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中外交流

GYMNOSPERMAE OF GUANGXI, SOUTH CHINA

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Abstract 43 species of Gymnospermae are indigenous to Guangxi, comprising Cycadaceae (3), Cephalotaxaceae (4), Taxaceae (4), Podocarpaceae (6), Pinaceae (17), Taxodiaceae (1), Cupressaceae (3) and Gnetaceae (5). Although the group is widespread in the province members are concentrated on the mountain ranges of the north and centre where there are acidic rocks and the climate is cooler. Several species of *Keteleeria* do grow on the limestone rock which covers over half the surface and they also tolerate greater dryness than other gymnosperms except the lowland *Pinus* species. A few species are very rare and localised, but there is litt e endemism because Guangxi has few natural boundaries.

Key words Gymnospermae, Guangxi, taxonomy, distribution, Cycadaceae, Cephalotaxaceae, Taxaceae, Podocarpaceae, Pinaceae, Taxodiaceae, Cupressaceae, Gnetaceae.

Introduction

Guangxi Province is between 21.5 to 26.4° N and 104.5 to 112° E. It is bounded by the provinces of Yunnan to the west, Guangdong to the east, Hunan to the north, Guizhou to the north-west. To the south west lies Vietnam and in the south is the Gulf of Tonkin in the China Sea.

The Tropic of Cancer thus bisects Guangxi and the climate is tropical in the south, subtropical in the north, and warm temperate on the mountains which are found mainly in the middle and north of the Province. The region is influenced by S.E. monsoonal conditions in the summer and by the

Central Asian high pressure system in the winter which periodically results in cold fronts moving south and affecting abroad band of territory down the middle of the Province right to the Vietnamese border and the island province of Hainan just offshore. The western and eastern-most parts of Guangxi largely escape this cold air movement between October and April.

The topography of Guangxi is very varied. In the north the mountains rise to just over 2,100 m and all the higher areas above about 1,500 m are composed of acidic sandstone, metamorphic and granitic rocks. Sandstones in particular often occur at lower altitudes but around 60% of Guangxi has limestone strata at the surface. These are commonly in the form of conical hills and between them are often broad valley bottoms. The latter are usually modified by intensive cultivation and the fertile alluvial soil supports a large population. There is a general trend downwards to the lower and more level terrain of the east and south-east.

The vegetation of Guangxi has long been subjected to modification by people and much of the original broad-leaved evergreen forest has been repeatedly destroyed (Lu Y.X. & Liang C.F. 1983). The results are varying stages of secondary forest, scrub and grassland. There is also variation from tropical plant communities in the south and south-west to subtropical ones over much of the province, with warm temperate communities on the higher mountains above c. 1500 m. There are four floristic regions in Guangxi; north and north-east, west and north-west, south-west and east. A moisture gradient exists which results in increasing dryness towards the west. The latitudinal extent of the plant regions tends to be higher in the west. Superimposed upon this regional zonation mediated by altitude and climate is the effect of the acidity or alkalinity of the underlying rocks (Lu Y.X. & Liang C.F. loc. cit.).

General distribution of gymnosperms

The political or administrative borders of Guangxi do not coincide with natural barriers to the spread of gymnosperms or with the boundaries of the major floristic regions of eastern Asia. Thus endemism in the province is low and the few endemic taxa are only distinct at infraspecific rank or if treated as species have very close relations elsewhere. However, considering somewhat wider are including E. Yunnan, Guizhou and S. Hunan in particular the level of endemicity is much greater. Several of the gymnosperm genera now confined to the S. China region once had a much wider distribution as shown by the fossil record (Florin 1963).

Many western areas are occupied by limestone hills, this dissected topo-

graphy extends into Guizhou, Yunnan and Vietnam. The majority of species only grow in the higher hills and mountains from about 700 m upwards, such areas being concentrated in the north and north-east and in several central areas, e.g. the Dayaoshan Range in east central Guangxi where about 20 species were collected in a recent botanical survey. The gymnosperms occupy a range of habitats in these central and northern areas. However, there are a number of species which grow exclusively or partly on limestone.

Predictably the distribution of gymnosperms within Guangxi is usually discontinuous because this dissected terrain has large tracts of intensively cultivated lowlands and dry limestone hill country devoid of gymnosperms. Guangxi is in a geologically old region of southern China, to the west of which lies the more recent complex of mountain ranges forming the Himalayan chain. This extends eastwards and northwards into south-western China involving Xizang, Yunnan and Sichuan Provinces. Guangxi is also near the northern margins of the great tropical rainforest region of South East Asia. Thus Guangxi's gymnosperms are composed of elements of an old southern and central Chinese flora, a younger Sino-Himalayan flora and a South East Asian rainforest flora.

In an interesting paper on the distribution of conifers in Sichuan by Kuan Chung-tian (1981) the author concludes that the western half of that province is dominated by more recently evolved taxa which are part of the Sino-Himalayan flora, whereas the eastern half partakes much more of the characteristics of the ancient Chinese flora. The floristic richness of E. Sichuan and the region of China to the east, i.e. including Guangxi, also results from the diversity of topography and climate and its freedom from Pleistocene glaciations (Florin 1963).

In the southern tropical forests of Guangxi along the Vietnam border the few gymnosperms present are mostly not coniferous. Usually they extend southwards to Indochina and Thailand and sometimes westwards through southern Yunnan to Burma and north-east India, or occasionally further afield in South-East Asia. South of Guangxi is the large island province of Hainan. In the mountainous centre of Hainan occur many closely related plants to those in southern Guangxi, several being gymnosperms. Eastern Guangxi near the Guangdong border has few gymnosperms, indeed the latter province has many fewer species than Guangxi. Still further eastwards there are links between the gymnosperms of Guangxi and the island of Taiwan. North of Guangxi there are many species shared with Guizhou and Hunan but few of them extend north of the Yangtse River. Across the China Sea

a few Guangxi species also occur naturally in Japan.

Frequency of gymnosperms in Guangxi

As in many other parts of the world, gymnosperms in Guangxi grow gregariously in small stands or large forests or are scattered through forests of other gymnosperms or broadleaved trees, often in mixed forests of both types. Other species are plants of open sites on high ridges, steep cliffs and mountain tops. Towards the centre and south, such habitats sometimes support a low, stunted and gnarled moss forest because of the frequency of wind, mist and rain.

Conifers forming dense stands include members of the Pinaceae such as *Pinus massoniana, P. yunnanensis,* and species of *Keteleeria* such as *K. fortunei*. On the other hand, *Dacrycarpus imbricatus* and *Nageia fleuryi* are examples of species which are scattered. Open ridge tops, peaks and cliffs have species such as *Cathaya argyrophylla, Podocarpus pilgeri* and *Pinus kwangtungensis* in the higher areas with acidic rocks, and lower down on limestone hills in W. and S.W. Guangxi are species of *Cycas* and *Keteleeria*. Most of the above species are canopy forming trees, sometimes emergents like *Dacrycarpus imbricatus*, whereas species of *Cephalotaxus*, Taxaceae and other *Podocarpus* are often understorey or middle storey trees and shrubs.

The gymnosperms of Guangxi vary greatly in their overall abundance, as discussed in detail in the notes on each taxon. *Pinus massoniana* is present in low altitude non calcareous habitats all over the province and often in uniform, single species forests. In the far west it is replaced by *P. yunnanensis* var. *tenuifolia* which, like *Cephalotaxus fortunei* and *Keteleeria calcarea*, is locally common or abundant. More scattered but still common in low altitude evergreen broad-leaved forest is *Podocarpus neriifolius*. Other species are uncommon but widespread; e.g. *Amentotaxus argotaenia, Fokienia hodginsii, Hesperopeuce longibracteata, Gnetum montanum,* their presence to some extent reflecting the distribution of mountains of acidic metamorphic or volcanic rocks. Some species are rare and local such as *Calocedrus macrolepis, Cathaya argyrophylla, Cycas micholitzii, Nageia fleuryi* and the two species of *Abies*. Very few are rare but scattered widely, e.g. *Pseudotaxus chienii* and probably *Cephalotaxus oliveri*.

Statistics of the gymnosperm flora

For this account 43 species of gymnosperms are described and treated as being probably indigenous to Guangxi, whereas 33 species are listed as indigenous there by Anon. (1979). There is some uncertainty about the status of a few species for two reasons. (1) For those with very close relatives in

neighbouring provinces there was sometimes very limited material available of the relevant taxa and thus it has not been possible to confirm their distinctiveness. (2) The true nativity of several species which have been widely cultivated in China and beyond for a long time is uncertain. Any instances where a species is definitely known to have been brought to Guangxi by humans, even though it may now be wild there, has been excluded from the main list. The mostly Northern temperate families Cephalotaxaceae, Cupressaceae, Pinaceae, Taxaceae and Taxodiaceae have 29 species. The Southern Hemisphere Podocarpaceae has 6, whilst the widespread tropical Cycadaceae and Gnetaceae have 8.

It is probable that one or two more gymnosperms remain to be discovered in Guangxi, most likely in the dissected upland regions in the south west near the borders of Vietnam and Yunnan where population pressure is low and the vegetation has not been much modified and apart from Longgang Conservation area has been inadequately botanised. One of the most likely species is *Dacrydium elatum* (Roxb.) Wallich (= *D. pierrei* Hickel in Chinese floras), a widespread species which occurs northwards to just across the border in Hanoi Province of Vietnam and in northern Laos a little further west. It is the most northerly representative of a predominantly Southern Hemisphere genus although *D. pectinatum* Laubenf. extends to Hainan.

Gymnosperms cultivated in Guangxi

As in most parts of China, gymnosperms are popular in cultivation in Guangxi. Several indigenous species are grown, sometimes as plantations and often for ornament. Many species from other parts of China are also cultivated, mostly in limestone free sites, especially in the cooler north-eastern region such as in and around Guilin. A complete list of genera in E. Asia which do not occur naturally in Guangxi is given in an appendix.

Gymnosperms from beyond China are rarely cultivated in Guangxi except for *Cedrus deodara* Loudon from Afghanistan and the West Himalaya, one or two species of *Araucaria* Juss. from the south west Pacific and Australia and occasionally a N. American conifer. Thus the main cultivated species are Chinese although usually not indigenous to Guangxi: A significant exception is *Cycas revoluta* which seems to be indigenous in western parts of Guangxi but which is cultivated in pots and ornamental flower beds across the Province.

The commonest cultivated Chinese species which are not indigenous to

Guangxi are; *Cryptomeria japonica* var. *sinensis* Sieb., *Juniperus chinensis* L. (= *Sabina chinensis* (L.) Antoine, *Platycladus orientalis* (L.) Franco (= *Thuja orientalis* L.) and *Ginkgo biloba* L. The famous "living fossil" *G. biloba is* the sole extant representative of a subclass which was widely distributed across the northern continents of Mesozoic times. It is not only valued for its ornamental qualities but also for its edible seeds and its wood. In several villages of Xingan County north-east of Guilin ginkgo trees are abundant and important to the local economy.

