

# BIOGEOGRAPHICAL IMPLICATIONS OF SOME PLANT SPECIES FROM A TROPICAL MONTANE RAIN FOREST IN SOUTHERN YUNNAN

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**ABSTRACT:** A pristine montane rain forest was recently discovered from Mengsong of Xishuangbanna in the southern Yunnan. It attracts botanists that many primitive plant taxa across various life forms were co-existed in the montane rain forest. In order to know the biogeography of the montane rain forest, distribution patterns of some species of biogeographical importance from the montane forest were enumerated and their biogeographical implications were discussed with geological explanation. It was concluded that the montane rain forest in the southern Yunnan has strong affinity to montane rain forests in Sumatra or Southeast Asia in broad sense. It was tentatively suggested that Sumatra could be once connected to Myanmar and drifted away due to northward movement of continental Asia by bumping of India plate.

**KEY WORDS:** biogeography; montane rain forest; southern Yunnan

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## 1 INTRODUCTION

Southern Yunnan of the southwestern China is exceptionally interesting to botanists because of its diversified biota and particularly geological and biogeographical history. The region is at a transitional zone from tropical Southeast Asia to temperate East Asia geographically, and is supposed to be a conjunction area between Shan-Tai fragment of Gondwanaland and the southeastern margin of Asian continent geologically (AUDLEY-CHARLES, 1987; FORTEY and COCKS, 1998; METCALFE, 1998). Southern Yunnan is not only a key area in biogeography but also a hot spot of biodiversity (MYERS, 1998).

A pristine montane rain forest was recently discovered from Mengsong of Xishuangbanna in the southern Yunnan, at the border between Myanmar and Yunnan of China (WANG *et al.*, 2001; ZHU *et al.*, 2004). The montane rain forest, which occurs at valleys and on montane slopes between 1500–1800m a. s. l., is dominated by families Magnoliaceae, Mastixiaceae, Lauraceae and Euphorbiaceae. Magnoliaceae and Lau-

raceae were supposed to be ones of primitive angiosperm families (STEVENS, 2003). *Mastixia euonymoides*, a dominant and the biggest tree species in the montane rain forest, is a primitive taxon in the family Mastixiaceae (TAKHTAJAN, 1997), Cornaceae (MATTHEW, 1976) or Nyssaceae (STEVENS, 2003). This species occurs only in the limited border area among Myanmar, Yunnan of China and Thailand, but its fossil taxa were widely distributed in European and America Tertiary floras, which were even called Mastixioidean European Flora (MAI, 1993; EYDE and XIANG, 1990; TIFFNEY and HAGGARD, 1996). *Gynanthes remota* of Euphorbiaceae, a relic and dominant species in the lower tree layer of the montane rain forest, occurs disjunctively in Mengsong of the southern Yunnan and Sumatra of Indonesia (ZHU *et al.*, 2000). Frequent shrub species *Lasianthus inodorus* of Rubiaceae, which distributed in mainland of Southeast Asia and Sumatra as well as Java, has its vicarious species in Kinabalu Mountain in Borneo (ZHU, 2001). Dominant herbaceous plant *Sarcandra hainanensis* of Chloranthaceae, was also supposed to be a primitive an-

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giosperm (ZHOU, 1999). It is interesting that many primitive taxa across various life forms were co-existed in the montane rain forest in the southern Yunnan. These indicate that the montane rain forest in the southern Yunnan is of importance to science not only for its biodiversity, but also for biogeography. Distribution patterns of taxa could give us some implications to biogeography of the montane rain forest in the southern Yunnan.

## 2 DISTRIBUTION OF TAXA

### 2.1 *Mastixia euonymoides* Prain.

It is a dominant species of the upper tree layer in the montane rain forest in Mengsong of the southern Yunnan. *M. euonymoides* is in the primitive subgenus *Manglesia* of Mastixiaceae. The subgenus *Manglesia* is composed by two species, i.e. *M. euonymoides* which occurs in the northeastern India, northern Burma, northern Thailand and southern Yunnan of China (ZHU, 1993), and *M. octandra* Matthew, which occurs in mountains of center Sumatra in Indonesia (MATTHEW, 1976) at similar altitudes (1700–1800m a. s. l.) (Fig. 1). The similar distribution pattern was found in some other taxa of seed plants, such as *Pinus merkusii* (SANTISUK, 1997) (Fig. 1).

