

## Tropical component of the Moss Flora of China

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In many ways, it is presumptuous for me to speak on the mosses of the tropical regions of China. Many consider the knowledge about the taxonomy, ecology, and geography of tropical bryophytes inadequate (Pócs 1982; Schuster 1983; Richards 1984), and this is certainly the case for the bryophytes of the tropical regions of China. The taxonomy of Chinese taxa is generally in a state of disarray. Early workers, both Chinese and others, have tended to describe new species based upon minor or inconsequential morphological characters and without apparent reference to related taxa found outside of China. This is clear from recent monographic studies that compared Chinese taxa with taxa throughout the world. For example, Su (1988) in his studies of *Homaliodendron* reduced the taxa of this genus for southeast Asia from over eighteen to four. Similar synonymizing has occurred in *Forsstroemia* (Stark 1987), Mniaceae (Koponen 1981), *Grimmia* and *Schistidium* (Cao & Vitt 1986) and the Calymperaceae (Lin & Reese 1989). Furthermore, monographers of groups have not always been able to study adequate collections from China as for example, Noguchi's (1976) revision of the Meteoriaceae or Nyholm's (1971) studies on the genus *Atrichum*. Even recent monographic or revisionary studies such as those on *Leucodon* (Akiyama 1988), *Trachyloma* (Miller & Manuel 1982), *Glossadelphus* (Tixier 1988), *Entodon* (Hu 1983), *Ctenidium* (Nishimura 1985),

*Forsstroemia* (Stark 1987), *Gollania* (Higuchi 1985) or *Fissidens* (Li 1985) appear to have had only those collections from China for study that were available in herbaria outside of China. The cause for this probably rests with the difficulty of borrowing material from Chinese herbaria. Even when specimens are loaned by Chinese herbaria the borrower gets only a small sample of what may be present. Herbaria I have visited in China have huge backlogs of unprocessed or unidentified collections. In many cases these collections come from significant regions such as western Sichuan, Yunnan and the tropical regions of Xizang (Tibet).

It is only fair to point out that our Chinese colleagues have worked under conditions that most of us would not tolerate. First, they have had to endure the problems of isolation from the West during the cultural revolution when most, if not all scholars, were assigned tasks completely unrelated to their interests or training such as working in the rice fields, building dams, mining coal, or being 'barefoot' doctors. During this period the survival of libraries and collections was accomplished only by the heroic action of teachers and students. And, collecting in China is not always easy. Travel is difficult to arrange, provisions for drying and preservation of collections are inadequate, and transportation of collections from the point of collection to the place of study is often delayed. Transit periods of from six to



Fig. 1. Location of tropical plant communities in China.

