

BIGNONIACEAE OF MAINLAND SOUTH-EAST ASIA

*Thawatchai Santisuk**

ABSTRACT

The complete enumeration of 14 genera and 36 species of the family Bignoniaceae of mainland South-East Asia is given, with identification keys to genera and species. The geographical distribution and ecology of the bignonaceous genera and species concerned are briefly discussed, and distribution maps of the members of the family are provided.

INTRODUCTION

The term "mainland South-East Asia" in this work implies Burma, Thailand, Cambodia, Laos, Vietnam, and peninsular Malaysia (Fig.1). These countries, except for Malaysia, share a common floristic component, particularly of the family Bignoniaceae.

Following the up-to-date taxonomic revisions of Bignoniaceae for the Flore du Cambodge, du Laos et du Viêt-Nam (Santisuk & Vidal, 1985), the Flora of Thailand (Santisuk, *in press*), and the Flora Malesiana (Steenis, 1977), it is felt that all the scattered information on Bignoniaceae indigenous to the mainland SE. Asia should be brought into conformity. In addition to these floras, other useful taxonomic accounts, conspectus, and enumerations of certain groups of the Asian Bignoniaceae were freely consulted, including Chatterjee (1948), Santisuk (1974, 1985) and Steenis (1976). Hence, the keys to genera and species of Bignoniaceae in the mainland SE. Asia have been combined. The reconstructed keys, though artificial, are informative and explanatory. In addition, the geographical distribution and ecology of Bignoniaceae are briefly summarized. The distributional ranges of certain bignonaceous plants have also been mapped (Figs. 2-17).

DISTRIBUTION

The family Bignoniaceae comprises about 120 genera and some 650 species, mostly tropical and subtropical, with a few genera in the warm temperate regions (e.g. *Catalpa*) and subtropical alpine (*Incarvillea*). The family is divided into three major tribes: Bignonieae, Tecomeae and Crescentieae. The last tribe, with 1-celled fruits, occurs in Africa and the Americas. The Bignonieae are predominantly American, whilst the Tecomeae have about an equal number of genera in the Old and New Worlds.

* The Forest Herbarium, Royal Forest Department, Bangkok 10900, Thailand.

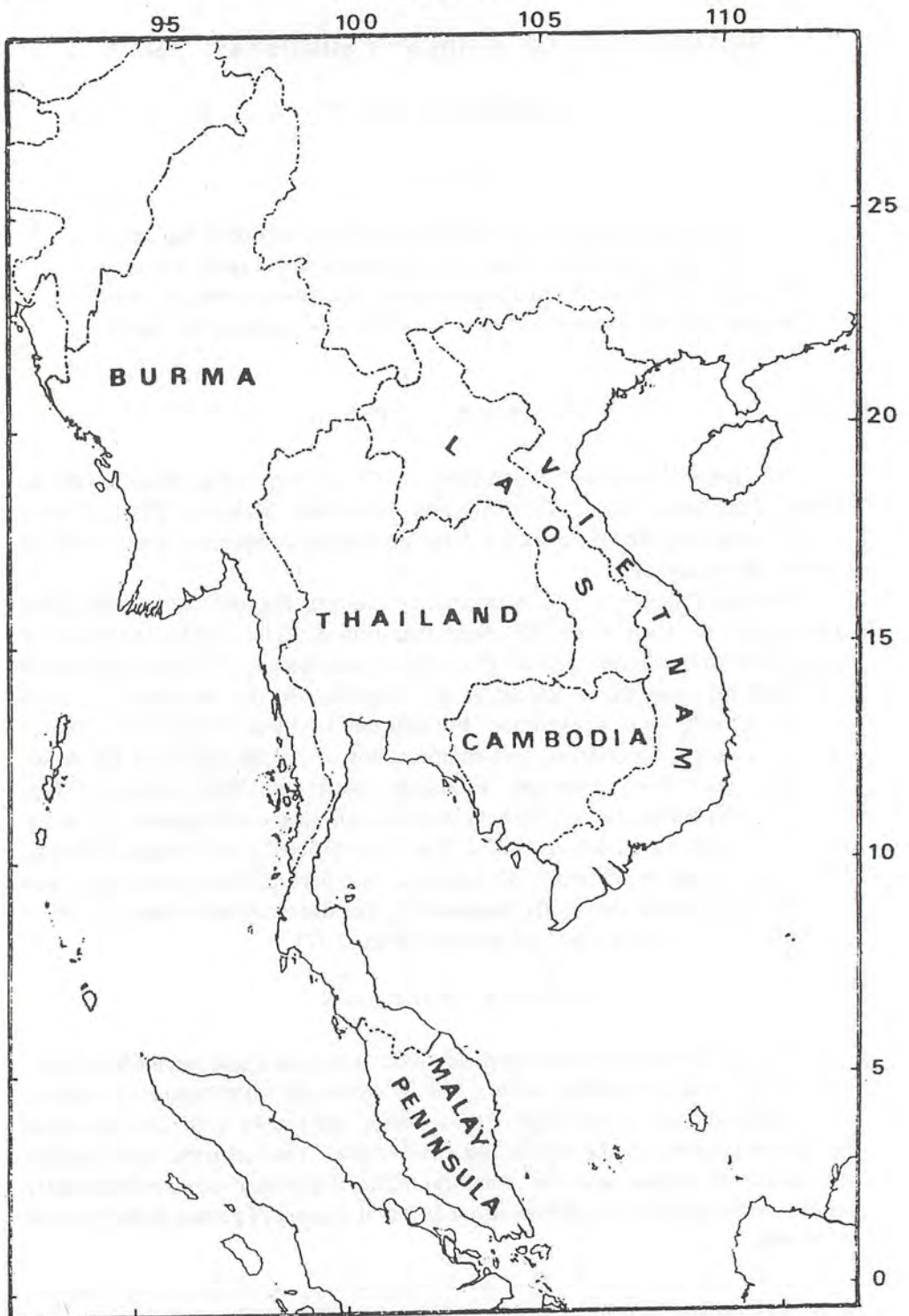


Figure 1. Map showing the geographical area of mainland South-East Asia (Burma, Thailand, Cambodia, Laos, Vietnam, and peninsular Malaysia)

The family is represented in the mainland SE. Asia by 14 genera and 36 species (Table 1). Three genera are endemic to the region, viz. *Barnettia* in Thailand, *Hieris* in Malaysia, and *Pauldopia* in Burma, Thailand, Laos and Vietnam. Of the remaining genera, 7 are distributed in tropical Asia only: *Deplanchea*, *Heterophragma*, *Millingtonia*, *Nyctocalos*, *Oroxylum*, *Pajanelia* and *Radermachera*, whilst *Fernandoa*, *Markhamia* and *Stereospermum* are shared with tropical Africa. Only the genus *Dolichandrone* occurs in the Old World, from the coast of Malabar throughout tropical SE. Asia and the whole of Malesia, tropical N. Australia, Micronesia to New Caledonia.

ECOLOGY

A fairly wide range of habitats is occupied by the family Bignoniaceae, ranging from arid environments in tropical N. Australia (e.g. *Dolichandrone filiformis*, *D. heterophylla*) to the deciduous forests in the seasonal areas of the mainland SE. Asia (e.g. *Barnettia kerrii*, *B. pagetii*, *Dolichandrone serrulata*, *Fernandoa adenophylla*, *Heterophragma sulfureum*, *Millingtonia hortensis*, *Stereospermum chelonoides*, *S. colais*, *S. fimbriatum*) and tropical rain forests (e.g. *Dolichandrone columnaris*, *Pajanelia longifolia*, *Radermachera hainanensis*). They are even represented in the mangrove formation (*Dolichandrone spathacea*). The representatives of Bignoniaceae in the mainland SE. Asia are, in majority, lowland tropical. Only a few ascend higher elevations up to c. 1,000 m. (e.g. *Markhamia stipulata* var. *kerrii*, *Pauldopia ghorta*, *Radermachera glandulosa*, *R. hainanensis*, *R. sinica*, *Stereospermum neuranthum*).

KEY TO THE GENERA OF BIGNONIACEAE IN THE MAINLAND SE. ASIA

1. Woody lianas; leaves pinnately 3-foliolate or 1-pinnate; capsules septicidally 2-valved
 2. Corolla almost actinomorphic, salver-shaped, straight, with a narrow cylindrical basal tube; calyx truncate with 5 horn-like teeth; leaves pinnately 3-foliolate 1. *Nyctocalos*
 2. Corolla zygomorphic, tubular, more or less geniculate above the cylindrical basal tube, the upper tube slightly curved; calyx inconspicuously 5-lobed, just below the margin with 5 spur-like, upcurved teeth at the base of each lobe; leaves 1-pinnate, usually 5-foliolate 2. *Hieris*
1. Trees, rarely shrubs; leaves simple or pinnately compound; capsules septicidally 2-valved or loculicidally 2-valved
 3. Leaves simple, in a whorl of 3-4, more or less tufted towards the end of branches; corolla yellow, tubular, tube short, slightly exceeding the calyx; didynamous stamens much exerted 3. *Deplanchea*

