

## A TAXONOMIC REVISION OF PLAGIOGYRIACEAE (PTERIDOPHYTA)

XIAN-CHUN ZHANG<sup>1</sup> & H.P. NOOTEBOOM<sup>2</sup>

### SUMMARY

A taxonomic revision of Plagiogyriaceae is presented. One genus and 11 species are recognised. One species, *P. egenolfioides*, is subdivided into four varieties. Only one species, *P. pectinata*, occurs in the New World, all others in the Old World. One species, *P. glauca*, and one variety, *P. egenolfioides* var. *decrescens*, extend east to the S Pacific islands (Solomons).

### INTRODUCTION

As a preliminary result of the current study, eleven species are recognised. Most of the wide-spread species are represented by local populations with diverse ranges of variation. This resulted in the past in endless unnecessary splitting based on a number of mostly overlapping characters, like the form of the frond-apex (pinna-like or not), the degree of pinna margin serration, aerophores' appearance, and the size of specimens. The number of species accepted here agrees with that in Christensen's index (1906), and also with the estimates of Tryon & Tryon (1982), and Tryon & Stolze (1989). Tryon also correctly predicted that there is not such a large diversification in *Plagiogyria* as recognised by some botanists.

Under 'Morphology' the paragraphs about the spores is written by Dr. G.A. van Uffelen.

### MATERIAL AND METHODS

During our joint research on Plagiogyriaceae for a revision for Flora Malesiana, most of the important types housed in American, European, Japanese, and Indonesian herbaria were available on loan or in the herbaria visited. Those of Blume, Rosenstock, Alderwerelt and Raciborski are in Leiden and those of Ching in Beijing. A total of about 1700 collections represented by more than 3000 herbarium sheets were studied with the aid of computer programmes for handling taxonomic collections and literature. These programmes were devised by the second author using Dbase IV. Further DELTA, TAXASOFT, and KCONI were used for technical and key descriptions.

1) The Herbarium, Institute of Botany, Academia Sinica, Beijing 100093, China.

2) Rijksherbarium/Hortus Botanicus, P.O. Box 9514, 2300 RA Leiden, The Netherlands.

## TAXONOMIC HISTORY

The first scientific record of a *Plagiogyria* species is found in Plumier's "Traité des Fougères de L'Amérique" published at Paris in 1705 before Linnaeus' invention of binomial nomenclature. Plumier's plate no. 81 correctly illustrates a specimen of the American *Plagiogyria*, except the long creeping rhizome, which must be an imagination. Plumier named his plant from Haiti as "*polypodium fuscum tenuissimis denticulis serratum*". Later, Willdenow (1810) gave it a formal binomial '*Acrostichum serrulatum*'. It seems it had never been recognised as a *Plagiogyria* until Lellinger made the new combination in 1971. Unfortunately, it is an illegal name [see literature cited under *Plagiogyria pectinata* (Liebm.) Lellinger in this paper]. As early as 1828 all the *Plagiogyria* species in Java were recorded by Blume in his enumeration, namely *P. adnata*, *P. glauca*, and *P. pycnophylla* (Blume's '*Lomaria glauca* var. *C*'), under the old comprehensive genus '*Lomaria*' (now *Blechnum* section *Lomaria*). At the same time, Wallich collected *Plagiogyria euphlebia* ('*Acrostichum triquetrum* Wall. no. 23, 1828, nomen') from the Himalayas, and already realised the character of a peculiar stipe-base of this group of plants, which can be inferred from the epithet. Kunze (1850) invented the name *Plagiogyria* only as a section name of *Lomaria*, based on the accurate observation of the complete oblique annulus in *L. euphlebia* Kunze and *L. glauca* Blume. One year after Kunze ascribed to *Plagiogyria* the above Asian species, Presl (1851) used two generic names for the American species, namely *Lomariidium* and *Polygramma*, of which the latter is invalid; if it had been validly published, *Polygramma* would be the correct genus name (cf. Pichi Sermolli, 1972).

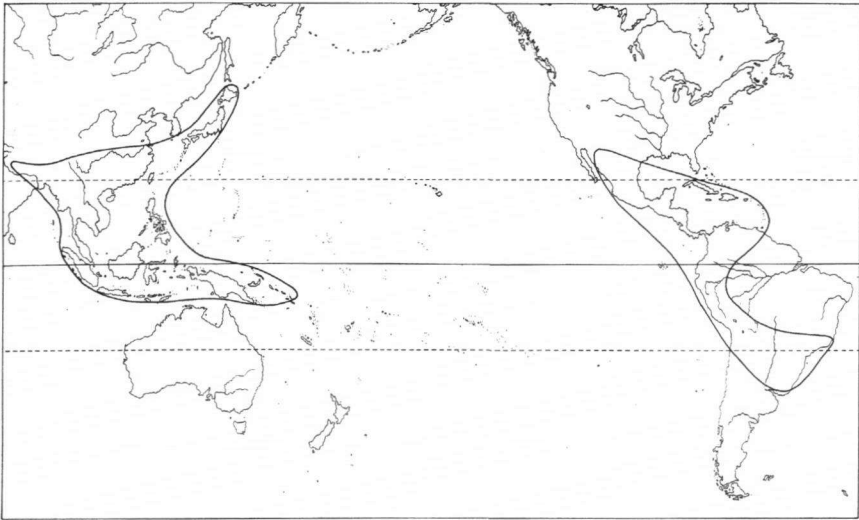
Mettenius in 1858 was the first to make a monographic study of *Plagiogyria*; he recognised six species when he published this genus. He was largely followed by other taxonomists although some authors continued to use *Lomaria*, *Lomariopsis*, *Stenochlaena*, or *Blechnum*, etc., because of their superficial similar appearance, and sometimes growing in the same environment. Hooker's conservative attitude is well known and his influence was great in systematic study of pteridology. Hooker and his followers just treated *Plagiogyria* as a section of *Lomaria*. From the last half of the 19th to the beginning of the 20th century, Baker, Hance, Christ, Makino, Alderwerelt, Rosenstock, Brause, Nakai, etc., occasionally published species of *Plagiogyria* under various genera. Nakai (1928) divided 18 *Plagiogyria* species into two groups, the *Polypneumatophorata* group, and the *Paripneumatophorata* group, which are somewhat natural from taxonomic and ecological view. He was also the first to accept Bower's family. With the increase of collections both from tropical Asia and America, Copeland made an extensive survey in 1929. As he stated himself, "The chief service of a treatise of this kind is to facilitate the study of the genus by others. Theoretically, it might be to make such study unnecessary; but the lesson of experience is that whenever a monograph is accepted for any considerable time as final, the result is that its field lags behind others ..." His paper is in large an assemblage of the knowledge of this group of ferns up to his time. Copeland was rather stubborn in not accepting Bower's evolutionary research, and "on rather important grounds of convenience", he put *Plagiogyria* in 'Polypodiaceae'.

In 1958 Ching published an important treatise on the Plagiogyriaceae of mainland Asia. He proposed an infrageneric classification and construed its phyletic relation as

well as dispersal routes. Copeland recognised 33 species of which 10 in the New World and 23 in Asia. Ching recognised more than 50 species, 1 in Australia (Queensland), 9 in America, about 42 in Asia (32 from China). He believed that this ancient group of ferns is still very active in speciation and that more species would be found, especially in the remote mountains in SW China. Copeland and Ching both made a great contribution to the study of this primitive fern family. Although most of the new species published by Copeland and Ching, and some of those of more locally based revisions, are sunk into older ones in this revision, their contributions are undoubtedly very important towards the understanding of this distinctive group of ferns. The only accepted species described in this century is *Plagiogyria japonica* Nakai (1928). It was known to Hooker as early as 1861 but mixed with materials of *P. euphlebia*. More recently, largely following Ching's publication on mainland Asian plants, Indian pteridologists revised their representatives adopting a lot of names apparently without a reference to the Chinese types. Taxonomically, all the Indian representatives were already well known to Hooker (1860), Beddome (1865, 1883, 1892), and Clarke (1880). Kazmi (1962), Nayar & Kazmi (1962), and Dixit & Das (1981) made very nice descriptive works but not on the basis of a reliable species concept. Nakaike (1971) and De Vol (1972) critically studied the nomenclature problem of some complex oriental species; while Lellinger (1971) elaborated on the New World representative. Now *Plagiogyria* is recognised by all modern pteridologists as the only genus of the family Plagiogyriaceae, after it was recognised as a distinct family in 1926 by Bower. Pichi Sermolli (1977) created Plagiogyriidae, while Reveal gave it an order name, Plagiogyriales Pic. Serm. ex Reveal (1993). This isolated small family has been central in the consideration of many Pteridophyte systems. Various relationships have been proposed with different groups. Many believe it is related with Osmundaceae and the tree ferns.

#### DISTRIBUTION AND ECOLOGY

*Plagiogyria* has an interesting amphi-Pacific disjunct distribution. In Asia it occurs north from Japan, S Korea (Cheju Island), to S China, westwards to E Himalayas ending on the south slope of the Central Himalayas, in India only common at the far eastern corner, not extending southwards on the subcontinent; eastwards it extends southwards via Indochina to Malesia, the Bismarck Archipelago, and the Solomon Islands. In tropical America it is found from Mexico to the Caribbean and the Andes of Venezuela, extending south to Bolivia and southeastern Brazil. The present distribution centre of *Plagiogyria* is in S and SW China. Eight species are found in China, most of which are very common and abundant. *Plagiogyria assurgens* is the only species endemic to China. Second to China, six species and one variety are found throughout the Philippines and, except the one variety shared with Borneo, all six species are shared with Taiwan and S to SW China. This distribution is not often found in other groups of ferns. The six species reached the Philippines perhaps from mainland China via Taiwan. Iwatsuki & Price (1977) comment that the Himalaya-Taiwanese floral component of northern Luzon is not a relict but recent. It is noted that *P. falcata*, *P. euphlebia*, and *P. stenoptera* in the Philippines are restricted in distri-



Map 1. Distribution of Plagiogyriaceae.

bution and their populations are small. Japanese islands are also very rich in species, five occur there and all are rather common, except *Plagiogyria stenoptera* which is found only in Yakushima island. This species has a disjunct distribution between SW China, Taiwan and northern Luzon and this case falls within many other examples of ferns that have a disjunctive distribution from SW China or E Himalayas to Taiwan and Japan. *Plagiogyria matsumureana*, an interesting endemic Japanese species, is the only summer green species of *Plagiogyria*. It is the only extant relative of the tropical American species, *P. pectinata*. These two species are so similar that they are nearly unseparable morphologically. It seems that the only possible explanation of the origin of the American species is that it is derived from a common ancestor with *P. matsumureana* in Asia. Unlike the Sino-Himalaya, or Sino-Japan distribution groups, *Plagiogyria* is not well developed in the Indian subcontinent. The fact that none of them occurs in Africa, Australia and the lower part of India, may shed light on the explanation of the historical biogeography of *Plagiogyria*. A few species in the north and northeastern corner of India are probably recently dispersed from the east. *Plagiogyria* has a wide extension in the islands of SE Asia, but most species are restricted to higher mountain forests. *Plagiogyria egenolfioides* is a species that has evolved four distinct local varieties. The four varieties are morphologically and ecologically different. *Plagiogyria egenolfioides* var. *sumatrana* is distributed from Sumatra to Peninsular Malaysia, not uncommon at 1300–1800 m high ridges. The plants are usually large, the leaves have an elongate pinna-like apex and resemble *P. euphlebia*. *Plagiogyria egenolfioides* var. *decrescens* is the commonest high altitude fern in New Guinea and ranges from 1800 to about 4000 m. In the summit grasslands, this variety forms large, dense populations often associated with *Blechnum vestitum* and it reaches eastwards into the Solomon Islands, and to the north into Seram. Two other varieties occur in Borneo, the Philippines, Sulawesi, and east to Seram. In the Pacific only *P. egenolfioides* var. *decrescens* and *P. glauca* were once collected on the summit of Mt Popomanatsen

in Guadalcanal (Solomon Islands). The geographic distribution probably is due to the fact that all *Plagiogyria* species are mountain plants, abundant on cold, moist, forested high ridges. Most, if not all, are growing in acid peaty soil (Holttum, 1966). Almost all of them can form large, dense populations, and are dominant herbs in the undergrowth. Some species have a forked rhizome, or form runners to propagate vegetatively. Map 1.

## MORPHOLOGY OF PLAGIOGYRIA

### Rhizome

The morphology and anatomy of the rhizome and stipe were studied in detail in some species by Bower (1910), Nayar & Kazmi (1962), and Ogura (1972).

The rhizome is erect, suberect, or decumbent, a few centimetres to about 15 cm long. Long rhizomes in *P. egenolfioides* var. *latipinna* and var. *decrescens* are up to 50 cm and still upright, only the stipe bases are relatively sparsely arranged. Short decumbent rhizomes are occasionally found in *P. euphlebia*, *P. falcata*, *P. japonica*, and *P. adnata*; in anatomy there are no essential differences from the erect ones. The shape of the rhizome is subject to change with the environmental condition. The long-rhizome specimens are plants growing in ground covered by a thick moss layer.

Occasional bifurcated rhizomes occur in *P. matsumureana*, *P. pectinata*, and stolons (runners) in *P. glauca* and *P. pycnophylla*.

The stolon is interesting in anatomy. Its basal part shows a protosteles, enlarges into a solenosteles and then a dictyosteles, showing all stages of ontogenetic development (Ogura, 1972).

### Stipe

There is no difference between the stipes of sterile fronds and those of the fertile ones in one species. Usually, the fertile frond has a longer stipe, but shorter stipes occur in some populations of *P. euphlebia* and in *P. egenolfioides*.

Cross sections of stipes, especially from the middle part of the swollen bases, are valuable in taxonomic studies of this genus. All the species except *P. matsumureana* and *P. pectinata* have one Loxsoma type steles in the stipe, V- or U-shaped, surrounded by a sclerenchyma sheath. In the above mentioned two species the steles is V-shaped at the very base but a few millimetres higher it divides into three meristeles.

*Plagiogyria egenolfioides* var. *decrescens*, var. *latipinna*, and var. *sumatrana*, *P. glauca*, and *P. pycnophylla* form a group characterised by a thick sclerenchyma sheath surrounding the vascular bundle. The latter is U-shaped in cross section when cut off at the middle part of a stipe base. In *P. egenolfioides* var. *egenolfioides* the plants are very small and the vascular bundle is V-shaped in cross section. *Plagiogyria assurgens* has one U-shaped vascular bundle surrounded by a thin layer of sclerenchyma. In large plants of *Plagiogyria euphlebia* the vascular bundle is U-shaped, in smaller plants it is V-shaped. *Plagiogyria adnata*, *P. falcata*, *P. japonica*, and *P. stenoptera* are species with a thin sclerenchyma sheath around the V-shaped vascular bundle. *Plagiogyria matsumureana* and *Plagiogyria pectinata* are two very exceptional species which have three vascular bundles each surrounded by a thin sclerenchyma sheath.

The distinction between the so-called U-shaped and V-shaped vascular bundles in some species is not very clear. For example, most of the cross sections made at the middle of the stipe bases in *P. stenoptera* show an arch with two divergent arms. The bottom has a roundish angle, which is called V-shaped; in some bigger specimens the stipe base is more dorsiventral and the vascular arch's bottom is horizontal, referred to as U-shaped. There is a gradual transition of the vascular bundle from U-shaped to V-shaped. The apomorphic state is a stele which divides into three strands. Ontogenetically and phylogenetically the evolution of the stele is interesting in all the groups of *Plagiogyria*.

### Aerophores

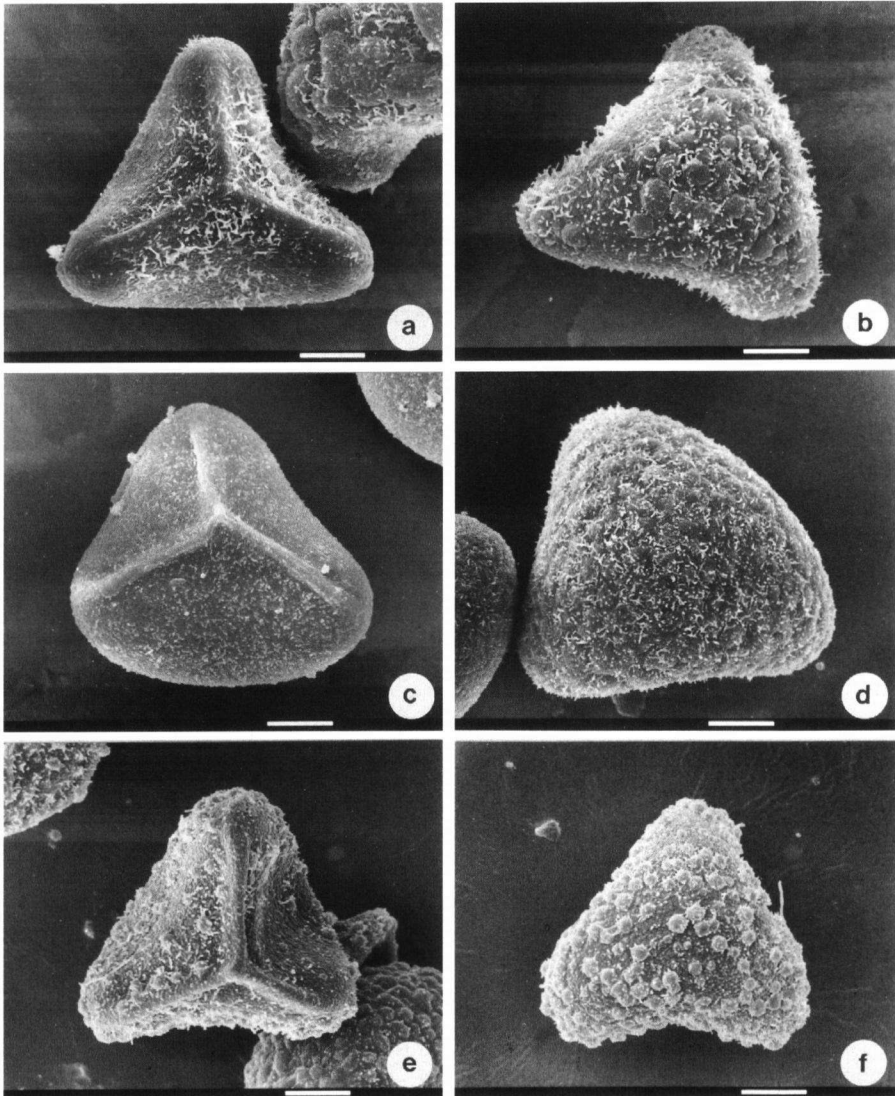
Aerophores (pneumatophores) are prominent on the dorsal side of swollen stipe bases. They form a common character of all *Plagiogyria* species. Hook-shaped aerophores up to 2 mm or more develop on stipes and on dorsal sides of rachises at the base of the insertion of pinnae in *P. egenolfioides* var. *decrescens*, var. *latipinna*, and var. *sumatrana*. Horn-like ones, usually c. 0.5 mm long, occur on the stipes and pinnae bases of *P. glauca* and *P. pycnophylla*. Nakai called them the *Polypneumatophorata* Group. They are also representatives of the most primitive members in *Plagiogyria* that have a thick sclerenchyma sheath around the vascular bundle in the stipes. In *P. egenolfioides* var. *egenolfioides*, and the dwarf plants of other taxa, the aerophores are not fully developed on the stipe and rachis, sometimes they even appear to be absent. Round, wart-like aerophores appear at the base of stipes of all other species (Nakai's *Paripneumatophorata* Group) and sometimes develop on the stipe and rachis of large specimens of *P. euphlebia*. In smaller specimens of *P. falcata*, *P. stenoptera*, *P. matsumureana*, and *P. pectinata* only very few small aerophores, usually 1 to 3 pairs, occur at the not much dilated bases. The development of aerophores correlates with that of the mechanical tissues (sclerenchymatic tissues) in the stipe and may function as an aeration pathway for the living parenchymatic tissues inside. Large stomata occur on the apex of the aerophores.

### Spores (by G.A. van Uffelen). — Plates 1–4

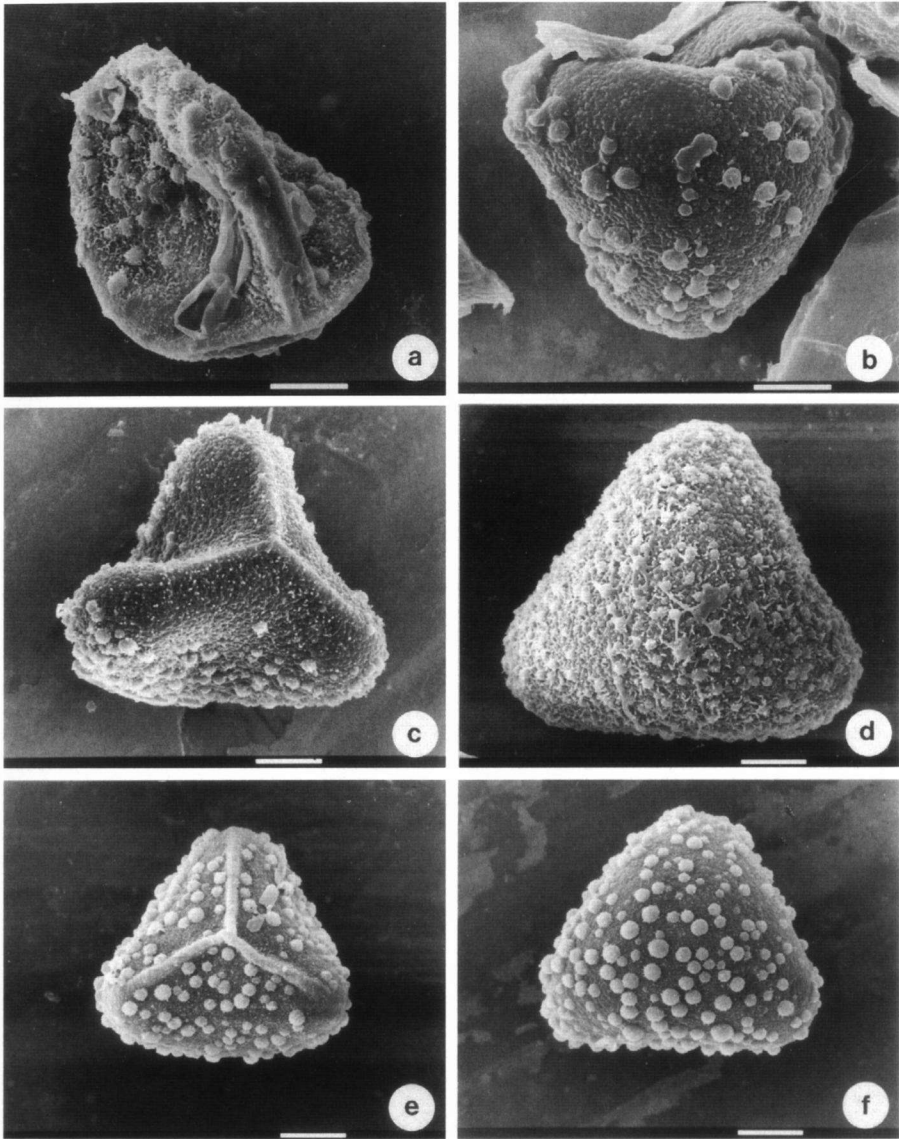
Spores of the genus *Plagiogyria* are tetrahedral, with a trilete aperture; the arms of the aperture are about 3/4 of the radius; the angles are rather prolonged, with depressions in between. The spores are about 50  $\mu\text{m}$  in diameter. The spore wall consists of an exospore, probably of the blechnoid type (sensu Lugardon), covered with a two-layered perispore, which may be slightly papillate bearing minute rodlets, or more coarsely tuberculate, with or without rodlets.

The spores of the species studied here fall into two groups: 1) *P. pycnophylla* (China), *P. glauca* (China), *P. matsumureana* (Japan), all with a slightly papillate perispore bearing minute rodlets, and 2) *P. euphlebia* (China), *P. japonica* (Japan), *P. adnata* (Japan), *P. egenolfioides* (Malesian Archipelago), *P. assurgens* (China), *P. falcata* (China), *P. stenoptera* (China), and *P. pectinata* (Bolivia), with a perispore that bears tubercles, ranging from a few scattered ones to so many that they cover almost the entire distal side of the spore; the proximal side always has fewer tubercles than the distal side; in some species the perispore also bears rodlets, on and between the tubercles.

Both Liew (1976) and Tryon & Lugardon (1991) have studied spores of the genus with electron microscopy. Liew's study is among the first to use scanning electron microscopy on spores and contains detailed descriptions. However, the more species one studies, the more difficult it becomes to fit the spores into Liew's five distinct types.

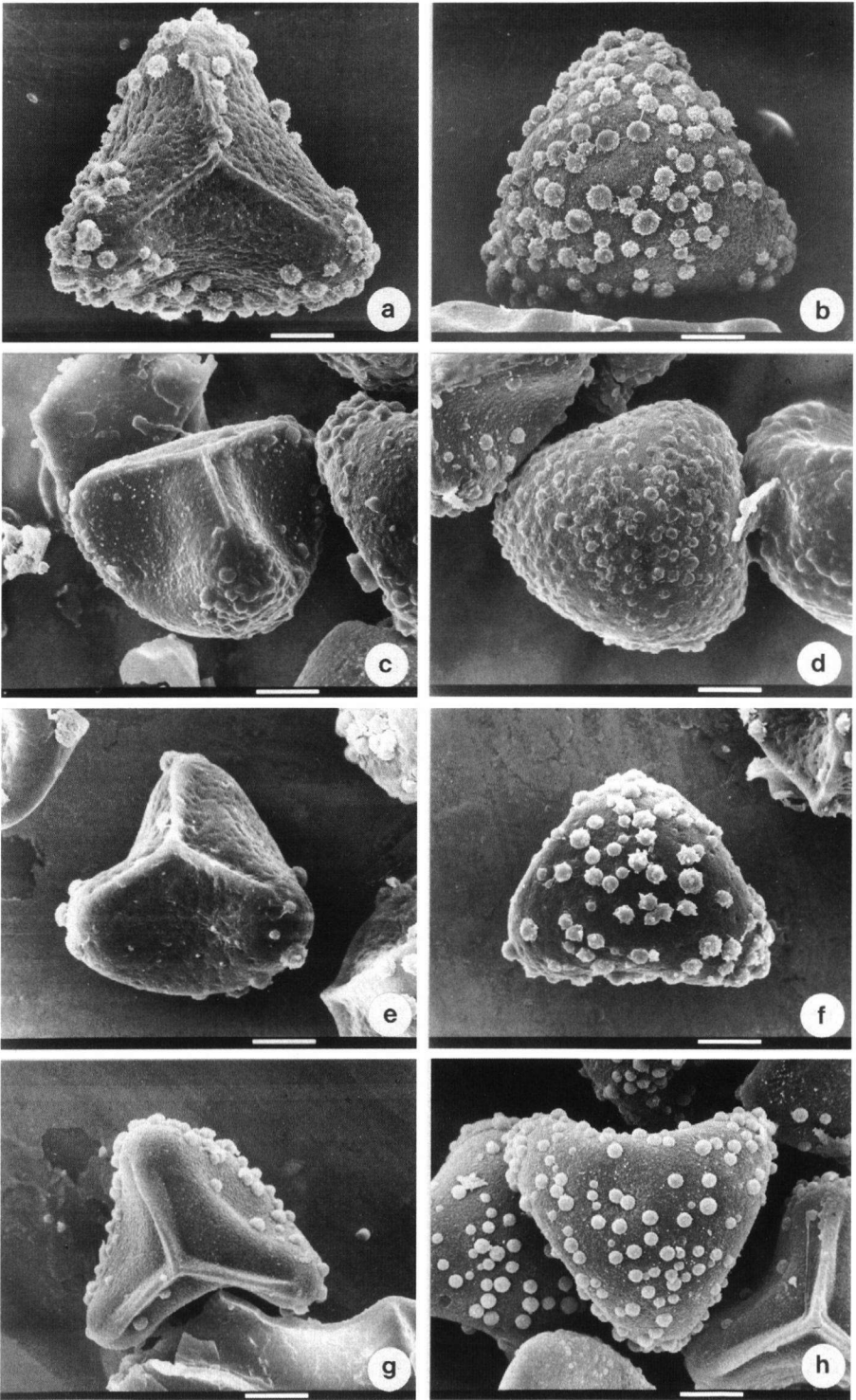


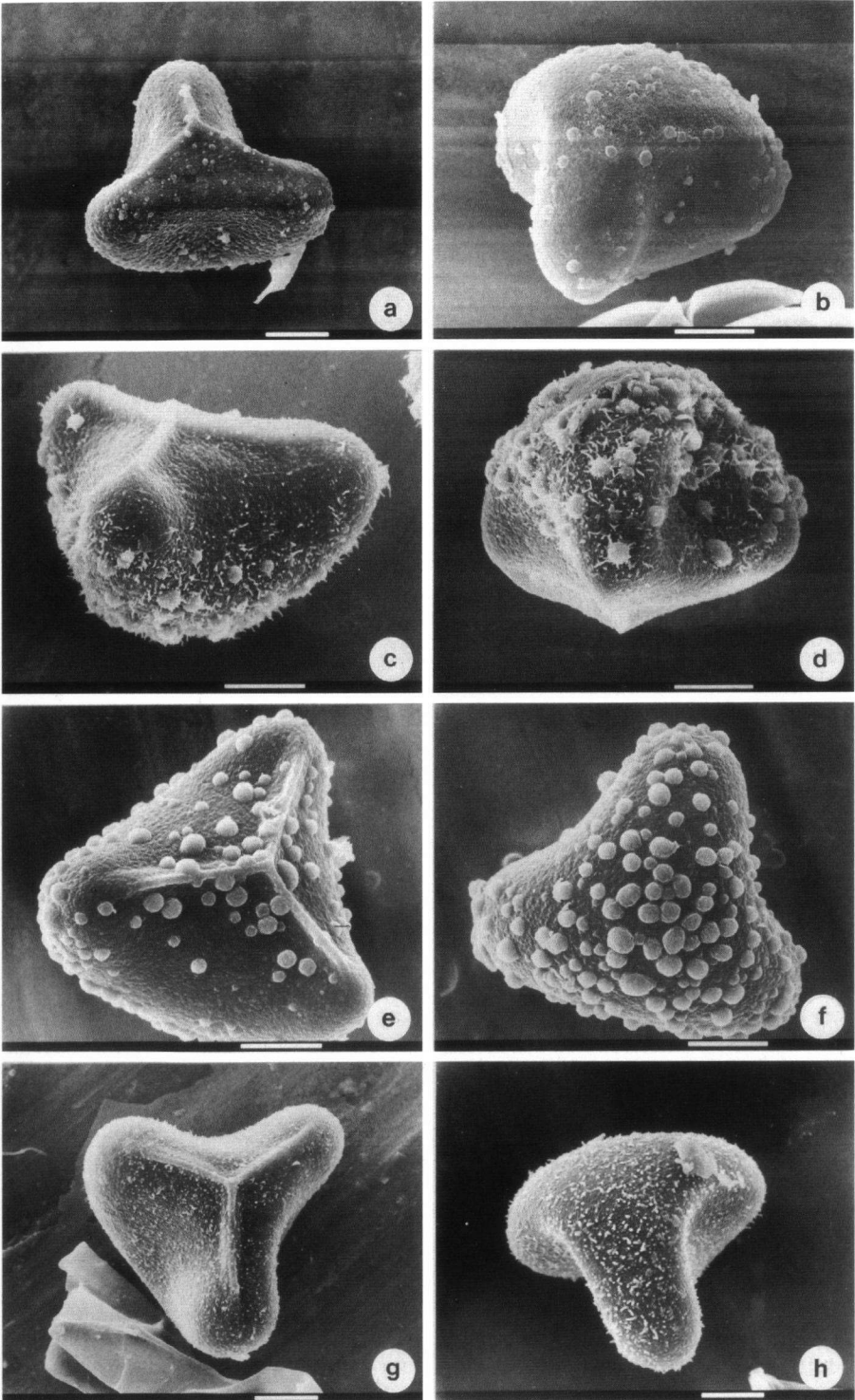
**Plate 1.** Spores; scale bars = 10  $\mu\text{m}$ . — a & b: *Plagiogyria pycnophylla* (T.N. Liou 23005, PE), China, Yunnan. Perispore slightly papillate, bearing many rodlets. — c & d: *P. glauca* (S.D. Fang 3512, PE), China, Yunnan. Perispore slightly papillate, with short rodlets. — e & f: *P. euphlebica* (W.T. Tsang 22526, PE), China, Guangdong. Perispore with many coarse tubercles, and also with small rodlets.



**Plate 2.** Spores; scale bars = 10  $\mu\text{m}$ . — a & b: *Plagiogyria japonica* (T. Nakai s.n., TI), Japan. Perispore with few, rather large tubercles, without rodlets. — c & d: *P. adnata* (S. Hatusima 14646, US), Japan. Perispore with many low tubercles, also with small rodlets. — e & f: *P. egenolfioides* var. *sumatrana* (de Wilde & de Wilde-Duyffjes 13234, L), Sumatra. Perispore with many very prominent, globular tubercles, without any rodlets.







## ACKNOWLEDGEMENTS

This research was financially supported by the Chinese Academy of Sciences and the Royal Dutch Academy of Sciences (KNAW, Koninklijke Nederlandse Akademie van Wetenschappen). Zhang would like to thank the director and curators of the Rijksherbarium / Hortus Botanicus for their support during his one-year stay in Leiden.

The directors and curators of the following herbaria are gratefully acknowledged for sending specimens on loan: A, B, BM, BO, E, F, GENT, GH, K, L, LG, MICH, NY, P, PE, TI, TOFO, U, and US. Zhang also wishes to express his gratitude to the staff members of BM, GENT, K, LG, P, and U, who made him feel welcome and comfortable during his visit.

Ms. Bertie Joan van Heuven did a lot of work in helping us making anatomical and SEM preparations. The drawings of specimens and distribution maps were made by Joop Wessendorp and Jan van Os, the photographs by Ben Kieft (all L).

Dr. T. Nakaïke, Dr. Hou Ding and Dr. David Boufford helped in searching for literature; Dr. T. Nakaïke also gave important instructions on species delimitation; Professors Chen Jing-Fu, vice-Professor Wang Pei-Shan; Wu Shi-Fu; Liu Zheng-Yu; and Mr. Fang Zheng-Dong kindly presented their collections from several provinces in China. We are very grateful to all of them.

## REFERENCES

- Beddome, R.H. 1865–1866. The ferns of British India.  
 Beddome, R.H. 1883. Handbook to the ferns of British India. Calcutta.  
 Beddome, R.H. 1892. Handbook to the ferns of British India with supplement. Calcutta.  
 Blume, C.L. 1828. Enumeratio plantarum Javae 2.  
 Bower, F.O. 1910. Studies in the phylogeny of the Filicales, I. Plagiogyria. *Ann. Bot.* 24.  
 Bower, F.O. 1926. *Ann. Bot.* 40: 484.  
 Bower, F.O. 1926. The Ferns, II. Cambridge.  
 Ching, R.C. 1958. The fern genus *Plagiogyria* on the mainland of Asia. *Acta Phytotax. Sin.* 7: 105–154.  
 Christensen, C. 1906. Index Filicum.  
 Clarke, C.B. 1880. A review of the ferns of Northern India. *Trans. Linn. Soc. London II. (Bot.)* 1: 425–661.  
 Copeland, E.B. 1929. The fern genus *Plagiogyria*. *Philipp. J. Sci.* 38: 377–417.  
 Cothorn, W. van. 1970. Comparative morphological study of the stomata in Filicopsida. *Bull. Jard. Bot. Nat. Belg.* 40: 81–239.  
 De Vol, C.E. 1972. The *Plagiogyria* of Taiwan. *Taiwania* 17: 277–292.

