2 meters in diameter, with very thick, tough, leathery leaves. From their position the plants obtain little water during the dry season and the extreme xerophytic adaptations bespeak the same condition. The peculiar grayish green of the leaves of *Ficus indica* makes it possible to locate the heads of the drainage channels from a distance. The root system is extensive, but the shoot system is decidedly not in comparison. Everywhere this species is a pioneer, and one which stands but little competition. Consequently its further distribution is limited to new fields. *Ficus indica* was the first of the shrubs to invade the higher ground and in April, 1914, was the commonest of the shrubs present on the highest ridges, in addition being the only shrub present inside the crater. Occasionally bushes of *Psidium guajava* and *Ficus ulmifolia* appear to be associated with *Ficus indica* at lower elevations.

The Tabernaemontana consocies.—A pioneer consocies of small shrubs which is invading the grassland from many centers of distribution between altitudes of 15 and 125 meters is characterized by the dominant species, *Tabernaemontana subglobosa*. This consocies differs from most of the others in its ability to invade the crests of ridges, whereas the sides are the usual points of invasion. The seeds become established both in dense grass and in the spaces between clumps and the shrubs grow to a height of 1.5 meters. Although the consocies is best represented on the fairly steep ash slopes which radiate from the crater, it is there very likely to be mixed in with other consocies. On the crests of ridges it stands out distinctly.

After establishment this species is rather intolerant and so disappears as taller shrubs or trees invade its areas. Where fires occur it keeps on by sprouts, thus contributing to the

mixture of grassland and parang vegetation that clothes the northern slopes at lower altitudes.

The Acacia farnesiana consocieties.—Readily invading the upper part of the deltal flats and the lower sides of the ash ridges in the more devastated areas, as well as the *Imperata* areas in the less devastated parts, is a shrub parang consocieties dominated by *Acacia farnesiana*. This consocieties has started from many centers of distribution both in grassland and in nonvegetated areas. It is spreading rapidly, as it is a fast grower, produces many seeds normally distributed by birds, and is associated with nitrifying bacteria which make it relatively independent in the poor soil. Although the leaves are small, the aggregate shade cast by this species after its branches begin to spread over the surrounding vegetation soon eliminates the grass and establishes thicket conditions, which are not easily displaced except by trees.

The consocieties is perfectly typical, containing many individuals of the dominant species and very little of anything else. In this area it generally does not enter into pioneer competition with other parang consocieties, but readily invades all grass consocieties where conditions are at all favorable for the *Acacia*. Although it mixes with some of the other parang consocieties as the distribution proceeds from the centers, it is not readily displacing any of them, but rather is living conjointly with them. In spite of the density of the *Acacia* thicket, there is abundant opportunity for seedlings of trees to become established. The growth of these causes the *Acacia* to become more treelike to the upper limit of its growth, after which the trees obtain control of the situation. Like the *Tabernaemontana* consocieties it will come in on crests of ridges at various elevations, but generally there it occurs in depressions or potholes or close to the side of the crest.

The Antidesma consocieties.—This consocieties of the parang association, a characteristic invader in grassland areas in many parts of the Philippines, is on Taal but feebly represented as a consocieties by *Antidesma ghesaembilla* and *Antidesma buniis*, associated with *Callicarpa blancoi*, invading grassland on Mount Mataas-na-golod. These species of plants are represented somewhat more abundantly in the general parang, but apparently will not be a conspicuous feature in the revegetation of Taal Volcano.

The Gliricidia consocieties.—This easily characterized consocieties of tall shrubs, abundantly present on the mainland, is very poorly

represented on the volcano in the vicinity of the former town, Pirapiraso, by a number of plants of *Gliricidia sepium*, occurring in the grassland as parts of the parang association rather than as a separate consocieties. The plants show more than usual xeromorphy.

The Morinda consocieties.—On Taal Island, *Morinda bracteata* fills a somewhat different rôle than customary. In addition to being one of the dominant species in the general parang, it characterizes a consocieties which invades unvegetated ground in the eastern and southern parts of the island. In appearance it differs from *Ficus indica* in being dark green. It alternates with *Ficus indica* in pioneer parang invasion, but the distribution of *Morinda* on the island is more limited. It differs from *Ficus indica* in readily being assimilated as a unit in general parang.

TREE CONSOCIETIES

The Trema consocieties.—The *Trema* consocieties is one of a group of parang consocieties in which small trees rather than shrubs are the dominant species. While this consocieties may invade open ground, and frequently invades grassland, it is particularly successful in young thickets. The dominant species, *Trema amboinensis*, is a very rapid grower and a very intolerant tree. Once started it soon outstrips other trees and then may obtain dominance in the area. If it were more tolerant, it might establish itself longer and better, but it seldom lasts more than one generation as a dominant tree. More usually this tree does not obtain controlling dominance in an area, but is only one among several trees, coming into notice so particularly on account of its very rapid growth which gives it a decided start.

The tree seeds abundantly and sprouts easily. Although there are large numbers of seedlings in certain of the ash-covered slopes of the northern side of the island the largest trees, many of which are from 25 to 30 cm in diameter and 7 meters high, are sprouts which have come up from old trees buried beneath the ash. This was particularly demonstrated along an erosion channel which was filled with ash which was later washed away exposing sprouts 20 cm in diameter from a trunk 35 cm in diameter. The *Trema* consocieties becomes mixed up with others before very long and so merges into the general parang, which may include trees of *Trema* for a long time.

The Cordia consocieties.—The consocieties dominated by the tree *Cordia myxa* is present on a number of the northern slopes, being established on the sides of ridges just below the crest, where

it readily forms groves of trees. It is not usually exclusive, and tends to become one of a number of dominant trees in a parang area. As it is fairly tolerant it can drive out less tolerant species and with its heavy crops of seeds is rapidly pushing into and superseding the grass areas.

The Pithecolobium consocias.—The parang consocias dominated by *Pithecolobium dulce* is fairly abundant and widespread on the island, occurring especially on the crests of ridges. It is most abundant in the northeastern region, developing as small, often bushy trees up to about 4 meters high. In April, 1914, the seed crop was very heavy. Many birds were noticed eating the sweetish, white, popcorn like arillus surrounding the seeds.

Pithecolobium mixes with *Acacia* to a considerable extent, but the *Acacia* is a pioneer in more different places and particularly at higher elevations. The shade from *Pithecolobium* readily eliminates any grass which is present. This consocias starts most frequently in rather open grassland but later may mix with the other consocias in a general parang and persist in the more xerophytic places.

GENERAL PARANG

As indicated above, the parang association is made up of a number of shrubs and small trees, forming very mixed vegetation which may be one of the stages leading up to the development of forest. The association is present on Taal in its distributional stages. Wherever shrubs or small trees occur they form units in parang. As certain species appear in one place and others in another the result is the development of consocias, the subsequent mingling of which brings about the existence of the general parang. In addition to those species which may characterize separate consocias are certain shrubs, which on Taal at least always occur as individuals in the general parang, but do not characterize consocias. The following list includes all such species and in addition many invading species of the *Bambusa-Parkia* association, which have not yet come to dominate:

Species of plants in the parang association.

DOMINANT SPECIES.

<i>Acacia farnesiana.</i>	<i>Breynia cernua.</i>
<i>Antidesma bunius.</i>	<i>Breynia rhamnoides.</i>
<i>Antidesma ghesaembilla.</i>	<i>Bridelia stipularis.</i>
<i>Antidesma rostratum.</i>	<i>Buddleia asiatica.</i>
<i>Atalantia disticha.</i>	<i>Callicarpa blancoi.</i>
<i>Blumea balsamifera.</i>	<i>Casearia cinerea.</i>

Species of plants in the parang association—Continued.

DOMINANT SPECIES—Continued.

<i>Clerodendron minahassae.</i>	<i>Morinda bracteata.</i>
<i>Cordia myxa.</i>	<i>Moringa oleifera.</i>
<i>Ehretia microphylla.</i>	<i>Muntingia calabura.</i>
<i>Erythrina indica.</i>	<i>Phyllanthus reticulatus.</i>
<i>Ficus cumingii.</i>	<i>Pithecolobium dulce.</i>
<i>Ficus indica.</i>	<i>Pipturus arborescens.</i>
<i>Ficus nervosa.</i>	<i>Psidium guajava.</i>
<i>Ficus tinctoria.</i>	<i>Semecarpus cuneiformis.</i>
<i>Ficus ulmifolia.</i>	<i>Tabernaemontana pandacagui.</i>
<i>Fluggea virosa.</i>	<i>Tabernaemontana subglobosa.</i>
<i>Gliricidia sepium.</i>	<i>Trema amboinensis.</i>
<i>Glochidion triandrum.</i>	<i>Wendlandia luzoniensis.</i>
<i>Macaranga tanarius.</i>	

VINES.

<i>Abrus precatorius.</i>	<i>Ipomoea obscura.</i>
<i>Canavalia ensiformis.</i>	<i>Ipomoea triloba.</i>
<i>Capparis horrida.</i>	<i>Luffa cylindrica.</i>
<i>Capparis micracantha.</i>	<i>Lygodium japonicum.</i>
<i>Celastrus paniculata.</i>	<i>Mezoneurum latisiliquum.</i>
<i>Cissampelos pareira.</i>	<i>Momordica ovata.</i>
<i>Cissus repens.</i>	<i>Momordica cochinchinensis.</i>
<i>Cissus trifolia.</i>	<i>Operculina turpethum.</i>
<i>Deeringia baccata.</i>	<i>Pericampylus incanus.</i>
<i>Derris polyantha.</i>	<i>Phaleria cumingiana.</i>
<i>Dioscorea bulbifera.</i>	<i>Quisqualis indica.</i>
<i>Dioscorea pentaphylla.</i>	<i>Rourea erecta.</i>
<i>Elaeagnus philippensis.</i>	<i>Streptocaulon baumii.</i>
<i>Gymnema pachyglossum.</i>	<i>Tetrastigma harmandii.</i>
<i>Hewittia sublobata.</i>	<i>Tournefortia sarmentosa.</i>

MISCELLANEOUS SPECIES, WEEDS, AND CULTIVATED SPECIES.

<i>Adiantum philippense.</i>	<i>Odontosoria chinensis.</i>
<i>Ageratum conyzoides.</i>	<i>Onychium siliculosum.</i>
<i>Amorphophallus campanulatus.</i>	<i>Pteris longifolia.</i>
<i>Carica papaya.</i>	<i>Pteris quadriaurita.</i>
<i>Commelina nudiflora.</i>	<i>Ricinus communis.</i>
<i>Datura alba.</i>	<i>Selaginella sp.</i>
<i>Desmodium capitatum.</i>	<i>Sida acuta.</i>
<i>Desmodium scorpiurus.</i>	<i>Sida rhombifolia.</i>
<i>Ipomoea batatas.</i>	<i>Tephrosia dichotoma.</i>
<i>Lycopersicum esculentum.</i>	<i>Triumfetta bartramia.</i>
<i>Manihot utilisima.</i>	<i>Vandellia crustacea.</i>
<i>Musa sapientum.</i>	<i>Waltheria americana.</i>
<i>Nephrolepis biserrata.</i>	

RELIC SPECIES.

<i>Canavalia lineata.</i>	<i>Saccharum spontaneum.</i>
<i>Imperata cylindrica.</i>	<i>Themeda gigantea.</i>
<i>Phragmites vulgaris.</i>	

Species of plants in the parang association—Continued.

INVADING SPECIES.

<i>Albizzia procera.</i>	<i>Ficus hauili.</i>
<i>Allaeanthus luzonicus.</i>	<i>Litsea glutinosa.</i>
<i>Alstonia scholaris.</i>	<i>Maesa cumingii.</i>
<i>Arenga</i> sp.	<i>Mallotus moluccanus.</i>
<i>Artocarpus nitida.</i>	<i>Melicope triphylla.</i>
<i>Bambusa blumeana.</i>	<i>Oroxylum indicum.</i>
<i>Ceiba pentandra.</i>	<i>Premna nauseosa.</i>
<i>Celtis philippensis.</i>	<i>Sterculia foetida.</i>
<i>Cratoxylon blancoi.</i>	<i>Vitex parviflora.</i>
<i>Eugenia jambolana.</i>	<i>Wrightia laniti.</i>

THE LOW ALTITUDE TREE FORMATION

THE BAMBUSA-PARKIA ASSOCIATION

This very typical association, formerly well represented on Taal Island especially in the northern part, as well as upon all the adjacent islands, now occurs on Taal Island on the north-eastern cape and on Mounts Binintiang Malaki and Balantoc in the northwestern region. The bamboo growth form—tall, treelike grasses—is a characteristic part of this association. It mixes, or alternates, with the *Parkia* type—moderately tall trees which are either deciduous or have their transpiration surface materially reduced for a part or all of the dry season. The bamboo element is represented on Taal by *Bambusa blumeana* on the slopes of Mounts Pirapiraso and Bignay in the northeast and at the foot of Mount Balantoc near Panipihan in the northwest. The bamboos must have regenerated from root-stocks beneath the mud and ashes for there has been no recent seeding of this species. Spreading by purely vegetative means is very slow. It will take a very long time for the bamboo thus to occupy the land apparently very suitable for it. *Bambusa* readily displaces any of the parang trees, forming a thicket of such density that but very few secondary species of minor importance can develop. The bamboo can be displaced only at higher elevations where conditions are less suitable for it.

While *Parkia timoriana*, itself, has not yet invaded the island, its growth form is represented by other species, particularly *Albizzia procera*, *Oroxylum indicum*, *Alstonia scholaris*, *Wrightia laniti*, *Eugenia jambolana*, *Ceiba pentandra*, *Sterculia foetida*, *Celtis philippensis*, *Mallotus moluccanus*, and *Ficus hauili*. For a complete list of the species so far present the reader will note the species listed as invading the parang. Some of these trees invade the grassland and others the parang, but seldom do any of them invade unvegetated ground. Their re-

lation to *Bambusa* in this area is evidenced by the fact that the majority of them occur in or near the areas where the bamboos also occur. Almost all of the species become higher than the parang species and so can replace parang. Particularly are they accomplishing this at lower altitudes. They have equal opportunity to invade the areas contemporaneously with parang species. Generally the parang species make faster initial growth, but many of the trees soon catch up. Between October, 1913, and April, 1914, it was very evident that species of this association were rapidly invading many new places in the parang and more than successfully competing with it in areas already invaded. In the absence of destructive factors, within a few years the northern part of the island should be vegetated with the *Bambusa-Parkia* association. From there it will gradually spread along both sides of the island to the southern corner.

THE WEED ASSOCIATION

The weed association is likely to be found in cultivated ground, after fires, and in clearings, when such areas are better represented on Taal, but at present in no place does it assume the appearance of an association. For the most part the weeds occur isolated in openings in other vegetation or under the partial shade of some trees. In the absence of cultivated land and the abundance of cogonal grasses, weeds have but little chance. Even when once started their brief life period permits them dominance only for a short time, and they are readily replaced by other vegetation. The weed association is represented by scattered plants of *Erigeron linifolius*, *Ageratum conyzoides*, *Synedrella nodiflora*, *Pterocaulon cylindrostachyum*, *Amaranthus spinosus*, *Heliotropium indicum*, *Blumea* sp., *Emilia sonchifolia*, *Vernonia cinerea*, *Leucas javanica*, *Portulaca oleracea*, *Scoparia dulcis*, and *Datura alba*.

CULTIVATED PLANTS

Although not a proper association, there are here grouped a few plants which have persisted from previous cultivation in the vicinity of the former towns, Bignay, Pirapiraso, Panipihan, and Binintiang. For the most part these plants are merely growing in the parang and in course of time will succumb to it. Of these cultivated plants, *Musa sapientum* is the largest and the most abundantly represented at a number of places near the northern coast of the island. Small trees of *Carica papaya* occur in a few places near former houses. The remaining ones were limited in distribution to the vicinity of Pirapiraso. *Ipomoea batatas*

is represented by a few plants which appeared to be commencing their development in December, 1913. There were a few small plants of the tomato, *Lycopersicum esculentum*, three plants of the peanut, *Arachis hypogaea* (one with partly ripe fruit), a few plants of cassava, *Manihot utilissima*, a single plant of rice, *Oryza sativa*, and one of sincamas, *Pachyrrhizus erosus*.

While the *Bambusa-Parkia* association may well be considered the logical climax association for the lower altitudes, it is not the climax for the higher altitudes on the volcano. There is as yet no evidence, however, indicating the steps nor the climatic type of vegetation, toward which succession leads.

ANNOTATED LIST OF SPECIES FOUND ON TAAL ISLAND SINCE THE
ERUPTION OF 1911

PTERIDOPHYTA

POLYPODIACEAE

Adiantum philippense L. 6772. Local in a deep ravine, Mount Ragatan.

Nephrolepis biserrata Schott 7378. Local in ravine, Mount Pirapiraso.

Odontosoria chinensis J. Sm. 6849, 6850, 7341. In ravines.

Onychium siliculosum (Desv.) C. Chr. 6762, 6880, 7373, 7447. Ravines or rocky bluffs.

Pteris longifolia L. 6769, 7376, 7450. On rocky bluffs or ravine sides; not common.

Pteris quadriaurita Retz. 6776, 7346. Local in a deep ravine, Mount Ragatan.

Pteris sp. 6765. In a deep ravine.

SCHIZAEACEAE

Lygodium japonicum (Thunb) Sw. 6760, 7328, 7435. Local in ravines; not common.

SELAGINELLACEAE

Selaginella sp. 6758, 6882. Local in a few ravines, north side.

SPERMATOPHYTA

PANDANACEAE

Pandanus tectorius Sol. 6851. Four plants, two of which were found on the strand and two on an ash ridge.

HYDROCHARITACEAE

Vallisneria gigantea Graebn. 6703. Submerged aquatic; northern parts.

GRAMINEAE

Bambusa blumeana Schultes f. 6730, 7457. On bottoms and sides of ravines, northeast cape and at the foot of Mount Balantoc.

Cynodon dactylon (L.) Pers. 6805, 7409, Local on wet strand in the northern parts.

- Dactyloctenium aegyptium* (L.) Willd. 6701. Local on the strand.
Digitaria consanguinea Gaud. 6757, 7362. Local on the strand.
Eleusine indica (L.) Gaertn. 7400. Local on the strand and in pockets.
Imperata cylindrica koenigii Benth. 6733. Fairly well distributed in the northeastern part.
Miscanthus sinensis Andr. 6863, 7398. Very infrequent in isolated clumps at higher elevations.
Oryza sativa L. One specimen seen.
Panicum caudiglume Hack. 7335. Bottom of deep valley; rare.
Panicum distachyum L. 6792. In grassy parang on Mount Binintiang Malaki.
Panicum repens L. 6847. Locally abundant in pockets at bluff ends and on the strand.
Paspalum scrobiculatum L. 6751, 7462. Local on the strand.
Paspalum sp. 7325. Ravine, foot of Mount Mataas-na-golod.
Phragmites vulgaris (Lam.) Trin. 6745, 6800. Fairly abundant on low wet areas at the outer ends of ravines.
Saccharum spontaneum indicum Hack. 6884, 7363, 7405. A very common grass, widely distributed in virtually all parts of the island where any vegetation is present, particularly on all slopes and sides of ravines; a few plants below the rim of the crater on the inside. The most abundant plant on the island.
Themeda gigantea (Cav.) Hack. 6705, 6796, 6864, 6881. Locally abundant, especially on Mounts Balantoc and Binintiang Malaki.

CYPERACEAE

- Bulbostylis barbata* Kth. 6780, 6783, 7349, 7408, 7461. A strand plant; found also in similar situations elsewhere on the island.
Cyperus compressus L. 6702. Local on the strand.
Cyperus diffusus Vahl. 7380, 7428. Strand plant.
Cyperus distans L. 6801, 7329, 7360. On the strand and in ravines.
Cyperus radiatus Vahl. 6704. Local on the strand.
Mariscus stuppeus (Forst.) Merr. 6825, 6848, 7606. On the strand and in the *Phragmites* marsh.

PALMAE

- Arenga* sp. One tree invading parang in north central region.

ARACEAE

- Amorphophallus campanulatus* (Roxb.) Bl. 6855. In parang near Pirapiraso and one plant in a *Phragmites* marsh.
Pistia stratiotes L. 7464. Floating aquatic washed up along the shore.

LEMNACEAE

- Lemna trisulca* Hegelm. Washed up on the shore with *Pistia*.

COMMELINACEAE

- Commelina nudiflora* L. 6868. Trailing herb; grown up through ash in a ravine near Pirapiraso.

DIOSCOREACEAE

Dioscorea bulbifera L. 6815, 6915, 7336, 7431, 7437. Woody vine in parang, particularly in the northeastern part.

Dioscorea luzonensis Schauer. 6788, 6789, 6831, 6835, 7438. Vine in parang with the preceding.

MUSACEAE

Musa sapientum L., var.? 6823. Local near former towns in the northern parts of the island.

ULMACEAE

Trema amboinensis Bl. 6711, 6718, 6748, 6770, 6782, 6802, 6877, 6891. A common parang tree in grassland, well distributed over much of the vegetated part of the island; many seedlings present, but the largest trees are sprouts from buried stumps.

MORACEAE

Allaeanthus luzonicus F.-Vill. 7375, 7454. Tree, locally invading the parang.

Artocarpus nitida Tréc. 7459. One tree of this rare species invading parang in north central region.

Ficus cumingii Miq. 6908, 6909, 6910. Small tree in parang. May be but a variety of *F. ulmifolia*.

Ficus hauili Blanco. 6854, 7443. A tree, locally invading parang.

Ficus indica L. 6742, 6862. Common shrub or small tree; characteristically a first invader of the open ground at the upper ends of gullies and ravines.

Ficus nervosa Heyne. Small shrub in parang.

Ficus tinctoria Forst. 6816, 6834, 6945, 6948(?), 6949(?). A tree in parang.

Ficus ulmifolia Lam., with its many forms. 6799, 6898, 7331, 7429, 7444, 7337. A common parang tree.

Ficus sp. 7410. A tree in parang on Mount Binintiang Malaki.

Streblus asper Lour. 7389. Small tree, local in parang.

URTICACEAE

Pipturus arborescens (Link) Rob. 6713, 6771, 7324, 7352. A small tree in the parang and in ravines.

AMARANTHACEAE

Aerua lanata (L.) Juss. 6738. A few small plants on the wet strand.

Alternanthera sessilis (L.) R. Br. 6852. A few plants on the strand.

Amaranthus spinosus L. 7384. A few small plants on the strand and in pockets worn in bluffs.

Deeringia baccata (Retz.) Moq. 6746, 6841. Vine in parang; uncommon.

PORTULACACEAE

Portulaca oleracea L. 7355. Local on the strand.

CERATOPHYLLACEAE

Ceratophyllum demersum L. 7369. Submerged aquatic, thrown up on the strand.

MENISPERMACEAE

Cissampelos pareira L. 6726, 7432. A vine in the parang.

Pericampylus incanus Miers. 7357. Vine, scarce in parang.

LAURACEAE

Cassytha filiformis L. 7449, 7467. Hemiparasitic vine, loading down *Phragmites* in wet strand.

Litsea glutinosa (Lour.) C. B. Rob. 7351. Tree; local on ridges; north east.

CAPPARIDACEAE

Capparis horrida L. 7370, 7415. A vine in the parang.

Capparis micracantha DC. 6898. A vine in the parang.

Crataeva religiosa L. 6829, 7416. Tree, invading parang.

Polanisia viscosa (L.) DC. 7393. Weed on the strand.

MORINGACEAE

Moringa oleifera Lam. 6944, 7327. Tree; local in parang on Mount Ragatan.

CONNARACEAE

Rourea erecta (Blanco) Merr. 6712, 7353, 7372, 7445. Vine in parang.

LEGUMINOSAE

Abrus precatorius L. 6830, 7367, 7441. A vine in the parang.

Acacia farnesiana (L.) Willd. 6804, 6839. An abundant parang shrub on the ash slopes and a very successful invader in grass.

Albizia procera (Roxb.) Benth. 6735, 6737, 6741, 7424. A tree; locally abundant in places in the northwest which were not exposed to the full force of the volcano.

Alysicarpus vaginalis (L.) DC. 6793, 6795. A vine in the parang on Mount Binintiang Malaki.

Arachis hypogaea L. 6764. A few plants in the parang near Pirapiraso, remnants of former cultivation.

Canavalia ensiformis (L.) DC., formae. 6820, 7338, 7379, 7463. A variable vine; in both the grassland and the parang.

Canavalia lineata DC. 6853, 6869, 7466. With *Ipomoea pes-caprae*; a characteristic vine on the strand.

Cantharospermum scarabaeoides (L.) Baill. 6731, 6899. A vine; local in the parang or on bluffs.

Crotalaria sp. 6890. Local on the strand.

Derris polyantha Perk. 7412, 7442. A vine in parang on sides of ridges.

Desmodium pulchellum Benth. 6717, 7350. A shrub, invading grassland; not common.

Desmodium scorpiurus (Sw.) Desf. 6775. Herb, in a ravine.

- Desmodium triflorum* (L.) DC. 6781. Low plant, not uncommon in grassland.
- Desmodium* sp. 7366. Herb, in parang.
- Erythrina indica* Lam. 7386. Tree, in grass on back strand.
- Gliricidia sepium* (Jacq.) Steud. A parang tree; very local in grassland back of Pirapiraso.
- Millettia* sp. 7390. One plant on a rock in water, east side of northeast cape.
- Mezoneurum latisiliquum* (Cav.) Merr. 7460. A vine invading grassland, north central part.
- Pachyrrhizus erosus* (L.) Urb. A single plant found.
- Pithecolobium dulce* Benth. 6708, 6752, 6837, 7458. A common tree, in parang on ridges.
- Sesbania cannabina* (Retz.) Pers. 6824. Abundant on the back strand in a place near the foot of Mount Binintiang Malaki.
- Tephrosia dichotoma* Desf. 6876, 6884, 7339. Occasional in grass and parang on the sides of ridges.
- Vigna lutea* (Sw.) A. Gray. 6895, 7465. Local on the strand at the edge of a bluff.

RUTACEAE

- Atalantia disticha* Merr. 7470. Tree on island next to Taal.

EUPHORBIACEAE

- Antidesma bunius* (L.) Spr. 6860, 7385, 7456. Small tree, in the parang on ridges.
- Antidesma ghesaembilla* Gaertn. 6723, 6785, 6827, 6887, 7332, 7334. An abundant small parang tree.
- Antidesma rostratum* Tul. 6914, 6951. Small parang tree on Mount Binintiang Munti.
- Breynia cernua* (Poir.) Muell.-Arg. 6767. Shrub or small tree, in the parang.
- Breynia rhamnoides* (Retz.) Muell.-Arg. 7440. A single small tree in parang.
- Bridelia stipularis* (L.) Bl. 6814, 6905, 6912, 7345, 7446. Common small parang tree.
- Fluggea virosa* (Willd.) Baill. 6719, 6732, 7348. Small parang tree.
- Glochidion triandrum* C. B. Rob. 7451. Small tree, in parang.
- Macaranga tanarius* (L.) Muell.-Arg. 6836, 6842, 7413. Common small parang tree; seedlings abundant in places on the strand.
- Mallotus moluccanus* (L.) Muell.-Arg. 7356, 7426. Tree, invading the parang.
- Manihot utilissima* Pohl. A few plants near Pirapiraso.
- Phyllanthus reticulatus* Poir. 6753, 7371. A shrub in the parang.
- Phyllanthus (erythrotrichus* C. B. Rob.?) 7423. A single shrub in parang.
- Ricinus communis* L. 6813, 6817, 7359. A common herb on the strand. Occasionally a tree 3 meters high, in the parang in ravines.

ANACARDIACEAE

- Semecarpus cuneiformis* Blanco. 6729, 7403. A small tree or shrub in the parang on the sides of ridges.

CELASTRACEAE

Celastrus paniculata Willd. 7397, 7420, 7468. Vine on trees and shrubs on the crests of ridges; not frequent.

VITACEAE

Cissus trifolia (L.) K. Sch. 6807. Vine in parang.

Cissus repens Lam. 6872. Vine in parang.

Tetrastigma harmandii Planch. 7381. A vine in the parang; rare.

ELAEOCARPACEAE

Muntingia calabura L. 6740, 7340. Seedlings on the strand and trees in the parang on the slopes of Mount Ragatan.

TILIACEAE

Triumfetta bartramia L. 6739, 7358. Weed in the parang and on the strand.

MALVACEAE

Sida acuta Burm. Seedling in a *Phragmites* marsh.

Sida cordifolia L. 6833. A weed on an adjacent island.

Sida rhombifolia L. 6777, 7353. Weed in the parang, local.

BOMBACACEAE

Ceiba pentandra (L.) Gaertn. 7387. A few trees in the parang near Pirapiraso.

STERCULIACEAE

Sterculia foetida L. 6803. Small to fair-sized trees on the outer sides of Mounts Binintiang Malaki and Pirapiraso.

Waltheria americana L. 6709, 6725, 7434. Weed in the grassland and parang.

HYPERICACEAE

Cratoxylon blancoi Bl. 6728, 7399. Tree, sprouting from buried stumps, local in the northwestern parts.

FLACOURTIACEAE

Casearia cinerea Turcz. 6714, 6830, 6843, 6858, 6888, 7342, 7407. Small tree; fairly abundant in the parang on sides of ridges.

CARICACEAE

Carica papaya L. 6845. A few scattered plants in ravines in northern parts of the island in the vicinity of former towns.

THYMELEACEAE

Phaleria cumingiana F.-Vill. 7392. A vine in a parang thicket; infrequent.

ELAEAGNACEAE

Elaeagnus philippensis Perr. 6828. Vine in parang; infrequent.

COMBRETACEAE

Quisqualis indica L. 7419. Vine in the parang; northeast cape.

MYRTACEAE

Eugenia jambolana Lam. 7404. Tree invading parang on the ridges; one on Mount Balantoc is a sprout from a 17 cm stump.

Psidium guajava L. 6774, 6911. Common parang tree.

OENOTHERACEAE

Jussieuia repens L. 7418. A single plant found floating in a mass of *Vallisneria*.

MYRSINACEAE

Maesa cumingii Mez 6763, 7347, 7430. A vine invading parang; seedlings present in ravines.

LOGANIACEAE

Buddleia asiatica Lour. 6721, 6755, 6787, 7377, 7425. Shrub in the parang; local.

APOCYNACEAE

Alstonia scholaris (L.) R. Br. 7391. Tree in the parang on Mount Ragatan.

Parsonsia (?) 6818. A single small vine in the parang.

Tabernaemontana pandacaqui Poir. 7382. A very few plants on a ridge to Mount Pirapiraso seem to belong to this species.

Tabernaemontana subglobosa Merr. 6790, 6819, 6821, 6857 (dwarfed), 6873, 6889, 6894, 6907, 7344. Common and widely distributed parang shrub; invading the *Saccharum* areas.

Wrightia laniti (Blanco) Merr. 6759, 6838, 7383, 7411. Tree; invading parang on sides of ridges.

ASCLEPIADACEAE

Gymnema pachyglossum Schltr. 7368. Vine, in the parang on Mount Pirapiraso, uncommon.

Streptocaulon baumii Decne. 6743, 6826, 6861, 6892, 6902, 7333, 7436. A common vine in the grass and parang; widely distributed.

CONVOLVULACEAE

Hewittia sublobata (L. f.) OK. 6773. Vine, local on the strand and in parang near it.

Ipomoea batatas (L.) Poir. 6844. A few vines near Pirapiraso.

Ipomoea obscura (L.) Ker. 6810. Vine in parang.

Ipomoea pes-caprae (L.) Roth. 6871. Abundant vine; characteristic of the strand.

Ipomoea pes-tigridis L. 6716, 6744, 6794. Local on the strand and in pockets in bluffs.

Ipomoea triloba L. Local on the strand in a *Phragmites* marsh.

Operculina turpethum (L.) Manso 6870, 7455. Vine; local on the strand.

BORAGINACEAE

Cordia myxa L. 6706, 6722, 6786, 6874, 6885, 6901. A common parang tree; invading grassland.

Heliotropium indicum L. 6707, 6811. Weed on the strand.

Tournefortia sarmentosa Lam. 6724, 6806, 6879. A vine growing over strand plants, also in parang on ridges.

VERBENACEAE

Callicarpa blancoi Rolfe 6727, 6904, 7401. A fairly common shrub in the parang.

Clerodendron minahassae T. & B. 6809, 6893, 6896, 7427. Shrub; local in the parang at low elevations in the northwest.

Premna nauseosa Blanco 6797, 7422. Shrub, local in the woods in the northwest.

Vitex parviflora Juss. 6840. Small tree on Mount Binintiang Malaki near the lake; not common.

LABIATAE

Leucas javanica Benth. 7330, 7439. Weed; local on the strand.

SOLANACEAE

Datura alba Nees 6950. Infrequent on the strand and in pockets in bluffs.

Lycopersicum esculentum Mill. Perhaps remaining from former cultivation near Pirapiraso.

SCROPHULARIACEAE

Lindenbergia philippensis (Cham.) Benth. 6710. A single plant in a pocket on the face of an eroding bluff, Mount Binintiang Munti.

Scocharia dulcis L. 6734, 6749, 7417. Weed on the strand and on the crests of a few ridges.

Vandellia crustacea (L.) Benth. 7374. Weed, local in grassland.

Vandellia pusilla (Willd.) Merr. 6784, (6798?). Local on lava strand.

BIGNONIACEAE

Oroxylum indicum (L.) Vent. 6946, 7395. An occasional tree invading the parang in the northwest and the northeast.

RUBIACEAE

Morinda bracteata Roxb. 6866, 6867, 6895. Fairly common as isolated clumps both in the grass and at the heads and edges of erosion gullies.

Oldenlandia sp. 7402. Local on Mount Binintiang Malaki.

Spermacoce hispida L. 6768, 6779, 7452. Local on the strand.

Wendlandia luzoniensis DC. 6856, 7448. Shrub; local on sides of ravines and on a ridge near the crater rim.

CUCURBITACEAE

Citrullus vulgaris (L.) Schrad. 7388. Local on the strand.

- Luffa cylindrica* Roem. 6822. Vine in thickets, Mount Binintiang Malaki.
Momordica charantia L. 6754. Vine; local in the parang.
Momordica cochinchinensis (Lour.) Spreng. 6878, 6886. Common vine in both grass and parang.
Momordica ovata Cogn. 6865, 6906, 7354, 7421. With the preceding and doubtfully distinct from it.

COMPOSITAE

- Ageratum conyzoides* L. 6766, 6791, 7365. Weed, not uncommon.
Blumea balsamifera (L.) DC. Two seedlings and one small shrub on the northeast cape in April, 1914.
Blumea sp. 7433. Weed, on crest of a ridge.
Eclipta alba (L.) Hassk. 6715, 6900. Locally abundant on strand.
Emilia sonchifolia (L.) DC. 7326. Weed, present in one locality.
Erigeron linifolius Willd. 6756, 7394. Weed, now present under trees.
Pterocaulon cylindrostachyum C. B. Clarke 7396. Weed, five plants on crest of Mount Balantoc.
Synedrella nodiflora (L.) Gaertn. Weed in parang; not common.
Vernonia cinerea (L.) Less. 7364. Weed, on the strand and adjacent grassland.
Wedelia biflora (L.) DC. 6778, 6897, 7414. Common on the open strand and in all the associations living on the strand.

CONCLUSIONS

1. The last eruption of Taal Volcano culminated January 30, 1911, resulting in the devastation of the island by a rain of hot, acid, mud and ash. Before revegetation could take place, the excess of acid had to be leached out of the soil and reseeding take place. This occupied a little more than a year. With the commencement of the second rainy season revegetation began to take place rapidly. By the end of the third rainy season, virtually all of the northern third of the island was vegetated, the densest vegetation being in the northeastern and northwestern corners. With the exception of Mount Binintiang Munti in the extreme southern corner and a very few places near the shore on the east and the west coast, the rest of the island was bare.

2. While in a few protected situations revegetation consisted of the sprouting of buried stumps, more than 99 per cent of the vegetation is the result of seeding.

3. Invasion took place first along the shore by plants with water-dispersed disseminuls. Soon after, the wind-distributed seeds of cogon grasses developed, forming grassland, which was barely established before birds brought in seeds of vines, shrubs, and small trees, which invaded the grass.

4. With so much available ground, given areas have been invaded by representatives of more than one association. Competition among individuals has led to the localization of succession

to many small areas. The extension in all directions from these centers gives expression to the general succession.

5. As the vegetation back from the shore of the mainland to the west and southwest was devastated, seeds were not furnished for dispersal by the southwest winds, whereas the northeast monsoon winds, blowing over area but little affected, furnished seeds to the northeastern exposure of the island. There revegetation has been most pronounced.

6. The structure of the vegetation is quite simple, consisting of nine associations in three genetic series. The water along the shore contains aquatic plants, low damp areas are vegetated with marsh plants, and the strand with strand plants. The slopes up to the crater are generally vegetated first with grasses and then with shrubs and small trees (parang). At least at lower altitudes the parang is being followed by trees and treelike grasses (bamboo).

7. Progress in revegetation is now very rapid. The following table gives a summary of the species of higher plants found on the island up to April, 1914:

	Families.	Genera.	Species.
Pteridophyta	3	7	9
Spermatophyta:			
Monocotyledoneæ	10	25	32
Dicotyledoneæ	44	111	138
Total	57	143	179

Mosses, lichens, algae, and fungi were exceedingly poorly represented.

8. In contradistinction to Krakatoa, ferns are but a very minor element, due to the comparative lack of them on the neighboring mainland, the exceeding dryness of the island, and the low altitude of the volcano. Taal agrees with Krakatoa in that water- and wind-distributed species appeared before bird-distributed species. The time element is much smaller on Taal because the distances involved are less. The distances from Taal Island to the nearest points on the mainland are as follows: North to Talisay, 6.3 km; northeast to Bañadero, 7.7 km; east to Lipa Point, 5 km; south, 13 km; southwest to Pansipit, 7.5 km; and west to Baños Point, 3.2 km.

9. On account of the relative accessibility and the government prohibition against inhabitation the island presents excellent opportunities to study natural revegetation to its best advantage.

EXPLANATION OF THE PLATES

PLATE III

Map showing the revegetation following the eruption of 1911. Map adapted from Adams, Geological Reconnaissance of Southwestern Luzon. *Philip. Journ. Sci.* 5 (1910) Sec. A.

PLATE IV

Diagram showing climatic conditions. (From Weather Bureau records.)

PLATE V

Diagrams showing the successions exhibited between the plant associations.

PLATE VI

FIG. 1. Dead stumps in the top of which seedling trees, *Ficus indica* and *Macaranga tanarius*, are growing. East coast of the northeast cape. April 21, 1914.

2. The northeast cape from Mount Ragatan, showing Mounts Pirapiraso and Bignay covered with parang and trees. Bamboos are present in the gullies. The valley in the middle of the picture is vegetated with *Imperata*. April 19, 1914.

3. Southward from Mount Bignay. Mount Ragatan on the extreme right center of the picture, back of it Mount Pinag-Ulbuan, vegetated with *Ficus indica* and *Morinda bracteata*. East of the latter, in the center of the background, is an old crater. The vegetation of the foreground is largely *Saccharum* with a few shrubs and small trees. April 19, 1914.

PLATE VII

FIG. 1. Westward from C 6 on the map. Mount Pinag-Ulbuan with *Morinda* and *Ficus indica* on the left, Mount Mataas-na-golod with *Saccharum* and parang in the background on the right. The upper part of the delta in the foreground with clumps of *Saccharum*. April 19, 1914.

