

Vascular Flora of Pagan Island, Northern Marianas¹

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THE ISLAND OF PAGAN is composed of two active volcanic mountains connected by a low isthmus. It is situated at about the center of the chain of young volcanic islands that make up the northern half of the Marianas at 18° 6'N., 145°45'E. Its flora is not very well known, and doubtless a fair number of species remain to be found there. In connection with the preparation of reports on the geology of the island (Corwin, *et al.*, ined.) and on a collection of fossil plants (Fosberg and Corwin, 1958) it has been necessary to bring together as completely as feasible the records of vascular plants found there to date.

Few botanical collectors have visited Pagan. Perhaps the first was A. Marche, who made general collections during a voyage to the Marianas in 1887 to 1889. There are a few specimens from Pagan in his collection which is at the Museum d'Histoire Naturelle in Paris. No comprehensive report on his plants has ever been published, and most of the specimens are only now being identified. It is not possible at this time to compile a complete list of his Pagan specimens, but those available are included here. The next visitor who left any botanical records was the German governor, G. Fritz, who made a voyage to the northern Marianas in 1901. He noted a few of the prominent plants, especially cultivated ones, and planted trees of several kinds on the various islands. His records, though not supported by specimens, are indicated in the following list by the symbol **Fr** in bold-faced type.

A long period with no botanical work on the island followed until the early 1930's, when the Japanese botanists became very active in Micronesia. In 1933 Prof. Ryôzô Kanehira made a short visit to Pagan, collecting a few specimens, several of which he reported in 1934 and the others in 1935. Prof. T. Hosokawa made two short visits in July and August, 1934, during which 42 plants were gathered. In 1934 he listed his own and previous records from all the Marianas, listing the islands for each species.

In 1949, under the auspices of the Pacific Vegetation Project, Mr. Donald Anderson spent a few days on the island and collected a fair number of species. A set of these will be deposited in the U. S. National Herbarium and others in the Bernice P. Bishop Museum and the New York Botanical Garden. In 1950, I was able to spend a day on the island and collected a number of specimens, sets of which will be deposited in the same herbaria. During a geological study of the island in the summer of 1954, Mr. L. D. Bonham, of the U. S. Geological Survey, collected 40 specimens in order to obtain identifications of plants mentioned in his account of the vegetation (in Corwin *et al.*, in preparation). His specimens will be deposited in the U. S. National Herbarium. One sight record by G. L. Corwin is included.

On the basis of these collections and records there are at present 168 species and varieties of vascular plants known from the island, 101 of which are probably indigenous, 8 (at least) of aboriginal introduction, and 59 probably of post-European introduction. In addition to these, 4 other species are recognized only as fossils (Fosberg and Corwin, 1958). In the following list specimens are not

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² United States Geological Survey, Washington 25, D. C.

cited, as I plan to publish an annotated catalog of the flora of Micronesia, in which all specimens seen will be cited. Neither a description of the island nor of its vegetation are included as these will be given in a paper on the fossil plants (Fosberg and Corwin, 1958). After each species the workers who have recorded or collected it on Pagan are designated by the following symbols in bold-faced type:

Marche	M
Fritz	Fr
Kanehira	K
Hosokawa	H
Anderson	A
Fosberg	Fo
Bonham	B
Corwin	C

The nomenclature is that presently accepted by me and not necessarily that under which the original reports were made.

The indigenous flora is almost entirely an attenuation of that of the Marianas group to the south, some of the species extending northward to the Bonin Islands. *Trema argentea* and *Myoporum boninense* may possibly be plants that have spread from the Bonin Islands southward in prehistoric time, though a spread in the opposite direction is entirely possible, as both species are known from Saipan. *Fimbristylis urakasiana* has previously been regarded as endemic on Uracas, the northernmost of the Marianas. It is very likely present at least on all of the recent volcanic islands of the group, but they have not been adequately enough studied and collected to detect all plants present, especially in such groups as *Fimbristylis*. Of the species and varieties, both recent and fossil, 20 are probably endemic to the Marianas and 3 more to the Mariana, Volcano, and Bonin islands. The remainder are widespread species, mainly of lowlands and strands of the Indo-Pacific area, a few of them almost pantropic. These figures are probably valuable only as a general indication of the distributional relations on a rather young volcanic island. When more

complete collections have been made, both on Pagan and on the other northern Marianas, more reliable and significant conclusions may be reached as to the origin of the flora of this area.

SYSTEMATIC LIST OF SPECIES

* Indicates recently introduced species; † indicates species believed to be of aboriginal introduction.

