

# Cytogenetics and Taxonomy of the Genus *Globba* L. (Zingiberaceae) in Malaya

## IV Distribution in Relation to Polyploidy

by

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### Abstract

Of the twelve species, five subspecies and eight varieties of *Globba* in Malaya, some are exclusively allotetraploid ( $2n = 32$ , AABB), some exclusively hexaploid ( $2n = 48$ , AAABBB), one decaploid ( $2n = 80$ ) and some with both allotetraploid as well as hexaploid chromosome races. *Globba* species with only  $2n = 32$  occur in lowland forests and at moderate elevations, while those with only  $2n = 48$  generally in montane forests. Both are of rather restricted and localised distribution when compared to taxa with  $2n = 32, 48$ . In the latter, the hexaploid infraspecific taxa are usually but not strictly montane in distribution. Where both the tetraploid and hexaploid taxa are montane in distribution, the hexaploids are of greater abundance. The reverse is true where tetraploid taxa occur in lowland forests and hexaploid in montane regions. *Globba* species in Malaya thrive in moist, partially shaded niches. An exception is *G. marantina* L. which colonises open habitats and has a wide distribution from India and Philippines to the Solomon Islands.

The genus *Globba* L. (Zingiberaceae) is confined in distribution to the eastern Himalayas and southern China southwards to Malaysia and the Solomon Islands (Holtum 1950, Pendleton 1949). Of the 128 species recorded (in Index Kewensis, compiled up to 1966), twelve species, five subspecies and eight varieties occur in Malaya. These include eight new taxa which are described in Lim (1972 a). Of these Malayan taxa, three species, two subspecies and five varieties are exclusively allotetraploid ( $2n = 32$ , AABB), three species and a subspecies exclusively hexaploid ( $2n = 48$ , AAABBB), one species decaploid ( $2n = 80$ ) and three species and a subspecies with both allotetraploid as well as hexaploid chromosome races. (see Table 1; Lim 1972 b). This paper presents the results of distributional studies of these Malayan taxa with special reference to their chromosome numbers.

### Materials and Method

Sources of information for distribution mapping were the 363 herbarium specimens on loan from the Botanic Gardens, Singapore, and personal field collection data. Cases in which identification was doubtful and handwritten data dubious were rejected.

In the mapping of each taxon, a distinction was made between herbarium and field collections. Herbarium collections are represented by solid circles, semi-circles and squares and field collections by outlined symbols. A single dot represents one to three collections from the same station, an enlarged symbol four or more. A large number of collections need not necessarily

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represent increased density of occurrence of the taxon, as it might well represent over-collection. Absence of dots might merely mean under-collecting. With the available information, the maps (figs. 1, 2 and 3) represent what is known of *Globba* distribution in Malaya to date.

No attempt was made to distinguish between the polyploids in the herbarium specimens. Taxa with  $2n = 48$  were distinguished from those with  $2n = 32$  in the mapping of field collections.

Root tips as well as pollen mother cells were investigated for chromosome counts. Details are as described in Lim 1972 b.

Information on the sources and chromosome numbers of fresh specimens are in Table 2 on p. 124 Herbarium specimens of these are deposited in the Herbarium, Botany Division, School of Biological Science, University of Malaya, Kuala Lumpur.

**Table 1. Intraspecific polyploidy in the Malayan species of *Globba*.**

Species with single level of ploidy	Species with $2n = 32, 48$	
(a) <i>Species with <math>2n = 32</math></i>	<i>2n = 32</i>	<i>2n = 48</i>
1 <i>G. fragilis</i> Lim	1 <i>G. pendula</i> Roxb.	<i>G. pendula</i> Roxb.
2 <i>G. albiflora</i> Ridl.	<i>G. pendula</i> var.	—
<i>G. albiflora</i> var.	<i>elegans</i> (Ridl.)	
<i>aurea</i> Holtt.	Holtt.	
3 <i>G. leucantha</i> var.	<i>G. pendula</i> spp.	—
<i>peninsularis</i> Holtt.	<i>montana</i> (Ridl.)	
4 <i>G. unifolia</i> Ridl.	Lim.	
(b) <i>Species with <math>2n = 48</math></i>	2 <i>G. patens</i> Miq.	<i>G. patens</i> Miq.
1 <i>G. curtisii</i> Holtt.	<i>G. patens</i> var.	—
2 <i>G. holttumii</i> Lim	<i>costulata</i>	
<i>G. holttumii</i> ssp.	Lim	
<i>aurea</i> Lim	3 <i>G. cernua</i> Bak.	<i>G. cernua</i> Bak.
(c) <i>Species with <math>2n = 80</math></i>	<i>G. cernua</i> ssp.	<i>G. cernua</i> ssp.
1 <i>G. marantina</i> L.	<i>crocea</i> Lim	<i>crocea</i> Lim
	<i>G. cernua</i> ssp.	—
	<i>porphyria</i> Lim	
(d) <i>Species with unknown chromosome number</i>	4 —	<i>G. variabilis</i> Ridl.
1 <i>G. fasciata</i> Ridl.	<i>G. variabilis</i>	—
	ssp. <i>pusilla</i>	
	Lim	

## Distribution

The distribution of *Globba* species with two anther appendages is recorded in figure 1 while that of *Globba* species with four anther appendages is recorded in figures 2 and 3.