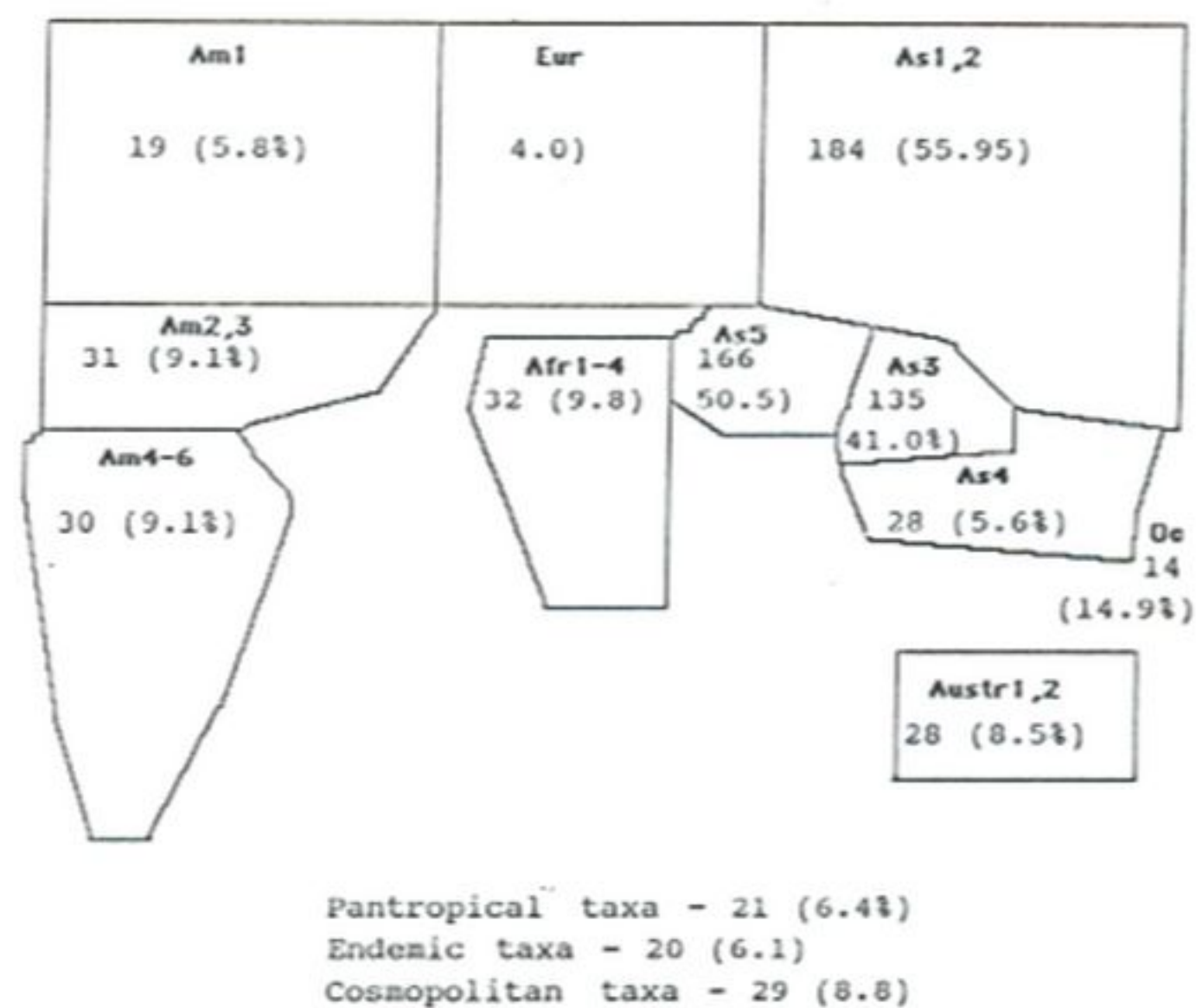


Fig. 2. Distribution of taxa associated with tropical vegetation of China (Figures do not include cosmopolitan taxa).

twelve months are not uncommon.

Finally, China is a large and diverse country and the number of bryology students are few by European and North American standards. There are many areas that need intensive study and this most certainly includes the tropical region of China. Those of us from the West that have been able to collect in limited areas in China are finding new species (Reese & Lin 1989) or taxa new to China (Redfearn et al 1989; Vitt personal communication). Although Chinese bryologists are busy today working on the bryophyte flora of China, such studies are not high on the list of government priorities. Even so, floras for specific provinces or regions have been prepared, such as the Flora of Xizang, and the floras of Yunnan, Hainan, and Sichuan provinces are currently in preparation. Unfortunately, these floras have been or are being prepared without a solid base of taxonomic studies of the Chinese taxa.

Ecological studies of tropical bryophytes in China are essentially lacking. This is due, in part, to a lack of training, equipment, and time. Many of the present bryologists in China received their education during the cultural revolution when the study of mathematics was considered unnecessary and when they were isolated from the exciting developments occurring in ecology elsewhere.

With these problems in mind, I will review for you what is known, and which is surely only a fraction of what is to be learned, about the mosses of tropical China and to suggest how our knowledge might be significantly increased in the next decade.

### **Tropical plant communities in China**

There are three types tropical plant communities in China (Hou 1983) found in China (Fig. 1). One type is the Bamboo

evergreen forests of subtropical and tropical zones. This plant community is extensively developed in Sichuan and southern China. Little is known about the bryophytes of these bamboo forests and I will not attempt to discuss this type of community.

A second type of tropical plant community is the Tropical broad-leaved semi-evergreen forests. This community is extensively developed in southwestern Guangxi, Xishuangbanna in Yunnan and Guangdong. These forests have a dry season and as the dry season becomes less distinct they become more and more similar to the Tropical Rain Forests discussed below. These semi-evergreen seasonal forests differ from tropical rain forests in several characteristics (Hou 1983). Trees of the upper layers are lower and very few of the larger trees are buttressed. Lianas and epiphytes are less abundant. In Xishuangbanna and Guangxi these forests are found on calcareous soils. However, on western Hainan Island, this type of forest occurs on acid soils.

The third type of tropical vegetation is the Tropical broad-leaved evergreen rain forest. Located on the eastern sides of Hainan and Tawain islands, in southeastern Yunnan Province, and in the extreme part of southwestern Tibet, these forests are characterized by a climate that is moisture saturated throughout the year. Evergreen trees in the families Moraceae, Myrtaceae, Annonaceae, Apocyanaceae, Sterculiaceae, Sapotaceae, Dipterocarpaceae, Meliaceae, Sapindaceae, Proteaceae, and Fagaceae are present. Many reach giant size, exhibit plank-buttresses and cauliflory, and are usually clothed with ferns, mosses and liverworts, and epiphytes belonging to the Araceae and the Orchidaceae.

All of these forests, except those in Taiwan, lie within the Indochinese Region (Takhtajan 1986). Hainan Island, southern

Table 1. World distribution pattern of mosses found in the tropical regions of China. See Table 2 for geographic regions indicated by the numbers in the distribution column.