- Gleichenia linearis* (Burm. f.) C.B.Cl. **Fo**
Cheilanthes tenuifolia (Burm.) Sw. **H, Fo**
Acrostichum aureum L. **H, Fo**
Asplenium laserpitiifolium Lam. **H**
Asplenium nidus L. **A**
Asplenium unilaterale Lam. **H**
Davallia solida (Forst. f.) Sw. **H, A**
Dryopteris unita (L.) O. Ktze. **Fo, B**
 "Lastrea" *torresiana* (Gaud.) Moore **A, Fo**
Nephrolepis hirsutula (Forst. f.) Presl **H, A, Fo, B**
Polypodium scolopendria Burm. f. **H, Fo, B**
Pteris quadriaurita Retz. **H, Fo**
Sphenomeris chinensis (L.) Maxon **Fo**
Psilotum nudum (L.) Griseb. **H**
Freyinetia mariannensis Merr. **H, A**
Pandanus dubius Spr. **H**
Pandanus tectorius Park. **K, H, A, B**
 Cenchrus brownii* R. & S. **A
 Cenchrus echinatus* L. **A
 Chloris inflata* Link **B
Chrysopogon aciculatus (Retz.) Trin. **A, Fo, B**
 Cynodon dactylon* (L.) Pers. **A, B
 Dactyloctenium aegyptium* (L.) Willd. **H, A, Fo, B
 Digitaria ciliaris* (Retz.) Koel. **Fo
 Eleusine indica* (L.) Gaertn. **A, Fo
 Eragrostis amabilis* (L.) W. & A. **H, A, Fo
Heteropogon contortus (L.) Beauv. **A, Fo**
Miscanthus floridulus (Labill.) Warb. **H, K, A, B**
Panicum ambiguum Trin. **A, Fo**
 Paspalum conjugatum* Berg. **Fo
Paspalum orbiculare Forst. f. **A, Fo**
 Pennisetum purpureum* Schumach **Fo
Sporobolus virginicus (L.) Kunth **A, B**
Thuarea involuta (Forst. f.) R. & S. **H**
 Zea mays* L. **Fr

- Zoysia tenuifolia* Trin. A, Fo
 **Cyperus compressus* L. A, B
Cyperus cyperinus (Retz.) Vahl. A
Cyperus javanicus Houtt. A, Fo
Cyperus polystachyos Rottb. Fo
Fimbristylis annua (All.) R. & S. A
Fimbristylis cymosa R. Br. A
Fimbristylis urakasiana Kük. Fo
Scleria lithosperma (L.) Sw. A
 †*Alocasia macrorrhiza* (L.) Schott H, Fo, B
 †*Colocasia esculenta* (L.) Schott Fo
 **Xanthosoma sagittifolia* Schott A
 †*Areca cathecu* L. C
 †*Cocos nucifera* L. Fr, B
 **Ananas comosus* (L.) Merr. Fr, A, Fo, B
 **Agave americana* L. B
 **Agave sisalana* Perr.? A
Dianella ensiformis (L.) DC. (Fossil only)
 **Crinum* sp. H
Curculigo orchioides Gaertn. H, K
 **Hymenocallis littoralis* (Jacq.) Salisb. A, B
 †*Tacca leontopetaloides* (L.) O. Ktze. H, A
 †*Musa sapientum* L. Fr, H, B
Spathoglottis micronesiaca Schltr. (Fossil only)
Taeniophyllum mariannense Schltr. H
Casuarina equisetifolia L. Fr, H, A, Fo, B
Trema argentea Pl. H, K, A, Fo
Boehmeria celebica B. H
Pipturus argenteus (Forst. f.) Wedd. H, A, B
 †*Artocarpus altilis* (Park.) Fosb. Fr, H, A, B
Ficus prolixa var. *carolinensis* (Warb.) Fosb. H, A, Fo, B
Ficus tinctoria var. *neo-ebudorum* (Summ.) Fosb. H, A, Fo, B
 **Achyranthes aspera* L. H
 **Amaranthus spinosus* L. Fo
Boerhavia diffusa L. H
Sesuvium portulacastrum L. A
 **Portulaca oleracea* L. A, Fo
Portulaca samoensis var. Poelln. H, A, B
Guamia mariannae (Saff.) Merr. K, H, K, A
Cassytha filiformis L. H
Hernandia sonora L. H
Capparis cordifolia Lam. A
Abrus precatorius L. M, H, A, Fo
Canavalia sericea Gray H, B
Cantharospermum scarabaeoides (L.) Bail. H
 **Cassia lechenaultiana* DC. K, A
 **Cassia occidentalis* L. A, Fo
 **Cassia tora* L. H
 **Crotalaria mucronata* Desv. A, Fo
 **Crotalaria trifoliatrum* Willd. H, H
 **Delonix regia* (Boj.) Raf. B
 **Desmodium triflorum* (L.) DC. H, A, Fo
Erythrina variegata var. *orientalis* (L.) Merr. H, A
Glycine clandestina Wendl. H, H
Mucuna gigantea (Willd.) DC. A
Mucuna pruriens (L.) DC. H
 **Pithecellobium dulce* (Roxb.) Benth. K, A, B
Vigna marina (Burm.) Merr. H, K, A
 **Citrus* sp. C
 **Euphorbia hirta* L. H, K, A, Fo
 **Euphorbia prostrata* Ait. Fo, B
 **Euphorbia thymifolia* L. A, Fo
 **Jatropha curcas* L. A
 **Jatropha gossypifolia* L. A, Fo, B
Macaranga thompsonii Merr. (Fossil only)
 **Manihot esculenta* Crantz A
Melanolepis multiglandulosa var. *glabrata* (M.-A.) Fosb. H, Fo, B
Phyllanthus mariannensis M.-A. H, K
 **Phyllanthus niruri* L. A, Fo
Aglaiia mariannensis Merr. H, A, Fo
 **Mangifera indica* L. B
Tristiropsis obtusangula Radlk. (Fossil only)
Colubrina asiatica (L.) Brongn. H, A
Elaeocarpus joga Merr. H, K
Grewia crenata (L. f.) Schinz & Guill. M, H, A, Fo
 **Triumfetta semitriloba* Jacq. A
 **Gossypium hirsutum* L.? A, B
Hibiscus tiliaceus L. H, A, Fo, B
 **Sida acuta* Burm. f. H, A, Fo
 **Sida rhombifolia* L. M, H, Fo
Thespesia populnea (L.) Sol. A
Urena lobata L. H
 **Ceiba pentandra* (L.) Gaertn. A
Melochia sp. A
Calophyllum inophyllum L. A
Ochrocarpos odoratus (Raf.) Merr. H
Eurya nitida Korth. H
 **Carica papaya* L. A, Fo