Presentation of checklist

Pinyin spellings of Chinese names are used to conform with modern Chinese usage. This results in some less familiar spellings, e.g. Guangxi instead of Kwangsi and Guilin instead of Kweilin. A few are much less obvious, e.g. Xizang for Tibet and Zhejiang for Chekiang.

The families and higher ranks are treated in a different order to that in Flora Reipublicae Popularis Sinicae (cited as F.R.P.S. in the account) e.g. the Podocarpaceae which is included in the Pinopsida and not in the Taxopsida along with *Taxus* and its relatives. This reflects recent taxonomic studies by workers in various countries, notably de Laubenfels (1988) and Hart (1987).

Genera and species are treated alphabetically within the family and the short diagnostic and comparative descriptions have been usually compiled from the herbaria at Yanshan (near Guilin, Index Herbarium Code IBY), Kunming (Yunnan, KUN) and Xiangshan (near Beijing, PE). Where possible living material in Guangxi and Yunnan was also used, this being mainly from cultivated plants. Distribution data was usually obtained from Chinese Floras and from discussions with the staff of the above herbaria. Information from material of Guangxi plants wild or cultivated outside China has been excluded.

Very few accounts written in non-Chinese languages give more than a few passing references to Guangxi, e.g. in his comprehensive book on *Pinus* Mirov (1967) indexes 18 references to Yunnan and none for Guangxi. A notable exception is Hu Shiu Ying (1964) in her account of Chinese gymnosperms in Massachusetts herbaria. The main work consulted for this account was "Flora Reipublicae Popularis Sinicae" Gymnospermae. Volume 7, (1978). The boundaries of the People's Republic of China as accepted in that work have been followed here. Thus, China includes autonomous regions such as Xizang (Tibet), Xinjiang (Sinkiang), Nei Mongol (Inner Mongolia) and in addition the island of Taiwan (Formosa). The large

southern island of Hainan has recently been elevated to full provincial status.

The studies for this paper were made during five months spent at the Guangxi Institute of Botany in 1988 and resulted from an invitation by the Institute to investigate the taxa of Gymnospermae present in Guangxi and their relationship to those of surrounding regions. The work was mostly carried out at the Guangxi Institute of Botany, near Guilin in north-east Guangxi, using the Herbarium (IBY) and the nearby experimental plantings and Guilin Botanic Carden. In addition Guangxi gymnosperms were studied in the Herbaria at Kunming (KUN) in Yunnan and Beijing (PE), as well as at Kew (K) the British Museum National History (BM), Dublin (DBN) and Leningrad (LE).

Descriptive account of gymnosperms of Guangxi

Cycadopsida 苏铁纲*

Cycadaceae** 苏铁科

Cycas L, 苏铁属

20 species. From E. Africa and Madagascar to N. Australia, W. Polynesia and northwards to S. China.

7 species recorded for China, including 1 endemic to Taiwan and 1 in Hainan. *Cycas* species probably extend naturally across southern China, as far north as the Yangtse River and as far east as Taiwan. Three species are accepted here for Guangxi, two confined to limestone areas near the Vietnam border and the third is more widespread. None are endemic to Guangxi and all are described and keyed out for Indo China in Lecomte (1931 pp 1086-1087), but neither his microsporophyll apex character used for male plants or ovule number for female plants will identify Guangxi plants.

In addition to the 3 species described below a cycad was recently collected in Longlin county in N. W. Guangxi near the Guizhou border (Wei Fanan pers. comm.). The plant was growing naturally and although it remains unidentified it seems to be most closely related to *C. pectinata* Griffith, a species from N.E. India. Burma, Thailand and the Indochina region, which in China is only present naturally in S. Yunnan. *C. pectinata*

* The Chinese names of all taxa are added by the editor.

** The morphological description to each family, genus and species are deleted by the editor because the space is limited.

is cultivated elsewhere however, including Guangxi where it has a large stout, but short, trunk and leaves which are longer and with wider pinnae than its close relation *C. siamensis*. The latter (at least in Guangxi) does not seem to have the spiny teeth of the megasporopohyll lamina that *C. pectinata* is said to have.

Cycas micholitzii Dyer **叉叶苏铁**

(*C. rumphii* Miq. var. *bifida* Dyer)

Distribution: In Guangxi confined to Longzhou County in the S. W. and bordering Vietnam. Also occurs in Hanoi Province (northern Vietnam) and Laos from where it was described. In Guangxi it grows on limestone, mainly on valley slopes with broad-leaved forest. There it is an understorey plant, but it sometimes grows in more exposed habitats on cliffs and hill tops where the forest cover is thin.

This rare Guangxi plant recently produced its cone for the first time in cultivation in China, at Yanshan near Guilin. An examination of the type at Kew shows that the Guangxi plants are correctly placed in *C. micholitzii*. It was named tentatively as this in F.R.P.S. Identifiable at once by its forked leaves.

Cycas revoluta Thunb. **苏铁**

Distribution: Occurs naturally in parts of S. and S.W. China but is so widely and commonly cultivated throughout southern and central regions that its real distribution cannot now be determined. Wild in S.W. Guangxi and grows in acidic and alkaline soils.

Beyond China *C. revoluta* seems to occur naturally throughout S.E. Asia, also Indonesia and the Philippines. *C. revoluta* is easily the most commonly cultivated gymnosperm in Guangxi and its stems are exported for propagation to other provines.

Cycas siamensis Miq. **山菠萝**

Distribution: In China confined so S. and S.W. Yunnan and S.W. Guangxi (Longzhou and Longsheng Counties) near Vietnam. Also occurs in Vietnam, Laos, Thailand and Burma. *C. siamensis* is a limestone species and grows on hill slopes and cliffs, often in quite exposed habitats in Guangxi. Similar habitats are roported from Thailand. Also cultivated in S. China, at least at Yanshan near Guilin and in Guangdong.

Taxopsida 红豆杉纲（紫杉纲）

Cephalotaxaceae 三尖杉科（粗榧科）

This family of one genus is sometimes put into the Pinopsida with the

Podocarpaceae which also has a very reduced cone. However, Fu Likuo (1984) concluded that the Cephalotaxaceae belonged with the Taxaceae and more recently Hart (1987) using cladistic analysis reached the same conclusion.

Cephalotaxus Siebold et Zucc. **三尖杉属**

7-9 species in eastern Asia ranging from Assam to Japan and from C. China (Hebei and Shanxi) to S. Vietnam. *Cephalotaxus* is centred in China where 7 species are indigenous (1 endemic to Taiwan).

4 species occur in Guangxi but none are endemic. The status of one of them is uncertain and more study of the ecology of some taxa is needed. Traditional characters such as colour of stomatal bands and leaf apex are of limited value because of the variation within populations (Fu Likuo 1984). In his revision Fu Likuo (loc. cit) uses morphological, anatomical and chemical data to support his taxonomic conclusions.

Cephalotaxus speeies are widely distributed in the hills and mountains of Guangxi and neighbouring provinces where they grow on acidic rocks, volcanic and sandstone and sometimes also on limestone. Often they are forest understorey plants.

Cephalotaxus fortunei Hook. f. **三尖杉**

Distribution: The most widely distributed species in China occurring from Yunnan and Sichuan eastwards to Zhejiang and Fujian. In Guangxi widespread in the mounains where it grows in light forest or sometimes in the open. On steep slopes of acidic sedimentary and volcanic rocks. Distinguished from other *Cephalotaxus* species by its longer leaves.

Like most species the hard wood is valued although rarely available for commercial use. However, a modern use of the plants is the extraction of alkaloids from shoots, leaves and seeds for use against cancer. Other species of *Cephalotaxus* have been investigated but seem to be inferior to *C. fortunei*.

Cephalotaxus mannii Hook.f. **海南粗榧**

(*C. hainanensis* H.L.Li, *C. griffithii* Hook.f.)

Distribution: China; Xizang, Yunnan, Guangxi, Hainan, Guangdong. On acidic rock in subtropical forest. In Guangxi probably confined to the W. and N.W. towards the Yunnan border. Elsewhere occurs in Vietnam, Laos?, N. Thailand, Upper Burma, Assam.

Guangxi plants are quite uniform and also match specimens from Hainan, the type area for *C. hainanensis* (described from sterile matcrial), a name by which Guangxi plants have been sometimes known, e.g. in F.R.P.S. Also,

specimens from S.E. Xizang are conspecific with Guangxi and Hainan plants (Fu Likuo 1984). Furthermore, this author concluded from studying the type of *C. mannii* from Khasia in Assam that it was conspecific with that of *C. griffithii* from Manipur in Assam, as well as plants from nearby Meog (Modog) County in S.E. Xizang. Subsequent studies showed that plants from further east also belong to *C. mannii*. For my study specimens from Xizang, Yunnan and Guangxi were examined.

Cephalotaxus oliveri Masters **篦子三尖杉**

Distribution: China, south of the Yangtse; E. Yunnan, Sichuan, Guizhou, Guangxi, Hunan, Hubei, Jiangxi and N. Guangdong. Also in Hanoi Province, Vietnam. Although Guangxi is not included in the distribution by F.R.P.S. there are a few specimens from north-eastern areas adjoining Hunan. There it grows on acidic rocks and is an understorey shrub in low or rather open forest.

C. oliveri is easily recognised from all other species by its distinctive leaves, the basis for it being separated into section *Pectinatae* (Fu Likuo 1984 and Li Ying, Wang Fu-Hsium et Chen Zu-keng 1986).

Cephalotaxus sinensis (Rehder et E. Wilson) H.L. Li **粗榧**

Distribution: widely distributed across S. and C. China from Yunnan and Sichuan to Fujian and Zhejiang, mainly in the south but extending northwards to S. Gansu, S. Shaanxi, Henan and S. Anhui. In Guangxi *C. sinensis* is an understorey shrub or small tree in open forest on steep hill slopes of acidic, volcanic and limestone rock. Widespread but scattered and generally uncommon, mostly occurring in the northern half.

C. sinensis is a rather ill-defined species and herbarium specimens are often difficult to separate from *C. mannii*. Living plants show diagnostic leaf and seed characters much better (Fu Likuo pers. comm.). There are two widespread varieties with var. *latifolia* Cheng et L.K. Fu (= *C. latifolia* L.K. Fu) less widespread but recorded from much of S. China, including Guangxi, where it is rare. The type locality is Miaoshan in the N.E. var. *latifolia* usually has longer and wider leaves with whiter stomatal bands below and more obvious secretory cells than var. *sinensis* and there seems to be a colour difference in the shoots. There are other reported differences in leaf anatomy (Fu Likuo 1984) but I am unconvinced that separation at specific level is appropriate.