3. Leaves 1-or 2-3 (-4) - pinnate
 4. Leaves 2-3(-4)-pinnate
 5. Capsules linear, flattened or compressed, at least 14 mm broad, septically 2-valved; valves woody, parallel to the flat septum
 6. Flowers in an elongate, stout, compact terminal raceme; corolla very thick and fleshy, ventricose-campanulate, with a very short cylindrical basal tube; stamens 5, all fertile, not exerted; leaf underneath without domatia **4. Oroxylum**
 6. Flowers in a spreading terminal thyrse; corolla thin, not fleshy, salver-shaped, with a very long, slender, cylindrical lower tube; stamens 4, didynamous, shortly exerted; leaf underneath with hairy domatia **5. Millingtonia**
 5. Capsules long, elegant, linear-terete or slightly compressed, usually less than 14 mm broad, tortuous, loculicidally 2-valved; valves thin or rarely woody, perpendicular to the septum; septum terete, corky or flat and thin
 7. Leaf rachis narrowly winged; septum flat and thin; seeds in 1-2 rows, thick and woody, wingless **6. Pauldopia**
 7. Leaf rachis not winged; septum terete, corky, with shallow impression of seeds; seeds in several rows, flat, thin, not woody, at both ends with hyaline wings **7. Radermachera**
 4. Leaves 1-pinnate
 8. Calyx regularly to irregularly 2-5-lobed or truncate to subtruncate, rarely spathaceously slit (*Fernandoa collignonii*)
 9. Septum of capsule terete, corky; capsules long, elegant, linear-terete, mostly tortuous, 3-20 mm broad
 10. Septum undulating with shallow impression of seeds, without conspicuous deep notches; body of winged seed flat, not grooved at the middle, not embedded in the septum **7. Radermachera**
 10. Septum with deep alternating notches; body of winged seed thick, trigonous, grooved at the middle, embedded in the septum **8. Stereospermum**
 9. Septum of capsule broad and flat or cruciform; capsules very coarse or woody terete, angular-terete to quadrangular-terete or wide linear-oblong, not tortuous, straight to curved or slightly twisted, up to c. 9 cm broad
 11. Leaves decussate; septum broad and flat without pseudoseptum
 12. Capsules flattened, dagger-shaped, oblanceolate, broadly winged along the margins; leaf rachis with a sharp, keel-like ridge above; leaflets 7-14 pairs **9. Pajanelia**
 12. Capsules terete, angular-terete to quadrangular-terete, not winged; valves longitudinally ridged or ribbed; leaf rachis not keeled above; leaflets less than 7 pairs **10. Fernandoa**
 11. Leaves \pm verticillate; septum cruciform, true septum narrow, pseudoseptum broad

13. Leaflets 3-4 pairs, subrotund or obtuse at the apex; undersurface of leaflet, and capsule adpressed stellate tomentose; capsules compressed, broadly oblong up to 55 cm long 11. **Heterophragma**
13. Leaflets 4-10 pairs, acuminate at the apex, glabrous on both sides; capsules ellipsoid-oblong, rarely exceeding 17 cm long, glabrous, with tuberculate, warty to sessile glands 12. **Barnettia**
8. Calyx conspicuously spathaceous, opening on the anterior side to the base of the tube; capsules always with cruciform septum
14. Corolla very thick and fleshy, dingy yellow to brownish red, ventricose campanulate, the cylindrical part of the tube very short, enclosed within calyx, limb strongly bilabiate; capsules deeply woolly, floccose or glabrescent, more or less tuberculate; a pair of pseudostipules usually conspicuous 13. **Markhamia**
14. Corolla thin, not fleshy, white, funnel-shaped, the lower cylindrical tube long and slender, much exceeding the calyx, limb almost actinomorphic with 5 subequal rounded lobes; capsules glabrous, not tuberculate; pseudostipules lacking 14. **Dolichandrone**

1. NYCTOCALOS Teijsm. & Binn.

Three species in SE. Asia and West Malesia; 1 species in the mainland South-East Asia.

Nyctocalos brunfelsiiflora Teijsm. & Binn.

Syn.- *N. shanicus* MacGregor & W.W. Smith

Distribution. Burma, Thailand, Cambodia, Borneo (Sabah, Sarawak), and SW. Java.

2. HIERIS Steenis

Monotypic.

Hieris curtisii (Ridl.) Steenis

Syn.- *Tecoma curtisii* Ridl.

- *Pandorea curtisii* Ridl.

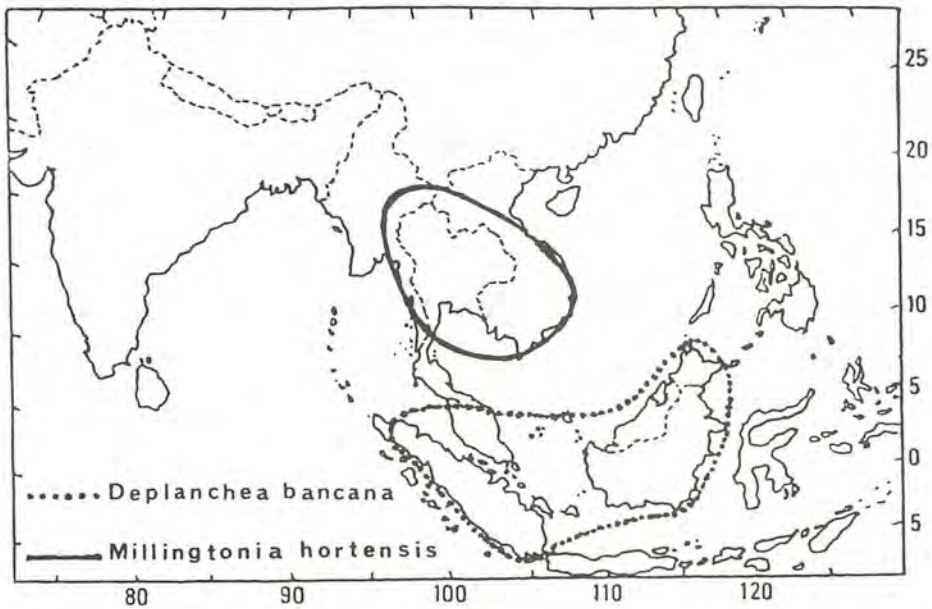
Distribution. Malaysia (Penang), endemic.

Table 1. Distributions of Bignoniaceae in the Mainland SE. Asia.

Species	Burma	Thailand	Cambodia	Laos	Vietnam	Malay Peninsula
<i>Barnettia</i>						
<i>kerrii</i>		+				
<i>pagetii</i>		+				
<i>Deplanchea</i>						
<i>bancana</i>						+
<i>Dolichandrone</i>						
<i>columnaris</i>		+	+		+	+
<i>serrulata</i>	+	+		+	+	
<i>spathacea</i>	+	+	+		+	+
<i>Fernandoa</i>						
<i>adenophylla</i>	+	+	+	+	+	+
<i>bracteata</i>					+	
<i>brilletii</i>					+	
<i>collignonii</i>		+		+	+	
<i>serrata</i>					+	
<i>Heterophragma</i>						
<i>sulfureum</i>	+	+	+	+		
<i>Hieris</i>						
<i>curtisii</i>						+
<i>Markhamia</i>						
<i>stipulata</i> var. <i>stipulata</i>	+	+		+		
var. <i>kerrii</i>	+	+		+	+	
var. <i>pierrei</i>		+	+		+	
<i>Millingtonia</i>						
<i>hortensis</i>	+	+	+	+	+	
<i>Nyctocalos</i>						
<i>brunfelsiiflora</i>	+	+	+			
<i>Oroxylum</i>						
<i>indicum</i>	+	+	+	+	+	+
<i>Pajanelia</i>						
<i>longifolia</i>	+	+				+
<i>Pauldopia</i>						
<i>ghorta</i>	+	+		+	+	
<i>Radermachera</i>						
<i>boniana</i>					+	
<i>eberhardtii</i>					+	
<i>gigantea</i>	+					

Table 1. (Continued)

Species	Burma	Thailand	Cambodia	Laos	Vietnam	Malay Peninsula
<i>glandulosa</i>	+	+		+		+
<i>hainanensis</i>		+	+	+	+	
<i>ignea</i>	+	+		+	+	
<i>inflata</i>					+	
<i>peninsularis</i>		+				
<i>pinnata</i> ssp. <i>acuminata</i>		+				+
<i>sinica</i>	+				+	
<i>stellata</i>					+	
<i>Stereospermum</i>						
<i>annamense</i>					+	
<i>chelonoides</i>	+		+	+		
<i>colais</i>	+	+	+	+	+	
<i>cylindricum</i>		+	+		+	
<i>fimbriatum</i>	+	+		+		+
<i>neuranthum</i>	+	+	+	+	+	

Figure 2. The distributions of *Deplanchea bancana* and *Millingtonia hortensis*.

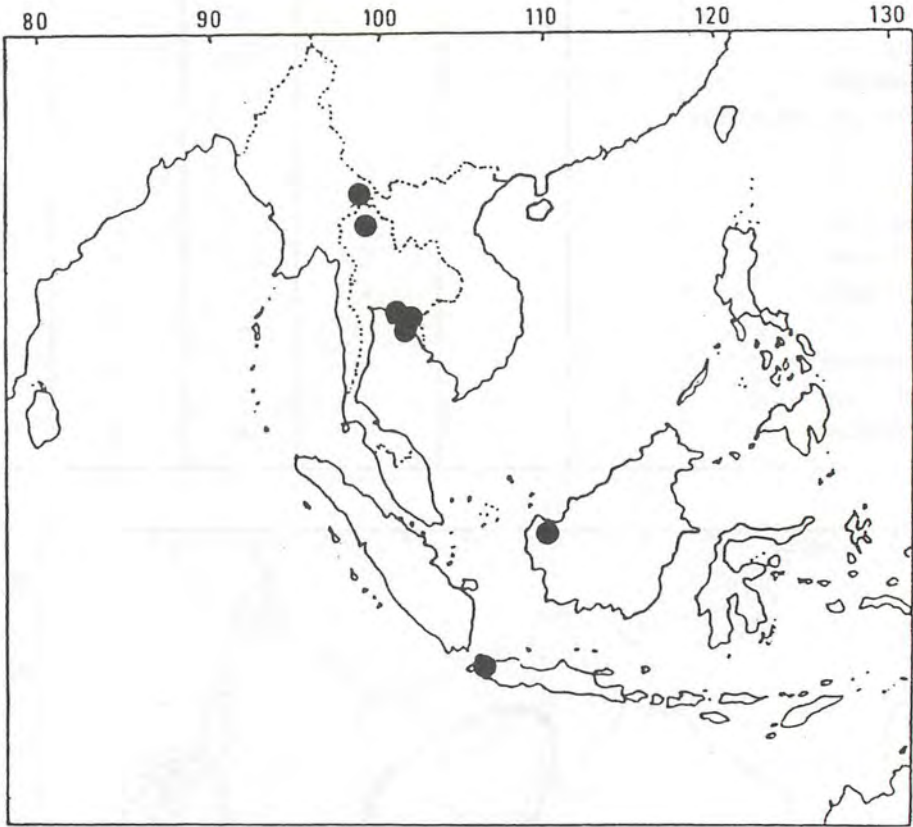


Figure 3. The distribution of *Nyctocalos brunfelsiiflora*.