2. Southwestward up the valley to the crater rim from the southern slope of Mount Mataas-na-golod. Vegetation at low altitudes is *Saccharum*. On Mount Pinag-Ulbuan, on the left are parang shrubs in addition to *Saccharum*. Note also the erosion! April 20, 1914.

3. Southwestward from Mount Pirapiraso showing a valley with *Imperata*. On the other side is Mount Ragatan with parang and trees, beyond and more to the right is Mount Mataas-na-golod with *Saccharum* and parang. Toward the left in the extreme background is a part of the crater rim. April 19, 1914.

PLATE VIII

- FIG. 1. A delta flat in the north central region, showing the sparse development of the *Phragmites* association. Mount Tibag in the middle on the right and back of it Mount Binintiang Malaki. October 25, 1913.
2. Looking northward from near the crater rim toward Mount Tibag in the north central region. Vegetation almost entirely *Saccharum spontaneum*. October 25, 1913.
3. Eastward from Mount Binintiang Malaki. The horseshoe ridge, Mount Balantoc, in the foreground, back of it the north central region. The rounded peak on the left is Mount Mataas-na-golod and to the right of it is Mount Pinag-Ulbuan. April 18, 1914.

PLATE IX

- FIG. 1. The foot of Mount Balantoc near the former town of Panipihan. Vegetation is mostly bamboo and trees. April 18, 1914.
2. South from the summit of Mount Binintiang Malaki. Beyond Mount Balantoc is a basin with a lake. In the background is the crater with its high southern wall. In the extreme background is Mount Macolod on the mainland. In the background on the right from the crater are Mounts Tabaro, Saluyan, and Binintiang Munti. April 18, 1914.
3. From the southern crater rim northwestward across the crater, showing Mounts Balantoc and Binintiang Malaki. April 20, 1914.

PLATE X

- FIG. 1. The crest of Mount Balantoc. The heavily vegetated, left-hand side is away from the crater. Mount Sungay in the extreme background on the mainland. April 18, 1914.
2. A regenerated tree, *Sterculia foetida*, on the lower lee slope of Mount Balantoc near Binintiang. Note also the indications of a former fence! April 18, 1914.
3. A portion of the crater wall on the northeast showing a shrub of *Ficus indica* within the crater. April 20, 1914.



PLATE III. REVEGETATION OF TAAL VOLCANO FOLLOWING THE ERUPTION OF 1911.

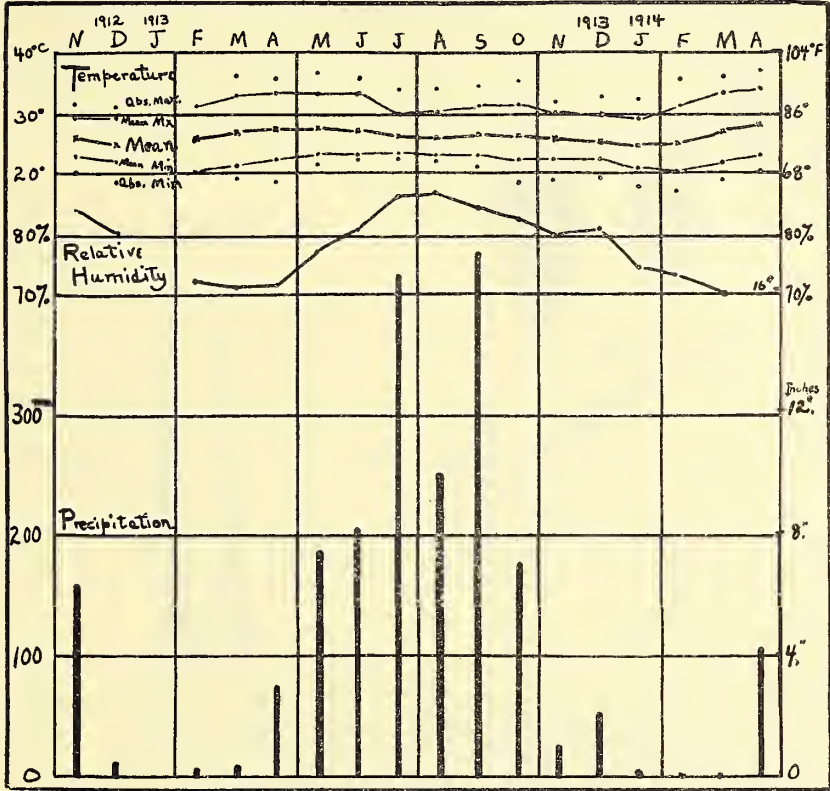


PLATE IV. DIAGRAM SHOWING CLIMATIC CONDITIONS ON TAAL ISLAND.

From the records of the Weather Bureau station, Ambulong, Tanawan (14° 07' north, 121° 04' east), a barrio on the shore of Lake Bombon.

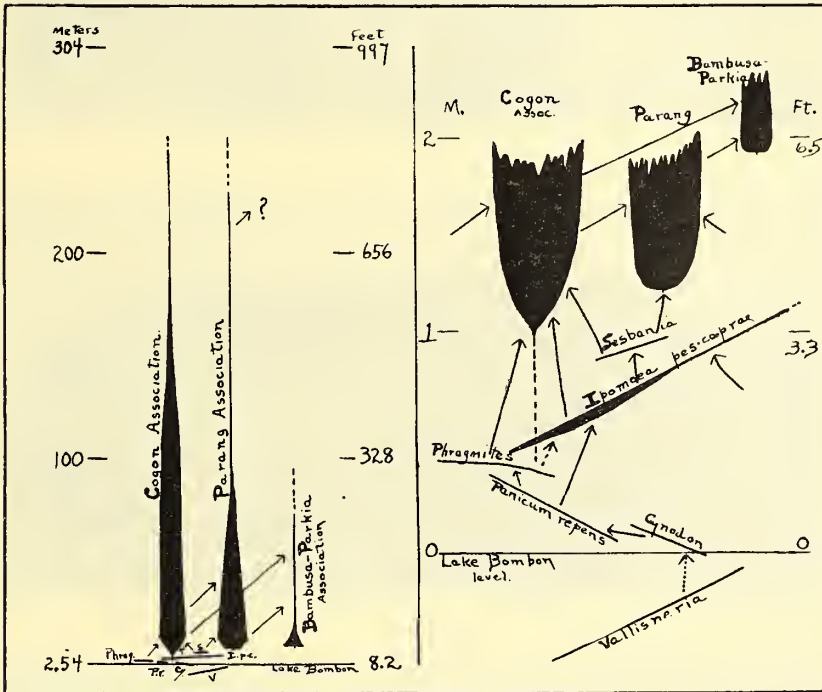


PLATE V. DIAGRAMS SHOWING THE SUCCESSIONS EXHIBITED BETWEEN THE PLANT ASSOCIATIONS ON TAAL VOLCANO, PHILIPPINE ISLANDS, 1914.

The approximate distribution in altitude is shown by the extent of the lines with reference to the scale on the left. The relative abundance of the associations at various altitudes is indicated by the thickness of the lines. Arrows pointing above the horizontal indicate succession to a higher genetic association.



Fig. 1.



Fig. 2.



Fig. 3.

PLATE VI.

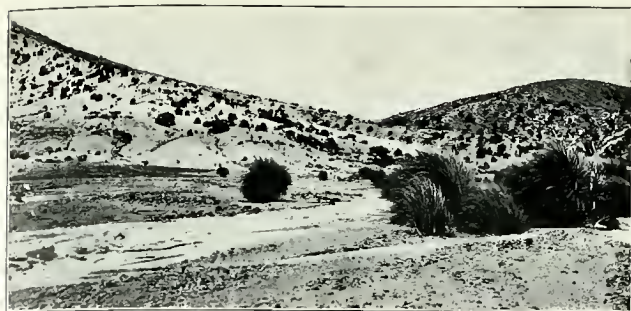


Fig. 1.



Fig. 2.



Fig. 3.

PLATE VII.



Fig. 1.



Fig. 2.

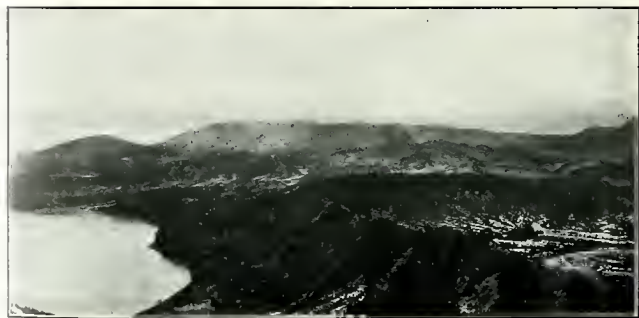


Fig. 3.

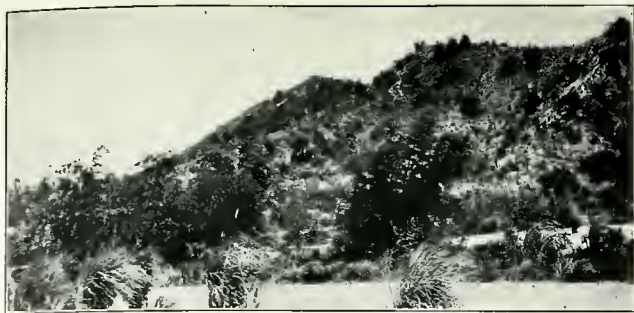


Fig. 1.



Fig. 2.

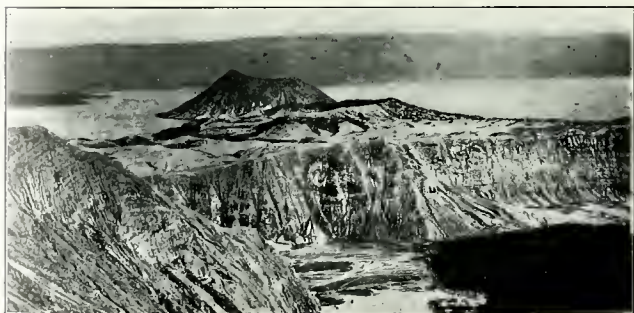


Fig. 3.

PLATE IX.



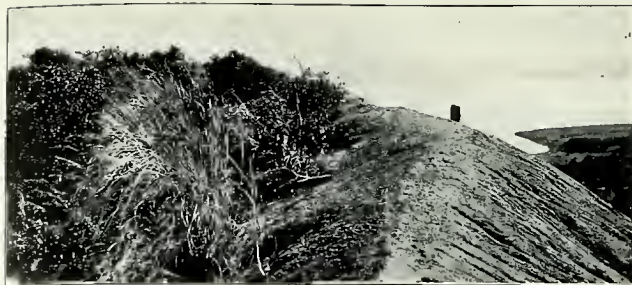


Fig. 1.



Fig. 2.



Fig. 3.

PLATE X.

HAWAIIAN FERNS COLLECTED BY M. L'ABBÉ U. FAURIE

By EDWIN BINGHAM COPELAND

(*From the College of Agriculture, University of the Philippines,
Los Baños, P. I.*)

More than three years ago, M. l'Abbé Faurie placed in my hands a remarkably complete collection of the ferns of Hawaii, which he made during the years 1909 and 1910. Partly because of the pressure of other duties, and partly because I understood that two other students of ferns were preparing general publications on the ferns of the Hawaiian Archipelago, I postponed the careful study of this collection until recently. One of these works has now been published,¹ and it is my understanding that the other work in question has been given up.

The ferns of the Hawaiian Islands have probably received from Doctor W. J. Hillebrand² more careful study than any man has ever given to those of any other limited area in the tropics. Lying as they do on a main route of the world's travel, the Hawaiian Islands have from early times been visited by many collectors, and for this reason, as well as because of the long sojourn of Doctor Hillebrand in the islands, their ferns are particularly well known. On the one hand, the admirable descriptions in Doctor Hillebrand's *Flora* make the study of these ferns easier than they would be if they came from almost any other part of the tropics. On the other hand, the ferns of Hawaii constitute in themselves a group of phenomenal difficulty. The isolated position of the Archipelago has resulted, in several genera, in the development of a flora altogether peculiar and local. Thus in the ferns, we have two genera, *Diellia* and *Sadleria*, each with a considerable number of species which have unquestionably been developed locally from a common ancestor. In both cases, the ancestor can be fixed with a considerable measure of certainty and exactness.

¹ W. J. Robinson, *The Ferns of the Hawaiian Islands*, Bull. Torrey Bot. Club 40 (1913).

² W. J. Hillebrand, *Flora of Hawaii* (1888).

The local development of a series of forms, which has taken place in the two genera just mentioned, has taken place also in the large genus *Asplenium*, apparently from a number of immigrant ancestral forms, and with the result that the derived groups have developed until they overlap, and the differentiation of groups, and the assignment of species and forms to the different groups, is only possible to a person who has something like the complete knowledge of the flora which Doctor Hillebrand possessed.

In both *Asplenium* and *Sadleria*, I have ventured to describe new species, and in *Asplenium* I have raised some of his forms to specific rank. The most of the species which I describe as new in this paper are, I believe, plants which Doctor Hillebrand had not seen. It must be remarked that the Abbé Faurie is himself a collector of very long experience, that he is a good student of ferns, and that he devoted himself for about a year and a half wholly to the collection of the Hawaiian plants. Even in a land where the ferns have been as well studied as in Hawaii, it would be very strange if the Abbé Faurie had not succeeded in finding a number of previously unknown plants. In fact, knowing as I do the work of Abbé Faurie, I consider the small number of new species which I can find in this collection almost as strong a testimonial as is Hillebrand's own work to the thoroughness with which Doctor Hillebrand has covered his field. Almost all of the species described by Doctor Hillebrand, and a wide range of forms which are not treated as species, are found in the Faurie collection.

It was once raised as an objection to systematic botanical work even on the Philippine flora, and has since been raised against work with plants coming from without the Philippines, that the opportunities for careful work of this kind in a place as remote as the Philippine Islands are hardly sufficient to justify the dangers which must result from hasty publication or publication without proper facilities. For the work with these Hawaiian ferns, I have had available, in the library of the Bureau of Science, every publication which I have known I would like to consult with the exception of the volume on ferns by Brackenridge in the report of the United States Exploring Expedition. I have previously consulted the Brackenridge volume, in the library of the Bishop Museum in Honolulu, and have made some notes from it, but would be very glad to have had continued access to this work. Hawaiian ferns are represented in very considerable number in the herbarium of the

Bureau of Science and in my own herbarium. These specimens go back to collectors as old as Gaudichaud, and include a considerable number collected and determined by Hillebrand himself. Of recent collections, we have one sent in exchange by the Bishop Museum to the Bureau of Science; a collection made by H. M. Curran, then of the Forestry Bureau of this Government, during a visit to the Hawaiian Islands; a few specimens collected by Doctor Bartsch of the United States Bureau of Fisheries; a collection recently sent to me by the Hawaiian Board of Forestry, and determined at the same time as the Faurie collection; and the plants which I have been able to collect on two personal visits to the mountains near Honolulu. In the older collections, I have fortunately had an especially large representation of species of *Asplenium*, sent to me by the courtesy of the Royal Botanic Garden at Berlin. Another evidence of the quality of the Faurie collection is furnished by the fact, that, among all the other recent collections in my possession, there is only one fern, the assignment of which to an old and recognized species is even doubtful.

In this collection there appear three cosmopolitan ferns not hitherto collected in Hawaii. These are:

ATHYRIUM ESCULENTUM (Retz.) Copel., Kauai.

ADIANTUM CUNEATUM L. & F., *Faurie No. 154*, Kauai, Kealea.

PTERIS LONGIFOLIA L., *Faurie No. 45*, Maui, Wailiku.

The descriptions of the new species, and the other changes of name which seem to be called for, are as follows:

ATHYRIUM MARGINALE (Hilleb.) Copel. comb. nov.

Asplenium marginale Hilleb. *Flora Hawaii* (1888) 613.

Diplazium, C. Chr. *Index Filicum* (1905) 235.

Faurie No. 291, Oahu, Punaluu, Alt. 800 m.

ATHYRIUM MAUIANUM Copel. sp. nov.

Rhizomate verosimiliter erecto, apice paleis castaneis (haud nigris) nitidis lanceolatis ca. 6 mm longis minute striatis integris vestito; stipite 35 cm alto, fusco, glabro; fronde "polystichoidea," 50–60 cm alta, 25–30 cm lata, acuminata; pinnis brevi-stipitatis, infimis quam sequentibus paullo longioribus, usque ad 20 cm longis, 3 cm latis, acuminatis, $\frac{3}{4}$ ad costam pinnatifidis, infimis solummodo rhachin versus angustatis, aliis e basi truncato vel subcordato sensim angustatis; segmentis acroscopicis quam basis-copicis ubique longioribus, oblongis, obtusis, serrulatis, membranaceis, glabris, sinubus inter lobos angustis; venis sat remotis, simplicibus, in dentes desinientibus et ibidem saepe falcatis; soris medialibus, brevibus, latis; indusio angusto.

Faurie No. 296, Maui, Makawao, alt. 800 m.

Differs from *Athyrium Fenzlianum* in the scales, from *A. marginale* in the absence of reduced basal pinnules, and from *A. deparioides* in the sharp and narrow sinuses. In essential characters it agrees more nearly with *A. kaalaanum*, but the two are so extremely unlike in appearance that, in the absence of intermediates, I cannot combine them. I have tried to identify this fern with *Diplazium sandwichense* Presl, Epim. 85, but can not reconcile Presl's "pinnis..... obtusis..... basi superiore rotundato..... truncatis inferiore acutissimis" with my plant.

From the Royal Botanical Garden at Berlin, I have a fragment collected by Gaudichaud, supposed to be *Diplazium sandwichense*. It does not fit Presl's description very perfectly and is more like *Athyrium Fenzlianum* than *A. mauianum*; the type was collected by Meyen.

ATHYRIUM KAALAANUM Copel. sp. nov.

Species *A. japonico* (Thunb.) Copel. affinis, rhizomate brevissimo, erecto, radices multos emittente; stipitibus confertissimis, 5 cm altis, basin versus paleis laete brunneis lanceolatis deciduis vestitis, stramineis et brunneis, carnosus; fronde 10–15 cm alta. 3–5 cm lata, acuminata, basi vix angustata, rhachi gracile sub lente minute squamosula, parte apicale tertia pinnatifida, infra eam partem pinnata pinnis adnatis, parte inferiore tertia ad mediam pinnata pinnis stipitatis; pinnis adscendentibus, liberis interdum $\frac{1}{2}$ ad costam pinnatifidis, lanceolatis, obtusis, basi plus minus truncatis; lobis integris, infimo basiscopico interdum praestantiore; lamina glabra, atroviride, membranacea; soris brevibus, medialibus, oblongis; indusio atrobrunneo angustissimo et deinde facile invisu.

Faurie No. 294, Kauai, Kaala, Nov. 1909.

Unquestionably related to *Athyrium japonicum*, from which it differs chiefly in rhizome and indusium. The rhizome of *A. japonicum* is often very short but still prostrate and the stipes not nearly so crowded as in this plant. Baker in the Synopsis, p. 235 of the second edition, states that "a similar plant grows in the Sandwich Islands;" but according to Hillebrand this reference is to *A. Fenzlianum* which is really a very distinct fern. *A. kaalaanum* may possibly be Hillebrand's var. "*depauperatum*" of *A. marginale*.

SADLERIA FAURIEI Copel. sp. nov.

Caudice ignoto; stipite 45 cm alto, castaneo, basi paleis fulvo-castaneis nitidis linearibus 2 cm longis duriusculis dense obtecto, sursum rhachique glabris; fronde ca. 50 cm alta, 35 cm lata; pinnis sessilibus, acuminatis, 15–20 cm longis, 20–25 mm latis, fere ad costam pinnatifidis, infimis paullo brevioribus; segmentis approximatis, 4–5 mm latis, plerumque falcatis, obtusis vel acutis, apicem versus minute crenulatis, glabris, coriaceis; venis inconspicuis; soris a costa $\frac{1}{3}$ ad apicem protensis, lineari-oblongis, paginam haud complentibus.

Faurie No. 95, Oahu, Kalihi, alt. 600 m.

Nearest to *Sadleria cyatheoides*, but with broader segments and very much harsher scales. These have a deep chestnut middle line, and in the lower part paler margins.

ASPENIUM POLYODON Forst.

Faurie No. 224, Kauai, Holokele, alt. 600 m.; *No. 312*, Hawaii, Glenwood, alt. 600 m.

In form this is very like some specimens of *Asplenium pseudofalcatum*, but the venation and sori are closer. There is no proliferation, and the texture is such that it is not to be expected. These specimens agree perfectly with specimens from New Zealand, and Samoa, bearing the name *A. falcatum* Lam. Our Australian specimens are uniformly more slender. I use Forster's name because I am not convinced that the Polynesian and Indian plants are identical. *A. falcatum* is reported from Java, Borneo, and Celebes, but our large collections from Java and Borneo do not contain it. If I knew the plants of Forster and Lamarck to be identical, I would use Lamarck's name in deference to long usage. If I were using the name *Asplenium adiantoides*, it would be in Lamarck's sense.

ASPENIUM COOKII Copel. sp. nov.

Species gregis *A. caudati* Forst., rhizomate repente, valido, paleis atrogriseis; fronde grande, angusta; pinnis incisis, pinatifidis vel pinnatis, papyraceis; soris longis (interdum plus quam 1 cm), divergentioribus.

Faurie No. 232, Kauai, Waimea, alt. 1,000 m, Feb., 1910, Type; bipinnate, with oblanceolate rather than obovate pinnules, narrowly cuneate below, and the apices narrowed or rarely truncate, and finely toothed. *No. 227*, Hawaii, Glenwood, alt. 600 m, is almost certainly the same, but the rhizome is wanting.

In my opinion, the following less cut plants may be referred to this species: *Nos. 222*, Hawaii, Glenwood, alt. 600 m; *226*, Hawaii, Maunakea, alt. 2,000 m; *217*, Maui, Makawao, alt. 700 m; *308*, ibidem, alt. 800 m; *229*, Molokai, Pakoo, alt. 800 m; and *223*, Molokai, Kamalo, alt. 1,000 m. These represent *Asplenium spathulinum* of Hillebrand's Flora. p. 604, which is not a tenable name for the Hawaiian plants. Robinson,³ discussing *A. caudatum*, says "Hillebrand separates *Knudsen 141* and *148* as *A. spathulinum* on the basis that the pinnae in these specimens are more deeply incised than in the others." That Hillebrand never intended to separate the two species on this character alone, or mainly, is sufficiently indicated by his including under *A. caudatum* his "var. *sectum*."

I have given to this species the name of the famous explorer who discovered the Hawaiian Islands and met his death there.

ASPENIUM SECTUM (Hilleb.) Copel. comb. nov.

Asplenium caudatum Forst. var. *sectum* Hillebrand Flora Hawaii (1888) 603.

Faurie No. 236, Maui (a monstrosity); *Nos. 460, 461*, Kauai, Waimea, alt. 1,000 m.

³ Bull. Torr. Bot. Club 40 (1913) 213.

Well described by Hillebrand, and surely related to the *Asplenium caudatum* of Hawaii, but still amply distinct. The upper end of the frond shows its connection with *A. caudatum*, which would hardly be recognized from the middle and basal parts.

ASPENIUM MIRABILE Copel. sp. nov.

Rhizomate ignoto; stipite ca. 50 cm alto, glabro, nitido, fere nigro; fronde oblonga, 1 m alta, utrinque angustata, glabra, papyracea, rhachi atro-viride; pinnis stipitatis, utroque latere ca. 35, inferioribus sterilibus ca. 8 cm longis, 1 cm latis, e basibus subobliquis sensim angustatis, ubique oblique inciso-lobatis, lobis truncatis emarginatis; medialibus 20 cm longis, 5-8 cm latis, valde acuminatis, ad alam angustam oblique pinnatifidis; segmentis infimis 6-14 mm longis orbicularibus vel obovatis, plerumque truncatis, medialibus 4-7 cm longis, anguste lanceolatis, e basibus late adnatis sensim angustatis, late serratis, superioribus anguste oblongis emarginatis; venis vix conspicuis, sat distantibus; soris 5-8 mm longis, in segmentis angustis costulae subparallelis, in segmentis latis divergentibus;

Faurie No. 239, Kauai, Keihia, alt. 300 m, Jan., 1910.

In spite of its nakedness, I am inclined to group this fern with *Asplenium horridum* because of the similarity of the lower pinnae. The two agree in texture and venation. Even the topmost pinnae are much more cut than those of *A. caudatum*.

ASPENIUM NEPHELEPHYLLUM Copel. nom. nov.

A. dissectum Brack. var. *kauaiense* Hilleb. Flora of Hawaii (1888) 606.

Faurie No. 266, Kauai, Waimea, alt. 1,000 m.

Aside from the exceedingly narrow ultimate divisions, this differs from *Asplenium schizophyllum* C. Chr. (*A. dissectum* Brack.) in having the rachises of the pinnae naked, and winged well toward the base. The texture is thinner (thin-membranaceous) and the more conspicuous veins do not reach the tips.

ELAPHOGLOSSUM FAURIEI Copel. sp. nov.

Elaphoglossum, *E. gorgoneo* simile, rhizomate minus crasso et stipitibus minus confertis, paleis nigris, nitidis, lineari-lanceolatis, rectis, rigidis, integris, cellulis earum elongatis regularibus.

Faurie No. 33, Molakai, Pukoo, alt. 600 m.

The specimen sent me has sterile fronds 15 to 20 cm long and 4 to 5 cm wide, with moderately decurrent base, on stipes 3 to 5 cm long; the fertile frond is 20 cm long, 2 cm wide, on a naked stipe 20 cm long. The margin is less evidently distinct in texture than in *E. gorgoneum*.

ELAPHOGLOSSUM CRASSICAULE Copel. sp. nov.

Species gregis *E. gorgonei*, rhizomate fere 1 cm crasso, paleis eis *E. Fauriei* similibus; stipitibus frondis sterilis 2 cm, frondis

fertilis 8–10 cm altis, validis; frondibus plantae in manu fragmentariis, parte frondis sterilis 30 cm alta, 7.5 cm lata, usque ad apicem dilatata, deorsum sensim usque ad pedem fere truncatam angustata, haud decurrente; fronde fertile sensim ad alam brevem angustata; venis plerisque infra marginem anastomasantibus, margine haud hyalina.

Faurie No. 427, Kauai. My specimen probably does not include more than half of the sterile frond.

The "gorgoneum" group in Hawaii is far from being as simple as might be supposed from its freedom from specific names. Of these, there seem to be only two, given to *Acrostichum gorgoneum* Kaulf. and *Aconiopteris obtusa* Fée. These I believe to be the same plant, although Christ (Monograph, p. 49) would distinguish them and place them in different groups. *Acrostichum pellucido-marginatum* Christ is not a Hawaiian plant, and may well be a good species. *A. Viellardii* Mett. (Cf. Hooker. Sp. Fil. 5: 255) has long, slender petioles and but slightly decurrent blades.

The paleae of *Elaphoglossum* usually furnish excellent diagnostic characters, and seem never to have received discriminating attention from writers on the Hawaiian ferns of this group. The *E. gorgoneum* of Christ's Monograph has rather broad paleae with crisped or ciliate margins. Fée does not describe the paleae of *A. obtusa*, but his figure indicates that they are of this type. We have Hawaiian specimens of this plant, collected by Faurie, Bartsch, the Hawaiian Board of Forestry, Forbes, and Curran. These paleae are brown, usually dark-brown, in color, and their cells are for the most part short and irregular. Hillebrand, on the other hand, describes the paleae as long, stiff, linear-lanceolate and entire. These are all truer of the two species described above, than of the plants I call *E. gorgoneum*. But Hillebrand says the paleae are dark-brown while both of these species have them very distinctly black.

LINDSAYA MACRAEANA (H. & A.) Copel. comb. nov.

Davalia macraeana H. & A. Bot. Beechey's Voyage (1832) 108.

Odontoloma, Brack. (1854).

SERTULUM BONTOCENSE: NEW OR INTERESTING PLANTS
COLLECTED IN BONTOC SUBPROVINCE, LUZON,
BY FATHER MORICE VANOVERBERGH, II

By E. D. MERRILL¹

(From the Botanical Section of the Biological Laboratory,
Bureau of Science, Manila, P. I.)

The first paper of this series was published in June, 1912,² and essentially the present contribution is like the first, consisting chiefly of the descriptions of new species of flowering plants that have been detected in the material submitted by Father Vanoverbergh for identification within the past two years. Seventeen species are proposed as new, in the genera *Adelmeria*, *Calophyllum*, *Croton*, *Dysoxylum*, *Flacourtia*, *Illigera*, *Leea*, *Loranthus*, *Psychotria*, *Pygeum*, *Ranunculus*, *Rubus*, *Saurauia*, *Schefflera*, *Sophora*, and *Trichosanthes*. *Polygala longifolia* Poir. is for the first time credited to the Philippines.

ZINGIBERACEAE

ADELMERIA Ridley

ADELMERIA OBLONGA sp. nov.

Species *A. paradoxae* (*A. bifidae*) simillima, differt capitulis oblongis, cylindraceis, usque ad 15 cm longis, 4 ad 6 cm diametro, labellum integrum.

About 2 m high, glabrous. Leaves oblong, coriaceous, pale and shining when dry, 30 to 40 cm long, 6 to 8 cm wide, the apex slenderly subcaudate-acuminate, base narrowed, acute; ligule very large and prominent, ovate to oblong-ovate, up to 6 cm long, subcoriaceous. Heads terminal, solitary, simple, somewhat recurved or nodding, cylindric, oblong, 10 to 15 cm long, 4 to 6 cm in diameter (when somewhat flattened in drying), rounded, each subtended by one or more reduced leaves. Bracts coriaceous, imbricate, brown when dry, obovate, about 4 cm long, 2.5 to 3.5 cm wide, rounded-truncate, sometimes slightly retuse, rather laxly imbricate. Bracteoles utricular, compressed, 3.5

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² Philip. Journ. Sci. 7 (1912) Bot. 71-107.

to 4 cm long, laterally keeled, 3-lobed at the apex, the lobes irregular, ovate, acuminate, up to 1.5 cm long, glabrous, each inclosing two flowers. Calyx tubular, about 3.5 cm long, glabrous, usually 2-lobed, the lobes ovate, acuminate, irregular, 0.8 to 1.5 cm long. Corolla white, the tube fleshy, slender, cylindric, about 3.5 cm long, externally usually slightly pubescent above, the lateral lobes ovate, acuminate, about 12 mm long, 8 mm wide, the upper (inner) one similar but thicker, externally slightly pubescent. Lip broadly ovate, entire, somewhat acuminate, externally slightly pubescent, about 12 mm long, 10 mm wide, about 15-nerved, adherent to the stamen below. Stamen about 8 mm long, 2.6 mm wide, adherent to the lip below, the connective produced about 1.5 mm, ovate, deeply cleft. Stigma obovoid, 1.5 mm long.

LUZON, Subprovince of Bontoc, Bauco, *Vanoverbergh* 3108, April, 1913, along streams, altitude about 1,500 meters.

The third species of this endemic genus to be found, differing from both the previously described ones in its much longer, cylindric, oblong, not globose or ovoid heads. In appearance it most closely resembles *ADELMERIA PARADOXA* (Ridl.) (*Hornstedtia paradoxa* Ridl. 1905, *Elmeria bifida* Ridl., and *Adelmeria bifida* Ridl. 1909), but in addition to the characters indicated above differs from that species in its entire lip, and slightly pubescent corolla. The head, so far as its shape and the bracts are concerned strongly resembles the inflorescence of *Hedychium coronarium* Koenig.

LORANTHACEAE

LORANTHUS Linnaeus

LORANTHUS EUCALYPTIPHYLLUS sp. nov. *Dendrophthoe*.

Species *L. haenkeano* affinis, differt foliis lanceolatis, falcatis vel subfalcatis, longioribus, usque ad 23 cm longis, floribus longioribus, circiter 4 cm longis.

A parasitic shrub, glabrous except the inflorescence, the branches terete, light-gray, smooth, shining, the ultimate ones 4 to 5 mm diameter. Leaves alternate, rather distant, lanceolate, subfalcate to strongly falcate, 17 to 22 cm long, 2.5 to 5 cm wide, very thickly coriaceous, pale, somewhat shining, and of about the same color on both surfaces when dry, brittle, the base acute or somewhat acuminate, gradually narrowed above the middle to the somewhat acuminate apex; lateral nerves about 7 on each side of the midrib, ascending, very obscure or nearly obsolete; petioles 2 to 3 cm long. Inflorescence in the upper axils, solitary, apparently erect or ascending, a compound umbel about 10 cm in diameter, many-flowered, the peduncle somewhat puberulent, about 3 cm long, the primary branches numerous,

densely gray-puberulent, 1 cm long or less, each bearing two lateral, sessile, and one median shortly pedicelled flowers, each flower subtended by a puberulent, ovate-oblong bracteole 2 mm long or less. Flowers 5- and 6-merous. Calyx densely puberulent, somewhat cylindric, truncate, narrowed below, about 5 mm long, 2 mm in diameter. Corolla red and yellow, sparingly puberulent externally, cylindric, 3 to 3.5 cm long, the reflexed portions of the lobes above the insertion of the stamen about 7 mm long. Anthers lanceolate, about 4 mm long, continuous with the short filament.

LUZON, Bontoc Subprovince, Bauco, *Vanoverbergh* 1505, December 4, 1912.

A species in the same group with *Loranthus haenkeanus* Presl, and manifestly allied to that species, which it greatly resembles. It differs in its much narrower, longer, falcate leaves, and in its considerably longer flowers. The leaves are remarkably like those of some species of *Eucalyptus*, in the group with *E. tereticornis* Sm., in shape, texture, and color, from whence its specific name.

RANUNCULACEAE

RANUNCULUS Linnaeus

RANUNCULUS LAXUS sp. nov.

Caulis erectis, dichotomis, usque ad 50 cm altis, plus minusve hirsutis; foliis longe petiolatis, 3-sectis, segmentis usque ad 3.5 cm longis, serratis, hirsutis, petiolulatis; floribus longe pedicellatis, flavis, circiter 8 mm diametro, sepalis reflexis; capitulis subglobosis vel ovoideis, 6 ad 8 mm diametro; carpellis glabris, laevis, circiter 3.5 mm longis, curvato-apiculatis.

An erect, perennial, dichotomously branched herb about 50 cm in height, the lower part of the stem, the petioles and to a less degree the leaves more or less hirsute with long, scattered, spreading hairs, the stems striate, up to 3.5 mm in diameter below, much smaller above, the branchlets nearly glabrous or only sparingly appressed-hirsute. Leaves long-petioled, all the lower ones divided into three, separate, petiolulate segments, the petioles up to 8 cm long, those of the uppermost leaves much shorter, the petiolules 4 mm long or less; segments sparingly hirsute, elliptic-ovate, 2 to 3.5 cm long, 1.5 to 2 cm wide, narrowed below to the acute base and above to the acute or somewhat acuminate apex, the margins in the upper one-half coarsely and irregularly serrate. Uppermost leaves bract-like, lanceolate, not lobed, about 1.5 cm long. Flowers few, yellow, about 8 mm in diameter, their pedicels 2 to 4 cm long. Sepals oblong, membranaceous, obtuse, reflexed, outside with very few, widely scat-

tered hairs, 3-nerved, 3 to 3.5 mm long, 1.5 mm wide. Petals yellow, oblong-elliptic, rounded, 5-nerved, 3.5 mm long, 2 mm wide, base somewhat narrowed, the basal scale orbicular, 0.3 mm in diameter, 0.5 mm from the base of the petal. Filaments 1 to 1.5 mm long; anthers elliptic-ovate, 1 mm long. Heads ovoid to subglobose, 6 to 8 mm in diameter. Achenes compressed, glabrous, smooth, inequilaterally ovate, 3.5 to 4 mm long, about 2 mm wide, the beak short, more or less curved, less than 1 mm long.

LUZON, Subprovince of Bontoc, Bauco, *Vanoverbergh* 3647, May 24, 1913, along small streams, altitude 1,650 meters.

A species manifestly closely allied to the Australian *Ranunculus plebeius* R. Br., and to the New Zealand *R. hirtus* Banks & Sol., the latter reduced by some authors to the former. It differs from our material of *R. hirtus* Banks & Sol., and from the descriptions of both species in being less hirsute, in its smaller flowers, and in its somewhat larger achenes. The second species of the genus to be found in the Philippines, and like *Ranunculus philippinensis* Merr. & Rolfe it finds its closest allies in Australia and New Zealand and not in the much closer Asiatic region.

HERNANDIACEAE

ILLIGERA Blume

ILLIGERA PUBESCENS sp. nov.

Frutex scandens, omnibus partibus plus minusve pubescentibus; foliis 3-foliolatis, foliolis subcoriaceis, ovatis, integris, usque ad 9 cm longis, basi late rotundatis, apice obtusis vel latissime breviter acuminatis, nervis utrinque 5, supra parce hirsuto-scabridis, subtus parce hirsutis; infructescentiis elongatis, fructibus 2-alatis, 2 cm longis, cum alis 4.5 cm latis.

A scandent shrub 3 to 4 m in height, all parts more or less pubescent, the branches striate, rather softly pilose, terete. Leaves 3-foliolate, their petioles about 7 cm long, rather densely pubescent at the somewhat swollen base and at the apex. Leaflets ovate, entire, subcoriaceous, 7 to 9 cm long, 5 to 6 cm wide, slightly shining when dry, the lower surface somewhat paler than the upper, the base broadly rounded, the apex obtuse or very broadly, obscurely, blunt-acuminate, upper surface somewhat hirsute-scabrid, the lower hirsute, especially on the midrib and nerves; lateral nerves 5 on each side of the midrib, distinct; petiolules densely pubescent, 1.5 to 2 cm long. Flowers not seen, but apparently in cymes, each cyme subtended by a leaf. Infructescence leafless, about 40 cm long, forming a rather narrowly pyramidal panicle, the branches spreading, distant, the

lower ones up to 12 cm long, all parts rather softly pilose with pale-brownish hairs. Fruits 2 cm long, 2-keeled, 2-winged, very sparingly pilose or glabrous, the fruit proper about 5 mm wide, the wings chartaceous, brown, shining, rounded, the total width of the fruit with the wings about 4.5 cm, the wings broadly rounded.

LUZON, Subprovince of Lepanto, near Cervantes, *Vanoverbergh 2135*, November 12, 1912, in thickets along streams.

A species quite different from the other Philippine forms, and apparently not previously described. The pubescence of the leaves and inflorescence is characteristic. Unfortunately it cannot, in the absence of flowers, be referred to its proper section.

ROSACEAE

PYGEUM Gaertner

PYGEUM RAMIFLORUM sp. nov.

Arbor parva, partibus junioribus inflorescentiisque dense ferrugineo-pubescentibus; foliis coriaceis, ellipticis ad oblongo-ellipticis, usque ad 8 cm longis, breviter acuminatis, basi acutis ad rotundatis, haud glandulosis, subtus ferrugineo-pubescentibus ad costa nervisque; inflorescentiis paniculatis, axillaribus, e ramis defoliatis, 2 ad 3 cm longis, dense multifloris; floribus 6-meris; ovario villosa; staminibus 18 vel 21.