Taxaceae 红豆杉科（紫杉科）

Amentotaxus Pilger **穗花杉属**

3 species, all indigenous to China, 1 endemic to Taiwan.

Shrubs or small trees, mostly growing in the forest understorey.

It has been suggested that this genus is intermediate between Taxaceae and Cephalotaxaceae (it was once included in the latter) and should constitute a separate family, Amentotaxaceae (Xi Yizhen 1986). This is not followed here, one reason being that the relationship between *Amentotaxus* and the geographically remote *Austrotaxus* Compton from New Caledonia needs clarifying. The two genera have many features in common and within Taxaceae sens. lat. they are apparently closer to each other than either is to the other 3 genera.

Amentotaxus argotaenia (Hance) Pilger 穗花杉

(*Cephalotaxus argotaenia* (Hance) Pilger)

Distribution: S. Gansu, S.E. Xizang, Yunnan eastwards to Hubei, N.W. Jiangxi and Fujian, mainly south of the Yangtse and with a distribution gap in the middle, also in Delei Valley, Assam, near the Xizang border.

In Guangxi scattered in moist valleys on acidic rock in a number of mountain areas. usually below 1000 m. A forest understorey species in many parts of the province from the S.W. (Longzhou County) to the N.E. (Huaping area).

The closest of the other two species to *A. argotaenia* is *A. formosana* from Taiwan and they have been considered conspecific.

Amentotaxus yunnanensis H. L. Li 云南穗花杉

Distribution: S.E. Yunnan, W. Guangxi (Debao County) N.W. Vietnam. A limestone species which is a forest canopy tree instead of an understorey species on acidic soils like *A. argotaenia*.

A. yunnanensis was apparently hitherto unknown from Guangxi until a specimen was collected in 1986 by a forester who sent it to the Guangxi Institute of Botany for identification (Wei Fanan pers. comm.). It may also be present in adjoining counties near the Vietnam border.

The best morphological character separating the two species seems to be the leaf stomatal band width and its conspicuousness. The Guangxi specimen of *A. yunnanensis* has larger fruits than any *A. argotaenia* seen at IBY but specimens of the former at KUN have small fruits mostly 2—3 cm long. Flora Yunnanica 4 : 121 (1986) also records smaller-sized fruits of *A. yunnanensis*. Although this work fails to list *A. argotaenia* there are Yunnanese specimens of it at KUN.

Pseudotaxus Cheng **白豆杉属**

(*Nothotaxus* Florin)

1 species endemic to China and with a very discontinuous distribution.

Closely related to *Taxus* but unlike that genus has subopposite or subverticillate branchlets, leaves with glaucous-white stomatal bands twice as wide as the yellowish or greygreen ones of *Taxus* leaves, sterile scales amongst the male sporophylls and more numerous scales at the base of the ovule, as well as a white aril instead of a red one.

Pseudotaxus chienii (Cheng) Cheng **白豆杉**

(*Taxus chienii* Cheng, *Nothotaxus chienii* (Cheng) Florin)

Distribution: Guangxi, Hunan, Guangdong, Jiangxi, Zhejiang(Ching Kang Mountains, the type locality). In Guangxi *P. chienii* has only been collected in a few mountain areas, mainly in the N. E. (Sze-Ming Mountains) and the centre (Dayaoshan Range). It usually grows on acidic rocks but can occur on limestone. Within and beyond Guangxi it is apparently always uncommon or rare and often absent from areas within its general range. An understorey plant of mixed deciduous and evergreen mainly broad-leaved forest. F.R.P.S. comments upon its attractiveness as an ornamental plant.

Taxus L. **红豆杉属**

8 or 9 species distributed across N. Temperate regions southwards to Mexico, the Philippines and Indonesia; a few authorities accept only one or two species, e. g. Pilger (1903). 4 species are accepted here as indigenous to China although they are sometimes difficult to separate because they can appear homogeneous, at least in the herbarium. 1 species with 2 varieties accepted for Guangxi.

Taxus chinensis (Pilger) Rehder **红豆杉**

(*T. wallichiana* var. *chinensis* (Pilger) Florin)

Distribution: var. *chinensis* and var. *mairei* (Lemée et A. Léveillé) Cheng et L.K. Fu. (*T. mairei* (Lemée et A. Léveillé) Hu et Liu). These endemic Chinese varieties have similar distributions; Yunnan, Sichuan, S. Gansu, eastwards to Zhejiang, Fujian, Taiwan (var. *mairei* only), northwards to S. Shaanxi, W. Henan and S. Anhui.

In Guangxi *Taxus chinensis* grows in the N., N.E. and centre (Dayaohan Range), growing on acidic rocks in the mountains. Sargent (1916 p.9) states that the species usually grows on limestone in Sichuan and Hubei, where they are understorey or canopy trees. The maximum height recorded in F.R.P.S. (page 443) being 30m. Apparently both varieties are usually rather scattered

and do not form dense stands such as *Taxus* species often do elsewhere in the world. This rarity may be in part due to felling of trees for their valuable timber. Few large trees are seen now.

Var. *chinensis* and var. *mairei* are separable by a combination of leaf and seed shape characters which are easier to see in fresh material. The great majority of the many specimens in Guangxi (IBY) belong to var. *mairei*, with only a few from Miaoshan and Dupanglin mountains in the north-east corresponding to var. *chinensis*. Var. *mairei* tends to have longer and wider leaves, discolorous and not concolorous below and with sharper apices, and fruits which are obovoid-rounded or oblong-obovoid but not ovoid-rounded. Although both varieties can grow in the same locality var. *mairei* usually grows below 1,200 m, whereas var. *chinensis* is above that altitude.

With hesitation I follow F.R.P.S. and retain the name *Taxus chinensis* for Guangxi plants because it is very likely that they should be treated under *T. sumatrana* (Miq.) Laubenf. based upon Sumatran plants. De Laubenfels (1988 p. 350) includes *T. chinensis* in this species as well as all other populations of *Taxus* from S.E. Asia. One of these is *T. celebica* (Warb.) H.L. Li described from the Celebes and also a name used outside China for most of the plants across S. China. De Laubenfels (loc. cit. p. 351) does not accept that there are two taxa in S. China in the sense used here (he also gives *T. mairei* as a synonym of *T. sumatrana*). Other authors, mainly within China, but also noted authorities beyond (especially Florin (1948, 378-383), have argued for two taxa.

The presence of two infraspecific taxa in Guangxi is described above under *T. chinensis*. This has been done solely to avoid making combinations for them within *T. sumatrana* which might not stand the test of time when the variation within the *Taxus* populations of Indonesia, N. Philippines, S. Vietnam, Upper Burma and the E. Himalaya, as well as S. China including Taiwan, becomes much better understood than at present. De Laubenfel's comment (1988 p. 351) that the two supposed "types" in China are no more than variations that he saw on a single tree in Taiwan does not seem to correspond with the situation in Guangxi.

Pinopsida (Coniferopsida) 松柏纲 (松杉纲)

Podocarpaceae 罗汉松科

The sections of *Podocarpus* L'Hérit ex Pers. described by Pilger (1903) form the basis for the segregate genera of de Laubenfels (1969). These genera are accepted here with the additional change of the generic name *Decussocarpus*

to *Nageia* (de Laubenfels 1987). Thus, the species of *Podocarpus* treated in F.R.P.S. are split into three genera, one of which is *Podocarpus* sens. strict.

Dacrycarpus (Endl.) Laubenf. **鸡毛松属**

(*Podocarpus* section *Dacrycarpus* Endl.)

9 species ranging from S. China to the Malaysian region and southwards to New Caledonia and New Zealand. The species are very distinct from other Podocarpaceae in eastern Asia. The most similar in general tree size and appearance of shoots is the species of *Dacrydium* found in Hainan. However, *Dacrydium* has homomorphic and not dimorphic leaves.

Dacrycarpus imbricatus (Blume) Laubenf. **鸡毛松**

(*Podocarpus imbricatus* Blume)

ribution: China; Yunnan, Guangxi, Guangdong and Hainan. Beyond China it is very widely distributed; N. Burma, Vietnam, the Philippines, the Malaysian region as far east as New Guinea, then absent from the Solomons but reappears in Vanuatu and Fiji. In C., S. and S.W. Guangxi, growing in rainforests from 400-1000 m, in or near valley bottoms on deep acidic or neutral soils. The large trees are often emergent and easily the largest of the podocarps (*Podocarpus* sens. lat.) in Guangxi. In Hainan there are large stands and it is an important tree.

Ac ording to de Laubenfels (1969) plants from northern parts of the species range belong to var. *patulus* Laubenf. This variety also occurs southwards to Sumatra, is absent from many Indonesian islands but reappears in the Moluccas and eastwards in Melanesia (Fiji is the type locality). Var. *imbric tus* grows in the "Indonesian gap". Var. *patulus* is said to have spreading or semi-spreading adult leaves whereas in var. *imbricatus* they are ± appressed (de Laubenfels 1969).

Nageia Gaertner **竹柏属**

(*Podocarpus* section *Nageia* Endl.; *Decussocarpus* de Laubenf.)

6 species distributed from Assam, S. China, Japan, southwards through S.E. Asia and Malaysia to New Guinea and New Britain. 4 species in China, one being endemic to Taiwan and of doubtful status. All belong to section *Dammaroides* (Horsf.) Laubenf. and are generally small to medium-sized forest understorey trees. This section is distinguished by multiveined leaves lacking an obvious midrib. The circumscription of *Nageia* used here is that of Page (1988) and is thus narrower than that of de Laubenfels (1987).

Nageia fleuryi (Hickel) Laubenf. **长叶竹柏**

(*Podocarpus fleuryi* Hickel; *Decussocarpus fleuryi* (Hickel) Laubenf.)

Distribution: China; Yunnan, S. Guangxi, Guangdong. Elsewhere grows in Vietnam, Laos and Cambodia. In Guangxi grows as an understorey tree, e.g. in the evergreen broad-leaved hill forests S.W. of Nanning towards the Vietnam border. Young plants especially can have very large leaves and a specimen from Vietnam seen had larger ones than any seen in China. Apart from *N. wallichiana* (Presl) Kuntze, an E. Himalayan species which just extends to Yunnan and has a fleshy upper peduncle, *N. fleuryi* has the largest leaves of any species of Podocarpaceae in the eastern Asian region.

Nageia nagi (Thunb.) Kuntze **竹柏**

(*Podocarpus nagi* (Thunb.) Makino, *P. nankoensis* Hayata?, *Decussocarpus nagi* (Thunb.) Laubenf).

Distribution: Widespread in China south of the Yangtse; Sichuan, Guizhou and eastwards to Zhejiang, Fujian, as well as Taiwan and Hainan. Also in S. Japan from where it was described.