### 2.2 *Gymnanthes remota* (Steenis) Esser

*Gymnanthes remota* occurs in montane rain forests between 1600–2000m a. s. l. in the northern Sumatra. It was recently found in the montane rain forest in Mengsong at the border area between the northern Myanmar and the southern Yunnan at a similar habitat as at Sumatra (ZHU *et al.*, 2000). It is a dominant species in lower tree layer of the montane rain forest in Mengsong (Fig. 2).

*Gymnanthes* is a genus of pantropical distribution. It is composed of 25 species, of which 21 species occur in the New World from the USA (Florida) to the Antilles and Paraguay, 2 in Africa (Congo Basin from Cameroon to Zaire), and 2 in Asia (ESSER, 1999). *G. borneensis*, which occurs in Peninsular Malaysia, center Sumatra, Lingga Archipelago, Borneo (Sabah, Sarawak, Brunei, center Kalimantan), while *G. remota* occurs in the northern Sumatra and Yunnan. *Gymnanthes*, sensu Pax et Hoffmann (1912), is originally restricted to the Neotropics, while sensu lato, as proposed by ESSER (1999) is pantropical distribution and has a center of diversity in the New World. It is conspicuous that the genus could be Gondwana origin. The existence of *G. remota* in the southern Yunnan implies that *Gymnanthes* could migrate to Asia by the drift of India plate from Gondwana. *Terminalia myriocarpa* Heurck

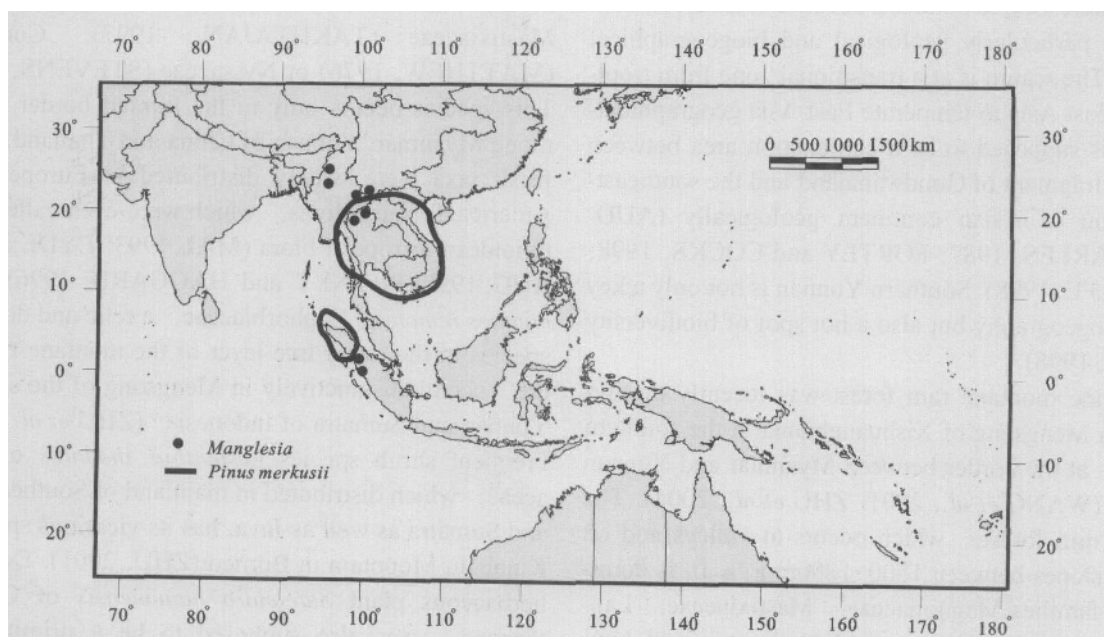


Fig. 1 Distribution of subgenus *Manglesia* and species *Pinus merkusii*

et Muell.-Arg., another tree species in southern Yunnan, has a similar distribution as *Gymnanthes remota* (Fig. 2) (STEENIS, 1954), which also consolidates the idea that

there is a closer floristic connection between northern Mainland SE Asia and Sumatra.