**Plate 3.** Spores; scale bars = 10  $\mu\text{m}$ . — a & b: *Plagiogyria egenolfioides* var. *latipinna* (M. Kato B 3671, L), Borneo (Kalimantan). Perispore with many prominent tubercles, with a few small rodlets, mainly on the tubercles. — c & d: *P. egenolfioides* var. *egenolfioides* (P.W. Richards 1994, K), Sarawak. Perispore with many slight tubercles, without rodlets. — e & f: *P. egenolfioides* var. *decrescens* (C. Ledermann 11927, B), New Guinea. Perispore with rather few, not very prominent tubercles, without rodlets. — g & h: *P. assurgens* (S.Y. Hu 885, A), China, Sichuan. Perispore with rather few, very distinctly globular tubercles, without rodlets.

**Plate 4.** Spores; scale bars = 10  $\mu\text{m}$ . — a & b: *Plagiogyria falcata* (R.C. Ching 8787, US), China, Anhui. Perispore with only a few not very prominent tubercles, without rodlets. — c & d: *P. stenoptera* (W.P. Fang 3177, E), China, Sichuan. Perispore with rather few tubercles, also with some rodlets. — e & f: *P. pectinata* (J.C. Solomon c.s. 18071, NY), Bolivia. Perispore with many prominent, globular tubercles, without rodlets. — g & h: *P. matsumureana* (J. Ohwi c.s. NSM 317, US and K. Iwatsuki 5054, CE, respectively), Japan. Perispore slightly papillate, with small rodlets.

- Dixit, R.D. & A. Das, 1981. The family Plagiogyriaceae Bower in India. Proc. Indian Acad. Sci. (Plant Sci.) 90: 371–387.
- Hennipman, E. 1968. The mucilage secreting hairs on the young fronds of some leptosporangiate ferns. Blumea 16: 97–103.
- Hennipman, E. 1977. A monograph of the fern genus *Bolbitis* (Lomariopsidaceae). Leiden Botanical Series Vol. 2. Leiden University Press, Leiden.
- Holtum, R.E. 1966. A revised flora of Malaya II. Ferns of Malaya. Second edition. Government Printing Office, Singapore.
- Holtum, R.E. 1968. A commentary of some type specimens of ferns in the Herbarium of K.B. Presl. Nov. Bot. Inst. Bot. Univ. Carolinae Pragensis.
- Hooker, W.J. 1860. Species Filicum 3.
- Hooker, W.J. 1861. A second century of ferns. London.
- Hovenkamp, P.H. 1986. A monograph of the fern genus *Pyrrosia* (Polypodiaceae). Leiden Botanical Series Vol. 9. E.J. Brill / Leiden University Press, Leiden.
- Iwatsuki, K. & M.G. Price. 1977. The Pteridophytes of Mt Burnay and vicinity, northern Luzon. South East Asian Studies 14: 540–572.
- Kazmi, F. 1962. Some new records of *Plagiogyria* from India. J. Bomb. Nat. Hist. Soc. 59: 697–698.
- Köhler, P.S. 1989. The Javanese Pteridophyta collected by Marian Raciborski housed in the herbarium of the Jagiellonian University (KRA). Zeszyty Naukowe Uniwersytetu Jagiellonskiego, Prace Botaniczne 18: 127–133.
- Kunze, G. 1840–1851. Die Farnkräuter, Schkuhr's Farnkräuter, Supplement. Leipzig.
- Kurita, S. 1963. Cytotaxonomical studies on some leptosporangiate ferns. J. Coll. Arts Sci. Chiba Univ. Nat. Sci. Sér. 4: 43–52.
- Lellinger, D.B. 1971. The American species of *Plagiogyria* section *Carinatae*. Amer. Fern J. 61: 110–118.
- Liew, F.S. 1976. Scanning electron microscopical studies on the spores of Pteridophytes. VII. The family Plagiogyriaceae. Taiwania 21: 37–49.
- Mettenius, G.H. 1858. Ueber einige FarnGattungen II. *Plagiogyria* in Abh. Senckenb. Naturf. Ges. 2.
- Nakai, T. 1928. Notes on Japanese ferns VII (*Plagiogyriaceae*, *Cheiropleuriaceae*, *Dipteridaceae* and *Polypodiaceae*). Bot. Mag. (Tokyo) 42: 203–210.
- Nakaike, T. 1971. Notes on *Plagiogyria* from Japan and adjacent regions. Bull. Nat. Sci. Mus. Tokyo 14: 257–268.
- Nakato, N. 1988. Notes on chromosomes of Japanese Pteridophytes (2). J. Jap. Bot. 63: 214–218.
- Nakato, N. & K. Mitui. 1983. Chromosome numbers of Japanese species in the genus *Plagiogyria*. J. Jap. Bot. 58: 105–109.
- Nayar, B.K. & F. Kazmi. 1962. Ferns of India No. IV, *Plagiogyria*. Bull. Nation. Bot. Gard. Lucknow 64: 1–37.
- Ogura, Y. 1972. Comparative anatomy of the vegetative organs of the Pteridophytes. Handbuch der Pflanzenanatomie ed. 2, VII, 3. Gebr. Borntraeger, Berlin.
- Pichi Sermolli, R.E.G. 1972. Names and types of fern genera. Webbia 26: 491–536.
- Pichi Sermolli, R.E.G. 1977. Tentamen pteridophytorum genera in taxonomicum ordinem redigendi. Webbia 31: 313–512.
- Plumier, P.R.C. 1705. Traité des Fougères de L'Amérique. Paris.
- Presl, C.B. 1851 ('1849'). *Epimeliaceae Botanicae*. Pragae.
- Price, M.G. 1972. A summary of our present knowledge of the ferns of the Philippines. Kalikasan 1: 17–53.
- Reveal, J.L. 1993. Phytologia 74: 176.
- Tryon, A.F. & B. Lugardon. 1991. Spores of the Pteridophyta. Surface, wall structure, and diversity based on electron microscope studies. Springer Verlag, New York etc.
- Tryon, R.M. & R.G. Stolze. 1989. Pteridophyta of Peru, Part I. Fieldiana, Bot. New Ser. 20: 99–101.
- Tryon, R.M. & A.F. Tryon. 1982. Ferns and fern allied plants. With special reference to Tropical America. Springer Verlag, New York.

- Tsai, J.L. 1973. Chromosome numbers of some Formosan ferns (2). *J. Sci. Engin.* 10: 261–276.
- Walker, T.G. 1966. A cytotaxonomic survey of the Pteridophytes of Jamaica. *Trans. Roy. Soc. Edinburgh* 66: 169–237.
- Walker, T.G. 1973. Evidence from cytology in the classification of ferns. In: A.C. Jermy et al., *The phylogeny and classification of the ferns*. *J. Linn. Soc. Bot. (London)* 67, Suppl. 1: 91–110.
- Wallich, N. 1828. A numerical list of dried specimens: no. 23.
- Weng, R.F. 1990. Cytological observations on some Chinese ferns. *Acta Phytotax. Sin.* 28: 27–33.
- Willdenow, C.L. von. 1810. *Species Plantarum* 5: 113.

## PLAGIOGYRIACEAE

Plagiogyriaceae Bower, *Ann. Bot.* 40 (1926) 484.

Terrestrial ferns, small to medium-sized, 10–150 cm, rarely up to 2 m high, devoid of scales. Rhizome stout, thickened, with persistent stipe bases, erect, suberect, or short decumbent, dictyostelic, sometimes bifurcated or stoloniferous; roots blackish, sparsely branched, wiry, regularly arranged on the stem, one beside each stipe base. Fronds dimorphous, bearing minute, uniseriate, multicellular, gland-headed, mucilage-secreting trichomes, most of which are lost when dry or becoming amorphous flaky ‘scales’ with the secretion. Stipes round, oval, triangulate, or tetragonal, bearing aerophores or not; base of stipe swollen, flat on ventral face and with a strong median ridge on the dorsal face, dividing this face into two surfaces, each of which bears a row of warts looking like aerophores; the stipe with a single vascular bundle which expands or divides into three meristeles in the enlarged base; rachis winged or not, ventral face sulcate, dorsal face terete, flat, or carinate, aerophores absent, or present near the base of the pinnae. Laminae of sterile fronds herbaceous to subcoriaceous, glaucous below or not, once pinnate or deeply pinnatifid; pinnae falcate to linear-lanceolate, glabrous or sparsely glandular hairy underneath, margin entire, minutely serrulate to dentate at the apex; veins simple, or paired at base, mostly once to twice forked, reaching the margin of a pinna. Laminae of fertile fronds similar in shape as the sterile ones, in the middle of a plant, erect, with a proportionally longer stipe and a shorter lamina, once pinnate or deeply pinnatifid, pinnae short stalked or sessile, glabrous or with few short glandular hairs at the edge, the tissue above the veinlets hygroscopic and reversible, functioning as indusium (‘false indusium’), at young stage the scarious margins cover the sori, recurved at mature stage, but when wet covering the sori again; veins free, once to twice forked, solitary or paired at the base, not entering into the scarious marginal part, margin of fertile pinnae entire or irregular, apical pinna usually pinnatifid or conform with the lateral ones, having a few lobes at the base or not; sori borne on the swollen end of veins, extended a little, confluent, ascrostichoid, nearly fully covering the lower surface of pinnae when ripe; paraphyses many, a little longer than sporangia, uniseriate, multicellular, orange to dark brown, gland-like, apically slightly capitate, deep in colour, intermingled with sporangia. Sporangia with a complete oblique annulus, not interrupted by the stalk, lateral in dehiscence, 64 spores per sporangium. Spores tetrahedral-globose, trilete, the laesurae about 3/4 of the radius, surface ornamentation irregular coarse tubercles, with coalescent papillae and rodlets.

Plagiogyriaceae is a monotypic family in the leptosporangiate Pteridophyta.

## PLAGIOGYRIA

*Plagiogyria* (Kunze) Mett., Abh. Senckenberg. Naturf. Ges. 2 (1858) 265; Bedd., Ferns Brit. India 1 (1866) 51; J. Sm., Hist. Fil. (1875) 162; Diels in Engl. & Prantl, Nat. Pflanzenfam. 1, 4 (1899) 281; C. Chr., Index Filic. (1906) 43; Alderw., Malayan Ferns (1908) 340; Malayan Ferns Suppl. 1 (1916) 243; Nakai, Bot. Mag. (Tokyo) 42 (1928) 204; Copel., Philipp. J. Sci. 38 (1929) 377; Backer & Posth., Varenfl. Java (1939) 30; Tardieu & C. Chr., Fl. Indo-Chine 6 (1939) 73; Ching, Acta Phytotax. Sin. 7 (1958) 134; Fl. Reipubl. Popul. Sin. 2 (1959) 85; Copel., Fern Fl. Philipp. 2 (1960) 193; B. K. Nayar & F. Kazmi, Bull. Nat. Bot. Gard. 64 (1962) 4; Holtum, Revis. Fl. Malaya 2, ed. 2 (1966) 109; Amer. Fern J. 61 (1971) 110; De Vol, Taiwania 17 (1972) 280; Pic. Serm., Webbia 26 (1972) 533; R. M. Tryon & A. F. Tryon, Ferns and Allied Pl. with spec. Ref. to Trop. America (1982) 134; R. M. Tryon & Stolze, Fieldiana, Bot. n.s. 20 (1989) 101; S. H. Wu & Ching, Fam. Gen. Pterid. Sin. (1992) 153. — *Lomaria* Blume, Enum. Pl. Javae (1828) 205, p.p.; Hook., Sp. Fil. 3 (1860) 2, p.p.; Racib., Pteridoph. Buitenzorg 1 (1898) 159, p.p. — *Lomaria* sect. *Plagiogyria* Kunze, Farmkräuter 2 (1850) 61, 63. — *Lomaria* § *Plagiogyria* Hook., Sp. Fil. 3 (1860) 19; Hook. & Baker, Syn. Fil. (1874) 182; C. B. Clarke, Trans. Linn. Soc. London II, Bot. 1 (1880) 172. — Type: *Plagiogyria euphlebia* (Kunze) Mett. (*Lomaria euphlebia* Kunze).

*Lomaridium* C. Presl, Epim. Bot. (1851) 154, p.p.

*Polygramma* C. Presl, Epim. Bot. (1851) 156, nom. inval. — Type: *Lomaridium* ? *semicordatum* C. Presl.

*Stenochlaena* C. Presl, Epim. Bot. (1851) 162, p.p.

*Plagiogyria* Group *Paripneumatophorata* Nakai, Bot. Mag. (Tokyo) 42 (1928) 204. — Type: Not designated.

*Plagiogyria* Group *Polypneumatophorata* Nakai, Bot. Mag. (Tokyo) 42 (1928) 204. — Type: Not designated.

*Plagiogyria* subsect. *Adnatae* Ching ex Lellinger, Amer. Fern J. 61 (1971) 111; Ching, Acta Phytotax. Sin. 7 (1958) 135; Fl. Reipubl. Popul. Sin. 2 (1959) 86. — Type: *Plagiogyria adnata* (Blume) Bedd.

*Plagiogyria* sect. *Carinatae* Ching ex Lellinger, Amer. Fern J. 61 (1971) 111; Ching, Acta Phytotax. Sin. 7 (1958) 135; S. H. Wu & Ching, Fam. Gen. Pterid. Sin. (1992) 154; nom. inval. — *Plagiogyria* sect. *Stenopterae* Ching, Fl. Reipubl. Popul. Sin. 2 (1959) 88, nom. nud. — Type: *Plagiogyria argutissima* H. Christ.

*Plagiogyria* sect. *Plagiogyria* Ching, Fl. Reipubl. Popul. Sin. 2 (1959) 86; S. H. Wu & Ching, Fam. Gen. Pterid. Sin. (1992) 153. — *Plagiogyria* sect. *Euplagiogyrae* Ching, Acta Phytotax. Sin. 7 (1958) 135, nom. illeg. — *Plagiogyria* subsect. *Euphlebiae* Ching ex Lellinger, Amer. Fern J. 61 (1971) 111, nom. superfl.; Ching, Acta Phytotax. Sin. 7 (1958) 135; Fl. Reipubl. Popul. Sin. 2 (1959) 86; nom. inval. — Type: *Plagiogyria euphlebia* (Kunze) Mett.

*Plagiogyria* subsect. *Pycnophyllae* Ching ex Lellinger, Amer. Fern J. 61 (1971) 111; Ching, Acta Phytotax. Sin. 7 (1958) 135; Fl. Reipubl. Popul. Sin. 2 (1959) 87; nom. inval. — Type: *Plagiogyria pycnophylla* (Kunze) Mett.

## KEY TO THE SPECIES AND VARIETIES

- 1a. Most pinnae except the uppermost of sterile lamina with an auriculate base, veins invisible on both surfaces, margin of sterile pinnae crenate ..... 3a. *P. egenolfioides* var. *egenolfioides*
- b. Base of pinnae of sterile lamina not auriculate, veins distinct or obscure on both surfaces, margin of sterile pinnae entire or not ..... 2
- 2a. Cross section from middle part of stipe base shows three oval vascular bundles, fertile lamina pinnate but towards apex deeply pinnatifid, or upper half pinnatifid; pinnae sessile with auriculate-adnate base ..... 3

- b. Cross section from middle part of stipe base shows one V-shaped or one U-shaped vascular bundle, fertile lamina pinnate throughout or except the very apex, or deeply pinnatifid and rachis slightly winged throughout, pinnae nearly sessile or (shortly) stalked, base not auriculate-adnate ..... 4
- 3a. Fronds covered with an amorphous gelatinous mucilage layer when dry, sterile lamina except a few free basal pinnae pinnatifid, widest medially, with stomata along the two sides of a vein, absent in the middle area between two veins, spores brown with reddish tubercles ..... **9. P. pectinata**
- b. Fronds not covered with an amorphous gelatinous mucilage layer when dry, sterile lamina pinnatifid, widest medially or a little above, with stomata scattered on the lower epidermis, spores yellow, without reddish tubercles **8. P. matsumureana**
- 4a. Most pinnae except the uppermost of sterile lamina with base adnate to rachis, or acroscopic side adnate, sometimes into a wide wing along the rachis ..... 5
- b. Most pinnae except the uppermost of sterile lamina with base not adnate, cuneate, rounded, truncate, or attenuate ..... 9
- 5a. Aerophores present on base of stipe, stipe and rachis, stipes reddish-brown, fronds covered with an amorphous gelatinous mucilage layer when dry, most pinnae except the uppermost of sterile lamina with only the acroscopic side of base adnate ..... **3c. P. egenolfioides var. latipinna**
- b. Aerophores only present on base of stipe, stipes stramineous or brownish, fronds not covered with an amorphous gelatinous mucilage layer when dry, generally pinnae except towards the very apex of sterile lamina with base adnate to rachis or the acroscopic side adnate into a wide wing along the rachis ..... 6
- 6a. Acroscopic side of pinna base of pinnatifid sterile lamina adnate to the rachis, but not into a wide wing, uppermost pinnae basiscopically perpendicular to the rachis ..... **5. P. falcata**
- b. Acroscopic side of pinna base of pinnatifid sterile lamina adnate to the rachis into a wide wing, uppermost pinnae basiscopically decurrent into rachis wing or round ..... 7
- 7a. Fertile lamina pinnate throughout except the apex and lower pinnae shortly stalked, lowermost pinnae not much shortened, sterile lamina widest medially to basally ..... **1. P. adnata**
- b. Fertile lamina pinnate throughout and pinnae nearly sessile, or deeply pinnatifid and rachis slightly winged throughout, 1–4 pairs of lowermost pinnae much shorter, deflexed, and often sterile, or some pairs becoming aerophore-like vestiges on the stipe together with aerophores, sterile lamina widest medially ..... 8
- 8a. Sterile laminae not glaucous beneath, (0)–3–6(–11) pairs of lowermost pinnae reduced to mere auricles, cross section from middle part of stipe base with one V-shaped vascular bundle; fertile lamina with dorsal side of rachis flattened or grooved, apex terminated by a pinna conform with the lateral ones which is often beaded at the base, base of middle pinnae shortly stalked, some pairs of lowermost pinnae becoming aerophore-like vestiges on the stipe together with aerophores, margin of pinnae sparsely short glandular hairy ..... **11. P. stenoptera**
- b. Sterile lamina glaucous beneath, 1–2(–4) pairs of lowermost pinnae much reduced, (0.5–)1–2(–3) cm long, cross section from middle part of stipe base with one U-shaped vascular bundle; fertile lamina with dorsal side of rachis carinate, apex

- pinnatifid, acuminate or caudate, base of middle pinnae broadly adnate, 1–4 pairs of lowermost pinnae much shorter, deflexed and often sterile, margin of pinnae glabrous ..... **2. P. assurgens**
- 9a. Sterile lamina glaucous beneath, widest in or a little above the middle ..... **6. P. glauca**
- b. Sterile lamina not glaucous, widest basally to medially ..... 10
- 10a. Aerophores cushion-like, on stipe and rachis near the base of pinnae ..... 11
- b. Aerophores slender, hook-shaped, with pointed apex, or elongate, horn-like, with blunt apex, on stipe and rachis ..... 12
- 11a. Most pinnae, except the uppermost of sterile lamina, with inequilateral base, rhizome thick with many stipe bases, veins of pinnae mostly paired at base or forked above base ..... **7. P. japonica**
- b. Most pinnae, except the uppermost of sterile lamina, with equilateral base, rhizome thin, sometimes woody, veins of pinnae mostly simple or as many simple as forked ..... **4. P. euphlebica**
- 12a. Aerophores only present on base of stipe, rhizome thick with many stipe bases, cross section from middle part of stipe base with one V-shaped vascular bundle ..... **7. P. japonica**
- b. Aerophores present on base of stipe, stipe and rachis, rhizome very woody, cross section from middle part of stipe base with one U-shaped vascular bundle . 13
- 13a. Aerophores elongate, horn-like with blunt apex, stipes stramineous or brownish, fronds not covered with an amorphous gelatinous mucilage layer when dry, sterile lamina herbaceous, paraphyses few, spores not tuberculate **10. P. pycnophylla**
- b. Aerophores hook-shaped, with pointed apex, stipes reddish-brown, fronds covered with an amorphous gelatinous mucilage layer when dry, sterile lamina subcoriaceous, paraphyses many, spores with reddish tubercles ..... **3. P. egenolfioides**

#### ALTERNATIVE KEY TO THE SPECIES AND VARIETIES

- 1a. Cross section from middle part of stipe base with three elliptic vascular bundles, fertile lamina pinnate or pinnatifid towards apex or in upper half; pinnae sessile, base auriculate-adnate ..... 2
- b. Cross section from middle part of stipe base with one V-shaped or one U-shaped vascular bundle, fertile lamina as in 1a or deeply pinnatifid, rachis slightly winged throughout; pinnae nearly sessile to stalked, base decurrent or auriculate .... 3
- 2a. Sterile lamina pinnatifid except a few free basal pinnae, fronds covered with an amorphous gelatinous mucilage layer when dry, stomata along both sides of a vein, absent in the middle area between two veins, spores brown with reddish tubercles ..... **9. P. pectinata**
- b. Sterile lamina pinnatifid, fronds not covered with amorphous gelatinous mucilage layer when dry, stomata scattered on the lower epidermis, spores yellow without reddish tubercles ..... **8. P. matsumureana**
- 3a. Sterile lamina, except sometimes a few free basal pinnae, pinnatifid ..... 4
- b. Sterile lamina, except the pinnatifid or pinnatilobed apex, pinnate, or lower part pinnate, upper 1/3 to 1/2 pinnatifid, or pinnate, apical pinna base free, or sometimes connected with upper lateral ones ..... 8



- 4a. Sterile lamina glaucous beneath ..... **2. *P. assurgens***
- b. Sterile lamina not glaucous beneath ..... 5
- 5a. Aerophores present on stipe and rachis, stipes reddish-brown, cross section from middle part of stipe base with one U-shaped vascular bundle, fronds covered with amorphous gelatinous mucilage layer when dry, sterile lamina subcoriaceous ..... **3c. *P. egenolfioides* var. *latipinna***
- b. Aerophores only present on base of stipe, stipes stramineous, or brownish, cross section from middle part of stipe base with one V-shaped vascular bundle, fronds not covered with amorphous gelatinous mucilage layer when dry, sterile lamina herbaceous ..... 6
- 6a. Fertile lamina pinnate except apex, lower pinnae shortly stalked, most pinnae except the uppermost of sterile lamina with base at acroscopic side adnate into a wide wing along rachis, dorsal side of rachis of fertile lamina not winged ... .. **1. *P. adnata***
- b. Fertile lamina pinnate throughout and pinnae nearly sessile, or deeply pinnatifid and rachis slightly winged throughout, most pinnae except the uppermost of sterile lamina with base adnate to rachis, dorsal side of rachis of fertile lamina sometimes winged on the ridges ..... 7
- 7a. Apex of fertile lamina terminated by a pinna conform with the lateral ones, which is often beaded at the base, upper part of stipe tetragonal, dorsal side of rachis of fertile lamina flattened or grooved, base of middle fertile pinnae shortly stalked, lowermost pinnae of fertile lamina becoming aerophores-like vestiges on stipe together with aerophores, margin of fertile pinnae sparsely short glandular hairy ..... **11. *P. stenoptera***
- b. Apex of fertile lamina pinnatifid, acuminate or caudate, upper part of stipe triangular, dorsal side of rachis of fertile lamina carinate, base of middle fertile pinnae broadly adnate, lowermost pinnae of fertile lamina not or gradually shortened, margin of fertile pinnae glabrous ..... **5. *P. falcata***
- 8a. Sterile lamina glaucous beneath, widest in or a slightly above the middle ... .. **6. *P. glauca***
- b. Sterile lamina not glaucous beneath, widest in or below the middle ..... 9
- 9a. Aerophores only present on base of stipe, not on rachis, or seemingly absent when dry ..... 10
- b. Aerophores present on stipe and rachis, or only present on base of stipe and lower part of rachis ..... 12
- 10a. Fronds covered with amorphous gelatinous mucilage layer when dry, stipes reddish-brown, veins invisible on both surfaces, pinnae of sterile lamina widest near base, most pinnae except the uppermost of sterile lamina with auriculate base, lowermost pinnae of fertile lamina gradually shortened ..... **3a. *P. egenolfioides* var. *egenolfioides***
- b. Fronds not covered with amorphous gelatinous mucilage layer when dry, stipes stramineous or brownish, veins distinct on both surfaces, pinnae of sterile lamina widest in the middle, most pinnae except the uppermost of sterile lamina with cuneate, rounded, or attenuate base, lowermost pinnae of fertile lamina longer than other pinnae or at least not shorter ..... 11

- 11a. Most pinnae except the uppermost of sterile lamina with inequilateral base, rhizome thick with many stipe bases ..... **7. *P. japonica***  
 b. Most pinnae except the uppermost of sterile lamina with equilateral base, rhizome thin, sometimes very woody ..... **4. *P. euphlebia***
- 12a. Aerophores cushion-like ..... **4. *P. euphlebia***  
 b. Aerophores slender, hook-shaped with pointed apex or elongate, horn-like, with blunt apex ..... 13
- 13a. Sterile lamina pinnate, with a free apical pinna, which is sometimes connected with upper lateral ones ..... **3c. *P. egenolfioides* var. *latipinna***  
 b. Sterile lamina pinnate, with a pinnatifid or pinnatilobed apex, or lower part pinnate, upper 1/3 to 1/2 pinnatifid ..... 14
- 14a. Aerophores on stipe and rachis elongate, horn-like, with blunt apex, stipes stramineous or brownish, fronds not covered with amorphous gelatinous mucilage layer when dry, fertile lamina pinnate throughout, pinnae nearly sessile or shortly stalked, spores yellow to brown, not tuberculate ..... **10. *P. pycnophylla***  
 b. Aerophores on stipe and rachis slender, hook-shaped, with pointed apex, stipes reddish-brown, fronds covered with amorphous gelatinous mucilage layer when dry, fertile lamina pinnate except towards the apex, lower pinnae shortly stalked to stalked, spores yellow or brown with reddish tubercles . **3. *P. egenolfioides***

### 1. *Plagiogyria adnata* (Blume) Bedd. — Fig. 1

*Plagiogyria adnata* (Blume) Bedd., Ferns Brit. India 1 (1865) pl. 51; Kuhn, Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 291; Luerss., Bot. Jahrb. Syst. 4 (1883) 365; Bedd., Handb. Ferns Brit. India (1892) 127, t. 65; Makino, Bot. Mag. (Tokyo) 8 (1894) 333, p.p.; H. Christ, Bull. Herb. Boissier 6 (1898) 959; Copel., Polypod. Philipp. Is. (1905) 97; Alderw., Malayan Ferns (1908) 342; Copel., Philipp. J. Sci., Bot. 3 (1908) 280; C. Chr., Acta Horti Gothob. 1 (1924) 92; Nakai, Bot. Mag. (Tokyo) 42 (1928) 207; Copel., Philipp. J. Sci. 38 (1929) 396; Hand.-Mazz., Symb. Sin. 6 (1929) 38; C. Chr. & Holttum, Gard. Bull. Str. Settle. 7 (1934) 225; Holttum, Gard. Bull. Str. Settle. 9 (1937) 133; C. Chr. & Tardieu, Notul. Syst. (Paris) 6 (1937) 134; Tardieu & C. Chr., Fl. Indo-Chine 6 (1939) 74; Backer & Posth., Varenfl. Java (1939) 31; Ogata, Icon. Filic. Jap. 8 (1940) pl. 385; Dickason, Ohio J. Sci. 46 (1946) 132; Ohwi, Fl. Japan (1957) 51; Ching, Acta Phytotax. Sin. 7 (1958) 120, 145; Fl. Reipubl. Popul. Sin. 2 (1959) 96; Tagawa, Col. Ill. Jap. Pterid. (1959) 68, 239, pl. 21, f. 125; Copel., Fern Fl. Philipp. 2 (1960) 195; Ching et al., Fl. Hainanica 1 (1964) 24, f. 9; Holttum, Revis. Fl. Malaya 2, ed. 2 (1966) 111; Nakaïke, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 257, pl. 1; De Vol, Taiwania 17 (1972) 283; Tagawa, Acta Phytotax. Geobot. 26 (1974) 113; De Vol & C.Y. Lu, Fl. Taiwan 1 (1975) 144; Hatus., Fl. Ryukyus (1975) 143; E. Walker, Fl. Okinawa & S. Ryukyu Is. (1976) 72; K. Iwats. & M.G. Price, South East Asia Studies 14 (1977) 549; Tagawa & K. Iwats., Fl. Thailand 3, 1 (1979) 47; L.K. Lin, Fl. Fujianica 1 (1982) 29, f. 29; Baishya & R.R. Rao, Ferns and Fern-allies of Meghalaya State, India (1982) 46, pl. 16; Numata et al., Ecol. Encycl. Wild Pl. Jap. (1990) 37; P.H. Hô, Ill. Fl. Vietnam 1 (1991) 51, f. 89, '*Plagiogyra*'; Parris et al., Pl. Mount Kinabalu 1 (1992) 97; K. Iwats., Ferns and Fern Allies of Japan (1992) 75, pl. 27, photogr. 1; J.F. Cheng, Fl. Jiangxi 1 (1993) 60; C.F. Zhang, Fl. Zhejiang 1 (1993) 34. — *Lomaria adnata* Blume, Enum. Pl. Javae (1828) 205; Hook., Sp. Fil. 3 (1860) 19, t. 147, excl. syn.: *Lomaria scandens*; Hook. & Baker, Syn. Fil. (1868) 182; C.B. Clarke, Trans. Linn. Soc. London II, Bot. 1 (1880) 472, p.p., excl. syn.; Racib., Pteridoph. Buitenzorg (1898) 162. — Type: *Blume s.n.* (L. sh. no. 908.315-140), Java.

[*Lomaria griffithiana* Hook., Sp. Fil. 3 (1860) 20, nom. nud., pro syn.] — [*Plagiogyria khasiana* Hook. ex Bir, Biology of Indian Pteridophytes (1987) 216, nom. nud.] — Voucher: *Hooker f. & Thomson s.n.* (K), 12-IX-1850, Khasia.

- Plagiogyria adnata* (Blume) Bedd. var. *condensata* H. Christ, Bull. Soc. Bot. France (Mém.) 1 (1905) 64. — Type: *Delavay 5118* (holo P), Yunnan, 'Tchen-fong-chan', VIII-1894.
- Lomaria brooksii* Alderw., Bull. Jard. Bot. Buitenzorg II, 28 (1918) 32. — *Struthiopteris brooksii* Ching, Sunyatsenia 5 (1940) 243. — Type: *Brooks 333s* (holo BM), Sumatra, Benkoelen, Lebong Simpang, alt. 1400 m, VIII-1917.
- Plagiogyria rankanensis* Hayata, Icon. Pl. Formos. 8 (1919) 151, f. 80; Copel., Philipp. J. Sci. 38 (1929) 397; Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 258; Enum. Pterid. Jap. Filic. (1975) 8; Kurata & Nakaike, Ill. Pterid. Jap. 1 (1979) 348; R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 377, fotogr. 6; H.S. Kung, Fl. Sichuanica 6 (1986) 123, pl. 36, f. 1–2; Nakaike, New Fl. Jap. Pterid. (1992) 236, fotogr. 236; X.C. Zhang, Expl. Pl. Resou. Mt Jiuwanshan, Guangxi (1993) 208; W.C. Shieh et al., Fl. Taiwan 1, ed. 2 (1994) 137. — Type: *Hayata s.n.* (holo TI), Taiwan, Ilan, nr Nanao, 'Rankanzan, ad 4500 ped. alt.', 12-V-1916.
- Plagiogyria distinctissima* Ching, Bull. Fan Mem. Inst. Biol. 1 (1930) 145; S.H. Fu, Ill. Important Chinese Pl., Pterid. (1957) 42, f. 51; Ching, Acta Phytotax. Sin. 7 (1958) 118, 141, pl. 31, f. 2; Fl. Reipubl. Popul. Sin. 2 (1959) 92, pl. 5, f. 7; B.K. Nayar & F. Kazmi, Bull. Nat. Bot. Gard. 64 (1962) 20, f. 9; Shing, Iconogr. Cormoph. Sinicorum 1 (1972) 126, f. 252; L.K. Lin, Fl. Fujianica 1 (1982) 29, f. 28; M.Q. Jiang, Fl. Anhui 1 (1985) 46, f. 36; J.F. Cheng, Fl. Jiangxi 1 (1993) 60, f. 45; C.F. Zhang, Fl. Zhejiang 1 (1993) 33, f. 1–35. — *Plagiogyria adnata* (Blume) Bedd. forma *reducta* C. Chr., Index Filic. Suppl. 3 (1934) 140. — Type: *W.P. Fang 3361* (holo PE; iso GH), Sichuan, Mt Emei, alt. 1050–1200 m, 26-VIII-1928.
- Plagiogyria yunnanensis* Ching, Bull. Fan Mem. Inst. Biol. 2 (1931) 186; Acta Phytotax. Sin. 7 (1958) 118, 142; Fl. Reipubl. Popul. Sin. 2 (1959) 93; P.H. Hô, Ill. Fl. Vietnam 1 (1991) 54, f. 96, '*Plagiogyra*'. — Type: *Hancock 216 (bis) ex horte* (holo K, n.v.; fragm. & fotogr. PE), Yunnan, Mengzi ('Mengtze').
- Plagiogyria adnata* (Blume) Bedd. var. *reflexa* C. Chr. & Tardieu, Notul. Syst. (Paris) 6 (1937) 134; Tardieu & C. Chr., Fl. Indo-Chine 6 (1939) 75. — Type: *Balansa 1884* (holo P; iso BM, K), Tonkin, summit Mont Bavi, alt. 1300 m, 13-VII-1886.
- Plagiogyria yakushimensis* Satô, J. Jap. Bot. 12 (1936) 824, f. 3; Ogata, Icon. Fil. Jap. 8 (1940) pl. 390. — *Plagiogyria rankanensis* Hayata var. *yakushimensis* Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 259; Enum. Pterid. Jap. Filic. (1975) 9. — *Plagiogyria adnata* (Blume) Bedd. var. *yakushimensis* K. Iwats., J. Fac. Sci. Univ. Tokyo sect. 3, Bot. 14 (1987) 70; K. Iwats., Ferns and Fern Allies of Japan (1992) 76, pl. 27, fotogr. 2. — Type: *Satô s.n.* (burned during World War II at K. Satô's private herbarium), Yakushima Isl., 1600–1700 m, 24-VIII-1935.
- Plagiogyria subadnata* Ching, Acta Phytotax. Sin. 7 (1958) 120, 145; Fl. Reipubl. Popul. Sin. 2 (1959) 96. — Syntypes: *To & Tsang 12099, 12320* (K, P, PE, US), Guangdong, Mt Longtoushan, Yao cun, [Lu (lu)] village, 25-V-5-VI-1934.
- Plagiogyria yakumonticola* Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 267, pl. 3, f. 2; Enum. Pterid. Jap. Filic. (1975) 10; Kurata & Nakaike, Ill. Pterid. Jap. 4 (1985) 264; Nakaike, New Fl. Jap. Pterid. (1992) 239, fotogr. 239. — Type: *Kurata s.n.* (holo TOFO), Yaku-isl., 13-VIII-1956.
- [*Plagiogyria triangularis* Hayata ex De Vol, Taiwania 17 (1972) 284, nom. nud., pro syn. — Voucher: *Mori 1477* (TAI n.v.).]
- Plagiogyria meghalayensis* R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 378, fotogr. 7. — Type: *Rao 4866* (CAL, n.v.), Meghalaya, Shillong, Elephant Falls, III-1979.
- Plagiogyria wulingshanensis* C.M. Zhang & S.F. Wu in W.T. Wang et al., Keys to the vascular plants of the Wuling Mountains (1995) 561. — Type: *Kunming Inst. Bot. Wuling Mnts exp. 2879* (PE, n.v.) China, Guizhou, Shigian.
- [*Plagiogyria parva* Copel. ex P.H. Hô, Ill. Fl. Vietnam 1 (1991) 53, f. 95, nom. nud. — Voucher: *Pételot s.n.* (holo P), Vietnam, Tonkin, 'Sentier de La Crête, Massif de la Fan Tsi Pan, Humus la base d'un rocher en forêt', alt. 1500 m, VII-1931].
- [*Plagiogyria parva* De Vol ex F.S. Liew, Taiwania 21 (1976) 38, nom. nud.] — Voucher: *Nakamura 4487* (TI), Taiwan, Hualien, Muhkwashan, 7-VIII-1940.