In Guangxi *N. nagi* is widespread and here as elsewhere in the wild it is a tree of evergreen broad-leaved hill forests, where it can be very common. It occurs from the lowlands to *c.* 1600 m on acidic soils. *N. nagi* is also commonly cultivated across southern China and southern Japan and further north where warm enough. This popular ornamental tree used to be especially planted around temples in China.

In Taiwan there are two taxa which are either regarded as distinct from *N. nagi* (Li, H.L. 1975), or as part of it (de Laubenfels 1987). Although no specimens from Taiwan have been examined for this study, the description and illustration by Li (loc. cit.) of *Podocarpus nankoensis* Hayata match mainland Chinese specimens of *N. nagi* in all significant respects. Thus, I conclude that Taiwan should be included in the distribution of *N. nagi*.

Podocarpus L'Hérit. ex Pers. **罗汉松属**

95 species distributed across tropical and subtropical regions in N. and S. Hemispheres, extending north in Asia to C. China and S. Japan, and south to temperate regions of Australasia and S. America. The Indo-Malaysian region has the highest concentration of species.

Podocarpus is here treated in the narrow sense of de Laubenfels (1948) and is thus equal to *Podocarpus* section *Podocarpus* of Pilger (1903) and F.R.P.S. Furthermore, *Podocarpus* sens. strict. has been divided into subgenera and sections by de Laubenfels (loc. cit.). The three species treated here all belong to subgenus *Foliolatus* Laubenf. (= *Podocarpus* B of Buchholz and Gray 1948). The sections within subgenus *Foliolatus* as outlined by de Laubenfels (loc, cit.) are very difficult to accept, at least from the evidence of

dried material, and are not discussed further here. If they were accepted each of the species below would be in a different section.

Podocarpus macrophyllus (Thunb.) D. Don **罗汉松**

Distribution: var. *macrophyllus*, Yunnan and Sichuan eastwards to Zhejiang, Fujian and Jiangsu north of the Yangtse and var. *maki* (Siebold) Endl. with a similar wide range but also extending north to Shaanxi. Apparently indigenous also in S. Japan. Both varieties are widespread in the hills and mountains of Guangxi and generally form small trees in mixed broad-leaved forest, often as part of a middle storey. It is unclear whether or not there are ecological differences. Var. *maki* has shorter, narrower leaves, is usually a smaller plant and is apparently rarer than var. *macrophyllus*.

Var. *maki* has also been known as *P. chinensis* (Roxb.) Wallich and is the name accepted by de Laubenfels (1985) who treats *P. chinensis* as separate species in the same section as *P. macrophyllus*. However, the key leaf shape characters that he uses seem of little significance because of so much overlap, at least amongst the many specimens from S. and C. China seen.

P. macrophyllus is a very popular ornamental species, particularly var. *macrophyllus*, which is very widely grown across S. China and further north where the climate permits. Likewise it is commonly cultivated in Japan and in both countries its natural range is somewhat obscured by artificial spread in cultivation.

Podocarpus neriifolius D. Don. **脉叶罗汉松**

Distribution: China; S.E. Xizang, Yunnan, Guizhou and eastwards to Zhejing and Fujian, i.e. all provinces south of Yangtse, including Taiwan and Hainan. Beyond China very widespread, extending westwards along the Himalayan foothills to C. Nepal, southwards to Malaysia and as far east as New Guinea, Melanesia (Solomon Islands, Vanuatu, Fiji).

Widespread in Guangxi as evidenced by the large number of specimens from various places. *P. neriifolius* is usually a small understorey tree in evergreen broad-leaved forests on hill slopes and valley bottoms below 1000 m. Although often common the trees are rather scattered. Cultivated in Guangxi and elsewhere in S. China.

Podocarpus pilgeri Foxw. **短叶罗汉松**（小叶罗汉松）

（*P. brevifolius* auct. non (Stapf) Foxw., *P. wangii* Chang）

Distribution: China; Yunnan, Guangxi, Guangdong, Hainan. Beyond China southwards to the Philippines, Indonesia (C. Celebes) and New Guinea.

In Guangxi *P. pilgeri* is a tree of steep and high slopes, exposed ridges and mountain tops where there is frequent wind and a high incidence of fog

and drizzle, occurring between 1500 and 2000 m in stunted mixed broad-leaved and gymnosperm moss forest. Thus *P. pilgeri* trees are usually small and gnarled with coriaceous revolute leaves. Known only from a few scattered localities.

In China *P. pilgeri* has usually been known as *P. brevifolius* (Stapf) Foxw. but de Laubenfels (1988) considers this species to be restricted to its type area, Sabah, N. Borneo, and furthermore puts the Bornean plant into a different section than *P. pilgeri*.

Among the Chinese specimens of *P. pilgeri* examined were a number from Dayaoshan Mountain Range in C. Guangxi, where above *c.* 1500 m this was the only member of the Podocarpaceae seen during a big survey in 1982 (Wei Fanan pers. comm.). Dayaoshan is the type locality for *P. wangii* Chang, treated as a synonym of *P. pilgeri* by de Laubenfels (1985 and 1988). The specimens in IBK match the illustration and type description of *P. wangii* very closely and also agree with descriptions of *P. pilgeri* F.R.P.S. treats *P. wangii* as a synonym of *P. brevifolius* but does not discuss *P. pilgeri* .*P. brevifolius* is said to have acute leaves as opposed to the blunt or rounded ones of *P. pilgeri*. However, both species usually have a similar stunted habit because they both grow in high exposed moss forest. Although only incomplete material of *P. brevifolius* from Borneo was seen it seems reasonable to accept *P. pilgeri* as the correct name for the Chinese plant.

Pinaceae 松科

Abies Miller 冷杉属

C. 55 species, N. Hemisphere, mainly in cool and cold temperate regions, extending southwards in the mountains to Honduras, the Mediterranean region, the Himalaya and S. China.

C. 20 species are indigenous to China, the exact number being still a little uncertain. The taxonomic complexity amongst the firs of W. and S.W. China is unparalleled in the genus elsewhere. Several taxa have been recently reduced from species to variety and a new classification of *Abies* has been proposed by Farjon and Rushforth (1989). 2 species are indigenous to Guangxi, one is endemic. Both are very local, having been described recently from the highest mountains in the north.

Abies yuanbaoshanensis Y. J. Lu et L. K. Fu 元宝山冷杉

(*A. fabri* (Masters) Craib var. *ziyuanensis* (Fu et Mo) Silba)

Distribution: On Rongshui Yuanbao Shan in the north of Guangxi between 1700 and 2050 m. Endemic and on acidic soils overlying old volcanic or metamorphic rocks.

A. yuanbaoshanensis belongs in section *Pseudopicea* Hickel subsection *Delavayianae* Farjon and Rushforth. Lu and Fu compare their species with *A. ziyuanensis*, but as stated below under that species it is not closely related. Furthermore, the very recent reduction of *A. yuanbaoshanensis* o synonomy under *A. fabri* var. *ziyuanensis* (Silba 1990) is quite unaceptable although it is related to typical *A. fabri*. Further west from Guangxi several species of *Abies* are very important components of the mountain forests in Yunnan and Sichuan and it would not be surprising if the closest relations of *A. yuanbaoshanensis* and the following species are found in this region.

Abies ziyuanensis L.K. Fu et S.L. Mo **资源冷杉**

(*A. fabri* (Masters) Craib var. *ziyuanensis* (Fu et Mo) Silba)

Distribution: On Ziyuan Xian Yinzhulao Shan in N.E. Guangxi at altitudes of 1650-1700 m. Also occurs just across the border in Hunan on the continuation of one of these ranges. A forest tree of acidic soils derivep from metamorphic rock.

A. ziyuanensis belongs to section *Momi* Franco subsect. *Holophyllae* Farjon and Rushforth and from the examination of many specimens of this subsection, especially in KUN, it seems to be most closely related to *A. chensiensis* Tieghem; especially subsp. *salouenensis* (Bordéres et Gaussen) Rushforth from Yunnan. Species of section *Momi* grow at lower altitudes in S.W. China as compared to those of section *Pseudopicea* Hickel, this situation also being true for Guangxi; see under *A. yuanbaoshanensis*. Thus, the statement by the authors of *A. ziyuanensis* that their species is most closely related to the E. Chinese *A. beshanzuensis* M.H. Wu is not accepted, in fact the last belongs to another subsection of section *Momi* (Farjon and Rushforth 1989).

Cathaya Chun et Kuang **银杉属**

1 species endemic to a small region of S. China.

The affinities of this distinctive genus have been the subject of much interest amongst Chinese and other botanists since its discovery in 1955 and there is still no consensus about this. In a recent study of relationships among genera in the Pinaceae it is stated that "The position of *Cathaya* in this group [*Larix, Cathaya, Pseudotsuga*] must remain somewhat open...." (Frankis, 1988). The author also concluded that *Cathaya* is more closely related to *Pseudotsuga* than to *Larix*. This contrasts with the uniting of *Cathaya* with *Tsuga* (Silba, 1984). My examination of the plentiful herbarium material of

Cathaya in Guangxi suggested a closer relationship to *Pseudotsuga* although it is easy to see resemblances to *Tsuga* as well, e.g. the decurrent leaf base and subsequent scar and the simple bract scales in the cone are features shared between *Cathaya* and *Tsuga*. One practical difference is that the leaves of *Tsuga* (as well as *Nothotsuga*) absciss as they dry whereas they are retained on the shoot in *Cathaya* like *Pseudotsuga*. From colour photographs of living coning shoots of *Cathaya*, was well as from the appearance of young plants, one can see resemblances to *Keteleeria* also.

Cathaya is apparently an ancient genus which once had much wider distribution because Tertiary fossils from as far west as Iceland are suggested as belonging to it by Page (1988).

Cathaya argyrophylla Chun et Kuang 银杉

(*Tsuga argyrophylla* (Chun et Kuang) Laubenf. et Silba.)

Distribution: N., N.W., C. Guangxi and in neighbouring parts of S. Guizhou and Hunan, also a small area of S.E. Sichuan. *Cathaya* is a mountain plant growing on neutral or somewhat acidic soils overlying volcanic rock between 1400 and 2000 m. Mainly confined to mountain ridge tops and steep cliffs, although the larger trees are on gentler slopes. It often grows with other Pinaceae like *Nothotsuga longibracteata* and *Pinus kwangtungensis*.

Although more small populations of *Cathaya* have been discovered during the past decade; on Dayaoshan Range in eastern-central Guangxi and across the northern borders with Hunan and Guizhou, the species is still considered as vulnerable and needing protection. There are now approximately 3260 plants of all ages known and found in 33 sites which are grouped into 8 areas (Mao 1989). Attempts have been made to cultivate it in Guangxi but they have only been successful in the small mountain station of Hongtan in Huaping Reserve not far from where it grows naturally. *Cathaya* has captured the imagination of many people in China because of a number of semi-popular articles about it. It has been called a "living fossil" and has been regarded as a vegetable equivalent of the giant panda.