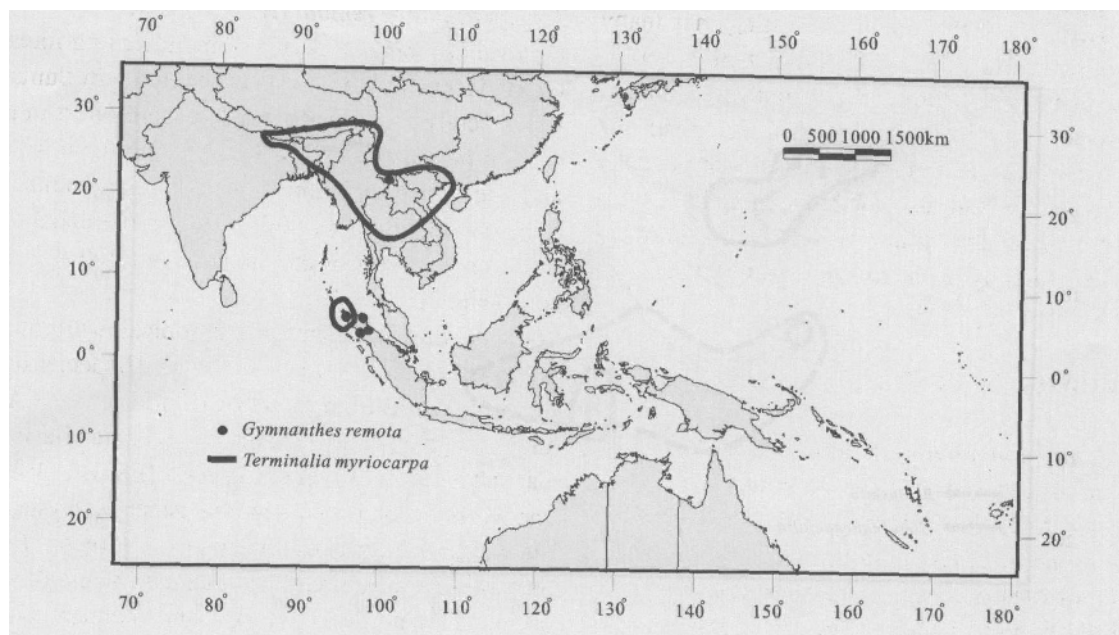


Fig. 2 Distribution of species *Gymnanthes remota* and *Terminalia myriocarpa*

### 2.3 *Bruinsmia* Boerl. & Koord.

*Bruinsmia* is a tropical Asian genus with two species. *Bruinsmia styracoides* Boerl. & Koord. is distributed in Sumatra, west Java, Borneo, Celebes and New Guinea in tropical montane forests between 700–1600m a. s. l. A vicarious species *Bruinsmia polysperma* (Clarke) Steenis occurs at montane forests over 1300m a.s.l. in the north-eastern India, northern Myanmar, northern Thailand and southeastern Xishuangbanna of southern Yunnan (STEENIS and BAKHUIZEN, 1967). *Bruinsmia* has not been seen in the southern Thailand, southern Myanmar and Malay Peninsula (Fig. 3). The similar distribution pattern was found in some other taxa of seed plants, such as *Ulmus lanceaefolia* (Fig. 3).

### 2.4 *Lasianthus inodorus* Bl.

This is a common shrub species in the montane rain forest in the southern Yunnan. It is composed by three vicarious subspecies (ZHU, 2001, 2002).

The typical subspecies *L. inodorus* has a wide, disjunctive distribution. It occurs in montane evergreen forests and montane rain forests over 1000m a. s. l. in the southern Yunnan, India (northeast part), Bangladesh (eastern part), Thailand, Cambodia, Vietnam and Indonesia (Sumatra, Java) (Fig. 4). However the specimens from mainland of Southeast Asia and the ones from Sumatra and Java are almost identical so that clear variation within this subspecies could not be recognized.

Vicarious subspecies *L. inodorus* Bl. subsp. *montigen-*

*us* H. Zhu and *L. inodorus* Bl. subsp. *pubescens* H. Zhu occur on Mount Kinabalu in Borneo, but at different habitats. Subspecies *montigenus* occurs in mossy forests over 1700m a. s. l., while subspecies *pubescens* occurs in montane evergreen forest between 400–2000m a. s. l.

## 3 DISCUSSION

It was suggested that the tropical flora of the southern Yunnan had a close affinity to tropical Asian flora (ZHU, 1994, 1996, 1997; ZHU and ROOS, 2002, 2004; ZHU *et al.*, 1997, 2001, 2003). Distribution patterns of those species mentioned above indicate that the montane rain forest in southern Yunnan has strong affinity to the same forest type in Sumatra or Southeast Asia in broad sense. The similar distribution patterns were also found in some other taxa of seed plants, such as *Pinus merkusii* (Fig. 1), *Terminalia myriocarpa* Heurck et Muell.-Arg. (Fig. 2), *Ulmus lanceaefolia* Roxb. ex Wall. (STEENIS, 1977) (Fig. 3), and *Altingia excelsa* Noron., *Dysoxylum excelsa* Bl., *Saprosma ternatum* (Wall.) Hook. f. (ZHU, 2000) etc.