*Rhizome* short, erect to suberect or curved, thick with many stipe bases. *Stipes* stramineous or brownish, of sterile fronds (4.5–)15–25(–35) cm long, of fertile fronds (17–)40–50(–65) cm long, base slightly to moderately enlarged, 2–7 mm wide in the

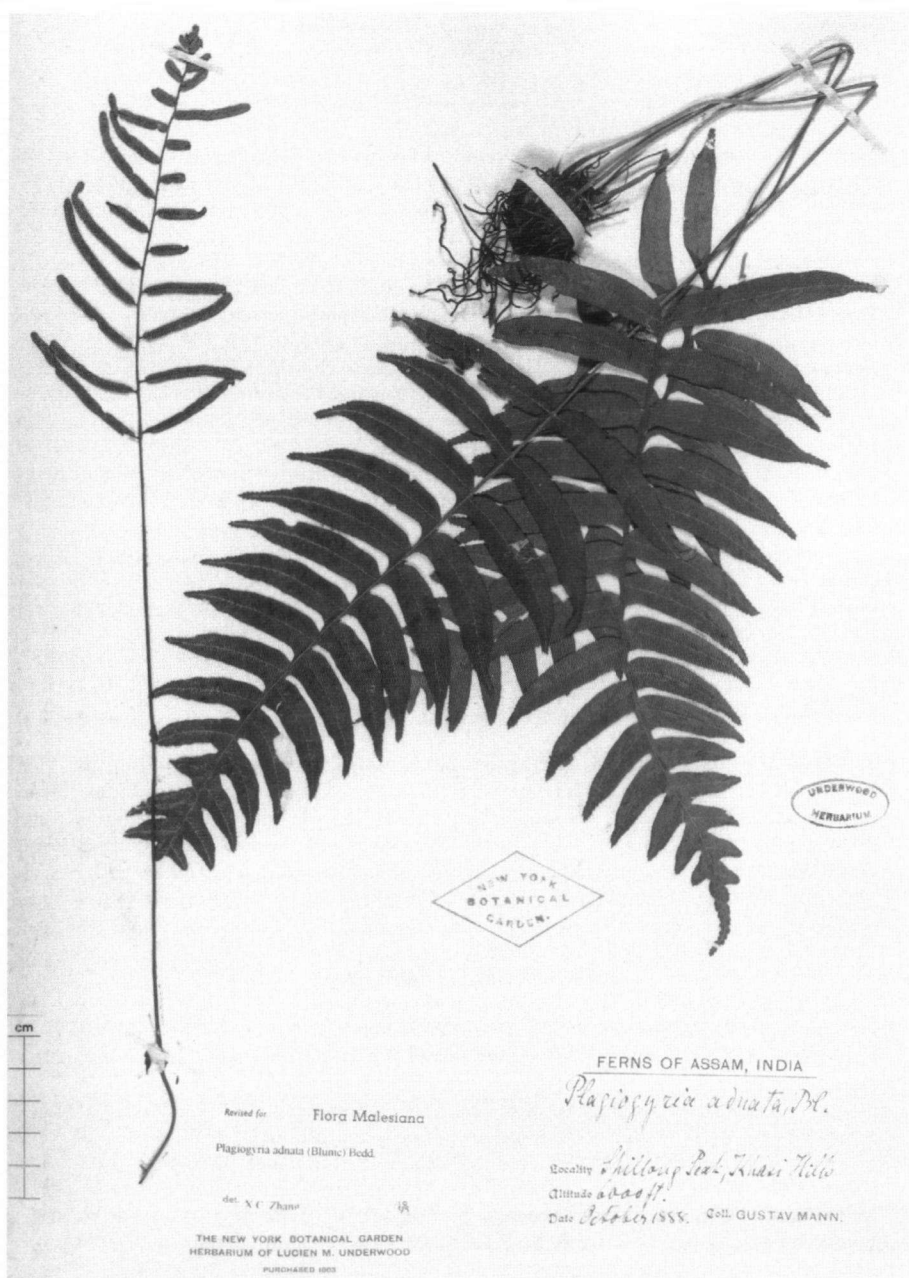


Fig. 1. *Plagiogyria adnata* (Blume) Bedd. [G. Mann s.n., X-1888 (NY), India, Khasia Hills, Shillong Peak].

middle, in cross section one V-shaped vascular bundle, upper part of stipe tetragonal or rarely triangular, aerophores only present on base of stipe; rachises glabrous. Fronds not covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis semiterete to trigonous, not winged, rachis (0.5–)1–1.5(–3) mm wide in the middle part. *Sterile lamina* herbaceous, not glaucous, pinnatifid, rarely except a few free basal pinnae, widest basally to medially, (8–)15–25(–36) cm long, (3–)5–15(–26) cm wide; pinnae (8–)13–20(–35) pairs, widest below or about the middle, veins of pinnae paired at base or forked above base or rarely simple, distinct on both surfaces, stomata scattered on the lower epidermis, margin minutely serrulate, towards the base entire or nearly so, or nearly entire except the apex, most pinnae except the uppermost with inequilateral base, acroscopic side adnate into a wide wing along rachis; lowermost pinnae adnate, not or slightly deflexed, not or slightly shortened; middle pinnae (1.5–)5–7(–11) cm long, (0.4–)0.7–1.2(–1.7) cm wide in the middle, acroscopic side of base adnate to the rachis into a wide wing, basiscopic side rounded, partly free from rachis; uppermost pinnae adnate, base about equal-sided, basiscopically decurrent into rachis wing; apex of lamina pinnatifid, terminated by a pinnatilobed, short-triangular or long-triangular segment. *Fertile fronds* usually longer than the sterile ones, dorsal side of rachis flattened or slightly grooved, not winged, rachis (0.5–)1(–2) mm wide in the middle part; lamina pinnate except the apex, lower pinnae shortly stalked, (8–)16–26(–45) cm long, (2–)4–10(–16) cm wide; pinnae glabrous or sparsely bearing short glandular hairs, (9–)13–17(–24) pairs, margin entire or sub-entire; lowermost pinnae not shortened, 1–4 cm apart; middle pinnae (1–)4–8(–11) cm long, 2–3(–4) mm wide, sessile or shortly stalked; apex terminated by a pinna conform with the lateral ones which is often beaded at the base or pinnatifid, acuminate, or caudate. Paraphyses many or few, rarely mostly lost, yellow to brown. Spores yellow, with reddish tubercles.

Distribution — Japan, China (Anhui, Zhejiang, Fujian, Jiangxi, Huibei, Hunan, Jiangxi, Guangdong, Guangxi, Hainan, Taiwan, Sichuan, Guizhou, Yunnan), Burma, E India (Assam, Khasia, Shillong), Thailand, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo (Mt Kinabalu), Philippines (Luzon).

Habitat — In forest on rather wet mountain slopes, altitude 60–2000 m, common above 500 m; on Mt Kinabalu 1400–1600 m.

Chromosome number — Nakato (1988) reported  $2n = 260$ , under the name of *P. rankanensis* Hayata, Weng (1990) reported  $n = 60$ , under the name *P. distinctissima* Ching.

Notes — 1. Kuhn (1869) ascribed *P. adnata* to T. Moore, Ind. Syn., a manuscript name. Apparently he was unaware of the combination made by Beddome four years before.

2. A few sheets of *Hancock 216 bis* in BM, K are all *P. stenoptera* (*Lomaria concinna*). Ching's original type of *P. yunnanensis* could not be traced in those herbaria.

## 2. *Plagiogyria assurgens* H. Christ — Fig. 2

*Plagiogyria assurgens* H. Christ in Baroni & H. Christ, Bull. Soc. Bot. Ital. (1901) 293; H. Christ, Bull. Acad. Int. Géogr. Bot. (1906) 139, cum plate on p. 132; C. Chr., Acta Horti Gothob. 1 (1924) 92; Copel., Philipp. J. Sci. 38 (1929) 398; Ching, Icon. Filic. Sin. 4 (1937) pl. 155; Acta Phytotax. Sin. 7 (1958) 117, 141; Fl. Reipubl. Popul. Sin. 2 (1959) 91; H.S. Kung, Fl. Sichuanica 6 (1986) 126, pl. 37, f. 1–3. — Type: *Scallan s.n.* (holo P), Sichuan, Mt Emel,

'Mont Omi', 'Uo-mi San, Tien-to-Sen, Sze-tchuen', 'in monte Mo Mi (Omei of Faber)', IX-1899.

*Lomaria deflexa* Baker, J. Bot. 24 (1888) 226, non Colenso (1844), nec Liebm. (1849). — *Spicanta deflexa* Kuntze, Revis. Gen. Pl. 2 (1891) 822. — *Blechnum faberi* C. Chr., Index Filic. (1906) 495. — Type: *Faber 1023* (holo K; fotogr. P), Sichuan, Mt Emei (Omei), alt. 7000 ft.

[*Plagiogyria assurgens* H. Christ var. *concolor* Ching, Fl. Reipubl. Popul. Sin. 2 (1959) 92, nom. nud.] — Voucher: *P. H. Yu 1227* (holo PE), Yunnan, Zhenxiong, Yigu, Mawuotang, alt. 1850 m, 6-X-1957.

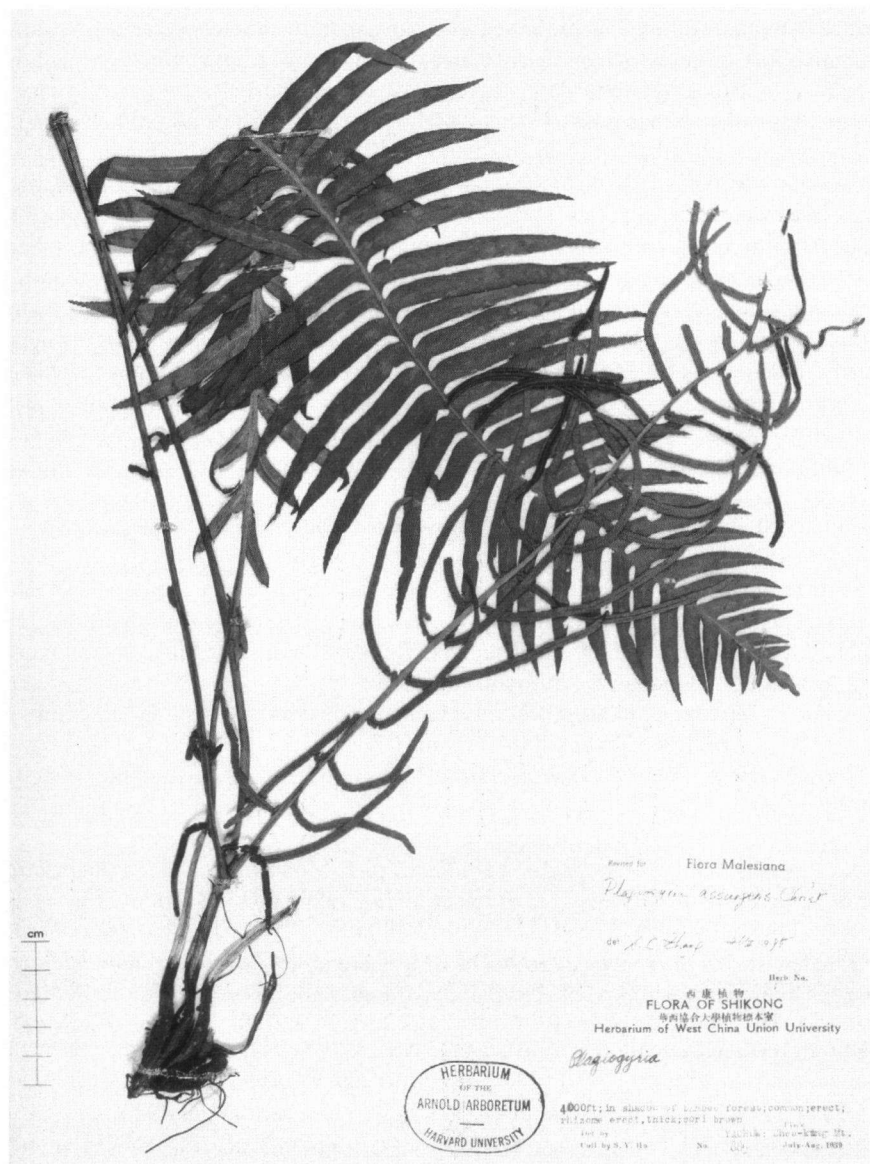


Fig. 2. *Plagiogyria assurgens* H. Christ [S. Y. Hu 885 (A), China, Sichuan, Ya'an, Mt Zhegushan].

*Rhizome* short, suberect or curved, thick with many stipe bases. *Stipes* stramineous, of sterile fronds 8–20 cm long, of fertile fronds 15–45 cm long, base moderately enlarged, 5–8 mm wide in the middle, in cross section one U-shaped vascular bundle, upper part of stipe tetragonal, aerophores only present on base of stipe; rachises glabrous. Fronds not covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis trigonous or carinate, not winged, rachis 1–4 mm wide in the middle part. *Sterile lamina* herbaceous to firm herbaceous, glaucous beneath, pinnatifid, widest medially, 23–63 cm long, 10–20 cm wide, index 1.9–3.2; pinnae 22–47 pairs, widest medially or widest near base, veins of pinnae paired at base or forked above base to paired at base with one branch forked above the base, distinct on both surfaces, stomata scattered on the lower epidermis, margin serrulate, towards the base entire or nearly so, most pinnae except the uppermost with inequilateral base, acroscopic side adnate into a wide wing along rachis; lowermost pinnae adnate, deflexed, abruptly shortened, 1–2(–4) pairs much reduced, to (0.5–)1–2(–3) cm long; middle pinnae 5–11 cm long, 0.7–1.2 cm wide in the middle, acroscopic side of base adnate to the rachis into a wide wing, basiscopic side rounded, partly free from rachis; uppermost pinnae adnate, base about equal-sided, basiscopically rounded; apex of lamina pinnatifid, terminated by a pinnatilobed, short-triangular segment. *Fertile fronds* usually longer than the sterile ones, dorsal side of rachis carinate, not winged, rachis 1–4 mm wide in the middle part; lamina deeply pinnatifid, rachis slightly winged throughout, 28–60 by 7–14 cm; pinnae glabrous, 20–35 pairs, margin entire; lowermost pinnae 1–4 pairs much shorter, deflexed and often sterile, 2–4(–7) cm apart; middle pinnae 30–80 mm long, (2–)3 mm wide, base broadly adnate; apex pinnatifid, acuminate or caudate. Paraphyses few, mostly lost, brown. Spores yellow, with reddish tubercles.

Distribution — China (Sichun, Yunnan).

Habitat — On humus-rich forest mountain slopes, altitude 1200–2500 m.

### 3. *Plagiogyria egenolfooides* (Baker) Copel.

*Plagiogyria egenolfooides* (Baker) Copel., J. Straits Branch Roy. Asiat. Soc. 63 (1912) 72; Alderw., Malayan Ferns Suppl. 1 (1916) 244; Copel., Sarawak Museum J. 2 (1917) 387; Philipp. J. Sci. 38 (1929) 394. — *Lomaria egenolfooides* Baker, Kew Bull. (1894) 7. — *Blechnum egenolfooides* (Baker) C. Chr., Index Filic. (1906) 153. — Type: *Hose 309* (holo K; iso P, fragm. BM, fotogr. PE), Sarawak, Mt Dulit, alt. 5000 ft, 1891.

For further synonymy see under the varieties.

*Rhizome* short to c. 15 cm long or occasionally up to 50 cm long, erect, suberect, or decumbent, narrow, sometimes very woody. *Stipes* reddish-brown, of sterile fronds (0.5–)3–35(–72) cm long, of fertile fronds (2.5–)6–55(–88) cm long, base slightly, strongly, or moderately enlarged, 0.5–20 mm wide in the middle, cross section one U-shaped or one V-shaped vascular bundle, upper part of stipe tetragonal, terete, or oval, aerophores present on stipe and rachis, only on base of stipe, or seemingly absent when dry, slender, hook-shaped, with pointed apex (usually); stipes and rachises glabrous. Fronds in var. *latipinna* usually covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis semiterete, trigonous, flattened or grooved, not winged, rachis (0.2–)0.5–4(–5) mm wide in the middle part. *Sterile lamina* subcoriaceous, not glaucous, rather thick to rather thin but firm, pinnate except the pinnatifid or pinnatilobed apex, or lower part pinnate and upper 1/3 to 1/2 pinnatifid or pinnatifid

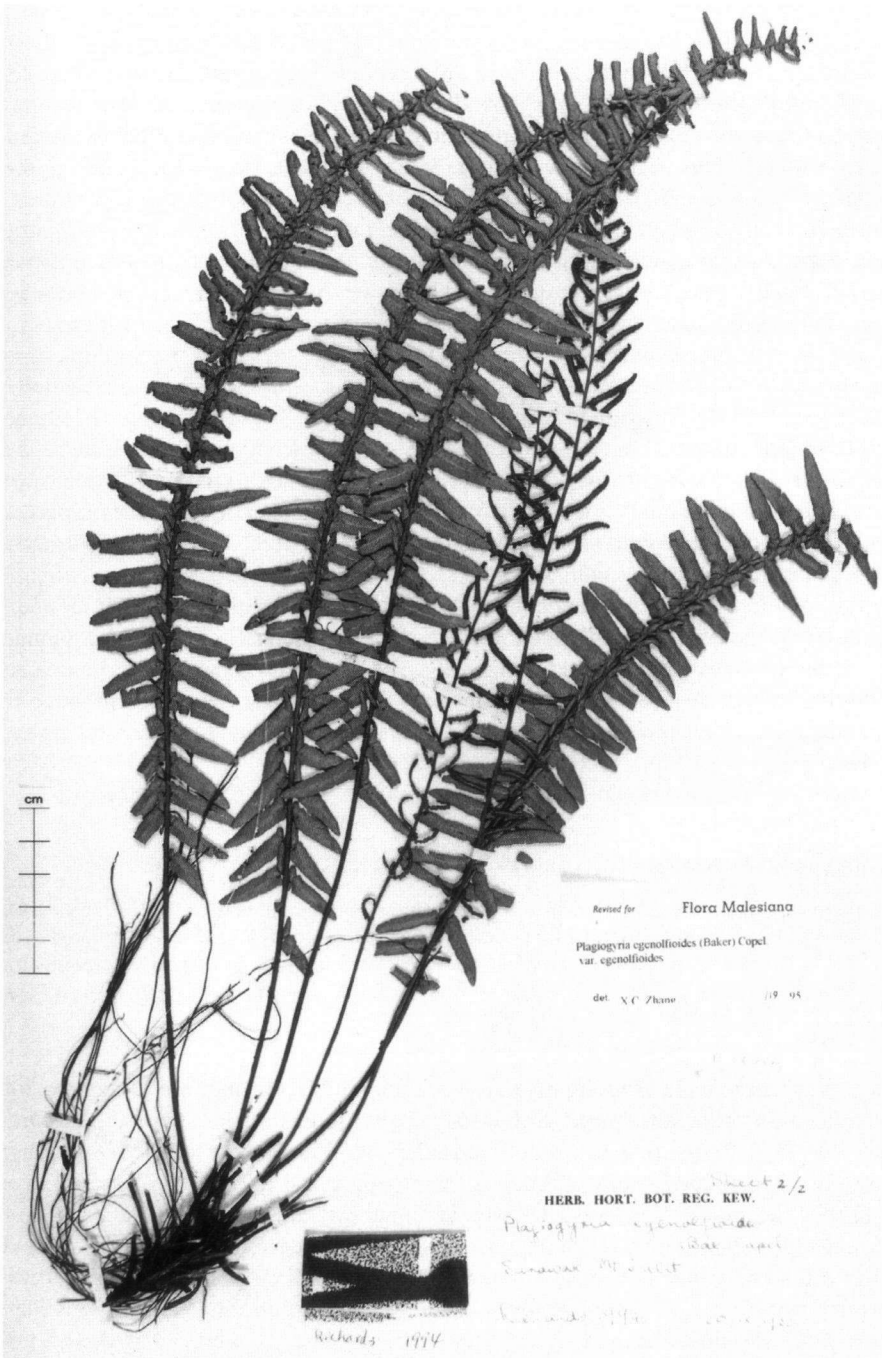


Fig. 3. *Plagiogyria egenolfioides* (Baker) Copel. var. *egenolfioides* [P.W. Richards 1994 (K), Sarawak, Mt Dulit].



except a few free basal pinnae, or rarely pinnatifid throughout, widest medially to subbasally, (4–)12–74(–100) cm long, (1–)2.5–22(–27) cm wide, index (1.68–)2–8 (–11); pinnae (6–)17–60(–80) pairs, widest near base to about the middle, veins of pinnae simple, paired at base, forked above base, or as many simple as forked, distinct, obscure, or invisible on both surfaces, stomata scattered on the lower epidermis, margin (sometimes except the apex) entire, crenate, or serrulate, most pinnae except the uppermost with equilateral or inequilateral base, acroscopic side adnate, cuneate, rounded, auriculate or attenuate; lowermost pinnae sessile, shortly stalked or rarely adnate but slightly constricted, deflexed or not, slightly, gradually, or abruptly shortened, not reduced or rarely some pinnae vestigial on stipe sided by aerophores; middle pinnae (0.5–)1–14(–20) cm long, (0.15–)0.4–1.4(–1.9) cm wide in the middle, sessile to shortly stalked, base rounded, cuneate, or auriculate; apex of lamina pinnatifid, terminated by a pinnatilobed segment or rarely by a pinna conform to lateral ones. *Fertile fronds* usually longer than the sterile ones, rarely shorter or about the same length, dorsal side of rachis semiterete, flattened, or grooved, not winged, rachis 0.5–4(–5) mm wide in the middle part; lamina pinnate throughout, pinnae nearly sessile or pinnae shortly stalked or pinnate except the apex, lower pinnae shortly stalked or pinnate, pinnae stalked, uppermost pinnatifid, pinnae base decurrent, (6–)11–60(–100) cm long, (0.7–)1.5–20(–30) cm wide; pinnae 15–72 pairs, sparsely short glandular hairy or glabrous, margin erose, entire, or subentire; lowermost pinnae the longest or gradually shortened, 0.5–4(–8) cm apart; middle pinnae (0.4–)0.8–14(–22) cm long, 1.5–6 mm wide, base slightly cordate, shortly stalked, or sessile (rarely auriculate or with one basispic lobe); apex pinnatifid, acuminate or caudate, rarely terminated by a pinna-like segment. Paraphyses many or few, mostly caducous, yellow, brown, or dark brown. Spores brown or yellow, with reddish tubercles.

## KEY TO THE VARIETIES

- 1a. Plants small (dwarfed), aerophores obscure, only present on base of stipe . . . . . **a. var. egenolfioides**  
 b. Plants not dwarfed, aerophores distinct, present from base of stipe to rachis . . . . . 2  
 2a. Pinnae stalked, apex of sterile lamina usually terminated by a pinna conform to lateral ones . . . . . **d. var. sumatrana**  
 b. Pinnae subsessile or base adnate to rachis; apex of sterile lamina usually pinnatifid . . . . . 3  
 3a. Lowermost pinnae gradually shortened . . . . . **b. var. decrescens**  
 b. Lowermost pinnae not shortened, or only 1 to 2 pairs shorter . . . . . **c. var. latipinna**

**a. var. egenolfioides** — Fig. 3, Map 2

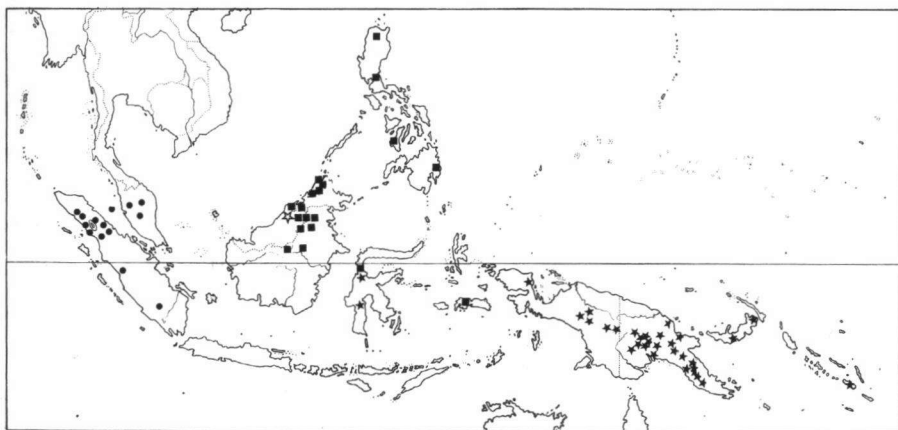
*Plagiogyria egenolfioides* (Baker) Copel., J. Straits Branch Roy. Asiat. Soc. 63 (1912) 72; Alderw., Malayan Ferns Suppl. 1 (1916) 244; Copel., Sarawak Museum J. 2 (1917) 387; Philipp. J. Sci. 38 (1929) 394. — *Lomaria egenolfioides* Baker, Kew Bull. (1894) 7. — *Blechnum egenolfioides* (Baker) C. Chr., Index Filic. (1906) 153. — Type: *Hose 309* (holo K; iso P, fragm. BM, photogr. PE), Sarawak, Mt Dulit, alt. 5000 ft, 1891.

*Plagiogyria minuta* Copel., Philipp. J. Sci., Bot. 10 (1915) 148; Alderw., Malayan Ferns Suppl. 1 (1916) 243; Copel., Sarawak Museum J. 2 (1917) 387; Philipp. J. Sci. 38 (1929) 394, pl. 3. — Type: *Native collector 939* (not '393' by Copeland 1915) (holo MICH; fragm. BM, photogr. GH, PE), Sarawak, without exact locality.

*Rhizome* short, erect or decumbent, narrow. *Stipe* of sterile fronds (0.5–)3–13 cm long, of fertile fronds (2.5–)6–23 cm long, base slightly enlarged, 0.5–2 mm wide in the middle, cross section one U-shaped vascular bundle or mostly one V-shaped vascular bundle, upper part of stipe tetragonal to terete or oval, aerophores only present on base of stipe or seemingly absent when dry. Fronds covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis semiterete, grooved or flattened, rachis (0.2–)0.5–1(–1.5) mm wide in the middle part. *Sterile lamina* rather thick, pinnate except the pinnatifid or pinnatilobed apex, widest medially, (4–)14–36 cm long, (1–)2.5–5.5 cm wide, index (4–)5–7.8; pinnae (13–)20–38 pairs, widest basally, veins of pinnae simple (or forked), invisible on both surfaces, margin crenate, most pinnae except the uppermost with equilateral or inequilateral base, auriculate; lowermost pinnae sessile, deflexed, gradually shortened; middle pinnae (0.5–)1–2.5 cm long, (0.15–)0.4–0.6 cm wide in the middle, sessile, base auriculate (auricle up to 0.8 cm long, and pinnatilobed); apex of lamina pinnatifid, terminated by a pinnatilobed segment. *Fertile fronds* usually longer than the sterile ones, dorsal side of rachis semiterete or grooved or flattened, rachis 0.5–1 mm wide in the middle part; lamina pinnate throughout, pinnae shortly stalked or nearly sessile, (6–)11–25 cm long, (0.7–)1.5–3.5 cm wide; pinnae 22–28 pairs, glabrous, margin erose; lowermost pinnae gradually shortened, 0.5–0.8 cm apart; middle pinnae (0.4–)0.8–1.5 cm long, 1.5–2 mm wide, base shortly stalked or slightly cordate (or auriculate, sometimes with one basispicopic lobe); apex pinnatifid, acuminate or caudate. Paraphyses few, mostly lost or absent, dark brown. Spores brown, with reddish tubercles.

Distribution — Endemic to Sarawak, three collections from Mt Dulit.

Habitat — On shaded sandstone cliff, growing with *Dipteris conjugata*, altitude 1230–1500 m.



Map 2. Distribution of: ● *Plagiogyria egenolfioides* (Baker) Copel. var. *sumatrana* (Rosenst.) X.C. Zhang & Noot.; ★ *P. egenolfioides* var. *decrescens* (C. Chr.) X.C. Zhang & Noot.; ☆ *P. egenolfioides* var. *egenolfioides*; ■ *P. egenolfioides* var. *latipinna* (Copel.) X.C. Zhang & Noot.

**b. var. *decreescens* (C. Chr.) X.C. Zhang & Noot., *comb. nov.* — Fig. 4, Map 2**

*Plagiogyria tuberculata* Copel. var. *decreescens* C. Chr., *Brittonia* 2 (1937) 284. — Type: *Brass* 4746 (holo BM; photogr. PE), Papua New Guinea, Central Division, Wharton Range, Murray Pass, alt. 2840 m, 8-VIII-1933.

*Blechnum pendulum* Brause, *Bot. Jahrb. Syst.* (1920) 157. — *Struthiopteris pendula* (Brause) Ching, *Sunyatsenia* 5 (1940) 243. — *Plagiogyria pendula* (Brause) Chambers ex Nakaike, *Bull. Nat. Sci. Mus. Tokyo* 17 (1991) 92, f. 13. — Type: *Ledermann* 11927 (holo B; photogr. BM, PE), Papua New Guinea, Sepik, 'Baumkronen', alt. 2070 m, 2-VI-1913.

*Plagiogyria novoguineensis* Alderw., *Nova Guinea* 14 (1923) 36. — Type: *Lam* 1860 (holo BO, n.v.; fragm. L, photogr. BM, K, PE), New Guinea, Doorman summit, alt. 2950 m, 30-X-1920.

*Plagiogyria papuana* C. Chr., *Brittonia* 2 (1937) 285, non Alston (1939); Nakaike, *Bull. Nat. Sci. Mus. Tokyo* 17 (1991) 92. — Syntypes: *Brass* 4317 (BM, photogr. PE), Papua New Guinea, Central Division, Mt Albert Edward, alt. 3680 m, 23-VI-1933; *ibid.*, *Brass* 4483 (BM, NY, photogr. PE), alt. 3680 m, 10-VII-1933.

*Plagiogyria tuberculata* auct. non Copel.: C. Chr., *Brittonia* 2 (1937) 284.

*Rhizome* short to c. 15 cm long or occasionally up to 50 cm long, erect, suberect, or decumbent. *Stipes* reddish-brown, of sterile fronds 6–35(–72) cm long, of fertile fronds 16–50(–88) cm long, base strongly or moderately enlarged, 5–15 mm wide in the middle, cross section one U-shaped vascular bundle, upper part of stipe tetragonal, aerophores present on stipe and rachis, slender, hook-shaped, with pointed apex. Fronds covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis semiterete to trigonous or grooved, rachis (1–)2–4(–5) mm wide in the middle part. *Sterile lamina* rather thick, lower part pinnate, upper 1/3 to 1/2 pinnatifid, widest medially, 12–74 cm long, (1.5–)3–13(–26) cm wide, index (2.5–)5–8(–11); pinnae (strongly ascending) (18–)30–60(–80) pairs, widest below or about the middle, veins of pinnae simple to as many simple as forked, distinct to obscure on both surfaces, margin entire, most pinnae except the uppermost with inequilateral to equilateral base, rounded to cuneate; lowermost pinnae sessile to shortly stalked, not deflexed, usually gradually shortened, some pinnae vestigial on stipe sided by aerophores (sometimes a few pairs); middle pinnae (1.3–)3.5–7(–18) cm long, (0.3–)0.5–1 cm wide in the middle, sessile to rarely shortly stalked, base rounded or cuneate (when dry); uppermost pinnae adnate, base unequal-sided, basiscopically decurrent into rachis wing to straight to the rachis; apex of lamina pinnatifid, sometimes terminated by a pinnatifid or a pinna-like segment. *Fertile fronds* usually longer than the sterile ones, sometimes shorter (or about the same length, sometimes from the high grasslands), dorsal side of rachis semiterete, trigonous or grooved, rachis (1–)2–4(–5) mm wide in the middle part; lamina pinnate except the apex, lower pinnae shortly stalked, 18–54(–90) cm long, 3–12(–25) cm wide; pinnae sparsely bearing short glandular hairs, 25–70 pairs, margin erose; lowermost pinnae gradually shortened, (0.8–)1–3(–6) cm apart; middle pinnae 3–14 cm long, 3–5 mm wide, base sessile, slightly cordate, or shortly stalked; apex pinnatifid, acuminate or caudate. Paraphyses many, yellow to (glossy) brown. Spores brown, with reddish tubercles.

*Distribution* — Sulawesi, Moluccas (Seram), New Guinea, S New Ireland, Solomon Islands (Guadalcanal); very common at high elevations in New Guinea.

*Habitat* — Forming large spots in fire-induced, treefern-dominated grasslands, and subalpine shrubbery, in primary cloud forest, rarely as an epiphyte, altitude 1250–4000 m.

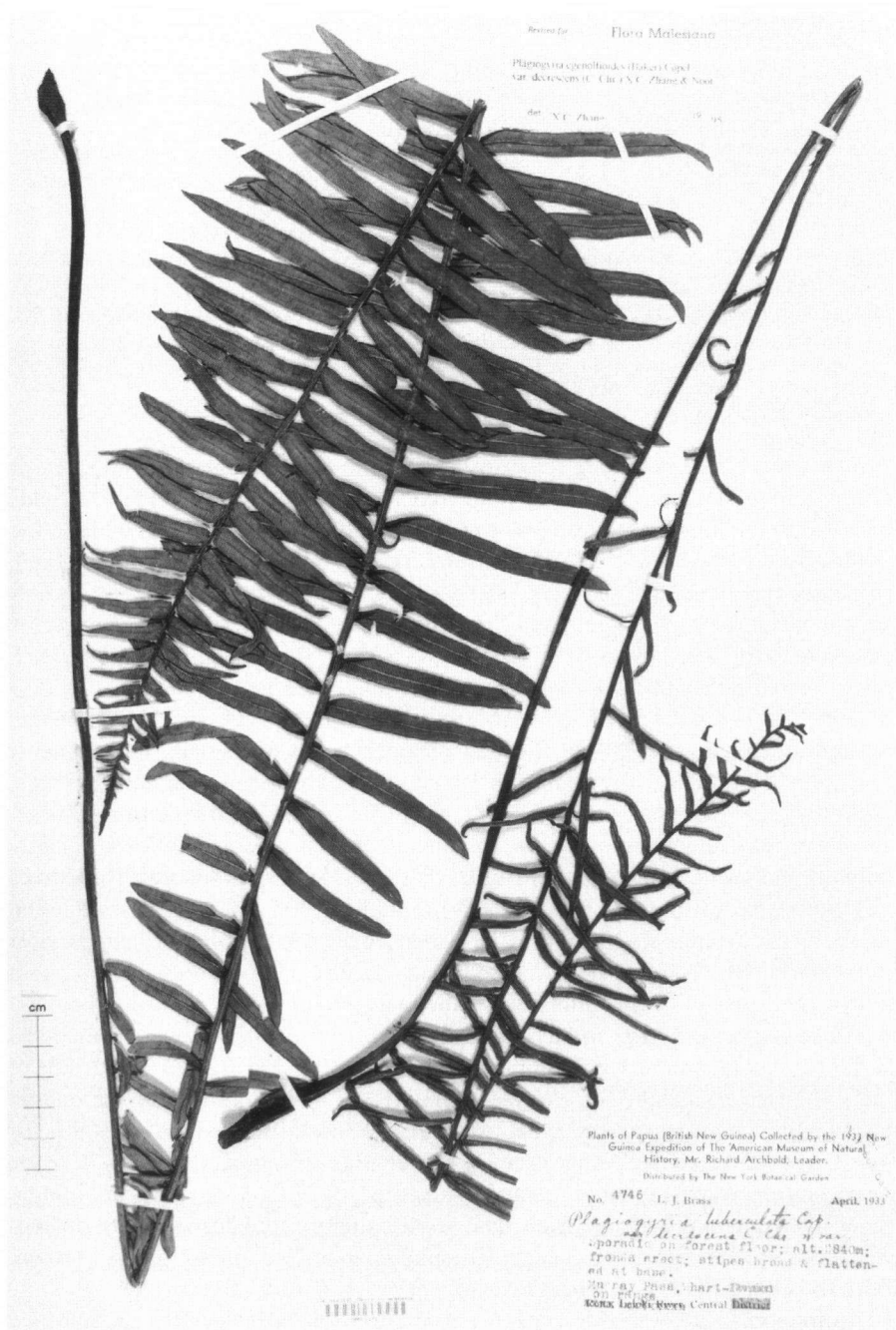


Fig. 4. *Plagiogyria egenolfioides* (Baker) Copel. var. *decrescens* (C. Chr.) X.C. Zhang & Noot. [L.J. Brass 4746 (GH), Papua New Guinea, Central, Murray Pass].