Keteleeria Carrière 油杉属

11 species (F.R.P.S.) or as few as 2 (Mabberley 1989). 6 species are listed for Guangxi in Anon (1979) and 2 others have since been described. Lack of specimens and knowledge of their ecology means that it is impossible for me to understand several of the more recent species but I believe that there are no more than half this number. 3 are tentatively accepted for the genus by Farjon in his recent revision (1989).

Keteleeria is centred in S. China, particularly Guangxi, extending north-

wards across the Yangtse and southwards to S. Vietnam and S. Laos. The species grow in uniform stands or are scattered in forests, mainly amongst broad-leaved trees. Most species grow on limestone, others on acidic rocks and at least two can grow on either. Often they grow on hills at medium or low altitudes and can be more drought tolerant than most E. Asian gymnosperms.

Keteleeria calcarea Cheng et L. K. Fu **黄枝油杉**

Distribution: N. Guangxi, S. Guizhou, S. Hunan.

Grows on many limestone hills across the northern half of Guangxi and in the adjoining counties of Guizhou. It is usually the commonest or only gymnosperm present in these calcareous habitats. The trees are scattered or in stands and are often on open exposed hill tops and cliffs where they can be small and stunted. Thus *K. calcarea* can withstand prolonged drought and it is noteworthy that its smaller roots are generally thickened and ± fleshy (Wei Fanan pers. comm.). It is easily the most successful *Keteleeria* in cultivation near the margin of a limestone area at Yanshan near Guilin.

Although only described in 1975 specimens were collected much earlier, these having been variously called *K. fortunei* or *K. davidiana*. Farjon (1989) and Silba (1990) reduce *K. calcarea* to synonymy under *K. davidiana* (Bertrand) Beissner but it is here treated as distinct although closely related to *K. davidiana* and only separable morphologically by a combination of characters.

Keteleeria davidiana (Bertrand) Beissner **铁坚油杉**

(*K. chien-peii* Flous, *K. esquirolii* A. Léveillé, *K. pubescens* Cheng et L.K. Fu).

Distribution: Yunnan, Guangxi, northwards to Sichuan, S.E. Gansu, Hunan, W. Hubei and S. Shaanxi. On limestone hills or occasionally deep sandstone-derived soils from 600-1200 m in N. and N.W. Guangxi. Also in Taiwan if *K. formosana* Hayata is treated as synonymous, e.g. Farjòn (1989).

Var. *chien-peii* (Flous) Cheng et L.K.Fu (= *K. chien-peii* Flous) and var. *davidiana* have both been reported from Guangxi although neither are given from there in F.R.P.S. I cannot distinguish two taxa from specimens labelled as these varieties in IBY and KUN and the above description encompasses both of them. Anon (1979) lists *K. esquirolii* A. Léveillé for Guangxi, but from a number of specimens examined no significant difference from others labelled as *K. davidiana* was observed. Var. *pubescens* (Cheng et L.K. Fu) Silba (*K. pubescens* Cheng et L.K. Fu) is included in *K. davidiana* because the few specimens available for study, including the type, seem to differ from the above varieties only by the greater shoot and cone apophysis hairiness and a

slightly more retuse ovuliferous scale margin, features which are very inconstant in *Keteleeria*. *K. pubescens* was described from northern Guangxi near the Guizhhou border at *c.* 1200 m.

Keteleeria evelyniana Masters 云南油杉

(*K. hainanensis* Chun et Tsiang, *K. roulletii* (A. Chev.) Flous, *K. davidiana* auct. non Beissner)

Distribution: Yunnan, Sichuan, Guizhou, W. Guangxi, Hainan. A limestone hill plant in the counties of Guangxi bordering on Yunnan, where it has been recorded up to 2600 m.

K. evelyniana is related to *K. davidiana*, both having deep brown and often densely hairy shoots and rather thin cone scales with an erose margin. However, *K. evelyniana* has at least some leaves consistently longer as well as differently shaped cone scales. Farjon (1989) reduces *K. roulletii* (A. Chev.) Flous to a variety of *K. evelyniana*. This is the *Keteleeria* from S. Vietnam and S. Laos, thus making *K. evelyniana* the most tropical species. I have not seen specimens from these two countries.

Keteleeria fortunei (Andr. Murray) Carrière 油 杉

(*K. cyclolepis* Flous, *K. oblonga* Cheng et L.K. Fu)

Distribution: E. Yunnan, Guizhou and eastwards to Zhejiang and Fujian. The most widespread species of *Keteleeria* but not present north of the Yangtse. A species of calcareous and acidic habitats. In Guangxi often around the base of limestone hills and sometimes planted there. Mainly present in northern areas but extends southwards at least to the Dayaoshan Range in east-central Guangxi. Occurs up to 1400 m in Guangxi and sometimes forms pure stands.

K. cyclolepis Flous is usually considered to be a distinct species in China, and in IBK there are many specimens labelled *K. fortunei* and others *K. cyclolepis*. Judging from these and others at KUN they are conspecific because morphologically, as well as ecologically and geographically, there seems to be no good distinguishing feature. Silba (1990) makes the combination *K. fortunei* var. *cyclolepis* (Flous) Silba but it is very doubtful if a distinction should be made even at varietal level. Both taxa have leaves smaller than other *Keteleeria* species. *K. cyclolepis* is said to have a few stomatal lines on the upper leaf surface unlike *K. fortunei*, as well as one or two even more insubstantial distinguishing characters.

I accept the reduction of *K. oblonga* Cheng et L.K. Fu to synonymy under *K. fortunei*. There is a discrepancy between the type description of the supposed diagnostic ovuliferous cone scale shape and its shape in the

isotype of *K. oblonga* in IBK. The specific epithet refers to the ovuliferous scale but this is broad and rounded in the isotype as well as in the illustration in F.R.P.S. Another difference is said to be the entire bract scales in *K. oblonga* as opposed to the 3-lobed ones in *K. fortunei*, but this really only amounts to a little less abrupt transition from the apical cusp to the shoulder of the scale in *K. oblonga* and *K. fortunei* shows considerable variation in this feature. *K. oblonga* was described from N.W. Guangxi and said to be confined to hill forests on acidic soils between 380 and 680 m but it is scarcely known apart from the type specimens.

Nothotsuga Hu ex C. Page

1 species endemic in S. China; N.E. Guizhou, N. and C. Guangxi. W. Hunan, N. Guangdong and W. Fujian.

Nothotsuga longibracteata (Cheng) Hu ex C. Page **长苞铁杉**

(*Tsuga longibracteata* Cheng)

In Guangxi on the higher parts of the mountains (to 2100 m), the southernmost population probably being on Damingshan Range in C. Guangxi. Although it can form a large tree it often grows on steep rocky slopes and cliffs where it is only small.

Previously known as *Tsuga longibracteata* in China and elsewhere, sometimes treated, e.g. F.R.P.S., in section *Heopuce* Keng et Keng. f., but very distinct from *Tsuga* sens. strict. (see under that genus here).

Pinus L. **松属**

C. 100 species widely disfributed across temperate and subtropical regions of the N. Hemisphere, extending northwards to subarctic regions and southwards to Honduras, the W. Indies and the Malaysian region.

22 species and 10 varieties are accepted as indigenous to China by F.R.P.S. whereas Mirov (1967) only gives 12 species although stating that several species are imperfectly known. Earlier Lee (1935) accepted 8 species for China. The only large parts of China lacking pines are in the far W. and N.W.

7 species are accepted here for Guangxi, none being endemic. Pines occur in many parts of the province but only *P. massoniana* is abundant over large areas. Several other species are local and confined to the higher parts of mountain ranges. As in other genera of Pinaceae there are more species westwards in Yunnan than eastwards in Guangdong. In Guangxi most pines grow solely or mainly on acidic soils but species in subgenus *Strobus* can grow on limestone. Usually the trees are in dense or uniform stands but on mountain tops and steep ridges the communities are more open and mixed. Alth-

ough not of high quality, the timber is valued for various purposes. Its importance is often a reflection of the fact that pines are often commoner and more readily available than other gymnosperms.

Subgenus **Strobus** (Sweet) Rehder **单维管束亚属**

(subgenus *Haploxylon* (Koehne) Pilger)

Pinus armandii Franchet **华山松**

Disrtribution: E. Xizang, Yunnan, Sichuan, Gansu, Guizhou, then discontinuous eastwards to Henan. A variety occurs in Taiwan. *P. armandii* is included in this account because forests of it grow along part of the Guangxi, Guizhou border in Longlin County (Wei Fanan pers. comm.). Thus despite the absence of specimens in IBY from this county it is presumed to be present in Guangxi. Beyond China *P. armandii* just reaches E. Upper Burma, i.e. near the Yunnan border, and is on several small islands south of Japan (there sometimes regarded as a separate species).

P. armandii grows in limestone areas in Guizhou and other provinces but can grow on acidic rocks. Often in uniform stands but also in mixed broad-leaved and gymnosperm communities. The black wingless seeds of this species are a popular edible product of the markets in town and cities of W. and S. W. China and timber is valued.

Pinus fenzeliana Hand.-Mazz. **海南五针松**

Distribution: Guangxi, only known from a few localities; Damiaoshan Range near the Guizhou border in the N.W., Damingshan Range and Mashan in central and south-central areas; also in S. and C. Guizhou and possibly a little further north; C. Hainan, the type area.

P. fenzeliana always seems to be local and is mostly uncommon. Generally on mountain ridges and summits up to *c.* 1700 m, on acidic or limestone rock, where soils are thin and poor, with larger trees occasionally on deep soils in valleys. Usually scattered. The timber is valued and probably past exploitation accounts for some of its present rarity.

Closely related to *P. armandii* and sometimes confused in the herbaria visited. Vegetative parts are difficult to distinguish but *P. fenzeliana* cones are smaller with thinner scales. Apparently the two species are ecologically and spatially separated in the Guizhou border areas where both occur. *P. fenzeliana* is reduced to synonomy under *P. kwangtungensis* by Farjon (1984) but they are quite distinct.

Pinus kwangtungensis Chun ex Tsiang **华南五针松**

(*P. wangii* var. *kwangtungensis* (Chun ex Tsiang) Silba)

Distribution: Guangxi, Guizhou, W. Hunan, N. Guangdong, C. Hainan. On limestone as well as acidic rocks from 700-1600 m in several areas of Guangxi, especially in the north. Usually in mixed communities, often with other gymnosperms, e.g. as in Huaping Forest Reserve, N.E. Guangxi.