*Globba* species with only  $2n = 32$  or  $2n = 48$  show a rather restricted distribution compared to those with  $2n = 32, 48$ .

*G. fragilis* Lim ( $2n = 32$ ) appears to be confined to Pulau Langkawi, Kedah (see fig. 3), *G. albiflora* Ridl. to Penang, *G. albiflora* var. *aurea* Holtt. to Gua Lambok and Sungei Betis in Kelantan, and *G. unifolia* Ridl. with its subspecific taxon to Trengganu and Kelantan. *G. unifolia* also occurs in Thailand. Trengganu might be its southern limit of distribution. *G. fasciata* Ridl. of unknown chromosome number, also has a very restricted distribution (see fig. 1).

*G. curtisii* Holtt. ( $2n = 48$ ) has so far been found only in a restricted part of the Main Range, between Bukit Kutu, the Gap and Fraser's Hill (see fig. 3). Further investigation might show that its distribution extends to other parts of the Main Range. *G. holttumii* Lim grows in large clumps in restricted localities in the Gombak Forest Reserve, Selangor (c.2500'), Genting Simpah, Selangor (2700'), Genting Highlands, Selangor (c.4000') and Fraser's Hill, Pahang (c.4000'). Both *G. curtisii* and *G. holttumii* are markedly montane in their distribution. *G. holttumii* ssp. *aurea* Lim, however, was collected from lowland Dryobalanops Forest, Lenggong Forest Reserve, Johore (c.300').

Four of the twelve species of *Globba* in Malaya show  $2n = 32$  and 48 and these are relatively widespread in distribution.

*G. pendula* Roxb., "the commonest *Globba* in Malaya, occurring in all parts of the country." (Holttum, 1950) was collected from all along the west coast of Malaya from Pulau Langkawi in the North to Singapore in the South (see fig. 1). Distribution seems densest in Perak, Selangor, Negri Sembilan and Malacca. On the eastern side of the Main Range, collections are from the interior of Pahang and from Kelantan. None of the 118 herbarium collections came from Trengganu and coastal Pahang. One single collection came from Pulau Tioman, off the Pahang coast. The species has a predominantly lowland distribution. Field specimens with  $2n = 48$  are from Fraser's Hill, Pahang (c.4000'). Chromosome races of  $2n = 32$  occur alongside those with  $2n = 48$  by the waterfall, near the old dairy farm on Fraser's Hill. Field collections of specimens solely with  $2n = 32$  were made along the west coast from the foot of Gunong Jerai, Kedah to around Kuala Lumpur. The chromosome race with  $2n = 48$  appears to be confined to montane areas. Where *G. pendula* Roxb. occurs, plants are found in abundance. This is also true of the subspecific taxa: *G. pendula* var. *elegans* (Ridl.) Holtt. in the Fraser's Hill region of Pahang and *G. pendula* ssp. *montana* (Ridl.) Lim in Penang. Outside Malaya, the species extends to India, Sumatra, and the Banka Islands.

Common on the west coast from Penang to Malacca, in both lowland and montane forest is *G. patens* Miq. ( $2n = 32, 48$ ) a species hitherto misidentified as *G. aurantiaca* Miq. see Lim (1972 a). Chromosome races with  $2n = 32$  seem confined to lowland forest up to c.2000', while those with  $2n = 48$  are from Fraser's Hill, Pahang (c.4000'), Bujang Melaka, Perak (c.2200'), Genting Highlands, Pahang (c.4000') and Bukit Lagong Forest Reserve, Selangor (c.200-800'). Excepting the last, *G. patens* with  $2n = 48$  appears mainly montane in distribution. Single herbarium collections have been made from Johore and Kelantan. A field collection of a narrow-leaved and nearly glabrous form was made from Lenggong Forest Reserve, Johore (c.200'). This appears similar to the form collected from Ulu Kahang (Holttum, S.F.N., 10927), and has  $2n = 32$ .