TAXA	XISHUANG- BANNA	HAINAN	MEDOG	HENG- CHUN	DISTRI- BUTION
<b>ANDREAEACEAE</b>					
<i>Andreaea rupestris</i> Hedw. var. <i>fauriei</i> Hedw.				X	1
<b>BARTRAMIACEAE</b>					
<i>Bartramia lthyphylla</i> Brid.				X	13
<i>Bartramidula bartramoides</i> (Griff.) Wijk & Marg.	X				3,4
<i>Bartramidula roylei</i> (Hook. f.) B.S.G.		X			1,3,4
<i>Breutelia arundinifolia</i> (Duby) Fleisch.				X	1,4
<i>Philonotis falcata</i> (Hook.) Mitt.	X				1,3,4,6,8,9
<i>Philonotis mollis</i> (Dozy & Molk.) Mitt.				X	1,3,4
<i>Philonotis papillatomarginata</i> Lou & Wu			X		15
<i>Philonotis thwaitesii</i> Mitt.	X				3,4
<i>Philonotis turneriana</i> (Schwaegr.) Mitt.	X				1,3,4,6
<b>BRACHYTHECIACEAE</b>					
<i>Brachythecium wichurae</i> (Broth.) Par.	X				1
<i>Eurhynchium riparioides</i> (Hedw.) Richards	X				13
<b>BRYACEAE</b>					
<i>Brachymerium capitulum</i> (Mitt.) Kindb.	X				14
<i>Brachymerium cellulare</i> (Hook.) Jaeg.	X				14
<i>Brachymerium nepalense</i> Hook. in Schwaegr.				X	1,3,4,12
<i>Bryum apiculatum</i> Schwaegr.	X				14
<i>Bryum argenteum</i> Hedw.	X				13
<i>Bryum atrovirens</i> Vill. ex Brid.	X				13
<i>Bryum billardei</i> Schwaegr.				X	14
<i>Bryum blandum</i> Hook. f. & Wils. ssp. <i>handellii</i> (Broth.) Och1				X	1,3
<i>Bryum coronatum</i> Schwaegr.	X				14
<i>Bryum dichotomum</i> Hedw.	X				13
<i>Bryum filiforme</i> Dicks. var. <i>concinatum</i>	X				9
<i>Bryum filiforme</i> Dicks. var. <i>filiforme</i>	X			X	13
<i>Bryum giganteum</i> (Schwaegr.) Arnott	X				1,3,6,12
<i>Bryum paradoxum</i> Schwaegr.				X	1,3,11
<i>Bryum recurvum</i> Mitt.	X				1,3
<i>Pohlia capilliformis</i> Lou & Wu				X	15
<i>Pohlia elongata</i> Hedw.	X				13
<i>Pohlia flexuosa</i> Hook.				X	1,3,4,10
<i>Pohlia prolifera</i> (Kindb.) Broth.	X				1,8,9,12
<b>CALYPERACEAE</b>					
<i>Calypotes afzelii</i> Sw.	X				14
<i>Calypotes erosum</i> C. Muell.	X	X			14
<i>Calypotes graeffianum</i> C. Muell.	X				3,4,7
<i>Calypotes lonchophyllum</i> Schwaegr.		X			14
<i>Calypotes moluccense</i> Schwaegr.		X			14
<i>Calypotes serratum</i> A. Brown	X	X			4,6
<i>Calypotes tahitense</i> (Sull.) Mitt.		X		X	4,6,7
<i>Calypotes tenerum</i> C. Muell.		X			14
<i>Calypotes thwaitesii</i> Besch. ssp. <i>fordii</i> (Besch.) Fleisch.		X			3,4,6
<i>Exostratum blumei</i> (Nees ex Hampe) L. T. Ellis				X	3,6,7
<i>Mitthyridium fasciculatum</i> (Hook. & Grev.) Robins.		X			3,4,7
<i>Mitthyridium flavum</i> (C. Muell.) Robins.	X	X			3,4,7
<i>Syrrhopodon armatispinosus</i> P. J. Lin		X			15
<i>Syrrhopodon armatus</i> Mitt.	X	X			14
<i>Syrrhopodon flameonervis</i> C. Muell.		X			1,3,4
<i>Syrrhopodon gardneri</i> (Hook.) Schwaegr.	X				14
<i>Syrrhopodon involutus</i> Schwaegr.		X			1,14
<i>Syrrhopodon japonicus</i> (Besch.) Broth.	X	X			1,3,4
<i>Syrrhopodon parasiticus</i> (Brid.) Besch.	X	X			1,14
<i>Syrrhopodon prolifer</i> Schwaegr.		X			14
<i>Syrrhopodon spiculosus</i> Hook. & Grev.		X			3,4,6,7
<i>Syrrhopodon tjbodensis</i> Fleisch.		X			1,4
<i>Syrrhopodon trachyphyllum</i> Mont.		X			1,3,4,6,7
<b>CRYPHAEACEAE</b>					
<i>Schoenobryum concavifolium</i> (Griff.) Gangulee	X				3,4
<i>Sphaerotheridella sphaerocarpa</i> (Hook.) Fleisch.			X		1,3