A small tree, 3 m high according to the collector, the young branches and leaves, petioles, the inflorescences, and the lower surfaces of adult leaves on the midrib and nerves densely ferruginous-villous. Older branches terete, glabrous, grayish or brownish. Leaves elliptic to oblong-elliptic, coriaceous, 6 to 8 cm long, 3 to 5 cm wide, entire, apex shortly acuminate, base acute to rounded, not glandular, the upper surface becoming glabrous or nearly so, somewhat shining, the nerves impressed, the lower surface much paler, brownish, prominently ferruginous-villous on the midrib and nerves; lateral nerves about 8 on each side of the midrib, very prominent; petioles densely pubescent, about 8 mm long; stipules oblong-ovate, somewhat oblique, very densely pubescent, caducous. Panicles solitary or somewhat fascicled, axillary, from the older branches (5 to 6 mm in diameter or more) below the leaves, densely ferruginous-villous, 2 to 3 cm long, branched from the base, rather densely many-flowered. Flowers yellowish, their pedicels 1.5 to 2 mm long, the bracteoles elliptic-ovate, concave, 2.5 to 3 mm long, the pedicels, bracteoles and calyces very densely ferruginous-pubes-

cent. Calyx funnel-shaped, about 4 mm long, the lobes 6, lanceolate, acuminate, 2 mm long, the alternating petals oblong to oblong-obovate, thinner, obtuse, villous, 1 to 1.5 mm long. Stamens 18 or 21; filaments 3 to 5 mm long, slightly villous below, glabrous above; anthers 1 mm long. Ovary narrow, densely villous, tapering above into the style which is densely villous below and glabrous above, the ovary and style about 5 mm long.

LUZON, Subprovince of Bontoc, Bauco, *Vanoverbergh 2820*, April 4, 1913, in forests, altitude about 1,500 meters.

A characteristic species, recognizable by its eglandular leaves which are comparatively small and few-nerved, and its rather congested, paniculate, short inflorescences which are borne on the larger branches below the leaves, not on the ultimate branchlets.

RUBUS Linnaeus

RUBUS VANOVERBERGHII sp. nov. § *Malachobatus*, *Alceaefolii*.

Frutex scandens, 2 ad 3 m altus, ramulis petiolisque dense pubescentibus, parce aculeatis; foliis suborbicularibus ad orbiculari-reniformibus, usque ad 9 cm longis, chartaceis, pallidis, late et obscurissime 3- vel 5-lobatis, denticulatis, supra subglabris, subtus leviter ciliato-pilosis; inflorescentiis axillaribus, solitariis vel fasciculatis, racemosis, 3 ad 5 cm longis, paucifloris, dense fulvo-villosis, sepalis lanceolatis, acuminatis, petalis orbicularis, 6 mm longis.

A scandent shrub 2 to 3 m high. Branchlets and petioles densely pubescent with soft, elongated, rather pale-brownish hairs, and sparingly aculeate with short, straight or curved spines less than 1 mm long. Leaves simple, suborbicular to orbicular-reniform, chartaceous, pale when dry, 4 to 8 cm long, about as wide, the base very broadly cordate, the apex rounded, obscurely, broadly, and shallowly 3- or 5-lobed, the margins sharply denticulate, dull, the upper surface glabrous or slightly pubescent along the nerves, the lower surface sparingly villous on the nerves and reticulations, with very few minute spines on the main nerves, the nerves about 5 from the base, radiate, straight, prominent, the reticulations very distinct; petioles 3 to 4 cm long; stipules falling early, lanceolate, 6 mm long, somewhat laciniate at the apex, the divisions few, about 2 mm long. Inflorescence axillary, solitary or somewhat fascicled, racemose, 3 to 5 cm long, densely pale-fulvous villous, few-flowered, the bracteoles oblong, pubescent, 8 mm long divided to about the middle into slender segments. Calyx densely fulvous, the pedicels short, the seg-

ments lanceolate, long and slenderly acuminate, somewhat lacinate, 5 to 6 mm long. Petals white, orbicular, rounded, 6 mm in diameter, the claw short, about 1 mm long. Filaments 3.5 mm long; anthers 1 mm long. Carpels glabrous, inequilaterally and narrowly ovoid, the styles 6 mm long.

LUZON, Subprovince of Bontoc, Bauco, *Vanoverbergh 2683*, February 13, 1913, in forests, altitude about 1,700 meters.

Not closely allied to any known Philippine species, well characterized by its obscurely and shallowly lobed, suborbicular, rounded, cordate leaves, and by its short, few-flowered racemose inflorescence. It is probably as closely allied to the Malayan *Rubus alceaefolius* Poir. as to any other species.

LEGUMINOSAE

SOPHORA Linnaeus

SOPHORA PHILIPPINENSIS sp. nov. § *Eusophora*.

Frutex erectus 0.5 ad 2 m altus, pubescens; foliis 10 ad 20 cm longis, foliolis 17 ad 23, oblongo-ellipticis ad oblongis, mucronatis, 1.5 ad 4 cm longis; racemis solitariis, subterminalibus, 8 ad 20 cm longis, multifloris; floribus circiter 12 mm longis, vexilla violacea, anguste obovata; staminibus basi plus minusve connatis.

An erect, pubescent shrub 0.5 to 2 m high, the older branches terete, glabrous, dark-colored, the younger ones densely ferruginous-pubescent. Leaves alternate, 10 to 20 cm long, pubescent, the rachis densely so; leaflets 17 to 23, opposite, oblong-elliptic to oblong, 1.5 to 4 cm long, 6 to 10 mm wide, narrowed below to the acute or subacute base and above to the slenderly mucronate apex, both surfaces prominently pubescent; the lateral nerves obsolete or very obscure; stipules linear, about 7 mm long. Racemes terminal or opposed to the terminal leaf, solitary, erect, pubescent, 8 to 20 cm long, many-flowered; pedicels pubescent 3 to 4 mm long; bracteoles linear, pubescent, about 6 mm long. Calyx campanulate, about 8 mm long, 6 mm in diameter at the mouth, the teeth broad, base narrowed, pubescent externally. Standard violet, curved, narrowly oblong-obovate, 5 mm wide, 12 mm long, apex rounded or somewhat retuse, glabrous or nearly so; wing and keel petals similar, their claws slender, 4 mm long, their laminae oblong, rounded, about 8 mm long, 3 mm wide, white. Stamens 10, the vexillary one free, the others more or less united near the base for the lower 1 to 3 mm, about 10 mm long; anthers ellipsoid, 1 mm long. Ovary cylindric, densely villous, about 6 mm long, 1.8 mm in diameter, its stipe 1.5 mm long; ovules about 10; style, somewhat tapering upward, slanted

but not curved, glabrous or nearly so. Pod densely subferruginous-pubescent, 8 to 10 cm long, 5 mm in diameter, or less, in the thicker parts terete or very slightly compressed, long-acuminate, torulose, with from 2 to 4 distant seeds.

LUZON, Subprovince of Bontoc, Bauco, *Vanoverbergh* 1223, 2612 (type), May, 1912, 1913, on hill sides, altitude about 1,450 meters: Subprovince of Benguet, Kias trail, *Sandkuhl* 124, August, 1913.

An ally of *Sophora japonica* Linn., but with more numerous leaflets. It differs from most of the species in the genus in its stamens, with the exception of the vexillary one, being distinctly united at the base.

MELIACEAE

DYSOXYLUM Blume

DYSOXYLUM FLORIBUNDUM sp. nov. § *Eudysoxylum*.

Arbor circiter 8 m alta, partibus junioribus plus minusve pubescentibus; foliis alternis, usque ad 40 cm longis, foliolis 14 ad 24, oblongis, falcatis, acuminatis, subtus parce pubescentibus vel subglabris, axillis venarum barbatis; paniculis axillaribus, quam folia brevioribus, angustis, multifloris; floribus 9 mm longis, 4-meris, tubus stamineus cum petalis ca. $\frac{1}{3}$ coalitis, petalis extus glabris, intus minutissime puberulis.

A tree about 8 m high, the older parts nearly glabrous. Branches grayish-puberulent, the yonger parts and the very young leaves rather densely so. Leaves alternate, 25 to 40 cm long, the petioles and rachis very minutely pubescent; leaflets 14 to 24, oblong, opposite or subopposite, firmly chartaceous or subcoriaceous, 6 to 13 cm long, 2 to 4 cm wide, strongly falcate, acuminate, the base very strongly inequilateral, acute, the midrib much nearer the lower margin than the upper, the upper surface glabrous, shining, the lower a little paler, sparingly pubescent, bearded in the axils; lateral nerves 10 to 13 on each side of the midrib, distinct, usually forked, obscurely anastomosing, the reticulations lax, not prominent; petiolules 2 to 3 mm long. Panicles axillary, solitary, 20 to 25 cm long, 4 to 7 cm in diameter, the branches 4 cm long or less, rather densely many-flowered, slightly pubescent. Flowers 4-merous, greenish-white, sessile or subsessile, the bracteoles lanceolate, acuminate, 1 mm long or less. Mature buds cylindric, about 9 mm long, 2 mm in diameter. Calyx 2 mm in diameter, 1 to 1.5 mm high, shallowly cup-shaped, broadly 4-toothed, slightly pubescent. Corolla glabrous externally, 4-lobed, the lobes 4 to 5 mm long, obtuse, recurved in anthesis, the lower one-third to one-half adnate to the staminal tube, the reflexed part minutely gray-puberulent inside. Staminal tube cylindric, about as long as the

petals, slightly enlarged above, truncate, obscurely crenulate, slightly pilose externally in the exposed part, inside very slightly pilose-hirsute. Anthers 8, elliptic-oblong, 1.2 mm long, attached near the apex, included, but their tips nearly reaching the summit of the tube. Disk cylindric, 4 mm long, somewhat hirsute, apex obscurely crenulate. Style as long as the calyx-tube, hirsute below, glabrous above; stigma depressed-globose, 1 mm in diameter.

LUZON, Subprovince of Bontoc, Bauco, along small streams, altitude about 1,500 m, *Vanoverbergh* 1470, September 12, 1912.

A species manifestly in the same group with and allied to *Dysoxylum forsteri* C. DC. of Australia and Polynesia, and to *D. muelleri* Benth., of Australia, but quite distinct from both.

POLYGALACEAE

POLYGALA LONGIFOLIA Linnaeus

POLYGALA LONGIFOLIA Poir. in Lam. Encycl. 5 (1804) 501; Chod. in Mém. Soc. Phys. Hist. Nat. Genève 31 (1893) 358.

Polygala leptalea DC. Prodr. 1 (1824) 325.

LUZON, Subprovince of Bontoc, *Vanoverbergh* 1745: Province of Nueva Vizcaya, *Bur. Sci.* 20135 *McGregor*. MINDANAO, District of Cotabato, Makar, *Copeland s. n.*

Not previously reported from the Philippines. India, Java, and northern Australia.

EUPHORBIACEAE

CROTON Linnaeus

CROTON COLUBRINOIDES sp. nov.

Species *C. caudato* affinis, differt omnibus partibus, floribus exceptis, glabris vel subglabris.

An erect or suberect shrub about 2 m high, glabrous or nearly so. Branches terete, glabrous, smooth, grayish-brown, the younger ones reddish-brown. Leaves broadly ovate, very similar in shape, size, and appearance to those of *Colubrina asiatica* Rich., subchartaceous, green, shining, 5 to 7 cm long, 3 to 5 cm wide, glabrous, or when young with very minute, scattered, stellate hairs on the lower surface, the base very broadly truncate-rounded, with two stipitate glands, 5-nerved, the apex sharply acuminate, the margins distinctly crenate-serrate; lateral nerves above the base 2 or 3 on each side of the midrib, reticulations lax; petioles 1.5 cm long; stipules linear, 5 mm long. Raceme terminal, simple, erect, nearly glabrous, about 12 cm long, many-flowered. Flowers white, mostly staminate, a few pistillate ones near the base of the raceme. Staminate flowers 7 to 8 mm in diameter. Sepals elliptic-ovate, acute, 3.5 to 4

mm long, pubescent only near the apex. Petals oblong to oblong-ob lanceolate, membranaceous, about 4 mm long, 1.5 mm wide, the margins lanate. Disk lanate. Stamens about 12; filaments 3 mm long, glabrous; anthers very broad, about 1 mm long. Pedicels glabrous, 5 to 6 mm long. Pistillate flowers in general similar to the staminate ones. Sepals ovate, acuminate, 5 mm long. Ovary densely pubescent, broadly ovoid; style-arms about 4 mm long, glabrous.

LUZON, Subprovince of Bontoc, Bauco, *Vanoverbergh* 3107, April 25, 1913, on hillsides, altitude about 1,300 meters.

A species similar to and manifestly allied to *Croton caudatus* Geisel, differing especially in being nearly glabrous throughout, with the exception of the flowers. In vegetative characters the plant very strongly resembles the widely distributed *Colubrina asiatica* Rich., from whence its specific name.

VITACEAE

LEEAE Linnaeus

LEEAE EUPHLEBIA sp. nov.

Frutex circiter 2 m altus; foliis decompositis, circiter 50 cm longis, glabris vel foliolis junioribus subtus ad costa leviter ciliatis; foliolis numerosis, chartaceis, ovatis ad oblong-lanceolatis, in siccitate brunneis, 5 ad 12 cm longis, caudato-acuminatis, basi acutis vel obtusis, nervis reticulisque prominentibus; inflorescentiis ad 20 cm diametro, in alabastro minoribus, densis, pubescentibus; floribus 5-meris, rubris.

A shrub about 2 m high, except the inflorescence glabrous or nearly so. Leaves decompose, up to 50 cm long, the lower pinnae up to 40 cm in length, glabrous or the younger leaves slightly ciliate on the midribs beneath, eglandular; leaflets brownish when dry, dull or slightly shining, the lower surface a little paler than the upper, ovate to oblong-lanceolate, 5 to 12 cm long, 2.5 to 5 cm wide, chartaceous, the base acute or obtuse, the apex slenderly caudate-acuminate, the margins prominently serrate, each third or fourth tooth usually larger than the others; petiolules slenderly but distinctly winged, the wings subundulate or somewhat crisped; lateral nerves 10 to 12 on each side of the midrib of average and larger leaves, fewer in smaller leaves, very prominent on the lower surface, anastomosing, the reticulations slender, subparallel, distinct. Inflorescence in bud or early anthesis 4 to 6 cm in diameter, dense, densely brown-pubescent, in full anthesis open, lax, up to 20 cm in diameter, the branches divaricate, the older parts sometimes nearly glabrous. Flowers red, 5-merous, the bracteoles triangular-ovate,

acuminate, 1 to 1.5 mm long. Pedicels stout, about 1 mm long. Calyx glabrous, 3 mm in diameter, the lobes broadly ovate, 1 mm long, acute. Petals red, the corolla 4 mm long, the free parts of the petals oblong-ovate, acute, about 3 mm long. Tube 3 to 3.5 mm long, ovoid to subglobose, 5-lobed at the apex the lobes entire, rounded. Anthers 1 mm long. Ovary glabrous.

LUZON, Bontoc Subprovince, Bauco, *Father M. Vanoverbergh* 444, April to October, 1910, on hillocks, altitude about 1,400 meters.

A species manifestly allied to the widely distributed *Leea sambucina* Willd., from which it is distinguished by its very prominently nerved leaves and its very narrowly but distinctly winged petiolules.

DILLENACEAE

SAURAUIA Willdenow

SAURAUIA BONTOCENSIS sp. nov.

Frutex vel arbor parva, 3 ad 6 m altus, ramulis subtus foliis inflorescentisque plus minusve setosis; foliis coriaceis, oblongo-ellipticis, usque ad 25 cm longis, supra glabris, nitidis, subtus parce setosis, acuminatis, basi obtusis ad rotundatis, nervis utrinque circiter 18, valde prominentibus; inflorescentiis e ramis vetustioribus, solitariis vel fasciculatis, paucifloris, depauperato-paniculatis, bracteatis, 4 ad 6 cm longis; floribus 5-meris, petalis circiter 15 mm longis.

An erect shrub or small tree, 3 to 6 m high. Branches stout, terete, brown, glabrous or nearly so, the younger ones rather densely covered with appressed or somewhat spreading, brown, lanceolate, acuminate, 2 mm long, setose scales. Leaves alternate, oblong-elliptic, coriaceous, 15 to 25 cm long, 7 to 12 cm wide, the apex shortly acuminate, base subacute or obtuse to rounded, margins distantly glandular-serrulate, the upper surface brownish or olivaceous, shining when dry, glabrous or nearly so, the lower surface somewhat paler, slightly shining, more or less spinulose-setose, especially near the midrib and the primary nerves; lateral nerves about 18 on each side of the midrib, very prominent, anastomosing, the reticulations very prominent, rather lax; petioles setose, 1.5 to 4 cm long. Inflorescence from the axils of fallen leaves on the branches below the leaves (0.8 to 1.5 cm in diameter), solitary or somewhat fascicled, of depauperate, bracteate panicles 4 to 6 cm long, more or less setose, few-flowered. Bracts leaflike, 1.5 to 2 cm long, 8 mm wide, narrowed at both ends, acuminate, irregularly spinulose-toothed, concave, prominently reticulate, the bracteoles similar but smaller and oblong to oblong-spatulate, 4 to 10 mm long;

pedicels about 10 mm long. Sepals 5, the outer two elliptic, rounded, sparingly setose and pubescent externally, about 10 mm long, 6 mm wide, much thicker than the three interior ones which are petaloid, broadly obovate, rounded to retuse, about 12 mm long and 10 mm wide, their margins minutely ciliate. Petals 5, white, very broadly obovate, slightly narrowed below, 15 mm long, 12 mm wide, glabrous, retuse, about 12-nerved. Stamens numerous; filaments and anthers each about 3 mm long. Style 2 mm long, the arms 5, 3 mm in length.

LUZON, Subprovince of Bontoc, Bauco, *Vanoverbergh* 445, 2555 (type), April, 1910 and February, 1913, in forests, altitude about 1,700 meters: Subprovince of Lepanto, near Mancayan, *Bur. Sci.*, 5947 *Ramos*, January, 1909: Subprovince of Abra, *Bur. Sci.*, 7098 *Ramos*, February, 1909. The name in Bontoc is *deguay*; in Abra *dogdoguay*.

Probably most closely allied to *Saurauia macgregorii* Merr., but with very much larger flowers and more numerous nerved leaves. The depauperate panicles from the larger branches with their comparatively large flowers are characteristic.

GUTTIFERAE

CALOPHYLLUM Linnaeus

CALOPHYLLUM VANOVERBERGHII sp. nov. § *Apetalum*.

Arbor parva partibus junioribus gemmisque exceptis glabra; foliis crasse coriaceis, utrinque concoloribus nitidisque, oblongis, usque ad 8 cm longis, obtusis, basi acutis; inflorescentiis axillaribus, brevibus, depauperato-paniculatis, paucifloris, sepalis 4, 2 exterioribus 6 mm longis, 2 interioribus subpetaloideis, paullo majoribus; ovario glabro.

A small tree, 3 m high *fide* Vanoverbergh, nearly glabrous, the branches terete, stiff, grayish or olivaceous, glabrous, the very tips of the branchlets sometimes a little pubescent, the buds brown- or ferruginous-pubescent. Leaves opposite, thickly coriaceous, oblong, 5 to 8 cm long, 2 to 3 cm wide, strongly shining and of about the same color on both surfaces when dry, the apex blunt, the base acute or sometimes a little decurrent; lateral nerves very close; petioles about 1 cm long, at first slightly pubescent, soon becoming quite glabrous. Inflorescence axillary, and terminating short lateral branchlets, 1.5 to 2.5 cm long, the peduncle very short, usually somewhat ferruginous-pubescent, bearing at its apex usually three short branchlets, often also with additional pedicelled flowers. Flowers white, their pedicels 5 to 10 mm long. Outer two sepals broadly ovate, obtuse, concave, about 6 mm long, glabrous or slightly pubescent

on the margins above, the inner two subpetaloid, narrowly obovate, rounded, 8 mm long, the median parts thicker than the margins. Petals none. Stamens indefinite; filaments 2 to 3.5 mm long; anthers narrowly obovoid or oblong-obovoid, 1.5 to 2 mm long. Ovary ovoid, glabrous, narrowed into the stout, 2 mm long style.

LUZON, Subprovince of Bontoc, Bauco, in forests, altitude about 1,700 m, *Vanoverbergh* 1466, September 12, 1912.

One of the few species of the § *Apetalum* known from the Philippines.

FLACOURTIACEAE

FLACOURTIA L'Héritier

FLACOURTIA LANCEOLATA sp. nov.

Frutex 3 ad 4 m altus inflorescentiis exceptis glaber; ramis ramulisque teretibus, lenticellatis, brunneis; foliis coriaceis, lanceolatis, usque ad 7 cm longis, in siccitate brunneis, nitidis, utrinque angustatis, basi acutis, apice acuminatis, nervis utrinque circiter 6, tenuibus; floribus ♂ 4-meris, racemosis, racemis axillaribus, solitariis vel fasciculatis, puberulis, petiolo aequantibus vel paullo longioribus.

A shrub 3 to 4 m high, glabrous except the inflorescence. Branches and branchlets slender, terete, brown, rather densely lenticellate. Leaves coriaceous, lanceolate, 5 to 7 cm long, 1.5 to 2 cm wide, rather dark-brown and shining when dry, of nearly the same color on both surfaces or the lower surface a little paler than the upper, subequally narrowed at both ends, the base acute, the apex rather slenderly acuminate, sometimes slightly falcate, the margins distantly crenulate; lateral nerves about 6 on each side of the midrib, slender, ascending, anastomosing; petioles puberulent, 3 to 4 mm long. Male racemes axillary, solitary or fascicled, dense, cinereous-puberulent, 7 mm long or less, the flowers 4-merous (rarely 5-merous ?), greenish, their pedicels about 3 mm long, jointed, the subtending bracteoles lanceolate, acuminate, about as long as the pedicels. Sepals puberulent, orbicular-ovate, obtuse, about 2 mm long, the basal appendages prominent. Stamens about 30; filaments 2 to 3 mm long, glabrous. Female flowers and fruits unknown.

LUZON, Bontoc Subprovince, Malamey, *Vanoverbergh* 1344, July 19, 1911, in forests, altitude 1,690 m.

A species manifestly allied to *Flacourtia rukam* Zoll. & Mor., but distinguishable not only by its much smaller, differently shaped leaves, but also by its shorter, congested, staminate inflorescences, short pedicels, and apparently smaller flowers

ARALIACEAE

SCHEFFLERA Forster

SCHEFFLERA CHARTACEA sp. nov. (*Heptapleurum*.)

Frutex circiter 2 m altus, ut videtur erectus, glaber vel inflorescentiis parcissime pubescentibus; foliis petiolatis, palmatim 5- vel 6-foliolatis, foliolis chartaceis, oblongo-ellipticis vel oblongo-obovatis, usque ad 7 cm longis, basi acutis, apice tenuiter caudato-acuminatis, nervis utrinque circiter 8; inflorescentiis terminalibus, paniculatis, folia subaequantibus, gracilis; floribus 5-meris, petalis vix 1.5 mm longis.

A species similar to and apparently closely allied to *Schefflera luzoniensis* Merr. differing especially in its chartaceous, not coriaceous leaves, much more slender, somewhat longer inflorescence, and much smaller flowers. Erect, *fide* Vanoverbergh, glabrous except the very slightly pubescent inflorescence, about 2 m high. Branches terete, grayish. Leaves alternate, palmately 5- or 6-foliolate, the petioles rather slender, 5 to 7 cm long. Leaflets variable in shape, oblong-elliptic to oblong-obovate, 5 to 7 cm long, 1.5 to 4 cm wide, entire, the base acute, the apex slenderly caudate-acuminate, the acumens 1.5 to 2 cm long, both surfaces somewhat shining and of about the same color when dry; lateral nerves about 8 on each side of the midrib, not very prominent, irregular, more or less confused with the secondary ones; petiolules 1 to 2 cm long. Inflorescence terminal, paniculate, about as long as the leaves, the common rachis about 1 cm long, slightly floccose-pubescent with deciduous hairs, bearing about 4 primary slender branches 12 to 15 cm in length. Flowers in 4- to 7-flowered, slenderly peduncled, lax umbels which are racemously arranged on the main branches of the inflorescence, the peduncles 1 to 1.8 cm long. Flowers 5-merous, greenish, their pedicels slender, 3 to 4 mm long. Calyx broadly funnel-shaped, less than 1 mm long, about 1 mm wide, truncate. Petals 5, oblong-ovate, acute, 1.3 mm long. Filaments about 1.2 mm long. Ovary 5-celled.

LUZON, Bontoc Subprovince, Bauco, altitude about 1,750 meters, *Vanoverberg* 1789, December 1, 1912, in forests.

Manifestly closely allied to *Schefflera luzoniensis* Merr., which it greatly resembles, differing in its thinner leaves, its lax, slender, inflorescence, and in its much smaller flowers.

RUBIACEAE

PSYCHOTRIA Linnaeus

PSYCHOTRIA BONTOCENSIS sp. nov.

Arbor parva, glabra; foliis oblongis ad late oblongo-oblan-
ceolatis, usque ad 20 cm longis, acutis vel obscure acuminatis,

basi longe angustatis, chartaceis vel subcoriaceis, nitidis, nervis utrinque circiter 20, subtus valde prominentibus; paniculis terminalibus, longe pedunculatis, multifloris, ramis primariis secundariisque subumbellatim dispositis; floribus circiter 6 mm longis.

A small tree, 3 m high according to the collector, glabrous or nearly so. Branches terete, light grayish-brown, the ultimate ones about 4 mm in diameter. Leaves oblong to broadly oblong-oblongeolate, 15 to 20 cm long, 6 to 7.5 cm wide, chartaceous to subcoriaceous, the apex acute or obscurely acuminate, base gradually narrowed and acute or cuneate, the upper surface brownish-olivaceous when dry, somewhat shining, the lower much paler, shining, sometimes slightly pubescent along the midrib; lateral nerves 20 on each side of the midrib, very prominent on the lower surface, curved, anastomosing very close to the margin, the reticulations slender, subparallel, lax; petioles 2 to 3 cm long; stipules not seen, very early deciduous. Inflorescence terminal, up to 18 cm in length, usually about 3 peduncles from each branchlet, the peduncles 8 to 11 cm long, black when dry, each bearing 5 umbellately disposed primary branches 1.5 to 3.5 cm in length, the tertiary and the ultimate branchlets also umbellately arranged. Flowers white, usually about 3 on each ultimate branchlet, their pedicels 1 mm long or less, the whole inflorescence black when dry. Calyx cup-shaped, about 2 mm long, truncate or irregularly toothed. Corolla-tube cylindric, villous inside, 4 mm long, the lobes 4, oblong, obtuse, 2 mm long, thickened at the apex inside; anthers 1 mm long.

LUZON, Subprovince of Bontoc, Bauco, *Vanoverbergh* 2610, March 9, 1913, along streams, altitude about 1,500 meters.

A species in the group with *Psychotria banahaensis* Elm., but not closely allied to that species. It is characterized by its long-peduncled, many-flowered inflorescence with its umbellately arranged branches and branchlets, and its many-nerved, comparatively large leaves.

PSYCHOTRIA VANOVERBERGHII sp. nov.

Arbor parva, glabra, circiter 4 m alta, ramis teretibus; foliis oblongo-ellipticis ad late oblongo-lanceolatis, coriaceis, utrinque angustatis, usque ad 8 cm longis, obscure obtuse acuminatis, basi acutis, in siccitate nitidis, viridis vel brunneis, nervis utrinque circiter 15, tenuibus, vix prominentibus; inflorescentiis terminalibus, usque ad 4 cm longis, paucifloris; floribus pedicellatis, circiter 6 mm longis.

A small tree, glabrous throughout. Branches slender, terete, pale-brownish or grayish, the ultimate ones about 1.5 mm in diameter. Leaves oblong-elliptic to broadly oblong-lanceolate, about equally narrowed at both ends, the apex shortly blunt-

acuminate, the base acute, margins slightly recurved, coriaceous, 5 to 8 cm long, 1.5 to 3 cm wide, when dry shining on both surfaces, greenish or brownish, or more often the upper surface greenish and the lower brownish; lateral nerves about 15 on each side of the midrib, slender, not prominent, anastomosing, the reticulations lax, obscure; petioles 5 to 10 mm long; stipules lanceolate, acuminate, about 1 cm long, early deciduous. Inflorescence terminal, about 4 cm long, with two primary branches from the base, slender, few-flowered, paniculate, the flowers disposed in threes on the ends of the ultimate branchlets, their pedicels about 2 mm long. Calyx cup-shaped, 1.5 long and wide, truncate or obscurely denticulate. Corolla white, the tube cylindric, 4 mm long, villous inside, the lobes 4 or 5, oblong, obtuse, 3 mm long. Anthers 4 or 5, narrowly oblong, 1.5 mm long.

LUZON, Subprovince of Bontoc, Bauco, *Vanoverbergh 1144, 2818* (type), March 1911 and April 1913, in forests, altitude 1,300 to 1,600 meters.

A species probably as closely allied to *Psychotria loheri* Elm. as to any other form, but distinguished by its much more numerous lateral nerves and longer inflorescence.

CUCURBITACEAE

TRICHOSANTHES Linnaeus

TRICHOSANTHES VANOVERBERGHII sp. nov. § *Eutrichosanthes*.

Scandens, dioica, foliis in ambitu late ovatis, 3- vel obscurissime 5-lobatis, usque ad 13 cm longis, scaberulis, subtus villosis, bracteis inflorescentiis ♂ oblongo-spatulatis, integris, circiter 8 mm longis; floribus ♀ spicatis, bracteatis; seminibus turgidis, obovoideis, lateraliter haud acute appendiculatis.

A scandent, dioecious, herbaceous plant at least 3 m in height. Branches rather slender, prominently sulcate, slightly pubescent. Leaves in outline broadly ovate, 7 to 13 cm long, 5 to 11 cm wide, rather deeply 3-lobed, sometimes with two additional but obscure lateral lobes, the margins with scattered, rather slender, prominent teeth, apex acuminate, tips of the lobes acute to obtuse, sinuses usually narrowly rounded, base prominently cordate, lobes and sinus rounded, the upper surface somewhat scabrid, the lower hirsute-villous with rather short, stiff, hairs, the leaf, when dry, chartaceous, not glandular; petioles 2 to 3 cm long, pubescent. Tendrils up to 7 cm long, forked. Male racemes axillary, solitary, long-peduncled, about 10 cm long, few-flowered, pubescent. Bracts oblong-spatulate, obtuse, about 8 mm long, 3.5 mm wide above, narrowed below. Calyx-tube and pedicels about 2.5 cm long, pubescent, slender below, widened above and about 3 mm in diameter at the throat, the lobes reflexed,

oblong-ovate, slightly acuminate, 4.5 mm long. Petals oblong-lanceolate, acuminate, the fimbriae slender, up to 15 mm long. Anthers 3.5 mm long, inserted near the apex of the tube, included. Female flowers in axillary, solitary spikes 5 to 7 cm in length, the flowers somewhat crowded toward the apex of the peduncle, in general similar to the staminate ones, each subtended by a persistent oblong-obovate to obovate bract 8 to 12 mm in length, entire or coarsely toothed, subpersistent. Fruits ovoid, about 3.5 cm long, glabrous. Seeds obovoid, turgid, about 6 mm long, nearly as wide, very slightly compressed, apex rounded, base narrowed, with a prominent longitudinal zone, the sides broadly rounded, obtuse, not with subacute appendages.

LUZON, Subprovince of Bontoc, Bauco, *Vanoverbergh* 1262, June, 1911, male flowers, 3662 *bis* (type), June, 1913, with female flowers and fruits.

A species manifestly allied to *Trichosanthes himalensis* Clarke, of India, differing in the shape of its fruits, its different seeds, and its oblong-spatulate to oblong-obovate, mostly entire bracts.

NOTES ON PHILIPPINE EUPHORBIACEAE, II

By E. D. MERRILL¹

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The percentage of novelties in current collections as the botanical exploration of the Philippines progresses still continues to be rather high, especially in those collections received from regions previously but slightly or not at all explored botanically. Two years ago the first paper under the above title was published,² in which one new genus and twenty-six new species were described. In this second paper of the series thirty-five new species are proposed, and the majority of the specimens on which the descriptions are based have been collected within the past two or three years. Notes are included on some of the older species, while the genus *Tragia* is new to the Philippines. New species are proposed in the following genera: *Alcinaeanthus*, *Antidesma*, *Aporosa*, *Bridelia*, *Cleidion*, *Cleistanthus*, *Codiaeum*, *Cyclostemon*, *Endospermum*, *Galearia*, *Glochidion*, *Homalanthus*, *Mallotus*, *Phyllanthus*, *Tragia*, and *Trigonostemon*.

ALCINAEANTHUS Merrill

ALCINAEANTHUS PARVIFOLIUS sp. nov.

Arbor dioica, ramulis junioribus inflorescentiisque exceptis glabra; foliis ellipticis ad oblongo-obovatis, 4 ad 6 cm longis, basi acutis, in pagina superiore 2-glandulosis, apice breviter acuminatis, margine distanter denticulatis, nervis utrinque 4 vel 5; paniculis ♂ axillaribus terminalibusque, multifloris, anguste pyramidalis, usque ad 5 cm longis.

A dioecious tree, according to the collector 20 m in height, glabrous except the young branchlets and slightly pubescent staminate panicles. Branches terete, glabrous, grayish-brown, the young branchlets somewhat cinereous-pubescent or puberulent. Leaves oblong-obovate to elliptic, firmly chartaceous, 4 to 6 cm long, 2 to 3.5 cm wide, brownish when dry, base acute,

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² Philip. Journ. Sci. 7 (1912) Bot. 379-410.

apex short-acuminate, margin distantly denticulate, glabrous, slightly shining; lateral nerves 4 or 5 on each side of the midrib, prominent on the lower surface, the reticulations rather close, distinct; petioles pubescent, 5 to 7 mm long, with two small distinct glands on the upper surface at the junction with the midrib. Male panicles axillary and terminal, many flowered, pyramidal, slightly pubescent, up to 5 cm long. Flowers small, yellowish-white, the buds globose, 1.5 to 2 mm in diameter, in detail as in *Alcinaeanthus philippinensis* Merr.

LUZON, Province of Laguna, San Antonio, *Bur. Sci.* 20586 Ramos, February, 1913, in forests.

Manifestly closely allied to *Alcinaeanthus philippinensis* Merr. from which it differs chiefly in its comparatively small leaves. It is perhaps but a variety of that species with greatly reduced leaves.

ANTIDESMA Linnaeus

ANTIDESMA PENTANDUM (Blanco) comb. nov.

Cansjera pentandra Blanco Fl. Filip. (1837) 73, ed. 2 (1845) 53; Meisn. in DC. Prodr. 14 (1857) 519.

Cansjera rheedii Blanco l. cc. 73, 52, non Gmel.

Antidesma rostratum Tul. in Ann. Sci. Nat. III 5 (1851) 218; Miq. Fl. Ind. Bat. 1² (1859) 426; Muell.-Arg. in DC. Prodr. 15² (1866) 257; F.-Vill. Novis. App. (1880) 191; Vid. Phan. Cuming. Philip. (1885) 143, Rev. Pl. Vasc. Filip. (1886) 240, Synopsis, Atlas (1883) 38, t. 82, f. G.

Antidesma salicifolium Presl Epim. Bot. (1851) 233.

Antidesma leptocladum Merr. in Philip. Journ. Sci. 1 (1806) Suppl. 78, Fl. Manila (1912) 288, non Tul.

This species is very common in thickets in and about Manila, and very manifestly is the form described by Blanco as *Cansjera rheedii* (non Gmelin), and as *C. pentandra*. The latter was compared to the former by Blanco, differing only in its 5, not 4, stamens. As a matter of fact *Antidesma rostratum* Tul.=*A. pentandrum* (Blanco) Merr. has 3, 4, or 5 stamens, 4-merous flowers being much more common than are the 3- or 5-merous ones. The species flowers about Manila from April to July, and is locally known as *bignay pogo*; this name, however, is applied to several other species. *Antidesma rostratum* Tul. was based on specimens collected in or near Manila by Perrottet and by Baume, in Pangasinan by Callery, with reference to Cuming's numbers 966, 1246, and 1316. Other than *Antidesma ghesaembilla* Gaertn. and *Antidesma bunius* Spr., it is the only species of the genus known from the vicinity of Manila. *Cansjera pentandra* Blanco was erroneously reduced by F.-Villar³ to *Antidesma cumingii* Muell.-Arg., an entirely different species, as comparisons of the descriptions and specimens show. It is a sylvan form not found near Manila. Later it was reduced by myself⁴ to *Antidesma leptocladum* Tul., due to the fact that I had erroneously determined a whole series of specimens as *Antidesma leptocladum* which are properly referable to *A. rostratum*=*A. pentandrum*. F.-Villar also reduced *Cansjera rheedii*

³ Novis. App. (1880) 190.

⁴ Govt. Lab. Publ. (Philip.) 27 (1905) 76.

Blanco (non Gmelin) to *Antidesma ghesaembilla* Gaertn., in which I followed him, but this also is a manifest error. *Antidesma ghesaembilla* Gaertn. is the species Blanco described as *Cansjera grossularioides*.

Antidesma salicifolium Presl was based on one of the specimens (Cuming 1316) cited by Tulasne in his original description of *Antidesma rostratum*.

Antidesma pentandrum (Blanco) Merr. is represented by the following specimens:

LUZON, Province of Cagayan, Cuming 1316 (cotype of *A. salicifolium* Presl): Province of Tarlac, For. Bur. 9604, 9606 Zschokke: Province of Zambales, For. Bur. 6947 Curran: Province of Bulacan, Malinta (for some years Blanco's home) For. Bur. 6113 Robinson & Merritt: Province of Rizal, Merrill 2678, For. Bur. 5198, 5201 Curran, Phil. Pl. 37 Ramos, Decades Philip. For. Fl. 175, For. Bur. 462 Ahern's collector: Province of Laguna, For. Bur. 11717 Whitford, Baker 128, Elmer: Province of Bataan, Merrill 2498, Leiberg 6125, For. Bur. 728, 2058, 3034 Borden, Whitford 1316, Bur. Sci. 6158 Robinson: Manila, Marave 86, Loher 4653, Normal School 64, 188, 189, 233.

Most of the above specimens have been erroneously determined and the duplicates distributed as *Antidesma leptocladum* Tul. Its recorded native (Tagalog) names are *bignay pogo*, *binayoyo*, *binayoyo maching*, *mala-binayoyo*.

ANTIDESMA PENTANDRUM (Blanco) Merr. var. **BARBATUM** (Presl) comb. nov.

Antidesma barbatum Presl Epim. Bot. (1851) 233.

Antidesma rostratum var. *barbatum* Muell.-Arg. in DC. Prodr. 15² (1866) 257.

This form is certainly not specifically distinct from *Antidesma pentandrum*, and appears to differ chiefly in its adult leaves being nearly glabrous. In general its distribution appears to be more northern than that of the species, for it extends to Formosa. I refer to it the following specimens many of which have been distributed as *Antidesma leptocladum* Tul., some as *A. lobbianum* Muell.-Arg.

FORMOSA, Henry 1144, 1885. BATANES ISLANDS, Batan, For. Bur. 15285 Agudo, Bur. Sci. 3656 Fénix. BABUYANES ISLANDS, Camiguin, Bur. Sci. 3996 Fénix. LUZON, Province of Cagayan, For. Bur. 16617 Curran: Province of Isabela, Bur. Sci. 8079 Ramos: Province of Ilocos Norte, Cuming 1246 (cotype): Province of Zambales, Merrill 2943, 2975, Bur. Sci. 5041 Ramos: Province of Tayabas, Whitford 556: Province of Albay, Cuming 966.

Native names recorded are *vinai* (Batangas), *malabignay* and *bolinog* (Zambales).

ANTIDESMA PENTANDRUM (Blanco) Merr. var. **LOBBIANUM** (Tul.) comb. nov.

Antidesma rostratum Tul. var. *lobbianum* Tul. in Ann. Sci. Nat. III 15 (1851) 219, in obs.

Antidesma lobbianum Muell.-Arg. in DC. Prodr. 15² (1866) 254; Rolfe in Journ. Bot. 23 (1885) 215; Vid. Rev. Pl. Vasc. Filip. (1886) 230.