Fig. 5. *Plagiogyria egenolfioides* (Baker) Copel. var. *latipinna* (Copel.) X.C. Zhang & Noot. [Merrill 5962 (US), Philippines, Mindora, Mt Halcon].

Chromosome number — Walker (1973) reported  $n = 66$  under the name of *P. tuberculata* Copel.

Note — Hennipman (1968) made a detailed study of the mucilage-producing glandular hairs on the base of stipes of this variety and *P. pycnophylla*. He found that the hairs of the two species show certain difference in orientation and in shape and size of stalk and the capitate glandular cell. Our observation confirmed his report, but this character is not very useful in practice for distinguishing species.

**c. var. latipinna** (Copel.) X.C. Zhang & Noot., *comb. nov.* — Fig. 5, Map 2

*Plagiogyria tuberculata* Copel. var. *latipinna* Copel., Philipp. J. Sci., Bot. 2 (1907) 133; Alderw., Malayan Ferns (1908) 826. — Type: *Merrill 5962* (iso GH, US, photogr. PE), Philippines, Mt Halcon, alt. 2400 m, XI-1906.

*Plagiogyria tuberculata* Copel., Philipp. J. Sci. 1, Suppl. (1906) 153; Alderw., Malayan Ferns (1908) 343; C. Chr., Mitt. Inst. Allg. Bot. Hamburg 7 (1) (1927) 154; Copel., Philipp. J. Sci. 38 (1929) 391, p.p., excl. pl. Borneo, Sumatra; Fern Fl. Philipp. 2 (1960) 194, p.p., excl. pl. New Guinea, Borneo, Sumatra; K. Iwats. & M.G. Price, South East Asia Studies 14 (1977) 550; Parris, Stud. Fl. Gunung Mulu Nat. Park, Sarawak (1984) 177; M. Kato, Acta Phytotax. Geobot. 40 (1989) 91. — Type: *Copeland 1924* (holo MICH-Herb. E.B. Copeland No. 33), Luzon, Lepanto, Bagnen, alt. 6500 ft, 4-XI-1905.

*Plagiogyria tuberculata* Copel. var. *gracilis* Copel., Leafl. Philipp. Bot. 2 (1908) 405; Alderw., Malayan Ferns Suppl. 1 (1916) 244. — Type: *Elmer 9740* (BM, F, GH, K, L, NY, P, U, US), Philippines, Negros, Mt Cuernos, alt. 1800 m, IV-1908.

*Plagiogyria pycnophylla* (Kunze) Mett. var. *integra* Copel., Philipp. J. Sci., Bot. 5 (1910) 285; Alderw., Malayan Ferns Suppl. 1 (1916) 244; Copel., Sarawak Museum J. 2 (1917) 388. — Type: *Brooks s.n.* (BM), Sarawak, Mt Bengkarum, Sambas River, alt. 3500 ft, IX-1908.

*Plagiogyria pycnophylla* (Kunze) Mett. var. *integra* Copel. subvar. *stenophylla* Bonap., Notes Pterid. 14 (1923) 484. — Type: *Mjöberg 9* (holo P; iso US), Sarawak, Mt Murud, alt 5000–6000 ft, 1922-1923.

*Plagiogyria rotundipinnata* Bonap., Notes Pterid. 14 (1923) 484; Copel., Philipp. J. Sci. 38 (1929) 395. — Type: *Mjöberg 7* (holo P; iso K, photogr. BM, PE), Sarawak, Mt Murud, summit, alt. 8000 ft, 1922-1923.

*Plagiogyria clemensiae* Copel., Philipp. J. Sci. 38 (1929) 395, pl. 4; C. Chr. & Holttum, Gard. Bull. Str. Settle. 7 (1934) 225; Tagawa, Acta Phytotax. Geobot. 26 (1974) 113; Parris et al., Pl. Mount Kinabalu 1 (1992) 97. — Type: *Clemens 10589* (holo MICH-Herb. E.B. Copeland No. 26, fragm. BM-Herb. C. Christensen, photogr. GH, NY, PE), Borneo, Mt Kinabalu, Paka Cave, alt. 3000 m, 12–14-XI-1915.

*Rhizome* short to c. 15 cm long, erect to decumbent, narrow and very woody. *Stipes* of sterile fronds (6–)10–35(–45) cm long, of fertile fronds 22–55(–66) cm long, base strongly or moderately enlarged, 4–20 mm wide in the middle, cross section one U-shaped vascular bundle (but in smaller plants more like a V-shaped form), upper part of stipe tetragonal, aerophores present on stipe and rachis, slender, hook-shaped, with pointed apex (usually short). Fronds usually covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis usually semiterete, trigonous, grooved, or sometimes flattened, rachis 1–2(–4) mm wide in the middle part. *Sterile lamina* rather thin to rather thick, lower part pinnate, upper 1/3 to 1/2 pinnatifid to pinnatifid except a few free basal pinnae (or pinnatifid, the Kinabalu high elevation population), widest medially to subbasally, (10–)20–50(–66) cm long, 5–18(–22) cm wide, index 2–4; pinnae 20–40(–60) pairs, widest medially (usually, rarely widest at the base in the pinnatifid form), veins of pinnae simple or paired at base or forked above base

(few veins), distinct on both surfaces, margin usually completely entire, sometimes except the apex, most pinnae except the uppermost with equilateral base, cuneate, rounded, attenuate, or acroscopic side adnate; lowermost pinnae sessile to shortly stalked or rarely adnate but slightly constricted, usually slightly deflexed, abruptly or slightly shortened; middle pinnae (3-)4-10(-20) cm long, (0.4-)0.6-0.9(-1.4) cm wide in the middle, sessile to rarely shortly stalked, basiscopic side rounded, partly free from rachis, straight to rachis, or round, base cuneate or rounded (sometimes attenuate); uppermost pinnae adnate, base unequal- to about equal-sided, basiscopically decurrent into rachis wing or rarely rounded; apex of lamina pinnatifid, terminated by a pinnatilobed, short-triangular to pinnatilobed, long-triangular or pinna-like segment (very rare, up to 10 cm long, base connected with upper shorter lateral pinnae). *Fertile fronds* usually longer than the sterile ones, dorsal side of rachis semiterete, flattened, or grooved, rachis 1-2(-5) mm wide in the middle part; lamina pinnate except the apex, lower pinnae shortly stalked, (8-)20-45(-65) cm long, (3-)7-20(-26) cm wide; pinnae usually sparsely bearing short glandular hairs or glabrous, 15-50(-72) pairs, margin entire or subentire; 1-2(-4) cm apart; middle pinnae 4-11(-16) cm long, 2-3 mm wide, base sessile to shortly stalked; apex pinnatifid, acuminate or caudate, or terminated by a pinna-like segment, or rarely by a pinna conform with the lateral ones, which is often beaded at the base. Paraphyses many, yellow to dark brown. Spores yellow, with reddish tubercles.

Distribution — Borneo, Philippines, Sulawesi, Moluccas (Seram).

Habitat — A common constituent on floor of mossy forest, in deep shade, rarely epiphyte on moss-covered tree trunks, altitude 1200-4000 m.

**d. var. *sumatrana* (Rosenst.) X.C. Zhang & Noot., *comb. & stat. nov.***

Fig. 6, Map 2

*Plagiogyria sumatrana* Rosenst., Feddes Repert. Spec. Nov. Regni Veg. 13 (1914) 214; Alderw., Malayan Ferns Suppl. 1 (1916) 244; Bull. Jard. Bot. Buitenzorg III, 2 (1920) 164; Copel., Philipp. J. Sci. 38 (1929) 392. — Type: *Winkler in Rosenstock, Filic. Sumatra Exp. 127* (BM, K, L, P), Sumatra, Batakland, 1911.

*Plagiogyria subrigida* Alderw., Bull. Jard. Bot. Buitenzorg III, 2 (1920) 163. — Syntypes: *Bünne-meijer 4122* (K, L, U), Sumatra, Mt Malintang, alt. 2000 m, 29-VII-1910; *Lörzing 6006* (L), Sumatra, Mt Sibajak, alt. 2000 m, 28-VIII-1910.

*Plagiogyria integripinnata* Bonap., Notes Pterid. 14 (1923) 60. — Type: *Haniff & Nur 8144* (holo P), Malaya, Peninsula, Gunung Tahan, alt. 5500 ft, 11-VI-1922.

*Plagiogyria malayensis* R.D. Dixit & A. Das, Fern Gaz. 12 (1981) 182, fotogr. 1. — Type: *Wray 317* (holo CAL; iso BM), Malaya, Peninsula, Perak, summit of Gunung Batu Puteh, 6700 ft. Paratype: *Scortechini 397* (CAL), Malaya, Peninsula, without exact locality.

*Plagiogyria tahanensis* Miyamoto & H. Ohba, Acta Phytotax. Geobot. 43 (1992) 31, f. 1 A-H. — Type: *Miyamoto, F. 89-373* (holo TI), Malaya, Peninsula, Pahang, summit of Gunung Tahan, alt. 1600 m.

*Plagiogyria tuberculata* auct. non Copel.: Holttum, Revis. Fl. Malaya 2, ed. 2 (1966) 111; A.G. Piggott, Ferns of Malaysia in Colour (1988) 88, fotogr. 252-255; Miyamoto & H. Ohba, Acta Phytotax. Geobot. 43 (1992) 32, f. 1 I.

*Rhizome* short to c. 15 cm long, erect to decumbent, narrow and very woody. *Stipe* of sterile fronds (2-)12-30(-40) cm long, of fertile fronds (4-)24-45 cm long, base strongly enlarged, 3-15 mm wide in the middle, cross section one U-shaped vascular bundle, upper part of stipe tetragonal, aerophores present on stipe and rachis (sometimes



Fig. 6. *Plagiogyria egenolfioides* (Baker) Copel. var. *sumatrana* (Rosenst.) X.C. Zhang & Noot. [Rosenstock, *Filic. Sumatr. Ex. 127*, leg. by Winkler (L), Sumatra, Batakerland].



absent on stipe, and not prominent), slender, hook-shaped, with pointed apex (usually). Fronds covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis grooved (usually), flattened, semiterete, or trigonous, rachis (0.5–)2–3(–5) mm wide in the middle part. *Sterile lamina* rather thick, pinnate except the pinnatifid or pinnatilobed apex or lower part pinnate, upper 1/3 to 1/2 pinnatifid, widest medially to subbasally, (5–)30–60(–100) cm long, (2.5–)13–22(–27) cm wide, index (1.68–)2–3.85(–6.13); pinnae (6–)17–39 pairs, widest below or about the middle, veins of pinnae simple to rarely as many simple as forked, distinct to obscure on both surfaces, margin entire or rarely serrulate, most pinnae except the uppermost with equilateral to inequilateral base, cuneate to rounded; lowermost pinnae shortly stalked (sometimes stalk up to 1 cm long), not deflexed, gradually to abruptly shortened (2 or 3 pairs); middle pinnae (1.5–)6–14 cm long, (0.4–)0.7–1.4(–1.9) cm wide in the middle, sessile to shortly stalked, base rounded or cuneate; uppermost pinnae adnate, base unequal-sided, basiscopically decurrent into rachis wing or rounded; apex of lamina pinnatifid or terminated by a pinna-like (2–7 cm long) or pinnatilobed, long-triangular segment, rarely terminated by a pinna conform to lateral ones with free base, shortly stalked, 11 cm long. *Fertile fronds* usually longer than the sterile ones, dorsal side of rachis grooved, flattened, or semiterete, rachis 1–4(–5) mm wide in the middle part; lamina pinnate, pinnae stalked, uppermost pinnatifid, pinnae base decurrent, (12–)35–60(–100) cm long, (2–)9–15(–30) cm wide; pinnae sparsely short glandular hairy or glabrous, 16–30 pairs, margin erose; lowermost pinnae not shortened (short to long stalked, rarely one or two pairs shorter), (2–)4(–8) cm apart; middle pinnae (2.5–)7–13(–22) cm long, (3–)4–5(–6) mm wide, base shortly stalked; apex pinnatifid, terminated by a pinna-like segment (usually 2–4 cm long). Paraphyses many, dark brown or yellow. Spores brown, with reddish tubercles.

Distribution — Sumatra, Peninsular Malaysia.

Habitat — Common in open forest and low scrub, on rather dry ground, in light shade, also on rocks in fairly open places, altitude 1000–2500 m.

#### 4. *Plagiogyria euphlebia* (Kunze) Mett. — Fig. 7

*Plagiogyria euphlebia* (Kunze) Mett., Farngett. II (1858) 274; Bedd., Handb. Ferns Brit. India (1892) 129; Makino, Bot. Mag. (Tokyo) 8 (1894) 334; H. Christ, Bull. Soc. Bot. France (Mém.) 1 (1905) 63; C. Chr., Acta Horti Gothob. 1 (1924) 92; Ridl., J. Malayan Branch Roy. Asiat. Soc. 4 (1926) 35; Nakai, Bot. Mag. (Tokyo) 42 (1928) 206; Tak. Itô, Ill. Pl. Formos. Suppl. (1928) pl. 199; Copel., Philipp. J. Sci. 38 (1929) 387; Hand.-Mazz., Symb. Sin. 6 (1929) 38; Ogata, Icon. Filic. Jap. 4 (1931) pl. 184; C. Chr., Contr. U.S. Natl. Herb. 26 (1931) 310; Y.C. Wu et al., Bull. Dept. Biol. Sun Yatsen Univ. 3 (1932) 224, pl. 103; C. Chr. & Tardieu, Notul. Syst. (Paris) 6 (1937) 134; Tardieu & C. Chr., Fl. Indo-Chine 6 (1939) 74; Ohwi, Fl. Japan (1957) 51; Ching, Acta Phytotax. Sin. 7 (1958) 117, 140; Fl. Reipubl. Popul. Sin. 2 (1959) 91; Tagawa, Col. Ill. Jap. Pterid. (1959) 69, 239, pl. 21, f. 127; B.K. Nayar & F. Kazmi, Bull. Nat. Bot. Gard. 64 (1962) 18, f. 8; Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 259; Shing, Iconogr. Cormoph. Sincorum 1 (1972) 125, f. 250; De Vol, Taiwanica 17 (1972) 282, pl. 1, f. 4–5; De Vol & C.Y. Lu, Fl. Taiwan 1 (1975) 141, pl. 47; Hatus., Fl. Ryukyus (1975) 143; Nakaike, Enum. Pterid. Jap. Filic. (1975) 7; Kurata & Nakaike, Ill. Pterid. Jap. 1 (1979); R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 375, photogr. 1; L.K. Lin, Fl. Fujianica 1 (1982) 29; Baishya & R.R. Rao, Ferns and Fern-allies of Meghalaya State, India (1982) 48; M.Q. Jiang, Fl. Anhui 1 (1985) 47, f. 37; H.S. Kung, Fl. Sichuanica 6 (1986) 120; K. Iwats., Himalayan Plants 1 (1988) 247; Jamir & R.R. Rao, Ferns of Nagaland (1988) 44, pl. 2; Numata

- et al., Ecol. Encycl. Wild Pl. Jap. (1990) 36; P.H. Hô, Ill. Fl. Vietnam 1 (1991) 52, f. 90, *Plagiogyra*; Nakaïke, New Fl. Jap. Pterid. (1992) 232, fotogr. 232; K. Iwats., Ferns and Fern Allies of Japan (1992) 76, pl. 28, fotogr. 1–3; J.F. Cheng, Fl. Jiangxi 1 (1993) 59, f. 44; C.F. Zhang, Fl. Zhejiang 1 (1993) 33, f. 1–34; X.C. Zhang, Expl. Pl. Resou. Mt Jiuwanshan, Guangxi (1993) 208; W.C. Shieh et al., Fl. Taiwan 1, ed. 2 (1994) 135, pl. 51. — *Lomaria euphlebica* Kunze, Bot. Zeitung (Berlin) (1848) 521; Farnkräuter (1850) 61, t. 125; Hook., Sp. Fil. 3 (1860) 21; Franch. & Sav., Enum. Pl. Jap. (1879) 216; C.B. Clarke, Trans. Linn. Soc. London II, Bot. 1 (1880) 478, excl. *L. articulata*. — Lectotype: Zollinger in Herb. Zollinger & Moritzi No. 1 (L), Japan. Syntype: Göring 128 (Herb. Römer).
- [*Acrostichum triquetrum* Wall., Cat. (1828) no. 23, nom. nud.] — [*Olfersia triquetra* C. Presl, Tent. Pterid. (1836) 235, nom. nud.] — [*Stenochlaena triquetra* J. Sm., J. Bot. (Hooker) 4 (1841) 149, nom. nud.; C. Presl, Epim. Bot. (1851) 165, nom. nud.] — [*Lomaria triquetra* T. Moore, Index Fil. (1857) 14, nom. nud.] — *Plagiogyria triquetra* Wall. ex Mett., Farngatt. II (1858) 274; Spreng. ex Salomon, Nomencl. Gefässkrypt. (1883) 282, pro syn.; B.K. Nayar & F. Kazmi, Bull. Nat. Bot. Gard. 64 (1962) 23, f. 10; F. Kazmi, J. Bomb. Nat. Hist. Soc. 59 (1962) 698; R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 376, fotogr. 4. — *Lomariopsis triquetra* (Wall. ex Mett.) Ettingsh., Farnkräuter Jetztw. (1865) 13, t. 5, f. 1, 6; t. 6, f. 5. — *Plagiogyria euphlebica* (Kunze) Mett. var. *triquetra* (Wall. ex Mett.) Ching, Acta Phytotax. Sin. 7 (1958) 117, 141; Fl. Reipubl. Popul. Sin. 2 (1959) 91. — Type: Wallich 23 (holo K; iso BM, P), Nepal, 1821. See note 1.
- Plagiogyria christii* Copel., Philipp. J. Sci. 1, Suppl. (1906) 153; Philipp. J. Sci., Bot. 2 (1907) 133; Alderw., Malayan Ferns (1908) 342, 826; Copel., Philipp. J. Sci. 38 (1929) 388; Fern Fl. Philipp. 2 (1960) 194; R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 375, fotogr. 2. — Type: Copeland 1509 (MICH, n.v.), Philippines, Mt Apo, 1500–1800 m.
- Stenochlaena henryi* H. Christ, Notul. Syst. (Paris) 1 (1909) 48, non *Plagiogyria henryi* H. Christ (1899). — Type: Henry 9164 (PE, US), Yunnan, Mengtze, SE Mt, alt. 7000 ft.
- Plagiogyria grandis* Copel., Philipp. J. Sci. 38 (1929) 389, pl. 1; C. Chr., Bull. Dept. Biol. Sun Yatsen Univ. 6 (1933) 13; Ching, Acta Phytotax. Sin. 7 (1958) 115, 138; Fl. Reipubl. Popul. Sin. 2 (1959) 88; Nakaïke, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 260, pl. 2, f. 1; L.K. Lin, Fl. Fujianica 1 (1982) 27; J.F. Cheng, Fl. Jiangxi 1 (1993) 59; C.F. Zhang, Fl. Zhejiang 1 (1993) 32. — *Plagiogyria euphlebica* (Kunze) Mett. var. *grandis* (Copel.) De Vol, Taiwanica 17 (1972) 282; De Vol & C.Y. Lu, Fl. Taiwan 1 (1975) 142. — Type: Cavalerie s.n. in Rosenstock, Fil. Chin. Exp. 171 (holo US; iso GH, NY, fotogr. PE), Guizhou, Guiding, Yunwu (Pin-fa), X-1912. See note 3.
- Plagiogyria koidzumii* Tagawa, Acta Phytotax. Geobot. 2 (1933) 189; Ogata, Icon. Filic. Jap. 8 (1940) pl. 388; De Vol, Taiwanica 17 (1972) 286, pl. 4; De Vol & C.Y. Lu, Fl. Taiwan 1 (1975) 145; Hatus., Fl. Ryukyus (1975) 143; Nakaïke, Enum. Pterid. Jap. Filic. (1975) 8; E. Walker, Fl. Okinawa & S. Ryukyu Is. (1976) 72; Kurata & Nakaïke, Ill. Pterid. Jap. 2 (1981) 10; Nakaïke, New Fl. Jap. Pterid. (1992) 234, fotogr. 234; W.C. Shieh et al., Fl. Taiwan 1, ed. 2 (1994) 137. — Type: Koidzumi s.n. (holo KYO, n.v.; iso BM, L, fotogr. PE), Japan, Iriomote Isl., 1–20-VII-1923. See note 2.
- Plagiogyria maxima* C. Chr., Bull. Mus. Paris II 6 (1934) 105; Tardieu & C. Chr., Fl. Indo-Chine 6 (1939) 73; Ching, Acta Phytotax. Sin. 7 (1958) 116, 139; Fl. Reipubl. Popul. Sin. 2 (1959) 89; P.H. Hô, Ill. Fl. Vietnam 1 (1991) 52, f. 92, '*Plagiogyra*'. — Type: Colani, Herb. Ecole sup. Hanoi 1968 (holo BM; iso PE), Tonkin, Chapa, XI-1924.
- Plagiogyria attenuata* Ching, Acta Phytotax. Sin. 7 (1958) 116, 139, pl. 30, f. 1; Fl. Reipubl. Popul. Sin. 2 (1959) 90. — Type: W.T. Tsang 25526 (holo PE), Guangdong, Huiyang, Mt Lianghuashan, 11-31-1935.
- Plagiogyria chinensis* Ching, Acta Phytotax. Sin. 7 (1958) 116, 140, pl. 30, f. 2; Fl. Reipubl. Popul. Sin. 2 (1959) 90; R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 376, fotogr. 3; L.K. Lin, Fl. Fujianica 1 (1982) 28, f. 26; J.F. Cheng, Fl. Jiangxi 1 (1993) 58, f. 43; C.F. Zhang, Fl. Zhejiang 1 (1993) 32, f. 1–33. — Type: Fujian Academy of Sciences s.n. (holo PE), Fujian, Mt Wuyi, Xianfengling, 16-VIII-1952.
- Plagiogyria integripinna* Ching, Acta Phytotax. Sin. 7 (1958) 116, 139, pl. 29, f. 1–2; Fl. Reipubl. Popul. Sin. 2 (1959) 89. — Type: K.M. Feng 232 (holo PE), Yunnan, Pingbian, Mt Daweishan.

*Plagiogyria elongata* R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 377, photogr. 5. — Syntypes: *Choudhury 29660* (CAL, n.v.); *Clarke 18853d* (K), Khasia, alt. 1300 m, 15-X-1872.

*Plagiogyria gigantea* auct. non Ching: P.H. Hô, Ill. Fl. Vietnam 1 (1991) 52, f. 91, p.p. quoad fig., 'Plagiogyra'.

*Plagiogyria scandens* auct. non Mett.: Khullar, Ill. Fern Fl. West Himalayas 1 (1994) 42, pl. 17.

*Rhizome* short, erect to decumbent, narrow, sometimes very woody. *Stipes* stramineous to brownish, of sterile fronds (7–)25–35(–70) cm long, of fertile fronds (9–)40–77 cm long, base slightly to strongly enlarged, 5–10(–20) mm wide in the middle, in cross section one V-shaped to one U-shaped vascular bundle, upper part of stipe terete or oval (usually) or tetragonal, aerophores only present on base of stipe or seemingly absent at dry stage, present on base of stipe and lower part of rachis, or present on stipe and rachis, cushion-like; rachises glabrous to hairy to sometimes densely hairy. Fronds not covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis semiterete (usually), flattened or grooved, not winged, rachis 1–2(–5) mm wide in the middle part. *Sterile lamina* herbaceous to firm herbaceous to subcoriaceous (very rare, in plants found near the sea), not glaucous, pinnate, apical pinna base free, or sometimes connected with upper lateral ones or rarely pinnate except the pinnatifid or pinnatilobed apex, widest basally to medially, (11–)20–60(–136) cm long, (7–)12–30(–40) cm wide, index 1.36–2.5(–3.8); pinnae 7–25 pairs, widest medially, veins of pinnae simple to as many simple as forked, distinct on both surfaces, stomata scattered on the lower epidermis, margin serrulate or towards the base entire or nearly so, most pinnae except the uppermost with equilateral, cuneate, rounded, or attenuate base; lowermost pinnae shortly stalked or rarely sessile, not deflexed, not or slightly shortened (the basal pair); middle pinnae (5–)11–17(–30) cm long, 0.9–2(–2.6) cm wide in the middle, shortly stalked or sessile, base cuneate or rounded; apex of lamina terminated by a pinna conform to lateral ones or rarely pinnatifid, base with 1–3 irregular auricles or free, shortly stalked, or connected with 1 or 2 shorter lateral pinnae (sometimes connected with more than 2 pairs), (4–)7–10(–30) cm long, terminated by a pinnatilobed, short-triangular or pinna-like segment. *Fertile fronds* usually longer than the sterile ones, rarely shorter or about the same length, dorsal side of rachis semiterete (usually), flattened, or grooved, not winged, rachis 1–2(–5) mm wide in the middle part; lamina pinnate throughout, pinnae shortly stalked or nearly sessile, (9–)20–50(–80) cm long, (3–)10–20(–33) cm wide; pinnae glabrous or sparsely bearing short glandular hairs, 7–25 pairs, margin entire, subentire, or erose; lowermost pinnae not shortened (or the basal pair shorter), (1–)4–6(–8) cm apart; middle pinnae (2–)7–20(–33) cm long, 2–4(–5) mm wide, base shortly stalked to sessile; apex terminated by a pinna conform with the lateral ones, which is often beaded at the base. Paraphyses many, brown. Spores yellow or brown, with reddish tubercles.

*Distribution* — Japan, China (Anhui, Zhejiang, Fujian, Hubei, Hunan, Jiangxi, Guangdong, Guangxi, Taiwan, Sichuan, Guizhou, Yunnan), Nepal, India, Burma, Vietnam, Philippines.

*Habitat* — In forest, altitude 50–2500 m, usually 600–1500 m; in Japan 50–650 m.

*Chromosome number* — Kurita (1963) and Tsai (1973) reported  $n = c. 125$  and  $n = 125$ , respectively; Nakato & Mitui (1983) reported  $2n = 260$ .



Fig. 7. *Plagiogyria euphlebia* (Kunze) Mett. [*T. Nakaike* 27 (L), Japan, Shizuoka].

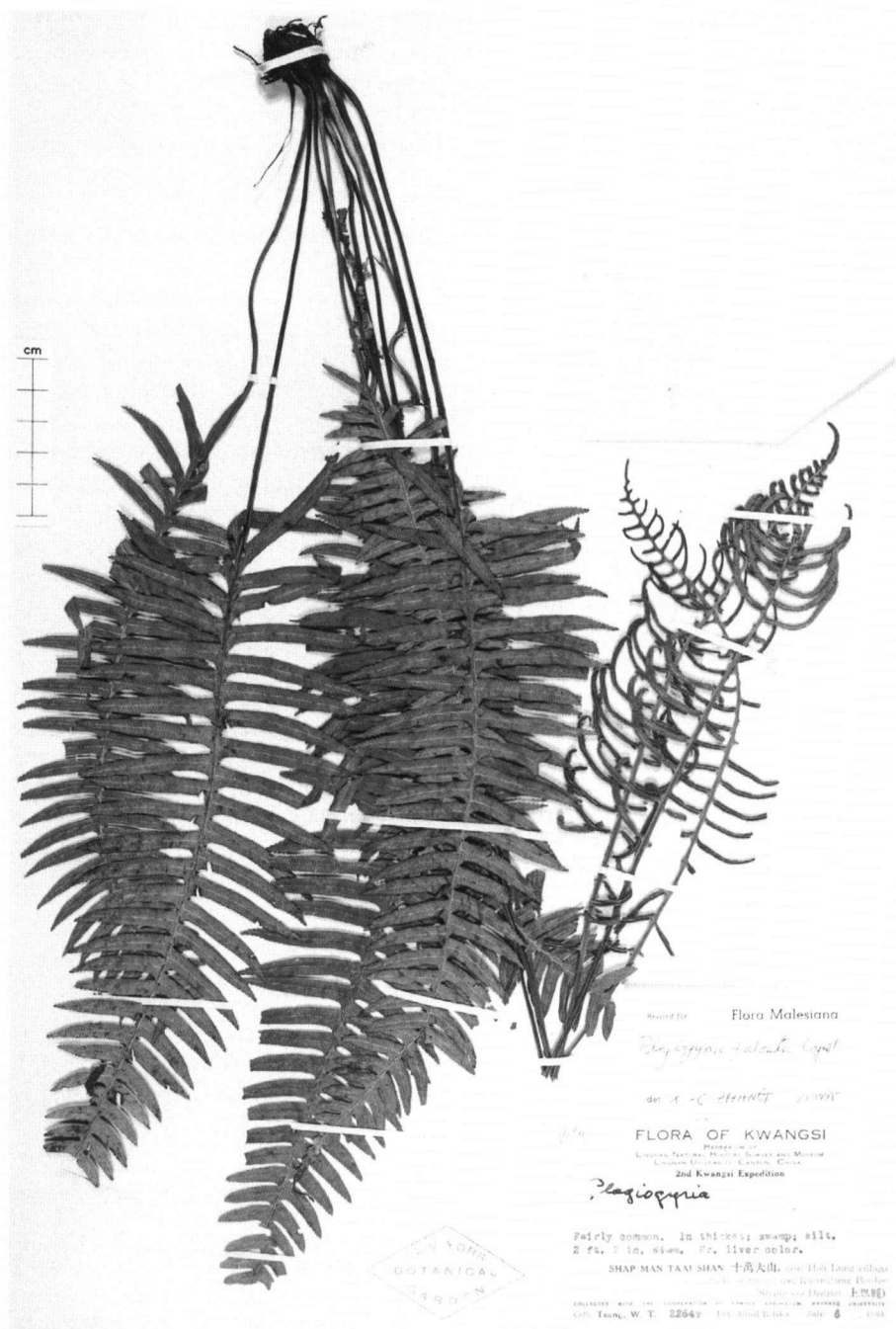


Fig. 8. *Plagiogyria falcata* Copel. [W. T. Tsang 22649 (NY), China, Guangxi, Shangs].

Notes — 1. Hooker (1860) and Clarke (1880) assumed that Wallich distributed two different species under the single name of *Acrostichum triquetrum*, namely *P. euphlebia* and *P. pycnophylla*. This is also one of the reasons why Pichi Sermolli (1972) did not select *P. triquetra* Mett. as lectotype of *Plagiogyria*. Wallich's no. 23 preserved in BM, K, and P represents only one species, e.g. *P. euphlebia*, which seems to be the only species of *Plagiogyria* collected by Wallich. Dixit & Das (1981) found Wallich no. 23 in CAL to be identical with the one in K. They recognised *P. triquetra* as a distinct species from *P. euphlebia* and hence supported the selection of it as the lectotype of *Plagiogyria* by J. Smith (1875).

2. *Plagiogyria koidzumii* seems to be a distinct species by its pinnatifid lamina apex, horizontally decumbent rhizome, shorter fertile fronds and relatively longer sterile fronds. Few collections from the type locality all show large smooth spores. From our point of view, the pinnatifid apex does not guarantee its identity, nor the large size of its spores. The latter may be an indication of a polyploid population. There are also specimens from Iriomote Isl. with longer fertile fronds. The shape of the rhizome is subject to change with the habitat. The horizontal rhizomes are mostly found in rock crevices. De Vol (1972) reported it from Taiwan, Nantou (*T. C. Huang c. s.* 934, TAI), but the spores are smaller and sink into the normal size of *P. euphlebia* (cf. Liew, 1976). Some collections from E China are similar to the Iriomote specimens, including those identified as *P. attenuata* and *P. chinensis*.

3. The largest specimens of *P. euphlebia* are from S Guizhou, Guangxi, SE Yunnan, and Vietnam. They have prominent aerophores on the base of the stipe as well as along the robust stipe, are sometimes very hairy and have the longest pinnae up to 35 cm. However, the occurrence of aerophores on the stipe is an inconstant character, some smaller plants from E China and Taiwan also have obvious aerophores on the stipe. Consequently the large specimens are named as *Stenochlaena henryi* (H. Christ, 1909), *P. grandis* (Copeland, 1929), *P. maxima* (Christensen, 1934), and *P. integripinna* (Ching, 1958).

## 5. *Plagiogyria falcata* Copel. — Fig. 8

*Plagiogyria falcata* Copel., Philipp. J. Sci., Bot. 2 (1907) 133, pl. 1, f. B; Alderw., Malayan Ferns (1908) 826; Hayata, Icon. Pl. Formos. 4 (1914) 239; Nakai, Bot. Mag. (Tokyo) 42 (1928) 208; Tak. Itô, Ill. Pl. Formos. Suppl. (1928) pl. 201; Copel., Philipp. J. Sci. 38 (1929) 400; Ogata, Icon. Filic. Jap. 8 (1940) pl. 386; Copel., Fern Fl. Philipp. 2 (1960) 196; K. Iwats. & M.G. Price, South East Asia Studies 14 (1977) 549. — Type: Merrill 5960 (MICH; iso P), Philippines, Mindoro, Mt Halcon, alt. 2100 m, XI-1906.

*Plagiogyria dunnii* Copel., Philipp. J. Sci., Bot. 3 (1908) 281; Philipp. J. Sci. 38 (1929) 402; C. Chr., Bull. Dept. Biol. Sun Yatsen Univ. 6 (1933) 13; S.H. Fu, Ill. Important Chinese Pl., Pterid. (1957) 42; Ching, Acta Phytotax. Sin. 7 (1958) 128, 153, pl. 40, f. 2; Fl. Reipubl. Popul. Sin. 2 (1959) 104; De Vol, Taiwania 17 (1972) 285, pl. 1, f. 3; De Vol & C.Y. Lu, Fl. Taiwan 1 (1975) 145; L.K. Lin, Fl. Fujianica 1 (1982) 27; M.Q. Jiang, Fl. Anhui 1 (1985) 48, f. 38; J.F. Cheng, Fl. Jiangxi 1 (1993) 62, f. 48; C.F. Zhang, Fl. Zhejiang 1 (1993) 35; X.C. Zhang, Expl. Pl. Resou. Mt Jiuwanshan, Guangxi (1993) 208; W.C. Shieh et al., Fl. Taiwan 1, ed. 2 (1994) 134. — Type: Dunn, Hongkong Herbarium No. 3934 (holo MICH-herb. E.B. Copeland No. 27; iso P, photogr. NY), Fujian, 'Yenping, alt. 3000 ft, collected on Mr. Dunn's expedition to Central Fokien, April to June 1905'.