TAXA	Table 1 (Con't.)				DISTRI- BUTION
	XISHUANG- BANNA	HAINAN	MEDOG	HENG- CHUNG	
<b>DALTONIACEAE</b>					
<i>Cyathophorella hookeriana</i> (Griff.) Fleisch.	X				1,4
<i>Cyathophorella tonkinensis</i> (Broth. & Par.) Broth.	X				1,3
<b>DICRANACEAE</b>					
<i>Aongstroemia orientalis</i> Mitt.	X				1,3,10
<i>Brothera leana</i> (Sull.) C. Muell.	X				1,3,9,10
<i>Campylopus caudatus</i> (C. Muell.) Mont. in Dozy & Molk.				X	3,4,6
<i>Campylopus gracilentus</i> Card.				X	1
<i>Campylopus japonicus</i> Broth.	X				1
<i>Campylopus umbellatus</i> (Arn.) Par.				X	1,3,4,10,11
<i>Dicranella coarctata</i> (C. Muell.) Bosch & Lac.	X				1,3,4
<i>Dicranodontium asperulum</i> (Mitt.) Broth.				X	3,8,9
<i>Dicranodontium denudatum</i> (Brid.) Britt. ex Williams				X	1,8,9
<i>Dicranodontium fleischerianum</i> Schultze-Motel var. <i>clemensiae</i> (Bartr.) Schultze-Motel		X			4
<i>Dicranodontium uncinatum</i> (Harv.) Jaeg.		X		X	3,4,8
<i>Dicranoloma assimile</i> (Hampe) Par.				X	1,4
<i>Dicranoloma blumii</i> (Nees) Par.		X			3,4,6
<i>Dicranoloma kwangtungense</i> Chen		X			1
<i>Dicranoloma striatulum</i> (Mitt.) Noe.		X			1
<i>Dicranoloma tibetanum</i> Gao in Gao & K.-C. Chang			X		15
<i>Dicranum hamulosum</i> Mitt.				X	1
<i>Dicranum japonicum</i> Mitt.				X	1
<i>Dicranum scoparium</i> Hedw.				X	13
<i>Holomitrium densifolium</i> (Wils.) Wijk & Marg.	X	X			1,3
<i>Leucoloma molle</i> (C. Muell.) Mitt.		X			3,4
<i>Leucoloma walkerii</i> Broth.		X			3,4
<i>Microdus brasiliensis</i> (Duby) Ther.	X				3,4,11
<i>Onchophorus wahlenbergii</i> Brid. var. <i>longisetus</i> Nog.				X	15
<i>Paraleucobryum enerve</i> (Thed.) Loeske				X	1,3,5,8,9
<i>Trematodon longicollis</i> Michx.	X	X		X	13
<i>Wilsoniella decipiens</i> (Mitt.) Alst. var. <i>acutifolia</i> (Dix.) Wijk & Marg.	X	X		X	4
<b>DIPHYSICIACEAE</b>					
<i>Diphyscium involutum</i> Mitt.	X			X	1,4
<b>DITRICHACEAE</b>					
<i>Ceratodon stenocarpus</i> Bruch & Schimp. ex C. Muell.	X				13
<i>Ditrichum brevidens</i> Nog.				X	15
<i>Ditrichum difficile</i> (Duby) Fleisch.		X			1,3,4,7,11
<i>Garckea flexuosa</i> (Griff.) Marg. & Nork.	X				3
<b>ENTODONTACEAE</b>					
<i>Entodon macropodus</i> (Hedw.) C. Muell.	X				1,3,9,11
<i>Entodon prorepens</i> (Mitt.) Jaeg.	X				1,3
<i>Erythrodontium julaceum</i> (Schwaegr.) Par.	X	X			1,3,4,12
<i>Levierella fabroniacea</i> C. Muell.	X				1,3,12
<i>Mesonodon flavescens</i> (Hook.) Buck	X				1,3
<i>Pterigynandrum filiforme</i> Hedw.	X				13
<b>ERPODIAEAE</b>					
<i>Aulacopilum abbreviatum</i> Mitt.	X				1,3
<i>Erpodium biserialatum</i> (Aust.) Aust.		X			1,9
<b>FABRONIACEAE</b>					
<i>Schwetschkeopsis fabronia</i> (Schwaegr.) Broth.	X				1,9
<b>FISSIDENTACEAE</b>					
<i>Fissidens adelphus</i> Besch.		X			1
<i>Fissidens areolatus</i> Griff.	X	X			1,3,4
<i>Fissidens bryoides</i> Hedw. ssp. <i>bryoides</i> var. <i>bryoides</i>	X				1,8,9,11
<i>Fissidens bryoides</i> Hedw. var. <i>ramosissimus</i> (Ther.) Iwets. & T. Saz.				X	1
<i>Fissidens ceylonensis</i> Dozy & Molk.	X			X	1,3,6,7
<i>Fissidens crenulatus</i> Mitt.		X			1,3,4

Table 1 (Con't.)