LUZON, without locality, Lobb 460, in herb. Kew. (cotype): Manila, Merrill 3477, Loher 4656.

This form should probably be merged in the species, as it appears to differ from typical *Antidesma pentandrum* chiefly in having slightly larger leaves, which may well be due to habitat only. I have examined

Lobb's specimen in the Kew Herbarium which is indicated as from Luzon, and which is exactly matched by *Loher 4656*. It is a well known fact that Lobb's labels were badly mixed, and although Tulasne's specimen of this same number was labeled as from Java, this is no indication that the specimen came from Java, and the same number will be doubtless found in other herbaria labelled as from Singapore or from Borneo. The fact that the species, that is *Antidesma pentandrum*, is very common in Luzon, and that it has never been discovered in Java⁵ up to this time is quite definite proof that the Kew label for Lobb's plant is correct.

It is strongly suspected that Tulasne's chief reason for separating Lobb's specimen as a variety of *Antidesma rostratum* was that the latter came from Luzon, and that the former he supposed, and so far as his specimen showed, came from Java. Tulasne is certainly correct in placing the plant with *Antidesma rostratum* = *A. pentandrum*, and Mueller is certainly in error in giving to it specific rank and placing it in the alliance with *Antidesma leptocladum* Tul. The floral characters are essentially quite the same as those of *A. rostratum* = *A. pentandrum*.

ANTIDESMA PENTANDRUM (Blanco) Merr. var. **ANGUSTIFOLIUM** var. nov.

A typo differt foliis minoribus angustioribusque, lanceolatis, 4 ad 7 cm longis, 1.5 ad 2 cm latis, in $\frac{1}{2}$ superiore angustatis.

LUZON, Benguet Subprovince, *Elmer 6327* (type), *6320*, the former with staminate flowers, the latter with pistillate ones, both collected May 23, and in the same locality and habitat. *Williams 940* apparently represents the same form.

This variety appears to me to differ from the species chiefly in leaf-form, and is characterized by its lanceolate leaves which are rather gradually narrowed above the middle, and which are decidedly smaller than the average of those of *Antidesma pentandrum*.

ANTIDESMA LUZONICUM sp. nov.

Arbor parva glabra; foliis firmiter chartaceis, oblongis ad oblongo-ellipticis, usque ad 8 cm longis, basi acutis vel obtusis, apice late subrostrato-acuminatis, brevissime petiolatis, nervis, utrinque circiter 5; floribus ♀ paniculatis, paniculis brevibus, in axillis superioribus, circiter 2 cm longis; fructibus in siccitate valde rugosis, circiter 3 mm longis, gibbosis, stigmatibus sublateralibus.

A small tree about 8 m high, glabrous. Branches and branchlets slender, terete, smooth, grayish or brownish. Leaves firmly chartaceous, oblong to oblong-elliptic, 5 to 8 cm long, 2.5 to 3 cm wide, shining, narrowed below to the acute or obtuse base and above to the broadly subrostrate-acuminate apex, the acumen prominent, blunt, the upper surface brownish-olivaceous, the lower somewhat paler when dry; lateral nerves about 5 on each side of the midrib, rather slender, anastomosing, somewhat

⁵ J. J. Smith in Koord. & Valetton Bijdr. Boomsoort. Java 12 (1910) 290.

curved, the reticulations lax; petioles 2 to 4 mm long. Flowers not seen. Panicles in fruit 2 cm long or less, in the upper axils, the branches few, somewhat pubescent, the fruits racemosely arranged, their pedicels short. Fruit apparently red, fleshy when fresh, glabrous, when dry wrinkled, about 3 mm long, distinctly gibbous, the stigma sublateral.

LUZON, Province of Camarines, Mount Isarog, *Phil. Pl. 1555 Ramos*, November 24, 1913, in forests.

Allied to *Antidesma pleuricum* Tul., from which it differs in its shorter, much narrower leaves and smaller panicles.

ANTIDESMA CLEMENTIS sp. nov.

Frutex subglaber, inflorescentiis leviter ferrugineo-pubescentibus; foliis chartaceis, oblongis ad late oblongo-lanceolatis, nitidis, usque ad 15 cm longis, basi acutis vel subrotundatis, apice subcaudato-acuminatis, nervis utrinque 7 vel 8; inflorescentiis quam folia longioribus, racemosis, simplex, axillaribus et e axillis defoliatis, bracteis ovatis, brevibus; floribus 4-meris, calycis usque ad medium divisus; ovario parce hirsuto; stigmate terminalibus.

A shrub, nearly glabrous, the inflorescence and the midrib and nerves on the lower surface of the leaves sparingly ferruginous-pubescent. Branches and branchlets terete, slender, light-gray, glabrous. Leaves firmly chartaceous, 8 to 15 cm long, 2.5 to 5.5 cm wide, oblong to broadly oblong-lanceolate, both surfaces shining, the upper glabrous, dark brownish-olivaceous when dry, the lower much paler, the base acute to somewhat rounded, the apex slenderly subcaudate-acuminate, minutely apiculate; lateral nerves 7 or 8 on each side of the midrib, slender, distinct, curved-anastomosing, the reticulations very slender; petioles 4 mm long; stipules not seen, very early deciduous, apparently very small. Female racemes slender, solitary, simple, up to 20 cm in length, sparingly ferruginous-pubescent, in the leaf-axils and in the axils of fallen leaves. Flowers 4-merous, slightly pubescent, their pedicels 2 to 3 mm long, the subtending bracteoles ovate, obtuse, pubescent, about 1 mm long. Calyx-teeth 4, broadly ovate, one-half as long as the calyx or less. Disk sparingly pubescent. Stigma terminal. Fruit reddish, narrowly ovoid, somewhat compressed, glabrous, somewhat rugose when dry, about 5 mm long.

MINDANAO, District of Lanao, Camp Keithley, *Mrs. Clemens 339, 884* (type), the former with nearly mature fruits, March, 1906, the latter with female flowers and very young fruits, January, 1907, in thickets along streams.

In vegetative characters this species very closely resembles a series of

specimens from Singapore distributed from the Botanic Garden as *Antidesma cuspidatum*, *A. moritzii*, and *A. fallax*, all apparently referable to the first species. From *A. cuspidatum* the above species differs in its rather short calyx-lobes and its short ovate bracteoles. From *A. moritzii* it differs in its simple racemes, nearly glabrous leaves, and glabrous branches. Similarly it differs from *A. fallax* in its simple racemes very much shorter petioles, and other characters.

ANTIDESMA CURRANII sp. nov.

Arbor parva, partibus junioribus inflorescentiisque exceptis glaber; foliis subcoriaceis vel chartaceis, oblongo-ovatis vel oblongis, tenuiter acuminatis, basi acutis vel subrotundatis, usque ad 15 cm longis, nutidis, subtus pallidioribus, nervis utrinque 7 ad 9, prominentibus; inflorescentiis ♀ axillaribus, paniculatis, floribus 4-meris, racemose dispositis, calycis ad medium divisis, lobis oblongis, obtusis; fructibus anguste ovoideis, 4 mm longis; stigmate terminalibus.

A small tree, glabrous except the branchlets and the inflorescence. Branches slender, dark-brown, lenticellate, terete, glabrous, the growing branchlets slightly pubescent. Leaves oblong-ovate to oblong, chartaceous or subcoriaceous, glabrous, 9 to 15 cm long, 3.5 to 5.5 cm wide, the upper surface rather dark-colored, the lower much paler, both shining, when dry, the base acute or somewhat rounded, the apex rather slenderly acuminate; lateral nerves 7 to 9 on each side of the midrib, prominent on the lower surface, anastomosing, the reticulations distinct, rather lax; petioles 1 to 1.4 cm long; bracteoles oblong, pubescent, 3 mm long. Infructescence axillary, solitary, paniculate, 2 to 3 cm long, sparingly pubescent, the fruits racemosely arranged on the rather short (1 cm) branches, the bracteoles lanceolate, acuminate, 1.2 mm long, the pedicels about 1 cm long. Fruit red, narrowly-ovoid, compressed, glabrous, wrinkled when dry, 4 mm long; stigma terminal; persistent calyx-lobes oblong, obtuse, about 1 mm long, more than one-half the length of the calyx.

LUZON, Subprovince of Benguet, Baguio, in stream depressions, *For. Bur.* 5087 Curran, August, 1906.

A species in the same group with *Antidesma pentandrum* (Blanco) Merr. (*A. rostratum* Tul.), but not at all closely allied to that form, and apparently not very close to any other known Philippine species. The short, paniculate, slightly pubescent, solitary, axillary infructescences, and the slenderly acuminate leaves are characteristic.

ANTIDESMA OBLIQUINERVIUM sp. nov.

Frutex 3 ad 5 m altus, partibus junioribus leviter villosis vel pubescentibus; foliis chartaceis vel submembranaceis, oblongo-ellipticis, utrinque subaequaliter angustatis, usque ad 10 cm

longis, apice acuminatis apiculatisque, basi acutis; nervis laterilibus utrinque circiter 7, plus minusve obliquis, leviter curvatis, tenuibus, distinctis; stipulis linearis, circiter 4 mm longis; inflorescentiis ♂ usque ad 7 cm longis, depauperato-paniculatis, pubescentibus; floribus spicatis, 4-meris, calycibus leviter lobatis, lobis late ovatis; staminibus 4; inflorescentiis ♀ simplicibus vel leviter paniculatis, usque ad 7 cm longis, floribus 4-meris, distincte pedicellatis, stigmate terminalibus.

A dioecious shrub 3 to 5 m high, somewhat villous. Branches slender, terete, brownish, glabrous, the younger ones pale or cinereous-pubescent. Leaves oblong-elliptic, 6 to 10 cm long, 2 to 4 cm wide, chartaceous to submembranaceous, subequally narrowed at both ends, the base acute, apex rather slenderly and prominently acuminate, the acumen apiculate, the upper surface brownish or olivaceous when dry, glabrous, or the midrib slightly pubescent, somewhat shining, the lower surface sparingly pubescent on the midrib and lateral nerves, paler than the upper surface, slightly shining; lateral nerves about 7 on each side of the midrib, slender but distinct, somewhat ascending, anastomosing near the margins; petioles pubescent, 1 to 3 mm long; stipules linear, pubescent, acuminate, about 4 mm long. Staminate and pistillate inflorescences numerous, pale-pubescent, up to 7 cm long, simple or somewhat paniced, the branches of the staminate spicate, of the pistillate racemose, the flowers of both numerous, subapproximate but not crowded. Pistillate flowers: Calyx cup-shaped, about 1 mm long and thick, divided to about the middle into 4, ovate, acute somewhat pubescent lobes, the pedicels glabrous, as long as the lanceolate, acuminate, 1.2 mm long bracteoles. Ovary ovoid, glabrous; stigma terminal, the arms three, short. Male flowers sessile or very shortly pedicelled, 4-merous, the calyx 0.5 mm long, 4-lobed, lobes short, broadly-ovate; filaments 4, about 1 mm long; bracteoles 0.5 mm long.

PALAWAN, Merrill 9294 (type), 9295, May 31, 1914, in forests, altitude about 150 meters, Taytay-Lake Manguao trail; Taytay, Merrill 9336, May 9, 1913, with very young male flowers; near Puerto Princesa, *For. Bur.* 21491 Fernandez, May 4, 1914, in forests, altitude about 60 meters.

Apparently allied to *Antidesma cuspidatum* Muell.-Arg. of the Malay Peninsula, but with much smaller leaves. It is characterized by its comparatively small, somewhat obliquely nerved leaves which are acuminate and at the same time apiculate, its linear stipules, and somewhat paniced inflorescences, the male flowers spicate, the female racemose.

ANTIDESMA PALAWANENSE sp. nov.

Frutex 2 ad 3 m altus partibus junioribus inflorescentiisque exceptis glaber; foliis subcoriaceis, nitidis, oblongis vel oblongo-

ellipticis, usque ad 12 cm longis, utrinque angustatis, basi acutis, apice latissime acuminatis, acumine obtusis vel retusis, nervis utrinque 6, subtus valde prominentibus; inflorescentiis ♀ racemosis, pubescentibus, densis, terminalibus, solitariis, pedunculatis, circiter 4 cm longis; floribus breviter pedicellatis, 4-meris, bracteis lanceolatis, acuminatis, 1.5 mm longis, calycis ultra medium divisis; stigmatibus terminalibus.

A shrub 2 to 3 m high, glabrous except the younger parts and the inflorescence. Branches slender, terete, brownish, slightly lenticellate, glabrous, the branchlets appressed-pubescent with short hairs. Leaves subcoriaceous, oblong to oblong-elliptic, subequally narrowed to the acute base and to the very broadly acuminate apex, 9 to 12 cm long, 3.5 to 5.5 cm wide, the acumens short, very blunt or retuse, both surfaces prominently shining, rather pale, and of about the same color when dry, glabrous; lateral nerves 6 on each side of the midrib, distant, looped-anastomosing, very prominent on the lower surface, the reticulations very lax; petioles 5 to 6 mm long, pubescent when young, becoming quite glabrous; stipules lanceolate or narrowly oblong-lanceolate, pubescent, deciduous, 3 to 5 mm long. Female inflorescence racemose, terminal, solitary, about 4 cm long including the peduncle, the flower-bearing part about 3 cm long, somewhat pubescent or puberulent, densely many flowered, cylindric. Flowers 4-merous, their pedicels pubescent, 1.2 mm long, the subtending bracteoles lanceolate, acuminate, pubescent, about 1.5 mm long. Calyx slightly pubescent, the lobes 4, broadly ovate, acute, 0.8 mm long, slightly pubescent, more than one-half as long as the calyx. Ovary glabrous, ovoid or narrowly ovoid; style terminal, 4-cleft.

PALAWAN, Mount Victoria, along streams, *Bur. Sci.* 749 Foxworthy, March 25, 1906.

A well-marked species probably most closely allied to *Antidesma pentandrum* (Blanco) Merr. (*A. rostratum* Tul.), but with entirely different leaves.

ANTIDESMA RAMOSII sp. nov.

Arbor parva plus minusve pubescentibus; foliis oblongis, usque ad 15 cm longis, chartaceis vel submembranaceis, brevissime petiolatis, basi rotundatis vel subrotundatis, apice acuminatis, nervis utrinque circiter 10, subtus prominentibus; inflorescentiis lateralibus terminalibusque, ♂ et ♀ racemosis; floribus 4-meris, calycis ad medium divisis; stigmatibus terminalibus.

A small tree, the branches slender, terete, brownish, lenticellate, glabrous, the branchlets, inflorescences, and lower surfaces of

the leaves softly pubescent with brownish hairs, the branchlets densely so. Leaves oblong, chartaceous or submembranaceous, oblong, 8 to 15 cm long, 3.5 to 5 cm wide, more or less narrowed to the rounded or subrounded base and to the rather prominently acuminate apex, the acumen sharp or apiculate, the upper surface subolivaceous when dry, shining, glabrous except for the pubescent midrib, the lower surface softly pubescent with scattered hairs; lateral nerves about 10 on each side of the midrib, very prominent on the lower surface, looped-anastomosing, the reticulations lax; petioles pubescent, 2 to 3 mm long. Male racemes axillary, solitary, simple, slender, about 6 cm long, slightly pubescent, the flowers rather scattered, 4-merous, their pedicels 2 mm long, the bracteoles oblong-ovate, about 0.5 mm long. Calyx 4-lobed, the lobes about one-half as long as the calyx. Stamens 4. Female racemes terminal and in the upper axils, simple or arranged in a depauperate panicle, 4 to 6 cm long, pubescent. Pedicels of the fruits 2 mm long. Calyx 4-cleft. Fruit red, somewhat compressed, narrowly ovoid, about 5 mm long, wrinkled when dry, glabrous; stigma terminal.

LUZON, Province of Rizal, Bosoboso, *Bur. Sci.* 1002 Ramos, June, 1906 (type); Morong, *Bur. Sci.* 1372 Ramos, August, 1906, the former with staminate flowers, the latter with fruits.

A species probably as closely allied to *Antidesma pentandrum* (*A. rostratum*) as to any other form, but quite different from that in its vegetative characters, shape and pubescent of its leaves, and its more numerous lateral nerves.

ANTIDESMA SAMARENSE sp. nov.

Frutex circiter 3 m altus, subtus foliis ad costa nervisque ramulis stipulisque plus minusve brunneo-villosis; foliis oblongis ad oblongo-obovatis, usque ad 18 cm longis, nitidis, in siccitate brunneis, tenuiter acuminatis apiculatisque, basi obtusis; nervis utrinque circiter 13, prominentibus, subrectis; stipulis brunneo-villosis, lineari-lanceolatis, acuminatis, circiter 5 mm longis; inflorescentiis ♂ villosis, densis, spicatis, simplicibus, 2 ad 5 cm longis; floribus 4- et 5-meris sessilibus, calycibus profunde divisis; bracteis oblongo-lanceolatis, acuminatis, circiter 1 mm longis.

A shrub about 3 m high, the branchlets, stipules, and leaves on the midrib and lateral nerves beneath more or less brown-villous. Branches terete, brown or gray, glabrous, rather slender. Leaves chartaceous, oblong to oblong-obovate, or broadly oblong-obovate, 9 to 18 cm long, 3 to 6 cm wide, brown when dry, the lower surface a little paler than the upper, the apex rather slenderly and sharply acuminate, slenderly apiculate, base

narrowed, obtuse; lateral nerves about 13 on each side of the midrib, prominent, nearly straight, somewhat ascending, curved-anastomosing near the margin; petioles 5 mm long or less, brown-villous; stipules linear-lanceolate, acuminate, somewhat brown-villous, about 5 mm long, 1 mm wide. Staminate inflorescence spicate, 2 to 5 cm long, villous, densely many flowered. Flowers 4- and 5-merous on the same spike. Calyx deeply divided, pubescent, the lobes broadly ovate, about 0.8 mm long. Stamens 4 or 5; filaments 1 mm long; bracteoles oblong-lanceolate, acuminate, pubescent, about 1 mm long.

SAMAR, *Phil. Pl.* 1665 Ramos, April, 1914, in forests, altitude about 200 m.

A species quite distinct from any form known to me, belonging in the same group with *Antidesma moritzii* Muell.-Arg. It is well characterized by its somewhat sparse brown undumentum, its brown leaves, its linear-lanceolate stipules, and its densely flowered simple male spikes. From *A. cumingii* Muell.-Arg. it is distinguished by many characters, notably its very narrow stipules.

APOROSA Blume

APOROSA ALVAREZII sp. nov.

Arbor circiter 10 m alta subtus foliis ad costa nervisque infructescentiis ramulisque densissime ferrugineo-villosis; foliis oblongis, chartaceis vel subcoriaceis, integris, usque ad 17 cm longis, tenuiter caudato-acuminatis, basi rotundatis vel subcordatis, nervis utrinque 8 ad 10, prominentibus; stipulis late acinaciformibus, circiter 1.5 cm longis; infructescentibus solitariis vel binis, axillaribus, brevibus; fructibus ovoideis, circiter 1.5 cm diametro, villosis.

A tree about 10 m high, the younger branches, infructescence and leaves on the costa and lateral nerves beneath very densely ferruginous-villous. Branches terete, brown, the older ones becoming glabrous. Leaves oblong, entire, chartaceous to subcoriaceous, 13 to 17 cm long, about 5 cm wide, the apex slenderly caudate-acuminate, the acumen 1 to 2 cm long, the base rounded to subcordate, the upper surface grayish-olivaceous when dry, pubescent on the midrib, otherwise glabrous, slightly shining, the lower surface brown, the midrib and nerves densely villous, the other parts slightly so; lateral nerves 8 to 10 on each side of the midrib, very prominent on the lower surface, curved, anastomosing; petioles densely villous, about 1 cm long; stipules broadly scimitar-shaped, strongly falcate, up to 1.5 cm long, 6 to 8 mm wide, base broadly rounded, apex slenderly acuminate. Pistillate inflorescences densely ferruginous-villous, axillary,

solitary or in pairs, apparently short, the rachis in fruit 2 cm long or less. Fruits few, ovoid, about 1.5 cm in diameter (immature), rather densely ferruginous-villous, pale-brown when dry, 2- or 3-celled, the pericarp brittle.

LUZON, Province of Camarines, near Goa, *For. Br.* 21245 *Alvarez*, April 5, 1914, in semi-open country, altitude about 300 m. *Bur. Sci.* 20567 *Ramos* from San Antonio, Province of Laguna, Luzon, probably represents the same species, but this specimen is with immature male flowers, the indumentum somewhat less dense and paler, and the leaves obscurely undulate-dentate. In other characters, so far as the specimens are comparable, the two appear to be identical.

A strongly marked species, recognizable by its ferruginous villous indumentum, its prominent acinaciform stipules, and its ovoid, villous fruits.

APOROSA BASILANENSIS sp. nov.

Arbor circiter 10 m alta plus minusve pubescentibus; foliis oblongis, chartaceis vel subcoriaceis, usque ad 20 cm longis, tenuiter acuminatis, basi rotundatis vel obtusis, nervis utrinque 6 ad 8, subtus valde prominentibus, curvato-adscendentibus; inflorescentiis ♀ ut videtur pedunculatis (floribus non visis), sub fructu 2 ad 4 cm longis, solitariis vel fasciculatis, ferrugineo-pubescentibus; fructibus leviter ferrugineo-pilosis, 2-locellatis, anguste ellipsoideis, acutis, in siccitate pallide brunneis, stigmate persistentibus, brevissime stipitatis; seminibus 2.

A tree about 10 m high, the young branchlets, inflorescence, and midrib and nerves on the lower surface of the leaves ferruginous-pubescent. Branches terete, brownish or grayish, glabrous. Leaves firmly chartaceous or subcoriaceous, oblong to oblong-elliptic, 12 to 20 cm long, 5 to 8 cm wide, entire, the apex slenderly and sharply subcaudate-acuminate, the base rounded or obtuse, both surfaces rather pale and shining when dry, the lower paler than the upper which is entirely glabrous, the lower surface ferruginous-pubescent on the midrib and lateral nerves; lateral nerves 6 to 8 on each side of the midrib, very prominent on the lower surface, curved-ascending, anastomosing near the margin, the reticulations distinct; petioles 5 to 8 mm long, pubescent when young, becoming glabrous. Flowers not seen. Female inflorescences solitary or fascicled, on the smaller branches in the axils of fallen leaves, ferruginous-pubescent, the rachis, in fruit, up to 3 cm long, the fruits subspicately arranged, their pedicels very short. Mature fruit pale-brownish when dry, sparingly ferruginous-pilose with rather scattered hairs, narrowly ellipsoid, 2 cm long, acute, the pericarp brittle, tardily dehiscent, 2-celled, 2-seeded, the seeds about 1

cm long, rarely 1-celled, 1-seeded. The subpersistent stigmas shortly stipitate, recurved, densely papillate, 2 mm long.

BASILAN, in forests east of the Cumalarang River, *Bur. Sci.* 16168 Reillo, September 7, 1912.

A species apparently belonging in the same group with *Aporosa arborea* Muell.-Arg. and *A. arborescens* Muell.-Arg., but entirely different from both. The subcaudate-acuminate apex of the leaves, their venation, and the narrowly ellipsoid, 2-seeded, pale-brown, acute 2 cm long fruits are characteristic.

APOROSA ELLIPTIFOLIA sp. nov.

Arbor glabra, usque ad 8 m alta; foliis ellipticis, coriaceis, in siccitate pallidis, plus minusve nitidis, circiter 10 cm longis, apice latissime brevissime acuminatis, acumine obtusis vel rotundatis, basi acutis; nervis lateralibus utrinque circiter 6, distinctis, grosse reticulato-anastomosantibus; fructibus ovoideis, glabris, 8 ad 10 mm longis, sessilibus vel subsessilibus.

A glabrous tree 6 to 8 m high. Branches terete, rather slender, smooth, gray. Leaves alternate, elliptic, coriaceous, 8 to 11 cm long, 4.5 to 6 cm wide, entire or with very faint indications of teeth at the ends of the lateral nerves, the apex very shortly, broadly, and obtusely acuminate, the base acute, both surfaces pale-green when dry, slightly shining, the lower somewhat paler than the upper; lateral nerves about 6 on each side of the midrib, rather prominent on the lower surface, coarsely looped-anastomosing, the primary reticulations lax, distinct; petioles about 1 cm long. Flowers not seen. Fruit axillary, sessile or subsessile, solitary or two or three in an axil, green and purplish when fresh, brown and minutely verruculose when dry, glabrous, ovoid, 8 to 10 mm long.

PALAWAN Silanga, *Merrill* 9609, May 24, 1913, on forested slopes at low altitudes.

Most closely allied to *Aporosa symplocosifolia* Merr., differing in its relatively much broader, short, broadly and bluntly acuminate leaves, and in the coarse, prominent, primary reticulations.

APOROSA SIMILIS sp. nov.

Species *A. fruticosae* (Blume) Muell.-Arg. valde affinis, differt ramulis glabris vel parcissime ciliatis, vix puberules vel pubescentibus, spicis masculinis subinterruptis, calycis laciniis integris, vix denticulatis, fructibus ut videtur paullo majoribus.

A shrub or small tree reaching a height of 10 m, quite glabrous, or the younger branchlets with very few, scattered, ciliate hairs, the branches terete, reddish-brown, the branchlets very slender, olivaceous. Leaves very similar to those of *Aporosa fruticosa*, membranaceous to chartaceous, glabrous, oblong to

oblong-elliptic or broadly oblong-lanceolate, 12 to 20 cm long, 4 to 7 cm wide, entire, narrowed to the acute base and to the rather slenderly acuminate apex, the acumen about 1.5 cm long, usually somewhat falcate, sharp, rather pale when dry, of about the same color on both surfaces and slightly shining when dry; lateral nerves about 9 on each side of the midrib, rather prominent, anastomosing, the reticulations distinct; petioles glabrous, 1 to 2 cm long; stipules lanceolate, acuminate, slightly pubescent, about 4 mm long. Male spikes solitary or fascicled in the axils of fallen leaves, peduncled, 1 to 2 cm long, cylindric, somewhat interrupted, 2.5 mm in diameter, glabrous, the flowers fragrant, bright-yellow. Calyx about 1.5 mm in diameter, the lobes 5, ovate to obovate, obtuse or rounded, entire. Stamens usually two. Female flowers not seen, but ovary apparently glabrous, judging from the young fruits. Fruits yellowish-red, globose, rather pale when dry, 2 cm in diameter when mature, glabrous, the pericarp thick, brittle, 3-celled, or by abortion 2-celled, the persistent stigmas sessile, obovate, forming a crown about 4 mm in diameter at the apex of the fruit.

NEGROS, Himugaan River, *For. Bur.* 7279 (type), 7254 Everett, May, 1907, the former with male flowers, the latter with fruit. LUZON, Province of Laguna, San Antonio, *Bur. Sci.* 13519, 15112 Ramos, August, 1910, June, 1912, the latter distributed as *Aporosa frutescens* Blume.

A species in vegetative characters and its fruits very similar to, and manifestly closely allied to the Javan *Aporosa fruticosa* (Blume) Muell.-Arg., from which it differs in the characters indicated in the diagnosis. Blume's species is represented in the Herbarium of the Bureau of Science by two Javan specimens collected and named by him, one with male flowers, and one with fruits.

BRIDELIA Willdenow

BRIDELIA ACUMINATISSIMA sp. nov. § *Monospermae*.

Arbor circiter 10 m alta, floribus exceptis glabra; foliis oblongis ad late oblongo-lanceolatis, chartaceis, usque ad 18 cm longis, supra olivaceis, nitidis, subtus pallidioribus, basi acutis ad rotundatis, apice longe tenuiterque acuminatis, nervis utrinque 9 ad 10, ascendentibus, arcuato-reticulatis; floribus ♀ fasciculatis, parce pubescentibus, sepalis anguste lanceolatis, acuminatis, 2 mm longis, petalis circiter 1 mm longis; fructibus ovoideis vel ellipsoideis, glabris, circiter 6 mm longis, 1-locularibus.

A tree about 10 m high, glabrous except the sparingly pubescent flowers. Branches terete, slender, light-gray or reddish-brown. Leaves oblong to broadly oblong-lanceolate, chartaceous, 10 to 18 cm long, 3 to 5 cm wide, the base acute to rounded,

the apex long and slenderly acuminate, the acumen usually somewhat falcate, the upper surface olivaceous, shining when dry, the lower somewhat glaucous, dull, much paler than the upper; lateral nerves 9 or 10 on each side of the midrib, slender, curved upward, looped-anastomosing near the margins, the reticulations fine, distinct; petioles about 8 mm long. Pistillate flowers numerous, small, densely fascicled in the axils, slightly pubescent. Sepals 5, narrowly lanceolate, acuminate, 2 mm long. Petals ovate, about 1 mm long. Immature fruit ovoid or ellipsoid, glabrous, about 6 mm long, 1-celled, tipped by the style.

LUZON, Province of Camarines, Mount Isarog, along streams in forests, *Phil. Pl.* 1551 Ramos, November 25, 1913.

The alliance of this species is manifestly with *Bridelia glauca* Blume which extends from Sumatra to Java, the Philippines, and Amboina. The present form is distinguished by its slenderly acuminate leaves which are quite glabrous, or at least not more than obscurely puberulent on the lower surface.

CLEIDION Blume

CLEIDION LANCEOLATUM sp. nov.

Frutex 2 ad 3 m altus plus minusve breviter adpressus hirsutus; foliis lanceolatis, chartaceis, usque ad 22 cm longis, utrinque subaequaliter angustatis, apice acuminatis, basi acutis vel leviter obtusis, nervis utrinque circiter 10, adscendentibus, pagina superiore minutissime albido-punctata; inflorescentiis ♂ tenuibus, usque ad 15 cm longis, axillaribus, solitariis, multifloris; ♀ subaequilongis, paucifloris; fructibus leviter pubescentibus.

A shrub 2 to 3 m high, apparently dioecious, the young branchlets, inflorescence and younger leaves sparingly appressed-hirsute with short hairs. Branches slender, terete, light-gray or somewhat brownish. Leaves lanceolate, chartaceous, dull or slightly shining when dry, lower surface a little paler than the upper, subequally narrowed to the acuminate apex and to the acute or somewhat obtuse base, 12 to 22 cm long, 2 to 4.5 cm wide, margins distantly crenate-serrate, the upper surface of the leaf with numerous, minute, white dots, obscurely verruculose on both surfaces; lateral nerves about 10 on each side of the midrib, prominent on the lower surface, curved-ascending; petioles 1 to 2 cm long, somewhat geniculate at the apex. Male inflorescences slender, axillary, solitary, up to 15 cm long, sparingly appressed-hirsute, the flowers very numerous, greenish, fascicled, the fascicles more or less distant below, approximate above, each fascicle subtended by one or more, broadly ovate, 1.5 to 2 mm long, acuminate bracts; buds ovoid, glabrous, 1.8 mm in diameter; sepals

3, broadly ovate, about 2 mm long, acute; stamens very many; anthers 4-celled. Female inflorescences slender, about as long as the males, axillary, solitary, few-flowered, the flowers long-pedicelled. Sepals (persistent on young fruit) lanceolate, acuminate, about 3.5 mm long. Ovary pubescent; styles cleft nearly to the base, the arms pubescent, about 1 cm long. Young fruit of three cocci, somewhat pubescent, the cocci ellipsoid, about 6 mm long.

SAMAR, *Phil. Pl.* 1648 Ramos, April, 1914 (type); *For. Bur.* 21052 Sherfese, Cenabre, & Cortes, April, 1914, locally known as *dagumay*.

A species characterized by its narrow, elongated, lanceolate leaves, quite different in aspect and in details from the common *Cleidion javanicum* Bl., which is widely distributed in the Philippines and otherwise the only known species of the genus in the Archipelago. It grows at low and medium altitudes in thickets and forests near small streams. Both specimens present staminate and pistillate inflorescences, but in each case they are on separate branches, apparently taken from separate plants.

CLEISTANTHUS Hooker f.

CLEISTANTHUS SAMARENSIS sp. nov.

Species ut videtur *C. bridelifoliae* C. B. Rob. affinis, differt foliis majoribus, usque ad 14 cm longis, nervis magis numerosis, 11 ad 12 utrinque, petiolis densissime ferrugineo-villosis.

A shrub or small tree, the branchlets, petioles, and flowers densely ferruginous- or fulvous-villous. Branches slender, terete, light-gray, glabrous. Leaves lanceolate, subequally narrowed to the blunt-acuminate apex and to the narrowly rounded and usually minutely cordate base, chartaceous, 8 to 13 cm long, 2 to 3.5 cm wide, the upper surface rather pale-gray and shining when dry, quite glabrous, the lower somewhat paler, shining, the midrib often slightly villous, especially near the base; lateral nerves 11 or 12 on each side of the midrib, distinct, anastomosing, curved, the reticulations distinct; petioles densely ferruginous-villous, up to 5 mm long; stipules lanceolate, acuminate, pubescent, 3 mm long. Male and female flowers in the same fascicles, 5-merous, all sessile, the fascicles axillary, dense, up to 1 cm in diameter, with numerous, pubescent, exceedingly variable, broadly obovate to spatulate bracts and bracteoles 2 to 4 mm long. Female flowers about 5 mm long, pubescent, the lobes oblong-lanceolate, narrowed upward to the blunt apex, 2.5 to 3 mm long, thick, glabrous inside. Petals ovate, membranaceous, truncate or broadly rounded, about 1 mm long. Ovary ovoid, densely hirsute with long, stiff, pale hairs, about 2 mm

long; styles 3, united for the lower 0.5 mm, free above, the free portions glabrous, about 1 mm long, each cleft into two 0.5 mm long, recurved arms. Male flowers (in bud only) sessile, 5-merous, pubescent; anthers 1 mm long.

SAMAR, Mount Cauayan, *Phil. Pl. 1685* Ramos, April, 1914, in forests, distributed as "*Cleistanthus robinsonii*" (non Elmer).

A species manifestly allied to *Cleistanthus bridelifolius* C. B. Rob., differing in the characters enumerated in the diagnosis.

CODIAEUM Blume

CODIAEUM HIRSUTUM sp. nov.

Frutex monoicus, partibus junioribus subtus foliis petiolisque longe patule ciliato-hirsutus; foliis subcoriaceis, oblongo-oblan-ceolatis, usque ad 34 cm longis, integris, acutis vel obscure acuminatis, basi longissime gradatim angustatis, nervis utrinque circiter 20; inflorescentiis axillaribus, solitariis vel binis, usque ad 1 m longis; floribus ♂ fasciculatis, circiter 1 cm diametro, sepalis 6, extus pubescentibus; staminibus circiter 100.

A monoecious shrub, the very young parts densely ciliate-hirsute with long, pale, more or less spreading hairs, similar but fewer hairs on the petioles and lower surface of the leaves, and usually a few on the upper surface. Ultimate branches nearly 1 cm in diameter, glabrous. Leaves alternate, subcoriaceous, oblong-oblan-ceolate or oblanceolate, entire, about 34 cm long, 7 cm wide in the upper one-fourth, narrowed upward to the acute or somewhat acuminate apex, and very gradually narrowed downward to the acute or cuneate base, the upper surface olivaceous, somewhat shining, sparingly ciliate-hirsute or nearly glabrous, the lower surface paler, prominently ciliate-hirsute with stiff, spreading, long, scattered, pale hairs; lateral nerves about 20 on each side of the midrib, distant, rather prominent; petioles 5 to 7 cm long. Inflorescence axillary, solitary or two from each axil, up to 1 m in length, somewhat appressed-hirsute with very short hairs, female flowers in one raceme, male flowers in others. Male flowers in distant fascicles along the rachis, white, their pedicels pubescent, 5 to 8 mm long. Sepals 6, membranaceous, broadly ovate, rounded, about 5 mm long, externally slightly pubescent. Petals very small, obscure, or perhaps obsolete, scarcely distinguishable from the disk-glands. Disk-glands about 15, oblong to obovate, 1 mm long. Stamens about 100, their filaments 2 to 2.5 mm long. Female flowers and fruits not seen, one rachis, however, presenting numerous axes of the fruits from which the cocci have fallen.

BILIRAN, *Bur. Sci.* 18539 *McGregor*, June 14, 1914.

A very characteristic species belonging in the group with *Codiaeum luzonicum* Merr. and *C. cuneifolium* Pax & K. Hoffm., from which it is at once distinguished by its indumentum, its leaves gradually narrowed downward from the upper three-fourths, and its very long inflorescence which is up to 1 m in length. The petals, if present, are scarcely distinguishable from the disk glands.

CYCLOSTEMON Blume

CYCLOSTEMON MAQUILINGENSIS sp. nov.

Arbor glaberrima, circiter 20 m alta; foliis coriaceis, oblongis ad oblongo-lanceolatis, nitidis, basi inaequilateralibus, usque ad 20 cm longis, integris, acuminatis, basi uno latere rotundatis altero angustioribus, acutis, nervis lateralibus utrinque circiter 9, adscendentibus, reticulis utrinque prominentibus; floribus ♂ axillaribus, fasciculatis, numerosis, glabris, pedicellatis; sepalis circiter 5 mm longis; staminibus 12 ad 15; fructibus glabris, ellipsoideis, 2.5 ad 3 cm longis, 1-locellatis, pericarpio in siccitate grosse rugosis.

A tree about 20 m high, entirely glabrous. Branches slender, terete, brownish-olivaceous. Leaves oblong to oblong-lanceolate, acuminate, entire, 12 to 20 cm long, 3.5 to 6.5 cm wide, brownish-olivaceous and somewhat shining when dry, the same color on both surfaces, narrowed upward to the blunt-acuminate apex, the base inequilateral, one side usually rounded, the other much narrower and acute; lateral nerves about 9 on each side of the midrib, rather slender, curved-ascending, anastomosing, the ultimate reticulations raised, the veinlets slender but distinct on both surfaces; petioles 5 to 7 mm long. Male flowers numerous, quite glabrous, axillary, fascicled, 10 to 15 in each axil, their pedicels rather slender, 5 to 7 mm long. Sepals 4, concave, elliptic-ovate, 4.5 to 5 mm long. Stamens 12 to 15; anthers about 3 mm long. Fruits ellipsoid, yellow, 1-celled, 1-seeded, 2.5 to 3 cm long, the endocarp rather hard and bony, less than 1 mm thick, the pericarp much thicker, when dry very coarsely wrinkled.

LUZON, Province of Laguna, Mount Maquiling, *For. Bur.* 19957 *Forestry Students (Baldemor)*, Feb. 28, 1913, in flower; *For. Bur.* 19881, 19957, 20877 (type) *Villamil*, July, 1913, Feb., 1914, the latter in flower.

This species grows in forests, ascending to at least 350 meters. It is well characterized by being entirely glabrous, even to the flowers, by its entire, somewhat inequilateral leaves, and by its rather large, ellipsoid, prominently and coarsely wrinkled fruits. Its leaves somewhat resemble those of *C. bordenii* Merr., but in floral and fruit characters it is entirely different.

CYCLOSTEMON CALCICOLA sp. nov.

Arbor glabra, 5 ad 8 m alta; foliis coriaceis in siccitate bruno-olivaceis, nitidis, oblongis, inaequilateralibus, usque ad 12 cm longis, acuminatis, basi acutis, margine integris vel leviter undulato-crenatis, nervis utrinque circiter 12, indistinctis; fructibus axillaribus, solitariis vel fasciculatis, pedunculatis, ellipsoideis, in siccitate reticulatis, nitidis, 10 ad 12 mm longis.