3. DEPLANCHEA Vieillard

Five species, 1 in West Malesia, 2 in New Guinea, and 2 in New Caledonia.

Deplanchea bancana (Scheffer) Steenis

Syn.- *Diplanthera bancana* Scheffer
- *D. coriacea* Steenis

Distribution. Malay Peninsula, Sumatra, Riouw Is., Banka, Billiton, and Borneo.

4. OROXYLUM Vent.

Monotypic.

Oroxylum indicum (Linn.) Kurz

Syn.- *Bignonia indica* Linn.
- *Spathodea indica* (Linn.) Pers.
- *Calosanthos indica* (Linn.) Blume
- *Bignonia pentandra* Lour.

Distribution. Widely distributed from Sri Lanka, India, the Himalayas, Burma, S. China, Thailand, Cambodia, Laos, Vietnam, and Malesia eastwards to the Philippines, Celebes, and Timor.

5. MILLINGTONIA Linn.f.

Monotypic, SE. Asia.

Millingtonia hortensis Linn.f.

Distribution. Lower Burma to Tenasserim, Thailand, Cambodia, Laos and Vietnam. Commonly cultivated as ornamental and wayside trees.

6. PAULDOPIA Steenis

Monotypic, SE. Asia.

Pauldopia ghorta (Buch.—Ham. ex G. Don) Steenis

Syn.- *Bignonia ghorta* Buch.—Ham. ex G. Don

- *Stereospermum ghorta* (Buch.—Ham. ex G. Don) C.B. Clarke
- *Tecoma bipinnata* Coll. & Hemsl.
- *Radermachera bipinnata* (Coll. & Hemsl.) Steenis ex Chatterjee
- *R. alata* Dop

Distribution. Burma, S. China (Yunnan), Thailand, Laos, and Vietnam (Tonkin).

7. RADERMACHERA Zoll. & Mor.

Fifteen species in Indo-Malesia, most abundant in tropical SE. Asia; 11 species in the mainland SE. Asia.

KEY TO THE SPECIES OF RADERMACHERA

1. Corolla slender tubular, the widened upper tube narrow, c. 6-9 mm wide at the mouth; calyx tubular, cupular to cupular-campanulate, stunted or lobed, usually with a whorl of gland fields; leaves 1-2-pinnate
 2. Leaves 1-pinnate
 3. Calyx tubular, 1-1.5 cm long, irregularly shortly 2-3-lobed, caducous; corolla tube straight, yellow, lobe margins glabrous, capsule tortuous, widely spaced; leaflets underneath with some scattered immersed minute glands **1. *R. eberhardtii***
 3. Calyx cupular, 0.3-0.5 cm long, evenly truncate to subtruncate, persistent; corolla tube slightly curved, white tinged pink, lobes ciliate along margins; capsule straight, crowded, hanging in bunch; leaflets underneath with a prominent dense gland field at the bases **2. *R. glandulosa***
 2. Leaves 2-pinnate
 4. Inflorescence a gradually elongating, slender thyse up to c. 60 cm long, often flowering in the upper part while fruiting in the lower; calyx bud ovoid, in anthesis cupularcampanulate, not inflated, 0.5-0.6 cm long, unevenly truncate, lobes inconspicuous, above the middle with a regular whorl of several condensed gland fields; leaflets 4.5-7.6 × 2.5-4 cm **3. *R. boniana***
 4. Inflorescence a spreading panicle c. 24 cm long; calyx bud turbinate, in anthesis tubular-barrel-shaped, c. 1.4-1.6 cm long, with 2-3 broad triangular lobes, inflated about the middle with a whorl of 2-5 glandular bulges; leaflets 7-13 × 3-6.5 cm **4. *R. stellata***
1. Corolla tubular, tubular-campanulate, salverform or funnellform, the widened upper tube rather broad, c. 1-2 cm wide at the mouth; calyx tubular, tubular-campanulate or campanulate with conspicuous lobes, glandular or glandless; leaves 2-3-pinnate

5. Leaves biternate or 2-pinnate; leaflets coriaceous, with shortly blunt-acuminate, blunt acute or obtuse tips; corolla tube 2.2-2.9 cm long
5. **R. pinnata ssp. acuminata**
5. Leaves 2-3 pinnate; leaflets papery, with acuminate to caudate tips; corolla usually longer
6. Calyx irregularly 2-3-lobed or subspathaceous; corolla white, yellow, or yellow orange to orange
7. Inflorescence a terminal thyrse, longer than 5 cm; corolla white
6. **R. gigantea**
7. Inflorescences very short, raceme-like or almost contracted to fascicles, c. 1-5 cm long, mostly axillary and/or lateral, or entirely cauliflorous; corolla yellow or yellowish orange to orange
8. Racemes axillary and/or lateral, ramiflorous, rarely in terminal, glabrous; calyx more or less campanulate, irregularly (2-) 3-lobed, rarely subspathaceous; corolla tubular-campanulate, with 5 large, rounded, unequal lobes; stamens 4, didynamous 7. **R. hainanensis**
8. Racemes stunted, almost reduced to fascicles, entirely rami- and cauliflorous; calyx, tubular, spathaceously slit about halfway towards the anterior base, occasionally irregularly 2-lobed; corolla tubular-funnel form or barrel-shaped, with very short, 5 subequal lobes; stamens 4, almost equal, free 8. **R. ignea**
6. Calyx regularly 5-lobed; corolla white
9. Leaves (2-)3-pinnate; tip of leaflet falcate-caudate; calyx widely campanulate, up to 2 cm broad 9. **R. peninsularis**
9. Leaves 2-pinnate; tip of leaflet acuminate; calyx usually up to 1.5 cm broad
10. Calyx bud more or less ellipsoid, in anthesis tubular to tubular-campanulate, 2-4 × 1-1.5 cm, not inflated; corolla salverform, 7-12 cm long; insertion point of stamens glabrous 10. **R. sinica**
10. Calyx bud globular, in anthesis inflated campanulate, c. 1.2 × 1.5 cm; corolla tubular campanulate, c. 6 cm long; insertion point of stamens with short glandular hairs 11. **R. inflata**

1. *Radermachera eberhardtii* Dop

Distribution. Vietnam (Tonkin and Annam).

2. *Radermachera glandulosa* (Bl.) Miq.

Syn.- *Spathodea glandulosa* Bl.

- *Stereospermum glandulosum* Miq.
- *Bignonia porteriana* Wall. ex DC.

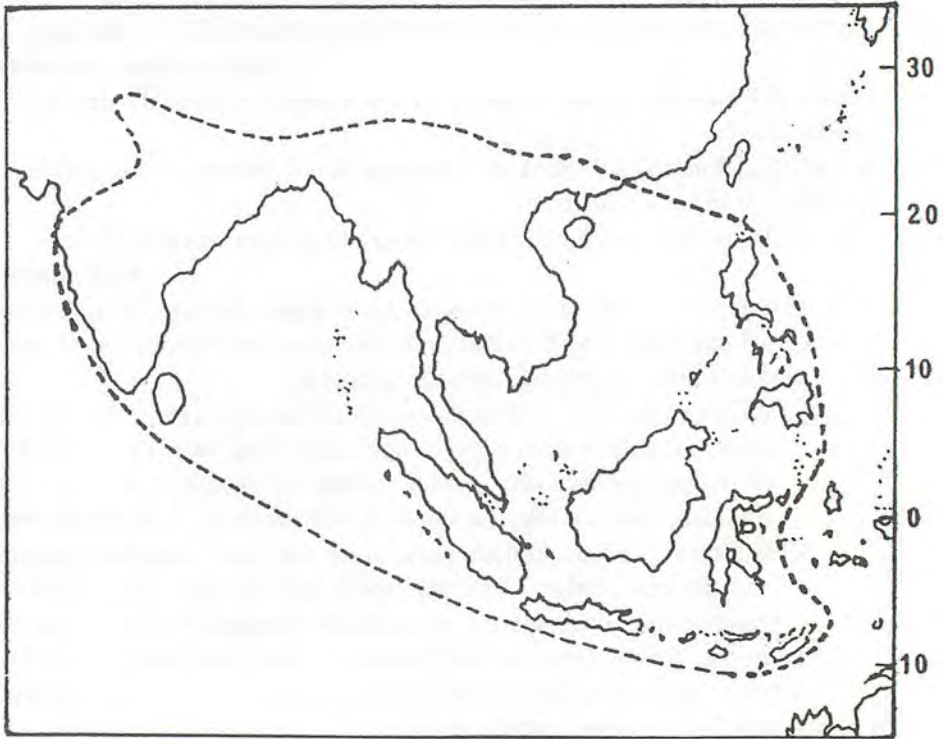


Figure 4. The distribution of *Oroxylum indicum*.

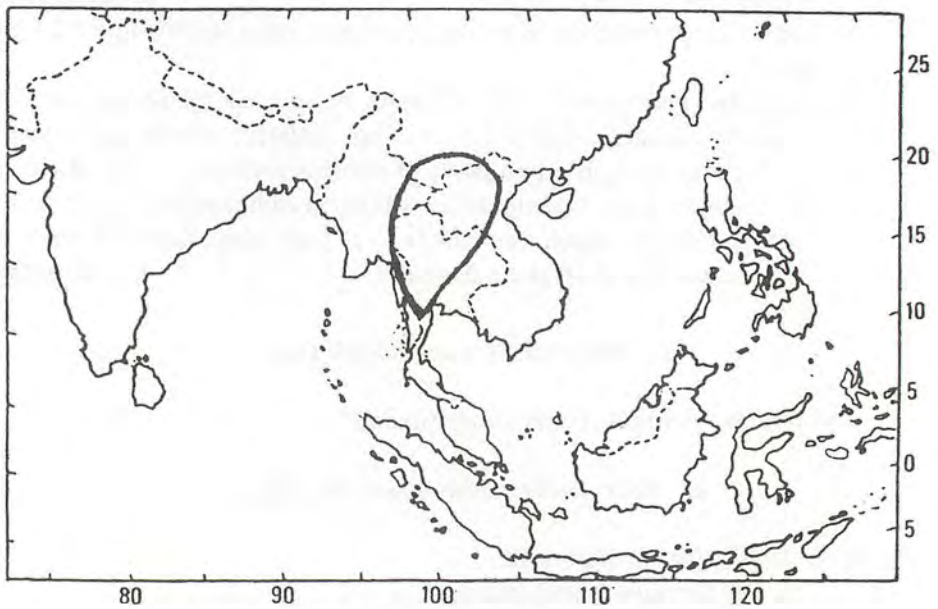


Figure 5. The distribution of *Pauldopia ghorta*.