At Fraser's Hill, Pahang (c.4000'), Cameron Highlands, Pahang (c.4750'), and Sungei Lallang Forest Reserve, Selangor (c.250'), *G. patens* var. *costulata* Lim was found. It resembles the specimens from Bukit Kutu in Selangor by Ridley (mentioned in Holttum, 1950, p.37). This variety ( $2n = 32$ ) apparently occurs in both lowland and montane forests.

Overlapping in distribution with *G. patens* Miq. is *G. cernua* Bak, which also consists of chromosomal races with  $2n = 32$  and  $2n = 48$ . *Globba cernua* Bak., however, is confined to montane forests between 2000' and 5000', within the region between Temangor, Perak and Gunong Angsi, Negri Sembilan. South

of this, one single collection was made from Singapore. Both chromosomal races occur in abundance in Fraser's Hill, Pahang and Maxwell's Hill, Perak. More common are plants with  $2n = 48$  than those with  $2n = 32$ . On Maxwell's Hill, the two chromosomal races occur together in mixed stands. In Cameron Highlands, only plants with  $2n = 48$  have so far been found. At Reid's Third Quartz Ridge, 12th mi, Gombak Road, Selangor all plants collected had  $2n = 32$  chromosomes. Fruiting specimens in the herbarium collections from Larut Hills and Maxwell's Hill in Perak, and Gunong Angsi in Negri Sembilan suggest that plants with  $2n = 32$  are also present.

Two new subspecific taxa, *G. cernua* ssp. *crocea* Lim ( $2n = 32, 48$ ) and *G. cernua* ssp. *porphyria* Lim ( $2n = 32$ ), were collected from Jenka Forest Reserve, Pahang (lowland Dipterocarp forest, c.200') and Bujang Melaka, Perak (c.1370') respectively. The two chromosomal races of *G. cernua* ssp. *crocea* were found side by side in Jenka Forest Reserve. Abundant occurrence along the jungle path from Kuala Tahan to Kuala Trengganu in the National Park in Pahang is reported by G. Smith in 1968 (personal communication).

*G. variabilis* Ridl. ( $2n = 48$ ), shows a rather widespread distribution from Gunong Korbu (Perak) on the western side of the Main Range and Kuala Klah (Kelantan) on the eastern side of the Main Range to Singapore (see fig. 3). It occurs mainly in lowland forest but also in montane areas. All living specimens collected from four main localities: Fraser's Hill, Pahang (c.4000'), Ulu Gombak Forest Reserve, Selangor (c.2500'), Sungei Lallang Forest Reserve, Selangor (c.250') and Bukit Timah Nature Reserve, Singapore (c.500') had somatic chromosome numbers of 48.

The relatively high occurrence of fruiting materials in 9.8 per cent of the 121 herbarium sheets in the Singapore Botanic Garden collection seems to suggest the possibility of the existence of a chromosome race with  $2n = 32$ . The possibility of these having  $2n = 48$ , however, could not be completely ruled out.

A new subspecies, *G. variabilis* ssp. *pusilla* Lim ( $2n = 32$ ) was collected from Gunong Pantii (1500'), Sungei Kayu and Sungei Sedili in Johore. So far, the distribution appears limited to the southern tip of the Malay Peninsula.

An apparent exception to the general finding (that species with  $2n = 32$  show a rather restricted distribution compared to those with  $2n = 32$  and 48) is *G. leucantha* Miq. Brief cytological investigations of *G. leucantha* var. *peninsularis* Holtt. from two localities in southern Johore disclosed somatic numbers of 32. *Globba leucantha* shows a widespread but discontinuous distribution in the north and extreme south of Malaya (see fig. 1). The relative paucity of both herbarium and field collections may be related to the seasonal dormancy of the species. *Globba leucantha* var. *peninsularis* occurs in southern Johore and Singapore, reportedly "common in forest" (Holttum 1950). A few collections were from southern Trengganu, northern Pahang and Perak and two field collections were from Gunong Pantii, Johore and Bukit Timah Nature Reserve, Singapore. *G. leucantha* var. *bicolor* Holtt. appears to be confined to the eastern part of the Main Range, in northern Pahang, southern Kelantan and Trengganu. *G. leucantha* var. *violacea* (Ridl.) Holtt. has been collected from Perak; and *G. leucantha* var. *flavidula* (Ridl.) Holtt. from Gunong Pantii, Johore (100'). Although a direct cytological investigation of *G. leucantha* var. *bicolor* and var. *violacea* has not been conducted, the rather high incidence of fruiting materials in the two varieties seems to suggest that they have somatic numbers of 32.