A glabrous tree 5 to 8 m high. Branches slender, terete, light-gray, lenticellate. Leaves coriaceous or subcoriaceous, oblong, 7 to 12 cm long, 3 to 4.5 cm wide, inequilateral, straight or very slightly falcate, one side distinctly narrower than the other, always acute at the base, the wider side either acute or rounded at the base, apex rather prominently acuminate, the acumen blunt, margins entire or obscurely undulate-crenate, when dry shining on both surfaces, brownish-olivaceous; lateral nerves about 12 on each side of the midrib, slender, anastomosing, not prominent, the ultimate reticulations rather dense; petioles 5 to 7 mm long. Flowers not seen. Fruit axillary, greenish-red and smooth when fresh, when dry dark-brown, shining, wrinkled, glabrous, ellipsoid, 10 to 12 mm long, solitary or fascicled, 1-celled, the peduncles about 3 mm long.

PALAWAN, Taytay Bay, on the small limestone island known as Apulit, *Merrill 9427, 9430* (type), May 31, 1913, in dry thickets in crevices and ravines, steep slopes, altitude about 10 m above sea level.

This species does not appear to be closely allied to any other Philippine form. It is characterized by its ellipsoid, 1-celled fruits which are quite glabrous, wrinkled, and shining when dry, and by its rather obscurely nerved leaves.

CYCLOSTEMON GLOBOSUS sp. nov.

Frutex vel arbor parva, glabra; foliis charactaceis vel subcoriaceis, ovatis ad oblongo-ovatis, acutis, circiter 5 cm longis, integris, nitidis, basi rotundatis, equilateralibus vel leviter inaequilateralibus, nervis utrinque circiter 6, tenuibus; fructibus globosis, glabris, 9 ad 12 mm diametro, breviter pedunculatis, 2-locellatis.

A shrub or small tree, quite glabrous, or the petioles minutely puberulent. Branches slender, terete, cinereous or light-gray, lenticellate, the branchlets very slender, dark-brown, more prominently lenticellate. Leaves ovate to oblong-ovate, chartaceous to subcoriaceous, rather dark-colored when dry, uniform in color and shining on both surfaces, the apex acute, margins entire, base rounded, equilateral or slightly inequilateral; lateral nerves about 6 on each side of the midrib, slender, equally prominent on both surfaces, the reticulations rather close, distinct; petioles

about 3 mm long. Flowers not seen. Fruit axillary, solitary or in pairs, globose, glabrous, rather coarsely wrinkled, brown when dry, 9 to 12 mm diameter, the pericarp crustaceous; cells 2, each with a single, thick, plano-convex seed about 7 mm in diameter.

CUYO, *Bur. Sci.* 21362 *Escritor*, July 20, 1913.

Allied to *Cyclostemon microphyllus* Merr., but with smaller glabrous fruits, its leaves dark-colored when dry, with less prominent nerves and quite different reticulations.

CYCLOSTEMON MINDANAENSIS sp. nov.

Arbor glabra, circiter 15 m alta; foliis oblongis, inaequilateralibus, coriaceis, usque ad 18 cm longis, in siccitate nitidis, flavido-brunneis, integris vel distanter irregulariter crenato-serrulatis, obtuse acuminatis, basi acutis, nervis utrinque circiter 6, curvato-adscendentibus; fructibus axillaribus, fasciculatis, oblongo-ovoideis, acutis, circiter 2.5 cm longis, in siccitate pallide brunneis, minute verruculosis, 1- vel 2-locellatis.

A tree apparently about 15 m high, glabrous or nearly so. Branches terete, or somewhat angular, pale when dry, smooth. Leaves oblong, more or less inequilateral, coriaceous, 12 to 18 cm long, 3 to 6 cm wide, entire or distantly and irregularly crenate-serrulate, gradually narrowed to the blunt-acuminate apex, the base acute, or acute on one side and somewhat rounded on the other, yellowish-brown when dry, of about the same color and strongly shining on both surfaces; primary lateral nerves about 6 on each side of the midrib, curved-ascending, anastomosing, distinct, the reticulations evident on both surfaces; petioles 5 to 8 mm long. Flowers not seen. Fruits axillary, fascicled, 2 to 4 or more in each axil, oblong-ovoid, acute, base obtuse, about 2.5 cm long, 10 to 12 mm in diameter, pale-brown when dry, minutely verruculose, when young sparingly pubescent, 1- or 2-celled, the pedicels about 1 cm long, when young appressed-pubescent, becoming quite glabrous.

MINDANAO, District of Zamboanga, Lumbiag, *For. Bur.* 12458 *Tarrosa* (type), July, 1908: District of Davao, Todaya, *Elmer* 11109.

The specimens were originally placed under *Stemonurus*, and the duplicates of both were probably distributed under this generic name; the species, however, is a euphorbiaceous plant and undoubtedly belongs in the genus *Cyclostemon*. It is well characterized by its strongly shining, pale leaves and its oblong-ovoid, acute fruits. The Moro name recorded by Tarrosa is *banau*.

CYCLOSTEMON MINDORENSIS sp. nov.

Frutex vel arbor parva, subglabra; foliis coriaceis, oblongis ad ovato-lanceolatis, leviter inequilateralibus, rectis, acuminatis,

basi acutis, integris vel subintegris, usque ad 8 cm longis, nervis lateralibus utrinque circiter 7 cum reticulis aequaliter distinctis; fructibus ovoideo-ellipsoideis vel oblongo-ovoideis, leviter pubescentibus, 1-locellatis, pedunculatis, 12 ad 15 mm longis.

A nearly glabrous shrub or small tree, the buds, the younger peduncles, and the fruits more or less pubescent, becoming nearly glabrous. Branches slender, terete, grayish, lenticellate. Leaves firmly coriaceous, oblong to ovate-lanceolate, somewhat inequilateral but scarcely falcate, 6 to 8 cm long, 2 to 3 cm wide, gradually tapering upward to the distinctly acuminate apex, the base acute to obtuse, margins entire or very distantly and obscurely undulate-crenate, usually recurved, when dry rather pale and equally shining on both surfaces; lateral nerves about 7 on each side of the midrib, about equally prominent on both surfaces, irregular, often scarcely more distinct than are the secondary nerves and the reticulations, the latter as prominent on the upper as on the lower surface; petioles 2 to 3 mm long. Flowers not seen. Fruits axillary, solitary or fascicled, ovoid-ellipsoid to oblong-ovoid, rounded, brown or gray when dry, slightly pubescent, 12 to 15 mm long, the pericarp scarcely wrinkled when dry, 1-celled, the peduncles about 1 cm long, usually slightly pubescent.

MINDORO, *Bur. Sci.* 21278, 21311 (type) *Escriitor*, July, 1913, the former from near Calapan, the latter from Naujan.

Probably as closely allied to *Cyclostemon monospermus* Merr. as to any other species, but with prominently acuminate, differently shaped leaves and larger fruits.

CYCLOSTEMON PALAWANENSIS sp. nov.

Frutex circiter 2 m altus partibus junioribus exceptis glaber; ramulis tenuibus, teretibus, junioribus plus minusve pubescentibus; foliis chartaceis, integris, oblongo-ovatis ad oblongis, aequilateralibus, usque ad 13 cm longis, obscure latissime obtuse acuminatis, basi acutis ad rotundatis, nervis utrinque circiter 8; fructibus axillaribus, depresso-globosis, 2-locellatis, usque ad 11 mm diametro, junioribus plus minusve adpresse hirsutis, pericarpio crustaceo.

A shrub about 2 m high, glabrous except the younger parts. Branches slender, terete, pale-gray, glabrous, the branchlets more or less pubescent, the growing tips somewhat appressed ferruginous-hirsute. Leaves firmly chartaceous, olivaceous when dry, somewhat shining, equilateral or nearly so, oblong-ovate to oblong, 8 to 13 cm long, 3 to 5 cm wide, entire, apex slightly acuminate, the acumen broad, blunt, the base acute to rounded;

lateral nerves about 8 on each side of the midrib, slender, curved-anastomosing, the reticulations evident on both surfaces; petioles 2 mm long or less, pubescent. Fruits axillary, solitary or in pairs, depressed-globose, up to 11 mm in diameter, 2-celled, the pericarp crustaceous, sparingly appressed-hirsute; pedicels slender, slightly pubescent, nearly 1 cm long.

PALAWAN, Lake Manguao, Merrill 9451, April 27, 1913, on dry forested ridges, altitude about 80 meters.

Closely allied to *Cyclostemon ellipsoideus* Merr., differing in its fewer nerved leaves and in its depressed-globose not ellipsoid fruits.

ENDOSPERMUM Bentham

ENDOSPERMUM OVATUM sp. nov. § *Euendospermum*.

Arbor, ramulis circiter 8 mm diametro, solidis; foliis coriaceis, non peltatis, ovatis, usque ad 14 cm longis, acutis vel leviter acuminatis, basi acutis ad late rotundatis, vix cordatis, supra glabris, junioribus subtus pubescentibus, vetustioribus glabris, ad apicem petioli biglandulosus; paniculis quam folia brevioribus, pubescentibus; fructibus subglobosis, carnosus, 6 mm longis, seminibus 2.

A tree, size not stated, the branches stout, terete, the ultimate ones 8 mm in diameter, glabrous, reddish-brown or grayish, marked with large petiolar scars, the growing tips pubescent. Leaves ovate, coriaceous, 8 to 14 cm long, 5 to 9 cm wide, entire, the apex acute or slightly acuminate, the base broadly rounded to acute, not cordate, the upper surface glabrous, smooth and shining, brownish or olivaceous when dry, the lower surface paler, in very young leaves rather softly pubescent with simple hairs, in age entirely glabrous, with two prominent glands, one on each side at the juncture of the petiole with the lamina, the base 5-nerved, the lateral nerves above the basal ones about 5 on each side of the midrib, very prominent, the reticulations prominent; petioles 3 to 7 cm in length. Panicles axillary, 10 to 18 cm long, somewhat pubescent with simple hairs, narrowly pyramidal, the lower branches 5 cm long or less, the upper gradually shorter. Flowers not seen. Fruit subglobose, fleshy, yellow, about 6 mm long, the seed smooth, broadly ellipsoid, 4 mm long.

MINDANAO, Butuan Subprovice, near Sumulao, Bur. Sci. 15921 Fénix, August, 1912.

Evidently a very distinct species but manifestly allied to *Endospermum borneense* Muell.-Arg., of Borneo, from which it differs in its differently shaped, somewhat larger leaves which are not all cordate at the base, and which are quite glabrous on both surfaces, and its paniculate, not racemose inflorescence.

GALEARIA Zollinger & Moritzi

GALEARIA PHILIPPINENSIS sp. nov. § *Eugalearia*.*Galearia filiformis* Merr in Philip. Journ. Sci. 4 (1910) Bot. 280, non Pax.

Arbor circiter 15 m alta, inflorescentiis exceptis glabra, bracteis minutis, quam floribus brevioribus, staminibus glabris, petalis glabris, cochleato-concavis, ramulis glabris, tenuibus; foliis chartaceis, usque ad 23 cm longis, oblongis, nervis utrinque circiter 7, subtus valde prominentibus, arcuato-anastomosantibus; inflorescentiis puberulis.

A small dioecious tree, reaching a height of 15 m, glabrous except the inflorescence. Branches and branchlets slender, subterete, reddish-brown. Leaves chartaceous, oblong, 14 to 23 cm long, 4 to 7 cm wide, pale or somewhat brownish, of about the same color and somewhat shining on both surfaces when dry, the apex blunt-acuminate, the base acute, sometimes a little acuminate, often slightly inequilateral; lateral nerves 7 on each side of the midrib, very prominent on the lower surface, arched-anastomosing, the reticulations lax, very prominent; petioles 5 mm long or less. Male racemes 10 cm long or more, the rachis puberulent, the flowers numerous, pedicelled, fascicled at the nodes, their pedicels puberulent, 2 mm long. Calyx puberulent, the teeth triangular-ovate, acute, less than 0.5 mm long. Petals glabrous, oblong, obtuse or acute, 1.5 mm long, cochleate-concave, keeled inside. Stamens entirely glabrous, the filaments 1 mm long. Rudimentary ovary obovoid, truncate, 1 mm long, pubescent. Female racemes slender, up to 18 cm long, puberulent, the flowers numerous, sessile, the subtending bracteoles, as in the male flowers, linear, less than 1 mm long. Calyx-lobes ovate, acute, about 1 mm long. Petals elliptic-ovate, acute, glabrous, 1.3 mm long, plane or nearly so, keeled inside. Ovary ovoid, ferruginous-pubescent, the style-arms about 1 mm long. Fruit (very immature) about 6 mm in diameter.

BASILAN, *Bur. Sci. 16319 Reillo* (type), September, 1912, growing near the seashore, pistillate flowers. MINDANAO, District of Zamboanga, Port Banga, *For. Bur. 9116 Whitford & Hutchinson*, in dipterocarp forests, altitude 30 meters, December, 1907, staminate flowers; San Ramon, *Hallier*, January, 1904 with immature fruits: District of Lanao Camp Keithley, *Mrs. Clemens s. n.*, June, 1906, May, 1907, staminate flowers.

This species, as the flowers show, is not at all closely allied to *Galearia filiformis* (Blume) Pax, as shown by comparison with authentic material of Blume's species (perhaps a cotype), collected in Java by Blume himself (ex Herb. Leiden), now in the Herbarium of the Bureau of Science. It is apparently most closely allied to *Galearia wallichii* (R. Br.) Hook. f., of the Malay Peninsula, from which it differs in its larger leaves, glabrous rachis, and in other characters.

GLOCHIDION Forster

GLOCHIDION DOLICHOSTYLUM sp. nov. § *Hemiglochidion*?

Arbor parva, ut videtur dioica, ramulis subtus foliis inflorescentiis que breviter pubescentibus; foliis usque ad 20 cm longis, oblongo-ellipticis ad oblongo-obovatis, subcoriaceis, in siccitate brunneo-olivaceis, supra minutissime verruculosi, subtus prominente reticulato-venosis, basi rotundatis, apice late acuminatis apiculatisque, nervis lateralibus subtus valde prominentibus, utrinque circiter 8; floribus ♀ 3- ad 5-meris, sessilibus, fasciculatis, axillaribus, 3 mm longis; ovarium glabrum, 6-loculare, 0.5 mm longum; columna stylaris cylindrica, 4 mm longa, leviter hirsuta.

A small, apparently dioecious tree, more or less pubescent. Branches brown, terete, the ultimate ones much elongated, rather slender, somewhat brown-pubescent. Leaves distichous, subcoriaceous, oblong-elliptic to oblong-obovate, 13 to 20 cm long, 5 to 8 cm wide, brownish-olivaceous when dry, dull or slightly shining, the upper surface minutely and densely verruculose, the lower surface prominently reticulate, pubescent on the midrib and lateral nerves with short, spreading, pale hairs, the base rather broadly rounded, the apex broadly and shortly acuminate, the acumen apiculate; lateral nerves about 8 on each side of the midrib, very prominent on the lower surface, curved, anastomosing; petioles pubescent, about 3 mm long. Female flowers in small, dense, axillary fascicles, the fascicles 5 mm in diameter or less, the flowers sessile, 3- to 5-merous; perianth segments oblong-obovate, acute, or obtuse, short-hirsute on both surfaces, the larger three about 3 mm long, the other two, when present, shorter and narrower. Ovary depressed-globose, glabrous, 6-celled, about 0.5 mm in diameter; style about as thick as the ovary, cylindric, not constricted above the ovary, sparingly pubescent with short spreading hairs, minutely toothed at the apex.

PALAWAN, Binaloan, Malampaya Bay, Merrill 9408, May, 1913, in forests at low altitudes.

A strongly marked species, characterized by its comparatively large, prominently reticulate, short petioled leaves, its small dense fascicles of sessile pistillate flowers, its unequal perianth segments, its small glabrous ovary, and especially by its greatly elongated cylindric styles.

GLOCHIDION NITIDUM sp. nov. § *Hemiglochidion*?

Arbor parva circiter 8 m alta, glabra; foliis crasse coriaceis, nitidis, falcatis, oblongo-ovatis, usque ad 13 cm longis, acuminatis basi acutis, nervis lateralibus utrinque circiter 6, prominentibus,

reticulis laxis; fructibus ovoideis vel ellipsoideis, 1.5 cm longis, 4-locellatis, pericarpio crustaceo, valvis 8, lanceolatis, utrinque aequaliter angustatis, acutis vel acuminatis.

A tree about 8 m high, entirely glabrous, (flowers unknown). Branches terete, brownish, glabrous. Leaves thickly coriaceous, falcate, strongly shining on both surfaces, brownish to yellowish-brown when dry, acuminate, base acute, up to 13 cm long, 3 to 4.5 cm wide; lateral nerves about 6 on each side of the midrib, prominent on the lower surface, curved, brownish, obscurely anastomosing, the reticulations slender, lax; petioles 3 to 4 mm long. Flowers fascicled, pedicelled, 5-merous (?), the perianth segments very short, the pedicels in fruit 3 to 4 mm long. Mature fruit red, ovoid to ellipsoid, acute at both ends or the base somewhat rounded, 1.5 cm long, 4-celled, composed of 8 lanceolate crustaceous valves which are equally narrowed at both ends, acute or acuminate, pale or pink when dry, the younger ones crowned by a cylindric styler column about 1 mm long.

LUZON, Province of Laguna, San Antonio, *Bur. Sci.* 20548 Ramos, March 3, 1913, in forests near swamps.

A species apparently belonging in the same group with, and allied to, *Glochidion subfalcatum* Elm., but with much fewer nerved leaves. In vegetative characters it greatly resembles *Glochidion macrocarpum* Blume, but its fruits are quite different from those of that species.

GLOCHIDION TRICHOPHORUM sp. nov. § *Hemiglochidion*.

Frutex vel arbor parva, monoica, omnibus partibus prominente ciliato-hirsutis; foliis ovatis ad oblongo ovatis, firmiter chartaceis vel subcoriaceis, usque ad 10 cm longis, brunneis, utrinque ciliato-hirsutis, base late rotundatis, plus minusve inaequilateralibus, apice acute acuminatis apiculatisque; nervis lateralibus utrinque circiter 6, prominentibus, reticulis laxis; floribus ♂ fasciculatis, pedicellatis, hirsutis, 6-meris; staminibus 3, antheris connatis, cum connectivo 2 mm longis; floribus ♀ sessilibus, 5-meris, 5 mm longis, columna stylaris cylindraceis, puberulis.

A shrub or small tree, monoecious, prominently ciliate-hirsute with rather stiff, spreading, brownish hairs. Branches terete, gray or brownish, glabrous, the branchlets densely brown-ciliate. Leaves ovate to oblong-ovate, brown when dry, somewhat shining, the lower surface paler than the upper, 5 to 10 cm long, 2.5 to 4.5 cm wide, rather slenderly and sharply acuminate, the acumen apiculate, base broadly rounded, distinctly inequilateral, both surfaces ciliate-hirsute with spreading, pale or brownish, scattered hairs, those on the lower surface mostly on the midrib and lateral nerves; lateral nerves about 6 on each side of the

midrib, prominent, anastomosing, curved, the reticulations lax; petioles densely pubescent, 2 mm long or less. Flowers fascicled, those in the lower fascicles mostly male, in the upper ones mostly female. Male flowers: Perianth somewhat campanulate, about 4 mm long, the segments 6, somewhat recurved, oblong-ob lanceolate, obtuse to acute, the outer three prominently ciliate-hirsute with spreading hairs, the inner three somewhat smaller, glabrous, or sparingly hirsute at the base only. Stamens 3, the anthers united, including the 0.5 mm long connectives about 2 mm in length; pedicels ciliate-hirsute, 3 to 5 mm long. Female flowers fewer than the males, mostly in the upper axils, sessile or nearly so, 5-merous, the segments ciliate-hirsute, obtuse or acute, linear-spatulate, equal, about 1 mm wide. Ovary globose, glabrous, 1 mm in diameter; style cylindric, nearly as thick as the ovary, jointed above the ovary and falling readily, puberulent except the somewhat cleft glabrous apex.

LUZON, Province of Tayabas, Mount Cadig, near Guinayangan, *Bur. Sci.* 20331 *Escritor*, March 7, 1913, in forests.

A species with indument characters resembling those of *Glochidion weberi* C. B. Rob., but with entirely different leaves and different flowers. It is not closely allied to any other known Philippine species.

HOMALANTHUS Jussieu

HOMALANTHUS MEGAPHYLLUS sp. nov. § *Disepali*.

Frutex circiter 3 m altus, glaber, foliis suborbiculari-ovatis, submembranaceis vel chartaceis, usque ad 35 cm longis, alte peltatis; inflorescentiis ♂ circiter 40 cm longis, bracteolis biglandulosus, unifloris; floribus tenuiter pedicellatis, circiter 2 mm diametro, staminibus 30; sepalis 2, valde inaequalibus.

A glabrous shrub about 3 m high. Leaves broadly ovate or suborbicular-ovate, broadly peltate, submembranaceous or chartaceous, up to 35 cm long and nearly as wide, the base broadly rounded, shining on both surfaces, the apex rounded or obtuse, radiately 10-nerved, the lateral nerves above the base about 11 on each side of the midrib, prominent; petioles as long as the lamina; stipules membranaceous, oblong-ovate or ovate-lanceolate, sharply acuminate, deciduous, 10 cm long. Male racemes about 40 cm long, many flowered, the flowers deciduous from the base upward, the bracteoles oblong, rounded or truncate, slightly cucullate, about 1 mm long, each with two round glands about 0.5 mm in diameter, each bract subtending a solitary, slenderly pedicelled staminate flower, the pedicels 6 mm long below, gradually shorter upward, the buds nearly sessile. Male flowers depressed-globose, 2 mm in diameter, greenish-yellow.

Sepals 2, unequal, the larger one reniform, about 1.5 mm wide, 1 mm long, the smaller orbicular, about 0.5 mm in diameter. Stamens about 30; filaments nearly 1 mm long. Female flowers and fruits not seen.

MINDANAO, Subprovince of Bukidnon, Sumilao, *Bur. Sci.* 15765 *Fénix*, August 5, 1912, in thickets along streams, locally known as *nabugli*.

A very characteristic species, allied to *Homalanthus fastuosus* and to *H. papuanus*, differing from both in its very large, long-petioled leaves, from the former also in its 1-flowered bracteoles, long-pedicelled flowers, and from the latter in its numerous stamens, long inflorescence, long-pedicelled flowers, and numerous other characters. The species is apparently dioecious, for on our material there is no indication of any female flowers at or near the base of the male inflorescence.

HOMALANTHUS ROTUNDIFOLIUS sp. nov. § *Monosepali*.

Frutex vel arbor parva, glabra; foliis rotundatis, peltatis, membranaceis, 3 ad 7 cm diametro, apice obscurissime biglandulosus; racemis usque ad 12 cm longis, bracteis minutis, unifloris, obscure biglandulosis, floribus ♂ 1.2 ad 2 mm diametro, sepalum 1, anticum, reniforme, 1 ad 1.5 mm diametro; staminibus circiter 25; fructibus leviter compressis, circiter 4 mm longis.

A shrub or small tree, 10 m high *fide* Ramos, entirely glabrous. Branches stout, terete, glabrous, somewhat olivaceous, marked with large petiolar scars, the internodes short. Leaves nearly round, prominently peltate, membranaceous, 3 to 7 cm in diameter; petioles slender 5 to 7 cm long, very obscurely biglandular at the apex; stipules membranaceous, oblong-lanceolate, acuminate, deciduous, 1.5 to 2 cm long. Racemes axillary, slender, solitary, up to 12 cm long, the female flowers few, basal, the male flowers above, very numerous, yellowish. Male flowers: pedicels slender, about 2 mm long, the flowers in anthesis globose, 1.5 to 2 mm in diameter; sepal 1, reniform, 1 to 1.5 mm in diameter; stamens about 25; subtending bracts small, obscurely biglandular. Female flowers not seen. Fruits compressed, 2-celled, about 4 mm long, 5 to 6 mm wide.

SAMAR, Paranas, along small streams, *Phil. Pl.* 1663 Ramos, April, 1914.

A species similar to and manifestly allied to *Homalanthus macradenius* Pax & K. Hoffm. of Mindanao, differing in its obscure glands and more numerous stamens.

HOMALANTHUS ALPINUS Elm. Leaf. Philip. Bot. 1 (1908) 307; Merr. in Philip. Journ. Sci. 5 (1910) Bot. 357; Pax in Engl. Pflanzenreich 52 (1912) 48.

This distinct species is at present represented in the Herbarium of the Bureau of Science by about 25 specimens. It is of wide distribution in the northern and central parts of the Philippines, occurring on the higher

mountains mostly at altitudes above 1,000 meters, from northern Luzon to central Negros. The duplicates of most of the material from the early collections of the Bureau of Science were distributed as *Homalanthus populneus* Pax, which is a very different species. *Homalanthus alpinus* is always dioecious.

HOMALANTHUS MACRADENIUS Pax & K. Hoffm. in Engl. Pflanzenreich 52 (1912) 51.

MINDANAO, District of Davao, Mount Apo, *Elmer* 10653 (type number), *Williams* 2570: Province of Surigao, *Ahern* 513, 585.

This distinct species was written up by me as a distinct species about ten years ago, but was never published, and the herbarium material, not very good, was later placed with *Homalanthus fastuosus* F.-Vill. The maximum size of the leaves is 15 cm in length, and Ahern's specimens show all intergrades between this size and the smaller leaves on the type material, which are 6 to 7 cm in diameter. The female flowers have two very unequal sepals, both reniform, the larger one 2 mm wide and 1 mm long, the smaller one less than 1 mm in diameter. The stigmas are very strongly recurved.

MALLOTUS Loureiro

MALLOTUS BREVIPES sp. nov.

Arbor parva 5 ad 10 m alta ramulis junioribus inflorescentiisque parce ciliato-hirsutis exceptis glabra; foliis oblongo-ovatis, integris, usque ad 12 cm longis, axillis exceptis eglandulosis, acuminatis; basi angustatis, distincte cordatis, breviter petiolatis; floribus ♂ axillaribus, solitariis, pedicellatis; fructibus depresso-globosis, 8 mm diametro, cocci extus dense breviter echinatis, parce pubescentibus.

A small tree 5 to 10 m high, nearly glabrous. Branches slender, terete, grayish, glabrous, the younger parts and the pedicels sparingly ciliate-hirsute with short, spreading, white or pale, simple hairs. Leaves opposite, chartaceous, rather pale, shining, and of about the same color on both surfaces when dry, entire, oblong-obovate, 7 to 12 cm long, 2 to 4.5 cm wide, the apex shortly and bluntly acuminate, narrowed below to a width of from 6 to 9 mm, then distinctly cordate; lateral nerves about 8 on each side of the midrib, rather prominent, curved-ascending, their axils glandular, the reticulations slender; petioles sparingly ciliate-hirsute, becoming nearly glabrous, 2 to 4 mm long. Flowers not seen, but pedicels of the fruits axillary, solitary, sparingly ciliate-hirsute, slender, about 2 cm long, the persistent sepals oblong, obtuse or acute, 5 mm long, two (or bracteoles) accrescent, somewhat ovate, 5 mm long and 3 to 3.5 mm wide. Fruits depressed-globose, about 8 mm in diameter, composed of three dehiscent cocci, the cocci densely covered externally with short, sharp spinelike processes which do not

exceed 1.5 mm in length and which are usually sparingly ciliate especially at their apices.

MINDANAO, District of Davao, between Digas and Santa Cruz, *Williams 2968* (type) June 29, 1905; District of Cotabato, Glan, *For. Bur. 18270 Miranda, For. Bur. 14246 Tarrosa*, May 25, 1912, all from low altitudes.

The species is a very characteristic one, but in the absence of staminate flowers I am not at all sure that it is really referable to the genus *Mallotus*. So far as the material goes, however, it agrees with *Mallotus*, and is hence placed in that genus. The striking characters of *Mallotus brevipes* are its very short-petioled, eglandular leaves which are pinnately nerved and narrowed to the distinctly cordate base, and its axillary, solitary, rather long-pedicelled, echinate fruits.

MALLOTUS SAMARENSIS sp. nov.

Frutex vel arbor parva, subglabra; foliis alternis, glabris, oblongis, usque ad 20 cm longis, acuminatis, basi angustatis, acutis vel obtusis, margine distanter serrulatis, eglandulosis; nervis lateralibus utrinque 9 vel 10, prominentibus; petiolo usque ad 2.5 cm longo; inflorescentiis ♂ axillaribus, solitariis, racemosis, folia subaequantibus; floribus numerosis, glomeratis, breviter pedicellatis, sepalis circiter 2.5 mm longis.

A shrub or small tree, subglabrous, apparently dioecious. Branches terete, pale-grayish, glabrous, the growing tips somewhat appressed-hirsute. Leaves alternate, oblong, chartaceous, 16 to 20 cm long, 5 to 7 cm wide, subequally narrowed to the distinctly acuminate apex and to the acute or obtuse base, the margins distantly serrulate, brownish-olivaceous, of the same color on both surfaces, and slightly shining when dry, eglandular; lateral nerves 9 or 10 on each side of the midrib, prominent, curved, anastomosing, the reticulations slender, subparallel; petioles up to 2.5 cm long. Male inflorescences racemose, axillary, solitary, very slightly pubescent, as long as the leaves, the flowers very numerous, in scattered or nearly approximate glomerules about 5 mm in diameter, the pedicels about 1 mm long, each glomerule with numerous, brown, ovate, acuminate, somewhat ciliate bracteoles about 1 mm in length. Sepals 3, ovate, acute to acuminate, 2.5 mm long. Anthers very numerous; filaments 0.8 mm long, flattened.

SAMAR, Yabong, *Bur. Sci. 17480 Ramos*, March 18, 1914, on forested slopes.

A species characterized by its oblong, eglandular leaves and its racemose staminate inflorescence, the flowers in numerous, dense, scattered or approximate glomerules, the racemes as long as the leaves. It is allied to *Mallotus ramosii* Merr., differing in its longer leaves which are but slightly and distantly serrulate and not rounded at the base, its longer petioles, and stouter racemes which have much larger glomerules and more numerous flowers than in *M. ramosii* Merr.

PHYLLANTHUS Linnaeus

PHYLLANTHUS LANCIFOLIUS sp. nov. § *Paraphyllanthus*.

Frutex erectus, monoicus, usque ad 1 m altus, ramulis exceptis subglaber; ramulis villosis; foliis lanceolatis, chartaceis, 1.5 ad 7 cm longis, acuminatis, basi leviter inaequilateralibus, rotundatis vel obscure cordatulis, nitidis, supra glabris, subtus parce villosis vel subglabris, nervis lateralibus utrinque circiter 10, tenuibus, anastomosantibus; floribus ♂ 6-meris, axillaribus, fasciculatis, breviter pedicellatis, segmentis 0.8 mm longis, ovatis, obtusis; staminibus 3, liberis, antheris 0.4 mm longis, longitudinaliter dehiscentibus; floribus ♀ axillaribus, solitariis, longissime pedicellatis, pedicellis usque ad 5 cm longis; ovario 3-loculare, glabro, stylis 3, liberis, patulis, furcatis.

An erect monoecious shrub about 1 m high, subglabrous except the branches and lower surface of the leaves. Branches slender, terete, reddish-brown, the younger ones rather prominently villous with pale or brownish, somewhat spreading, short hairs. Leaves alternate, distichous, exceedingly variable in size, lanceolate, or the smaller ones ovate-lanceolate, chartaceous, 1.5 to 7 cm long, 0.7 to 1.8 cm wide, olivaceous or somewhat brownish, of the same color and shining on both surfaces when dry, the upper surface glabrous, the lower sparingly villous often becoming glabrous, narrowed upward to the acuminate or merely acute apex, the base somewhat inequilateral, rather broadly rounded, usually slightly cordate; lateral nerves about 10 on each side of the midrib, slender, not prominent, spreading, anastomosing, the reticulations lax; petioles pubescent, 1 mm long or less; stipules linear-lanceolate, acuminate, brown, about 1.5 mm long. Male flowers numerous, in axillary fascicles, 6-merous, their pedicels up to 3 mm long, glabrous. Segments 0.8 mm long, ovate, rounded or obtuse. Disk-glands 6, somewhat stalked, orbicular, 0.3 mm in diameter. Stamens 3, free, the filaments short, the anthers 0.3 mm long, longitudinally dehiscent. Female flowers solitary, in the upper axils, with very long and slender pedicels, the pedicels up to 5 cm in length. Perianth segments 6, oblong-lanceolate, acuminate, entire, about 1 mm long. Disk prominent, about 1 mm in diameter. Ovary depressed-globose, glabrous, 3-celled, 0.5 mm in diameter; styles 3, spreading or appressed to the top of the ovary, free or nearly so, each cleft about to the middle.

SAMAR, *Bur. Sci.* 17465 Ramos, March 16, 1914 (type). SIKUIJOR, *Piper* 382, May 9, 1911.

This species does not closely resemble any other known Philippine

species, and is well characterized by its lanceolate leaves which vary greatly in size, and by its very long and slenderly pedicelled female flowers. By Robinson's key to the Philippine species it falls next to *P. tenuipes* C. B. Rob., but is not closely allied to that species.

PHYLLANTHUS SECURINEGIOIDES sp. nov.

Frutex monoicus glaber, ramulis elongatis, tenuibus; foliis chartaceis, oblongo-ellipticis ad lanceolatis, 7 ad 12 longis, acutis vel acuminatis, utrinque subaequaliter angustatis, aequilateralibus, nervis utrinque circiter 8; floribus axillaribus, fasciculatis, 6-meris, ♂ numerosis, campanulatis, 2 mm longis, pedicellis 2 mm longis sursum incrassatis, staminibus 3, filamentis plus minusve connatis, antheris liberis longitudinaliter dehiscentibus, ♀ paucis, pedicellis 3 ad 6 mm longis, segmentis inaequalibus, interioribus paullo minoribus; ovario 3-loculare; stylis 3, patulis, furcatis; fructibus 3-coccis.

A glabrous monoecious shrub 3 to 4 m high, the branches elongated, slender, terete, pale or brownish, the upper parts of the younger branchlets somewhat compressed. Leaves alternate, distichous, equilateral, chartaceous, oblong-elliptic to lanceolate, 7 to 12 cm long, 2 to 3.5 cm wide, subequally narrowed to the acute or somewhat acuminate apex and base, pale or brownish-olivaceous when dry, somewhat shining; lateral nerves about 8 on each side of the midrib, slender, anastomosing, the reticulations lax; petioles about 2 mm long. Flowers white, in axillary fascicles, 6-merous, those on some branches all male, numerous, those other branches all female, few. Male flowers: Pedicels 2 mm long, thickened upward, from stout, branched, short, brown, somewhat hirsute axillary processes, the flowers at the tips of the processes; perianth 2 mm long, campanulate, the lobes oblong-elliptic to oblong-obovate, subequal, rounded or obtuse. Disk-glands evident. Stamens 3, the filaments 1 mm long, more or less united; anthers basifixed, oblong, obtuse, 0.5 mm long, longitudinally 2-celled. Rudimentary ovary none. Female flowers in separate fascicles on the same plant, few, their pedicels 3 to 6 mm long, elongated in fruit, the perianth-lobes oblong-ovate, obtuse, about 1.8 mm long, the inner three somewhat smaller, all slightly accrescent and up to 2.7 mm long in young fruit. Disk prominent. Ovary globose, glabrous, 3-celled; styles 3, spreading, appressed to the ovary, about 1 mm long, free or united only at the base, forked. Fruit a depressed-globose, 3-lobed capsule about 5 mm long, 8 mm wide, composed of three dehiscent cocci, the pedicels up to 1 cm in length.

LUZON, Province of Tayabas, Guinayangan, *Bur. Sci.* 20725 *Escriitor*, March 8, 1913 (type). Here I also refer the following two specimens

from the same Province: Guinatacutan, *Bur. Sci. 13188 Foxworthy & Ramos*, March, 1911, in fruit, a form with narrow lanceolate leaves, and *Bur. Sci. 13270 Ramos*, Kabibihan, March, 1911, with male flowers, referred by the late Dr. C. B. Robinson to *Securinea acuminatissima*.

I cannot definitely refer this species to any described section of the genus *Phyllanthus*. It resembles *Securinea*, but its 3 stamens and absence of a rudimentary ovary in the male flowers excludes it from that genus; it seems to come nearest to the section *Gomphidium*, but the styles are scarcely united, are spreading, and prominently cleft. It is not at all closely allied to any species of *Phyllanthus* familiar to me, and probably will have to be made the type of a new section. Its striking characters are its 6-merous flowers, 3 stamens with filaments somewhat united, anthers erect, free, longitudinally dehiscent, disk present in both sexes, ovary 3-celled, styles 3, spreading, slightly united at the base, each cleft about half-way to the base.

SECURINEGA Jussieu

SECURINEGA FLEXUOSA Muell.-Arg. in DC. Prodr. 15² (1865) 450.

Fluggea flexuosa Muell.-Arg. in Linnaea 34 (1865) 76; C. B. Rob. in Philip. Journ. Sci. 4 (1909) Bot. 74.

Phyllanthus acuminatissimus C. B. Rob. l. c. 3 (1908) Bot. 200.

Securinea acuminatissima C. B. Rob. l. c. 4 (1909) Bot. 73.

After a careful examination of a full series of specimens I can see no good reason for considering that more than one species is represented here. *Cuming 1855*, the type of Mueller's species is to me only a rather small leaved form of the species later described by Dr. Robinson; this form is sufficiently closely matched by some of the recently collected material, and all intermediates occur. Additional material: NEGROS, *For. Bur. 19407 Curran*. LEYTE, *Piper 582, 604, Wenzel 67, 181, 402, Bur. Sci. 15213 Ramos*. LUZON, Province of Sorsogon, *For. Bur. 21023 Darling*. MINDANAO, *Bur. Sci. 21498 Escritor; For. Bur. 20509 Rafael & Ponce*.

The Visayan name *Anislag* appears on several specimens from Leyte and on the Sorsogon specimen, the latter with the statement that the timber is noted for its durability when used as posts.

TRAGIA Linnaeus

TRAGIA IRRITANS sp. nov. § *Eutragia*.

Scandens, ramis tenuibus, teretibus, glabris; foliis pilis hirsutis sparsis urentibus instructis, membranaceis, oblongis, usque ad 13 cm longis, nitidis, subtus pallidis, basi alte cordatis, apice late acuminatis, margine integris vel supra distanter denticulatis; racemis tenuibus, elongatis, paucifloris; floribus ♀ 6- (vel 5- ?) meris, calycibus vix accrescentibus, lobis integris.

A scandent woody vine climbing in tall trees, the branches very slender, terete, glabrous, grayish, greatly elongated, 2 mm in diameter, the younger ones very slightly hirsute. Leaves distant, alternate, membranaceous, oblong, 8 to 13 cm long, 3 to 6 cm wide, the base deeply cordate, the sinus narrow, lobes broadly rounded, the apex rather broadly acuminate, sometimes

apiculate, the margin entire, or in the upper part with minute teeth at the ends of the lateral veins, both surfaces shining, the upper olivaceous, the lower paler, in age becoming quite glabrous, when young with scattered, long, white, stiff, stinging hairs; basal nerves usually 5; lateral nerves above the basal ones 5 to 7 on each side of the midrib, slender, distinct; petioles 2 to 3 cm long. Racemes slender, including the peduncles 20 cm long or more, the flowers few, scattered (not seen); pedicels thickened, 2 mm long, each with a bract and two lateral bracteoles, the bract oblong-ovate, acute or obtuse, somewhat pubescent, 1.5 mm long, the bracteoles lanceolate, 1 mm long. Persistent calyx-segments of the female flowers 6 (or 5), lanceolate, acute, entire, 2 to 2.3 mm long, slightly hirsute, not accrescent. Young fruits 3-locellate, slightly hirsute.