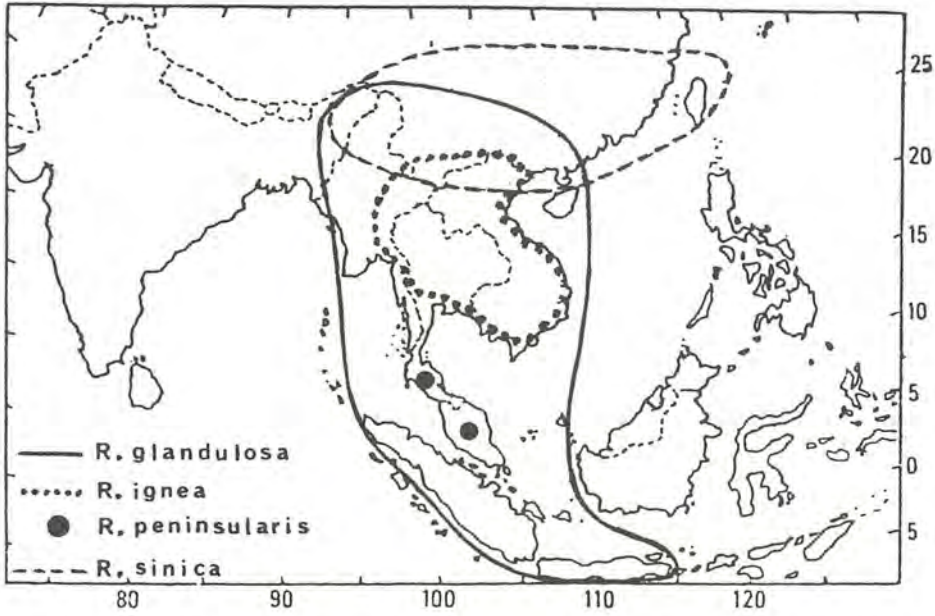


Figure 6. The distributions of *Radermachera glandulosa*, *R. ignea*, *R. peninsularis*, and *R. sinica*.

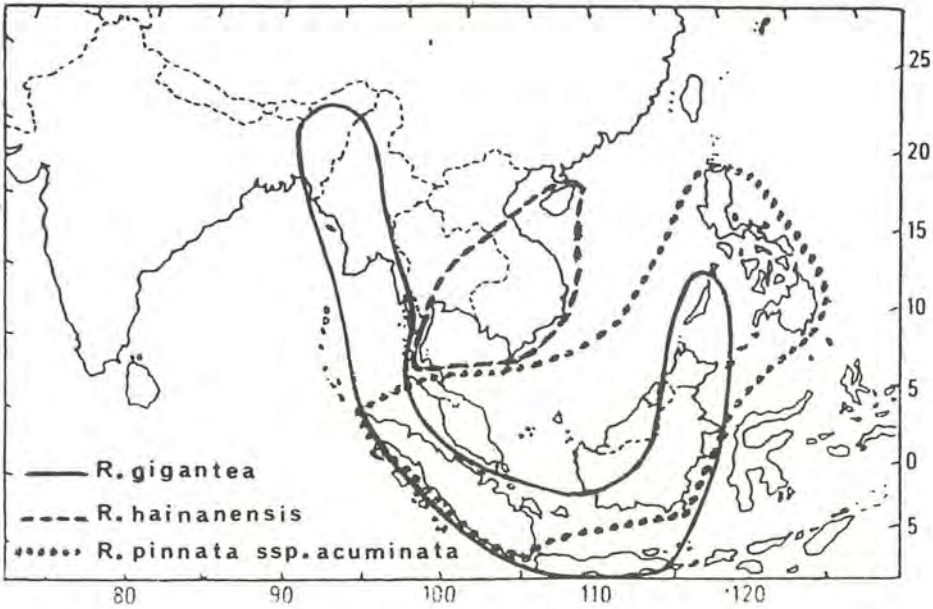


Figure 7. The distributions of *Radermachera gigantea*, *R. hainanensis*, and *R. pinnata ssp. acuminata*.

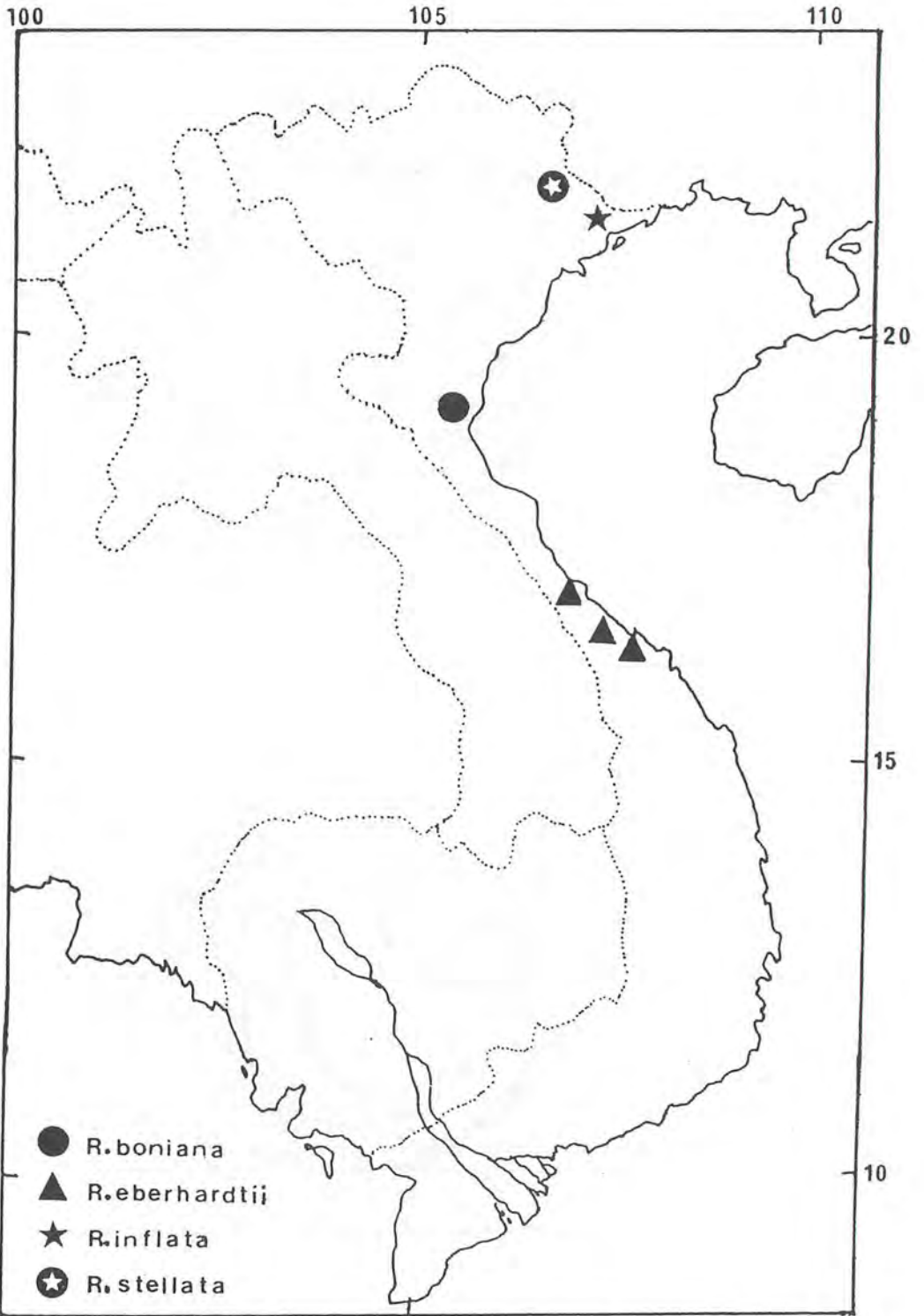


Figure 8. The distributions of *Radermachera boniana*, *R. eberhardtii*, *R. inflata*, and *R. stellata*, endemic to Vietnam.

Distribution. Assam, Burma, SE. China (Kwangsi, Kwangtung), Laos, Thailand, Malay Peninsula, Sumatra, and Java.

3. *Radermachera boniana* Dop

Distribution. Vietnam (Tonkin), endemic.

4. *Radermachera stellata* Steenis

Distribution. Vietnam (Tonkin), endemic.

5. *Radermachera pinnata* (Blanco) Seem. subsp. *acuminata* (Steenis) Steenis

Syn.- *Spathodea lobbii* Teijsm. & Binn.

- *Radermachera lobbii* (Teijsm. & Binn.) Miq.

Distribution. Peninsular Thailand, Malay Peninsula, Sumatra, Borneo, and SW. Philippines.

6. *Radermachera gigantea* (Bl.) Miq.

Syn.- *Spathodea gigantea* Bl.

- *Bignonia amoena* Wall.

- *Spathodea amoena* (Wall.) DC.

- *Radermachera amoena* (Wall.) Seem.

- *Stereospermum hypostictum* Miq.

- *Radermachera elmeri* Merr.

- *R. elliptica* Merr.

- *R. punctata* Elmer ex Steenis

- *R. borneensis* Steenis

Distribution. Assam, Burma, Sumatra, Java, Borneo, Philippines, and Lesser Sunda Islands.