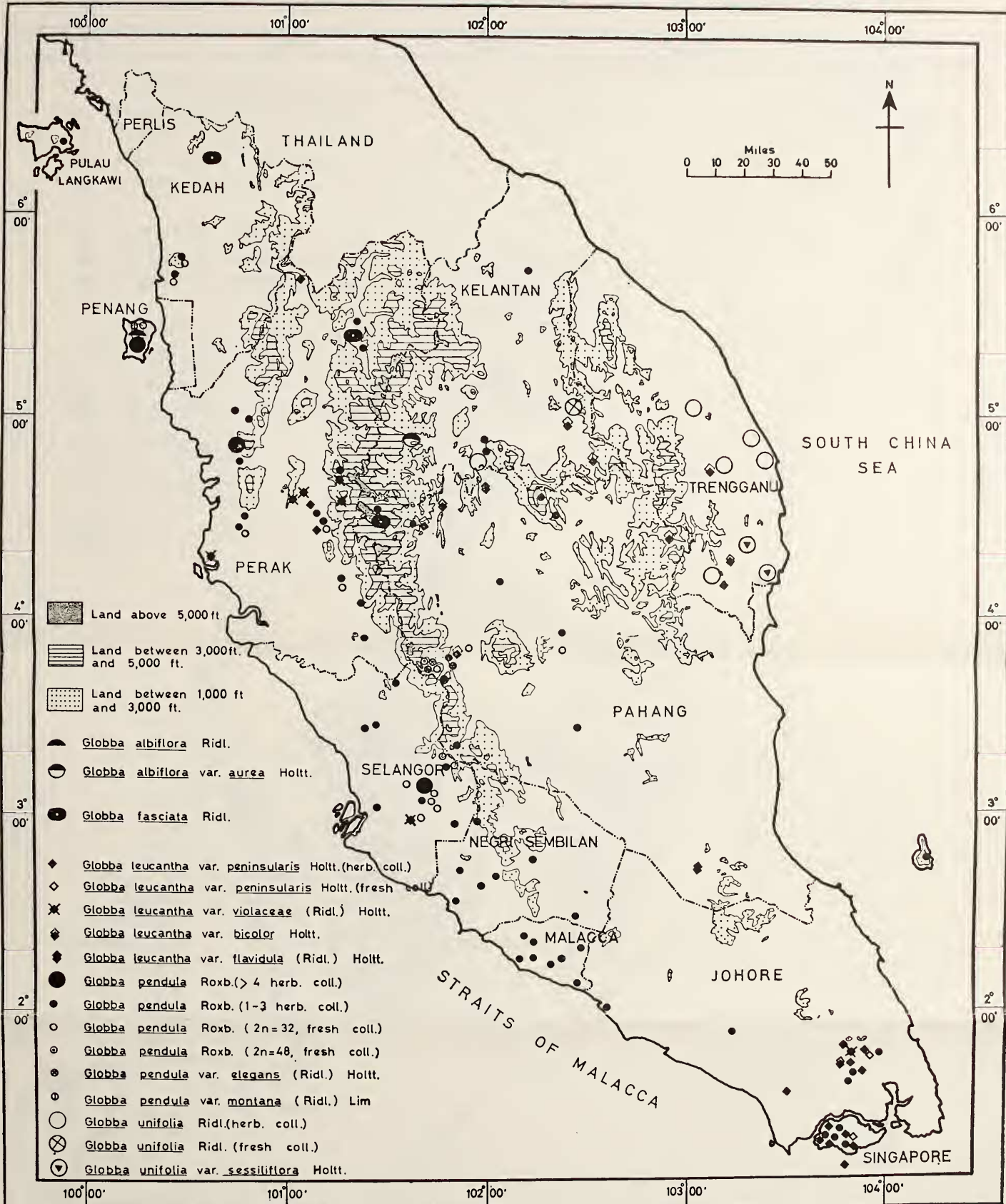


Fig. 1 Distribution map of *Globba* species with two anther appendages in Malaya.