LUZON, Province of Bataan, Lamao River, altitude about 200 m, in forests, *For. Bur. 2910 Borden*, March, 1905.

The species grows on large trees in forests, and the stinging hairs on the leaves are irritating to the skin. It is undoubtedly most closely allied to the Javan *Tragia hirsuta* Blume, but differs in many characters, notably in its leaves, when adult, being quite glabrous. The genus is new to the Philippines, the species described by Blanco as *T. innocua* and *T. bracteata* certainly not belonging in the genus.

TRIGONOSTEMON Blume

TRIGONOSTEMON POLYANTHUS sp. nov. § *Eutrigonostemon*.

Frutex, partibus junioribus inflorescentisque exceptis glaber; foliis oblongis ad late oblongo-oblancheolatis, chartaceis, usque ad 11 cm longis, acuminatis, basi rotundatis, integris, nervis utrinque circiter 7; petiolo 0.5 ad 2 cm longo; inflorescentiis axillaribus, pedunculatis, usque ad 6 cm longis, corymbosis, multifloris; floribus ♂ circiter 5 mm longis, atropurpureis, sepalis petalisque 5; antheris 3.

A shrub 2 to 3 m high, glabrous except the younger parts and the inflorescence. Branches slender, terete, grayish, glabrous, the growing branchlets rather densely hirsute with pale, short, appressed hairs, the same type of indumentum on the young petioles, very young leaves, and the inflorescence. Leaves dark-brown when dry, oblong to broadly oblong-oblancheolate, 6 to 11 cm long, 2 to 4 cm wide, entire, narrowed upward to the rather sharply acuminate apex, base slightly narrowed, rounded; lateral nerves about 7 on each side of the midrib, slender, distinct, anastomosing, curved, the reticulations obscure, lax; petioles 0.5 to 2 cm long. Inflorescences numerous, axillary, solitary, long-peduncled, corymbose, many flowered, up to 6 cm

long, much branched in the upper part, pale appressed-hirsute with short hairs. Male flowers 5-merous, their pedicels 3 to 5 mm long. Sepals oblong-ovate, obtuse, 2 to 2.5 mm long, unequal. Petals 5, dark-purple, glabrous, rounded, base cuneate, 4 mm long. Androphore 1 mm long; anthers 3, 0.8 mm long, capitate at the apex of the androphore, slightly bifid at the apex. Disk-glands 5, oblong, 0.5 mm long. Rudimentary ovary none.

SAMAR, Cauayan Valley, *Phil. Pl.* 1645 Ramos, April, 1914, in forests.

This species is manifestly closely allied to *Trigonostemon wenzelii* Merr. in spite of the difference in the inflorescence. It is distinguished from that species by its corymbose, many flowered male inflorescences; in *T. wenzelii* the inflorescence is racemose, and the leaves are rounded at the base. Perhaps the present species may prove to be only a form of *T. wenzelii* with abnormal inflorescences.

[Vol. IX, No. 4, including pages 293 to 390, was issued November 25, 1914.]

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No. 6

SWAMP VEGETATION IN HOT SPRINGS AREAS AT LOS BAÑOS,
LAGUNA, P. I.

By FRANK C. GATES

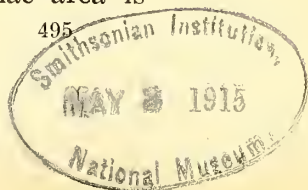
*(From the College of Agriculture, University of the Philippines,
Los Baños, P. I.)*

Five plates

Just west of Los Baños, Laguna, P. I., extending from near Mount Maquiling, an extinct volcano, north to Lake Bay is a low swampy region, about 100 hectares in extent, in which thermal areas are present near the foot of the mountain. From the majority of the pools of hot water small streams run to the lake for most of the year. During the latter part of the dry season the water-table level may be so lowered that no streams run from many of the pools, while some of the pools may even dry up.

The temperature of the hot water is always distinctly above that of the air. In the middle of the hot season of 1913, pools from which no streams were running had a temperature of from 37° to 41.5° C., while at the points of emission in others the thermometer registered between 70° and 80° . With the advance of the rainy season, the temperature of all the pools increases to a greater or less extent, the minimum being about 46° and the maximum 91.2° . Most of the pools vary between 81° and 87° . After the rainy season is well established, temperatures seldom exceed 87° .

The swamp region is now conveniently divided by the railroad. The eastern part of the area will be designated the Los Baños hot springs, and the western part—much the larger—the Tarlac area, from the adjacent barrio, Tarlac (or Tadalac), a fishing village on the shore of Lake Bay. At the Los Baños springs the rifle range and drainage ditches interfere with the completion of the normal plant successions. The Tarlac area is



a large swamp through which the Casilihan River flows to Lake Bay. A number of hot springs are located on the periphery of the area.

In the Tarlac area there are no drainage ditches. The water level is persistently higher and the liability to overflow is greater than in the Los Baños area. For this reason the abrupt tension line surrounding the hot springs swings backward and forward through a greater amplitude, coincident with the fluctuations in the hot water level. Because of the hot springs the temperature of the ground water is higher than the general average of the region. The continued presence of this warm soil water has not been conducive to the development of genetically high vegetation.

THE VEGETATION

The vegetation of the two areas is very similar, although on a much larger scale in the Tarlac area. With a few exceptions the same associations occur in both places, but on account of ditches the developmental stages are further advanced in the Los Baños area.

The general appearance of the vegetation does not differ greatly between the dry and wet seasons, but many of the details show considerable variation. The associations are most conspicuously differentiated during the rainy season as active vegetation is then at its height. During the dry or hot season many of the plants die down to the ground and successions between associations of herbaceous species are virtually at a standstill. The area is noteworthy for the readiness with which a number of strand plants occupy space in a swamp.

THE BOTTOM THERMAL ASSOCIATION

In the pools of hot water bacteria and blue-green algae (*Cyanophyceae*) were found on the bottom and at the surface. Collections made by me on December 4, have been examined by Dr. W. R. Shaw, who reports on the material as follows:

A preliminary examination of the material from the hot springs at Los Baños presents the following organisms: A very slender filamentous plant which appears to belong to *Thiothrix* or to some allied genus of the sulphur bacteria; a crococcaceous species resembling *Aphanocapsa*; a number of filamentous *Cyanophyceae*, of which the more abundant appear to be an *Amphithrix*, a *Hypheothrix*, and a *Rivularia*-like species; and a large number of *Bacterium*-like cylindric cells which are rounded at the ends. These *Bacterium*-like cells may be a gonidial stage of the *Rivularia*-like species, mentioned above. This species consists of long parallel filaments with thicker middle parts made up of barrel-shaped cells and

heterocysts. They taper toward both ends, and the slender ends are composed of longer or shorter cylindric cells which are rounded at the tips and are of about the same diameter as the free *Bacterium*-like cells.

The bottom forms nearest the hot water vents appeared as brownish, gelatinous masses closely covering the bottom. This mass was characterized by bacteria. Farther back from the hot water vents blue-green algae, growing at the upper surface of the gelatinous mass, gave color to the bottom growth. These organisms developed in water of a temperature up to 56°. In June, 1914, a new vent for the hot water in the center of a patch of these organisms resulted in the death of all those plants within its sphere of influence until the temperature was lowered to 56°. In the pool nearest Los Baños, during the dry season, a layer of bluish-green scum extends quite up to the hot water vents. As the water becomes hotter, with the commencing rainy season, the plants are killed for some distance from the vents until the temperature of the water is lowered to within their requirements. Plants were found alive in a few undrained depressions which existed near the hot water vents. Investigation disclosed the fact that these depressions were filled with relatively cool water, from 44° to 50°, while the water at the surface, a few centimeters above, might be from 60° to 80°. One of these pools was stirred up with a stick with the result that the temperature at the bottom rose to 65° and on the following day all the plants in it were dead. The dead algae and other plants in the hot water pools flocculate and form a matrix for the deposition of salts found in the hot water.

With the very high hot water in September, 1914, thermal organisms seemed to withstand a higher temperature for about a month. They were very generally found in water with temperatures up to about 60° and in a few extreme cases even up to 62°. This condition lasted into October, but eventually all of these forms that were in water with a temperature above 56° succumbed.

THE SURFACE-THERMAL ASSOCIATION

Filamentous blue-green algae, some of which are attached to the banks of the streams, were very commonly found along the streamlets from the hot springs. The critical temperature was 52°. The mat of these algae helped to support the runners of *Bacopa* which extended from the shore. Upon the establishment of the *Bacopa* association, these algae densely filled the spaces and quickly covered any *Bacopa* stems that sank below the surface of the water.

The rise of the hot water in September, 1914, entirely destroyed the vegetative parts of these algae. The algae did not reappear until the temperature of the hot water near the shore had fallen below 52°.

THE BACOPA-LIPPIA ASSOCIATION

Bordering the hot water pools and growing along streams and on flood plain flats is an association of low succulent plants, well characterized by *Bacopa monniera* (L.) Wettst.¹ This species produces a dense carpet of bright green vegetation completely covering the ground. *Lippia nodiflora* (L.) Rich., a plant of somewhat similar vegetative characteristics, is often present, occasionally in alternation with *Bacopa*. Whenever the association tends to advance into hot water, *Bacopa* is always the pioneer. Often it persistently sends its runners into the hot water and they are as persistently killed thereby.

In the dry season diminution or drying up of the hot water pools is not followed by a complete invasion of *Bacopa*. On the contrary it also dries up on account of lack of water, due both to the decreased supply and the higher concentration.

During the dry season of 1913, which was not severe, the plants of *Bacopa* shriveled somewhat and flowered less frequently than usual, but did not die down to the ground. With the first showers of the rainy season, the vegetation reacted with vigorous growth, most noticeable in *Bacopa* and *Lippia*. Each of these species formed extensive mats, soon occupying the entire stream beds. *Lippia* was firmly rooted close to the ground at each node, so that when the stream became established many plants were submerged, and thus being held under water they were drowned. *Bacopa* grew rapidly upward, forming dense mats which gradually sank into the water. The submerged parts died, but parts above the water remained alive. Later, as the water became hotter, the plants at and below the surface were killed. Parts above the water, no longer supported from below fell into the hot water and were killed. This rapidly pushed the *Bacopa* back from the hot springs. In one pool *Bacopa* receded more than 2 meters in less than a week. The critical temperature is between 48° and 52°, higher than this being fatal. The steam, which is constantly rising from the pool, is not injurious. It was clearly evident that at temperatures slightly above the fatal point, if the upper parts of the

¹ The plant indentifications were either made or verified by Mr. E. D. Merrill, botanist of the Bureau of Science, Manila, P. I.

plants were supported above the water, those parts could still obtain water through the dead stems below. On such stems the region just above the water was larger than normal, the same as is observed in girdled stems.

During the moderately severe dry season of 1914, the pool nearest Los Baños dried up completely. The ground was in addition well drained by ditches. Even with the coming of the rainy season no hot water issued from the vents of this pool, until the torrential rains of early September. Then a large pool was formed in which the hot water quickly killed *Bacopa*. The stream bed had been occupied by *Bacopa* and *Lippia*, but when hot water began to flow in it, all vegetation in a channel about 30 cm wide was killed. The sharp tension line coincided with a temperature of 52°. The hot water spread out into the surrounding low areas and killed most of the vegetation. Near the hot water vents everything was killed.

Associated with *Bacopa* and *Lippia* is *Portulaca oleracea* L.—also a succulent plant—and, in addition, the ever-present, easy-demanding, convolvulaceous *Merremia hastata* (Desr.) Hallier f.

In the area immediately around the hot springs, higher ground seemed to be the most potent cause for succession. Such spots were rapidly taken possession of by *Fimbristylis spathacea* Roth.

In addition to the immediate vicinity of hot water vents, the *Bacopa-Lippia* association occurs along streams and on low flats at or below the water-table level during the rainy season.

Along streams this association forms a narrow zone extending into the water. Landward the association is repeatedly broken by clumps of *Fimbristylis spathacea* Roth, or by other plants. *Lippia* is here much more commonly found, but it seldom supplants *Bacopa*. *Portulaca* occurs in a few such places. There are usually no additional species, although two convolvulaceous vines, *Merremia hastata* Hallier f. and *Jacquemontia paniculata* Hallier f., sometimes trail out over the *Bacopa*.

On flats, *Bacopa* spreads out in all directions and forms a luxuriant mat of vegetation. A few plants of *Lippia* may be present near the margins, but only rarely in the center of the mat. *Lippia* and convolvulaceous vines are the only species associated with *Bacopa* on the majority of these flats. In case the flat is not submerged for any length of time, vines, such as *Merremia*, *Jacquemontia*, and *Cissus trifolia* (L.) K. Sch., are likely to become more abundant during the dry season. Very shortly after the first rains, *Fimbristylis spathacea* Roth appears

and soon develops into typical clumps. Before it has obtained complete dominance *Acrostichum aureum* L. is likely to invade the area from the edges.

The high hot water of 1914 materially extended the areas of the flats in the vicinity of the Los Baños springs by killing back considerable *Acrostichum*. As a result of this high hot water much of the *Bacopa* between the clumps of *Fimbristylis* was killed, and the appearance of the area was materially transformed from one of *Bacopa* with some *Fimbristylis* here and there to an area with scattered clumps of *Fimbristylis*, a little *Bacopa* near the edges, and a few dead ferns near the margin. As complete, prolonged submergence of a clump of *Fimbristylis* is necessary to cause death, this year's high hot water hastened the elimination of *Bacopa*, while the destruction of *Acrostichum* was really favorable to the extension of *Fimbristylis*, causing a reversal of the normal genetic succession.

This association, represented by etiolated plants of *Lippia* only, also occurs on the tension line between *Typha* in the water and talahib, *Saccharum spontaneum* L., on the railway embankment. *Bacopa* readily remains as a relic in succeeding associations which do not cut off too much light.

Occasionally the *Acrostichum* association seems to invade *Bacopa* directly along the banks of streams, but usually one or more associations intervene. The same is true with respect to the parang association. The relationships of the *Bacopa-Lippia* associations are best seen at the Los Baños hot springs where there is less fluctuation of the water level. In the Tarlac area the high hot water each year kills back the *Bacopa* clear to the shrubs, under which it cannot persist during the dry season. During the dry season there is usually some *Bacopa* around most of the hot springs in this area—especially those nearer the margin of the swamp. Only a very little *Bacopa* is enabled to persist to restock the area, due to the fact that much of it is killed back each rainy season, and that the areas in which the plant thrives are covered with water for a period after the rainy season, thus preventing natural reproduction of the plant.

This easily explains its scarcity in the Tarlac area. High water itself usually does not kill *Bacopa* unless the temperature goes above 52°, for *Bacopa* will grow upward with the rising water. It partly floats on the water and partly rests against other plants. In case the water rises very rapidly so as to drown most of the plants of *Bacopa*, there are always detached pieces of stems which float to the surface and grow there.

THE *FIMBRISTYLIS SPATHACEA* ASSOCIATION

Taking advantage of inequalities in the ground in the *Bacopa* association *Fimbristylis spathacea* Roth commences to develop. This species soon builds up small hummocklike clumps in the *Bacopa*. When these clumps are far apart, this association appears only in very isolated patches. When near together the spreading flower stems of *Fimbristylis spathacea* form a layer or story above the *Bacopa*, which is growing between the clumps. As the plants of *Fimbristylis* become more numerous the aggregation of small and large clumps builds up a fibrous turf. This turf may sometimes be very dense. When the hot water rises in level, it often surrounds the clumps of *Fimbristylis* which, however, do not die unless the hot water entirely covers the center of the clump for some time.

The *Fimbristylis spathacea* association usually occurs in the immediate vicinity of the hot springs, but may sometimes form a narrow belt along streams where the bank is low and very flat. *Fimbristylis* occupies virtually all the area in the association, although some *Lippia* and *Bacopa* may remain; and vines, such as *Merremia hastata* and *Cissus trifolia*, as well as invading species, may be present.

Under exceptional conditions where flats of *Fimbristylis spathacea* are burnt over, cogon, *Imperata cylindrica*, immediately follows. Where the *Fimbristylis* is merely cut or eaten off, no cogon follows as the ground is too wet.

In the Tarlac area this association is not well represented. This is due to the pronounced fluctuations in the water level, to which *Fimbristylis* does not quickly adjust itself. At the Los Baños springs the presence of ditches keeps the hot water down so that *Fimbristylis* does not ordinarily become submerged.

THE *DIPLACHNE* ASSOCIATION

The *Diplachne* association is semiaquatic. The plants are rooted below the surface of the water with stems extending above the water. This association occurs in warm water at a short distance from the hot springs. It is thoroughly dominated by a grass, *Diplachne fusca* Beauv., whose loose lax stems partly trail over the water and with partial support become erect. Thus, although the plants may be rooted only on the banks, the entire centers of streams may be covered with this vegetation. The flower stems are about 1 meter high and over them there may be trailing vines; such as *Merremia*, *Cissus*, and *Tournefortia sarmentosa* Lam. With these exceptions there are no secondary species in the association.

There was no positive evidence of the dynamic activities of *Diplachne* until after the persistent high hot water following the heavy rains of September, 1914. The high water killed considerable vegetation in the vicinity of the hot water vents. Re-invasion of plants began soon after the water cooled. Bacteria and blue-green algae in the water and *Bacopa* above the water were the pioneers. The latter was generally followed by *Fimbristylis spathacea*, but in a very few places *Diplachne* invaded the *Bacopa*.

On the banks of streams this association readily gives way to others, but as a rule it does not show indications of succession. A radical lowering of the water table to below the surface of the ground would lead to its elimination, but the mere drying up of the streams during the dry season—a condition which is also unfavorable for rapid advances of other vegetation—does not materially affect it. A permanent lowering of the water makes the habitat favorable for the re-invasion of the *Bacopa-Lippia* association, represented especially by *Lippia*.

As a pioneer invader in two of the hot springs in the Tarlac area this association was sparingly represented by plants of *Diplachne fusca* Beauv., rooted below the surface in lukewarm water. This species is adapted to fluctuations in water level, but very high water would entirely submerge it, and hot water would kill it. Wherever it occurs the structure of the association is very simple.

THE IPOMOEA REPTANS ASSOCIATION

This semiaquatic association in which the plants are generally rooted in damp ground just above the water level, but with long stems which run out over the water, was represented in the Tarlac area in 1913 at one of the hot springs near the railroad. *Ipomoea reptans* Poir. rooting back of *Diplachne*, sends out runners under it into the hot water. There the tips are killed back. In this locality there were no secondary species, but where this association occurs along ponds or along Lake Bay, the stems catch floating aquatics and debris of all sorts.

In the high hot water of September, 1914, all of this association in the Tarlac area was killed. The association is not present in the vicinity of the Los Baños springs.

THE FIMBRISTYLIS MILIACEA ASSOCIATION

Occupying a limited area at water-table level in the eastern part of the Los Baños area is a small patch of an association

thoroughly dominated by a sedge, *Fimbristylis miliacea* Vahl. The individual plants are about 70 cm high and usually form a rather dense turf. The waxy green color of the stems of the plants make this association stand out distinctly from the surrounding associations. The area thus occupied is generally burnt over during the dry season. On one side it is bordered by cogon, which, however, does not replace *Fimbristylis* as the ground is water-soaked during the greater part of the year; this condition precludes cogon. The presence of *Acrostichum* and *Acacia* is indicative of succession, but very little headway is being made on account of the dense turf and recurring fires. There are no secondary species of importance.

This association replaces the *Fimbristylis spathacea* association by crowding *Bacopa* and *Lippia* from between the clumps of *Fimbristylis spathacea* Roth and eliminates the latter species by shading.

In the damp ground at the edge of the water behind *Diplachne* in the Tarlac area there was a rather poor representation of this association. No particular relation was noticed between this association and the *Ipomoea reptans* association, although runners of *Ipomoea* often passed through the *Fimbristylis* area toward the open water. *Sesbania* replaces either *Fimbristylis* or *Ipomoea* under favorable conditions.

THE VALLISNERIA ASSOCIATION

The *Vallisneria* association, an aquatic one in which the plants are rooted beneath the surface of the water and the entire plant remains submerged, is present in the Casilihan River in the Tarlac area, but does not occur in the vicinity of the hot springs. The association is represented by *Vallisneria gigantea* Graebn., *Ceratophyllum demersum* L., and *Potamogeton malainus* Miq., none of which is abundant. This association also occurs in Lake Bay at the mouth of the river. Whenever any of the plants reach the surface of the water they catch such floating aquatics as *Pistia*, *Lemna*, and *Jussieua repens* L., as well as floating débris.

This association is not present in the Los Baños area.

THE LEMNA-PISTIA ASSOCIATION

An association of floating aquatic plants, characterized by *Lemna trisulca* L., and *Pistia stratiotes* L., is found near the mouth of the Casilihan River, as well as in Lake Bay. When

the water level is much lowered *Pistia* may rest on the ground and under these conditions its roots extend into the soil. Any other plants that become established there can easily shade *Pistia* out of existence.

This association is not present in the Los Baños area.

THE CASTALIA-NYMPHAEA ASSOCIATION

The *Castalia-Nymphaea*, an association of aquatic plants rooted in mud with leaves floating on the surface of the water, is now sparingly represented near the upper part of the swamp, rather near some of the hot springs. *Castalia pubescens* Willd. was the only species present. The appearance of the association was entirely typical. With it were no regular secondary species. In the Tarlac area it was often the association bordering the Casilihan River, where it was succeeded either by *Typha* or by *Panicum amplexicaule* Rudge and *Panicum repens* L.

This association does not occur in the Los Baños area.

THE TYPHA ASSOCIATION

This marsh association, dominated by *Typha angustifolia javanica* Schindl., occurs in a few of the ditches in the Los Baños area and borders pools and streams running from the hot springs in both areas, but does not occur in hot water. Aside from *Polygonum tomentosum* Willd. and convolvulaceous vines which may be locally present, there are seldom any secondary species.

From the front of this association a mat of *Bacopa* may sometimes extend out over pools of open water. In the ditches, *Typha* is as a rule not replaced. The exception was in a single pool in the Los Baños area where eight plants of *Sesbania cannabina* Pers. became established in 1913. Around pools and along streams *Typha* readily gives place to *Phragmites* and less readily to *Acrostichum*.

In the Tarlac area the high water of 1914 submerged much of the *Typha*. As September is the normal resting season of *Typha*, the dead leaves could not be taken to indicate that they were killed by the high water, especially as seeds were found germinating without having fallen from the spike.

In the level central part of the Tarlac area, *Typha* was succeeded by wide areas of *Panicum repens* L. This grass is periodically harvested for forage, as well as pastured by carabaos, both of which tend to retard natural succession. Elsewhere *Typha* is succeeded by the *Phragmites* association, which is very abundant and wide spread in this area.

THE SCIRPUS GROSSUS ASSOCIATION

An association, dominated by *Scirpus grossus* L. f., a tall, stout, rank, 3-angled sedge, common along the shore of Lake Bay, is found in the hot springs region in but one limited area. This is just in front of the *Barringtonia* woods where the Casilihan River enters the swamp area. The density of the *Scirpus* is not sufficient to exclude secondary species, among which *Polygonum tomentosum* Willd. was especially abundant. The *Scirpus* was readily succeeded by *Phragmites*, which formed a narrow fringe immediately in front of the forest.

THE PHRAGMITES ASSOCIATION

A swamp association, dominated by a tall reed grass, *Phragmites vulgaris* Trin., covers more area than any other association in the swamp. It thoroughly dominates the central part of the Tarlac area, bordering the stream where *Typha* does not. It extends from the immediate vicinity of the hot springs nearly to Lake Bay, as well as a considerable distance back from the stream on both sides. When in bloom, the tall flowering stems of *Phragmites* are easily the most conspicuous feature of the area.

Normally, *Phragmites* grows in water from a few centimeters to a meter in depth. Although it can grow rather close to the hot springs it is more easily killed by hot water than several other plants. Thus, considerable *Phragmites* in the central part of the Tarlac swamp was killed by the high hot water in September, 1914, with the result that during October, in place of an extensive area of *Phragmites* in flower, there was merely a fringe at the edge of the swamp. As soon as the water cooled, a reinvasion of *Phragmites* set in. Those rhizomes which had not been killed sent up new shoots. On the surface of the water, forming a part of the abundant debris, were many short pieces of *Phragmites* stems which were sprouting as they floated. As the water receded they came nearer to the ground, with correspondingly greater chances of establishment. This of course shortened the invasion time. The setback has given the *Sesbania* a chance materially to extend its range, and this extension has rapidly taken place.

The *Phragmites* association is very simple in structure, rarely containing more than the dominant species, closely in control of the environment. The tension lines on both sides are sharp. In the Tarlac area, vines, such as *Merremia gemella* Hallier f., *Ipomoea* sp., and *Cissus trifolia* K. Sch. may sometimes occur in profusion near the margin with the *Sesbania* association.

When the vines become very dense, they may so load down the *Phragmites* that it falls, sometimes submerging and thus destroying the vines. In the center of the association, vines are much less common, although seldom entirely absent. In addition to those mentioned in the Tarlac area, *Merremia hastata* Hallier f., *Ipomoea cairica* Sweet, and *Streptocaulon baumii* Dcne. are common in the Los Baños area. In both cases the vines are so promiscuous in distribution that they do not determine any line of succession.

On account of drainage ditches in the Los Baños area, the water level is lower and here *Phragmites* is losing its dominance. During the rainy season the ground is water-soaked, but in the dry season it does not contain a great deal of water. The large rootstocks of *Phragmites* build up the ground in their immediate vicinity. The abundant aerenchyma on the roots testifies to the usual water-soaked condition of the soil. The roots permeate the surface soil in all directions so thoroughly that there is very little room for other plants. The numerous culms, each about 1 cm in diameter and from 1 to 3 m high, grow close together.

In this rather intolerant species, because of crowding, the leaves are limited to a bunch at the top. Individual plants growing in full illumination are leafy to the base. Viewed from within, the vegetation appears like a miniature forest of leaf-surmounted canes, and from without as a very dense mass of broad-leaved grass. Only rarely can even etiolated plants be found on the ground floor beneath *Phragmites*.

The transition into the *Phragmites* association is very abrupt, as *Phragmites* grows higher than any other herb in the swamp. *Phragmites* successfully invades *Typha* in standing water. The tension line is very sharp. *Phragmites* is invaded by the *Premna odorata* consociates of the parang association. As *Premna* is tolerant, especially as a seedling, its seeds can germinate under *Phragmites* and send up spindling stocks through it. At the level of the grass leaves the stems of *Premna* branch widely, forming a canopy over *Phragmites*. Thus shaded, *Phragmites* must give way.

At present a considerable part of the Los Baños area is in this condition. *Phragmites* is surely being replaced by the taller *Premna*. Although the number of plants of *Phragmites* is so much greater in proportion, the spreading canopies of *Premna* above give the character to the general appearance from the outside. Under cover of the shade, at the level where the dead or dried stocks of *Phragmites* are bent over in the wind, a dense

layer of rubbish collects. Often a layer nearly 20 cm thick is thus formed, which entirely excludes light from the ground.

THE ACROSTICHUM ASSOCIATION

A stage of vegetation, somewhat intermediate between herbs and shrubs, dominated by a fern, *Acrostichum aureum* L., is present in both areas. This fern is characteristic of salt marshes, but although this swamp area is a fresh-water habitat, the hot water issuing from the hot springs contains salts. The fern might be considered as a miniature tree fern, for the stem develops upright, although seldom reaching a height of more than 30 cm. From the top of the thick stem, the leaves radiate obliquely upward in all directions to a height of from 1 to 2 m. When well developed the spreading leaves interlock, and from above the vegetation appears to be a solid mass of fern. A cross section, however, shows that the plants are well spaced, from 0.5 to 1.5 m apart, the ground between being bare of plants and in the rainy season usually covered with water.

This association invades all the genetically lower associations which are not too near the hot water. Of the associations which may succeed, the *Acacia* consociates of the parang association is the more usual. Individual trees of *Acacia farnesiana* Willd. occur here and there throughout much of the area dominated by the fern. The first response to the presence of *Acacia* is the larger size of the leaves of *Acrostichum* in a circle around the *Acacia* plant, even before the *Acacia* is as high as the fern. The effect extends beyond the area shaded when shading begins to take place. This better development is probably due to the local presence of more available nitrogen associated with the leguminous *Acacia*.

When *Acacia* becomes sufficiently numerous to give the character to the general impression as seen from the outside, the upper story of vegetation is formed by the spreading branches of *Acacia*, although, per unit area, individuals of *Acrostichum* are much more numerous. The *Acrostichum* grows very dense and the numerous long leaves extend up into the crown of the *Acacia*. A radically different idea of the area is thus given from the inside. *Acrostichum* appears almost entirely prevalent, there being but relatively few *Acacia* stems. The ground is bare.

Acrostichum shows excellently the change in size of leaves in its rôles of invader, dominant species, and relic. From invader to dominant species the change is gradual, the leaves under

the latter condition being larger. The change from dominant species to a relic is very abrupt wherever the *Acacia* has a sharp boundary. Leaves of *Acrostichum* in *Acacia* may be twice as large as those in the *Acrostichum* association. In nonleguminous associations in which *Acrostichum* occurs it may be much dwarfed and readily gives place under shading.

In the Tarlac area this association is poorly represented. It occurs sparingly toward the upper and mountain side of the area. The ferns are scattered and do not dominate the situation. Hot water readily kills this fern. By October, 1914, all the fern outposts had been killed, the only living ferns being those near the edge of the thickets where they were not reached by the hot water. Thus, *Acrostichum* is of minor importance in this area, hardly being able to hold its own as an association.

THE SESBANIA ASSOCIATION

The *Sesbania* association is common on the strand of Lake Bay, and is also plentifully represented in the Tarlac hot springs area. The rather open, sprawling, shrubby, very intolerant growth of this plant would appear to make it a poor plant to succeed in this area, where the vegetation in general is rather dense. On the strand, *Sesbania cannabina* Pers. grows under beach conditions. Its root system is submerged at least during the rainy season. In the hot springs area it regularly grows in water, or where the soil is very wet throughout the year. It will grow in water 2 m in depth. Whenever the stem is submerged for any length of time abundant aerenchyma is developed. On the main stem the aerenchyma is seldom more than 3 mm in thickness, and by its development the epidermis is split into long shreds. Root clusters are developed from nodes of the stem under water, and on these roots aerenchyma is usually exceedingly well developed. In extreme cases, 80 per cent of the diameter of a root from 6 to 9 mm thick may be aerenchyma. On many of these root clusters there are prominent root tubercles, which are developed entirely under water. Roots that are exposed to the air dry up as the water recedes.

Sesbania invades either *Phragmites* or *Typha*, particularly the former. When crowded, *Sesbania* grows higher than either. Under the dense shade of *Phragmites* it appears that *Sesbania* cannot start, but by taking advantage of resting periods and of conditions less favorable to *Phragmites*, *Sesbania* obtains a start and often gains the upper hand on *Phragmites*. The killing of so much *Phragmites* during the high hot water of September, 1914, has already resulted in a marked increase in the

Sesbania area. There are no secondary species with it except the ever-present vines, *Merremia gemella* Hallier f., *Ipomoea* sp., and *Cissus trifolia* K. Sch. The first of these is the most noteworthy, for under the hot water swamp conditions it possesses a woody stem which may reach a diameter of 20 mm in place of its normal herbaceous stem. The stem is larger above the surface of the water than below it. When festoons of vines entirely cover *Sesbania*, they interfere with its development. The tight woody coils on the stem also interrupt the development of aerenchyma.

Sesbania keeps its place in the area because of the fact that the shrubs which would naturally succeed it do not grow in standing water. Whenever conditions are at all favorable for parang shrubs they readily replace *Sesbania*.

Around certain of the hot springs in the Tarlac area there is a zone of *Panicum repens* L. between the parang and *Sesbania*. This is due to the complex local conditions attendant upon the fluctuations of the hot water.

Eight plants of *Sesbania cannabina* Pers., invading *Typha* in a ditch along the railroad, is the total extent of this association in the vicinity of the Los Baños springs. The plants are poorly developed and badly overrun with vines.

THE CYNODON ASSOCIATION

A wet-ground and strand association, dominated by a grass, *Cynodon dactylon* Pers., occurs sparingly in the immediate vicinity of the Los Baños hot springs in certain low areas which are wet to the surface even during the greater part of the dry season.

There are no secondary species with it. It is invaded by both *Fimbristylis spathacea* Roth and *Panicum repens* L. When *Fimbristylis miliacea* Vahl, in very wet places, is too closely cropped by cattle or goats, *Cynodon* will sometimes appear and become established.

THE PANICUM REPENS ASSOCIATION

The *Panicum repens* association is present in both hot-spring areas. This wet-ground association of grasses is typical of certain parts of the strand and also develops on flat wet areas. Along Lake Bay this association is present before *Sesbania* and gives place to it. Around certain of the hot springs this association is present as a tension-line association between the hot springs and the parang shrubs on the dry land. There it is fairly well developed, containing also a number of secondary

species, particularly *Wedelia biflora* DC., *Cosmos caudatus* HBK., *Vernonia cinerea* Less., and *Eclipta alba* Hassk. In the shallow water in front of it there may be a little *Sesbania*, which can withstand a greater degree of submergence than *Panicum repens* L., while the latter can develop on drier ground to better advantage.

In the wet open flat area in the center of the Tarlac region, there is a large tract of ground covered with *Panicum repens* L., mixed with *Paspalum longiflorum* Roxb., *Panicum amplexicaule* Rudge, *Panicum (Echinochloa) crus galli* L., *Panicum (Echinochloa) stagninum* Retz., and probably other grasses, whose identity was not evident from the lack of flowers. Grass for forage is obtained from this area, and parts of it are used for pasture. These conditions maintain *Panicum repens*, which otherwise would be replaced by one of the *Phragmites*, *Sesbania*, or *Acrostichum* associations, all of which are present in the immediate vicinity.

In the Los Baños area, the maintenance of a rifle range is responsible for the continued existence of this association in the wetter parts of the flats near the stone quarry. The *Panicum* is rather low, seldom more than 30 cm in height. The ground is densely carpeted, but the lax flower stems are openly disposed. But few species are associated with *Panicum*; for example, *Wedelia biflora* DC., *Panicum (Echinochloa) colonum* L., and *Commelina nudiflora* L.

The *Panicum repens* association tends to spread into the *Cynodon*, while it may be replaced by a number of associations, particularly as the water content of the soil is reduced. Although the area may be burnt over once each year, most of it is very low and consequently too wet for the healthy development of cogon grasses.

THE COGON ASSOCIATION

The cogon association, a common secondary association of this part of the world is very sparingly represented in the hot springs area, as the ground is too wet. In small patches of higher ground which have been burnt over, cogon, *Imperata cylindrica koenigii* Benth., obtains a foothold and spreads rapidly through the burnt area. As the dry stems of *Fimbristylis miliacea* Vahl are more easily burned than others, the cogon association has seemed more likely to follow that association.

The Imperata consocies.—The *Imperata consocies* is entirely typical, consisting of a dense growth of a grass, *Imperata cylin-*

drica koenigii, with no regular secondary species. The consocieties does not have a firm grip on the land and considerable evidence of successions from it are visible. *Acrostichum* spreads into it along the margins and even into the very center of the grass area, because the wet soil is more favorable to *Acrostichum* than to *Imperata*. As this latter association is rather open, it does not generally annihilate the cogon, but becomes the dominant species with the cogon persisting as a relic. Either directly or through an *Acrostichum* stage the cogon passes into the parang association. *Acacia farnesiana* Willd. obtains a foothold and develops readily. As soon as it becomes higher than the cogon it exhibits its ability to shade the cogon out of existence. This may be entirely accomplished within a year under favorable circumstances. If fires did not occur during the dry season the cogon would very shortly become nonexistent, as conditions are so much better suited for other plants.

The Saccharum consocieties.—The *Saccharum* consocieties, dominated by talahib, *Saccharum spontaneum* L., hardly occurs in the hot springs area proper, but is abundant on the ballast of the railroad through the area. It shows no successional relationship with the hot-springs vegetation, being separated from it by sharp tension lines at the limits of the railway ballast.

THE PARANG ASSOCIATION

The normal association to succeed a number of the associations treated of above, consists of shrubs and small trees. For the most part, in the Tarlac area, this association is on the border of the swamp rather than in it; while at the Los Baños springs, on account of the permanent lowering of the water by ditches, this association is actively invading the swamp area and radically changing its structure. In the Tarlac area, although the tendencies are clearly indicated, succession is very slow and barely taking place, on account of the pronounced fluctuations of the water level. The wetter areas are most easily invaded by the *Acacia* and the *Premna* consocieties.

The Acacia farnesiana consocieties.—Invading the water-soaked, *Acrostichum*-dominated ground in the vicinity of the quarry in the Los Baños area, are a number of shrubs of *Acacia farnesiana* Willd. which have sprung up in the spaces between the plants of *Acrostichum* and, growing higher than them, are shading them out of existence. The canopy developed by *Acacia* has permitted relatively few plants to become very important in effecting succession. In point of relative abundance, about

8 per cent of the individual plants are *Acacia*, 90 per cent are *Acrostichum*, and the remaining 2 per cent are distributed among *Premna*, *Phyllanthus*, and a few vines. Farther from the hot springs the *Acacia* consociates mixes with the *Premna* consociates and may even be more or less replaced by it.

In the Tarlac area a fringe of *Acrostichum* generally separates *Acacia* from the main body of the marsh. Into this, *Acacia* readily invades and obtains dominance. The appearance is not entirely typical for other shrubs have also invaded with the result that the area is mostly a jumble of the *Acacia* and *Premna* consociates of the parang association with the *Acrostichum* and *Phragmites* associations. Irregular setbacks have interrupted and often reversed the normal trend of succession. In spite of this fact progress in shrub invasion is evident.

The Premna consociates.—The *Premna* consociates represents the highest vegetation at present in the Los Baños area. It is a consociate of the parang association dominated by *Premna odorata* Blanco, associated with the usual promiscuous vines. Nowhere is this consociate well developed as yet, as it is in a transition stage in which the *Premna* is gradually assuming dominance because of its more advantageous growth form.

In the Tarlac area *Premna* is following *Acacia*, but very slowly on account of the frequent setbacks.

The Pithecolobium consociates.—Along the railroad in both areas a few trees of *Pithecolobium dulce* Benth. serve to indicate the presence of the *Pithecolobium* consociates of the parang association.

The Gliricidia consociates.—Where low knolls occur in the boundary of the hot-springs area, especially near the railroad, the shrubby vegetation is frequently composed of thickets of *Gliricidia sepium* Steud. The consociate is typically developed, a dense growth of *Gliricidia*, with relatively few secondary species. Back of it is usually cultivated land.

The general parang association.—As more and more of the typical parang species invade and spread over an area, the more mixed the vegetation becomes, until it is no longer possible to distinguish consociates. The parang is then in the prime of its development, and may be termed the general parang. In the swamp areas there are very few spots which have arrived at this stage, although, back from the swamp areas on the adjacent dry land, the tendencies in that direction are very obvious. A large number of species go to make up this jungle, the most abundant of which are here listed:

Species in the parang association in the swamp area.

DOMINANT SPECIES.

<i>Acacia farnesiana</i> (L.) Willd.	<i>Leca aculeata</i> Blanco.
<i>Callicarpa blancoi</i> Rolfe.	<i>Macaranga tanarius</i> Muell.-Arg.
<i>Erythrina indica</i> Lam.	<i>Phyllanthus reticulatus</i> Poir.
<i>Ficus pseudopalma</i> Blanco.	<i>Pithecolobium dulce</i> Benth.
<i>Ficus ulmifolia</i> Lam.	<i>Premna odorata</i> Blanco.
<i>Ficus</i> spp.	<i>Psidium guajava</i> Linn.
<i>Gliricidia sepium</i> (Jacq.) Steud.	<i>Semecarpus cuneiformis</i> Blanco.
<i>Glochidion</i> sp.	<i>Tabernaemontana pandacqui</i> Poir.