TAXA	XISHUANG- BANNA	HAINAN	MEDOG	HENG- CHUNG	DISTRI- BUTION
<i>Fissidens diversifolius</i> Mitt.	X				1,3
<i>Fissidens formosanus</i> Nog.		X			1
<i>Fissidens geminiflorus</i> Dozy & Molk. var. <i>nagasakius</i> (Besch.) Iwats.		X			1,4
<i>Fissidens guangdongensis</i> Iwats. & Li		X			15
<i>Fissidens gymnogynus</i> Besch.	X				1
<i>Fissidens hollianus</i> Dozy & Molk.	X				1,3,4
<i>Fissidens incognitus</i> Gangulee		X			1,3
<i>Fissidens javanicus</i> Dozy & Molk.	X				1,3
<i>Fissidens laxus</i> Sull. & Lesq.	X	X			1,3,4
<i>Fissidens maceratus</i> Mitt.		X			7
<i>Fissidens mangarevensis</i> Mont.		X			1,6
<i>Fissidens microcladus</i> Thwaites & Mitt.	X				9,10,13
<i>Fissidens nobilis</i> Griff.	X	X			1,3,4
<i>Fissidens obscurirete</i> Broth. & Par. in Broth.	X	X			1,6
<i>Fissidens pepuensis</i> Chen		X			15
<i>Fissidens plagiochiloides</i> Besch.	X	X			1,3,4
<i>Fissidens robinsonii</i> Broth.		X			1,3,4
<i>Fissidens taxifolius</i> Hedw.	X			X	13
<i>Fissidens tosaensis</i> Broth.	X	X			1
<i>Fissidens virens</i> Thwait. & Mitt.	X	X			1
<i>Fissidens zippelianus</i> Dozy & Molk. in Zoll.	X	X			14
<i>Fissidens zollingeri</i> Mont.	X	X			9,14
FUNARIACEAE					
<i>Funaria hygrometrica</i> Hedw.	X				13
<i>Physcomitrium coorgense</i> Broth.	X				1
GRIMMIACEAE					
<i>Grimmia delcavata</i> Card.				X	1
<i>Racomitrium fasciculare</i> (Hedw.) Brid. var. <i>atroviridie</i> Card.				X	1
<i>Racomitrium fasciculare</i> (Hedw.) Brid. var. <i>orientale</i> Card.				X	1
<i>Racomitrium heterostichum</i> (Hedw.) Brid.				X	13
HEDWIGIACEAE					
<i>Bryowijkia ambigua</i> (Hook.) Nog.	X				1,3
HOOKERIACEAE					
<i>Callicostella papillata</i> (Mont.) Mitt.	X	X			1,3,4,7
<i>Chaetomitriopsis glaucocarpa</i> (Schwaegr.) Fleisch.	X				1,3,4
<i>Distichophyllum collenchymatosum</i> Card.		X			1
<i>Distichophyllum maibarae</i> Besch.	X	X			1
<i>Distichophyllum mittenii</i> Bosch & Lac.		X			1,4,6
<i>Distichophyllum tortile</i> Dozy & Molk. ex Bosch & Lac.		X			4
<i>Hookeriopsis geminidens</i> Broth.	X				4
<i>Hypopterygium fauriei</i> Broth.	X				1
<i>Hypopterygium japonicum</i> Mitt.	X				1,9
<i>Hypopterygium tenellum</i> C. Muell.		X			1,3,4,12
<i>Lopidium nazeense</i> (Ther.) Broth.		X			1
<i>Lopidium struthiopteris</i> (Brid.) Fleisch.		X			1,3,4,6,7,12
<i>Lopidium trichocladon</i> (Bosch & Lac.) Fleisch.	X				1,4
HYLOCOMIACEAE					
<i>Macrothamnium macrocarpum</i> (Reinw. & Hornsch.) Fleisch.	X				1,3,4,6
HYPNACEAE					
<i>Ctenidium serratifolium</i> (Card.) Broth.		X			1
<i>Ectropothecium dealbatum</i> (Reinw. & Hornsch.) Jaeg.		X			1,4,6
<i>Ectropothecium wanglenum</i> Chen		X			15
<i>Ectropothecium zollingeri</i> (C. Muell.) Jaeg.	X				1,4,6
<i>Girardiella levieri</i> C. Muell.			X		1
<i>Gollania ruginosa</i> (Mitt.) Broth.	X				1
<i>Gollania varians</i> (Mitt.) Broth.	X				1
<i>Hypnum plunaeforme</i> Wils.		X			1,3,4
<i>Isopterygium albescens</i> (Hook.) Jaeg.	X				1,3,4,6,7
<i>Pylaisiadelphina falcata</i> (Dozy & Molk.) Buck		X			1,4
<i>Taxiphyllum taxirameum</i> (Mitt.) Fleisch.	X				13
<i>Vesicularia hainanensis</i> Chen		X			15
<i>Vesicularia montagnei</i> (Bel.) Broth.	X				1,3,4,6,7
<i>Vesicularia reticulata</i> (Dozy & Molk.) Broth.		X			1,3,4,6,7
LEMBOPHYLLACEAE					
<i>Porotrichum mahahaicum</i> (C. Muell.) Fleisch.			X		4