P. kwangtungensis has recently been reduced to a variety of *P. wangii* Hu et Cheng (Silba 1990). This is not accepted here despite the obvious closeness of the two species. Silba (loc. cit.) mentions a slight difference in number of leaf stomatal lines but does not comment upon the leaf anatomy differences such as resin canal numbers given in F.R.P.S. Also the material studied in KUN showed that shoots of the S.E. Yunnanese *P. wangii* are pubescent. Another reason for not changing the status of *P. kwangtungensis* is because Silba (loc. cit.) fails to comment upon the relationship of these Chinese taxa to the similar Japanese *P. parviflora* Sieb. et Zucc. and cones of *P. wangii* seem to resemble those of *P. parviflora* more closely than do those of *P. kwangtungensis*. However, if a detailed study of the three taxa were made it might result in the recognition of only one species.

Interestingly, *P. kwangtungensis* has a similar use in Guangxi to *P. parviflora* in Japan, namely in bonsai culture, and the two species appear very similar when thus treated.

Subgenus **Pinus** (subgenus *Diploxylon* (Koehne) Pilger) **双维管束亚属**

Pinus latteri Mason **南亚松**

(*P. merkusii* var. *latteri* (Mason) Silba, *P. merkusii* var. *tonkinensis* A. Chev., *P. ikedai* Yamamoto)

Distribution: China; Hainan, Guangxi, extreme south, Guangdong. Rare as a wild tree in Guangxi although recorded from several counties. Almost certainly mostly planted in this tropical lowland region. *P. latteri* forms pure forests in the hills and mountains of Hainan from 50-1200 m (F.R.P.S.). but surprisingly I saw no specimens from there. Beyond China occurs in Burma, N. Thailand, N. Laos, northern Vietnam and the Philippines (2 places in Luzon).

The Chinese plants have been variously known as *P. merkusii* Junghuhn et Vriese, the type of which is from Sumatra, *P. ikedai* Yamamoto, described from Hainan, and *P. merkusii* var. *tonkinensis* A. Chev. from Hanoi Province, northern Vietnam. *P. latteri* was described from Burma. Plants from all except the first locality are here treated as conspecific, *P. latteri* being the earliest name available for the species in these northern regions.

P. merkusii is a southernly species and although widely planted elsewhere in the region, it is indigenous to Sumatra only and has the distinction of being

the only pine found naturally south of the Equator. De Laubenfels (1988) gives several features separating *P. merkusii* from *P. latteri*, including a distinct seedling stage only found in the latter, as well as differences in shoot formation, cone shape, apophysis and seed weight. Yet de Laubenfels (loc. cit.) keeps them combined although such characters, plus the wide distribution gap, would usually be regarded as sufficient to separate two species. Silba (1990) however reduced *P. latteri* to a variety of *P. merkusii* and retains var. *tonkinensis* as distinct at varietal level although he states no diagnostic characters.

Pinus massoniana Lambert **马尾松**

Distribution: Most of China south of the Yangtse, from S.E. Yunnan?, E. Sichuan and Guizhou to Zhejiang and in Taiwan and Hainan (var. *hainanensis* Cheng et L.K. Fu). N. of the Yangtse in Shaanxi, Hubei, Anhui and Jiangsu. Beyond China in Hanoi Province, northern Vietnam.

In S. China *P. massoniana* extends from the lowlands to *c.* 1500 m. In Guangxi it is very widespread and often abundant, being only completely absent from the southernmost region and the extreme west. A tree of acidic soils, especially the sandstone which is so common in many places. It often forms dense and uniform stands which on gentler slopes are usually selectively culled by local people. Also extensively planted, including valley bottoms which are sometimes near limestone hills. The distribution, ecology and economic importance of this valuable species is detailed by Zhou and Yang (1984).

P. massoniana is a very commonly used timber tree in Guangxi for many types of construction work, as it also is in provinces to the north and east. Thus, the comment in Dallimore and Jackson (1966) that the wood "does not appear to have an independent commercial value" has no relevance to Guangxi although admittedly the quality is very inferior to gymnosperms like *Cunninghamia lanceolata*.

Pinus taiwanensis Hayata var. **damingshanensis** Cheng et L.K. Fu **大明松**

Distribution: Guangxi and S. Guizhou only. Apparently a rare tree which is scattered in a few mountain localities in each province, occasionally forming pure stands. On acidic soils with a fairly high rainfall. In Guangxi grows mainly in northern areas although the type locality is Damingshan Range in C. Guangxi.

Var. *taiwanensis* was described from Taiwan but is also in several mainland provinces in central and eastern China from S. Hunan (i.e. just north of Guangxi), E. Hebei, S. Henan, eastwards to Zhejiang and Fujian. Separated from

var. *damingshanensis* only by the position of the resin canals (F.R.P.S. 1978, p. 208). The mainland populations of *P. taiwanensis* have often been known as a separate species, *P. hwangshanenisis* Hsia, e.g. Mirov (1967), but tbe differences are so slight that this separation cannot be sustained. *P. taiwanensis* is related to *P. densiflora* from N.E. China and Japan, both having the typical flat and rather thin cone apophyses, although the colour is quite different.

Pinus yunnanensis Franchet var. **tenuifolia** Cheng et Law **细叶云南松**

Distribution: Var. *tenuifolia* only seems to be present in E. Yunnan, S. Guizhou and a small area of far W. and N.W. Guangxi. There it grows on acidic soils from 400-1200 m.

Var. *yunnanensis* grows in S.E. Xizang, S. Sichuan and much of Guizhou and Yunnan. Also recorded for Guangxi (F.R.P.S.) but have not found any specimens so tentatively conclude that only var. *tenuifolia* is present there. The two varieties are separable by the more slender and often longer leaves of var. *tenuifolia* which result in a quite different appearance in living trees. A few specimens from Yunnan at KUN have these features so var. *tenuifolia* must also grow there.

In many respects the appearance of trees of var. *tenuifolia* resembles those of *P. massoniana* and the variety seems to replace the common *P. massoniana* in far W. and N.W. Guangxi. Silba (1990) treats var. *tenuifolia* as *P. insularis* Endl. var. *tenuifolia* (Cheng et Law) Silba but only compares it with var. *insularis* from Luzon in the Philippines. Earlier (Silba 1986) the author included *P. yunnanensis* in *P. insularis* as var. *yunnanensis* (Franch.) Silba and did not mention var. *tenuifolia*, but Guangxi was included in the distribution of var. *yunnanensis*. F.R.P.S. discusses the relationship between *P. yunnanensis* and *P. insularis* stating that they differ in leaf width and thickness and cone scale thickness.

P. yunnanensis seems to be most closely related to *P. kesiya* Royle ex Gordon (= *P. khasya* Royle), a species described from Assam but often considered to extend eastward to S. Yunnan. *P. kesiya* is maintained by F.R.P.S. and said to be easily distinguished from *P. yunnanensis* by shoot size and colour and leaf size and texture, but is treated as a variety of *P. insularis* by Silba (1990, as var. *khasyana*). Farjon (1984) also considers *P. yunnanensis* and *P. kesiya* to be closely related. The uniting of these taxa from Assam to the Philippines and from S.W. China to southern Vietnam (Annam Province) is not accepted here because of insufficient study. Suffice it to say that if their merging eventually becomes accepted the oldest available name appears to be *P. kesiya*.

Pseudotsuga Carrière **黄杉属**

4-5 species; temperate western N. America and W. and S. China. 3 species and 2 varieties occur in China, all endemic, and are distributed from S. E. Xizang and Yunnan to Zhejiang, Fujian and Taiwan, i.e. mostly south of the Yangtse. 1 species in Guangxi with 2 varieties.

Pseudotsuga sinensis Dode **黄杉**

P. sinensis occurs in Yunnan, Sichuan, Guizhou, Guangxi and eastwards to Zhejiang. Only known from a few counties in the west and north-west of Guangxi near the Yunnan and Guizhou borders respectively. This species grows on limestone hills in Guangxi and in neighbouring regions, as well as on ± neutral soils around the margin of such limestone areas. It is probably the only species of the genus growing in calcareous habitats.

Two varieties of *P. sinensis* occur in Guangxi. *P. sinensis* var. *brevifolia* (Cheng et L.K. Fu) Farjon et Silba is apparently confined to Guangxi and Guizhou and is only known from three border areas of W. and N. W. Guangxi. Described as *P. brevifolia* Cheng et L.K. Fu in F.R.P.S. In Guangxi var. *sinensis* only seems to grow in one county in the N. W. bordering on Guizhou. Var. *brevifolia* also grows in this county and, in one instance at least, in the same area. Beyond Guangxi var. *sinensis* is widespread in western and central parts of the range of the species.

Var. *brevifolia* only seems to differ from var. *sinensis* by its shorter and proportionately wider leaves. The type description of *P. brevifolia* compares it only with *P. gaussenii* Flous, now almost certainly better treated as *P. sinensis* var. *gaussenii* (Flous) Silba, from E. China. From the few specimens of the latter seen it is apparent that all three varieties are very closely related indeed. More distinct is *P. forrestii* Craib, the western counterpart of *P. sinensis* from the region where Yunnan, Xizang and Sichuan meet. It has long slender leaves and subglobose cones.

Tsuga Carrière **铁杉属**

10 species, temperate N. Hemisphere; N. America, Asia from Nepal to Japan. 5 species and 4 varieties are accepted for China by F.R.P.S., one of them being what is treated here as *Nothotsuga longibracteata*; very distinct from *Tsuga* species with its leaves radiating round the shoots and larger cones with bract scales at least as long as ovuliferous scales. 1 true species of *Tsuga* is in Guangxi.

Tsuga chinensis (Franchet) Pritzel var. **tchekiangensis** (Flous) Cheng et L.K. Fu **南方铁杉**

Widely distributed in the mountains of the north and centre of Guangxi. Often on steep slopes and cliffs where it forms a small, dense, pyramidal tree, less commonly on gentler slopes where it is taller. Always on acidic rocks or soils derived from them. Also recorded from Yunnan, Hunan, Guangdong, Jiangxi, Fujian and Anhui.

Var. *tchekiangensis* differs from var. *chinensis* by its white stomatal bands and thinner cone scales, both characters often being difficult to determine in older herbarium specimens. The type variety has an even wider distribution, S. Yunnan to S. Gansu and Shaanxi, eastwards to Zhejiang and Fujian but apparently not Guangxi. Some authorities, e.g. Li Hui-Lin *et al.* (1975), regard *T. sinensis* as conspecific with *T. formosana* Hayata from Taiwan.