HERBACEOUS SECONDARY SPECIES.

<i>Abutilon indicum</i> G. Don.	<i>Mimosa pudica</i> Linn.
<i>Achyranthes aspera</i> Linn.	<i>Oplismenus undulatifolius</i> Beauv.
<i>Ageratum conyzoides</i> Linn.	<i>Panicum (Echinochloa) colonum</i> Linn.
<i>Amaranthus spinosus</i> Linn.	<i>Ricinus communis</i> Linn.
<i>Barleria prionitis</i> Linn.	<i>Scleria scrobiculata</i> Nees.
<i>Commelina nudiflora</i> Linn.	<i>Solanum nigrum</i> Linn.
<i>Dactyloctenium aegyptium</i> Willd.	<i>Sphacranthus africanus</i> Linn.
<i>Eleusine indica</i> (Linn.) Gaertn.	<i>Synedrella nodiflora</i> Gaertn.
<i>Heliotropium indicum</i> Linn.	<i>Triumfetta bartramia</i> Linn.
<i>Hibiscus surratensis</i> Linn.	<i>Urena lobata</i> Linn.

RELIC SPECIES.

<i>Acrostichum aureum</i> Linn.	<i>Typha angustifolia javanica</i> Schindl.
<i>Bacopa monniera</i> Wettst.	(Rare.)
<i>Phragmites vulgaris</i> Trin.	

VINES AND LIANAS.

<i>Abrus precatorius</i> Linn.	<i>Melothria mucronata</i> Cogn.
<i>Cissus trifolia</i> K. Sch.	<i>Merremia gemella</i> Hallier f.
<i>Hewittia sublobata</i> O. Ktze.	<i>Merremia hastata</i> Hallier f.
<i>Ipomoea cairica</i> Sweet.	<i>Merremia vitifolia</i> Hallier f.
<i>Ipomoea obscura</i> Lindl.	<i>Sida javensis</i> Cav.
<i>Ipomoea</i> sp.	<i>Tournefortia sarmentosa</i> Lam.
<i>Jacquemontia paniculata</i> Hallier f.	

THE ERYTHRINA-BARRINGTONIA ASSOCIATION

The highest vegetation of the swamp, as such, is an association of trees, dominated by *Erythrina fusca* Lour. and *Barringtonia luzonensis* Rolfe. In this area these trees are found in the Tarlac swamp near the entrance of the Casilihan River. While the association has been seriously interfered with in this region, it appears that normally this association consists of well-spaced trees growing in water. Small trees and shrubs may be present in openings. Vines and lianas are generally very abundant. At the margin, vines are particularly conspicuous. The transition from the marsh to the swamp-tree association is abrupt.

THE BAMBUSA-PARKIA ASSOCIATION

Although not an integral part of the swamp vegetation, the *Bambusa-Parkia* association was found on dry land above the high-water level bordering parts of the western and southern limits of the Tarlac area. It is a very common association along Lake Bay, where it is one of the most important back-strand elements. It is present near, but not at, the mouth of the Casilihan River. Along streams that run from hot springs to Lake Bay, the *Bambusa-Parkia* association is not present, whereas in the lower courses of streams coming directly from the mountain the banks are always lined with bamboo, *Bambusa blumeana* Schultes.

CONCLUSIONS

1. Just west of Los Baños, Laguna, P. I., at the foot of Mount Maquiling, is a low swampy area fed by mountain streams and hot-water springs. The area has been under constant observation and study since September, 1912.

2. In the hot water, as it issues from the ground, there is no vegetation. The highest temperature recorded was 91.2° C. Bacteria and blue-green algae inhabiting the bottom of the pools appear when the temperature of the water is lowered to 56°. Surface algae develop in water whose temperature does not exceed 52°. Among the higher plants, only *Bacopa monniera* Wettst. and *Fimbristylis spathacea* Roth will withstand a water temperature as high as 48°.

3. Higher and lower hot-water levels at different times of year are accompanied by advances and retreats of the plant associations in the immediate vicinity of the hot springs.

4. Eighteen normal swamp associations are present in the area; three additional associations invade on the margins where conditions permit.

5. Of the eighteen swamp associations, but one is characterized by woody species. All of the swamp associations are characterized by a large number of individuals of a very few species.

6. While the greater part of the swamp is vegetated with marsh vegetation (grass and more or less grasslike, wet-ground preferring plants) the successions tend toward the development of a swamp forest except in the immediate vicinity of the hot springs.

7. The readiness with which normal strand plants occupy space in the swamp is noteworthy. The presence of vines and lianas under the most diverse conditions is a conspicuous feature of the area.

EXPLANATION OF THE PLATES

(Photographs by Gates)

PLATE XI

Diagram of the successions in the Los Baños area.*

PLATE XII

Diagram of the successions in the Tarlac area.*

PLATE XIII

- FIG. 1. Looking northwestward at the Los Baños hot springs, *Bacopa-Lippia* and *Fimbristylis spathacea* associations nearest the hot water. Farther away are *Acrostichum* and *Acacia farnesiana* Willd. In the extreme foreground is *Typha* in a ditch along the railroad. December 16, 1912.
2. From the railroad, looking northward at the Los Baños hot spring near the close of the dry season. An upright stick marks one of the hot water vents, near to which runners of *Bacopa* approach. *Fimbristylis spathacea* Roth at the right marks the normal boundary of the pool of hot water. *Acrostichum* and *Acacia farnesiana* Willd. are in the background. May 24, 1913.
3. The edge of a flat in the Los Baños area. In the foreground is *Bacopa monniera* Wettst. in flower; in the background is the fern, *Acrostichum aureum* L., and *Acacia farnesiana* Willd. Between *Acrostichum* and *Bacopa* are plants of *Lippia nodiflora* Gaertn. May 24, 1913.

PLATE XIV

- FIG. 1. From the railroad looking over the eastern part of the Tarlac area. *Phragmites vulgaris* Trin. is in flower. March 9, 1913.
2. From the railroad looking over the western part of the Tarlac swamp area. Mount Maquiling is in the background and a hot spring at the extreme right in the foreground. March 9, 1913.
3. A hot spring in the western part of the Tarlac area when the high water had partly receded. The bushes of *Gliricidia sepium* Steud. on the extreme left were killed by the high hot water. Between them and the hot water *Panicum repens* L. is reinvading. Dead bushes of *Sesbania cannabina* Pers. are standing in hot water. November 25, 1914.

* In Plates XI and XII for Bottom algae assoc. read Bottom thermal assoc.; for Surface algae assoc. read Surface thermal assoc.

PLATE XV

- FIG. 1. In the center of the Tarlac swamp after the crest of the flood. The water is 1 m deep, while at the time of the crest it was 1.6 m deep. The bushes are *Sesbania cannabina* Pers. in fruit, but illustrating the usual very open growth. A vine, *Merremia gemella*, Hallier f. is also shown. October 31, 1914.
2. A part of the stem of a plant of *Sesbania* showing the root clusters and the aerenchyma developed under water during the flood. October 31, 1914.
3. From the railroad looking into a part of the *Erythrina-Barringtonia* swamp forest. Notice the abundance of vines, both in the woods and in the openings towards the right and in the foreground. At the foot of the large tree, *Erythrina fusca* Lour., are large aroids, *Alocasia macrorrhiza* Schott. March 9, 1913.

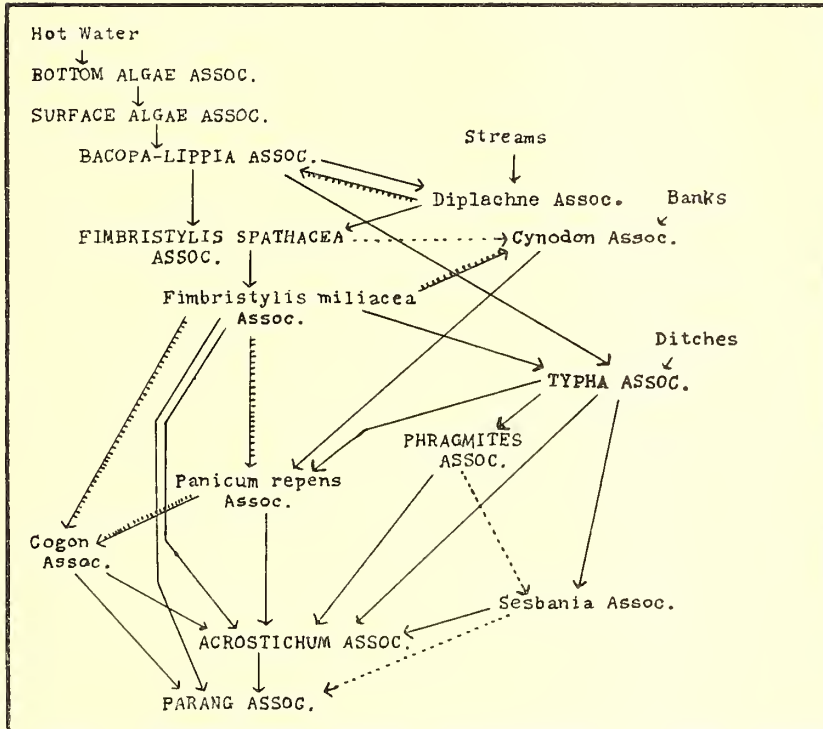


Diagram showing the successions between the plant associations in the Los Baños hot springs swamp area, Laguna Province, Philippine Islands, 1914. Capital letters denote the important associations in this area, primary, ||||| secondary, and successions which ordinarily take place, but are not present in this area. (In place of Bottom algae assoc. read Bottom thermal assoc.; and for Surface algae assoc. read Surface thermal assoc.)

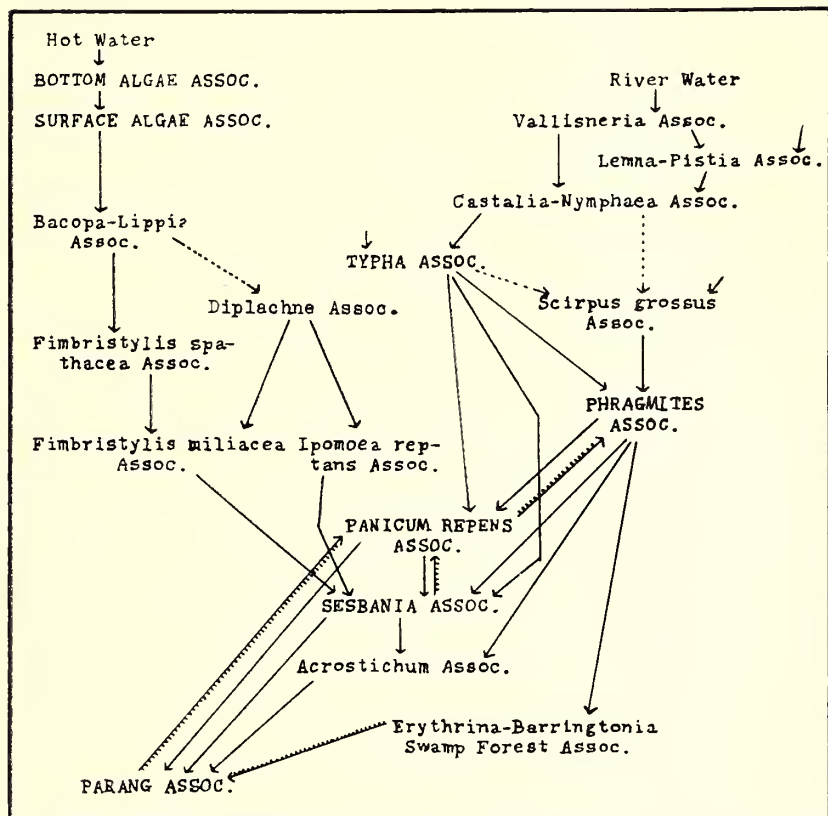


Diagram showing the successions between the plant associations in the Tarlac hot springs swamp area, Laguna Province, Philippine Islands, 1914. Capital letters denote the important associations in this area. primary, ||||| secondary, and successions which ordinarily take place, but are not present in this area. (In place of Bottom algae assoc. read Bottom thermal assoc.; and for Surface algae assoc. read Surface thermal assoc.)



Fig. 1.



Fig. 2.



Fig. 3.



Fig. 1.



Fig. 2.



Fig. 3.

PLATE XIV.



Fig. 1.



Fig. 2.



Fig. 3.

DILLENiaceae novae

By E. D. MERRILL¹

(From the Botanical Section of the Biological Laboratory,
Bureau of Science, Manila, P. I.)

The present paper consists of the descriptions of four new species of *Dillenia* and twelve new species of *Saurauia*, all Philippine. In the genus *Dillenia* a recent collection from Samar has enabled me to determine *Cuming 1726*, collected in that Island in the year 1838, specimens of which have been lying in various herbaria since 1840 determined only to the genus. It is a very striking undescribed species of *Dillenia* with cauline inflorescence, a character at least very unusual in the genus. The genus *Saurauia*, with the present additions, becomes one of the large genera in the Philippines as to the number of individual species. As recently as the year 1906 but six species of the genus were known from the Archipelago, while at present no less than forty are known, with several additional forms already collected but represented by inadequate specimens. The great increase in the number of known species of *Saurauia* parallels the increase in such genera as *Elaeocarpus*, *Medinilla*, *Eugenia*, *Psychotria*, *Ficus*, *Begonia*, *Cyathea*, *Pandanus*, *Freyinetia*, etc., and in all these genera large additions are to be expected as botanical exploration progresses, and as opportunity is had to study the material secured by such exploration.

DILLENIA Linnaeus

DILLENIA CAULIFLORA sp. nov.

Arbor circiter 20 m alta, inflorescentiis stipulisque leviter villosis exceptis glabra; foliis ellipticis vel oblongo-ellipticis, circiter 20 cm longis, coriaceis, distincte abrupte acuminatis, basi subacutis, nervis utrinque circiter 16, subtus valde prominentibus; inflorescentiis caulinis, 10 ad 12 cm longis, crassis, parce ramosis; floribus albis, circiter 6 cm diametro; staminibus exterioribus numerosis, circiter 5 mm longis, interioribus paucis, quam exterioribus duplo longioribus; carpellis 9.

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A tree about 20 m high, glabrous except the deciduous stipules and the sparingly villous inflorescence. Branches terete, brown, the ultimate ones about 5 mm in diameter, scars obscure. Leaves elliptic or oblong-elliptic, coriaceous, about 20 cm long, 10 cm wide, base subacute to obscurely rounded, apex abruptly and prominently acuminate, the acumen about 1 cm long, margins coarsely crenate-serrate; lateral nerves about 16 on each side of the midrib, very prominent on the lower surface, the reticulations very fine, faint, obsolete on the upper surface; petioles about 3.5 cm long, those of young leaves margined by the 5 mm wide stipules throughout their length, the stipules sparingly villous with long hairs, deciduous. Inflorescence cauline, about 12 cm long, stout, sparingly branched, somewhat villous with scattered, long hairs especially at the nodes, the branches 3 to 5 mm in diameter, short, few-flowered. Flowers white. Sepals subcoriaceous, elliptic, concave, about 1.5 cm long, persistent and enveloping the young fruit. Petals obovate, 3 to 3.5 cm long. Stamens indefinite, the outer ones very numerous, erect, about 5 mm long, pale-yellowish when dry, the inner row about twice as long, curved over the outer ones, purplish or reddish when dry. Carpels 9, the styles spreading, about 6 mm long, the carpels loosely arranged, cohering at the axils, slightly spiral, the very young seeds with no indication of an aril.

SAMAR, Yabong, in damp forests, *Phil. Pl.* 1695 Ramos (type), April, 1914 *Cuming* 1726. LEYTE, *Wenzel* 984, July, 1914.

A species well characterized by its cauline inflorescence. Its leaves much resemble those of some forms of *Dillenia philippinensis* Rolfe, but its cauline inflorescence, and details of the flowers and fruits are entirely different.

DILLENIA FISCHERI sp. nov. § *Wormia*.

Arbor circiter 20 alta, inflorescentiis exceptis glabra; foliis coriaceis, oblongo-ellipticis, usque ad 11 cm longis, basi acutis ad rotundatis, apice rotundatis, margine integris vel obscure undulatis, nervis utrinque circiter 8; inflorescentiis terminalibus axillaribusque, paniculatis, paucifloris; floribus albis, circiter 6 cm diametro, sepalis extus pubescentibus, staminibus aequalibus, carpellis 4 ad 6.

A tree about 20 m high, glabrous except the inflorescence. Branches rather slender, terete, grayish, the younger ones reddish-brown. Leaves coriaceous, pale when dry, shining, oblong-elliptic or elliptic, 6 to 11 cm long, 2.5 to 5.5 cm wide, entire or very obscurely undulate, apex rounded, base acute to somewhat rounded; lateral nerves about 9 on each side of the midrib, prominent, curved-ascending, the reticulations distinct; petioles

1 to 1.8 cm long. Inflorescence terminal and axillary, up to 10 cm long, somewhat pubescent, usually dichotomously branched, few-flowered, the pedicels up to 4 cm in length. Flowers white, in anthesis about 6 cm in diameter. Sepals subcoriaceous, externally pubescent, concave, rounded, oblong to obovate, persistent. Petals oblong to obovate-oblong, rounded, about 3 cm long, 1 cm wide. Stamens indefinite, all equal, about 7 mm long. Carpels 4 to 6; styles recurved, 6 to 8 mm long. Young fruits oblong-lanceolate, compressed, about 12 mm long, the carpels more or less cohering axially, apparently dry and dehiscent at maturity.

MINDANAO, Butuan Subprovince, near Butuan, *For. Bur.* 20500 Ponce, *For. Bur.* 20534 Miranda (type), September 3, 1913, in semi-open forests, altitude about 20 meters.

Dedicated to Mr. A. F. Fischer of the Philippine Bureau of Forestry, the specific name first being applied to a specimen collected by him on the Island of Sibuyan; however the species represented by *For. Bur.* 18856 Fischer has recently been described by Mr. Elmer as *Wormia sibuyanensis* = *Dillenia sibuyanensis* (Elm.) Merr. The present species differs from *D. sibuyanensis* in its larger, quite differently shaped leaves, more ample inflorescence, larger flowers, and fewer carpels.

DILLENIA MEGALANTHA sp. nov. § *Capellia*.

Arbor alta ramulis junioribus leviter hirsutis exceptis glabra; foliis oblongis vel oblongo-ellipticis, usque ad 30 cm longis, coriaceis, basi rotundatis, apice breviter acuminatis, margine undulato-crenatis, nervis utrinque circiter 20, prominentibus, breviter petiolatis; floribus terminalibus, solitariis vel paucis, magnis, flavidis, circiter 20 cm diametro; antheris exterioribus quam interioribus multo brevioribus; carpellis circiter 14.

A tall tree, quite glabrous except the somewhat hirsute younger branchlets, the hairs stiff, pale, mostly at the nodes. Branches terete, brown when dry, the ultimate ones about 8 mm in diameter, marked with rather large petiolar and stipular scars. Leaves oblong or oblong-elliptic, 22 to 25 cm long, 10 to 14 cm wide, coriaceous, rather pale when dry, shining, base broadly rounded, apex shortly and broadly acuminate, margins coarsely undulate-crenate; lateral nerves about 20 on each side of the midrib, prominent, the reticulations rather dense, more prominent on the upper than on the lower surface; petioles stout, about 2 cm long, the stipules obovate, rounded-truncate, more or less narrowed below, about 4 cm long and 3 cm wide, deciduous, free from the petioles or but very slightly attached, chartaceous, dark-brown when dry. Flowers about 20 cm in diameter, yellow, terminal or in the uppermost axil, solitary, the pedicle stout,

about 4 cm long. Sepals 6, coriaceous, concave, broadly ovate, up to 4 cm long, the outer ones somewhat shorter. Petals yellow, broadly obovate, rounded, about 9 cm long. Stamens indefinite, the very numerous outer ones about 1 cm long, the fewer inner ones up to 3 cm in length, more or less spreading or recurved. Carpels about 14, the styles spreading-recurved, about 2 cm long.

SAMAR, Ambalete, *Bur. Sci.* 17581 Ramos, April 7, 1914, in damp forests, said by the collector to be a tree 40 m in height, but this is probably exaggerated.

A very characteristic species on account of its unusually large, solitary, yellow flowers, which, in anthesis, are about 20 cm in diameter. It apparently belongs in the group designated by Blume as the genus *Capellia*.

DILLENIA PAPYRACEA sp. nov. § *Wormia*.

Arbor circiter 25 m alta, partibus junioribus inflorescentiisque exceptis glabra; foliis subcoriaceis, oblongo-obovatis, usque ad 50 cm longis, sessilibus vel breviter petiolatis, basi longe angustatis, conduplicatis, apice brevissime acuminatis vel acutis, margine undulato-dentatis, nervis utrinque circiter 20; paniculis folia subaequantibus, paucifloris; floribus albis; carpellis circiter 12, dehiscentibus, seminibus arillatis.

A tree about 25 m high, glabrous except the sparingly pubescent younger parts and the inflorescence. Branches stout, dark-brown, terete, about 1 cm in diameter, marked with large petiolar scars. Leaves subcoriaceous, pale or brownish when dry, slightly shining, oblong-obovate, up to 50 cm long and 17 cm wide, apex shortly acuminate or merely acute, margins rather distantly undulate-dentate, base long-narrowed, sessile or subsessile, the lower 7 to 8 cm conduplicate, the epidermis on the upper surface of the folded base brown when dry, apparently modified as absorbent tissue; lateral nerves about 20 on each side of the midrib, prominent, reticulations subparallel, distinct, the folded narrow base clasping the stem. Panicles in the uppermost axils, about as long as the leaves, stout, with few branches, few-flowered, the flowers said to be white, sessile or subsessile. Petals and stamens not seen. Sepals coriaceous, externally somewhat appressed-pubescent, coriaceous, apparently fleshy when fresh, obovate to oblong-obovate, rounded, concave, 5 to 5.5 cm long, 2.5 to 3 cm wide, surrounding the young fruit. Carpels about 12, the styles recurved, 10 to 12 mm long; immature carpels united axially below, dehiscent, about 2.5 cm long; immature seeds brown, about 3 mm long, surrounded at the base by a loose, somewhat cup-shaped aril.

BASILAN, Tongatong, *Bur. Sci.* 16339 Reillo, September, 1912 "flowers white," in forests. MINDANAO, District of Zamboanga, Alimpagu, *For. Bur.*

15226 Klemme, September 30, 1910, forested slopes, altitude about 40 meters, the bark very flaky, covered with large, brittle, membranaceous, dark-brown, papery scales.

The species is manifestly allied to *Wormia suffruticosa* Griff. (*W. subsessilis* Miq.) but with entirely different leaves.

SAURAUIA Willdenow

SAURAUIA AMPLA sp. nov.

Arbor parva, partibus junioribus inflorescentiisque plus minusve furfuraceis exceptis glabra, haud setosis; foliis late oblongis, coriaceis, circiter 50 cm longis, margine distanter minute apiculato-serrulatis, basi rotundatis, apice breviter acuminatis, nervis utrinque circiter 18; inflorescentiis caulinis, paniculatis, paniculis numerosis, fasciculatis, circiter 12 cm longis; floribus circiter 2.5 cm diametro, sepalis glabris; ovario 5-loculare, stylis 5, liberis.

A tree about 12 m high, glabrous except the somewhat furfuraceous younger parts and the inflorescence, not at all setose. Branches stout, much wrinkled when dry, brownish, about 1 cm in diameter, the growing tips and very young leaves more or less furfuraceous. Leaves ample, broadly oblong or elliptic-oblong, about 50 cm long, 22 cm wide, subcoriaceous, shining, quite glabrous, base rounded, apex very shortly acuminate, margins distantly and minutely apiculate-serrulate. Inflorescence from the trunk, of many flowered, numerous, rather densely fascicled panicles about 12 cm in length, the younger parts more or less furfuraceous, branched above the middle, the bracts oblong-ovate, about 3 mm long. Flowers white, about 2.5 cm in diameter when spread. Sepals elliptic-ovate, glabrous, rounded, about 7 mm long and 3 mm wide. Corolla-lobes about 9 mm long and 7 mm wide, somewhat obovate, inequilaterally retuse. Anthers about 2.5 mm long. Ovary glabrous, 5-celled; styles 5, free, about 6 mm long.

SAMAR, Cauayan Valley, *Phil. Pl. 1694 Ramos*, April, 1914, along small streams in forests, altitude about 100 meters.

A very characteristic species easily recognized by its very large glabrous leaves and densely fascicled, cauline panicles.

SAURAUIA BAKERI sp. nov.

Frutex vel arbor parva, foliis inflorescentiis ramulisque prominente setosis; foliis chartaceis, oblongo-obovatis, usque ad 12 cm longis, utrinque setosis, acuminatis, basi angustatis, obtusis, margine prominente setoso-ciliatis, nervis utrinque circiter 10; inflorescentiis cymosis, paucifloris, axillaribus, solitariis, 2 ad 4 cm longis, sepalis exterioribus dense setosis, setis patulis; floribus 1.3 cm diametro, stylis 3, basi breviter unitis.

A shrub or small tree, most parts prominently setose with more or less spreading, curved, dense or scattered, 1 to 2.5 mm long, pale-brownish setae. Branches slender, terete, grayish-brown, glabrous, the branchlets distinctly furfuraceous and appressed setose. Leaves oblong-obovate, firmly chartaceous, brownish when dry, somewhat shining, 6 to 12 cm long, 2.5 to 4.5 cm wide, lower surface paler than the upper, apex rather abruptly and sharply acuminate, base narrowed, obtuse, margins prominently setose-ciliate, both surfaces with scattered, spreading or somewhat appressed setae especially on the midrib and lateral nerves; lateral nerves about 10 on each side of the midrib, slender, prominent, curved-anastomosing; petioles densely setose, 8 to 15 mm long. Cymes axillary, solitary, few-flowered, rather densely setose, long peduncled, the branches few, short. Flowers white, about 1.3 cm in diameter. Sepals ovate, about 5 mm long, obtuse, the outer three densely setose with spreading setae 1 to 2 mm in length, the inner two setose only on the median central part, thinner than the outer ones, petaloid. Corolla lobes oblong-obovate, inequilaterally retuse, about 6 mm long, 4 mm wide. Stamens about 25; filaments and anthers each about 1.8 mm long. Ovary ovoid, glabrous; styles 3, united for the lower 0.5 mm, the arms about 3 mm long.

LUZON, Province of Tayabas, near Malinao, *Bur. Sci.* 10746 Curran (type), July, 1908, *C. F. Baker* 3259, May, 1914, on forested slopes.

The species is similar to and manifestly closely allied to *Saurauia clementis* Merr. but has much smaller flowers, while the styles are united for only the lower 0.5 mm.

SAURAUIA CONFUSA sp. nov.

Frutex circiter 4 m altus ramulis dense adpresse ferrugineo-setosus; foliis obovatis ad elliptico-obovatis, chartaceis, usque ad 18 cm longis, acuminatis, basi angustatis, subrotundatis, nervis utrinque circiter 12, utrinque ad costa nervisque setosis; inflorescentiis axillaribus, solitariis, pedunculatis, usque ad 5 cm longis, setosis, cymosis; stylis 3 vel 4, liberis, 4 ad 5 mm longis.

A shrub about 4 m high, rather prominently appressed-setose. Branches terete, pale-brown, the branchlets densely appressed-setose with short setae, these pale brown or somewhat ferruginous, similar ones on the petioles and inflorescence. Leaves obovate to elliptic-obovate, chartaceous, 9 to 18 cm long, 4 to 8 cm wide, acuminate, base more or less narrowed, somewhat rounded, the margins setose-serrulate, the upper surface brown and shining when dry, with numerous, short, appressed setae on the midrib and lateral nerves, fewer on the reticulations, the lower sur-

face paler than the upper and more prominently setose; lateral nerves about 12 on each side of the midrib, prominent; petioles densely setose, 1 to 1.5 cm long. Cymes axillary, solitary, peduncled, rather few-flowered, up to 5 cm in length, densely appressed-setose, the pedicels up to 1 cm in length, bracts apparently small, deciduous. Outer three sepals broadly ovate, densely setose, about 6 mm long, 4 to 5 mm wide, the inner two about 7 mm long, thinner, glabrous except for the setose median part, elliptic-ovate, petaloid. Ovary glabrous, ovoid; styles 3 or 4, free to the base, 4 to 5 mm long.

LUZON, Province of Laguna, Dahican River, *Phil. Pl. 1134 Ramos* (type), September, 1912, distributed as *Saurauia altissima* Zipp.: Province of Camarines, Mount Cauayan, *Bur. Sci. 22181 Ramos*, December, 1913.

A species manifestly allied to the Bornean *Saurauia ferox* Korth., but differing in many details, and readily distinguished by its fewer lateral nerves; in the present species the lateral nerves are about 12 pairs, while in Korthals' species they are about 18 pairs as indicated by his figure.

SAURAUIA ELMERI sp. nov.

Frutex vel arbor parva, ramulis foliis utrinque petiolis floribusque plus minusve setosis; foliis oblongo-obovatis, chartaceis, usque ad 11 cm longis, acuminatis, basi obtusis vel subacutis, utrinque parce setosis, nervis utrinque circiter 9; floribus axillaribus, solitariis, longe pedicellatis, circiter 1.4 cm diametro, stylis 3, basi unitis, 3 ad 4 mm longis.

A shrub or small tree, the branches glabrous, pale-brownish, the young branchlets rather densely appressed-setose and somewhat furfuraceous. Leaves chartaceous, brown when dry, oblong-obovate, 8 to 11 cm long, 3 to 4.5 cm wide, sharply acuminate, base narrowed, acute to somewhat obtuse, the lower surface paler than the upper, both with scattered setae on the midrib and lateral nerves and fewer ones on the reticulations, the setae short, subappressed or somewhat spreading, the margins setose-serulate; lateral nerves 8 to 10 on each side of the midrib, prominent; petioles setose, 8 to 14 mm long. Flowers axillary, solitary, their pedicels slender, setose, about 1.5 cm long. Sepals ovate, obtuse to acute, 4 to 5 mm long, the outer three prominently setose with slender, more or less spreading, brownish, 1 to 1.5 mm long setae, the inner two petaloid, glabrous except for the slightly setose median part. Stamens 20, the anthers about 1.6 mm long. Corolla 1.6 mm in diameter, the lobes oblong-obovate, irregularly retuse, about 6 mm long, 3 mm wide. Ovary ovoid, glabrous; styles 3, united for the lower 1 mm, the arms about 3 mm in length.

LUZON, Province of Tayabas, Lucban (Mount Banajao), *Elmer 9225*, May 1907, distributed as *Saurauia luzoniensis* Merr.

A species similar to *Saurauia gracilipes* Merr. in many characters, but with longer, more slender setae, and the inner petals not conspicuously narrower than the outer ones. It is not at all closely allied to *Saurauia luzoniensis* Merr., but like *S. gracilipes* Merr., is readily recognizable by its solitary, rather long pedicelled, axillary flowers.

SAURAUIA FASCICULIFLORA sp. nov.

Arbor circiter 5 m alta ramulis costa utrinque subtus ad nervis inflorescentiisque plus minusve adpresse setosis; foliis oblongis, coriaceis, usque ad 15 cm longis, acutis, basi subobtusis, supra brunneis, nitidis, nervis utrinque circiter 16; floribus fasciculatis, pedicellatis, caulinis et e ramis vetustioribus junioribusque; stylis 5, basi longe unitis.

A tree about 5 m high, the branches terete, brownish, glabrous, the branchlets rather densely appressed setose with pale or more usually ferruginous, stout, short setae, the setae 2 mm long or less. Leaves oblong, coriaceous, 12 to 14 cm long, 3.5 to 5 cm wide, acute, base subobtuse, margins setose-denticulate, the upper surface shining, rather dark-brown, glabrous except the appressed-setose midrib, the lower surface paler, appressed setose on the midrib and lateral nerves, with few shorter setae on the reticulations; lateral nerves about 16 on each side of the midrib, prominent; petioles densely appressed-setose, 1 to 2 cm long. Flowers pale-pink, fascicled, on the trunk as well as on the larger and smaller branches, none axillary, few to many in a fascicle, the pedicels 1.5 cm long or less, more or less appressed ferruginous-setose. Sepals ovate, coriaceous, sparingly appressed-setose, the outer two about 6 mm long, 4 mm wide, acute, the inner three somewhat larger, about 8 mm long and 6 mm wide, rounded, the innermost two glabrous or nearly so, thinner than the outer ones. Corolla about 2.5 cm in diameter, the lobes obovate, inequilaterally retuse, about 10 mm long, 7 mm wide. Stamens 20; filaments and anthers each about 2.5 mm long. Styles 5, the free portions about 4 mm long, united for the lower 2 mm.

PALAWAN, Mount Capoas, *Merrill 9508*, on forested ridges and talus slopes, altitude about 800 meters, April 21, 1913.

A species most closely allied to *Saurauia negrosensis* Elm., differing in its fascicled flowers which are for the most part borne on the trunk and larger branches, not in the leaf axils, its more numerous setae, and its styles united for the lower 2 mm, not free to the base.

SAURAUIA GRACILIPES sp. nov.

Frutex vel arbor parva ramulis subtus foliis ad costa nervisque petioles pedicellis sepalisque plus minusve setosis; foliis

chartaceis, oblongo-obovatis ad late oblanceolatis, usque ad 17 cm longis, acuminatis, basi angustatis, acutis vel subacutis, nervis utrinque circiter 8; floribus axillaribus, solitariis vel binis, longe pedicellatis, sepalis exterioribus quam 2 interioribus multo latioribus; stylis 3, liberis, 5 mm longis.

A shrub or small tree, more or less appressed-setose, branches terete, glabrous, grayish, the younger ones appressed-setose and more or less furfuraceous as are the petioles and pedicels. Leaves chartaceous, oblong-obovate to broadly oblanceolate, 9 to 17 cm long, 3.5 to 5.5 cm wide, apex acuminate, narrowed below to the acute or subacute base, the margins more or less denticulate or setose-denticulate, the upper surface glabrous except for the sparingly appressed-setose midrib, brownish-olivaceous, the lower appressed-setose on the midrib and lateral nerves with few short setae on the reticulations; petioles 5 to 12 mm long, more or less appressed-setose. Flowers solitary or in pairs, axillary, their pedicels slender, appressed-setose, 1.5 to 3 cm long. Exterior three sepals broadly ovate, about 8 mm long, 7 mm wide, rather densely covered with stout, appressed setae, the setae up to 2 mm long, obscurely ciliate, the inner two petaloid, narrowly oblong, glabrous, about 8 mm long and 3.5 mm wide. Corolla-lobes about 10 mm long, 6 mm wide, oblong-obovate; filaments and anthers each about 2.5 mm long. Ovary glabrous; styles three, free, about 5 mm long.

MINDANAO, Lake Lanao, Camp Keithley, *Mrs. Clemens* 849, April, 1907, and December, 1906, on Sacred Mountain, altitude about 900 meters.

This species, from its floral structure and the position of its flowers, is allied to *Saurauia samarensis* Merr., but is totally different in vegetative characters; both have wide, setose outer sepals and very much narrower, glabrous or nearly glabrous inner sepals. *Cuming* 1712, from Samar, tentatively referred by Dr. Stapf¹ to *Saurauia ferox* Korth., represents a very closely allied form, but a critical comparison with the Mindanao specimens presents several differences. In Cuming's specimen the lateral nerves are about 12 on each side of the midrib instead of 8, the petioles are somewhat longer, and the setae on the outer sepals are distinctly spreading and minutely ciliate. Neither specimen can be referred to Korthal's species, as the latter has peduncled, cymose inflorescences.

SAURAUIA KLEMMEI sp. nov.

Frutex circiter 4 m altus ramulis subtus foliis ad costa nervisque inflorescentiisque plus minusve setosis; foliis oblongo-obovatis, usque ad 22 cm longis, chartaceis vel subcoriaceis, nitidis, supra subolivaceis, subtus pallidis, breviter abrupte acuminatis, basi angustatis, acutis, nervis utrinque circiter 17, prominen-

¹ Trans. Linn. Soc. Bot. 4: 134.

tibus; inflorescentiis e ramis vetustioribus caulinis axillaribusque, cymosis, paucifloris; stylis 4 vel 5, basi unitis.

A shrub about 4 m high, the young branchlets, petioles, lower surface of the leaves on the midrib and lateral nerves more or less setose, the setae appressed or spreading, up to 3 mm long, the cymes also pubescent and setose. Older branches glabrous, terete, grayish-brown. Leaves oblong-obovate, chartaceous to subcoriaceous, shining, 14 to 22 cm long, 5 to 8 cm wide, apex shortly and abruptly acuminate, base narrowed, acute, the margins entire or distantly and minutely apiculate-serrulate, the upper surface dark-olivaceous when dry, glabrous, or the younger ones with few setae along the midrib, the lower surface pale, prominently setose on the midrib, less so on the lateral nerves; lateral nerves about 17 on each side of the midrib, prominent, the reticulations prominent; petioles rather densely setose, the setae more or less spreading, 1.5 to 4 cm long. Cymes peduncled, axillary, on the larger branches and on the trunk, apparently numerous, furfuraceous-pubescent and more or less setose. Flowers about 1.7 cm in diameter, the sepals ovate to obovate, the inner two about 7 mm long, 5 mm wide, nearly glabrous, the outer three slightly smaller, externally slightly setose and more or less pubescent, the setae less than 1 mm long. Corolla lobes oblong-obovate, about 7 mm long and 5 mm wide, inequilaterally retuse. Stamens about 25; filaments and anthers each about 2.5 mm long. Styles 4 or 5, united for the lower 1 to 1.5 mm, the arms about 5 mm long.

LUZON, Province of Isabela, near Ilagan, *For. Bur. 6640 Klemme*, March, 1907, in open level forests, locally known as *bahisudsud*.

A species characterized by its rather long petioles, its leaves gradually narrowed from about or from above the middle to the acute base, and its short, cymose, solitary or somewhat fascicled inflorescences which are borne in the upper axils, on the branches below the leaves, and on the trunk. The collector's note reads: "most of the flowers come directly out of the trunk."

SAURAUIA LEYTENSIS sp. nov.

Frutex circiter 3 m altus, ramulis foliis petiolis inflorescentiisque plus minusve setosis; foliis chartaceis, oblongo-obovatis, usque ad 25 cm longis, tenuiter acuminatis, basi subrotundatis, nervis utrinque circiter 12; floribus axillaribus lateralibusque, solitariis vel admodum fasciculatis, sepalis extus dense longe setosis; ovario 3-loculare, stylis 3, liberis.

A shrub about 3 m high, all parts more or less setose, the branchlets and petioles densely so. Branches terete, grayish-brown, glabrous, the branchlets densely covered with appressed sharp setae, intermingled with shorter, subfurfuraceous scales.

Leaves chartaceous, pale when dry, slightly shining, oblong-obovate, 12 to 25 cm long, 5 to 11 cm wide, the upper surface with widely scattered, closely appressed setae 1 mm long or less, the lower surface prominently setose on the midrib and lateral nerves with longer setae, with scattered shorter ones on the secondary nerves and reticulations, apex slenderly acuminate, base somewhat narrowed, somewhat rounded, the margins setose-serrulate; lateral nerves about 12 on each side of the midrib, prominent, the reticulations prominent, the primary ones subparallel; petioles 1 to 2 cm long, densely setose. Flowers apparently white, axillary and lateral from the branchlets below the leaves, solitary or in very few-flowered fascicles, the pedicels densely setose, up to 1.5 cm long. Outer three sepals ovate to oblong-ovate, obtuse, about 1 cm long, densely setose with more or less spreading, slender, 2 to 4 mm long setae, the inner two subpetaloid, somewhat narrower than the outer ones, with very broad, thin, glabrous margins, setose only along the median line in the lower part. Ovary glabrous, ovoid; styles 3, about 4 mm long, free to the base. Seeds brown, oblong-obovoid, subtruncate, about 1 mm long.