TAXA	Table 1 (Con't.)				DISTRI- BUTION
	XISHUANG- BANNA	HAINAN	MEDOG	HENG- CHUNG	
<b>LESKEACEAE</b>					
<i>Leskea polycarpa</i> Ehrh. ex Hedw.	X				1,8,9,12
<i>Pseudoleskeopsis zippellii</i> (Dozy & Molk.) Broth.	X				4
<i>Regmatodon declinatus</i> (Hook.) Brid.	X				1,3
<i>Regmatodon orthostegius</i> Mont.	X				3
<b>LEUCOBRYACEAE</b>					
<i>Leucobryum aduncum</i> Dozy & Molk.		X			1,3,4,6
<i>Leucobryum bowringii</i> Mitt.	X				1,3,4,6
<i>Leucobryum candidum</i> (P. Beauv.) Wils. in Hook. f. var. <i>pentastichum</i> (Doz. & Molk.) Dix.			X		4,6,7
<i>Leucobryum chlorophyllum</i> C. Muell.			X		1
<i>Leucobryum glaucum</i> (Hedw.) Aongstr. in Fr.			X		1,6,8,9,12
<i>Leucobryum javense</i> (Britt.) Mitt.	X				1,3,4,6
<i>Leucobryum neilgherrense</i> C. Muell.	X	X			1,3,4
<i>Leucobryum scalare</i> C. Muell. ex Fleisch.	X				1,3,4,6
<i>Leucobryum subsanctum</i> Broth.			X		4
<i>Leucobryum teysmannianum</i> Dozy & Molk.			X		4,6,7
<i>Leucophanes albescens</i> C. Muell.			X		3,4,6
<i>Leucophanes candidum</i> (Schwaegr.) Lindb.			X		3,4,6,7
<i>Leucophanes octoblepharoides</i> Brid.			X		3,4,6,7
<i>Octoblepharum albidum</i> Hedw.	X	X			14
<b>LEUCOMIACEAE</b>					
<i>Leucomium strumosum</i> (Hornsch.) Mitt.			X		14
<b>METEORACEAE</b>					
<i>Aerobryidium filamentosum</i> (Hook.) Fleisch. in Broth.	X				1,3,4
<i>Aerobryidium wallichii</i> (Brid.) Fleisch.		X			1,3,4,6
<i>Aerobryopsis subdivergens</i> (Broth.) Broth.		X			1
<i>Barbella cubensis</i> (Mitt.) Broth.	X				1,3,4,7
<i>Barbella pendula</i> (Sull.) Fleisch.	X				1,9,10
<i>Floribundaria sparsa</i> (Mitt.) Broth. var. <i>pilifera</i> (Nog.) Nog.	X				3
<i>Floribundaria walkeri</i> (Ren. & Card.) Broth.	X				3,4
<i>Meteoropsis reclinata</i> (C. Muell.) Fleisch. ex Broth.	X				3,4
<i>Meteoropsis squarrosa</i> (Hook.) Fleisch. var. <i>pilifera</i> Lou			X		15
<i>Meteorium latiphyllum</i> Lou			X		15
<i>Papillaria cordatifolia</i> Lou			X		15
<i>Papillaria semitorta</i> (C. Muell.) Jaeg.	X				1,3,4
<i>Pseudobarbella ancistrodes</i> (Ren. & Card.) Manuel	X				1,3,4
<i>Pseudobarbella validifrons</i> Wu & Lou			X		15
<b>MNIACEAE</b>					
<i>Orthomnion dilatatum</i> (Mitt.) Chen	X				1,3
<i>Plagiomnium cuspidatum</i> (Hedw.) T. Kop.	X				13
<i>Plagiomnium maximoviczii</i> (Lindb.) T. Kop.	X			X	1,3
<i>Plagiomnium rhynchophorum</i> (Hook.) T. Kop.	X			X	1,3,4,7
<i>Plagiomnium rostratum</i> (Schrad.) T. Kop.	X				1,3,4,7,11
<i>Plagiomnium succulentum</i> (Mitt.) T. Kop.	X	X		X	1,3,4
<i>Rhizomnium striatum</i> (Mitt.) T. Kop.	X				1,3
<b>MYURACEAE</b>					
<i>Oedocladium fragile</i> Card.			X		1
<b>NECKERACEAE</b>					
<i>Handeliobryum sikkimense</i> (Par.) Ochyra	X				1
<i>Homaliadelphus targionianus</i> (Mitt.) Dix. & P. de la Verde	X		X		1,3
<i>Homaliodendron exiguum</i> (Bosch & Lac.) Fleisch.	X	X			1
<i>Homaliodendron flabellatum</i> (J. Sm.) Fleisch.	X				1,3,4,6,7,10
<i>Homaliodendron microdendron</i> (Mont.) Fleisch.	X	X			1,3,4
<i>Homaliodendron microphyllum</i>			X		15
<i>Homaliodendron scalpellifolium</i> (Mitt.) Fleisch.		X			1,3,4,6,10
<i>Neckera setschwanica</i> Broth.	X				15
<i>Neckeropsis calcicola</i> Nog.	X				1
<i>Neckeropsis crinita</i> (Griff.) Fleisch.	X				3,4
<i>Neckeropsis gracilentia</i> (Bosch & Lac.) Fleisch.	X				1,3,4,6
<i>Pinnatella alopecuroides</i> (Hook.) Fleisch.	X				3,4
<i>Pinnatella ambigua</i> (Broth. & Lac.) Fleisch.	X				3,4
<i>Pinnatella intralimbata</i> Fleisch.	X				3,4,7
<i>Pinnatella makinoi</i> (Broth.) Broth.	X				1
<i>Pinnatella microptera</i> Fleisch.	X				4
<i>Thamnobryum plicatum</i> (Lac.) Iwats.	X				1
<i>Thamnobryum sandei</i> (Besch.) Iwats.	X				1