In Yunnan and Sichuan grows the related *T. yunnanensis* Masters, treated under *T. dumosa* (D. Don) Eichler in F.R.P.S., the latter otherwise a well-known Himalayan species extending from Assam westwards. Yunnan and Sichuan specimens of this taxon are distinguishable from *T. chinensis* by their leaves being obtuse or acute and never emarginate, the cones having thinner and often fewer scales which open more widely and are scarcely shining where exposed. In addition many specimens of *T. dumosa* examined had deep brown, conspicuously hairy shoots.

Taxodiaceae 杉 科

This small family with 9 or 10 genera, each monotypic or with 2 species, has a relic distribution because the fossil record shows that they were once widespread. 5 of the extant genera are concentrated in China south of the Yangtse.

Cunninghamia R.Br. 杉木属

2 species, almost endemic to China; one widespread and the second confined to Taiwan.

Cunninghamia lanceolata (Lambert) Hook.f. 杉 木

Distribution: Widespread in Guangxi and common in many areas but so often planted that its natural occurrence is dfficult to determine and it is possibly only indigenous in the west. Similarly, the distribution given in F.R.P.S. probably does not correspond to its true range which is said to include nearly every province south of the Yangtse, also S. Jiangsu, as well as Hanoi Province, northern Vietnam. On acidic sandstone soils, especially in cooler areas with a fairly high rainfall.

C. lanceolata is the most valuable tree in Guangxi and some other regions in S. China, being used for construction work and furniture making in par-

ticular. The trees can grow on a wide variety of soils, including some moderately alkaline, but the best and largest trees are in mountain valleys with deep neutral to acidic soils and a fairly high and regular rainfall. Unfortunately, there are few of these forest giants left now in Guangxi. Like some other Taxodiaceae the trees have the property of regenerating freely from trunk stumps.

Cupressaceae 柏 科

Calocedrus Kurz **翠柏属**

2 species, 1 in eastern Asia, the other in western N. America.

Until fairly recently included in *Libocedrus* L. but the latter is best regarded as being confined to New Caledonia and New Zealand. Two other species previously included in *Libocedrus*, one in New Guinea and one in Chile are now generally treated as constituting monotypic genera. A recent cladistic study by Hart (1987) strongly suppots the distinctness of *Calocedrus*.

Many authorities treat the Taiwanese plant as a separate species e.g. Li (1975), but as pointed out in F.R.P.S. none of the supposed differences between var. *formosana* (Florin) Kudo and var. *macrolepis*; shoot section, leaf and cone scale shapes, as well as stamen number, are very singificant.

Calocedrus macrolepis Kurz **翠 柏**

(*Libocedrus macrolepis* (Kurz) Benth.)

Distribution: Yunnan, Guizhou, Guangxi, Hainan, Guangdong and adjacent parts of Vietnam and Upper Burma, as well as N. Thailand (var. *macrolepis*); Taiwan (var. *formosana*). A rare species in Guangxi. Occurs wild in the south west (Jingxi County) but is local and scattered. It grows best in warm hill sites not subject to extremes of moisture and temperature and is there a fast-growing tree. The wood is valued for making furniture, probably one reason for its rarity. It is occasionally cultivated in Guangxi.

Chamaecyparis Spach **扁柏属**

7 species; temperate N. Hemisphere, N. America, eastern Asia (especially southern regions). 3 species in China; 1 in S.W. China, 2 in Taiwan, including an endemic species.

The species described here has usually been treated in *Cupressus* L., e.g. in F.R.P.S., but has long been considered anomalous in that genus. Harrison (1966 P. 204) comment upon its intermediate position. However, despite this species having cones which mature in the second year and scale leaves more like a *Cupressus* species, its flattened foliage sprays, cone size and number of seeds per scale link it more firmly to *Chamaecyparis*.

There are true *Cupressus* species in S.W. China, especially *C. torulosa* D. Don, but they do not extend naturally to Guangxi. A taxon of uncertain status (probably originating from the eastern Himalaya) cultivated in Guangxi is the well-known *C.cashmeriana* Royle ex Carrière. The name *C. himalaica* Silba var. *darjeelingensis* Silba has recently been proposed for this taxon and it has also been suggested that it is only a stable juvenile form of *C. torulosa*. The flattened foliage sprays of *C. cashmeriana* recall those of *Chamaecyparis funebris* but they are glaucous instead of green or grey-green. The cones are smaller than in other *Cupressus* species (i.e. more like *Chamaecyparis species*) but there are more seeds per scale than in *C. funebris*.

Chamaecyparis funebris (Endl.) Franco 柏 木

(*Cupressus funebris* Endl.)

Distribution: Exact natural area uncertain because this species is so often cultivated for its timber as well as for aesthetic reasons. In China *C. funebris* grows wild in nearly all areas south of the Yangtse from Yunnan eastwards, excluding the island provinces, and is also apparently wild in all the countries bordering China to the south and southwest; Vietnam, Laos, Thailand and Burma. It probably originated somewhere in the western part of this large region.

In Guangxi *C. funebris* is widespread in the north in forest remnants and similar places, especially near settlements. It usually grows on calcareous or neutral soils and can be locally common. Sargent (1916, p. 56) states it grows best on limestone with pure forests occurring on limestone hills in E. Sichuan and W. Hubei. In Guangxi it is often planted on the lower slopes or around the base of limestone hills but can also be seen in sandstone areas.

Fokienia A. Henry et H. Thomas 福建柏属

Monotypic and endemic to S. China.

Fokienia is a distinctive genus with foliage, particularly leaf shape, resembling *Calocedrus* but cones more like *Chamaecyparis*. These similarities were also pointed out by Dallimore and Jackson, p. 629 (1966) but the authors are wrong in saying *Fokienia* has 12–16 seeds per scale. The adult leaves also resemble those of the Japanese *Thujopsis dolabrata* which is cultivated in S. China (including Guangxi), but *Fokienia* has thin scale leaves and conspicuous branchlet nodes, Whereas *Thujopsis* has thick scale leaves of different alignment and inconspicuous branchlet nodes. The ± globular cones of *Fokienia* show its affinity with subfamily Cupressoideae, whereas *Thujopsis* with elongated cone and very unequal scales clearly belongs to subfamily Thujoideae along with *Calocedrus*.

Fokienia hodginsii (Dunn) A. Henry et H. Thomas **福建柏**

Distribution: From Yunnan and Sichuan eastwards to Zhejiang and Fujian, not occurring wild north of the Yangtse.

Fokienia grows on the higher mountains in the north of Guangxi, often on very steep slopes and cliff faces of acidic rocks. In these habitats it is usually a small scrubby tree. The wood is much prized for making chests and other fine cabinet work so its rarity is in part due to larger and accessible trees being felled.

Gnetopsida 买麻藤纲

Gnetaceae 买麻藤科

Gnetum L. 买麻藤属

C. 28 species; tropical regions of America, W. Africa, S. and S.E. Asia, W. Pacific.

F.R.P.S. gives 7 species for China extending to 26.6°N, but other authorities accept fewer e.g. Maheswari and Vasil (1961) only accepted 1 for China. Differences between taxa are often minor and difficult to see in herbarium specimens. In addition, characters involving sexual parts are of limited value in a dioecious genus. It is therefore perhaps not surprising that there is divergence of opinions on species limits. All species inhabit tropical and subtropical rainforests and swamp forests and range from coastal lowlands to nearly 2000 m. Ecological details are difficult to obtain but the species described below are at least partly separable ecologically (Mao Zong Zheng pers. comm.).

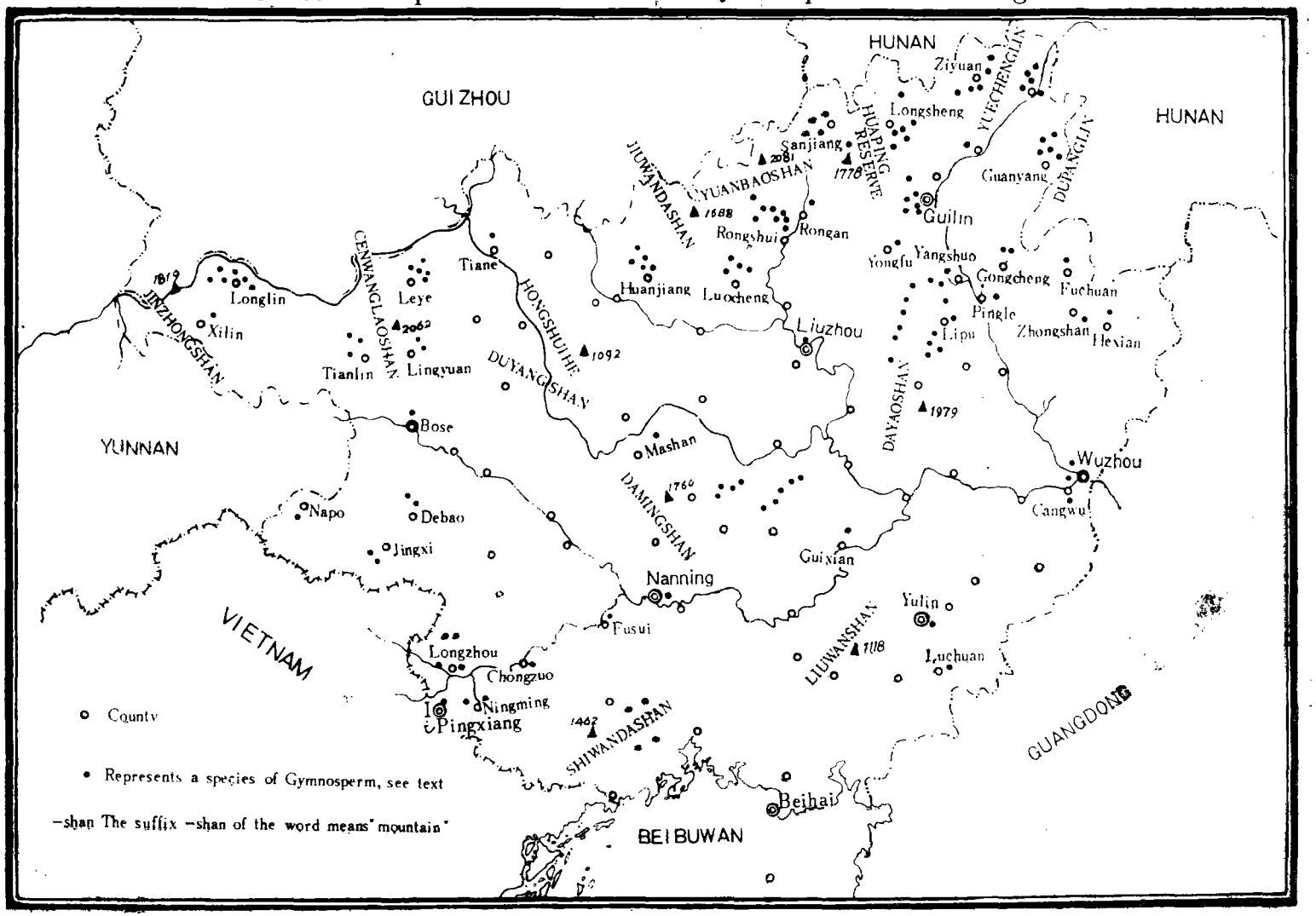
Gnetum is the sole genus in the family and the Chinese species belong to section *Cylindrostachys* Markgr. They are further divided into 2 subsecticns, *Sessiles* Markgr. and *Stipitati* Markgr., according to the presence or absence of a pedicel. This division probably has little taxonomic significance but is maintained by F.R.P.S. 5 species are tentatively accepted here for Guangxi but detailed studies are much needed, especially of the variation in wild populations. All the Chinese plants are lianes with thick rope-like stems.