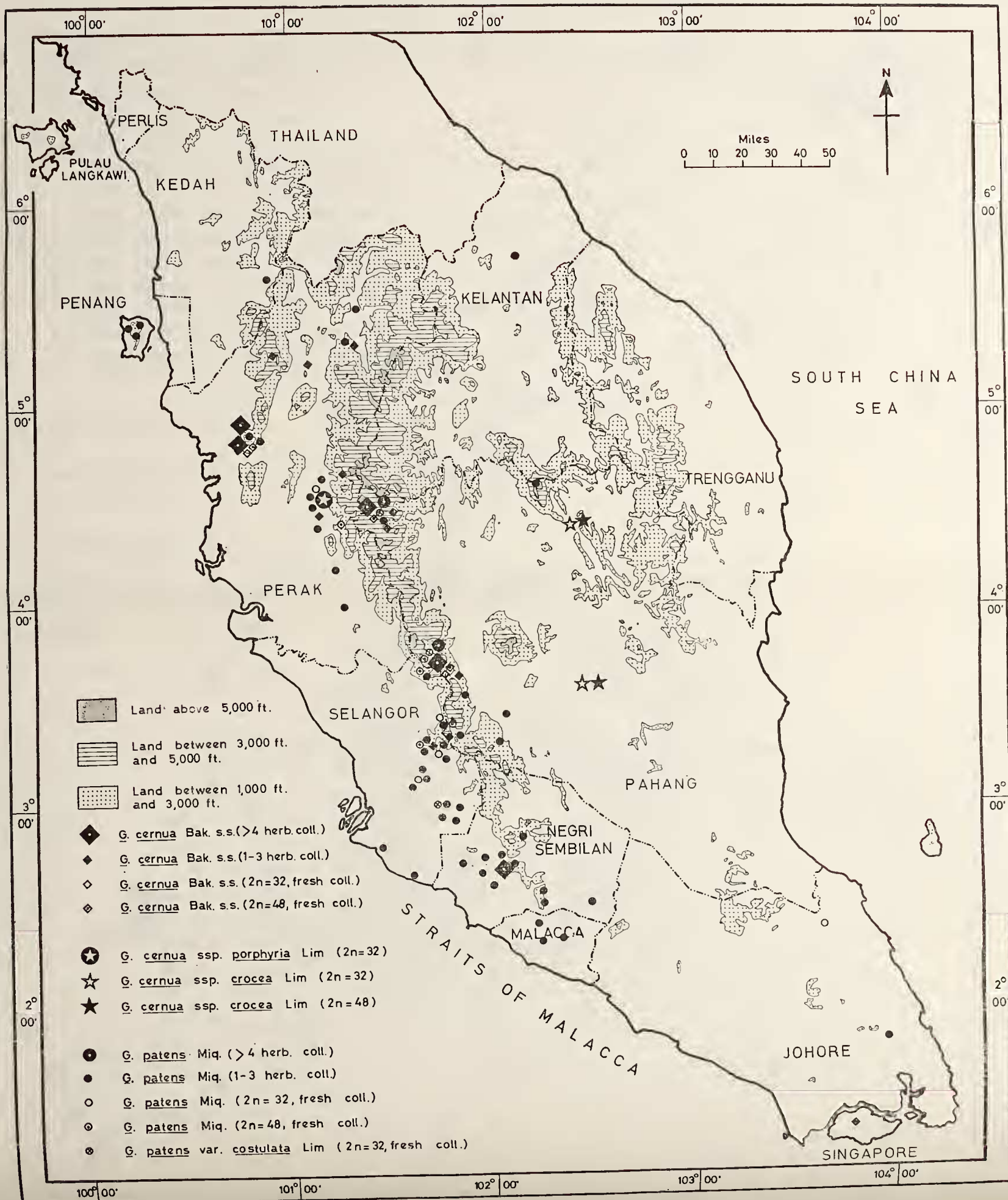


Fig. 2 Distribution map of *Globba* species with four anther appendages (*G. cernua* Bak. and *G. patens* Miq.) in Malaya.