TAXA	Table 1 (Con't.)				DISTRI- BUTION
	XISHUANG- BANNA	HAINAN	MEDOG	HENG- CHUNG	
<b>ORTHOTRICHACEAE</b>					
<i>Groutiella tomentosa</i> (Hornsch.) Milik & Marg.	X				11
<i>Macromitrium fasciculare</i> Mitt.		X			1,3,4,12
<i>Macromitrium goniostomum</i> Broth.		X			3
<i>Macromitrium japonicum</i> Dozy & Molk.	X	X			1,3
<i>Macromitrium nepalense</i> (Hook. & Grev.) Schwægr.	X				1,3,4
<i>Orthotrichum consobrinum</i> Card.	X				1
<i>Rhachithecium perpusillum</i> (Thwaites & Mitt.) Broth.	X				14
<i>Schlotheimia grevilleana</i> Mitt.		X			1,3,4,12
<i>Zygodon obtusifolius</i> Hook.	X				14
<b>PHYLLOGONIACEAE</b>					
<i>Horikawaea nitida</i> Nog.			X		1
<b>POLYTRICHACEAE</b>					
<i>Atrichum yakushimense</i> (Horik.) Miz.	X				1
<i>Microdendron sinense</i> Broth.			X		1
<i>Pogonatum camusii</i> (Ther.) Touw				X	15
<i>Pogonatum gymnohyllum</i> Mitt.				X	1,3,4
<i>Pogonatum inflexum</i> (Lindb.) Lac.	X	X			1,3
<i>Pogonatum spurio-cirratum</i> Broth.	X			X	1,4
<i>Pogonatum takao-montanum</i> Horik.				X	1
<i>Polytrichastrum formosum</i> (Hedw.) G. L. Smith var. <i>densifolium</i> (Mitt.) Osada				X	1,3
<i>Polytrichum swartzii</i> Hartm.				X	13
<b>POTTIACEAE</b>					
<i>Barbula indica</i> (Hook.) Spreng. in Steud.	X				1,3
<i>Barbula subcomosa</i> Broth.				X	1
<i>Barbula unguiculata</i> Hedw.	X				13
<i>Didymodon vinealis</i> (Brid.) Zander	X				13
<i>Hydrogonium dixonianum</i> Chen	X				1
<i>Hydrogonium javanicum</i> (Dozy & Molk.) Hilp.	X	X			1,3,4
<i>Hymenostomum edentulum</i> (Mitt.) Besch.				X	1,3,4,6
<i>Hymenostylium recurvirostre</i> (Hedw.) Dix.	X				13
<i>Hyophila involuta</i> (Hook.) Jaeg.	X				13
<i>Hyophila javanica</i> (Nees & Blume) Brid.	X				1,3,4
<i>Hyophila propagatifera</i> Broth.				X	1
<i>Leptodontium flexifolium</i> (Dicks. ex With.) Hampe				X	1
<i>Leptodontium taiwanense</i> Nog.				X	15
<i>Molendoc sendteriana</i> (B.S.G.) Limpr.				X	1,3,8,9
<i>Oxystegus tenuirostris</i> (Hook. & Tayl.) A. J. Sm.	X				13
<i>Reimersia inconspicua</i> (Griff.) Chen				X	1,3,4
<i>Splachnobryum giganteum</i> Broth.	X				1
<i>Trichostomum crispulum</i> Bruch in F. A. Muell.	X				13
<i>Trichostomum platyphyllum</i> (Broth. ex Iis.) Chen	X				1
<i>Weissia crista</i> (Hedw.) Gaertn.	X			X	13
<i>Weissia longidens</i> Card.	X				1
<i>Weissia planifolia</i> Dix.	X			X	1
<b>PTEROBRYACEAE</b>					
<i>Calyptothecium ramosii</i> Bertr.	X	X			4
<i>Calyptothecium urvilleanum</i> (C. Muell.) Broth.	X				1,4,6
<i>Calyptothecium wrightii</i> (Mitt.) Fleisch.	X				3
<i>Garovaglia plicata</i> (Brid.) Bosch & Lac.	X				4
<i>Pterobryopsis auriculata</i> Dix.	X				3
<i>Pterobryopsis crassicaulis</i> (C. Muell.) Fleisch.		X			4
<i>Pterobryopsis subcrassicaulis</i> Broth.	X				1
<b>PTYCHOMITRIACEAE</b>					
<i>Glyphomitrium humillimum</i> (Mitt.) Card.	X				1
<i>Ptychomitrium formosicum</i> Broth.				X	1
<b>RHACHITHECIACEAE</b>					
<i>Powellia involutifolia</i> Mitt.			X		6,7
<b>RACOPILACEAE</b>					
<i>Racopilum aristatum</i> Mitt.	X				1
<i>Racopilum orthocarpum</i> (C. Muell.) Dix.	X				3
<b>SEMATOPHYLLACEAE</b>					
<i>Acanthorrhynchium papillatum</i> (Harv.) Fleisch.	X				3,4,6
<i>Acroporium alto-pungens</i> (C. Muell.) Broth.		X			4