7. *Radermachera hainanensis* Merr.

Syn.- *Radermachera pierrei* Dop

- *R. grandiflora* Dop

- *R. poilanei* Dop

Distribution. SE. China (Hainan), Thailand, Cambodia, Laos, and Vietnam.

8. *Radermachera ignea* (Kurz) Steenis

Syn.- *Spathodea ignea* Kurz
 - *Mayodendron igneum* (Kurz) Kurz

Distribution. S. China (Yunnan), Burma, Thailand, Laos, and Vietnam.

9. *Radermachera peninsularis* Steenis

Distribution. Peninsular Thailand, endemic.

10. *Radermachera sinica* (Hance) Hemsley

Syn.- *Stereospermum sinicum* Hance
 - *Radermachera tonkinensis* Dop

Distribution. Assam, Upper Burma, S. China (Yunnan, Kwangtung Kwangsi), Vietnam (Tonkin), Taiwan, and the southern Ryu Kyu Islands

11. *Radermachera inflata* Steenis

Distribution. Vietnam (Tonkin), endemic.

8. STEREOSPERMUM Cham.

Over 12 species, in tropical Africa and Madagascar to SE. Asia; 6 species in the mainland SE. Asia.

KEY TO THE SPECIES OF STEREOSPERMUM

1. Calyx campanulate; corolla with a short cylindrical basal tube and tubular-campanulate widened upper tube more or less curved above basal tube, mouth bilabiate; insertion point of stamens hairy to glabrous; flowers diurnal
2. Inflorescence a short thyrses, c. 5-14 cm long; calyx bud globular; corolla mouth glabrous; leaflets bluntly acute to obtuse; insertion point of stamens always hairy 1. *S. neuranthum*
2. Inflorescences widely-branched panicles, c. 20-40 cm long; calyx bud ovoid to ellipsoid; corolla mouth villous; leaflets shortly acuminate or acuminate to caudate
3. Innovations and panicle viscid glandular tomentose to pubescent; calyx finely pubescent; capsule long terete. stout, straight, with or without 4-obscurely lengthwise ridges; mature leaflets coarse, broadly elliptic to broadly ovate, abruptly shortly acuminate, petiolule 1-3 mm long or subsessile; insertion point of stamens hairy to glabrous 2. *S. chelonoides*

3. Innovations, panicle and calyx usually glabrous to subglabrous, rarely finely puberulous; capsule long quadrangular, twisted, more or less tortuous, with 4-prominently sharp ribs at the angles; mature leaflets not coarse, elliptic, acuminate to caudate, petiolule slender, 6-17 mm long; insertion point of stamens always hairy

3. *S. colais*

1. Calyx tubular or tubular-campanulate; corolla with a long, narrow cylindrical lower tube and gradually funnel form or tubular campanulate-widened upper tube, straight, mouth not bilabiate; insertion point of stamens glabrous; flowers nocturnal

4. Inflorescence a widely-branched panicle up to c. 35 cm long, viscid glandular hairy; bracts and bracteoles inconspicuous; calyx tubular; margins of corolla lobes deeply fringed-laciniate; leaflets acuminate to caudate-acuminate, sparsely puberulous underneath

4. *S. fimbriatum*

4. Inflorescences narrow thyrses or raceme-like thyrses, c. 10-25 cm long, with numerous conspicuous bracts and bracteoles; calyx tubular or tubular-campanulate; margins of corolla lobes irregularly incised or crisped; leaflets bluntly acute to obtuse, hoary to appressedly greyish-tomentose underneath

5. Calyx tubular, 17-22 cm long, longitudinally ridged, finely pubescent; the widened upper tube of corolla shorter than the slender, cylindrical lower tube; margins of corolla lobes more or less crisped and slightly crenate; raceme-like thyse with densely leafy bracts and bracteoles

5. *S. cylindricum*

5. Calyx tubular-campanulate, c. 8-10 mm long, not ridged, appressedly yellowish to greyish-white tomentose; the tubular-campanulate-widened upper tube longer than the narrow cylindrical lower tube; margins of corolla lobes irregularly incised; thyse with widely-spaced bracts and bracteoles

6. *S. annamense*

1. *Stereospermum neuranthum* Kurz

Syn.- *Stereospermum wallichii* C.B. Clarke

- *Radermachera wallichii* (C.B. Clarke) Chatterjee

- *Stereospermum grandiflorum* Cubitt & W. W. Smith

Distribution. India (Manipur), Burma, Thailand, Cambodia, Laos, and Vietnam.

2. *Stereospermum chelonoides* (Linn.f.) DC.

Syn.- *Bignonia chelonoides* Linn.f.

- *B. suaveolens* Roxb.

- *Tecoma suaveolens* (Roxb.) G. Don

- *Stereospermum suaveolens* (Roxb.) DC.

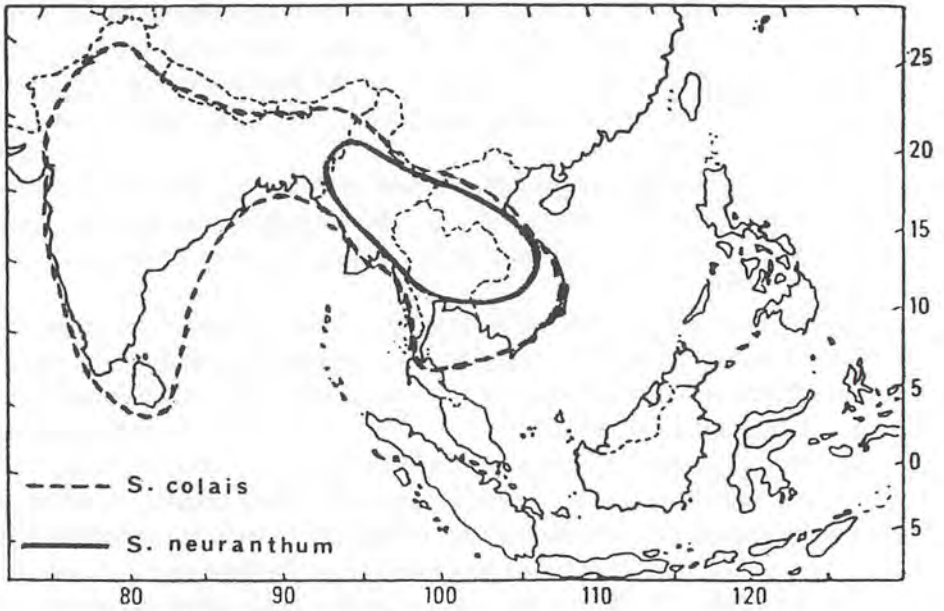


Figure 9. The distributions of *Stereospermum colais* and *S. neuranthum*.

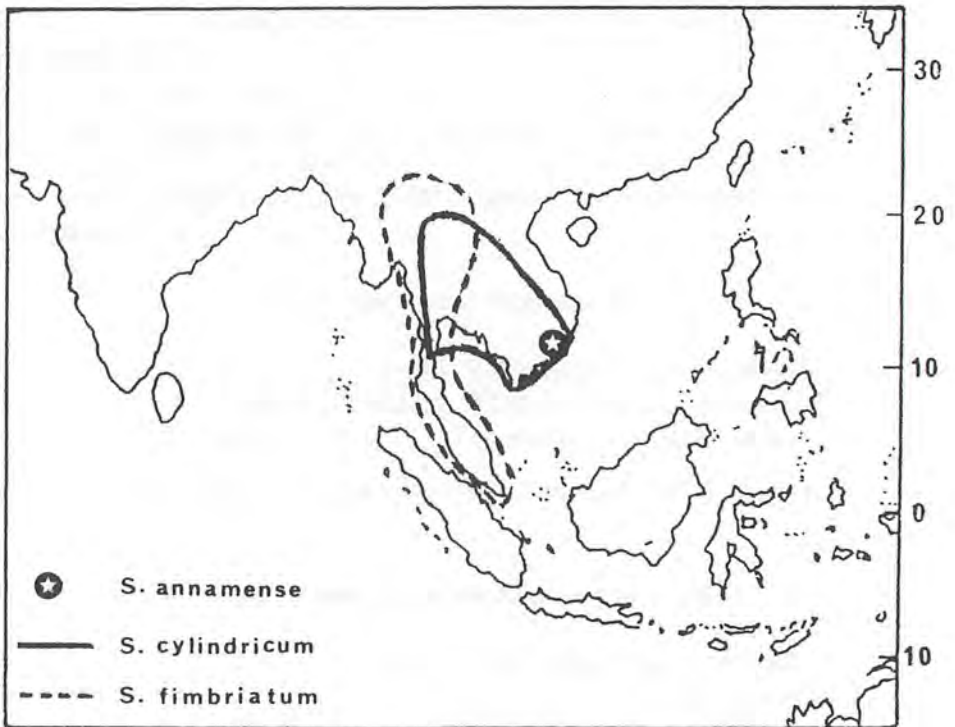


Figure 10. The distributions of *Stereospermum annamense*, *S. cylindricum*, and *S. fimbriatum*.

- *Heterophragma suaveolens* (Roxb.) Dalz. & A.L. Gibson

Distribution. Sri Lanka, India, Nepal, Burma, Cambodia, and Laos.

3. *Stereospermum colais* (Buch.- Ham. ex Dillw.) Mabblerley

Syn.- *Bignonia colais* Buch.—Ham. ex Dillw.

- *Dipterosperma personatum* Hassk.
- *Stereospermum personatum* (Hassk.) Chatterjee
- *S. tetragonum* DC.

Distribution. Widely distributed from Sri Lanka through the India subcontinent, Burma, S. China (Yunnan), Thailand, Cambodia, Laos, and Vietnam.

4. *Stereospermum fimbriatum* (Wall. ex G. Don) DC.

Syn.- *Bignonia fimbriata* Wall. ex G. Don

- *Stereospermum mekongense* Dop

Distribution. Burma, Thailand, Laos, and Malay Peninsula.