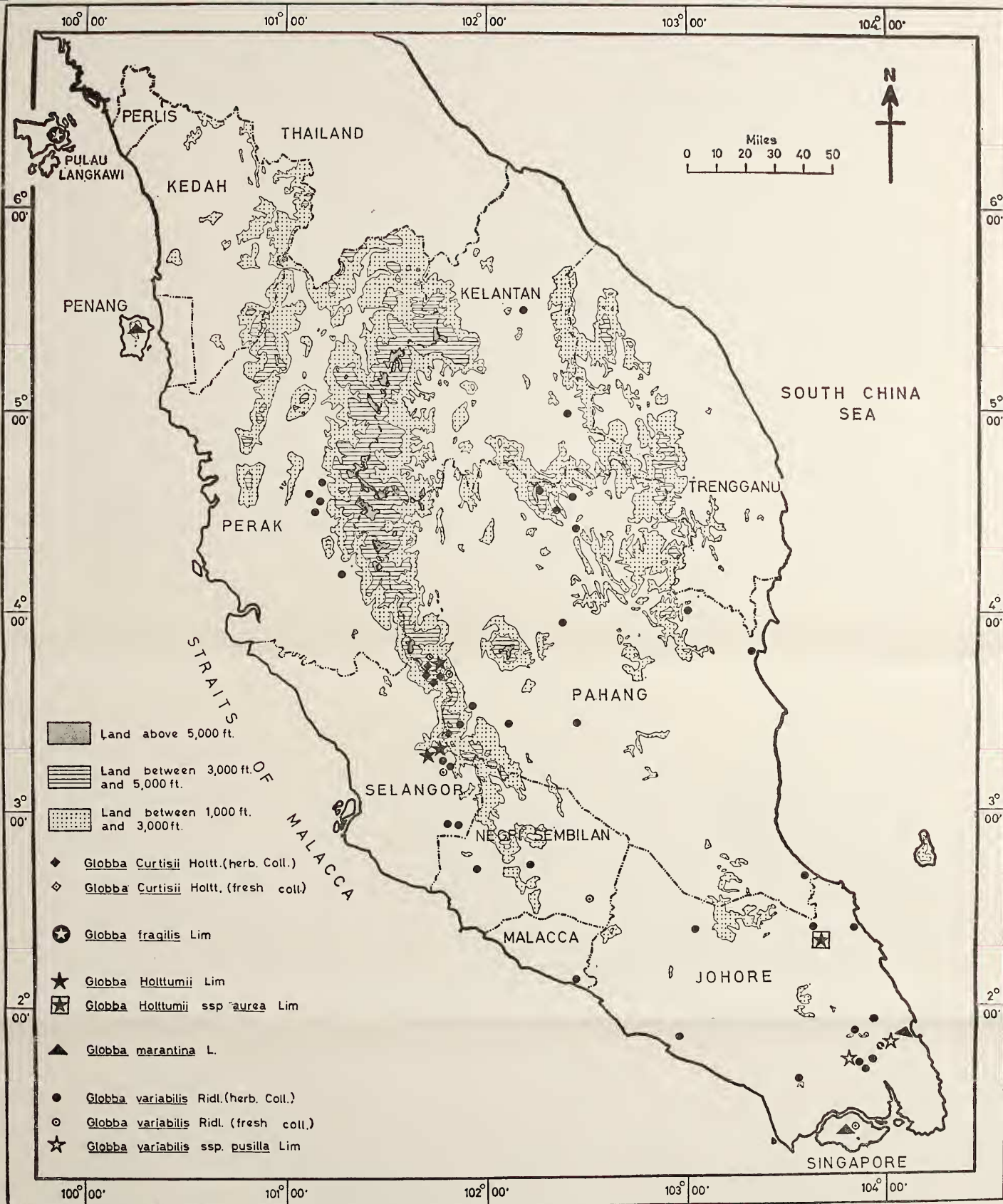


Fig. 3 Distribution map of *Globba* species with four anther appendages (*G. curtisii*, Holtt., *G. fragilis* Lim, *G. holttumii* Lim, *G. marantina* L. and *G. variabilis* Ridl.) in Malaya.





A comparison of the distribution of *Globba* species with only  $2n = 32$  and those with only  $2n = 48$  shows that, with the exception of *G. leucantha*, both are rather restricted and localised in occurrence. Species with  $2n = 32$  have been found on lowland forests and at moderate elevations, while species with  $2n = 48$  usually occur in montane forests. The exception was *G. holttumii* ssp. *aurea* ( $2n = 48$ ) found so far in lowland Dryobalanops forests in north-eastern Johore.

*G. marantina* L. ( $2n = 80$ ) was found in Ayer Itam, Penang and Jason Bay, Johore. Living materials for investigation were collected from the waterfall Botanic Garden, Penang. The paucity of collections may be attributable to its seasonal dormancy for about four months annually when it is nowhere to be seen. *G. marantina* is apparently localised in distribution in Malaya, but has a very widespread distribution in the Indo-Malaysian region — from India (*G. strobilifera* Zoll. & Mor. = *G. marantina* L., *G. bulbifera* Roxb. = *G. marantina* L., fide Index Kewensis, 1895, herbarium sheet examination of *G. bulbifera* Roxb. in comparison to living specimens of *G. marantina* L.) to Sumatra (*G. bracteata* Heyne = *G. marantina* L., fide Index Kewensis, 1895) to the Philippines, New Guinea, the Moluccas Islands and the Solomon Islands where *G. marantina* is the only species of the genus. Pendleton (1949) surmised that since the Pulau Islands, west of Solomons, were very similar to the Solomons, *G. marantina* might be there too. The ecological success of *G. marantina* may be attributed to its propagation by rhizome and bulbils, both being very resistant to adverse conditions, and its ability to colonise efficiently open habitats where competition for survival would be less keen. The other Malayan *Globba* species thrive well only in moist, partially shaded niches.

A study of intraspecific distribution in the four *Globba* species with  $2n = 32, 48$  shows that the subspecific taxa with  $2n = 48$  are generally but not strictly montane in distribution. Almost all the chromosomal races with  $2n = 32$  in *G. pendula* Roxb. s.s. are lowland in distribution, the one with  $2n = 48$  is solely montane. Those of *G. patens* Miq. s.s. show a similar distributional distinction, with the exception of the single collection of specimens with  $2n = 48$  from Bukit Lagong Forest Reserve, Selangor (c.200–800'). Both the chromosomal races of *G. cernua* Bak. s.s. are restricted to the highlands; but those of *G. cernua* ssp. *crocea* are found in lowland forests. In contrast, *G. variabilis* Ridl. s.s. ( $2n = 48$ ) occurs both in the lowlands as well as in montane area, though predominantly in the latter. The subspecies *pusilla* has been collected from localities of moderate elevation.