**Passiflora foetida* var. *hispida* (DC.) Killip. A, Fo, B
Pemphis acidula Forst. H, A
Terminalia catappa L. H, A
Eugenia reinwardtiana DC. A
 **Psidium guajava* L. A
Barringtonia asiatica (L.) Kurz H, A, B
Melastoma malabathricum L. Fo
Polyscias grandifolia Volk. H, A
 **Polyscias scutellaria* (Burm. f.) Fosb. Fo
Centella asiatica (L.) Urb. H
Lysimachia mauritiana Lam. H, H
Dioscalyx megacarpa Merr. H
Pouteria obovata (R. Br.) Baehni H, A
Geniostoma micranthum DC. K
Jasminum marianum DC. A
Bleekeria mariannensis (A. DC.) Koidz. K, H, K, A
Cerbera dilatata Mgf. H, A
Ochrosia oppositifolia (Lam.) K. Schum. H, A, B
 **Thevetia peruviana* (Pers.) Merr. A, Fo
 **Ipomoea aquatica* Forsk. Fo
 **Ipomoea batatas* (L.) Poir. Fr, A, Fo
Ipomoea pes-caprae (L.) Sweet H, A, Fo, B
Operculina ventricosa (Bert.) Peter M, Fo
Heliotropium ovalifolium var. *depressum* (Cham.) Merr. Fo
Messerschmidia argentea (L. f.) Johnst. H
 **Hyptis pectinata* (L.) Poir. Fo
 **Hyptis capitata* Jacq. H
 **Hyptis suaveolens* Poir. H
Callicarpa candicans (Burm. f.) Hochr. H, A
Callicarpa lamii Hosok. M, A
Premna obtusifolia R. Br. H, K, A, Fo, B
 **Stachytarpheta indica* (L.) Vahl A, Fo
Vitex negundo L. H
Myoporum boninense Koidz. A
Hedyotis foetida var. *mariannensis* (Merr.) Fosb. H, A

**Morinda citrifolia* L. H, A, B
Psychotria mariana Bartl. H, K, A, Fo, B
Randia cochinchinensis (Lour.) Merr. A
Scaevola frutescens (Mill.) Kr. H, A
 **Ageratum conyzoides* L. Fo
 **Elephantopus mollis* H. B. K. K, A, Fo
 **Emilia sonchifolia* (L.) DC. A, Fo
Glossogyne tenuifolia Cass. H, K, Fo
 **Synedrella nodiflora* Gaertn. H, K
 **Vernonia cinerea* (L.) Less. H, A, Fo
Wedelia biflora (L.) DC. H, A, Fo
Wedelia biflora var. *canescens* (Gaud.) Fosb. A

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