5. *Stereospermum cylindricum* Pierre ex Dop

Distribution. Thailand, Cambodia, and Vietnam.

6. *Stereospermum annamense* A. Chev. ex Dop

Distribution. Southern Vietnam, endemic.

9. PAJANELIA DC.

Monotypic.

***Pajanelia longifolia* (Willd.) K. Schum.**

Syn.- *Bignonia longifolia* Willd.

- *B. multijuga* Wall.
- *Pajanelia multijuga* (Wall.) DC.
- *P. rheedii* Wight

Distribution. From southern India eastwards through eastern Bengal, Lower Burma, Tenasserim, Andaman Is., Peninsular Thailand, Malay Peninsula, Sumatra and the Natuna Islands.



Figure 11. The distribution of *Pajanelia longifolia*.

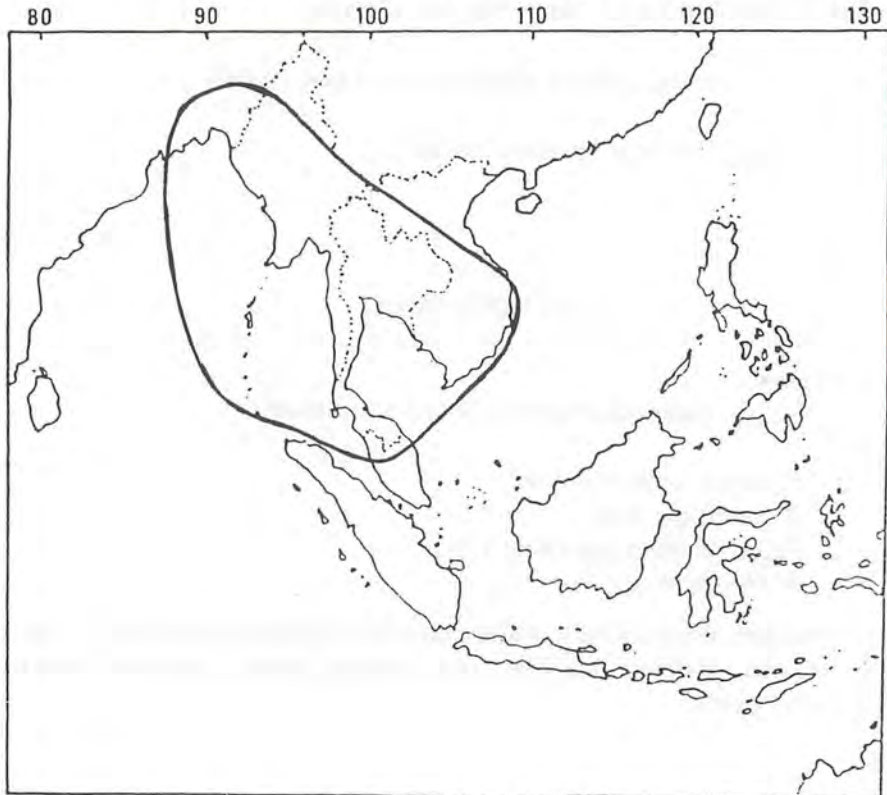


Figure 12. The distribution of *Fernandoa adenophylla*.

10. FERNANDOA Welw. ex Seem.

About 4 species in tropical West Africa and East Africa, 3 in Madagascar, and 6 in Indo-Malesia; in the mainland SE. Asia 5 species have been recorded.

KEY TO THE SPECIES OF FERNANDOA

1. Foliaceous pseudostipules usually conspicuous; leaflets subsessile, pubescent underneath, considerably diminishing in size downwards; capsule long terete, twisted and arcuate, rusty tomentose; calyx broadly campanulate, 2.7-4.5 cm long, densely rusty tomentose, usually persistent in fruit; corolla coarse, fleshy, yellowish woolly-tomentose outside 1. **F. adenophylla**
1. Foliaceous pseudostipules lacking; leaflets shortly petiolulate, gradually diminishing in size downwards, glabrous; capsules terete, angular-terete or quadrangular, straight to slightly arcuate, glabrescent to glabrous
 2. Leaflets underneath puberulous, domatia lacking; capsule long quadrangular, valves thick, spongy, woody; septum c. 2.6 mm broad, 4-6 mm thick; hyaline winged-seeds large, c. 6.3 × 2.1 cm 2. **F. brilletii**
 2. Leaflets glabrous, domatia more or less hairy; capsules terete or angular terete, valves not spongy
 3. Thyrse and pedicel stout, glabrous; calyx tubular, leathery, 2-3-lobed, more or less halfway slit spathaceous towards the anterior base; ovary glabrous; capsule angular-terete, unequally sized, 35-45 cm long, 3.5-6.8 cm diam with 3 prominent lengthwise ribs on each valve 3. **F. collignonii**
 3. Thyrse and pedicel not stout, glabrous or puberulous; calyx tubular or tubula-campanulate, thin, irregularly 3-5-lobed, not spathaceous; ovary appressed tomentose to pubescent; capsule terete, with raised lengthwise ridges
 4. Thyrse 9-14 cm long, glabrous, ebracteolate; calyx tubular-campanulate, with 5 lengthwise ridges at least in the upper-half, glabrous; leaflets shallowly serrate or crenate to subentire 4. **F. serrata**
 4. Thyrse 15-28 cm long, puberulous, when young with foliaceous linear-lanceolate to linear bracts; calyx narrow tubular, smooth, puberulous; leaflets entire 5. **F. bracteata**

1. *Fernandoa adenophylla* (Wall. ex G. Don) Steenis

Syn.- *Bignonia adenophylla* Wall. ex G. Don

- *Spathodea adenophylla* (Wall. ex G. Don) DC.

- *Heterophragma adenophylla* (Wall. ex G. Don) Benth

- *Haplophragma adenophyllum* (Wall. ex G. Don) Dop

Distribution. Assam, Bangladesh, Burma, the Andaman Islands, Thailand,

Cambodia, Laos, Vietnam, and Malay Peninsula.

2. *Fernandoa brilletii* (Dop) Steenis

Syn.- *Hexaneurocarpon brilletii* Dop

Distribution. Northern Vietnam, endemic.

3. *Fernandoa collignonii* (Dop) Steenis

Syn.- *Spathodeopsis collignonii* Dop

Distribution. Northern Thailand, Laos and northern Vietnam.

4. *Fernandoa serrata* (Dop) Steenis

Syn.- *Haplophragma serratum* Dop

Distribution. Vietnam, endemic.

5. *Fernandoa bracteata* (Dop) Steenis

Syn.- *Radermachera bracteata* Dop

- *R. brilletii* Dop

Distribution. Northern Vietnam, endemic.

11. HETEROPHRAGMA DC.

Species 2, another species, *H. quadriloculare* (Roxb.) K. Schum. is confined to S. India (Deccan Peninsula).

***Heterophragma sulfureum* Kurz**

Syn.- *Heterophragma vestitum* Dop

Distribution. Burma, Thailand, Cambodia, and Laos.

12. BARNETTIA Santisuk

Species 2, endemic to Thailand.

KEY TO THE SPECIES OF BARNETTIA

1. Corolla gradually and narrowly funnel-shaped widened towards the mouth;

- calyx and capsule with dense, minute tuberculate to warty glands
1. Corolla abruptly tubular-campanulate widened in the upper tube above a very short cylindrical basal tube; calyx and capsule with scattered slightly warty to sessile glands

1. **B. pagetii**2. **B. kerrii**

1. ***Barnettia pagetii* (Craib) Santisuk**

Syn.- *Radermachera pagetii* Craib

Distribution. Central and southwestern Thailand.

2. ***Barnettia kerrii* (Barnett & Sandwith) Santisuk**

Syn.- *Radermachera kerrii* Barnett & Sandwith

Distribution. Northern, northeastern and central Thailand.

13. **MARKHAMIA** Seem. ex Baill.

About 10 species, mostly in tropical Africa, 1 species in the mainland SE. Asia.

***Markhamia stipulata* (Wall.) Seem. ex K. Schum.**

Syn.- *Spathodea stipulata* Wall.

- *Bignonia stipulata* (Wall.) Roxb.
- *Dolichandrone stipulata* (Wall.) C.B. Clarke
- *Spathodea velutina* Kurz
- *Markhamia indica* Pham Hoang Ho

Three varieties can be recognized in the mainland SE. Asia.

KEY TO THE VARIETIES OF MARKHAMIA STIPULATA

1. Calyx always floccose or lanate woolly; corolla dingy-yellow or brownish yellow; capsule floccose to deeply lanate woolly, with widely spaced tuberculate glands under indumentum
 2. Calyx and capsule floccose 1. **var. stipulata**
 2. Calyx and capsule thinly to deeply lanate woolly 2. **var. kerrii**
1. Calyx with early caducous indumentum, usually sparsely pubescent to puberulous in the upper part; corolla reddish yellow or reddish brown; capsule sparsely puberulous to subglabrous, with densely spaced tuberculate to warty glands 3. **var. pierrei**