*Plagiogyria tenuifolia* Copel., Philipp. J. Sci., Bot. 3 (1908) 281; Philipp. J. Sci. 38 (1929) 401, pl. 7; Ching, Acta Phytotax. Sin. 7 (1958) 126, 153; Fl. Reipub. Popul. Sin. 2 (1959) 104; Edie, Ferns of Hong Kong (1977) 28, 90, f. 33. — Type: Matthew 51 (?), Hongkong.

- Lomaria matthewii* H. Christ ex C.G. Matthew, Notes on the Ferns of Hong Kong and the Adjacent Mainland (1908) 15; Dunn & Tutcher, (Fl. Kwangtung & Hongkong) Kew Bull. Misc. Add. 10 (1912) 341. — Type: *Matthew 104* (holo P), Hongkong, Ma-on-shan, alt. 1500 ft, II-1906.
- Plagiogyria hayataana* Makino, Bot. Mag. (Tokyo) 23 (1909) 245; Copel., Philipp. J. Sci. 38 (1929) 401. — Syntypes: *Nakahara 458* (Makino n.v.), Taiwan, Nantou, 'Rakurakusha', VIII-1905; *Kawakami & Mori 2402* (Makino n.v.), Nantou, 'Mushazan', 10-VIII-1906; *Kawakami & Mori s.n.* (Makino n.v.), 'Randaisan' ('Ekitaisan'), 9-VIII-1909.
- Plagiogyria adnata* (Blume) Bedd. var. *angustata* Rosenst., Feddes Rept. Spec. Nov. Regni Veg. 13 (1913) 122; Copel., Philipp. J. Sci. 38 (1929) 397. — Type: *Cavalerie s.n. in Rosenstock, Fil. Chin. Exp.* 170 (L), Guizhou, Pin-fa, X-1912.
- Plagiogyria angustipinna* Ching, Acta Phytotax. Sin. 7 (1958) 126, 153, pl. 40, f. 1; Fl. Reipubl. Popul. Sin. 2 (1959) 104; Ching et al., Fl. Hainanica 1 (1964) 24. — Type: *Wang, C. 35570* (holo PE; iso NY, US), Hainan, 18-XII-1928.
- Plagiogyria chekiangensis* P.L. Chiu, Acta Phytotax. Sin. 13 (1975) 111, fotogr. 1, pl. 20; C.F. Zhang, Fl. Zhejiang 1 (1993) 35. — Type: *Zhejiang Pl. Resour. Exped. 25849* (holo HHBG; iso PE), Zhejiang, Suichang, Nankeng, 4-V-1959.
- Plagiogyria dentimarginata* J.F. Cheng, Acta Phytotax. Sin. 26 (1988) 321, f. 1; Fl. Jiangxi 1 (1993) 61, f. 47; C.F. Zhang, Fl. Zhejiang 1 (1993) 35. — Type: *J.F. Cheng 64261* (holo JXU; iso PE), Jiangxi, Dexing, Mt Damaoshan, alt. 120 m, 24-IX-1964.
- Plagiogyria stenoptera* auct. non (Hance) Diels: Makino, Bot. Mag. (Tokyo) 23 (1909) 244.
- Plagiogyria matsumureana* auct. non Makino: Hayata, Bot. Mag. (Tokyo) 23 (1909) 32, p.p.; Y.C. Wu et al., Bull. Dept. Biol. Sun Yatsen Univ. 3 (1932) 222, pl. 102.

*Rhizome* short to c. 15 cm long, suberect, narrow or thick with many stipe bases. *Stipes* stramineous, of sterile fronds (6–)12–20(–30) cm long, of fertile fronds 20–45 cm long, base slightly or moderately enlarged, 4–6(–8) mm wide in the middle, in cross section one V-shaped vascular bundle, upper part of stipe (sharp) triangular, aerophores only present on base of stipe; rachises glabrous. Fronds not covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis carinate, not winged (or winged on the sharp ridge), rachis 1–2 mm wide in the middle part. *Sterile lamina* herbaceous, not glaucous, pinnatifid, widest medially, (10–)20–40(–55) cm long, (3–)5–13(–17) cm wide, index (2.5–)3–4(–5.4); pinnae (12–)35–53 pairs, widest near base, veins of pinnae paired at base or forked above base to paired at base, or branched at base, both branches forked above or rarely simple, distinct on both surfaces, stomata scattered on the lower epidermis, margin serrulate, sometimes towards the base becoming entire or nearly so, or entire except the apex (rarely biserrulate to the apex), most pinnae except the uppermost with inequilateral or with (nearly) equilateral base, adnate to rachis; lowermost pinnae adnate, deflexed (usually), not shortened to abruptly shortened; middle pinnae (1.5–)5–8.5 cm long, 0.4–1 cm wide in the middle, acroscopic side of base adnate to the rachis but not into a wide wing, basicopic side straight to rachis or rounded, partly free from rachis or round; uppermost pinnae adnate, base about equal-sided, basicopically straight to the rachis; apex of lamina pinnatifid, terminated by a pinnatilobed, long-triangular segment. *Fertile fronds* usually longer than the sterile ones, dorsal side of rachis carinate, rachis 1.5–2.5 mm wide in the middle part; lamina deeply pinnatifid, rachis slightly winged throughout, 20–50 cm long, 3–6(–10) cm wide; pinnae glabrous, (15–)35–50 pairs, margin subentire; lowermost pinnae not or gradually shortened (sometimes not well developed), 2–3 cm apart; middle pinnae (1–)2.5–5 cm long, 2–4 mm wide, base broadly adnate; apex pinnatifid, acuminate, or caudate. Paraphyses few, mostly lost or absent, yellow. Spores yellow, with reddish tubercles.

Distribution — China (Anhui, Zhejiang, Fujian, Jiangxi, Hunan, Guangdong, Guangxi, Hongkong, Hainan, Taiwan, Guizhou), Philippines.

Habitat — In dense ravine forest, or under shade rocks, altitude 40–2150 m, usually 500–1500 m.

## 6. *Plagiogyria glauca* (Blume) Mett. — Fig. 9, Map 3

*Plagiogyria glauca* (Blume) Mett., Farngett. II (1858) 273; Bedd., Ferns Brit. India I (1866) pl. 90; Kuhn, Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 291; Bedd., Handb. Ferns Brit. India (1892) 127; H. Christ, Bull. Soc. Bot. France (Mém.) I (1905) 64; Bull. Acad. Int. Géogr. Bot. (1906) 138; Copel., Philipp. J. Sci. 1, Suppl. (1906) 153; Philipp. J. Sci., Bot. 2 (1907) 133; Alderw., Malayan Ferns (1908) 342; Copel., Sarawak Museum J. 2 (1917) 388; C. Chr., Acta Horti Gothob. 1 (1924) 92; Copel., Philipp. J. Sci. 38 (1929) 393; Hand.-Mazz., Symb. Sin. 6 (1929) 38; C. Chr., Contr. U.S. Natl. Herb. 26 (1931) 310; C. Chr. & Holttum, Gard. Bull. Str. Settlement. 7 (1934) 225; Backer & Posth., Varenfl. Java (1939) 31; Copel., Fern Fl. Philipp. 2 (1960) 195; Panigrahi, Bull. Bot. Surv. India 2 (1960) 313; Holttum, Revis. Fl. Malaya 2, ed. 2 (1966) 112; N.C. Nair, Records Bot. Surv. India 20, 2 (1971) 2; Tagawa, Acta Phytotax. Geobot. 26 (1974) 113; K. Iwats. & M.G. Price, South East Asia Studies 14 (1977) 550; M. Kato, Acta Phytotax. Geobot. 40 (1989) 91; Parris et al., Pl. Mount Kinabalu I (1992) 97. — *Lomaria glauca* Blume, Enum. Pl. Javae (1828) 204; Moritzi, Syst. Verz. (1844) 112; Kunze, Bot. Zeitung (Berlin) 6 (1848) 143; Farnkräuter (1851) 91, t. 138; Hook., Sp. Fil. 3 (1860) 22; Hook. & Baker, Syn. Fil. (1868) 182; C.B. Clarke, Trans. Linn. Soc. London II, Bot. 1 (1880) 472; H. Christ, Ann. Jard. Bot. Buitenzorg 15 (1897) 113. — *Plagiogyria glauca* (Blume) Mett. subsp. *glauca* Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 264. — Lectotype: *Blume s.n.* (L sh. no. 908.316-285), Java, Salak.

*Lomaria glauca* Blume var. *B* Blume, Enum. Pl. Javae (1828) 204. — Lectotype: *Blume s.n.* (L sh. no. 908.316-284).

[*Lomaria nivea* Zoll., Natuur-Genesck. Arch. Ned. Indië (1844) 238, nom. nud.; Backer & Posth., Varenfl. Java (1939) 31, nom. nud., pro syn. — Voucher: Unknown, Java, G. Salak].

*Plagiogyria glauca* (Blume) Mett. var. *philippinensis* H. Christ, Bull. Herb. Boissier 6 (1898) 150; Copel., Polypod. Philipp. Is. (1905) 98; Alderw., Malayan Ferns (1908) 342; Hayata, Bot. Mag. (Tokyo) 23 (1909) 31; Tak. Itô, Ill. Pl. Formos. Suppl. (1928) pl. 200; De Vol, Taiwania 17 (1972) 283, pl. 1, f. 1–2; pl. 2; De Vol & C. Y. Lu, Fl. Taiwan 1 (1975) 142. — Type: *Loher s.n.* (P), XI-1893, Mt Data.

*Plagiogyria nana* Copel., Philipp. J. Sci., Bot. 4 (1909) 114; Alderw., Malayan Ferns Suppl. 1 (1916) 244; Copel., Philipp. J. Sci. 38 (1929) 393; Fern Fl. Philipp. 2 (1960) 195. — *Plagiogyria glauca* (Blume) Mett. var. *nana* (Copel.) C. Chr., Brittonia 2 (1937) 284. — Syntypes: *FB 16306* (MICH); *PPE-113* (BM, K, L, NY, P, PE, US), Luzon, Benguet, Mt Pulog, alt. 2850 m, V-1909.

*Blechnum papuanum* Brause, Bot. Jahrb. Syst. 56 (1920) 158. — *Plagiogyria papuana* (Brause) Alston, J. Bot. (1939) 290, non C. Chr. 1937. — *Struthiopteris papuana* (Brause) Ching, Sunyatsenia 5 (1940) 243. — *Plagiogyria brausei* Nakaike, Bull. Nat. Sci. Mus. Tokyo 17 (1991) 90. — Type: *Ledermann 11978* (holo B, fragm. BM, photogr. BM, PE), Papua New Guinea, Sepik, alt. 2070 m, 3-VI-1913.

*Plagiogyria formosana* Nakai, Bot. Mag. (Tokyo) 42 (1928) 205; Ogata, Icon. Filic. Jap. 8 (1940) pl. 387; Ching, Acta Phytotax. Sin. 7 (1958) 123, 149, pl. 37, f. 2; Fl. Reipubl. Popul. Sin. 2 (1959) 100; W.C. Shieh et al., Fl. Taiwan 1, ed. 2 (1994) 135, photogr. 45. — *Plagiogyria glauca* (Blume) Mett. subsp. *formosana* (Nakai) Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 264. — Type: *Nakahara s.n.* (holo TI, photogr. BM, PE), Taiwan, "Tozan Nitak", XII-1906.

*Plagiogyria formosana* Nakai var. *angustata* Nakai, Bot. Mag. (Tokyo) 42 (1921) 205; Ching, Acta Phytotax. Sin. 7 (1958) 124, 149. — Type: *Kawakami & Mori 1831* (holo TI, photogr. BM, PE), Taiwan, Mt Xinggaoshan, alt. 2100 m.

*Plagiogyria glaucescens* Ching, Acta Phytotax. Sin. 7 (1958) 124, 150, pl. 38, f. 2; Fl. Reipubl. Popul. Sin. 2 (1959) 102; B.K. Nayar & F. Kazmi, Bull. Nat. Bot. Gard. 64 (1962) 27, f. 11;



R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 385, fotogr. 15; Baishya & R.R. Rao, Ferns and Fern-allies of Meghalaya State, India (1982) 48; Ching & S.K. Wu, Fl. Xizang. 1 (1983) 40. — *Plagiogyria glaucescens* Ching var. *glaucescens* X. Cheng, Vascular. Pl. Hengduan Mount. 1 (1993) 18. — Type: *Feng, K.M. 7157* (holo PE), Yunnan, Mekong-Salwin Divide, Gongshan, Doyon-lumba, alt. 2500–3100 m, 30-VIII-1940.

*Plagiogyria glaucescens* Ching var. *arguta* Ching, Acta Phytotax. Sin. 7 (1958) 125, 151; Fl. Reipubl. Popul. Sin. 2 (1959) 102; Ching & S.K. Wu, Fl. Xizang. 1 (1983) 40; X. Cheng, Vascular. Pl. Hengduan Mount. 1 (1993) 18. — *Plagiogyria distanta* Jamir & R.R. Rao, Ferns of Nagaland (1988) 42; R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 386, fotogr. 16. — Type: *Feng, K.M. 478* (holo PE), Yunnan, Lijiang, Gezi, 10-III-1939.

*Plagiogyria media* Ching, Acta Phytotax. Sin. 7 (1958) 124, 149, pl. 38, f. 1; Fl. Reipubl. Popul. Sin. 2 (1959) 101; Shing, Iconogr. Cormoph. Sinicorum 1 (1972) 127, f. 254; R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 385, fotogr. 14; K. Iwats. et al., J. Fac. Sci. Univ. Tokyo sect. 3, Bot. 14 (1986) 14; S.H. Kung, Fl. Sichuanica 6 (1986) 121; X. Cheng, Vascular. Pl. Hengduan Mount. 1 (1993) 18. — Type: *Yu, T.T. 20914* (holo PE; iso A), Yunnan, Taron-Taru Divide, Tarulaka, alt. 3000 m, 1-XI-1938.

*Rhizome* short to c. 15 cm long, erect, suberect to curved, or decumbent, narrow and very woody or thick with many stipe bases. *Stipes* stramineous or brownish, of sterile fronds 3–55 cm long, of fertile fronds 5–75 cm long, base strongly enlarged, 5–15 mm wide in the middle, in cross section one U-shaped vascular bundle, upper part of stipe tetragonal, terete, or oval, aerophores present on stipe and rachis, elongate, horn-like, with blunt apex; rachises glabrous to hairy or sometimes densely hairy. Fronds not covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis semiterete to flattened or grooved, not winged, rachis 0.5–4 mm wide in the middle part. *Sterile lamina* firm herbaceous or subcoriaceous, glaucous beneath, pinnate except the pinnatifid or pinnatilobed apex, widest medially or a little higher, 7–110 cm long, 2–30 cm wide, index (1.8–)2.8–3.8(–4.6); pinnae 13–43 pairs, widest below or about the middle to near the base, veins of pinnae as many simple as forked, distinct on both surfaces, stomata scattered on the lower epidermis, margin serrulate, most pinnae except the uppermost with equilateral base, truncate or rounded; lowermost pinnae sessile to shortly stalked, not or slightly deflexed, abruptly shortened or not, some pinnae vestigial on stipe sided by aerophores; middle pinnae 1–15.5 cm long, 0.6–1.8 cm wide in the middle, sessile, base truncate or rounded (at dry stage); apex of lamina pinnatifid, terminated by a pinnatilobed segment or by a pinna conform to lateral ones, base connected with 1 or 2 shorter lateral pinnae or rarely with 1–3 irregular auricles, 1–10 cm long. *Fertile fronds* usually longer than the sterile ones, dorsal side of rachis semiterete, flattened, or grooved, not winged, rachis 0.5–4 mm wide in the middle part; lamina pinnate throughout, pinnae shortly stalked or nearly sessile, 11–77 cm long, 4–24 cm wide; pinnae glabrous, 13–43 pairs, margin subentire to erose; lowermost pinnae gradually shortened or some pairs aerophore-like vestiges on stipe together with aerophores, 2–4 cm apart; middle pinnae 2–14 cm long, 2–4.5 mm wide, base shortly stalked, sessile, or slightly cordate; apex pinnatifid, acuminate or caudate. Paraphyses few, mostly lost, dark brown or yellow. Spores yellow to brown, not obviously tuberculate.

*Distribution* — China (Taiwan, Xizang, Yunnan), India (Assam, Khasia and Jaintea Hills, Manipur, Naga Hills), N Burma, Sumatra, Java, Lesser Sunda Islands (Flores), Borneo (Mt Kinabalu), Philippines (Luzon, Mindanao), Sulawesi, Moluccas (Seram), New Guinea, S New Ireland, Solomon Islands (Guadalcanal).

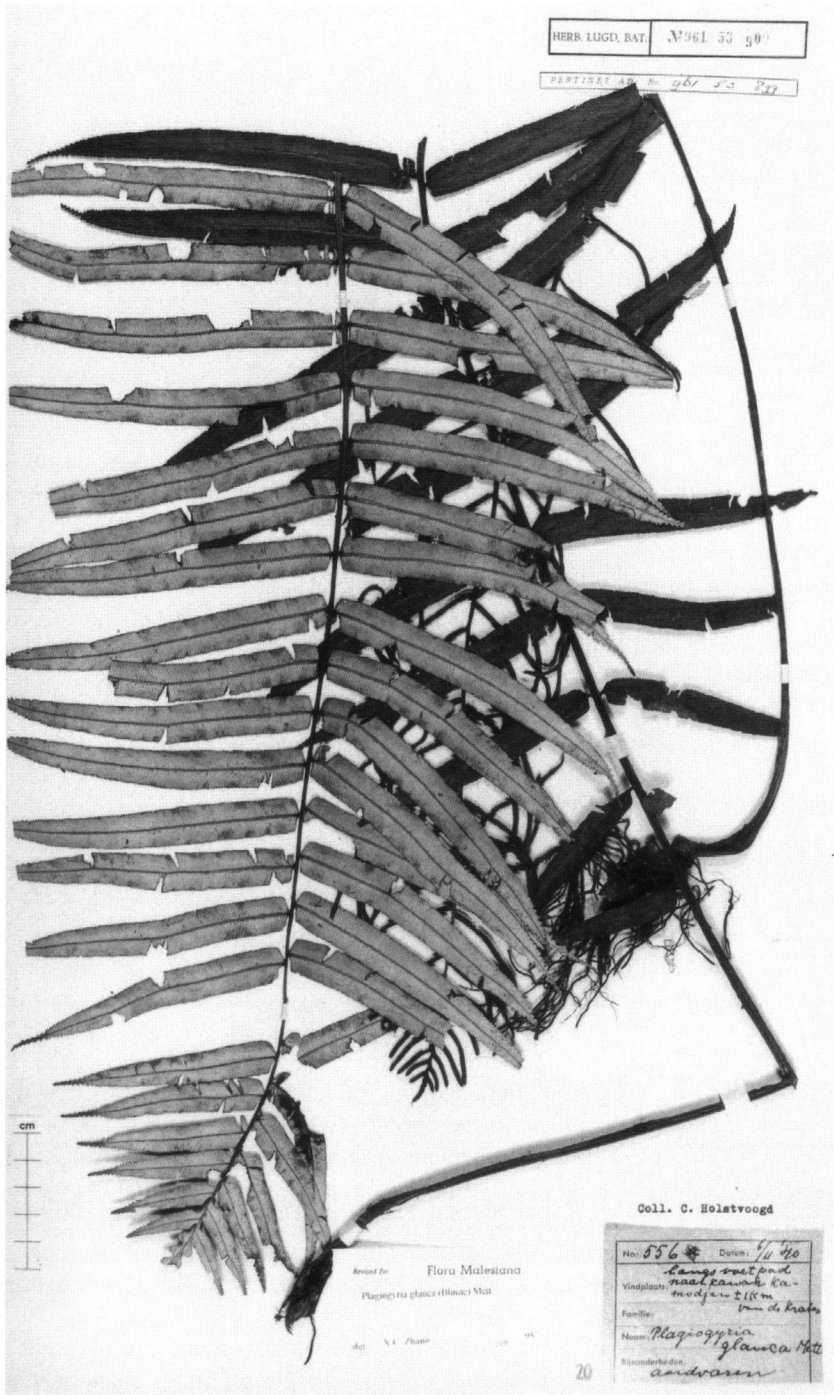
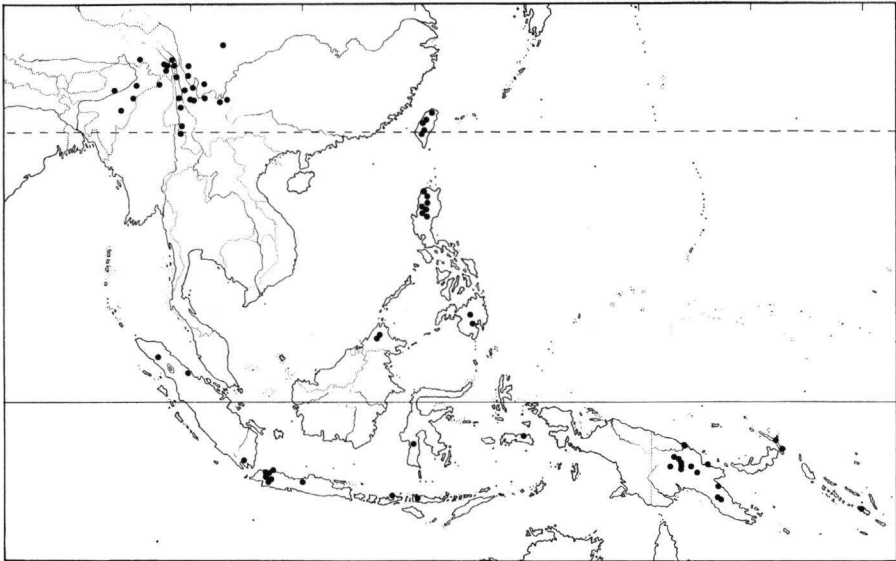


Fig. 9. *Plagiogyria glauca* (Blume) Mett. [C. Holstvoogd 556 (L), Java, Kamodjan].



Map 3. Distribution of *Plagiogyria glauca* (Blume) Mett.

Habitat — In light shade or open places, grasslands, altitude 1200–3800 m.

Chromosome number — Walker (1973) reported  $n = c. 132$ , Tsai (1973) reported  $n = 75$ , under the name of *P. formosana* Hayata.

Note — Clarke (1880) considered this to be only a variety of *P. pycnophylla*, and correctly pointed out that some of the Javanese specimens are much larger than those from Khasia. M.G. Price (pers. comm.) informed us that *P. glauca* and *P. pycnophylla* grow together in the Philippines. *Plagiogyria glauca* and *P. pycnophylla* coexist in most of their area of distribution except in Sichuan (the northern limit of *P. pycnophylla*), S Yunnan to Thailand, Indochina and Peninsular Malaysia where *P. glauca* is absent, and in Taiwan where *P. pycnophylla* is wanting. The Taiwan population of *P. glauca* is rather constant with a terminal pinna. Perhaps *P. glauca* is distinguished from *P. pycnophylla* only because of the very obvious white wax under the laminae. But, when the wax is lost on herbarium specimens, more probably the name *P. pycnophylla* will be given. In this case, the only suggestion is using a binocular to trace the white colour at the recurved pinna margins (the same situation applies to *P. assurgens*, another glaucous *Plagiogyria*).

The function of the wax is not well clear for this kind of ferns mainly distributed in humid mountain forests. Certainly it protects the stomata from losing much water during the dry season of year.

### 7. *Plagiogyria japonica* Nakai — Fig. 10

*Plagiogyria japonica* Nakai, Bot. Mag. (Tokyo) 42 (1928) 206; Ohwi, Fl. Japan (1957) 51; S.H. Fu, Ill. Important Chinese Pl., Pterid. (1957) 41, f. 50; Ching, Acta Phytotax. Sin. 7 (1958) 119, 143, pl. 33, f. 1; Fl. Reipubl. Popul. Sin. 2 (1959) 94, pl. 5, f. 1–6; Tagawa, Col. Ill. Jap. Pterid.

- (1959) 69, 240, pl. 21, f. 126; Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 261; Shing, Iconogr. Cormoph. Sinicorum 1 (1972) 126, f. 251; De Vol, Taiwania 17 (1972) 284; De Vol & C. Y. Lu, Fl. Taiwan 1 (1974) 144; Nakaike, Enum. Pterid. Jap. Filic. (1975) 7; Y.X. Jin, Fl. Jiangsu 1 (1977) 20, f. 19; Kurata & Nakaike, Ill. Pterid. Jap. 1 (1979) 334; L.K. Lin, Fl. Fujianica 1 (1982) 30, f. 30; M.Q. Jiang, Fl. Anhui 1 (1985) 46, f. 35; H.S. Kung, Fl. Sichuanica 6 (1986) 121, pl. 36, f. 3; Numata et al., Ecol. Encycl. Wild Pl. Jap. (1990) 36; Nakaike, New Fl. Jap. Pterid. (1992) 233, photogr. 233; K. Iwats., Ferns and Fern Allies of Japan (1992) 76, pl. 27, photogr. 3–5; J.F. Cheng, Fl. Jiangxi 1 (1993) 61, f. 46; C.F. Zhang, Fl. Zhejiang 1 (1993) 34, f. 1–36; X.C. Zhang, Expl. Pl. Resou. Mt Jiuwanshan, Guangxi (1993) 208; W.C. Shieh et al., Fl. Taiwan 1, ed. 2 (1994) 137. — Lectotype (Nakaike 1971): *Nakai, T. s. n.* (holo, TI), Japan, Izu, Yahatano ('Yugashima'), IV-1928. See note 1.
- Plagiogyria adnata* (Blume) Bedd. var. *distans* Rosenst., Feddes Repert. Spec. Nov. Regni Veg. 13 (1913) 122; Copel., Philipp. J. Sci. 38 (1929) 397; Hand.-Mazz., Symb. Sin. 6 (1929) 38. — Type: *Cavalerie 2 bis in Rosenstock, Filic. Chin. Exp. 169* (L, K, P), Guizhou, 'Pin-fa et Kuy-yang'. See note 2.
- Plagiogyria intermedia* Copel., Philipp. J. Sci. 38 (1929) 390, pl. 2; C. Chr., Bull. Dept. Biol. Sun Yatsen Univ. 6 (1933) 13. — Type: *Faurie 160* (BM, P), Japan, Koyasan, 1907.
- Plagiogyria caudifolia* Ching, Acta Phytotax. Sin. 7 (1958) 119, 144; Fl. Reipubl. Popul. Sin. 2 (1959) 95. — Type: *Liu, C.T. c.s. 10035* (holo PE), Sichuan, Chongqing, Mt Jinyunshan, 1-X-1957.
- Plagiogyria hainanensis* Ching, Acta Phytotax. Sin. 7 (1958) 119, 143, pl. 32, f. 2; Fl. Reipubl. Popul. Sin. 2 (1959) 94; Ching et al., Fl. Hainanica 1 (1964) 24. — Type: *Wang, C. 35550* (holo PE; iso GH), Hainan, without exact locality, 18-XII-1933.
- Plagiogyria liankwangensis* Ching, Acta Phytotax. Sin. 7 (1958) 118, 142, pl. 32, f. 1; Fl. Reipubl. Popul. Sin. 2 (1959) 93. — Type: *Wang, C. 39304* (holo PE), Guangxi, Pingnan, Mt Yaoshan, alt. 900 m, 8-VI-1936.
- Plagiogyria pseudojaponica* Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 266, pl. 3, f. 1; Enum. Pterid. Jap. Filic. (1975) 9; New Fl. Jap. Pterid. (1992) 235, photogr. 235. — *Plagiogyria japonica* Nakai var. *pseudojaponica* (Nakaike) K. Iwats., J. Fac. Sci. Univ. Tokyo sect. 3, Bot. 14 (1987) 71. — Type: *Nakaike 5548* (holo TOFO), Japan, Yaku-isl., 1-VIII-1968.
- Lomaria euphlebica* auct. non Kunze: Hook., Sec. Cent. Ferns (1861) t. 89, p.p., quoad fig.; Hook. & Baker, Syn. Fil. (1868) 183, p.p., excl. syn. *Lomaria articulata*.
- Plagiogyria adnata* auct. non (Blume) Bedd.: Tak. Itô, Ill. Pl. Formos. Suppl. (1928) pl. 198, 'adnata'; Ogata, Icon. Filic. Jap. 4 (1931) pl. 183; Y.C. Wu et al., Bull. Dept. Biol. Sun Yatsen Univ. 3 (1932) 220, pl. 101.

**Rhizome** short to c. 15 cm long, erect, suberect, curved, or decumbent, thick with many stipe bases. **Stipes** brownish or stramineous, of sterile fronds (7–)20–40 cm long, of fertile fronds 40–55 cm long, base moderately enlarged, 2–7 mm wide in the middle, in cross section one V-shaped vascular bundle, upper part of stipe tetragonal, terete, or oval, aerophores only present on base of stipe, cushion-like; rachises glabrous. Fronds not covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis semiterete, flattened, or grooved, not winged, rachis 1–1.5(–2) mm wide in the middle part. **Sterile lamina** herbaceous, not glaucous, pinnate except the pinnatifid or pinnatilobed apex or lower part pinnate, upper (1/4–)1/3–1/2 pinnatifid, widest subbasally (usually) to medially, (12–)20–43 cm long, (4–)10–20 cm wide, index (1.4–)2–2.5(–4); pinnae (8–)12–20(–30) pairs, widest medially, veins of pinnae paired at base or forked above base, distinct on both surfaces, stomata scattered on the lower epidermis, margin serrulate sometimes towards the base becoming entire or nearly so, most pinnae except the uppermost with inequilateral base, rounded or cuneate; lowermost pinnae sessile, not or slightly deflexed, slightly shortened; middle pinnae (4.5–)5.5–10 cm long, 0.90–1.7 cm wide in the middle, sessile or shortly stalked,



Fig. 10. *Plagiogyria japonica* Nakai [K. Satake s. n., 30-XII-1961 (US) Japan, Kiri-yama, Mt Amagi].

base rounded or cuneate; uppermost pinnae adnate, base unequal-sided, basiscopically decurrent into rachis wing, rounded, or straight to the rachis; apex of lamina pinnatifid, terminated by a pinna-like or pinnatilobed, long-triangular segment [4–7(–10) cm long, base connected with upper lateral ones]. *Fertile fronds* usually longer than the sterile ones, dorsal side of rachis flattened or semiterete, not winged, rachis 1–2 mm wide in the middle part; lamina pinnate throughout, pinnae shortly stalked, 23–50 cm long, 6–17 cm wide; pinnae sparsely bearing short glandular hairs or glabrous, 9–19 pairs, margin subentire to erose; lowermost pinnae the longest, (1–)2–4(–6) cm apart; middle pinnae (4–)7–8(–10) cm long, 3(–4) mm wide, base shortly stalked; apex pinnatifid, terminated by a pinna-like segment or by a pinna conform with the lateral ones, which is often beaded at the base. Paraphyses many, brown or yellow. Spores yellow, with reddish tubercles.

Distribution — Japan, Korea (Cheju), China (Jiangsu, Anhui, Zhejiang, Fujian, Jiangxi, Hubei, Hunan, Guangdong, Guangxi, Hainan, Taiwan, Sichuan, Guizhou, Yunnan).

Habitat — In forest, in ravines, rocky place, altitude 150–1780 m.

Chromosome number — Kurita (1963) reported  $n = c. 100$ ; Nakato & Mitui (1983) reported  $2n = 260$ .

Notes — 1. The distribution of this species in Taiwan is based on Nakaike's report (1971); only one specimen is seen, i.e. *S. Sasaki s.n.* (TNS, n.v.), Taiwan, Kaohsiung ('Takao'), Mt Bui-san. Ching (1958) reported *P. japonica* from Assam based on *Gammie 346* and was followed by De Vol and some local flora authors who credited the distribution of *P. japonica* to Assam. *Gammie 346* in Paris (P) turned out to be *P. euphlebia*.

2. In K and P *Cavalerie 2 bis* (28-IV-1902) is *P. adnata*.

## 8. *Plagiogyria matsumureana* Makino — Fig. 11

*Plagiogyria matsumureana* Makino, Bot. Mag. (Tokyo) 8 (1894) 333; Nakai, Bot. Mag. (Tokyo) 42 (1928) 209; Tak. Itô, Ill. Pl. Formos. Suppl. (1928) pl. 202; Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 266; Copel., Philipp. J. Sci. 38 (1929) 403; Ogata, Icon. Filic. Jap. 4 (1931) pl. 185; Ohwi, Fl. Japan (1957) 52; Ching, Acta Phytotax. Sin. 7 (1958) 125, 151; Tagawa, Col. Ill. Jap. Pterid. (1959) 69, 240, pl. 22, f. 128; Numata et al., Ecol. Encycl. Wild Pl. Jap. (1990) 37; Iwats., Ferns and Fern Allies of Japan (1992) 76, pl. 28, fotogr. 4–6. — *Plagiogyria semicordata* (C. Presl) H. Christ subsp. *matsumureana* (Makino) Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 265; Enum. Pterid. Jap. Filic. (1975) 9; Kurata & Nakaike, Ill. Pterid. Jap. 4 (1985) 250; Nakaike, New Fl. Jap. Pterid. (1992) 237, fotogr. 237. — Lectotype (Nakaike, l.c.: 266): *sin. col.* (TI), Japan.

[*Lomaria matsumureana* Makino, Bot. Mag. (Tokyo) 8 (1894) 90, nom. nud.].

*Lomaria euphlebia* Kuntze var. *serrata* Baker, Gard. Chron. 14 (n.s.) (1880) 494. — Type: *Maries s.n.* (holo, K), Japan.

*Lomaria fauriei* H. Christ, Bull. Herb. Boissier 4 (1896) 666. — *Plagiogyria fauriei* (H. Christ) Matsumura, Ind. Pl. Jap. 1 (1904) 332; C. Chr., Index Filic. (1906) 495. — *Blechnum fauriei* (H. Christ) Tokubuchi, Bot. Mag. (Tokyo) 19 (1905) 231, '*fauriae*'. — Type: *Faurie 4350* (holo P), Japan.