The ecological spread of chromosomal races with  $2n = 32$  of *G. pendula* Roxb. s.s. and *G. patens* Miq. s.s. was found to be more extensive than that of chromosomal races with  $2n = 48$ . In *G. cernua* Bak. s.s., where the two chromosomal races occur together in montane areas, plants with  $2n = 48$  are more abundant than plants with  $2n = 32$ .

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**Table 2. Source and Chromosome Numbers of Living Specimens of Malayan *Globba* Species.**

<i>G. marantina</i> L.:	PENANG, Waterfall Gardens, lowland, LIM Siew-Ngo, KLU 4831, $2n = 80$ .
<i>G. cernua</i> Bak.	PAHANG, Western Hill, Fraser's Hill, 4000', LIM Siew-Ngo, KLU 4844, $2n = 32$ .
	———, <i>idem</i> , KLU 4843, $2n = 48$ .
	———, <i>idem</i> , KLU 4832, $2n = 48$ .
	———, Bukit Peninjau, Fraser's Hill, 4000', LIM Siew-Ngo, KLU 8205, $2n = 32$ .
	———, <i>idem</i> , M.E.D. POORE, KLU 4796, $2n = 48$ .
	———, Parit Falls, Cameron Highlands, 4700', LIM Siew-Ngo, KLU 8233, $2n = 48$ .
	———, Robinson Falls, Cameron Highlands, 4400', LIM Siew-Ngo, KLU 8235, $2n = 48$ .
	———, Gunong Jasar, Cameron Highlands, 4500', LIM Siew-Ngo, KLU 8222, $2n = 48$ .
	———, <i>idem</i> , *, $2n = 48$ .
	PERAK, Maxwell's Hill, 3750', LIM Siew-Ngo, KLU 4833, $2n = 32$ .
	———, <i>idem</i> , KLU 4834, $2n = 48$ .
	SELANGOR, Reid's 3rd quartz ridge, Gombak, 12th mi., 1800', A. LETHBRIDGE, KLU 8228, $2n = 32$ .
<i>G. cernua</i> ssp. <i>crocea</i> Lim	PAHANG, Jenka Forest Reserve, 200', M.E.D. POORE, KLU 4791, $2n = 32$ .
	———, <i>idem</i> , I. CLEAR & C. C. HO, KLU 4817, $2n = 48$ .
<i>G. cernua</i> ssp. <i>prophyria</i> Lim	PERAK, Bujang Melaka, 1370', K. JONG, KLU 8240, $2n = 32$ .
<i>G. unifolia</i> var. <i>sessiliflora</i> Holtt.	KELANTAN, Sungei Lebir, 300', B. C. STONE, KLU 7367, $2n = 32$ .
<i>G. fragilis</i> Lim	KEDAH, Pulau Langkawi, lowland, K. C. CHEANG, KLU 4847, $2n = 32$ .
<i>G. curtisii</i> Holtt.	PAHANG, Waterfall by old dairy farm, Fraser's Hill, 4000', K. JONG, KLU 4793, $2n = 48$ .