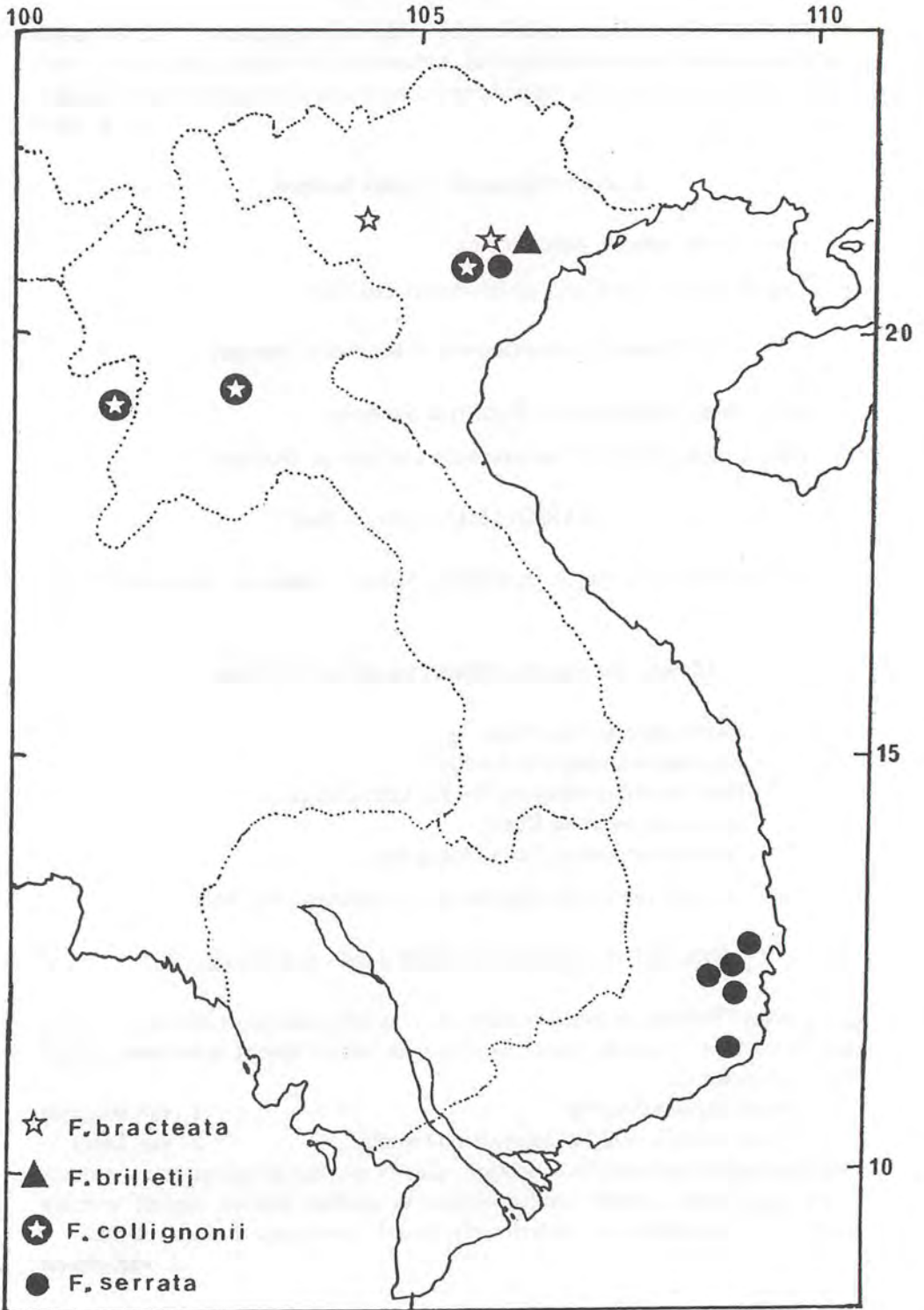


Figure 13. The distributions of *Fernandoa bracteata*, *F. brilletii*, *F. collignonii*, and *F. serrata*, in northern Thailand, Laos and Vietnam.

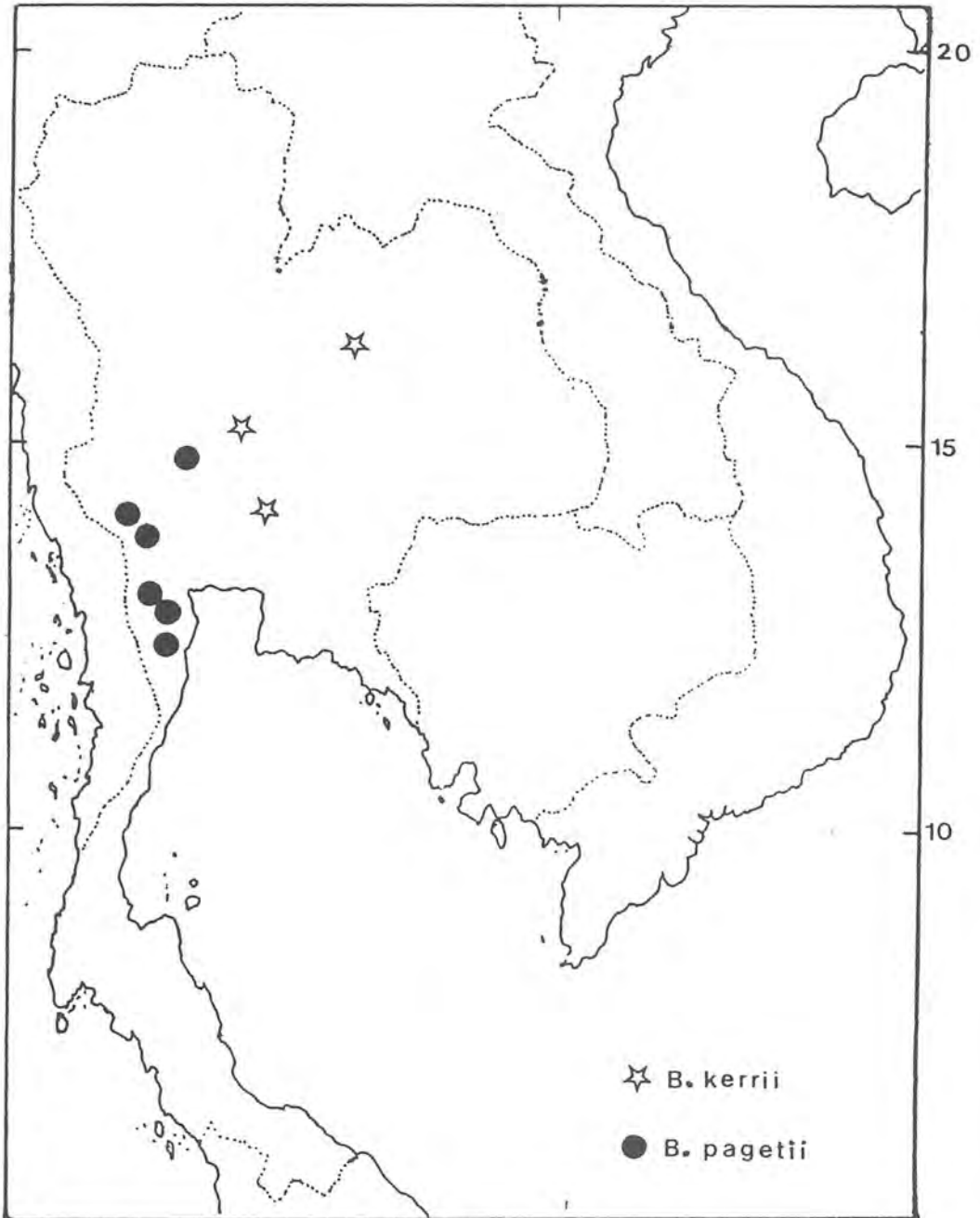


Figure 14. The distributions of *Barnettia kerrii* and *B. pagetii*, endemic to Thailand.

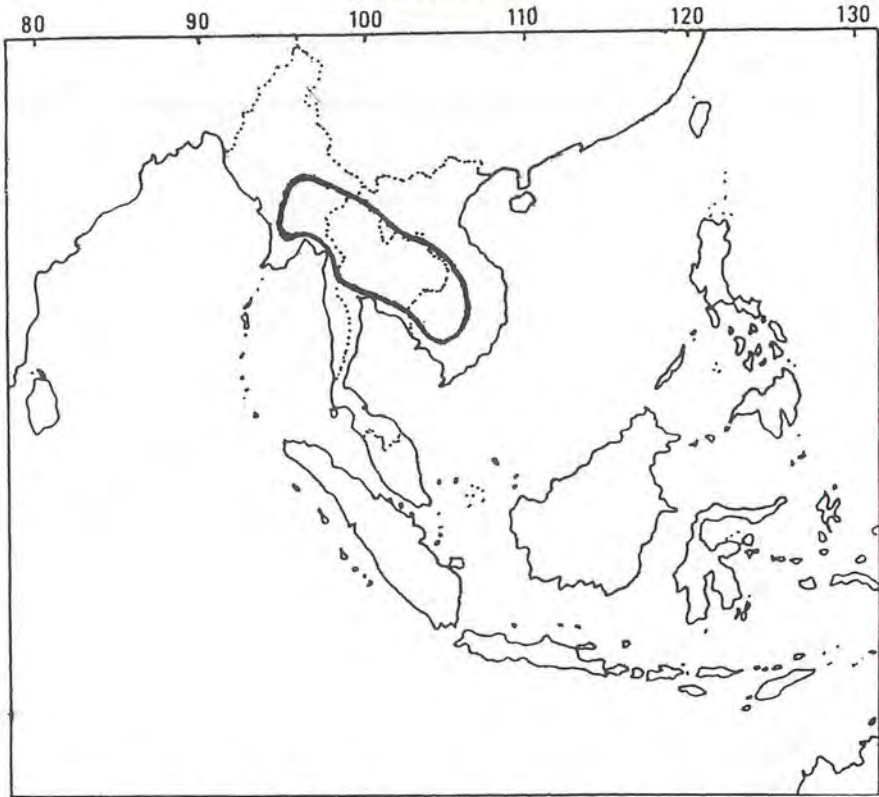


Figure 15. The distribution of *Heterophragma sulfureum*.