Gnetum gracilipes C.Y. Cheng **细柄买麻藤**

Distribution: Apparently endemic to Guangxi. Southern lowland rainforest areas from near the Vietnam border northwards, sometimes in swampy terrain.

G. *gracilipes* is very closely related to *G. montanum* and *G. pendulum* in subsection Stipitati. From the limited herbarium material available, including a sterile isotype, I am unable to comment upon its specific distinctiveness. From *G. montanum* it is said to differ in the number of flowers in each circle of bracts, as well as in minor details of seed size (excluding *G. montanum* f.

Sketch—map of distribution of Gymnosperms in Guangxi*



*charting: from the editor after the author's idea and desire

megalocarpum). From *G. pendulum* it is said to differ in seed shape (especially at base and apex) and petiole features. The yellow seed is said to be edible.

Gnetum hainanense C.Y. Cheng 海南买麻藤

Distribution: S. Guangxi, Hainan, probably also S. Guangdong. Tropical lowlands, in rainforest.

Earlier accounts sometimes treated the Hainan plants under the more widespread *G. parvifolium* see below. However, all the Guangxi specimens attributable to *G. hainanense* (including a paratype) have considerably larger leaves than those of *G. parvifolium*. Both species are in subsection *Sessiles*.

Gnetum montanum Markgr. 买麻藤

Distribution: Yunnan, Guangxi, Guangdong, possibly Guizhou, extending northwards to c. 25℃ and up to nearly 2000m. In subtropical rainforest. Also in Burma and N.E. India

G. montanum belongs to subsection *Stipitati* with pedicellate seeds, although in some specimens they are subsessile. A few specimens with large seeds 2.7—3.7 cm long belonged to f. *megalocarpum* Markgr. This taxon appears to be a sporadic variant occurring across the range of the species, including Guangxi.

Gnetum parvifolium (Warb.) Cheng 小叶买麻藤

(*G. montanum* f. *parvifolium* (Warb.) Markgr.)

Distribution: S. China from Yunnan to Fujian and extending to 26.6℃ N, the most northerly limit of the genus in China. Lowland rainforest, especially on lower hill slopes. The commonest species in Guangxi judging from the large number of specimens and is widespread in this province.

G. parvifolium is another species in subsection *Sessiles* and is identified by its small leaves and shorter and smaller male strobili with fewer bract circles.

Gnetum pendulum C.Y. Cheng f. **intermedium** C.Y. Cheng

(*G. intermedium* (C.Y. Cheng) C.Y. Cheng et Shao) 短柄垂子买麻藤

Distribution: E. Yunnan, S.E. Guizhou, S.E. and W. Guangxi. In broad-leaved rainforests, usually below 800 m. f. *pendulum* has a wider distribution, S.E. Xizang, Yunnan, Guizhou, Guangdong and Hainan, but there are apparently no specimens from Guangxi. F. *pendulum* has larger seeds on longer stalks than f. *intermedium*.

G. *pendulum* (both forms) is difficult to define and seems only separable from *G. montanum* by very minor characters. The most significant difference seems to be the number of male flowers in each bract circle but unfortunately very few specimens seen had male strobili.

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APPENDIX

Eastern Asian gymnosperms not indigenous to Guangxi

Several prominent and well-known genera of gymnosperms which occur in many Parts of China are absent or very rare in Guangxi, presumably mainly because the climate is too warm. Notable examples are *Larix* and *Picea* (Pinaceae), *Juniperus* (Cupressaceae) and *Ephedra* (Ephedraceae). *Picea* has an unrivalled development in the mountains of N. Yunnan and W. Sichuan. *Ephedra* species are concentrated in the colder and arid parts of north and north west China southwards to the Himalaya. *Juniperus* (including *Sabina* Miller. as well as *Juniperus* L. sens. strict.) is very common and widespread north of the

Yangtse River but is only represented in cultivation in Guangxi.

The table lists those genera of gymnosperms indigenous to eastern Asia which do not occur naturally in Guangxi. With the exception of three monotypic genera* they all have species indigenous to China:-

Ginkgoopsida

Ginkgoaceae — *Ginkgo*: monotypic. Region of natural occurrence uncertain, possibly E. China; there is a wild population in Zhejiang.

Taxopsida

Taxaceae — *Torreya* Arn.: Yunnan and Sichuan and eastwards on both sides of the Yangtse to Zhejiang and Jiangsu. The genus is also in Japan and N. America.

Pinopsida

Podocarpaceae — *Dacrydium* Forst.f.: From Hainan and Hanoi Province (northern Vietnam) southwards to Malaysia and the S. W. Pacific (see notes above).

Pinaceae* — *Larix* Miller: mountains and hills of West and North China. Also N. Temperate regions.

Picea A. Dietr: similar to *Larix* but also widespread in the lowlands of northern China. N. Temperate regions generally.

Pseudolarix Gordon: monotypic. E. China

**Pinus krempfii* Lecomte from C. Vietnam is sometimes considered to represent a separate genus, *Ducampopinus* A. Chev. This rare and remarkable species has flat leaves to 6 mm wide, in pairs and with a deciduous sheath. The cones closely resemble (at least superficially) those of some Asian pines of subgenus *Pinus* except for the thicker scales with an umbonal depression in the middle of the apophysis.

Taxodiaceae — *Cryptomeria* D. Don: monotypic. Widespread in western and central China. Also in Taiwan where the plants are sometimes regarded as specifically distinct.

Glyptostrobus Endl.: monotypic. Apparently confined to lowland S. Guangdong and Fujian naturally.

Metasequoia Hu et W.C. Cheng: monotypic. From a small area of eastern Sichuan but in the past known to have had a wide distribution. Now being cultivated widely in China, including Guangxi, and beyond.

Sciadopitys Siebold et Zucc.: monotypic. Endemic to Japan. Very distinct in the family and probably best treated in a separate family Sciadopityaceae.

Taiwania Hayata: two species with the well-known disjunction involving S.W. China and Taiwan

Cupressaceae

Cupressus L.. S.W. China, westwards to southern Xizang. Also in many other warm temperate or subtropical regions of the N. Hemisphere.

Juniperus L. (including Sabina Miller): widespread in W., N., C. and E. China, southwards to Fujian and Taiwan. Elsewhere widespread in the N. Hemisphere from the Arctic to E. Africa and the West Indies.

Microbiota Komarov: monotypic and closely related to *Platycladus*. Restricted to a small region of the USSR north of Vladivostok and just east of the Amur River boundary with China.

Platycladus Spach: monotypic. Related to *Thuja* and often included in it. Reported wild in Guangxi, this being presumably based on naturalised plants.

Thuja L.: 1 species in N.E. China and Korea and a second in Sichuan but known only from the type and very closely related to *T. koraiensis*. Also in Japan and N. America.

Thujopsis Siebold et Zucc.: monotypic. Endemic to Japan. Related closely to *Thuja*.

Gnetopsida

Ephedraceae

Ephedra L.: W. and N. China, especially in Xizang and Xinjiang. North temperate regions and southwards to N. Africa and S. America.

The genera *Cedrus* Trew (Pinaceae) and *Agathis* Salisb. (Araucariaceae) are excluded from eastern Asia. The first has a species ranging from Afghanistan to C. Nepal and the second has a species in the Phlilppines.

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广西裸子植物

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编者按 本文作者赛克斯（W. R. sykes）为新西兰科学与工业研究部土地资源分部植物研究所植物分类学家，作为交换学者，于1988年在广西植物研究所工作了五个月，除了概览式的植物考察之外，主要研究了广西植物研究所馆藏的裸子植物标本，在此期间，曾去昆明植物所一次，离所回国前到过北京中科院植物所。离开中国后去了苏联列宁格勒的植物所，最后去了英国的邱园，大英博物馆，爱丁堡皇家植物园等单位也都看了标本，且和不少同行专家交流其研究心得，此种活动一直延续至回国之后，可见其治学之严谨与细致。本文撰写完成时本来包括有属、种的精练的形态描述，只因本刊篇幅有限，不能尽录，只得忍痛删去。保留其分布和讨论部分，当然还包括其最重要的分类学修订处理部分。赛克斯先生工作勤奋务实，认识植物甚多，著作也不少，其主要的最新著作有南太平洋纽埃（Niue）岛植物志，克马德克（Kermadec）群岛植物志和1988年出版的新西兰植物志第四卷（三作者之一）。

摘要* 广西本土生长的裸子植物共43种**，包含苏铁科3种，三尖杉科4种，红豆杉科4种，罗汉松科6种，松科17种，杉科1种，柏科3种，和买麻藤科5种。虽然它们在本区分布较广，但其种类多集中于北部和中部属酸性土且气候较凉的山脉上。油杉有数种生长在石灰岩石山上，它们比低地的松树之外的裸子植物较为耐旱。少数种类稀少且分布局限，少数为特有。

经作者研究，广西裸子植物的学名有些需要修改：*Cephalotaxus hainanensis*和*C. griffithii*应归并于*C. mannii*；*Podocarpus imbricatus*需改为*Dacrycarpus imbricatus*，*Podocarpus fleuryi*或*Decusocarpus fleuryi*改为*Nageia fleuryi*，*Podocarpus nagi*或*Decusocarpus nagi*改为*Nageia nagi*，过去误定为*Podocarpus brevifolius*或*P. wangii*应改为*Podocarpus pilgeri*；*Keteleeria pubescens*应归并于*K. davidiana*，*K. hainanensis*归并于*K. evelyniana*，*K. cyclolepis*和*K. oblonga*归并于*K. fortunei*；*Tsuga longibracteata*改为*Nothotsuga longibracteata*；*Cupressus funebris*改为*Chamaecyparis funebris*，不同意把*Pinus kwangtungensis*改为*P. wangii* var. *kwangtungensis*等。

* 此中文摘要由梁畴芬代笔——编者。

** 本文完成后，在我区乐业县又发现松属一新种，名为拉雅松Pinus crassicorticea Y. C. Zhong et K. X. Huang。见《广西植物》第十卷第四期（1990）——编者。