There were some possible explanations to the close floristic affinity between the southern Yunnan (or Southeast Himalayas) and Malesia. The floristic connections between islands of the Malay Archipelago and mainland Southeast Asia were mostly explained on the basis of stepping stones of various mountains or bridges in the region, such as the theory of STEENIS (1962, 1964), and now better explained by plate tecton-



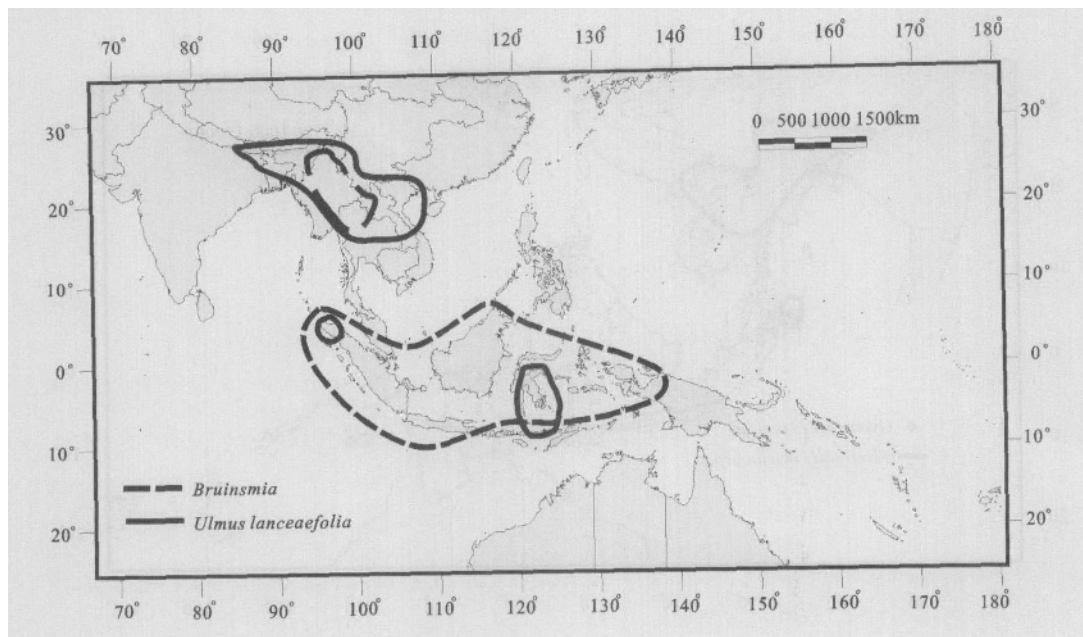


Fig. 3 Distribution of genus *Bruinsmia* and species *Ulmus lanceaeifolia*

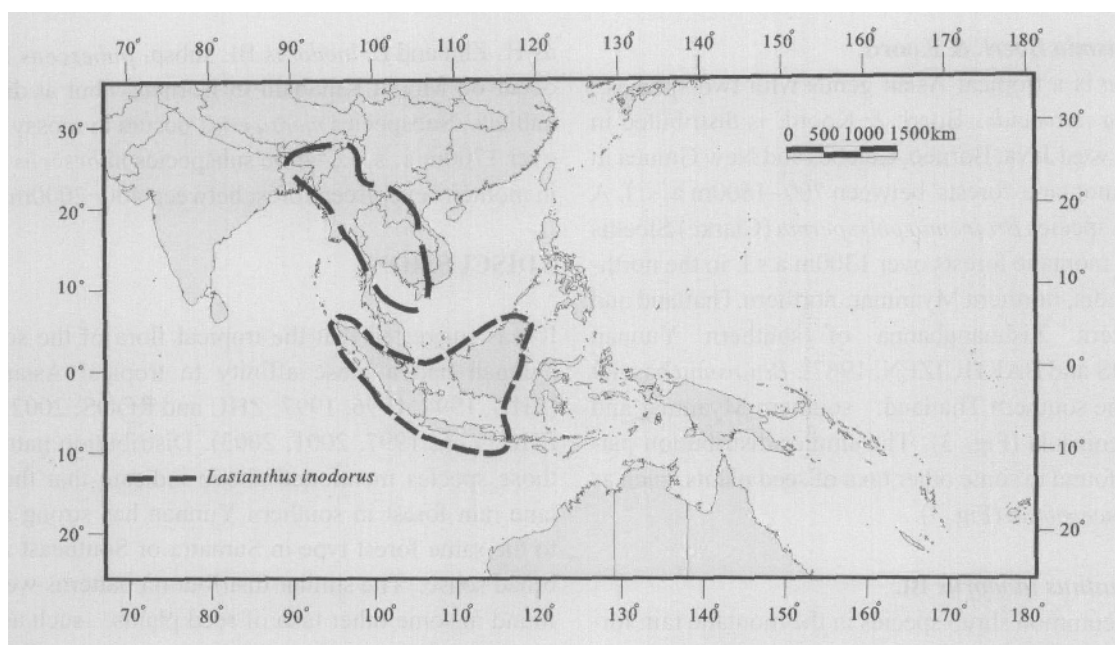


Fig. 4 Distribution of species *Lasianthus inodorus*

ic theory based on more geological and biogeographical evidence. Direct land connection between mainland of Southeast Asia and Western Malesia could be existent until early Pliocene (5Ma ago) (HALL, 1998) and there was no geographical barrier to natural distribution of plants between mainland of Southeast Asia and Western Malesia during most of the Tertiary (MORLEY, 1998).