*Rhizome* short, erect, suberect, or decumbent, thick with many stipe bases. *Stipes* stramineous, of sterile fronds 4–17 cm long, of fertile fronds 23–56 cm long, base slightly enlarged, 4–9.5 mm wide in the middle, in cross section three oval vascular bundles, upper part of stipe tetragonal, aerophores only present on base of stipe or

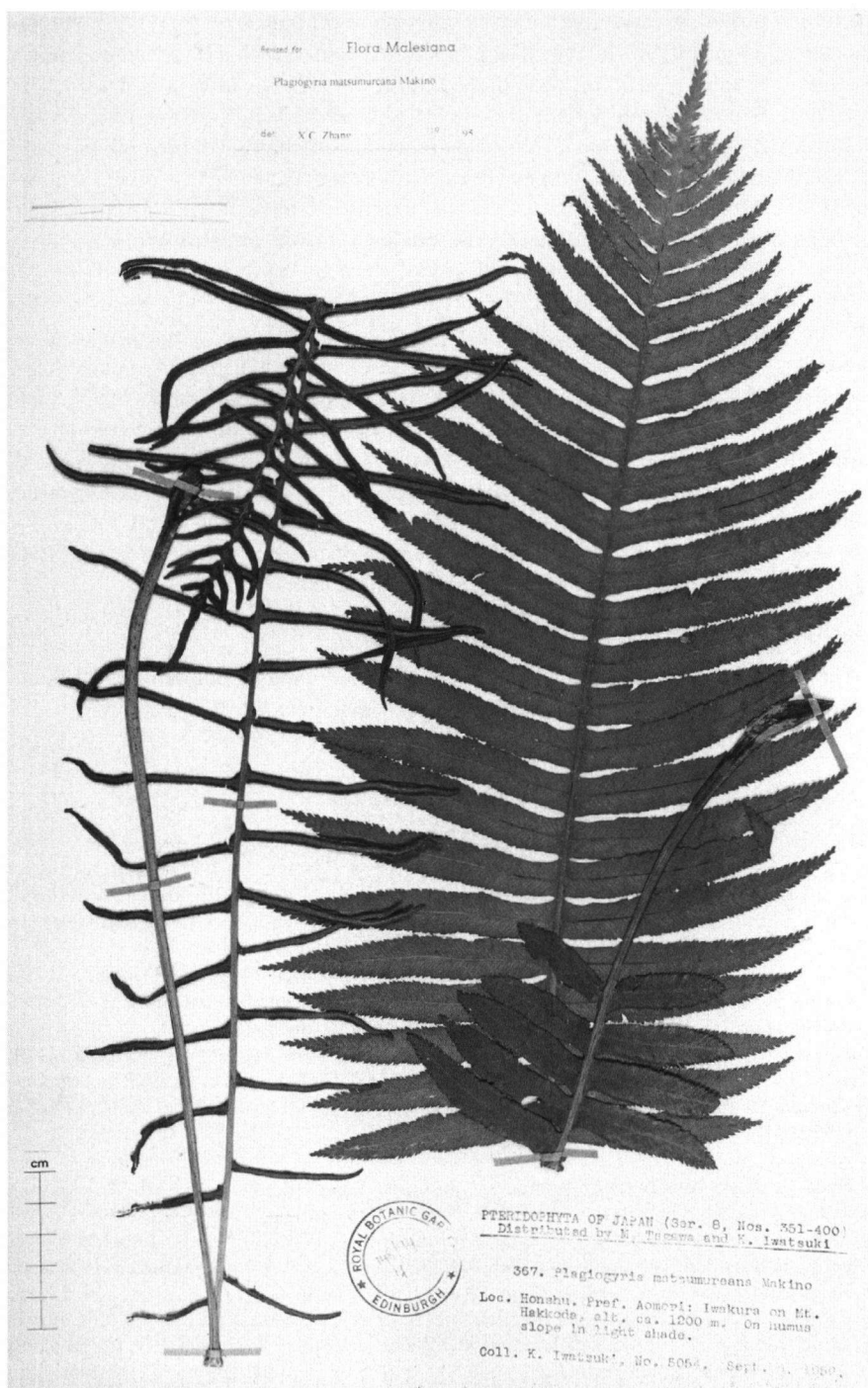


Fig. 11. *Plagiogyria matsumureana* Makino [K. Iwatsuki 5054 (E), Japan, Aomori, Mt Hakkoda].

seemingly absent at dry stage; rachises glabrous. Fronds not covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis flattened or grooved, not winged, rachis 1–2.5 mm wide in the middle part. *Sterile lamina* herbaceous, not glaucous, pinnatifid, widest medially or a little higher, (26–)40–56 cm long, (9–)14–20 cm wide, index 2–3; pinnae 26–42 pairs, widest medially, veins of pinnae paired at base, with both branches forked above, distinct on both surfaces, stomata scattered on the lower epidermis, margin biserrulate (sharply) or serrulate, most pinnae except the uppermost with about equilateral base, adnate to rachis; lowermost pinnae adnate, slightly deflexed, gradually shortened; middle pinnae (5–)7–9(–12) cm long, 0.7–1.2(–1.4) cm wide in the middle, base adnate, basiscopic side like the acroscopic side; uppermost pinnae adnate, base about equal-sided; apex of lamina pinnatifid, terminated by a pinnatilobed, short-triangular segment. *Fertile fronds* usually longer than the sterile ones, dorsal side of rachis flattened or grooved, not winged, rachis (1–)1.5–2.5(–3) mm wide in the middle part; lamina pinnate, pinnae sessile, base auriculate adnate, uppermost deeply pinnatifid, (24–)40–56(–60) cm long, (4–)7–11(–14) cm wide; pinnae glabrous, 22–36 pairs, margin erose or subentire; lowermost pinnae gradually shortened, 2–4 cm apart; middle pinnae (2.5–)4–8 cm long, 2.5–3 mm wide, base broadly adnate; apex pinnatifid, acuminate, or caudate. Paraphyses many, brown. Spores yellow, without reddish tubercles.

Distribution — Endemic to Japan, common in Hokkaido, Hakodate, Honshu, south to Yakushima.

Habitat — In light shade in humus of slope in deciduous broad-leaved forest, also in deciduous coniferous forest, altitude 500–2000 m, usually 500–1200 m.

Chromosome number — The reported numbers are  $n = c. 75$  (Kurita, 1963);  $n = 66 \pm 1$  (Mitui, 1976);  $2n = 130$ ,  $n = 65$  (Nakato & Mitui, 1983).

## 9. *Plagiogyria pectinata* (Liebmann) Lellinger — Fig. 12, Map 4

*Plagiogyria pectinata* (Liebmann) Lellinger, Amer. Fern J. 61 (1971) 115; Knobloch & Correll, Amer. Fern J. 68 (1978) 11; A.R. Sm., Fl. Chiapas 2 (1981) 172, f. 68; Mickel & Beitel, Mem. New York Bot. Gard. 46 (1988) 282, f. 15; B. C. — *Lomaria pectinata* Liebmann, Kongel. Danske Vidensk. Selsk. Naturvidensk. Math. Afh. 5 (1849) 233 (seors. 81); Hook., Sp. Fil. 3 (1860) 18; Copel., Philipp. J. Sci. 38 (1929) 409, pl. 15. — Type: *Liebmann 2477* (holo BM), Mexico, Oaxaca, 'Cerro de Sempoaltepec', alt. 8–9000 ft. See note.

[*Polypodium fuscum tenuissimum denticulis serratum* Plum., Traité Foug. Amer. (Filic. Amer.) (1705) pl. 81.] — *Acrostichum serrulatum* Willd., Spec. Pl. 5 (1810) 113, non Sw. (1788). — *Polybotrya ? plumieri* T. Moore, Index Fil. (1857) 14. — *Plagiogyria serrulata* Lellinger, Amer. Fern J. 61 (1971) 118. — Type: Plumier's plate 81.

*Lomarium ? semicordatum* C. Presl, Epim. Bot. (1851) 155. — *Lomaria semicordata* (C. Presl) Hook. & Baker, Syn. Fil. (1868) 182. — *Plagiogyria semicordata* (C. Presl) H. Christ, Farnkr. Erde (1897) 176; Diels in Engl. & Prantl, Nat. Pflanzenfam. 1, 4 (1899) 281, f. A–F; Bower, The Ferns 2 (1926) 276, f. 542; Copel., Philipp. J. Sci. 38 (1929) 408; Knobloch & Correll, Ferns and Fern Allies of Chihuahua, Mexico (1962) 131, pl. 39, f. 1–2; V. Vareschi, Fl. Venezuela. Helechos 1 (1968) 283, t. 58; Lellinger, Amer. Fern J. 61 (1971) 113; A.R. Sm., Fl. Chiapas 2 (1981) 172; Proctor, Ferns of Jamaica (1985) 159; Maria Teresa Murillo P., Fl. Colombia Pterid. Monogr. 9 (1988) 35, f. 6, map 5; R.M. Tryon & Stolze, Fieldiana, Bot. n.s. 20 (1989) 101, f. 14; Rivero, Amer. Fern J. 82 (1992) 33. — *Plagiogyria semicordata* (C. Presl) H. Christ subsp. *semicordata*, Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 265. — Type: in sylvis Colombia, without collector, (holo PRC, n.v.).



- Lomaria arguta* Fée, Mém. Foug. 5. Gen. Filic. (1857) 70; Hook., Sp. Fil. 3 (1860) 18. — *Plagiogyria arguta* Copel., Philipp. J. Sci. 38 (1929) 407, pl. 8. — Type: *Schaffner 98* (P?, n.v.; U), Mexico, Veracruz, Cerro del Agua, 'Vallée d'Orizaba', alt. 2700 m, 1854.
- Plagiogyria biserrata* Mett., Farngett. II (1858) 272, t. 4: 1–18; Copel., Philipp. J. Sci. 38 (1929) 408. — *Lomaria biserrata* (Mett.) Mert. & Lind. ex Hook., Sp. Fil. 3 (1860) 19. — Syntypes: *Moritz 400* (B, n.v., K, fotogr. US), Venezuela, Colonia Tovar; *Linden 556* (B, n.v., BM, K, P, US), Venezuela, Truxillo et de Merida (Caracas), 4000–14500 ft, IV-1842.
- [*Lomaria ? serrata* Moritz ex Mett., Farngett. II (1858) 272, 'Moritz Herb', nom. nud., pro syn.] — Voucher: Probably *Moritz 400*.
- Plagiogyria costaricensis* Mett. ex Kuhn, Linnaea 36 (1869) 149; Copel., Philipp. J. Sci. 38 (1929) 414; Lellinger, Amer. Fern J. 61 (1971) 116. — *Lomaria costaricensis* (Mett.) Baker, Syn. Fil. II (1874) 482, non H. Christ (1904). — Type: *Wendland 1066* (BM?), Costa Rica, Heredia, Volcán, Barba.
- Lomaria fialhoi* Fée & Glaz., Crypt. Vasc. Brésil (1869) 239, t. 7, f. 2. — *Plagiogyria fialhoi* (Fée & Glaz.) Lellinger, Amer. Fern J. 61 (1971) 116; Windisch & Pereira-Noronha, Amer. Fern J. 73 (1983) 79, f. 1–25. — Type: *Glaziou 3326* (holo P; iso K), Brazil, Seera os Orgaos, Est. Rio de Janeiro.
- Plagiogyria ? aequidentata* E. Fourn., Mex. Pl. 1 (1872) 133. — Type: *Müller 723* (holo P?), Mexico, Veracruz, Orizaba.
- Blechnum urbanii* Brause, Symb. Antill. 7 (1911) 157, 'urbani'. — *Plagiogyria urbanii* (Brause) Copel., Philipp. J. Sci. 38 (1929) 413, pl. 14, 'urbani'. — Type: *von Türckheim 3408* (holo B, n.v.; fragm. US; fotogr. BM, US), Santo Domingo, near Constanza, alt. 2200 m, VI-1910.
- Plagiogyria anisodonta* Copel., Philipp. J. Sci. 38 (1929) 409, pl. 9. — Syntypes: *Jiménez 1018* (US), Costa Rica, Alajuela, Volcán Poas, alt. 2800 m, II-1915; *ibid.*, *Standley 34895* (US), alt. 2500–2640 m, 17-II-1924; Extinct crater of Mount Poas, alt. 2644 m, X-1896; *Conduz 10714* (US).
- Plagiogyria denticulata* Copel., Philipp. J. Sci. 38 (1929) 412, pl. 12. — Syntypes: *Herzog 1954* (US), Bolivia, Santa Cruz, 'Im Nebelwald des Bergkammes der Laguna verde bei Comparapa', alt. 2600 m, IV-1911.
- Plagiogyria latifolia* Copel., Philipp. J. Sci. 38 (1929) 411, pl. 11. — Type: *MacBride 3432* (holo US; iso F, GH), Peru, Cani, 7 miles NE of Mito, 16–26-IV-1923.
- Plagiogyria maxonii* Copel., Philipp. J. Sci. 38 (1929) 410, pl. 10; Lellinger, Amer. Fern J. 61 (1971) 117; Proctor, Ferns of Jamaica (1985) 160, f. 40. — Syntypes: *Maxon 9910* (US, F, NY), Jamaica, summit of Blue Mountain Peak, alt. 2100–2200 m, 7–9-VII-1926; *Maxon 1439* (US) *ibid.*, *Maxon 9721* (US), Mossman's Peak.
- Plagiogyria obtusa* Copel., Philipp. J. Sci. 38 (1929) 413, pl. 13. — Type: *Léon 11126* (holo US; iso NY), Cuba, near Pico Turquino.
- Plagiogyria truncata* Mickel & Beitel, Mem. New York Bot. Gard. 46 (1988) 283, f. 15D; Palacios-Rios, Amer. Fern J. 80 (1990) 31. — Type: *Mickel 3815* (holo NY, n.v.), Mexico, Oaxaca, alt. 2130 m, 5-X-1969.

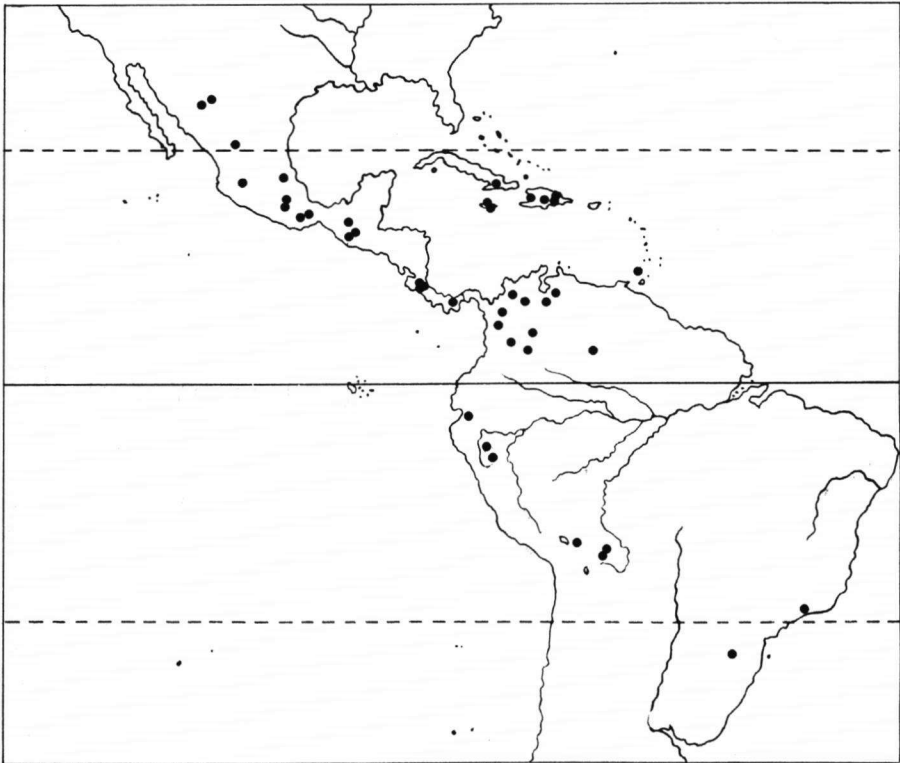
*Rhizome* short to c. 15 cm long, erect to decumbent, thick with many stipe bases. *Stipes* stramineous (some pinkish), of sterile fronds 5–47 cm long, of fertile fronds 7–54 cm long, base slightly enlarged, (3–)4–8(–12) mm wide in the middle, in cross section three oval vascular bundles, upper part of stipe tetragonal, aerophores only present on base of stipe or seemingly absent at dry stage; rachises glabrous. Fronds covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis flattened, grooved, or trigonous, not winged, rachis 1–3(–5) mm wide in the middle part. *Sterile lamina* firm herbaceous, not glaucous, pinnatifid except a few free basal pinnae, widest medially, (23–)32–68(–87) cm long, (4–)8–18(–27) cm wide, index (2.6–)3–4(–6); pinnae (25–)30–40(–70) pairs, widest medially, veins of pinnae paired at base or forked above base, with one branch forked above the base, with both branches forked above, or branched at base, both branches forked above, distinct on both



Fig. 12. *Plagiogyria pectinata* (Liebm.) Lellinger [W.R. Maxon 9875 (US), Jamaica, summit of Blue Mountain Peak].

surfaces, stomata along the two sides of a vein, absent in the middle area between two veins, margin serrulate to biserrulate, most pinnae except the uppermost with equilateral base, adnate to rachis; lowermost pinnae adnate but slightly constricted, slightly deflexed, gradually shortened or not; middle pinnae (2-)4-9(-14) cm long, 0.5-1 (-1.2) cm wide in the middle, acroscopic side of base adnate to the rachis but not into a wide wing, basiscopic side like the acroscopic side, straight to rachis, or round (slightly); uppermost pinnae adnate, base about equal-sided; apex of lamina pinnatifid, terminated by a pinnatilobed, long-triangular or short-triangular segment. *Fertile fronds* usually longer than the sterile ones, dorsal side of rachis grooved or flattened to semiterete, not winged, rachis 1-3(-4) mm wide in the middle part; lamina pinnate, pinnae sessile, base auriculate adnate, upper half pinnatifid, (16-)40-50(-60) cm long, (4.5-)7-14(-18) cm wide; pinnae glabrous, (20-)30-40(-45) pairs, margin erose; lowermost pinnae gradually shortened (not very obvious), (2-)3-4(-5) cm apart; middle pinnae (2.5-)4-8(-10) cm long, 2-4 mm wide, base broadly adnate; apex pinnatifid, acuminate or caudate. Paraphyses many, brown or yellow. Spores brown, with reddish tubercles.

Distribution — Mexico, Costa Rica, Guatemala, Cuba, Jamaica, Haiti, Dominican Republic, Grenada, Panama, Venezuela, Colombia, Ecuador, Peru, Bolivia, Brazil.



Map 4. Distribution of *Plagiogyria pectinata* (Liebm.) Lellinger.

Habitat — On wet slopes in forest, ravines, to subpáramo scrub or in protected sites on the páramo, also in coniferous forest in Mexico; altitude 1200–3570 m, usually 2000–3000 m.

Chromosome number — Walker (1966) reported  $n = 66$ , under the name of *P. semicordata* (C. Presl) H. Christ.

Note — Liebmann noted the specimen growing on oak trunks ('Voxer paa Egestammar'), which is believed to be a wrong field note by Copeland (1929), and Mickel (1987). It is believed that *Plagiogyria* is very strictly terrestrial. Rarely *Plagiogyria* can grow on tree trunks in very humid tropical forests. The type of *Lomaria pendula* Brause (synonym of *P. egenolfioides* var. *decreescens*) from Papua New Guinea is also labelled as an epiphyte.

We refrain from evaluating the variation of the American *Plagiogyria*, it is not so striking in comparison with its oriental relatives. Copeland (1929) regarded the American *Plagiogyria* not as a single species but 10, out of which 5 new; Lellinger (1971) made an elaborate survey and keyed out 6 species. Tryon & Tryon (1982) provisionally stated that there is only one member of *Plagiogyria* in the New World.

Van Cotthem (1970) for the first time reported the stomata of *P. pectinata* (*P. semicordata*) only along the lateral wings, and larger than in other species he studied.

The classification as a subspecies of the endemic Japanese *P. matsumureana* by Nakaike (1971) might be followed if *P. pectinata* would not have such characteristic spores and stomata patterns.

## 10. *Plagiogyria pycnophylla* (Kunze) Mett. — Fig. 13, 14, Map 5

*Plagiogyria pycnophylla* (Kunze) Mett., Farnagatt. II (1858) 272, t. 4, f. 22; Bedd., Ferns Brit. India 1 (1865) pl. 52; Kuhn, Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 291; Bedd., Handb. Ferns Brit. India (1892) 129; H. Christ, Bull. Soc. Bot. France (Mém.) 1 (1905) 63; Copel., Philipp. J. Sci. 1, Suppl. (1906) 154; Sarawak Museum J. 2 (1917) 388, p.p., excl. var. *integra*; Ridl., J. Malayan Branch Roy. Asiat. Soc. 4 (1926) 36; Copel., Philipp. J. Sci. 38 (1929) 390; Hand.-Mazz., Symb. Sin. 6 (1929) 38; C. Chr. & Holttum, Gard. Bull. Str. Settlement. 7 (1934) 224; Backer & Posth., Varenfl. Java (1939) 31; Copel., Fern Fl. Philipp. 2 (1960) 194; B.K. Nayar & F. Kazmi, Bull. Nat. Bot. Gard. 64 (1962) 28, f. 12; A. Das & R.D. Dixit, Bull. Bot. Surv. India 22 (1980) 159; Nakaike, Bull. Nat. Sci. Mus. Tokyo 17 (1991) 93; Parris et al., Pl. Mount Kinabalu 1 (1992) 97. — *Lomaria pycnophylla* Kunze, Bot. Zeitung (Berlin) 6 (1848) 143; Hook., Sp. Fil. 3 (1860) 21, t. 148; Hook. & Baker, Syn. Fil. (1868) 183; C.B. Clarke, Trans. Linn. Soc. London II, Bot. 1 (1880) 472; Racib., Pteridoph. Buitenzorg 1 (1898) 161. — *Stenochlaena* ? *pycnophylla* (Kunze) C. Presl, Epim. Bot. (1851) 165. — [*Lomaria scandens* De Vriese ex Hook., Sp. Fil. (1860) 22, nom. nud., pro syn., non Willd.] — Lectotype (proposed here): *Gesker s.n.* (L sh. no. 908.325-138), Java, Mt Gede. See note 1.

*Lomaria pycnophylla* Kunze forma *major* Racib., Pteridoph. Buitenzorg 1 (1898) 162. — Lectotype: *Raciborski s.n.* (L sh. no. 908.316-303), Java, Mt Gede. See note 3.

*Lomaria pycnophylla* Kunze forma *alpina* Racib., Pteridoph. Buitenzorg 1 (1898) 162. — Lectotype: *Raciborski s.n.* (L sh. no. 938.297-304; iso in K, P), Java, Mt Pangerango. See note 3.

*Lomaria glauca* Blume var. *C* Blume, Enum. Pl. Javae (1828) 204. — Lectotype: *Blume s.n.* (L sh. no. 908.316-296), Java.

[*Lomaria glauca* Blume var. *concolor* Moritzi, Syst. Verz. (1844) 112, nom. nud. — Voucher: Zollinger 232z (iso L), Java, G. Salak, alt. 2000 m, 2–4-XI-1843].

*Lomaria callosa* Fée, Mém. Foug. 5. Gen. Filic. (1853) 70. — Type: *Lobb 274* (holo P, n.v.; iso BM, K), Java, 1847.

[*Plagiogyria adenopus* T. Moore ex Hook., Sp. Fil. 3 (1860) 22, nom. nud., pro syn. — Voucher unknown. See note 2].

- Plagiogyria scandens* Mett., Farngett. II (1858) 273, t. 4: 21; Salomon, Nomencl. Gefässkrypt. (1883) 282; A. Das & R.D. Dixit, Bull. Bot. Surv. India 22 (1980) 159, photogr. 1, 2; R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 381, photogr. 11; Jamir & R.R. Rao, Ferns of Nagaland (1988) 46, pl. 3. — Lectotype (Das & Dixit, 1980): *Griffith s.n.* (B; photogr. in CAL), Khasya. See note 4.
- Plagiogyria pycnophylla* var. *remota* H. Christ, Bull. Herb. Boissier 6 (1898) 150; Copel., Polypod. Philipp. Is. (1905) 97; Alderw., Malayan Ferns (1908) 343. — Type: *Loher 953* (holo K), Luzon, Mt Data, alt. 2250 m, II-1894.
- Plagiogyria pycnophylla* (Kunze) Mett. var. *mixta* Copel., Philipp. J. Sci. 1, Suppl. (1906) 154. — Type: *Copeland 1854* (n.v.), Mt Data, alt. 2000 m.
- Plagiogyria glauca* (Blume) Mett. var. *virescens* C. Chr., Contr. U.S. Natl. Herb. 26 (1931) 310. — *Plagiogyria virescens* Ching, Acta Phytotax. Sin. 7 (1958) 122, 148; Fl. Reipubl. Popul. Sin. 2 (1959) 99; B.K. Nayar & F. Kazmi, Bull. Nat. Bot. Gard. 64 (1962) 34; F. Kazmi, J. Bomb. Nat. Hist. Soc. 59 (1962) 698; Ching & S.K. Wu, Fl. Xizang. 1 (1983) 41. — Type: *Rock 7644* (holo US, n.v.; iso GH, K, fragm. in PE), Yunnan, 'Shweli River drainage, basin to summit of Shweli-Salween watershed east of Tengyueh', XI-1922. See note 7.
- Plagiogyria gigantea* Ching, Lingnan Sci. J. 15 (1936) 275; Acta Phytotax. Sin. 7 (1958) 123, 148, pl. 36, f. 1; Fl. Reipubl. Popul. Sin. 2 (1959) 99; P.H. Hô, Ill. Fl. Vietnam 1 (1991) 52, p.p. excl. f. 91, '*Plagiogyra*'; Tardieu & C. Chr., Fl. Indo-Chine 6 (1939) 75; R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 382, photogr. 13; H.S. Kung, Fl. Sichuanica 6 (1986) 123; Jamir & R.R. Rao, Ferns of Nagaland (1988) 46; X. Cheng, Vascular. Pl. Hengduan Mount. 1 (1993) 18. — Type: *Forrest 25279* (holo K, fragm. PE, photogr. BM), Yunnan, 'Shweli-Salween Divide', X-1924.
- Plagiogyria coerulescens* Ching, Acta Phytotax. Sin. 7 (1958) 123, 148, pl. 36, f. 2; Fl. Reipubl. Popul. Sin. 2 (1959) 100; R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 381, photogr. 10. — Type: *Tsui, W.H. 17* (holo PE), Yunnan, Jingdong, Mt Wuliangshan, alt. 3000 m, 1955.
- Plagiogyria communis* Ching, Acta Phytotax. Sin. 7 (1958) 122, 147, pl. 35, f. 2; Fl. Reipubl. Popul. Sin. 2 (1959) 98; Panigrahi, Bull. Bot. Surv. India 2 (1960) 313; B.K. Nayar & F. Kazmi, Bull. Nat. Bot. Gard. 64 (1962) 31; F. Kazmi, J. Bomb. Nat. Hist. Soc. 59 (1962) 697; N.C. Nair, Records Bot. Surv. India 20, 2 (1973) 2; Tagawa & K. Iwats., Fl. Thailand 3, 1 (1979) 48, f. 3; 5; Baishya & R.R. Rao, Ferns and Fern-allies of Meghalaya State, India (1982) 47; Ching & S.K. Wu, Fl. Xizang. 1 (1983) 40; K. Iwats. et al., J. Fac. Sci. Univ. Tokyo sect. 3, Bot. 14 (1986) 14; H.S. Kung, Fl. Sichuanica 6 (1986) 123, pl. 37, f. 4–6; K. Iwats., Himalayan Plants 1 (1988) 247; X. Cheng, Vascular. Pl. Hengduan Mount. 1 (1993) 17. — Type: *Feng, K.M. 7407* (holo, PE), Yunnan, Gongshan, 'Cham-pu-tong', alt. 1800–2000 m, 4-IX-1940.
- Plagiogyria decrescens* Ching, Acta Phytotax. Sin. 7 (1958) 121, 146, pl. 33, f. 2; Fl. Reipubl. Popul. Sin. 2 (1959) 97; R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 378, photogr. 8; X. Cheng, Vascular. Pl. Hengduan Mount. 1 (1993) 17. — Type: *Yu, T.T. 20070* (holo PE; iso A), Yunnan, 'Taron-taru Divide, valley of Bucuhwang', alt. 2600 m, 3-IX-1938. See note 5.
- Plagiogyria lanuginosa* Ching, Acta Phytotax. Sin. 7 (1958) 121, 147, pl. 34, f. 1; Fl. Reipubl. Popul. Sin. 2 (1959) 98; R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 378, photogr. 9. — Type: *Feng, K.M. 12788* (holo PE), Yunnan, Malipo, Zhongzhai, altitude 1600–1800 m, 3-XI-1947. See note 6.
- Plagiogyria lineata* Ching, Acta Phytotax. Sin. 7 (1958) 123, 149, pl. 37, f. 1; Fl. Reipubl. Popul. Sin. 2 (1959) 100; X. Cheng, Vascular. Pl. Hengduan Mount. 1 (1993) 18. — Type: *Yu, T.T. 19982* (holo PE; iso A, also a paratype of *P. communis* Ching), Yunnan, 'Taron-Taru Divide, Tangtehawang', alt. 1800 m, 27-VIII-1938. Paratype: *Wang, C.W. 67017* (A, PE), Yunnan, Gongshan, 'Cham-pu-tong', Zhuangdui, 5-X-1935.
- Plagiogyria minguingsensis* R.D. Dixit & A. Das, Proc. Indian Acad. Sci. (Plant Sci.) 90 (1981) 382, photogr. 12. — Type: *A.S. Rao 17786a* (holo CAL, n.v.).
- Plagiogyria simulans* Ching, Acta Phytotax. Sin. 7 (1958) 121, 146, pl. 34, f. 2; Fl. Reipubl. Popul. Sin. 2 (1959) 97; B.K. Nayar & F. Kazmi, Bull. Nat. Bot. Gard. 64 (1962) 32; F. Kazmi,

J. Bomb. Nat. Hist. Soc. 59 (1962) 697. — Type: *Li, M.K. A-1052* (holo PE), Yunnan, without exact locality, 1939.

*Plagiogyria taliensis* Ching, Acta Phytotax. Sin. 7 (1958) 121, 146, pl. 34, f. 1; Fl. Reipubl. Popul. Sin. 2 (1959) 97; X. Cheng, Vascular. Pl. Hengduan Mount. 1 (1993) 17. — Type: *Tsiang, Y. 11604* (holo PE; iso K), Yunnan, Dali, Mt Cangshan, nr Zhonghesi, alt. 2500 m, 23-VIII-1933. See note 7.

*Plagiogyria tetraptera* W.M. Chu & J.J. He, Acta Bot. Yunn. Suppl. 5 (1992) 36, f. 2–4. — Type: *Chu, W.M. c.s. 11390* (PYU, n.v.). See note 7.

*Plagiogyria wilhelmensis* Nakaike, Bull. Nat. Sci. Mus. Tokyo 17 (1991) 93, f. 14. — Type: *Nakaike 280* (holo TNS, n.v.).

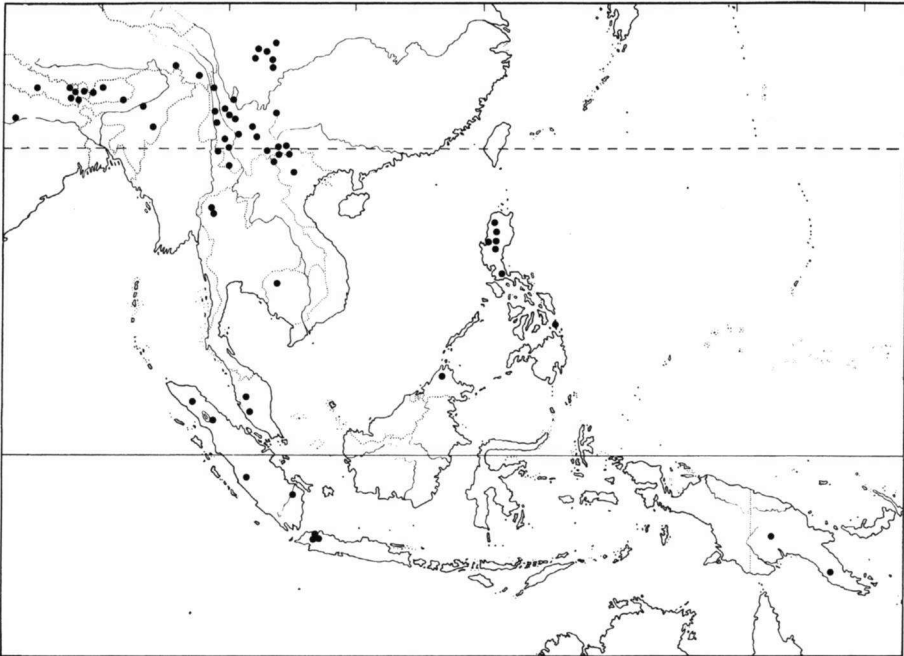
*Rhizome* short to c. 15 cm long, erect, narrow and very woody. *Stipes* stramineous or brownish, of sterile fronds 6–60 cm long, of fertile fronds 10–70 cm long, base strongly enlarged, 5–15 mm wide in the middle, in cross section one U-shaped vascular bundle, upper part of stipe tetragonal, terete, oval, or triangular, aerophores present on stipe and rachis, elongate, horn-like, with blunt apex; rachises glabrous to hairy to sometimes densely hairy. Fronds not covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis flattened, semiterete, or grooved, not winged (or winged on ridges), rachis 1–4 mm wide in the middle part. *Sterile lamina* herbaceous, not glaucous, pinnate except the pinnatifid or pinnatilobed apex, widest medially, 15–100 cm long, 6–40 cm wide, index (1.8–)2.3–2.8(–4.1); pinnae 20–50 pairs, widest near base or below the middle, veins of pinnae simple to as many simple as forked, distinct on both surfaces, stomata scattered on the lower epidermis, margin serrulate, most pinnae except the uppermost with equilateral base, truncate or rounded; lowermost pinnae sessile to shortly stalked, slightly deflexed or not, gradually or slightly shortened, some pinnae vestigial on stipe sided by aerophores; middle pinnae 3–20 cm long, 0.6–2 cm wide in the middle, sessile, base truncate or rounded; apex of lamina pinnatifid, terminated by a pinnatilobed segment or by a pinna conform to lateral ones, base connected with 1–2 shorter lateral pinnae, 3–7 cm long. *Fertile fronds* usually longer than the sterile ones, dorsal side of rachis flattened, semiterete, or grooved, not or sometimes winged on the ridges (slightly, also along the corner line of stipe); lamina pinnate throughout, pinnae shortly stalked or nearly sessile, 20–70 cm long, 4–20 cm wide; pinnae glabrous, 16–40 pairs, margin erose; lowermost pinnae gradually shortened or some pairs aerophore-like vestiges on stipe together with aerophores, 2–4(–5) cm apart; middle pinnae (3–)4.5–13(–21) cm long, 2–4 mm wide, base sessile, slightly cordate, or shortly stalked; apex pinnatifid, acuminate or caudate or terminated by a pinna conform with the lateral ones which is often beaded at the base. Paraphyses few, mostly caducous, dark brown or brown. Spores yellow to brown, not obviously tuberculate.

*Distribution* — China (Sichuan, Yunnan, Xizang), N Burma, Sikkim, Bhutan, Nepal, E India (Assam, Khasia and Jaintea Hills, Manipur), Peninsular Malaysia, Sumatra, Java, Philippines (Luzon), Borneo (Mt Kinabalu), Sulawesi, New Guinea.

*Habitat* — In wet places of forest, altitude 1200–3500 m.

*Notes* — 1. Kunze's herbarium at Leipzig was destroyed (Stafleu & Cowan, 1979). Gesker's specimen in L is selected as lectotype because it is in accordance with Kunze's original material from Java that bears the name of '*Lomaria scandens* W.' by De Vriese.

2. The names *Plagiogyria adenopus* Moore and *Stenochlaena triquetra* J. Sm. are both on the labels of Hooker f. & Thomson's Khasia collections of this species. This



Map 5. Distribution of *Plagiogyria pycnophylla* (Kunze) Mett.

might well be the reason why Hooker (1860) and Clarke (1880) thought that Wallich no. 23 is a mixture of *P. euphlebia* and *P. pycnophylla*.