LEYTE, Dagami, *Bur. Sci.* 15240 *Ramos* (type), August, 1911; Jaro, *Wenzel* 748, May 27, 1914, in forests, altitude about 500 meters.

The species is well characterized by its peduncled, solitary or subsolitary flowers, the pedicels and calyx densely setose, the bracts none or small and early deciduous. Wenzel's specimen was, with doubt, referred to *Saurauia ferox* Korth., which the present species resembles in leaf characters, but which has an entirely different inflorescence.

SAURAUIA PALAWANENSIS sp. nov.

Arbor circiter 7 m alta foliis subtus dense cinnamomeo-pubescentibus, oblongis ad oblongo-oblancheolatis, crasse coriaceis, usque ad 13 cm longis, utrinque acutis, nervis utrinque 14 ad 20, prominentibus, reticulis subtus obsoletis, supra impressis; floribus solitariis, axillaribus, pedicellatis, bracteatis, bractetolis anguste lanceolatis; stylis 4, liberis.

A tree about 7 m high, the younger parts and the lower surface of the leaves densely cinnamomeous-pubescent with very short indistinct hairs. Branches terete, grayish, wrinkled, the younger ones brownish. Leaves thickly coriaceous, oblong to oblong-oblancheolate, 6 to 13 cm long, 2 to 4 cm wide, acute at both ends, the margins distinctly serrulate, the upper surface quite glabrous, dark-olivaceous, somewhat shining; lateral nerves 14 to 20 on each side of the midrib, prominent, the reticulations on the lower surface entirely obscured by the indumentum, on the upper surface faint, impressed; petioles 5 to 15 mm long,

more or less puberulent and with very few scattered, appressed scales, becoming glabrous or nearly so. Flowers white, axillary, solitary, their pedicels about 1 cm long, more or less puberulent and with few appressed scales, below the flower bearing one or two lanceolate to oblanceolate, acuminate, coriaceous, pubescent bracts 5 to 9 mm in length. Sepals coriaceous, ovate, more or less pubescent or puberulent and with very few appressed scales. Corolla lobes oblong-ovate, about 12 mm long, 8 mm wide, retuse. Filaments and anthers each about 3 mm long. Ovary 4-celled; styles 4, free, about 6 mm long.

PALAWAN, Mount Victoria, *Bur. Sci.* 681 Foxworthy, March 23, 1906, moist slopes along streams, altitude about 1,100 meters.

The species is distinguished by its thickly coriaceous leaves which are glabrous and dark-olivaceous above and brown beneath, the lower surface covered with a dense cinnamomeous, puberulent indumentum, and its solitary axillary flowers. It is not at all setose. It is distinguished from all the other Philippine forms with this type of indumentum by its solitary axillary flowers.

SAURAUIA PANAYENSIS sp. nov.

Arbor circiter 7 m alta ramulis petiolisque furfuraceis et parciissime setosis, inflorescentiis puberulis; foliis oblongis ad oblongo-obovatis, chartaceis vel subcoriaceis, circiter 25 cm longis, glabris, acuminatis, basi acutis vel subacutis, nervis utrinque circiter 15, prominentibus; inflorescentiis cymosis, cymis fasciculatis, puberulis, 3 ad 4 cm longis, paucifloris, plerumque caulinis et in ramis vetustioribus; ovario puberulo, stylis 4 vel 5, liberis, circiter 4 mm longis.

A tree about 7 m high, glabrous except the younger branchlets, petioles, and inflorescence. Branches brown, striate, glabrous, the young branchlets furfuraceous and with very few appressed setae as are the petioles; leaves glabrous, oblong to oblong-obovate, firmly chartaceous to subcoriaceous, about 25 cm long, 8 to 9 cm wide, shortly and sharply acuminate, base acute or subacute, sometimes slightly inequilateral, shining, the margins distantly apiculate-serrulate; lateral nerves about 15 on each side of the midrib, prominent, anastomosing, the reticulations coarse, lax, prominent; petioles about 2.5 cm long. Inflorescence cymose, puberulent, the cymes fascicled, few-flowered, 3 to 4 cm long, cymes mostly fascicled from rather large tubercles on the trunk and larger branches, few in the leaf axils, the flowers white to slightly pink, the bracteoles very small. Sepals ovate, obtuse, the outer two about 4 mm long, somewhat puberulent, not at all setose, the inner three thinner, rounded, about 3.5 mm wide. Ovary ovoid, puberulent; styles 4 or 5, free to the base, about 4 mm long, glabrous above, the

basal parts rather densely pubescent. Seeds angular, dark-brown, about 1 mm long.

PANAY, Dumarao, *Merrill 6701*, March 25, 1910, in shaded ravines along small streams, altitude about 100 meters.

A species probably as closely allied to *Saurauia subglabra* Merr. as any other, and greatly resembling it in vegetative characters. It differs in its rather densely fascicled shorter cymes which are distinctly pubescent and mostly from the trunk and larger branches, and its puberulent ovary and pubescent style bases.

SAURAUIA PAPILLULOSA sp. nov.

Arbor 10 ad 12 m alta ramulis junioribus inflorescentiisque furfuraceis et adpresse breviter setosis, subtus foliis plus minusve furfuraceo-papillulosis; foliis oblongis ad oblongo-obovatis, coriaceis, usque ad 14 cm longis, acutis vel obscure acuminatis, basi acutis ad subrotundatis, nervis utrinque circiter 10; inflorescentiis axillaribus, cymosis, pedunculatis, bracteatis, paucifloris, 4 ad 9 cm longis; sepalis extus furfuraceis et leviter setosis; stylis 4 vel 5, basi unitis.

A tree 10 to 12 m high, the branches grayish or brown, the younger ones densely furfuraceous and appressed-setose, the setae short. Leaves coriaceous, oblong to oblong-obovate, 7 to 14 cm long, 2 to 5 cm wide, acute or obscurely acuminate, base acute to subrounded, margins apiculate-serrulate, the upper surface pale or dark-colored when dry, with few, scattered, subfurfuraceous setae, the lower pale, with numerous, short, furfuraceous papillae; lateral nerves about 10 on each side of the midrib, prominent, curved, the reticulations distinct; petioles 1 to 1.5 cm long, furfuraceous and appressed-setose. Cymes axillary, few-flowered, solitary, long-pedicelled, all parts more or less furfuraceous and appressed-setose, the bracts subtending the few short branches broadly ovate, concave-navicular, 8 to 10 mm long, about 8 mm wide, acuminate, furfuraceous and slightly setose, apiculate-toothed, sessile or on short stalks; branches few, 2 cm long or less and only at the upper part of the inflorescence, the whole inflorescence 4 to 9 cm long. Flowers white, about 1.8 cm in diameter. Outer three sepals narrowly elliptic to obovate-elliptic, about 6 mm long, 3 to 4.5 mm wide, more or less furfuraceous, the inner two petaloid, broadly elliptic, about 8 mm long and 5 mm wide, glabrous except for the median line in the lower part. Corolla-lobes free nearly to the base, broadly elliptic to orbicular-elliptic, 8 mm long, retuse. Stamens about 20, the filaments and anthers each about 3 mm long. Styles united for the lower 1 mm, the arms 4 or 5, about 3 mm long.

LUZON, Subprovince of Ifugao, Mount Polis, *Bur. Sci. 19640* (type), 18762 *McGregor*, February, 1913.

A species readily distinguished by its leaves being furfuraceous-papillose on the lower surface, the papillae scattered, small, not at all setaceous.

SAURAUIA SAMARENSIS sp. nov.

Frutex 2 ad 3 m altus plus minusve pubescentibus setosisque; foliis chartaceis vel subcoriaceis, oblongo-obovatis, usque ad 27 cm longis, acuminatis, basi acutis, obtusis, vel anguste rotundatis, nervis utrinque circiter 13, supra parce breviter adpresse setosis, subtus submolliter hirsutis; floribus axillaribus, circiter 3 cm diametro, solitariis fasciculatisque, pedicellatis, sepalis exterioribus late ovatis, dense longe setosis, interioribus petaloideis, quam exterioribus multo angustioribus; stylis liberis, 3 vel 4.

A shrub 2 to 3 m high, the branches brown, terete, densely appressed setose and pubescent, the setae somewhat ciliate as are those on the pedicels and sepals. Leaves oblong-obovate, 16 to 27 cm long, 6 to 9 cm wide, chartaceous or subcoriaceous, the apex slenderly acuminate, somewhat narrowed below to the acute, obtuse, or narrowly rounded base, the margins apiculate-serrulate, the upper surface brown when dry, shining, with scattered, appressed, thickened setae less than 1 mm long, the lower surface paler, uniformly and rather densely subappressed softly hirsute; lateral nerves about 13 on each side of the midrib, prominent; petioles 1 to 2.5 cm long, densely pubescent and setose, the setae somewhat ciliate, appressed. Flowers axillary, solitary or fascicled, their pedicels 1.5 to 2 cm long, densely hirsute and setose. Outer three sepals broadly ovate, rounded, about 1 cm long, thickly and densely setose, the setae themselves more or less ciliate, more or less spreading, 2 to 4 mm long, pale-brownish, the two inner sepals very different, petaloid, narrowly oblong, as long as the outer ones but much narrower, about 3.5 mm wide, obtuse, glabrous, or the median portion below slightly setose. Corolla white or pink, about 3 cm in diameter, the lobes oblong, subtruncate-rounded, retuse, not narrowed at the apex, about 10 mm long and 6 mm wide. Stamens about 20, the filaments and the anthers each about 2.5 mm long. Ovary glabrous; styles 3 or 4, quite free, about 3 mm long.

SAMAR, Yabong and Cauayan Valley, *Bur. Sci.* 17484 *Ramos* (type), *Phil. Pl.* 1693 *Ramos*, March and April, 1914, in damp forests along small streams.

The species is well characterized by its fascicled or solitary, rather long pedicelled flowers, and its very dissimilar sepals, the inner two very narrow, glabrous or nearly so, the outer three broadly ovate and densely setose, the setae themselves more or less ciliate.

MELIACEAE NOVAE

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The present contribution consists of the description of seven new species of *Aglaia* and four new species of *Dysoxylum*, all Philippine, including a note on the identity of *Melia iloilo* Blanco. In this family, as in many others, current collections, especially those from previously little known parts of the Philippines, consistently present new forms, especially in the two genera mentioned above. In both genera a number of apparently undescribed forms, with fruit only, still remain to be considered at a later date when flowering specimens shall have been collected. It is confidently expected that future botanical exploration will greatly increase the number of species not only in *Aglaia* and *Dysoxylum*, but in several other genera of this family as well.

AGLAIA Loureiro

AGLAIA ACUMINATA sp. nov. § *Euaglaia*.

Arbor 10 ad 15 m alta, partibus junioribus petiolis inflorescentiisque dense adpresse brunneo-lepidotis; foliis alternis, circiter 30 cm longis, foliolis 9 ad 11, valde inaequalateralibus, lanceolatis vel oblongo-lanceolatis, sursum angustatis, longe acuminatis, basi acutis vel acuminatis, junioribus dense lepidotis, vetustioribus glaberrimis, usque ad 10 cm longis, nervis utrinque circiter 10, obscuris; paniculis axillaribus, pyramidatis, usque ad 16 cm longis, floribus parvis, 5-meris, sessilibus, spicatim dispositis, tubus stamineus liber.

A tree 10 to 15 m high, the younger branchlets, panicles, very young leaves, rachis and petioles densely appressed brown or cupreous-lepidote, the scales minute, not at all ciliate, the mature leaflets entirely glabrous. Leaves alternate, 25 to 30 cm long, the rachis and petioles ultimately glabrous; leaflets 9 to 11, alternate, lanceolate to oblong-lanceolate, very inequilateral, 6 to 11 cm long, 2 to 3 cm wide, subcoriaceous, oliva-

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ceous, shining, gradually narrowed upward to the long acuminate apex, the acumen blunt, the base acute to somewhat acuminate; lateral nerves about 10 on each side of the midrib, very obscure, the reticulations obsolete or nearly so. Panicles axillary, pyramidal, up to 16 cm long, branched from near the base, the branches few, spreading, the lower ones up to 9 cm in length, the flowers small, 5-merous, sessile, spicately disposed on the ultimate branchlets. Calyx densely cupreous-lepidote, in bud about 1 mm long. Petals 5, glabrous. Staminal tube (in young buds) about 0.5 mm long, entirely free, truncate; stamens 5, included.

PALAWAN, Taytay, *Merrill 9306*, May 31, 1913, at the borders of the forest by a small spring, altitude about 15 m.

A species well characterized by its cupreous, or brown, appressed lepidote scales, its glabrous leaflets which are narrowed upward to the long acuminate apex, the nerves obscure and the reticulations obsolete or nearly so. It falls in the group with *Aglaiia glabriflora* Hiern, according to C. DeCandolle's classification.

AGLAIIA ALTERNIFOLIOLA sp. nov. § *Euaglaiia*.

Arbor circiter 15 m alta, partibus junioribus inflorescentisque adpresse lepidotis exceptis glabra; foliis alternis, usque ad 50 cm longis, foliolis alternis, distantibus, utrinque 5 vel 6, oblongis, subcoriaceis, usque ad 20 cm longis, utrinque glaberrimis, breviter acuminatis, basi acutis ad subtruncato-rotundatis, nervis utrinque circiter 11; paniculis axillaribus, usque ad 30 cm longis, pauciramosis, ramis distantibus, laxifloris; floribus racemose dispositis, pedicellatis, 5-meris, tubus stamineus liber.

A tree about 15 m high, the younger parts and the inflorescence rather densely appressed-lepidote with brownish scales. Branches brown, rugose, terete, those 5 to 7 mm in diameter or less more or less lepidote. Leaves alternate, up to 50 cm long, the petioles, rachis and petiolules more or less lepidote; leaflets 5 or 6 on each side of the midrib, distant, alternate, oblong, subcoriaceous, entirely glabrous on both surfaces, about 20 cm long, 5.5 to 8 cm wide, base acute to subtruncate-rounded, apex shortly and rather abruptly acuminate; lateral nerves about 11 on each side of the midrib, the reticulations slender, rather distinct, lax. Panicles axillary, up to 30 cm long, branched from near the base, the branches few, the lower ones up to 13 cm long, branched and floriferous in the upper one-half, lax. Flowers racemously arranged on the ultimate branchlets, the buds obovoid, narrowed below to the stout jointed pedicel, the pedicels lepidote, 2 mm long or less. Calyx externally lepidote, 5-toothed, the teeth 0.5 mm long. Petals 5, in bud about 2 mm long,

glabrous. Staminal tube quite free, ovoid in bud, 1 to 1.2 mm long, truncate. Anthers 5, included.

BASILAN, Zimot, near the seashore, *For. Bur.* 18996 Miranda, October 4, 1912.

Apparently more closely allied to the Bornean *Aglaia laxiflora* Miq. than to any other species, but the panicles not long peduncled and much shorter than the leaves.

AGLAIA ILOILO (Blanco) comb. nov.

Melia iloilo Blanco Fl. Filip. ed. 2 (1845) 241, ed. 3, 2 (1878) 85.

Aglaia argentea F.-Vill. Novis. App. (1880) 44; Perk. Frag. Fl. Filip. (1904) 32, non Blume.

Blanco's specimens were from Arayat, Province of Pampanga, Luzon, there known as *iloilo*. He describes the species as having 12 pairs of leaflets, while our material from Arayat bearing the native name *iloilo* has 21 and 23 leaflets, with from 18 to 22 pairs of nerves. The species is manifestly closely allied to *Aglaia argentea* Blume, differing notably in the number of leaflets. Blume's species has at most 15 leaflets, usually but 11 while in the typical form the leaflets present but about 16 pairs of lateral nerves. In *Aglaia iloilo* the leaflets are oblong (not linear as described by Blanco), up to 20 cm long and 6 cm wide, base cordate, the lower surface very densely silvery lepidote. Blume's species has been well figured and described by Koorders and Valetton Ic. Bogor. 1 (1897) t. 13.

Aglaia iloilo is represented by the following specimens: LUZON, Province of Pampanga, Arayat (type locality), *Merrill* 1361, March, 1903, *For. Bur.* 17715 *Curran*, March, 1910. MINDORO, *For. Bur.* 8662 *Merritt*, January, 1908. MINDANAO, *For. Bur.* 11759 *Whitford*, March, 1912.

Var. **AMPLA** var. nov.

A typo differt foliolis majoribus, usque ad 35 cm longis et 14 cm latis.

LUZON, Province of Laguna, Mount Maquiling, *For. Bur.* 19976 *Villamil*, August, 1913.

AGLAIA LOHERI sp. nov. § *Euaglaia*.

Frutex vel arbor, ramulis subtus foliis inflorescentiisque prominente brunneo-lepidotis; foliis 20 ad 27 cm longis, foliolis 7 ad 9, lanceolatis ad oblongo-lanceolatis, crasse chartaceis, usque ad 9 cm longis, utrinque acuminatis, nervis utrinque circiter 10, obscuris; paniculis axillaribus, brevibus, circiter 7 cm longis, paucifloris; floribus racemose dispositis, 5-meris, calycibus pedicellisue dense brunneo-lepidotis, tubus stamineus liber; ovario dense lepidoto.

A shrub or tree, the branchlets and inflorescence densely brown-lepidote, the older branchlets pale, sparingly lepidote, terete, about 2 mm in diameter. Leaves 20 to 27 cm long, the rachis, petioles and petiolules more or less lepidote, often becoming glabrous or nearly so. Leaflets 7 to 9, lanceolate to oblong-lanceolate, firmly chartaceous, 7 to 9 cm long, 2 to 3 cm

wide, rather pale when dry, the upper surface quite glabrous, the lower somewhat paler, and with numerous, scattered, brown, lepidote scales that do not cover the entire surface, subequally narrowed to the acuminate apex and to the distinctly acuminate base, the bases of the lower leaflets distinctly inequilateral; lateral nerves about 10 on each side of the midrib, obscure; petiolules 7 to 10 mm long. Panicles in the upper axils, densely brown-lepidote, up to 7 cm long, branched from near the base, the branches few, the lower ones 2 cm long or less, the flowers few, racemosely disposed on the primary branches. Pedicels 1.5 to 2 mm long. Calyx densely brown-lepidote, about 2 mm long, the teeth 5, ovate, 0.7 mm long. Petals 5, glabrous, oblong-obovate, rounded, about 2 mm long. Staminal tube obovoid, glabrous, nearly 2 mm long, truncate. Anthers 0.5 mm long, sessile, included. Ovary narrowly ovoid, densely brown-lepidote, the style glabrous.

LUZON, Province of Rizal, Siya Bundoc, *Loher 5682*, June, 1905.

A species well characterized by its small, few-flowered panicles which are densely brown-lepidote. It resembles *Aglaia lanceolata* Merr., but is entirely different in its inflorescence, while from *Aglaia curranii* Merr. it is at once distinguished by its lepidote leaves.

AGLAIA MULTIFOLIOLA sp. nov. § *Euaglaia*.

Arbor circiter 15 m alta, partibus junioribus petiolis inflorescentiisque densissime cupreo-lepidotis, foliolis subtus dense brunneo-lepidotis, nitidis; foliis alternis, usque ad 80 cm longis, foliolis 25 ad 29, oblongis vel oblongo-lanceolatis, subcoriaceis, supra glabris, usque ad 20 cm longis, acuminatis, basi cordatis, plerumque inaequilateralibus, nervis utrinque circiter 20; paniculis axillaribus, pyramidatis, ad 30 cm longis; floribus 5-meris, sessilibus, in ramulis ultimis spicatum dispositis.

A tree about 15 m high, the branchlets, petioles and rachis, and inflorescence very densely cupreous-lepidote with closely appressed scales. Ultimate branchlets at least 1 cm in diameter, cupreous-brown in color, more or less marked with large petiolar scars. Leaves alternate, up to 80 cm long, the leaflets 25 to 29, oblong to oblong-lanceolate, subcoriaceous, 8 to 20 cm long, 2 to 4.5 cm wide, apex shortly acuminate, base somewhat rounded, distinctly cordate, often somewhat inequilateral, the upper surface when dry olivaceous, slightly shining, glabrous, the nerves impressed, the lower surface very densely and uniformly pale brown-lepidote, the scales shining, appressed, the midrib and lateral nerves somewhat darker colored than the surface; lateral nerves about 20 on each side of the midrib, distinct, the reticulations, entirely obscured by the indumentum. Panicles axillary,

up to 30 cm long, densely cupreous-lepidote, pyramidal, many flowered, the lower branches up to 15 cm long, spreading, the upper gradually shorter, scattered. Flowers 5-merous, sessile, spicately disposed on the ultimate branchlets, in young panicles somewhat crowded and subglomerate. Calyx densely cupreous-lepidote, cup-shaped, about 1.5 mm in diameter. Petals 5, oblong-elliptic to elliptic-obovate, glabrous, free, about 2 mm long. Staminal tube turbinate-obovoid, truncate, free, about 1.5 mm in diameter; anthers 5, included, broadly ovoid, about 0.8 mm long. Ovary densely lepidote, the scales minutely ciliate.

MINDANAO, District of Zamboanga, Port Banga, *For. Bur.* 9208 Whitford & Hutchinson (type), January, 1908. BASILAN, Hallier s. n., January, 1904, *For. Bur.* 18964 Miranda, September 30, 1912.

This species grows in forests at low altitudes and is known at Port Banga as *bancogniau*, while the name given on one of the Basilan specimens is *tocang calao*. Its alliance is with *Aglaiia argentea* Blume, from which it is at once distinguished by its much more numerous leaflets and more numerous nerves. It is more closely allied to the Philippine *Aglaiia clarkii* Merr., from which it is distinguished by its quite different indumentum, differently shaped leaflets, and fewer lateral nerves.

AGLAIIA STELLATO-TOMENTOSA sp. nov. § *Euaglaiia* ?

Arbor circiter 15 m alta partibus junioribus subtus foliolis inflorescentiisque dense pallide stellato-tomentosis; foliis alternis, usque ad 1 m longis, foliolis circiter 15, oppositis vel suboppositis, chartaceis, usque ad 30 cm longis, oblongis, acuminatis, basi rotundatis ad leviter cordatis, supra glabris, nitidis, subtus densissime stellato-tomentosis, nervis utrinque 25 ad 30, prominentibus; fructibus paniculatis vel racemosis, obovoideis, usque ad 2 cm longis, densissime stellato-tomentosis.

A tree about 15 m high, the younger parts, inflorescence, and lower surfaces of the leaflets densely stellate-tomentose, the indumentum pale, sometimes somewhat ferruginous on the younger parts. Branchlets stout, the ultimate ones about 1.5 cm in diameter, ferruginous stellate-tomentose. Leaves alternate, up to 1 m in length, the petioles very stout, about 20 cm long, and with the rachis, at least when young, very densely stellate-tomentose with usually pale, rarely somewhat ferruginous hairs. Leaflets about 15, oblong, chartaceous, opposite or subopposite, 20 to 30 cm long, 6 to 10 m wide, apex rather shortly acuminate, base broadly rounded to subcordate, the upper surface glabrous, pale or olivaceous, shining, the lower surface densely stellate-tomentose, pale; lateral nerves 25 to 30 on each side of the midrib, prominent, the reticulations obscure on the upper surface, entirely obscured by the indumentum on the lower surface. Flowers not seen, the inflorescence axillary, solitary,

densely stellate-tomentose, the fruiting racemes 20 cm long or less. Fruits obovoid, up to 2 cm long (somewhat immature), the pericarp densely stellate-tomentose with pale-brownish indumentum, wrinkled when dry, the pedicels stout, 5 mm long or less.

BASILAN, *For. Bur.* 20085 *Miranda* (type), October, 1912, or from the neighboring island of Malamaui. MINDANAO, District of Cotabato, *For. Bur.* 14917 *Tarroso*, May 31, 1912. Here I also refer tentatively *Hallier* s. n. from Basilan, differing from the type in having a paniced, not racemose infructescence.

Among the Philippine species most closely allied to *Aglaia bernardoi* Merr. from northern Luzon. Its true alliance, however, seems to be with *Aglaia hemsleyi* Koord. of Celebes, differing from that species notably in its pale, not ferruginous indumentum.

AGLAIA VILLAMILII sp. nov. § *Euaglaia*.

Arbor circiter 25 m alta, partibus junioribus inflorescentiisque brunneo-lepidotis; foliis circiter 50 cm longis, foliolis 14, oblongis, chartaceis, usque ad 15 cm longis, utrinque glabris vel junioribus subtus parcissime lepidotis; paniculis terminalibus, folia subaequantibus, multifloris; floribus 5-meris, in ramulis ultimis subspicatum dispositis, confertis, tubus stamineus liber, ovoideus ad obovoideus, ore valde contractus.

A tree about 25 m high, the younger parts and the inflorescence rather densely brown-lepidote, the scales on the inflorescence dark-brown in color. Branches terete, the ultimate ones about 5 mm in diameter. Leaves about 50 cm long, the rachis, petioles, and petiolules brown-lepidote. Leaflets 14, oblong, chartaceous, 10 to 15 cm long, 4 to 5 cm wide, rather pale when dry, the upper surface shining, glabrous, the lower surface rather dull, glabrous, or in young leaflets sparingly lepidote in the lower part near the midrib, the apex blunt-acuminate, the base acute to rounded, somewhat inequilateral; lateral nerves about 15 on each side of the midrib; petiolules about 5 mm long. Panicles terminal, many flowered, about as long as the leaves, the lower branches up to 14 cm in length, the upper gradually shorter. Flowers subspicately crowded on the ultimate branchlets, yellow, the pedicels stout, very short. Calyx externally densely dark-brown lepidote, short, 5-toothed, about 1.5 mm in diameter. Petals 5, oblong-elliptic, obtuse, 2.8 mm long, Staminal tube ovoid to obovoid, glabrous, free, about 2.2 mm long, 1.6 mm in diameter, rounded at the apex and contracted to a mouth about 0.3 mm in diameter. Stamens 5, wholly included, the anthers about 1.2 mm long.

MINDANAO, District of Zamboanga, Margosatubig, *For. Bur.* 21866 *Vil-*

lamil, June 8, 1914, on slopes in forests, altitude about 60 meters, locally known as *sandalo*.

A very characteristic species, recognizable by its large, many flowered, dark-brown lepidote panicles, its long leaves with numerous nearly or quite glabrous leaflets, its subspicate but densely arranged flowers, and by the staminal tubes being rounded and contracted to a minute orifice. It belongs in the group with *Aglaia glabriflora* Hiern, according to the classification of C. DeCandolle, but is very different from the species placed here.

AGLAIA LAGUNENSIS sp. nov. § *Hearnia*.

Arbor parva partibus junioribus inflorescentiisque exceptis glabra; foliis circiter 30 cm longis, foliolis 6 vel 7, crasse chartaceis vel subcoriaceis, oblongis ad oblongo-obovatis, usque ad 18 cm longis, acuminatis, utrinque glabris, nervis utrinque circiter 10; paniculis axillaribus, pyramidatis, quam folia paulo brevioribus, lepidotis, multifloris; floribus in ramulis ultimis racemose dispositis, tubus stamineus liber, crenulatus.

A tree about 8 m high, the younger parts and the inflorescence lepidote, otherwise glabrous. Branches terete, the ultimate ones 2 to 3 mm in diameter and rather densely lepidote with small, pale-brownish scales. Leaves about 30 cm long, the rachis, petioles and petiolules pale brownish-lepidote. Leaflets 6 or 7, firmly chartaceous to subcoriaceous, oblong to oblong-obovate, or the lower ones broadly ovate, acuminate, rather pale when dry, slightly shining, glabrous on both surfaces, the lower surface a little paler than the upper, the base acute to rounded; lateral nerves about 10 on each side of the midrib; petiolules 5 to 10 mm long. Panicles in the upper axils, pyramidal, many flowered, rather lax, up to 25 cm in length, the branches spreading, rather slender, the lower ones sometimes up to 20 cm in length, all parts rather densely lepidote with pale-brownish, small scales. Flowers small, yellow, racemosely and laxly disposed on the ultimate branchlets, the pedicels slender, up to 2 mm in length. Calyx about 1.5 mm in diameter, 5-toothed, lepidote. Petals 5, glabrous, free, obovate to oblong-obovate, obtuse, about 1.5 mm long. Staminal tube turbinate, glabrous, shallow, about 1.5 mm in diameter, the margins crenulate, bearing 5, somewhat inflexed, broadly ovate, sessile, 0.3 mm long anthers on the very margin. Fruits subglobose to ovoid, when dry 2 to 2.5 cm long, brown, glabrous, the fleshy pulp surrounding the seeds edible.

LUZON, Province of Laguna, Mount Maquiling, *For. Bur.* 20497, 20586 *Villamil*, September, 1913, in forests, altitude about 225 meters, *For. Bur.* 10324 *Florentino*, August, 1912 (type).

Among the Philippine species most closely allied to *Aglaia everettii* Merr., but the lepidote scales not at all tomentose.

DYSOXYLUM Blume

DYSOXYLUM LONGIFLORUM sp. nov. § *Eudysoxylum*.

Arbor parva, partibus junioribus foliisque plus minusve ciliato-hirsutis; foliis usque ad 60 cm longis, foliolis 15 ad 19, submembranaceis, oblongo-obovatis, usque ad 18 cm longis, nervis utrinque circiter 13; floribus circiter 2.5 cm longis, caulinis, e tuberculis magnis, racemosis (?) vel fasciculatis (?), petalis cum tubo plus minusve connatis, extus in partibus superioribus pubescentibus; ovario dense villosa.

A tree about 7 m high, the younger parts, petioles, rachis, midrib on the upper surface, and midrib and nerves on the lower surface more or less ciliate-hirsute. Leaves alternate, up to 60 cm long. Leaflets 15 to 19, submembranaceous, oblong-obovate, subolivaceous, 12 to 18 cm long, 4 to 5 cm wide, shortly and obtusely acuminate, base narrowed, more or less inequilateral, acute to subobtuse, the margins somewhat ciliate; lateral nerves about 13 on each side of the midrib. Flowers white, about 2.5 cm long, fascicled or in short racemes on large woody tubercles on the trunk, the pedicels about 1 cm long. Calyx cylindric, 12 mm long, externally slightly pubescent, 3-lobed, the lobes broadly ovate, about 3 mm long. Petals about 2.5 cm long, the lower 10 mm more or less connate with the tube, about 2 mm wide, externally distinctly pubescent in the upper part. Disk glabrous, cylindric, truncate, free, about 4.5 mm long. Staminal tube cylindric, glabrous, about 2.5 cm long, irregularly lobed at the apex, the anthers oblong, 1.2 mm long, inserted near the apex of the tube. Ovary densely villous, the style densely villous in the lower one-half, glabrous above; stigma 1 mm in diameter.

LUZON, Province of Cagayan, Pamplona, in forests, *Bur. Sci.* 7480 Ramos, March 17, 1909.

A very characteristic species on account of its unusually long flowers which are borne on large woody tubercles on the trunk. It resembles *Dysoxylum cumingianum* in its cauline inflorescence but it entirely different in its floral and vegetative characters, while the petals are manifestly connate with the staminal tube.

DYSOXYLUM PALAWANENSE sp. nov. § *Eudysoxylum*.

Arbor 10 ad 15 m alta partibus junioribus inflorescentiisque cinereo-puberulis exceptis glabra; foliis alternis, usque ad 30 cm longis, foliolis 8, coriaceis, oblongis, leviter acuminatis, in siccitate utrinque densissime verruculosus, nervis utrinque cir-

citer 10; inflorescentiis axillaribus, simplicibus, spiciformis, usque ad 18 cm longis; floribus 4-meris, circiter 6 mm longis, fasciculatis, extus puberulis, breviter pedicellatis; tubus stamineus liber; ovario puberulo.

A tree 10 to 15 m high, the younger parts and the inflorescence cinereous-puberulent. Branches terete, wrinkled, grayish-brown, glabrous, the growing parts densely puberulent. Leaves alternate up to 30 cm long, glabrous, or the very young ones more or less puberulent; leaflets usually 8, coriaceous, brittle, in general oblong, 9 to 11 cm long, 3.5 to 4.5 cm wide, acuminate, base mostly acute, usually more or less inequilateral, when dry brownish, dull, both surfaces minutely and densely verruculose; lateral nerves about 10 on each side of the midrib, not prominent, the reticulations nearly obsolete. Inflorescence cinereous-puberulent, spiciform, up to 18 cm long, solitary, axillary, the flowers fascicled at the nodes, very shortly pedicellate, yellow or greenish-yellow. Calyx puberulent, shallow, about 1.6 mm in diameter, shallowly 4-toothed. Petals 4, oblong, free, about 6 mm long, 2 to 2.5 mm wide, externally slightly puberulent. Staminal tube cylindric, glabrous, free, truncate, 5 mm long. Anthers 8, 1 mm long, oblong, included. Disk shallow, about 1 mm high, 1.5 mm in diameter, truncate, glabrous. Ovary ovoid, 4-celled, puberulent; style about 3 mm long, glabrous or nearly so.

PALAWAN, Silanga, Merrill 9608, May 24, 1913, in forests at low altitudes.

In vegetative characters this species closely resembles *Dysoxylum verruculosum* Merr., but its calyx is entirely different. It belongs in the group with *Dysoxylum vrieseanum* C. DC., but is quite different from it and the other species placed here.

DYSOXYLUM RAMOSII sp. nov. § *Eudysoxylum*.

Arbor parva, partibus junioribus inflorescentiisque puberulis, foliolis subtus ad costa nervisque leviter hirsutis; foliis alternis, usque ad 30 cm longis, foliolis plerumque 6, coriaceis, oblongo-obovatis ad ellipticis, usque ad 11 cm longis, in siccitate olivaceis, plus minusve verruculosus, abrupte breviter acuminatis, nervis utrinque circiter 7; inflorescentiis axillaribus, solitariis, simplicibus, racemosis, usque ad 10 cm longis; floribus circiter 7 mm longis, extus puberulis, petalis liberis, ovario puberulo.

A tree about 8 m high, the younger parts and the inflorescence more or less cinereous-puberulent, the leaflets more or less hirsute on the midrib and lateral nerves beneath. Branches subterete, usually puberulent, grayish-brown in color when dry. Leaves alternate, up to 30 cm long, the leaflets usually 6; leaflets oblong-obovate to elliptic, coriaceous, brittle, olivaceous and of

the same color on both surfaces when dry, dull or slightly shining, more or less verruculose, 9 to 11 cm long, 4 to 7 cm wide, the apex abruptly and shortly blunt-acuminate, base acute to rounded; lateral nerves about 7 on each side of the midrib, rather prominent on the lower surface and here more or less hirsute. Inflorescence axillary, solitary, spike-like, simple, up to 10 cm long, the flowers more or less fascicled, their pedicels 2 mm long or less. Flowers white, 4-merous. Calyx shallow, about 4 mm in diameter, obscurely 4-toothed, puberulent. Petals 4, oblong, puberulent externally, about 7 mm long, 3 mm wide. Staminal tube cylindric, glabrous, free, obscurely crenulate, about 6 mm long; anthers 1.2 mm long, oblong, included. Disk free, glabrous, somewhat crenulate, about 2 mm long. Ovary ovoid, 4-celled, puberulent; style 4 mm long, puberulent below, nearly glabrous upward.

LUZON, Province of Laguna, San Antonio, *Bur. Sci. 20512 Ramos* (type), March 3, 1913, in forests. *Bur. Sci. 20538 Ramos*, same locality and date is probably referable to the same species, but its leaves are smaller and very slightly hirsute or nearly glabrous beneath, while the racemes are shorter.

This species approaches *Dysoxylum wenzelii* Merr. in many characters, but it is quite different in its leaves. It is in the alliance with *Dysoxylum vrieseanum* C. DC., but is entirely different from the other species placed here.

DYSOXYLUM ROBINSONII sp. nov. § *Eudysoxylum*.

Arbor glabra, vel foliolis junioribus leviter pubescentibus; foliis alternis, usque ad 60 cm longis, foliolis circiter 15, oblongis ad oblongo-lanceolatis, acuminatis usque ad 19 cm longis, nervis utrinque circiter 15; racemis brevibus, paucifloris, caulinis, e tuberculis magnis; floribus circiter 1.7 cm longis, 4-meris, tubus stamineus liber, ovario dense villosa, petalis extus leviter pubescentibus.

A tree about 8 m high, quite glabrous except the young leaflets which are sparingly pubescent. Branches terete or somewhat compressed, pale-brownish, the ultimate ones 5 to 7 mm in diameter. Leaves alternate, up to 60 cm long. Leaflets about 15, oblong to oblong-lanceolate, chartaceous, greenish or brownish when dry, quite glabrous, 9 to 19 cm long, 2.5 to 6 cm wide, the apex more or less acuminate, base obtuse, often somewhat inequilateral; lateral nerves about 15 on each side of the midrib, in younger leaves somewhat pubescent. Racemes few flowered, 3.5 cm long or less, from large woody tubercles on the trunk, usually but 3 or 4 flowers in each raceme. Flowers 4-merous, about 1.7 cm long, their pedicels about 13 mm in length, glabrous.

Calyx cylindric, somewhat inflated, about 10 mm long, 3-lobed, the lobes broadly ovate, about 3 mm long, externally slightly pubescent. Petals 4, about 1.7 cm long, 2.8 mm wide, pubescent on the back in the upper one-half. Staminal tube cylindric, free, glabrous, about 16 mm long, the lobes about 2 mm long; anthers 8, oblong, 1.2 mm long, at the apex of the tube. Disk cylindric, glabrous free, truncate, 4 mm long. Ovary densely villous, the style villous in the lower one-half, glabrous above.

LUZON, Province of Laguna, Mount Banajao, *Bur. Sci.* 9870, 6055 Robinson, March 5, 1910, and March 8, 1911, in forests, altitude about 700 meters: Province of Tayabas, Lucban (Mount Banajao), *Bur. Sci.* 19510 Ramos, January, 1913 (type).

A species in the group with *Dysoxylum cumingianum* C. DC., but entirely different in its vegetative characters, more numerous, leaflets, and especially in its few flowered racemes and very much larger flowers.

[Vol. IX, No. 5, including pages 391 to 494, was issued January 30, 1915.]

ERRATA

Page 13, line 2 from the bottom, for Jara, read Java.

56, line 2 from the top, for *Panicum molle* Sw., read *Panicum barbinode* Trin.

57, line 15 from the top, for *Cynorosus*, read *Cynosurus*.

99, line 3 from the bottom, for *adoratissima*, read *odoratissima*.

125, line 14 from the bottom, for *Paratrophia*, read *Paratropia*.

133, line 13 from the top, for (Hallier f.), read (Linn.).

141, line 11 from the bottom, for AGANTHACEAE, read ACANTHACEAE.

162, line 1, bottom, for *Diatype*, read *Diatrype*.

185, lines 11 and 12 from the top, for CENTHOSPORA, read CEUTHOSPORA.

236, line 2 from the top, for DENTRITICA, read DENDRITICA.

261, add X, after the last word of the title.

277, line 2 from the top, for LORANTHIS, read LORANTHUS.

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[New genera, new species, and combinations published for the first time are in black-faced type; synonyms and species mentioned incidentally in the text, are in *italics*.]

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