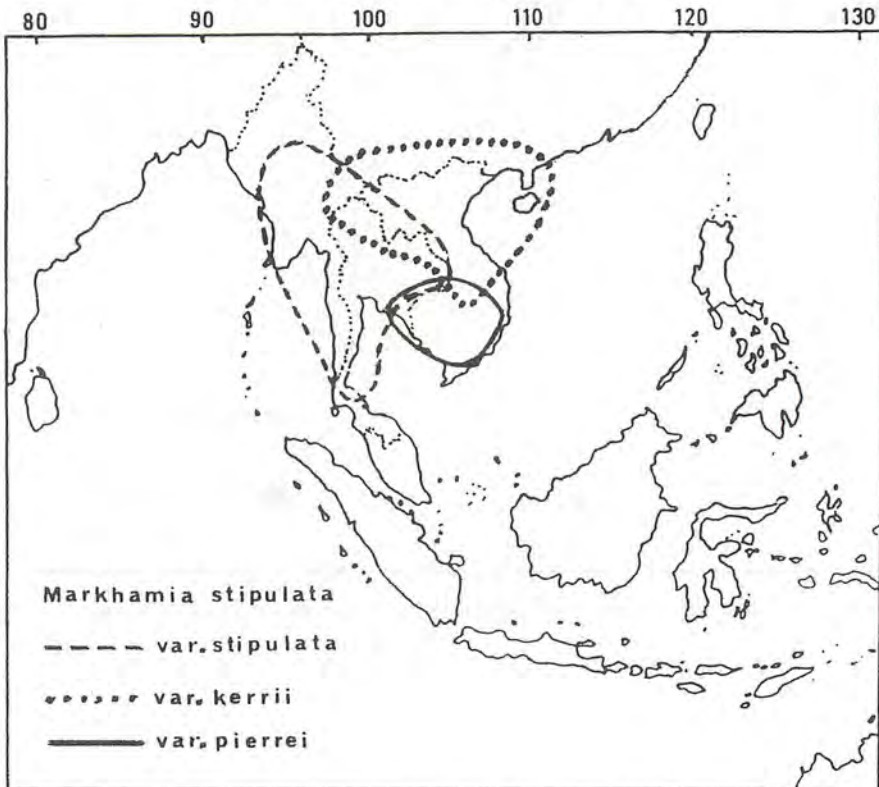


Figure 16. The distributions of *Markhamia stipulata* var. *stipulata*, var. *kerrii*, and var. *pierrei*.

1. var. *stipulata*

Distribution. Burma, Tenasserim, the Andaman Islands, Thailand, and Laos.

2. var. *kerrii* Sprague

Syn.- *Spathodea cauda-felina* Hance

- *Dolichandrone cauda-felina* (Hance) Benth. & Hook. ex Hemsl.
- *Markhamia cauda-felina* (Hance) Sprague
- *M. stipulata* (Wall.) Seem ex K. Schum. var. *cauda-felina* (Hance) Santisuk

Distribution. S. & SE. China (Yunnan, Lungchow, Kochow, Hainan), Burma, Thailand, Laos, and northern & central Vietnam.

3. var. *pierrei* (Dop) Santisuk

Syn.- *Markhamia pierrei* Dop

Distribution. Southeastern Thailand, Cambodia, and Vietnam.

14. DOLICHANDRONE (Fenzl) Seem.

Ten species, one in tropical E. Africa, 5 in tropical S. & SE. Asia, 3 in tropical N. Australia, and one widely distributed from Malabar through Indo-Malesia to New Caledonia; 3 species in the mainland SE. Asia.

KEY TO THE SPECIES OF DOLICHADRONE

1. Lower cylindrical tube of corolla slightly longer than campanulate-widened upper tube; leaflets remotely serrate to obscurely serrate; seeds thin, rectangular, with lateral membranous-hyaline wings; inland tree 1. **D. serrulata**
1. Lower cylindrical tube of corolla much longer than campanulate-widened upper tube; leaflets entire; seeds thick, corky, or thin, with lateral membranous-hyaline wings
 2. Capsule elongate, linear-flattened; pseudoseptum broad, thick, corky; seeds very thin, with lateral membranous-hyaline wings; lower cylindrical tube of corolla at least three times as long as campanulate-widened upper tube; inland tree 2. **D. columnaris**
 2. Capsule elongate, subcylindrical, slightly compressed; pseudoseptum flattened, hard; seeds and lateral wings thick, corky; lower cylindrical tube of corolla about twice as long as campanulate-widened upper tube; back-mangrove tree 3. **D. spathacea**

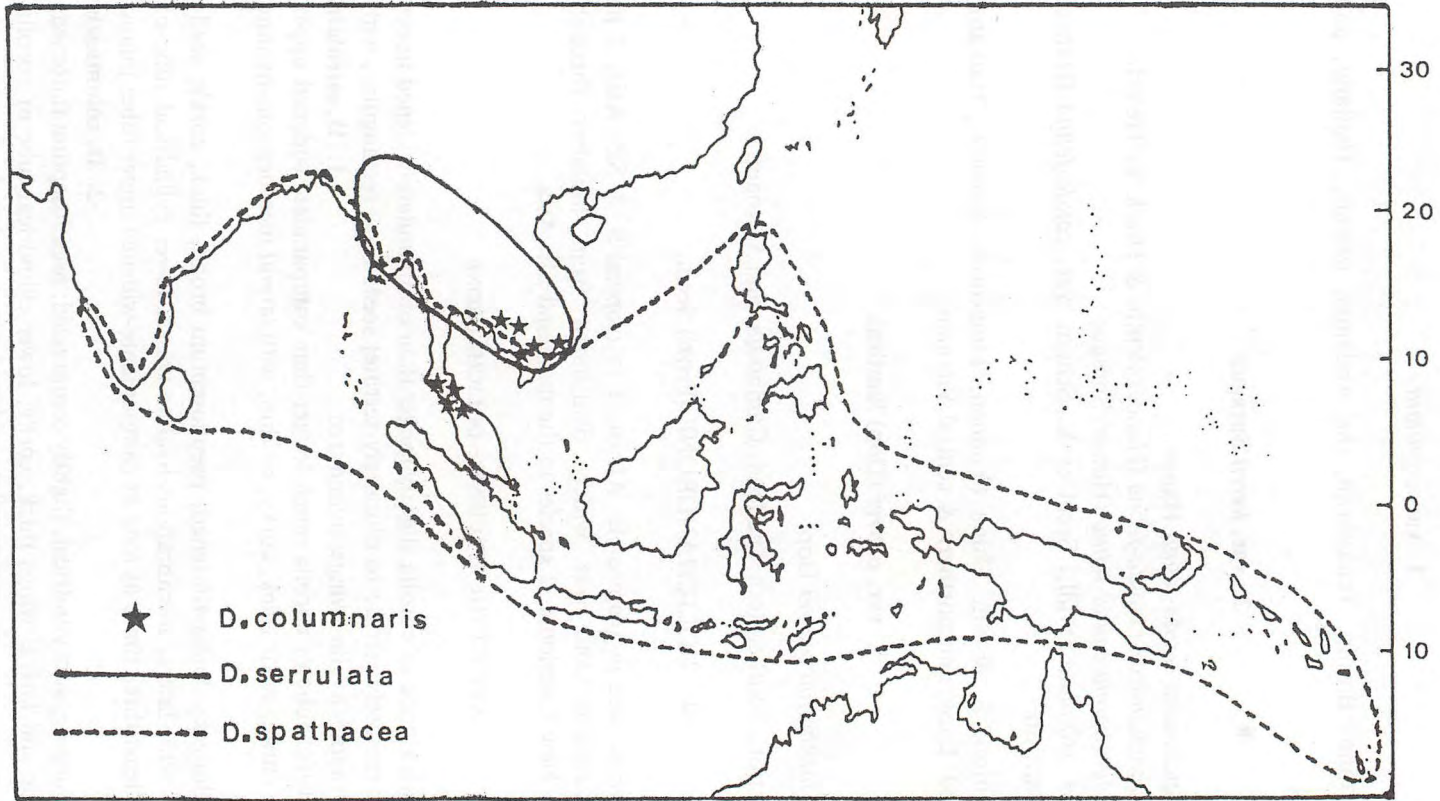


Figure 17. The distributions of *Dolichandrone columnaris*, *D. serrulata*, and *D. spathacea*.

1. *Dolichandrone serrulata* (DC.) Seem.

Syn.- *Stereospermum serrulata* DC.
- *Spathodea serrulata* (DC.) DC.

Distribution. Burma, Thailand, Laos, and Vietnam.

2. *Dolichandrone columnaris* Santisuk

Distribution. Peninsular Thailand, northernmost Malay Peninsula, Cambodia, and southern Vietnam.

3. *Dolichandrone spathacea* (Linn.f.) K. Schum.

Syn.- *Bignonia spathacea* Linn. f.
- *B. longissima* Lour.
- *Dolichandrone longissima* (Lour.) K. Schum.
- *Spathodea longiflora* Vent.
- *S. rheedii* Spreng.
- *Dolichandrone rheedii* (Spreng.) Seem.
- *Spathodea loureiriana* DC.

Distribution. Widely distributed in the Indo-Pacific area from Malabar, South India, Sri Lanka, eastwards throughout tropical SE. Asia and Malesia to the New Hebrides and New Caledonia.

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Figure 18. *Dolichandrone columnaris* Santisuk. A detached corolla. (Satun, May 1984).



Figure 19. Typical trees of *Dolichandrone columnaris* Santisuk in the coastal rice fields of Langu-Thung Wa route, Satun Province.

- Figure 20. *Dolichandrone spathacea* (L.f.) Schum. Calices and corollas (Bandon, Suratthani, June 1984).
- Figure 21. *Markhamia stipulata* (Wall.) Seem. ex Schum. var. *kerrii* Sprague. Corollas and a capsule (Paai, Maehongson, May 1973).



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Figure 22. *Radermachera ignea* (Kurz) Steenis. Calices and corollas (Paai, Maehongson, June 1973).

Figure 23. *Barnettia kerrii* (Barnett & Sandwith) Santisuk. Inflorescences (Phra Putthabat, Saraburi, January 1974).



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Figure 24. *Radermachera glandulosa* (Bl.) Miq. An inflorescence (La-un, Ranong, September 1984).

Figure 25. *Radermachera hainanensis* Merr. Inflorescences and capsules (Pakthongchai, Nakhon Ratchasima, April 1980).



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Figures 26 & 27. *Sterepermum neuranthum* Kurz. 26, Calyx and corolla (lateral view). 27, Corolla (front view) (Hod, Chiangmai, June 1973).



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- Figure 28. *Stereospermum colais* (Buch.- Ham. ex Dillw.) Mabblerley. Corollas. (Paai, Maehongson, May 1977).
- Figure 29. *Stereospermum fimbriatum* (Wall. ex G.Don) DC. A corolla with deeply incised lobes. (Chumphon, March 1979).



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