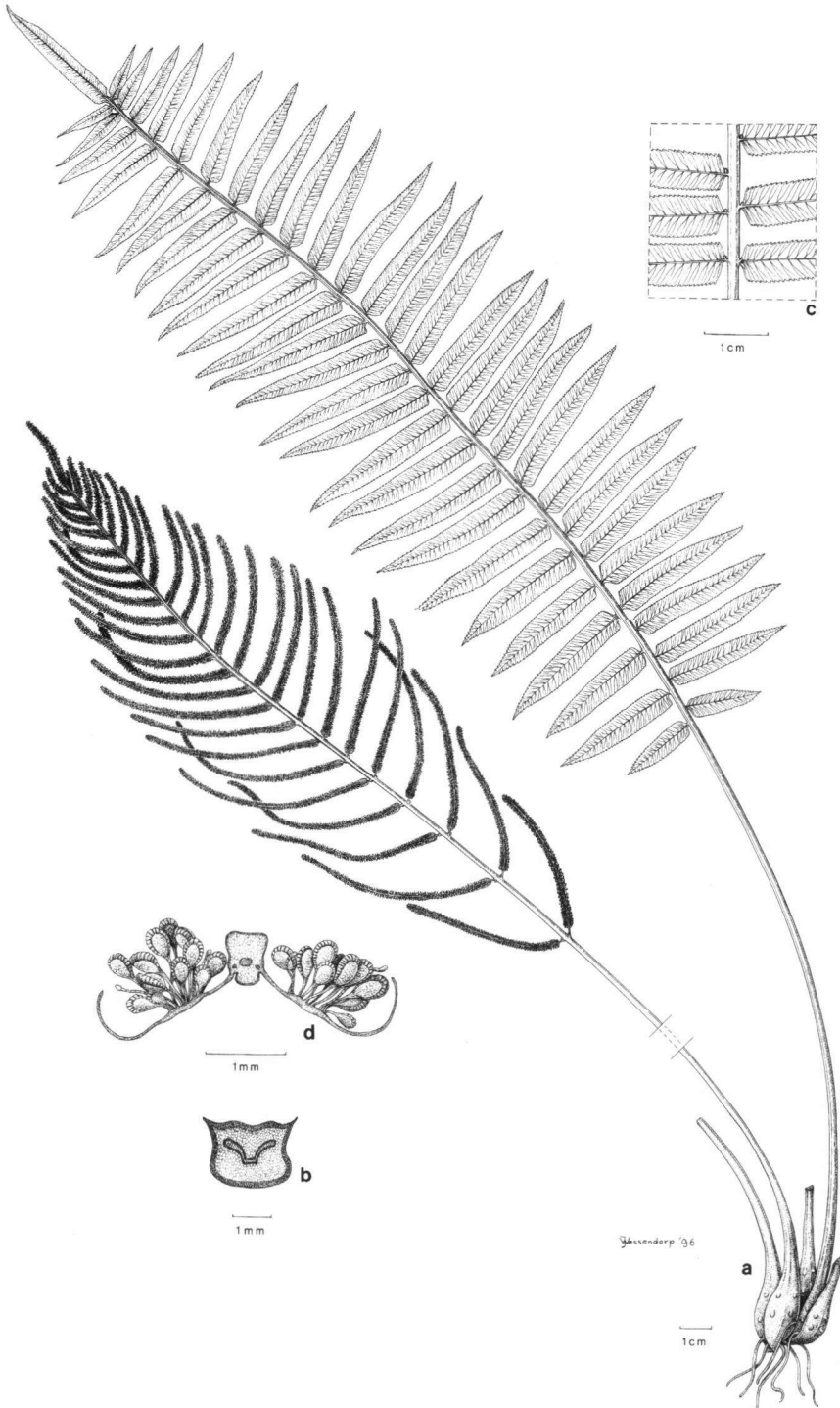
3. Raciborski did not designate the type of his two forms published in 1898. The collections, without numbers, are distributed in BO, KRA, L and P (cf. Köhler, 1989). The specimens in L bear his handwriting and can be regarded as lectotypes.

4. Mettenius validly published *P. scandens* which was based on Griffith's Khasya collection '*Stenochlaena* Griff. in herb. Kunzei'. His drawing of a fertile pinna with a remote vein connecting the ends of all the lateral veins we believe to be a wrong observation. In *P. pycnophylla* and *P. egenolfioides* the fertile pinnae always show a dark thick strip along the ends of veins which could be mistaken as containing a vein.

Das & Dixit (1980) chose as lectotype for *P. scandens* Mett. a Griffith specimen in Mettenius' herbarium in Berlin. They separated it from *P. pycnophylla* based on the very variable terminal leaflet, usually pinnatifid, occasionally conform to the lateral one.

5. *Plagiogyria decrescens* has the lowermost pinnae gradually shortened and a short stipe devoid of aerophores, in contrast to normal *P. pycnophylla* that has aerophores on the stipe juxtaposed with reduced auricular pinnae. Stolons are also found in this form (Zink & Zhang no. 613 from Sichuan).

6. Ching's *P. lanuginosa* has a dense cover of hairs on stipe and rachis. The presence of hairs on mature specimens is a variable character; very common is that hairs only remain at the base of lateral pinnae or sparsely on the rachis. This form more often occurs in SE Tibet, SE Yunnan, N Vietnam, and Java, and may have relation with





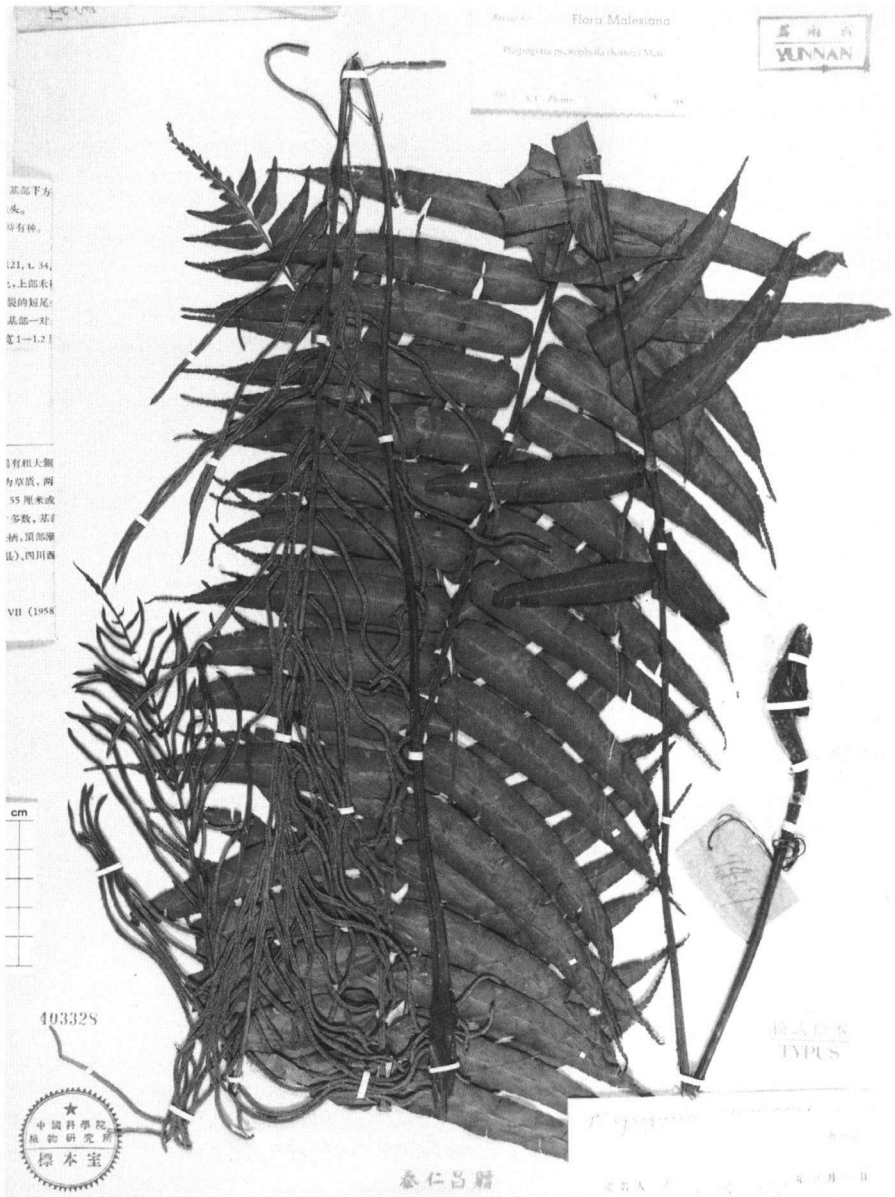


Fig. 14. *Plagiogyria pycnophylla* (Kunze) Mett. [K.M. Feng 7407 (PE), China, Yunnan, Gongshan].

Fig. 13. *Plagiogyria pycnophylla* (Kunze) Mett. [Palmer & Bryant 963 (GH), Java, Mt Pangrango].  
a. Habit; b. cross-section through stipe; c. detail of pinnae; d. cross-section of fertile pinna with sporangia.

limestone subsoil. In *P. glauca* some collections from Sulawesi and New Guinea have hairs like that of *P. lanuginosa*.

7. Small to medium-sized specimens with very thin wings on the four angles of the stipe are occasionally found in the moist forests in Assam, Yunnan, and Thailand, but are very common in the Philippines. Another extreme condition of *P. pycnophylla* is the form named as *P. virescens* or *P. taliensis* collected from open dry habitat, which show a shiny, glabrous, round stipe, at least for the lower half.

### 11. *Plagiogyria stenoptera* (Hance) Diels — Fig. 15

*Plagiogyria stenoptera* (Hance) Diels in Engl. & Prantl, Nat. Pflanzenfam. 1, 4 (1899) 282; Copel., Philipp. J. Sci. 1, Suppl. (1906) 154; Alderw., Malayan Ferns (1908) 341; Nakai, Bot. Mag. (Tokyo) 42 (1928) 208; Tak. Itô, Ill. Pl. Formos. Suppl. (1928) pl. 203; Copel., Philipp. J. Sci. 39 (1929) 398; C. Chr. & Tardieu, Notul. Syst. (Paris) 6 (1937) 134; Tardieu & C. Chr., Fl. Indo-Chine 6 (1939) 77, f. 9: 1–3; Ogata, Icon. Filic. Jap. 8 (1940) pl. 389; Ohwi, Fl. Japan (1957) 51; S.H. Fu, Ill. Important Chinese Pl., Pterid. (1957) 41, f. 49; Ching, Acta Phytotax. Sin. 7 (1958) 126, 152, pl. 39, f. 2; Fl. Reipubl. Popul. Sin. 2 (1959) 103; Tagawa, Col. Ill. Jap. Pterid. (1959) 69, 240, pl. 22, f. 129; Copel., Fern Fl. Philipp. 2 (1960) 196; Shing, Iconogr. Cormoph. Sinicorum 1 (1972) 127, f. 253; De Vol, Taiwania 17 (1972) 285, pl. 1, f. 6; pl. 3; De Vol & C. Y. Lu, Fl. Taiwan 1 (1975) 145; Nakaike, Enum. Pterid. Jap. Filic. (1975) 10; Kurata & Nakaike, Ill. Pterid. Jap. 4 (1985) 260; H. S. Kung, Fl. Sichuanica 6 (1986) 124, pl. 35, f. 2; P.H. Hô, Ill. Fl. Vietnam 1 (1991) 53, f. 94, '*Plagiogyra*'; Nakaike, New Fl. Jap. Pterid. (1992) 238, fotogr. 238; K. Iwats., Ferns and Fern Allies of Japan (1992) 77, pl. 29, fotogr. 5; X. C. Zhang, Expl. Pl. Resou. Mt Jiuwanshan, Guangxi (1993) 208; W. C. Shieh et al., Fl. Taiwan 1, ed. 2 (1994) 138, pl. 52. — *Blechnum stenopterum* Hance, J. Bot. 21 (1883) 268. — *Lomaria concinna* Baker, J. Bot. 23 (1885) 103, nom. superfl.; Baker in Hook., Icon. Pl. 7 (1886) pl. 1644. — *Lomaria stenoptera* (Hance) Baker, Ann. Bot. (London) 5 (1891) 40, 220. — Type: *Hancock 39* (K; iso BM), Taiwan, 'Tamsui District', XI-1881. See note 1.

*Plagiogyria henryi* H. Christ, Bull. Herb. Boissier 7 (1899) 47; Bull. Soc. Bot. France (Mém.) 1 (1905) 64; Copel., Philipp. J. Sci. 38 (1929) 399, pl. 5; Ching in Hu & Ching, Icon. Filic. Sin. 1 (1930) pl. 30; C. Chr., Contr. U.S. Natl. Herb. 26 (1931) 309, pl. 21. — *Lomaria decurrens* Baker, Kew Bull. 1 (1906) 9, nom. superfl. — Type: *Henry 9036a* (K, P), Yunnan, 'Mengtze, E Mt 6000'. See note 2.

[*Plagiogyria auriculifera* Makino, Bot. Mag. (Tokyo) 23 (1909) 244, nom. nud., pro syn.]

*Plagiogyria argutissima* H. Christ, Bull. Acad. Int. Géogr. Bot. 20 (1910) 141; Copel., Philipp. J. Sci. 38 (1929) 403; Ching, Acta Phytotax. Sin. 7 (1958) 125, 151, pl. 39, f. 1; Fl. Reipubl. Popul. Sin. 2 (1959) 102. — Type: *Cavalerie 3392* (holo P; iso PE), Guizhou, 'Pin-fa', alt. 990–1000 m, X-1908. See note 3.

*Plagiogyria petelotii* Copel., Philipp. J. Sci. 38 (1929) 399, pl. 6; P.H. Hô, Ill. Fl. Vietnam 1 (1991) 53, f. 93, '*Plagiogyra*'. — Type: *Pételot 1656* (P), Tonkin, Chapa, VII-1924.

*Plagiogyria stenoptera* (Hance) Diels var. *major* Ching, Acta Phytotax. Sin. 7 (1958) 126, 152; Fl. Reipubl. Popul. Sin. 2 (1959) 104. — Type: *Tsiang, Y. 4653* (holo PE), Guizhou, Zhenfeng, 13-X-1931.

*Plagiogyria matsumureana* auct. non Makino: Hayata, Bot. Mag. (Tokyo) 23 (1909) 32, p.p.

*Rhizome* short, erect to suberect, thick with many stipe bases. *Stipes* stramineous, of sterile fronds (3–)4–8(–12) cm long, of fertile fronds (9–)11–22(–28) cm long, base slightly enlarged, 4–8 mm wide in the middle, in cross section one V-shaped vascular bundle, upper part of stipe tetragonal, aerophores only present on base of stipe; rachises glabrous. Fronds not covered with an amorphous gelatinous mucilage layer when dry, dorsal side of rachis flattened or upwards carinate, with crisped wings on the two ridges or not, rachis 1–2 mm wide in the middle part. *Sterile lamina* herbaceous, not

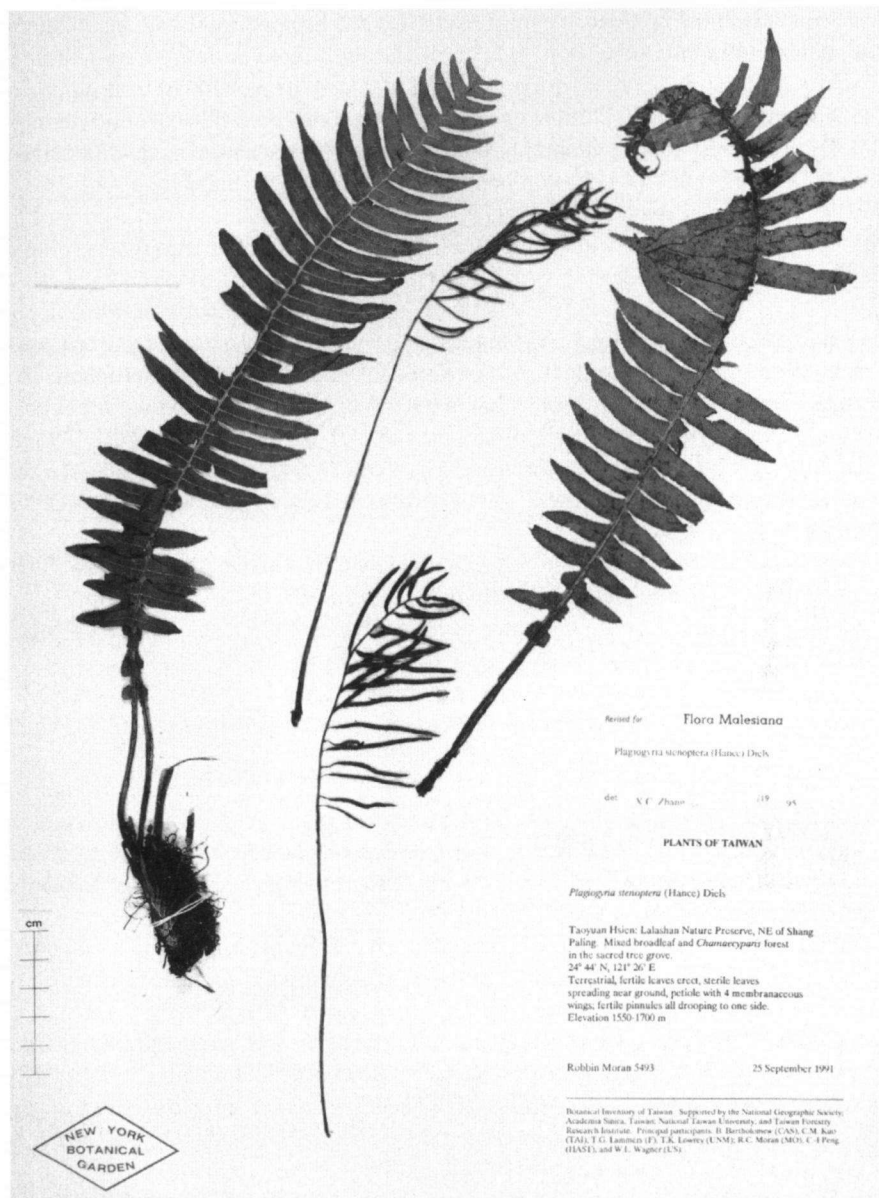


Fig. 15. *Plagiogyria stenoptera* (Hance) Diels [Robbin Moran 5493 (NY), China, Taiwan, Taoyuan, Lalashan Nature Preserve].

glaucous, pinnatifid, widest medially, 20–62 cm long, 4–20 cm wide, index (2.6–) 3.3–4.3(–5.5); pinnae 25–35 pairs (auricle pinnae excluded), widest near base or medially (in very large forms), veins of pinnae forked above base, distinct on both surfaces, stomata scattered on the lower epidermis, margin serrulate or towards the

base becoming entire or nearly so, most pinnae except the uppermost with inequilateral base, adnate to rachis; (0–)3–6(–11) pairs reduced to mere auricles; middle pinnae 2.5–10.5 cm long, 0.7–1.4 cm wide in the middle, acroscopic side of base adnate to the rachis into a wide wing, basiscopic side like the acroscopic side or round (in large fronds); uppermost pinnae adnate, base about equal-sided, basiscopically decurrent into rachis wing; apex of lamina pinnatifid. *Fertile fronds* usually longer to shorter than the sterile ones, dorsal side of rachis flattened to grooved, sometimes winged on the ridges, rachis 1–2 mm wide in the middle part; lamina pinnate throughout, pinnae nearly sessile or rarely deeply pinnatifid and rachis slightly winged throughout, (10–)35–55(–75) cm long, 4–8(–12) cm wide (because pinnae drooping to one side); pinnae sparsely short glandular hairy on the inner side, 15–30 pairs (vestigial ones excluded); margin of pinnae entire to subentire; some pairs of lowermost pinnae aerophore-like vestiges on stipe together with aerophores (or sometimes replaced by auricle pinnae like the sterile ones), 2 cm apart; middle pinnae (2.5–)4–6(–12) cm long, 2–3 mm wide, base shortly stalked; apex terminated by a pinna conform with the lateral ones, which is often beaded at the base. Paraphyses absent. Spores yellow, with reddish tubercles.

Distribution — Japan (Yakushima), China (Hubei, Hunan, Guangxi, Taiwan, Sichuan, Guizhou, Yunnan), Vietnam, Philippines (Luzon).

Habitat — In moist dense mountain forests, or in ravines, rocky slopes, altitude 500–2500 m.

Chromosome number — Tsai (1973) reported  $n = 75$ .

Notes — 1. Baker (1885) published *Lomaria concinna* based on *Hancock 39*, which is also the type of *Blechnum stenopterum* Hance (1883).

Following Ching (1958), Lellinger (1971) founded *Plagiogyria* sect. *Carinatae* on *P. argutissima*. They both mistook it for a member of the ‘three vascular bundles’ group constituted by the Old World *P. matsumureana*, and the New World *P. pectinata*. *Plagiogyria argutissima* is conspecific with *P. stenoptera* which has one V-shaped vascular bundle, it is the nearest relative of the two ‘three vascular bundles’ species, distinguished by its lower pinnae reduced to small confluent auricles and by its stalked fertile pinnae consistently beaked at the apex; obviously it is also very close to *P. assurgens* and *P. falcata*.

2. Christ (1899), when working at Basel, published *P. henryi* based on *Henry 9036a*. His pteridophyte specimens were purchased by Bonaparte and are now in Paris. Not knowing Christ’s work, Baker (1906) published *Lomaria decurrens*, based on the Kew duplicate of Henry’s collection (Baker cited *Henry 9036*, in fact it is *9036a* in K, *Henry 9036* is *P. adnata* as it is also in NY and P).

3. There are five specimens (3 not mounted) of *Cavalerie 3392* in P of exactly the same shape and probably collected from the same plant. The only sheet in PE is also from the same collection. Rosenstock (1913) cited *Cavalerie 3392p* (‘Kuy-tcheu, Pin-fa et Kuy-yang, X-1912’) as the holotype of *P. adnata* var. *angustata*. The specimen identified by him as this variety in L is *Cavalerie s.n.*, Kuy-tchen, Pin-fa, Pai-he-hin, X-1912 (*Rosenstock, Filic. Chin. Exp. 170*), but it is another common species, namely *P. falcata*. Morton Neg. No. 1797 was taken from this sheet in Leiden.

## HYBRIDS

**1. *Plagiogyria* × *neointermedia* Nakaike**

*Plagiogyria* × *neointermedia* Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 262; Enum. Pterid. Jap. Filic. (1975) 8; Kurata & Nakaike, Ill. Pterid. Jap. 7 (1994) 24. — Type: *Nakaike 15138* (holo, TOFO, n.v.), Japan, Owase, Kuki.

Nakaike supposed this to be a hybrid between *P. euphlebia* and *P. rankanensis* (*P. adnata* in this treatment).

**2. *Plagiogyria* × *sessifolia* Nakaike**

*Plagiogyria* × *sessifolia* Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 262, pl. 2, f. 2; Enum. Pterid. Jap. Filic. (1975) 10 (*sessilifolia*); Kurata & Nakaike, Ill. Pterid. Jap. 7 (1994) 28; Nakaike, Ind. Hybr. Ferns Jap. (1970) 25, nom. nud. — Type: *Kido, M. 4255* (holo TOFO), Japan, Ohguchi, Fuke, 9-X-1961.

Nakaike spelled the name as '*sessifolia*' when the name was validly published. It is supposed to be a hybrid of *P. euphlebia* and *P. japonica*.

**3. *Plagiogyria* × *wakabae* Nakaike**

*Plagiogyria* × *wakabae* Nakaike, Bull. Nat. Sci. Mus. Tokyo 14 (1971) 262; Enum. Pterid. Jap. Filic. (1975) 10; Kurata & Nakaike, Ill. Pterid. Jap. 7 (1994) 34; Nakaike, Ind. Hybr. Ferns Jap. (1970) 25, nom. nud. — Type: *Kurata, S. s.n.* (holo TOFO), Japan, Takeo, Mt Mifuneyama, 11-VIII-1961.

This is supposed to be a hybrid between *P. japonica* and *P. rankanensis*.

Currently, the status of the above three hybrids is not confirmed due to a lack of cytological investigation. Type specimens all show shrivelled, irregular spores, and the fronds show intermediate forms between the supposed parents. *Plagiogyria adnata*, *P. euphlebia*, and *P. japonica* are three very close related species, and sympatric from Central China to Japan. Ching (1958) suspected that *P. japonica* is a hybrid of the former two judging from the morphology of this species, but this is not supported by the reported chromosome counts. We find many specimens of *P. japonica* that produce abnormal spores, quite a few specimens approach the morphology of *P. adnata*, and also many specimens of *P. adnata* approach the shape of *P. japonica*. It seems that hybrid swarms exist between *P. adnata* and *P. japonica* from Central China to the Japanese Islands. We could not find more intermediates between *P. adnata* and *P. euphlebia*, and between *P. euphlebia* and *P. japonica* in the collections available for this research. Since different quantities of abnormal spores are found in most species and shrivelled ones conspicuously in the younger stage specimens (usually those collected before September), as we noticed during the studies of *Plagiogyria*, spore abortion may also be caused by disturbance of the normal process of spore development by certain external factors (Hennipman, 1977; Hovenkamp, 1986). An other reason is that by the nature of the so-called 'mixed sorus' (Bower, 1910) of *Plagiogyria* the sporangia are not all in the same development stage and, without any

indication of a gradate sequence on one fertile lamina, the young spores are often mixed with ripe ones in samples of spores which are not collected from a single sporangium. If the above three hybrids are not hybrids after all, *P. × neointermedia* and *P. × wakabae* would be identified as *P. japonica*, *P. × sessilifolia* as *P. euphlebia*.

#### DUBIOUS HYBRIDS

1. [***Plagiogyria adnata* × *P. pseudojaponica*** Hatus., Fl. Ryukyus sec. ed. (1994) 6, nom. nud. — Voucher: Unknown].
2. [***Plagiogyria pseudojaponica* × *P. yakushimensis*** Hatus., Fl. Ryukyus sec. ed. (1994) 6, nom. nud. — Voucher: Unknown].

Hatusima mentioned the above two hybrids from S Japan without any explanation. According to the above delimitation of species, *P. pseudojaponica* is conspecific with *P. japonica*, and *P. yakushimensis* is *P. adnata* (the population of small plants). If the hybrid plants exist, they could be considered to be hybrids between *P. adnata* and *P. japonica*.

#### DUBIOUS NAME

*Plagiogyria furunculata* Bir, Biology of Indian Pteridophytes (1987) 216, nom. nud. — Voucher: Unknown, India.

#### EXCLUDED NAMES

1. *Acrostichum seetacoonense* Roxb. ex Griff., Calcutta J. Nat. Hist. 4 (1844) 480. — Type: *Roxburgh s.n.* (BR), Bangladesh, Chittagong, near the burning wells of Seetacoond. = ***Bolbitis appendiculata*** (Willd.) K. Iwats. subsp. ***vivipara*** var. ***vivipara*** (see Hennipman, 1977).  
Moore (1857) suspected *Acrostichum seetacoonense* Roxb. to be a synonym of *Lomaria triquetra* (= *Plagiogyria euphlebia*). Christensen (1906) suggested it is a species of *Plagiogyria* or *Stenochlaena*.
2. *Lomaria ? lucida* C. Presl, Reliq. Haenk. 1 (1825) 52. — Type: Herb. Presl (Prague), Luzon.  
Copeland (1929) suspected this to be an earlier name for *Plagiogyria glauca* (Blume) Mett. After a study of Presl's type in Prague, Holtum (1968) reported that the type is a young sterile plant of *Diplazium*, possibly *D. pallidum*, and believed that Presl's name should be treated as a nomen dubium (see also Price, 1972).
3. *Plagiogyria nana* Fée ex Salomon, Nomencl. Gefässkrypt. (1883) 282, nom. nud., pro syn. — Voucher: Unknown.  
In Salomon's index *P. nana* Fée is a synonym of *Blechnum nigrum* Mett.
4. *Plagiogyria niponica* Mett. ex Salomon, Nomencl. Gefässkrypt. (1883) 282, nom. nud., pro syn. — Voucher: Unknown.

Salomon listed *P. niponica* Mett., a manuscript name, as a synonym of '*Blechnum spicant* var.'. Perhaps it is identical with *Blechnum niponicum* (*Struthiopteris niponica*), a common Japanese fern.

5. *Plagiogyria ornifolia* Fée ex Salomon, Nomencl. Gefässkrypt. (1883) 282, nom. nud., pro syn.

Salomon listed *P. ornifolia* Fée as a synonym of *Blechnum procerum* Sw.

#### IDENTIFICATION LIST

<i>Plagiogyria</i>	4. <i>euphlebia</i>
1. <i>adnata</i>	5. <i>falcata</i>
2. <i>assurgens</i>	6. <i>glauca</i>
3. <i>egenolfioides</i>	7. <i>japonica</i>
a. var. <i>egenolfioides</i>	8. <i>matsumureana</i>
b. var. <i>decrescens</i>	9. <i>pectinata</i>
c. var. <i>latipinna</i>	10. <i>pyncnophylla</i>
d. var. <i>sumatrana</i>	11. <i>stenoptera</i>

- Acosta-Arteaga 685: 9 — Adelbert 173: 6 — Alfaro 16533: 9 — Alice 2427: 9; 2433: 9 — d'Alleizette 90: 1 — Allen 3270: 6 — Alston 12852: 6; 14921: 3d; 14944: 6 — André 975: 9 — Anjiang Agricultural School 1324: 1 — Ashton A-219: 3c — Atehortu 1277: 9.
- Backer 31286: 6 — F. & C. Baker 23: 6 — Bakhuizen van den Brink 4415: 1; 4555: 6 — Balansa 1884: 1 — van Balgooy 273: 3b — Barker LAE-67208: 3b; LAE-67272: 3b — Bartlett 6064: 6; 8027: 3d; 8492: 3d — Beattie 10180: 6 — Beccari 411: 1 — Beer 12302: 10 — Beijing Exped. 89-221: 1; 688: 4; 89-1445: 4; 1557: 1; 89-1591: 4; 89-1799: 5; 2035: 11; 2332: 11; 2425: 1; 89-2833: 1; 89-2859: 11; 89-2907: 1; 89-4398: 1; 89-4403: 1; 89-4422: 4; 4496: 11; 89-4743: 1; 89-4945: 4; 89-5057: 5; 89-5061: 1; 89-5085: 7; 89-5093: 7; 89-5531: 1; 89-5663: 1; 89-5671: 1 — Bellingham 1324: 9 — Beumée 413: 3d — van Beusekom 2434: 10 — Bir 871: 10 — Biswas 5675: 10 — Bodinier 2399: 4; 2540 bis: 4; 2540 bis: 7; 2541: 1; 2940: 1; 2941: 1 — Bor's collector 222: 10 — Boufford 19200: 7; 20253: 8; 22202: 4; 22275: 8; 23419: 8; 23544: 4; 24166: 7 — Brade 471: 9 — Braithwaite 4684: 3b; 4730: 6 — Brass 4286: 6; 4483: 3b; 4746: 3b; 5031: 3b; 9442: 3b; 9482: 6; 9660: 3b; 9954: 3b; 10335: 3b; 10542: 3b; 11894: 3b; 29918: 3b; 30141: 6; 30317: 6; 31289: 6 — Breedlove 12907: 9 — C.J. Brooks 333s: 1 — W.P. Brooks 617: 8 — C.A. Brown CR-93: 9 — H.W. Brown 152: 1 — BS series 5436: 10; 5799: 10; 8424: 6; 14876: 6; 16306: 6; 16307: 10; 19606: 10; 37815: 10; 38569: 4; 40351: 6; 40455: 10; 44970: 10 — Buchtien 410: 9; 877: 9; 2146: 9; 2677: 9 — Bünnemeijer 4122: 3d; 10046: 10; 10049: 10 — Burger 4352: 9.
- Cadière 19: 1; 134: 1; 1013: 4; 1909: 1 — Camp E-2225: 9 — Canton Christian College (C.C.C.) 9385 bis: 1; 9385 bis: 5; 12099: 1; 12320: 1 — Cavalerie 2 bis: 7; 2 bis: 1; 50: 4; 79: 11; 171: 4; 347: 4; 2893: 11; 3392: 11; 7233 bis: 7; 7233 bis: 1 — Chand 2223: 6 — Chang S.Y. 2853: 7; 2921: 5; 5625: 1; 6715: 4 — Chang Z.S. 8514: 11 — Charett 1439a: 4; 1439b: 7 — Chen H.B. 631: 1 — Chen M. 1146: 7 — Chen (Y.S. & Y.F.) 2503: 6 — Chen Z. Y. 51137: 1 — Cheng J.F. 63-150: 7; 64-261: 5; 73-170: 1; 73-257: 4; 73-355: 7; 73-358: 7 — Cheng W.C. & Hwa C.T. 1138: 11 — Chevalier 30734: 4; 30888: 1; 38719: 1 — Chew Wee Lek 729: 3c — Chiang T.P. 179: 11 — Chiao C.Y. 209: 1; 1214: 7; 18728: 7 — Ching R.C. 15: 4; 22: 4; 33: 4; 34: 4; 42: 4; 47: 4; 63: 4; 2280: 1; 2359: 4; 5898: 1; 5988: 4; 7143: 4; 7480: 7; 8787: 5; 22036: 6; 25299: 10 — Chiu P.S. 32: 5; 1135: 1; 1210: 4; 1226: 1; 1523: 7; 1601: 5; 1623: 1; 1647: 7; 1733: 1; 1987: 4; 2088: 4; 2089: 1; 2180: 7; 2270: 1; 2271: 4; 2304: 5; 2344: 1; 2345: 7; 3063: 4; 3841: 4; 3842: 1; 3887: 5; 3971: 7; 4340: 4; 4688: 7; 4727: 7; 4728: 4; 4733: 5; 4787: 4; 5003: 5; 5106: 4; 5107: 4; 6084: 4; 6085: 1; 6215: 1; 6277: 5; 11702: 5 — Chow H.C. 281: 1 — Chu W.M. 223b: 6; 1695: 6; 2782: 6; 3622: 10; 4818: 2; 8586: 10; 14940: 10 — Chuang C.C. 2516: 6;