Those distribution patterns of plant taxa suggest the historical connection between the southern Yunnan and mainland of Southeast Asia, and the Malay Archipelago

and support tectonic explanation. Based on those patterns of disjunctive distribution between mainland of Southeast Asia and Sumatra, a suggestion was come out as that Sumatra could be once connected to Myanmar and drifted away due to northward movement of continental Asia by bumping of India plate. It is coincided with some geological point of view (PENNY, 1997). If it is true, the close floristic affinity between the southeastern Himalayas and the southern Yunnan, and Sumatra and Java could be better explained (Fig. 5).

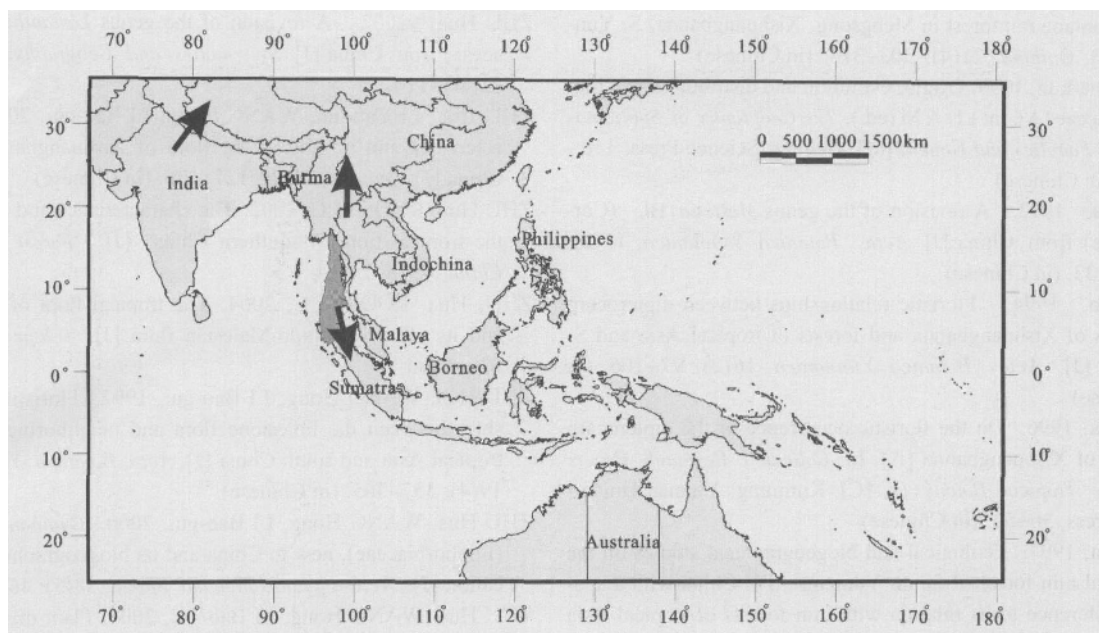


Fig. 5 Conjectural movements of Southeast Asian tectonics since the Tertiary

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