- G. holttumii* Lim ———, idem, KLU 4822,  $2n = 48$ .  
 SELANGOR, Gombak Forest Reserve, 2500', LIM Siew-Ngo, \*,  $2n = 48$ .  
 ———, Genting Simpah, 2700', K. JONG, \*,  $2n = 48$ .  
 ———, Genting Highlands, 4000', LIM Siew-Ngo, \*,  $2n = 48$ .
- G. holttumii* ssp. *aurea* Lim JOHORE, Lenggor Forest Reserve, 300', P. C. LEE, KLU 8206,  $2n = 48$ .
- G. × intermedia* =  
*G. patens* ×  
*cernua* Lim PAHANG, Parit Falls, Cameron Highlands, 4700', LIM Siew-Ngo, KLU 4840,  $2n = 48$ .  
 ———, Robinson Falls, Cameron Highlands, 4400', LIM Siew-Ngo, KLU 4841,  $2n = 48$ .  
 ———, Gunong Jasar, Cameron Highlands, 4800', LIM Siew-Ngo, KLU 4842,  $2n = 48$ .  
 ———, idem, KLU 4848,  $2n = 48$ .
- G. patens* Miq. SELANGOR, Gombak 22nd mi., 1500', LIM Siew-Ngo, KLU 8211,  $2n = 32$ .  
 ———, Genting Simpah, 1800', LIM Siew-Ngo, KLU 8219,  $2n = 32$ .  
 ———, *Kanching Dryobalanops* Forest Reserve, lowland, Honours students, KLU 4827,  $2n = 32$ .  
 ———, Ulu Langat Forest Reserve, 700', T. WHITMORE, \*,  $2n = 32$ .  
 ———, Gombak Forest Reserve, (12th mi.), 1500', A. LETHBRIDGE, KLU 4849,  $2n = 32$ .  
 JOHORE, Lenggor Forest Reserve, 200', P. C. Lee, \*,  $2n = 32$ .  
 PAHANG, by Golf Course, Fraser's Hill, 4000', K. C. CHEANG, KLU 8232,  $2n = 48$ .  
 ———, Genting Highlands, 4000', B. C. STONE, KLU 6588,  $2n = 48$ .  
 PERAK, Bujang Melaka, 2200', K. JONG, \*,  $2n = 48$ .  
 SELANGOR, Bukit Lagong Forest Reserve, 200–800', M. E. D. POORE, \*,  $2n = 48$ .
- G. patens* var. *costulata* Lim PAHANG, Waterfall by old dairy farm, Fraser's Hill, 4000', A. LETHBRIDGE, KLU 8209,  $2n = 32$ .  
 ———, Cameron Highlands, 4750', W. L. CHEW, KLU 8231,  $2n = 32$ .  
 SELANGOR, Sungei Lallang Forest Reserve, Kajang, 250', J. DRANSFIELD, \*,  $2n = 32$ .
- G. variabilis* Ridl. SELANGOR, Gombak Forest Reserve (12th mi.), 1500', LIM Siew-Ngo, KLU 8208,  $2n = 48$ .  
 ———, Sungei Lallang Forest Reserve, Kajang, 200', J. DRANSFIELD, \*,  $2n = 48$ .  
 PAHANG, Fraser's Hill, 4000', LIM Siew-Ngo, \*,  $2n = 48$ .  
 SINGAPORE, Bukit Timah Nature Reserve, 500', LIM Siew-Ngo, \*,  $2n = 48$ .
- G. variabilis* ssp. *pusilla* Lim JOHORE, Gunong Panti, 1500', W. L. CHEW, KLU 8246,  $2n = 32$ .

- G. albiflora* Ridl. PENANG, Penang Hill, 1300', LIM Siew-Ngo, KLU 8221, 2n = 32.
- G. pendula* Roxb. SELANGOR, University Campus, Kuala Lumpur, lowland, LIM Siew-Ngo, KLU 4799, 2n = 32.  
 ———, Kanching *Dryobalanops* Forest Reserve, lowland, Honours students, KLU 4813, 2n = 32.  
 ———, Genting Simpah, 1800', K. Jong, KLU 8213, 2n = 32.  
 ———, Ayer Hitam Forest Reserve, 350', P. C. LEE, KLU 8201, 2n = 32.  
 PERAK, Ulu Kinta, off Ipoh, lowland, P. C. LEE, \*, 2n = 32.  
 PENANG, Waterfall Gardens, lowland, LIM Siew-Ngo, KLU 8216, 2n = 32.  
 KEDAH, Foot of Gunong Jerai, lowland, LIM Siew-Ngo, KLU 8225, 2n = 32.  
 ———, Jungle south of Gunong Jerai, lowland, LIM Siew-Ngo, KLU 8226, 2n = 32.  
 PAHANG, Waterfall by old dairy farm, Fraser's Hill, 4000', LIM Siew-Ngo, KLU 8203, 2n = 48.  
 ———, *idem* KLU 4836, 2n = 48.
- G. pendula* var. *elegans* (Ridl.) Holtt. PAHANG, *idem*, LIM Siew Ngo, KLU 4830, 2n = 32.
- G. pendula* ssp. *montana* (Ridl.) Lim PENANG, Penang Hill, 1200', LIM Siew-Ngo, KLU 8219, 2n = 32.  
 ———, Waterfall Gardens, lowland, LIM Siew-Ngo, KLU 8216, 2n = 32.  
 ———, Ayer Itam Dam, 1090', LIM Siew-Ngo, KLU 8229, 2n = 32.
- G. leucantha* var. *peninsularis* Holtt. JOHORE, Gunong Panti, 1500', J. SINCLAIR, KLU 8200, 2n = 32.  
 SINGAPORE, Bukit Timah Nature Reserve, 500', LIM Siew-Ngo, KLU 4839, 2n = 32.
- Bukit = Hill  
 Gunong = Mountain  
 Sungei = River  
 Pulau = Island  
 \* = *Sine specimen exsiccatum*

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