- 2544: 11; 4711: 11; 4751: 6 — Chun N.K. 42878: 4 — Chun S.H. 14200: 1; 14269: 1; 15669: 5; 15752: 11; 16840: 1 — Chung In-Cho 1936: 7 — Clarke 5152: 10; 5649: 1; 6420: 10; 8326: 10; 8821: 10; 14402: 1; 14402d: 1; 14426a: 1; 14426b: 1; 15326a: 4; 16427a, b: 10; 18390e: 10; 18459a, b, c: 4; 18722a, b: 4; 18738a: 4; 18759: 4; 18794b: 6; 18819: 1; 18833: 1; 18834e, f, g, h: 4; 18853b, d: 4; 18873: 1; 18873h, s: 1; 18967b, c: 1; 18996p, q, z: 6; 19245: 10; 19250: 10; 19250b: 10; 26019: 10; 40346e: 6; 40422b, c, d: 10; 41268: 6; 41279a, c: 6; 41333: 6; 42769b, d: 1; 44665a, b, c: 1; 44899i, m: 6; 45206b, c: 6; 45455a, b: 4; 45458a, e: 6; 45923b: 10 — Clemens 4101: 1; 4322: 1; 7384: 6; 10041a: 6; 10589: 3c; 10590: 10; 11070: 6; 27043: 10; 27960: 1; 28186: 1; 28385: 6; 28960 bis: 3c; 28960 bis: 10; 28961: 3c; 28962: 3c; 29059: 3c; 29060: 6; 30516: 6; 31672: 3c; 31695: 3c; 31822: 3c; 32051: 6; 32636: 3c; 41164: 6; 41406: 3b; 51112: 3c — Colani 1968: 4; 1968 bis: 10 — Collenette 21517: 3c — Conduz 10714: 9 — Conzatti 677: 9; 957: 9 — Coode NGF 40277: 6 — Cooper 3196: 10; 3198: 10; 4380: 10 — Copeland PPE-113: 6; 1513: 6; 1924: 3c; 2302: 6 — Corner 25317: 3d — Correll 23112: 9 — Craig 130: 3b — Craven 2685: 6 — Croft 114: 3b; 292: 6; 295: 3b; 1292: 3b; 1410: 6; in LAE series: 60707: 3b; 61471: 3b; 61588: 3b; 61816: 6; 65079: 3b; 65199: 3b; 65243: 6; 65243: 10; 65815: 3b; 65975: 6; 68007: 3b; 68045: 6; 68126: 3b; 68186: 3b — Crook 1922: 1 — Cuatrecasas 5465: 9; 5511: 9 — Cufodontis 648: 9.
- Dalziel 65: 1 — Dang C.Z. 361: 1 — Danser 6224: 6 — Davidson 1430: 3d — Delavay 4162: 6; 4411: 10; 4412: 10; 5042 bis: 11; 5042 bis: 4; 5118: 1 — Deng L. 1185: 7 — De Vol 16: 7; 17: 7 — Dixit 52883: 10 — Ducloux 48: 1; 151: 11; 2045: 1; 5103: 11 — Dunn 3934: 5.
- East Hainan Exped. 723: 5 — Eberhardt 13: 4; 21: 4; 41: 4; 50: 4; 69: 4; 124: 11; 179: 11; 1932: 4 — Ecolog. Dept. Inst. Bot. 6: 11 — Ekman H-7501: 9; H-7720: 9; H-12002: 9; H-12790: 9; 14546: 9 — Elmer 9740: 3c; 10644: 6; 10910: 4; 14102: 3c — Ender 3979: 3c — Esquirol & Marchand 3247: 5 — A.M. Evans 3183: 9 — G.B. Evans 97: 3d — Everett 84: 6 — Evrard 231: 1; 1134: 4; 1284: 4; 1871: 11; 2060: 1 — Eyma 2926: 6.
- Faber 1023: 2 — Fan & Li Y.Y. 244: 5 — Fang W.P. 3177: 11; 3361: 1; 3787: 11; 3885: 1; 5791a: 1; 5791b: 7; 8081: 1; 8630: 10; 12526: 4 — Fang Z.D. 1806: 6; 3512: 6 — Faurie 10: 8; 26: 4; 27: 7; 160: 7; 202: 8; 203: 7; 280: 4; 421: 6; 422: 4; 423: 11; 617: 6; 642: 8; 958: 8; 2861: 7; 4604a: 1; 4604b: 7; 5613: 8; 7767: 7; 8431: 6; 8432: 11 — Fay 2433: 9 — FB 16307: 10; 4974: 10; 7979: 10 — Fendler 325: 9 — Feng K.M. 232: 4; 478: 6; 538: 10; 2621: 6; 3217: 11; 3399: 6; 4014: 6; 4512: 10; 4606: 11; 4797: 1; 4889: 6; 5568: 6; 7157: 6; 7407: 10; 11102: 11; 11258: 11; 12788: 10; 12880: 11; 13756: 1; 13947: 4 — Feudler 325: 9 — Feung 4405: 6; 4453: 5 — Fleming 1318b: 4; 1527: 4 — Fleury 38799: 1 — H.O. Forbes 740: 6; 1041b: 6; 1845: 1; 1859b: 1 — Forero 545: 9 — Forestry Dept. Yunnan Univ. 1196: 6 — Forrest 8882: 6; 18842: 10; 24909: 6; 25249: 6; 25279: 10; 28938: 6 — Fosberg 44599: 6 — Fuchs 21488: 6 — M. Fuentes 1789: 9 — Fujian Exped. 219: 4; 226: 7; 238: 7 — Miyoshi Furuse 5367: 1; 7767: 7; 7912: 1; 7930: 4; 8336: 1; 10036: 7; 10423: 1; 10500: 11; 10517: 11; 10525: 8; 28552: 7; 33339: 7; 33374: 7; 33409: 4; 33410: 7; 33671: 7; 33865: 8; 36390: 7.
- Gamble 5235a: 10; 7241: 10 — Gammie 346: 4 — Gardette 93: 1; 1037: 10 — Garwood 1351: 9 — Gastony 334: 9; 347: 9 — Ghiesbreght 395: 9 — Gibbs 2: 5; 4142: 3c — Glaziou 2423: 9; 3326: 9; 4376: 9 — L.D. Gómez P. 2377: 9 — Gould 683: 10 — J.L. Gressitt 358: 5 — Griffith 467: 10; 2845: 10 — Guizhou Drug Contrl Inst. 176: 4 — Guizhou Exped. 8514: 11.
- Hainan Fern Exped. 1507: 7; 1793: 5; 1796: 1; 1797: 7 — J.G. Hallier 485: 6 — Halliwell 4336: 8 — Hancock 4: 7; 8: 6; 39: 11; 98: 1; 99: 1; 107: 10; 216: 11; 216 ex horte: 1 — Haniff & Nur 8144: 3d — Hara 2318: 10; 63-5214: 10 — Harris 7144: 9 — Hart 188: 9 — Hartley 11132: 3b — Hasama 12999: 8 — Hatusima 14031: 1; 19961: 1; 23150: 4 — Haight 5659: 9 — He G.Z. 4855: 7 — He X.Y. 23889: 7; 28239: 7 — Hennipman 3400: 10; 3583: 1; 3665: 1; 5254: 3c; 6516: 9 — Henry 255: 4; 3217: 11; 9036: 1; 9036a: 11; 9164: 4; 13475: 11; 13476: 4 — Herb. Copeland 1925: 11; 2141: 10 — Herb. Drake (leg. Dr. Rein) 3094: 8 — Herb. Filic. Luerssen No. 11145: 1; No. 12999: 8 — E. Hernández 760: 9 — Herzog: 9 — Hill 17719: 9 — Hinton 2808: 9; 6823: 9 — Hochreutiner 944: 10; 1045: 6 — Holbrook 39: 4 — Holm 608: 9 — Holstvoogd 556: 6 — Holtum 20764: 3d; 25491: 10 — Hongkong Herbarium No. 3934: 5; No. 3935: 4; No. 3936: 1 — Hoogland 6977: 6; 7092: 3b; 7504: 3b — Hooker f. & Thomson 99: 4; 101: 10; 164: 1; 195: 6 — Hope 15326b, c: 4 — Hopkins 859: 6; UPNG-13390: 6 — Hose 33: 3c; 283: 3c; 309: 3a — Hosseus 348: 10 — Hou X.Y. 898: 7; 1732: 1; 1734: 4 —



- Howard 9123: 9 — Hu C.M. 1693: 1; 2517: 1; 4179: 7; 4638: 7; 5117: 5; 5563: 1 — Hu S.Y. 885: 2 — M Hutoh 16550: 8.
- M. Inada 3369: 8 — Inst. Bot. Guangxi Exped. 688: 7 — Inst. Bot. Libo Exped. 2305: 4 — Ip N.K. 1830: 4 — R. Ito 383: 4; 1327: 1; 1328: 7; 1383: 4 — Iwatsuki P-590: 1; P-654: 1; P-830: 6; S-1025: 6; S-1067: 3d; 1091: 10; S-1124: 6; S-1154: 3d; 3484: 11; 3655: 8; 4788: 1; T-7208: 1; 5054: 8; 5348: 4.
- Jacobs 4411: 10; 7151: 10; 7256: 6; 8253: 6 — Jeng Y.C. 1936: 11; 2233: 6 — Jermy 4126: 6; 4127: 6; 4128: 6; 5029: 3b; 5030: 3b; 7099: 10; 7249: 6; 7284: 3b; 7286: 6; 7328: 6; 13212: 3c; 14163: 3c; 14309: 3c; 14407: 3c; J-14978: 3c; J-15086: 3c; J-15160: 3c; J-15187: 3c; J-15355: 3c; J-15356: 3c; J-15357: 3c — Jia S.X. 1978: 6 — Jiang Su 4096: 6; 10126: 10; 10417: 6 — Jiangxi Exped. 1312: 4 — O Jimenes 1018: 9 — A Jimenez 3401: 9 — Jinpo Shan Exped. 1840: 7 — Johansson 233: 3b; 301: 10.
- Kalkman 4520: 3b; 5079: 10; 5151: 6 — Kanashiro T. 1962: 1 — Kanehira R. 2667: 4; 2677: 3c; 2885: 6; 2950: 6 — Kao M.T. 3206: 11; 5564: 6; 7571: 6 — Kappelle 457: 9; 1415: 9 — M. Kato 294: 4; 561: 6; 979: 6; 1491: 10; 2133: 10; 2183: 10; C-3502: 6; B-3671: 3c; C-5670: 3c; B-8942: 3c; B-9496: 3c; B-9562: 3c; B-10906: 3c; B-10921: 3c; B-11416: 3c — R. Kato 491: 6 — Kawakami & Mori 1831: 6; 2358: 6 — Kingdon Ward 9333: 6; 21041: 10 — Knobloch 5947: 9 — Ko S.P. 51021: 7 — Koelz 28574: 4; 30685: 4 — Kooper 1709: 6; 1710: 6 — Koorders 32037b: 6 — Körnicke 11682: 6; 11683: 6 — Koyama 40: 4 — Kramer 5976: 10; 7710: 4; 7713: 6 — Kuan C.T. 6553: 10; 7241: 11; 7861: 4; 9226: 1 — Kung H.S. 38: 1; 2500: 4; 2564: 11; 2662: 11; 2786: 1; 3360: 11; 3893: 2; 4037: 4; 4072: 11; 4098: 11; 5241: 1 — Kuntze 6887: 10 — Kuo C.C. 3207: 4 — Kurata 380: 11; 476: 4; 963: 4; 966: 4; 1996: 15149: 11 — Kurz 4415: 10.
- Lai S.S. 3375: 7; 6204: 7 — Lam 1860: 3b — Lau S.K. 27374: 5 — Ledermann 11927: 3b; 11978: 6 — Lellinger 852: 9; 1614: 9; 8959: 9 — Lems 64-90604: 9 — Li B.S. 966: 6; 1271: 6; 1870: 10; 3327: 6; 3511: 10; 4236: 10; 6866: 6 — Li C.T. 600926: 4; 602148: 1 — Li G.F. 64167: 7 — Li H.J. 5028: 4; 7668: 1; 8356: 11 — Li M.K. 1045: 6; A-1052: 10 — Li M.S. 223: 7; 747: 5 — Li X.G. 204075: 4 — Liao C.C. 941: 6 — Liesner 24756: 9 — Linden I. Lin 556: 9; 312: 9 — Lindig 113: 9 — Ling Y. 3171: 1; 3919: 1 — Liou T.N. 17543: 6; 17550: 6; 17597: 6; 21081: 6; 23005: 10 — E. Little (& R.R. Little) 8189: 9; 9184: 9; 9947: 9 — Liu C.T. 10035: 7; 10037: 4 — Liu H.J. 6254: 7; 28: 7 — Liu L.H. 9205: 11; 9468: 4; 15067: 7; 16329: 7 — Liu T.N. 2566: 7; 2961: 7 — Liu T.Y. 29: 1 — Liu Y. & Father 525: 7 — Liu Z.Y. 265: 7; 271: 11; 322: 7; 731: 1; 818: 7; 862: 7; 889: 7; 890: 11; 891: 2; 973: 2; 1110: 1; 1124: 7; 2159: 7; 2161: 4; 2165: 11; 2272: 4; 3799: 7; 4085: 2; 4197: 1; 7157: 11; 9840: 7 — Lobb 274: 10 — Loher A. 934: 1; 952: 6; 953: 10 — Longqishan Exped. 304: 5; 316: 5; 325: 1; 357: 4; 396: 7; 831: 5; 925: 5; 50291: 11 — Lörzing 351: 3d; 6006: 3d; 14940: 3d; 15154: 3d; 16291: 3d — Ludlow 3503: 10; 7262: 10 — Ludlow, Sherriff & Hicks 17012: 10 — Lyonnet 1419: 9; 2025: 9; 3119: 9.
- MacBride 3432: 9; 3830: 9 — Maire 71112: 4 — Makino 29031: 4 — Mangen M-174: 3b; 2264: 3b — Mann 607: 4; 608: 10 — Mao P.I. 3217: 11 — Matsumura 133: 8; 222: 11 — Mathew 104: 5; 200: 8 — Matuda 28140: 9; 30762: 9 — Maximowicz 35: 4; 36: 1; 37: 8 — Maxon 1413: 9; 1439: 9; 9721: 9; 9875: 9; 9910: 9 — Mayebar 5527: 7 — McClure 6468: 7; 6861: 7 — Meebold 6627: 6 — Meijer 1718: 10; 6501: 10 — M. Mejia 585: 9 — R.J. Mejia 3138: 9; 3717: 9 — Merrill 682: 6; 5960: 5; 5961: 4; 5962: 3c; 7501: 10; 7818: 6; 11114: 1 — Mickel 1142: 9; 2435: 9; 3194: 9; 4615: 9; 6779: 9 — Midzumoto 305123: 4 — Miyamoto 89-373: 3d — Mjöberg 7: 3c; 9: 3c — Moge 3947: 3c — Molesworth Allen 2894: 3d; 3272: 6; 4304: 3d — Moran 5432: 6; 5493: 11 — Moritz 400: 9 — Murakami 398: 6 — G. Murata 9831: 7; 17724: 7 — J. Murata 704: 6; 15908: 1 — Murillo 795: 9.
- Nakaike 27: 4; 5548: 7 — NE Yunnan Exped. 166: 2; 601: 11; 722: 2 — Nicolson 3241: 10 — Nie M.X. 3077: 7; 3938: 7; 3987: 1; 4119: 7 — Nitta Aya 15125: 6 — Nootboom 926: 1; 1945: 3c — NW Yunnan Jingshajiang Exped. 4095: 6; 4267: 6; 4320: 6; 63-6613: 6; 63-6717: 6.
- K. Ogata 11149: 3c. — M. Ogata 45: 1; 46: 4; 47: 6; 48: 5; 49: 4; 51: 1 — Ohba 69-712: 4; 66-2455: 11; 67-7188: 1 — Ohwi NSM-317: 8 — Oldham 451: 7; 457: 7.
- E. Palmer 124: 9 — W. Palmer & Bryant 472: 6; 762: 6; 882: 6; 963: 10 — Panigrahi 3335: 4; 4571: 1; 15741: 10 — Parris B.S. 4198: 6; 4199: 6; 4200: 6; 4201: 6; 4202 H133: 3b; 4203: 3b; 4204: 3b; 4205 H250: 3b; 4885: 3b; 5701: 4; 5806: 6; 5858: 3b; 6464: 3c; 8544: 1; 8746: 3c;

- 8747: 10; 8754: 6; 10508: 3d; 11291: 1; 11466: 3c; 11541: 3c; 11565: 3c — Peng T.C. 330: 1 — Pételot 570: 1; 662: 10; 682: 10; 1656: 11; 1968: 10; 3520: 1; 4203: 1; 6441: 11 — Phengklai 1122: 7; 2218: 7 — Piggott 1197: 3d — Pinto 3613: 9; 3639: 9 — Pittier 2970: 9 — Pleyte 77: 6; 317: 6 — PNH series (Alcasid) 1764: 10; (Celestino) 3977: 10; (Sulit) 5068: 10 — Poilane 2032: 1; 3591: 1; 3594: 1; 6928: 1; 10355: 1; 23542: 1 — M.G. Price 1119: 4; 2592: 3c — W.R. Price 105: 6; 202: 3c; 1032: 5 — Pringle 4999: 9; 8958: 9; 15703: 9 — Pulle 630: 3b; 724: 3b; 1017: 10; 10041a: 6.
- Qinghai-Xizang Exped. 73-694: 10; 73-775: 6; 74-3915: 10 — Qiu B.Y. 53443: 10.
- Raap 151: 6; 262: 6 — Richards 1994: 3a; 2122: 3c — Riddell 18: 10; 100: 1 — Ridley 14146: 3d; 15992 bis: 3d — Rivero 1801: 9 — Robinson 134: 10 — Rock 3151: 6; 7068: 10; 7389: 6; 7571: 11; 7572: 4; 7644: 10; 7659: 6; 7699: 11; 11496: 6 — Rose 9598: 9 — Rosenstock; Filic. Boliv. Exp. 50: 9; Filic. Chin. Exp. (Cavalerie) 75: 11; 168: 1; 169: 7; 170: 5; Filic. Jap. Exp. 55: 7; Filic. Sumatr. Exp. (Winkler) 127: 3d — P. van Royen 11005: 3b; 11162: 3b.
- S China Inst. Bot. Huanan Exped. 2080: 4; 2656: 11 — S Guizhou Exped. 3405: 7; 3571: 7; 3602: 1; 3927: 1 — Y. Saiki 582: 5; 583: 6; 1123: 7; 1124: 7; 1491: 8; 1492: 4; 1859: 4; 1937: 11; 2218: 7; 2340: 1; 2640: 11 — SAN (Shim Phyu Soon): 81813: 3c — Sands 2360: 6 — J.S. Santos 5451: 4 — Jose Vera Santos 5565: 6 — Savatier (ex Dr. Rein) 3094: 8; 3742: 7 — Schiffner 9214: 6 — Schlim 312: 9 — Schmutz 3244: 6 — Schodde 1772: 3b; 1910: 6 — Seifriz 1091: 9 — K. Seto 6769: 8 — Shen C.F. 1786: 6 — Shimizu 1491: 10; M-13548: 3d; T-23756: 1 — Shing K.H. 54: 7; 382: 2; 395: 11; 518: 11; 537: 11; 657: 10; 667: 10; 753: 11; 754: 2; 755: 11; 757: 11; 758: 11; 759: 11; 760: 11; 761: 11; 762: 11; 763: 11; 764: 11; 765: 11; 768: 11; 782: 11; 1235: 1; 1677: 1; 1697: 1; 1893: 1; 5284: 4; 5286: 1; 5512: 4 — Shiota K. 1534: 7 — Sichuan Economic Plants Exped. 591: 1 — Sichuan-Guizhou Exped. 557: 1; 1012: 7; 1254: 4; 1292: 1; 1803: 7 — Sin S.S. 185b: 4 — Sinclair 9048: 3c; 9121: 3c — Sino-American Guizhou Bot. Exped. 1595: 7; 1834: 4; 1943: 7; 1975: 4; 2301: 1 — Sino-Amer. Bot. Exped. to Yunnan (1984) 229: 10 — Sino-British Exped. to Cangshan, Yunnan 330: 6 — Sino-Rossica Yunnan Exped. 12: 4; 2064: 1; 2125: 11; 2456: 11; 3501: 4; 3913: 1; 3914: 10 — Sleumer 4328: 3b — van Slooten 466: 6 — C.L. Smith 2063: 9 — E. Smith 1451: 7 — Harry Smith 2087: 10; 13498: 2; 13528: 10 — H.M. Smith 510: 10 — J.M.B. Smith 497: 6; T-16074: 10 — L.B. Smith 10377: 9 — Solomon 18071: 9 — Stainton, Sykes & Williams 6944: 4 — Standley 34895: 9; 42129: 9 — van Steenis 3535: 1; 8617: 10; 10961: 10; 20823: 6 — Steinbach 8489: 9 — Sterly 80-53: 6; 80-91: 6 — Stevens in LAE series 51365: 3b; 55871: 3b; 58423: 3b — A.N. Steward c.s. 439a: 11; 439b: 7; 439c: 4; 754: 7 — Steyermark 36054: 9; 49090: 9; 49927: 9 — Stolze 1454: 9 — Stone 11381: 6; 11388: 3d; 13514: 3d — Stork 146: 9; 2338: 9 — Stresemann 147: 3c — Sun C.L. 975: 2 — Sun Hong-Fan s207: 6; 6733: 3d — Surbeck 328: 3d; 598: 1; 695: 6; 747: 3d; 1195: 3d; 1199: 6 — Suzuki-Tokie ST-11727: 11.
- Tabata 11380: 10 — Tagawa 50: 11; 102: 4; 677: 8; 767: 11; 802: 11; 857: 1; T-1307: 1; 2307: 11; T-2872: 10; 3991: 8; 4278: 7; 4481: 8; 4555: 4; 4764: 4; 5065: 8; 5288: 1; 5560: 7; 6108: 7; 6159: 8; 6345: 8; 6633: 4; 6653: 7; 6769: 8; 6980: 7; 7013: 8; 7384: 1; 7472: 7; 7580: 1; 7793: 11; 7833: 11; 7834: 4; 7902: 4 — Takeda 176: 8; 1325: 7 — Tam 59868: 7; 61580: 1; 62655: 7; 63555: 11 — Tan S.X. 2269: 9 — Tanaka 62: 4; 365: 6; 10428: 6; 303281: 1 — Tang L. 247: 1 — Taquet 3805: 7; 3809: 7; 4489: 7 — Tashiro Z. 411: 11 — Thakur Rup Chand 1892: 10; 2342: 4 — To & Tsang 12099: 1; 12320: 1 — Tolentino HAL-13: 3c — Tonduz 10714: 9 — D. LeRoy Topping 1129: 10; 1131: 6; 1670: 3c; 1701: 3c — Tryon 5945: 9; 6038: 9; 6693: 9 — Tsai H.T. 59949: 6 — Tsai K.L. 514: 7 — Tsang W.T. 20364: 5; 20438: 5; 22649: 5; 22812: 5; 25526: 4; 25529: 4; 25634: 4 — Tschonoski 37a: 8; 37b: 4 — Tsiang H.L. 34786: 2 — Tsiang Y. 4653: 11; 5553: 1; 5895: 4; 7703: 7; 11604: 10 — Tsieng C.P. 30620: 7; 31143: 11; 31671: 4; 31695: 11; 32205: 7; 50309: 1; 51176: 7; 401701: 5 — Tsoong K.K. 392: 5 — Tsoong P.C. 806: 1 — Tsugaru 13644: 8 — Tsui W.H. 17: 10 — Türckheim 3408: 9.
- Ueda B-8627: 3c; B-8942: 3c — University of San Carlos 610: 4 — Upadhyay 1336: 10 — Uribe 208: 9.
- Valkenburg 243: 3b; 540: 3b; 724: 3b — Vandenberg NGF-35036: 3b — Vanoverbergh 3619: 4 — Veldkamp 6535: 3b; 7124: 6; 7508: 6; 7604: 3b; 7615: 6 — Versteeg 1003: 3b; 2416: 3b; 2501: 3b — Vieillard 662 bis: 10; 662 bis: 4 — Vink 17081: 3b; 17216: 6; 17259: 3b; 17378: 3b — de Vogel 8516: 3c — de Voogd 1566: 10 — de Vriese 328: 6; 510 bis: 6.

- W Yunnan Pl. Exped. 11240: 6; 11251: 10 — Wade ANU-7671: 6 — E.H. Walker SIRI 6728: 4; SIRI 6973: 1 — T.G. Walker T-8713: 3b; T-8790: 6; T-8791: 6; T-8820: 6; T-11779: 6; T-11882: 3b — Wallich 23: 4; 167: 4 — Wang C. 35550: 7; 35570: 5; 39304: 7; 40043: 1; 40611: 11; 44073: 7 — Wang C.W. 63681: 6; 66702: 6; 67017: 10; 68718: 6; 82378: 4; 87685: 11 — Wang F. 305: 4 — Wang F.L. 1031: 1 — Wang F.T. 23597a: 11; 23631: 1 — Wang H.C. 1372: 6; 1903: 6 — Wang M.J. 2109: 4 — Wang P.S. 75803: 7; 75964: 2; 75970: 2; 76374: 5; 76489: 5; 76864: 4; 77057: 5; 77058: 4; 77118: 1; 78615: 1 — Wang Y.J. 5343: 7 — Wang Y.M. 4598: 11; 4862: 7; 5582: 7; 6235: 11; 6579: 11 — Wang Z.R. 527: 4; 529: 4; 651: 4; 663: 1; 727: 10; 742: 1 — G. Watt 6150: 10 — M.D. Watt 5: 9 — Weber 6098: 9; 6227: 9 — Webster 12268: 9 — Wei C.F. 207: 4; 236: 1; 309: 1 — Whong K.K. Y.S.-184: 5; Y.S.-185: 7 — Wiakabu in LAE series 73691: 3b; 73722: 3b — Wilbur 20001: 9 — de Wilde & de Wilde-Duyfjes 13060: 3d; 13120: 3d; 13234: 3d; 13255: 6; 16924: 1 — Wilford 874: 7 — Wilson E.H. 2680: 1; 5284: 2; 5285: 6 — Wilson K.A. 623: 9 — H. Winkler 1030: 3c — L. Wray 317: 3d; 3852: 3d — L. Wray & Robinson 5400: 3d — Wu S.F. 320: 11; 321: 11; 561: 7; 625: 11; 1015: 4; 1016: 7; 1017: 1; S-1197: 4; 1369: 1; S-1666: 1; 5338: 1; 6424: 1; 6474: 1; 6589: 5; 6590: 1; 6821: 4; 7030: 1; 7070: 5; 7189: 4; 7217: 7; 7876: 7; 8825: 7; 8917: 4 — Wu S.K. 61-3824: 10; 4114: 10; 4163: 1; 4237: 4; 94240: 10 — Wulingshan Exped. 177: 1; 845: 7; 1032: 1; 1712: 4; 2343: 1; 2698: 4 — Wurdack 1159: 9.
- Xia Q. 140: 10 — Xin J.S. 786: 10 — Xu X.H. 150: 7; 182: 7 — Xu Y.C. 17: 6; 21: 6.
- Yamamoto 263: 1 — Yang G.H. 56047: 1; 57372: 7 — Yao C.W. 4556: 2; 4924: 1 — Yao G.H. 5754: 5; 5759: 7; 5805: 7 — Yao K. 9520: 1 — Yapp 449: 3d — Yates 72: 3d; 2016: 3d; 2680: 6; 2761: 10 — Yi T.P. 75-80: 7; 74-602: 7 — Young 4605: 9 — Yu P.H. 234: 11; 774: 7; 1225: 11; 1227: 2 — Yu S.L. 900430: 1 — Yu T.T. 4045: 2; 4191a: 1; 4191b: 11; 4212: 4; 4227: 11; 18235: 6; 19982: 10; 20070: 10; 20914: 6 — Yue J.S. 1352: 4; 1890: 1; 2527: 7; 3330: 7; 4923: 7; 5435: 5.
- Zhang B.Y. 48: 1 — Zhang Z.S. 400754: 11; 401984: 11 — Zhang Z.Y. 64-22: 10; 64-64: 10 — Zhejiang Econom. Bot. Exped. 25849: 5 — Zhejiang Forestry Coll. J8314 134: 5 — Zheng X.J. 10042: 11; 30132: 11 — Zhou H.C. 12333: 2 — Zhou S. 934: 1; 8061: 1 — Zink 631: 10 — Zogg 4136: 6; 6179: 11; 6236: 11; 10358: 11 — Zollinger 1: 4; 231 z: 6; 232 z: 10; 335 z: 6.

## INDEX

Numbers refer to the species number as used in this revision. Genus names (and their synonyms) have been referred to page number. For synonyms *italics* have been used. The following abbreviations have been used, respectively, for hybrids (*hyb.*), dubious hybrids (*dub. hyb.*), dubious name (*dub.*), and excluded names (*excl.*).

## Acrostichum

- seetacoonense* Roxb. ex Griff. excl. 1  
*serrulatum* Willd. 9  
*triquetrum* Wall. 4

## Blechnum

- egenolfoides* (Baker) C. Chr. 3, 3a  
*faberi* C. Chr. 2  
*fauriei* (H. Christ) Tokubuchi 8  
*papuanum* Brause 6  
*pendulum* Brause 3b  
*stenopterum* Hance 11  
*urbanii* Brause 9

*Lomaria* Blume [p. 414]

- § *Plagiogyria* Hook. [p. 414]  
sect *Plagiogyria* Kunze [p. 414]  
*adnata* Blume 1

*(Lomaria)*

- arguta* Fée 9  
*articulata* F. Muell. 7  
*biserrata* (Mett.) Mert. & Lind ex Hook. 9  
*brooksii* Alderw. 1  
*callosa* Fée 10  
*concinna* Baker 11  
*costaricensis* (Mett.) Baker 9  
*decurrens* Baker 11  
*deflexa* Baker 2  
*egenolfoides* Baker 3, 3a  
*euphlebia* Kunze 4  
var. *serrata* Baker 8  
*euphlebia* auct. 7  
*fauriei* H. Christ 8  
*fialhoi* Fée & Glaz. 9

**(Lomaria)**

- glauca* Blume 6  
 var. *B* Blume 6  
 var. *C* Blume 10  
 var. *concolor* Moritzi 10  
*griffithiana* Hook. 1  
*lucida* C. Presl excl. 2  
*matsumureana* Makino 8  
*matthewii* H. Christ ex C.G. Matthew 5  
*nivea* Zoll. 6  
*pectinata* Liebmann 9  
*pyncophylla* Kunze 10  
 forma *alpina* Racib. 10  
 forma *major* Racib. 10  
*scandens* De Vriese ex Hook. 1, 10  
*semicordata* (C. Presl) Hook. & Baker 9  
*serrata* Moritz ex Mett. 9  
*stenoptera* (Hance) Baker 11  
*triquetra* T. Moore 4  
*Lomaridium* C. Presl [p. 414]  
*semicordatum* C. Presl 9  
*Lomariopsis triquetra* (Wall. ex Mett.)  
 Ettingsh. 4  
*Ofersia triquetra* C. Presl 4  
**Plagiogyria** (Kunze) Mett. [p. 414]  
 group *Paripneumatophorata* Nakai [p. 414]  
 group *Polypneumatophorata* Nakai [p. 414]  
 sect. *Carinatae* Ching ex Lellinger [p. 414]  
 sect. *Euplagiogyrae* Ching [p. 414]  
 sect. *Plagiogyria* Ching [p. 414]  
 sect. *Stenopterae* Ching [p. 414]  
 subsect. *Adnatae* Ching ex Lellinger [p. 414]  
 subsect. *Euphlebiae* Ching ex Lellinger  
 [p. 414]  
 subsect. *Pyncophyllae* Ching ex Lellinger  
 [p. 414]  
*adenopus* T. Moore ex Hook. 10  
*adnata* (Blume) Bedd. 1  
 forma *reducta* C. Chr. 1  
 var. *angustata* Rosenst. 5  
 var. *condensata* H. Christ 1  
 var. *distans* Rosenst. 7  
 var. *reflexa* C. Chr. & Tardieu 1  
 var. *yakushimensis* K. Iwats. 1  
*adnata* auct. 7  
*adnata* × *P. pseudojaponica* Hatus.  
*dub. hyb. 1*  
*aequidentata* E. Fourn. 9  
*angustipinna* Ching 5  
*anisodonta* Copel. 9  
*arguta* Copel. 9  
*argutissima* H. Christ 11  
*assurgens* H. Christ 2  
 var. *concolor* Ching 2

**(Plagiogyria)**

- attenuata* Ching 4  
*auriculifera* Makino 11  
*biserrata* Mett. 9  
*brausei* Nakaike 6  
*caudifolia* Ching 7  
*chekiangensis* P.L. Chiu 5  
*chinensis* Ching 4  
*christii* Copel. 4  
*clemensiae* Copel. 3c  
*coerulescens* Ching 10  
*communis* Ching 10  
*costaricensis* Mett. ex Kuhn 9  
*decrescens* Ching 10  
*denticulata* Copel. 9  
*dentimarginata* J.F. Cheng 5  
*distanta* Jamir & R.R. Rao 6  
*distinctissima* Ching 1  
*dunnii* Copel. 5  
*egenolfioides* (Baker) Copel. 3  
 var. *decrescens* (C. Chr.) X.C. Zhang  
 & Noot. 3b  
 var. *egenolfioides* 3a  
 var. *latipinna* (Copel.) X.C. Zhang  
 & Noot. 3c  
 var. *sumatrana* (Rosenst.) X.C. Zhang  
 & Noot. 3d  
*elongata* R.D. Dixit & A. Das 4  
*euphlebia* (Kunze) Mett. 4  
 var. *grandis* (Copel.) De Vol 4  
 var. *triquetra* (Wall. ex Mett.) Ching 4  
*falcata* Copel. 5  
*fauriei* (H. Christ) Matsumura 8  
*filhoi* (Fée & Glaz.) Lellinger 9  
*formosana* Nakai 6  
 var. *angustata* Nakai 6  
*furunculata* Bir *dub.*  
*gigantea* Ching 10  
*gigantea* auct.  
*glauca* (Blume) Mett. 6  
 subsp. *formosana* (Nakai) Nakaike 6  
 subsp. *glauca* Nakaike 6  
 var. *nana* (Copel.) C. Chr. 6  
 var. *philippinensis* H. Christ 6  
 var. *virescens* C. Chr. 10  
*glaucescens* Ching 6  
 var. *arguta* Ching 6  
 var. *glaucescens* X. Cheng 6  
*grandis* Copel. 4  
*hainanensis* Ching 7  
*hayatana* Makino 5  
*henryi* H. Christ 4, 11  
*integripinna* Ching 4  
*integripinnata* Bonap. 3d

## (Plagiogyria)

- intermedia* Copel. 7  
*japonica* Nakai 7  
 var. *pseudojaponica* (Nakaike) K. Iwats. 7  
*khasiana* Hook. ex Bir 1  
*koidzumii* Tagawa 4  
*lanuginosa* Ching 10  
*latifolia* Copel. 9  
*liankwangensis* Ching 7  
*lineata* Ching 10  
*malayensis* R.D. Dixit & A. Das 3d  
*matsumureana* Makino 8  
*matsumureana* auct. 5, 11  
*maxima* C. Chr. 4  
*maxonii* Copel. 9  
*media* Ching 6  
*meghalayensis* R.D. Dixit & A. Das 1  
*minguingensis* R.D. Dixit & A. Das 10  
*minuta* Copel. 3a  
*nana* Copel. 6  
*nana* Fée ex Salomon *excl.* 3  
 × *neointermedia* Nakaike *hyb.* 1  
*niponica* Mett. ex Salomon *excl.* 4  
*novoguineensis* Alderw. 3b  
*obtusa* Copel. 9  
*ornifolia* Fée ex Salomon *excl.* 5  
*papuana* (Brause) Alston 6  
*papuana* C. Chr. 3b  
*parva* Copel. ex P.H. Hô 1  
*parva* De Vol ex F.S. Liew 1  
*pectinata* (Liebmann) Lellinger 9  
*pendula* (Brause) Chambers ex Nakaike 3b  
*petelotii* Copel. 11  
*pseudojaponica* Nakaike 7  
*pseudojaponica* × *P. yakushimensis*  
 Hatus. *dub. hyb.* 2  
*pyncnophylla* (Kunze) Mett. 10  
 var. *integra* Copel. 3c  
 subvar. *stenophylla* Bonap. 3c  
 var. *mixta* Copel. 10  
 var. *remota* H. Christ 10  
*rankanensis* Hayata 1  
 var. *yakushimensis* Nakaike 1  
*rotundipinnata* Bonap. 3c  
*scandens* Mett. 10

## (Plagiogyria)

- scandens* auct. 4  
*semicordata* (C. Presl) H. Christ  
 subsp. *matsumureana* (Makino)  
 Nakaike 8  
 subsp. *semicordata* Nakaike 9  
*serrulata* Lellinger 9  
 × *sessifolia* Nakaike *hyb.* 2  
*simulans* Ching 10  
*stenoptera* (Hance) Diels 11  
 var. *major* Ching 11  
*stenoptera* auct. 5  
*subadnata* Ching 1  
*subrigida* Alderw. 3d  
*sumatrana* Rosenst. 3d  
*tahanensis* Miyamoto & H. Ohba 3d  
*taliensis* Ching 10  
*tenuifolia* Copel. 5  
*tetraptera* W.M. Chu & J.J. He 10  
*triangularis* Hayata ex De Vol 1  
*triquetra* Wall. ex Mett. 4  
*truncata* Mickel & Beitel 9  
*tuberculata* Copel. 3c  
 var. *decreescens* C. Chr. 3b, 10  
 var. *gracilis* Copel. 3c  
 var. *latipinna* Copel. 3c  
*tuberculata* auct. 3b, 3d  
*urbanii* (Brause) Copel. 9  
*virescens* Ching 10  
 × *wakabae* Nakaike *hyb.* 3  
*wilhelmensis* Nakaike 10  
*wulingshanensis* C.M. Zhang & S.F. Wu 1  
*yakumonticola* Nakaike 1  
*yakushimensis* Satô 1  
*yunnanensis* Ching 1  
*Polybotrya plumieri* T. Moore 9  
*Polygramma* C. Presl [p. 414]  
*Spicanta deflexa* Kuntze 2  
*Stenochlaena* C. Presl [p. 414]  
*pyncnophylla* (Kunze) C. Presl 10  
*henryi* H. Christ 4  
*triquetra* J. Sm. 4  
*Struthiopteris brooksii* Ching 1  
*papuana* (Brause) Ching 6  
*pendula* (Brause) Ching 3b