TAXA	XISHUANG- BANNA	HAINAN	MEDOG	HENG- CHUNG	DISTRI- BUTION
<i>Acroporium hamulatum</i> (Fleisch.) Fleisch.		X			4
<i>Acroporium oxyporum</i> (Lac.) Fleisch.	X				3,4
<i>Acroporium secundum</i> (Reimw. & Hornsch.) Fleisch.		X			3,4
<i>Acroporium turgidum</i> Mitt.		X			3,4,6
<i>Brotherella nictans</i> (Mitt.) Broth.	X				3
<i>Foreauella orthothecia</i> (Schwaegr.) Dix. & Verd.	X				3,4,6
<i>Glossadelphus bilobatus</i> (Dix.) Broth.	X				4
<i>Glossadelphus glossoides</i> (Bosch & Lac.) Fleisch.	X				4
<i>Glossadelphus laevifolius</i> (Mitt.) Bartr.	X				1,3,6,10
<i>Neacroporium flagelliferum</i> (Sak.) Iwats. & Nog.	X				1
<i>Rhaphidostichum macrostictum</i> (Broth. & Par.) Broth.	X				1
<i>Sematophyllum tristiculum</i> (Mitt.) Fleisch.	X				1,3,4
<i>Taxithellium nepalense</i> (Schwaegr.) Broth.		X			3,4,12
<i>Trichosteleum hamatum</i> (Dozy & Molk.) Jaeg.		X			1,3,4,6,7
<i>Trichosteleum mammosum</i> (C. Muell.) Jaeg.		X			3,4
<i>Trichosteleum pseudo-mamosum</i> Fleisch.		X			4
SPHAGNACEAE					
<i>Sphagnum junghuhnianum</i> Dozy & Molk.				X	1,3,4
SPIRIDENTACEAE					
<i>Spiridens reinwardtii</i> Nees				X	1,4,6
SPLACHNACEAE					
<i>Tayloria indica</i> Mitt.	X				3,4
STEREOPHYLLACEAE					
<i>Entodontopsis anceps</i> (Bosch & Lac.) Buck & Ireland	X	X			3,4
<i>Entodontopsis pygmaea</i> (Par. & Broth.) Buck & Ireland	X				3
THELIACEAE					
<i>Myurella sibirica</i> (C. Muell.) Reim.	X				1,8,9
THUIDIACEAE					
<i>Actinothuidium hookeri</i> (Mitt.) Broth.			X		1,3
<i>Anomodon minor</i> (Hedw.) Fuernr. ssp. <i>integerrimus</i> (Mitt.) Iwats.	X				1,3
<i>Anomodon thraustus</i> C. Muell.	X				1
<i>Anomodon viticulosus</i> (Hedw.) Hook. & Tayl.	X				13
<i>Bryohaplodium angustifolium</i> (Hampe & C. Muell.) Watan. & Iwats.	X				13
<i>Bryohaplodium microphyllum</i> (Hedw.) Watan. & Iwats.	X				13
<i>Claopodium aciculatum</i> (Broth.) Broth.	X				1
<i>Claopodium assurgens</i> (Sull. & Lesq.) Card.	X	X			1,3,4,7
<i>Claopodium prionophyllum</i> Broth.	X				1,3,4
<i>Herpetineuron toccocae</i> (Sull. & Lesq.) Card.	X				13
<i>Pelekium bifarium</i> (Bosch & Lac.) Fleisch.	X				1,3,4,6
<i>Thuidium bonianum</i> Besch.	X				1,3
<i>Thuidium cymbifolium</i> (Dozy & Molk.) Dozy & Molk.	X	X			1,3,4,6,7
<i>Thuidium delicatulum</i> (Hedw.) Mitt.					
var. <i>radicans</i> (Kindb.) Crum, Steere & Anderson	X				13
<i>Thuidium glaucinum</i> (Mitt.) Bosch & Lac.	X	X			1,3,4,6,9
<i>Thuidium kenedeei</i> Sak.	X				1
<i>Thuidium minutulum</i> (Hedw.) B.S.G.	X				1,8,9,10,11
<i>Thuidium plumulosum</i> (Dozy & Molk.) Bosch & Lac.		X			3,4,6
<i>Thuidium sparsifolium</i> (Mitt.) Jaeg.	X				1,3
<i>Thuidium talongense</i> Besch.	X				1
<i>Thuidium tamariscellum</i> (C. Muell.) Bosch & Lac.	X				15,8,10,11,12
TRACHYPODIACEAE					
<i>Diaphandon blandus</i> (Harv.) Ren. & Card.				X	1,3,4
<i>Duthiella flaccida</i> (Card.) Broth.	X				1,3,4
<i>Duthiella formosana</i> Nog.			X		15
<i>Duthiella wallichii</i> (Mitt.) C. Muell.	X				1,3,4
<i>Pseudospirodonopsis horrida</i> (Card.) Fleisch.			X		1,3,4
<i>Trachopodiopsis lancifolium</i> Wu			X		15
<i>Trachopodiopsis auriculata</i> (Mitt.) Fleisch.		X			2,3,6
<i>Trachopodiopsis serrulata</i> (P. Beauv.) Fleisch.					
var. <i>crispata</i> (Hook.) Zant.	X				1,3,10
<i>Trachypus bicolor</i> Rein. & Hornsch. var. <i>viridulus</i> (Mitt.) Zant.	X				1,3,4,10,11,12

Yunnan and Guangxi, and the coastal regions of Guangdong are included in his South Chinese Province. The tropical region of Taiwan occurs on the southern peninsula of Hengchun and is included in the Philippinean Province of the Malesian Region.

### **Mosses of the tropical regions of China**

Except for a preliminary list of the mosses of Hainan Island by Tan, Li & Lin (1987), there are no published studies that list the mosses found specifically in the tropical regions of China. There is a recent index to the mosses of Taiwan (Kuo & Chiang 1987), but this index understandably does not delineate taxa found in the tropical rain forests. However, Chuang (1973) in his Moss flora of Taiwan exclusive essentially of pleurocarpous families, does cite 55 taxa from the Hengchun area where tropical rain forests occur. Consequently, the lists compiled for each of these regions is tentative and based upon collections made by my colleagues and I in Xishuangbanna, from a few collections made by others, and the few published records that specifically list localities in tropical regions. Moreover, it should be kept in mind that the identification of collections made in Xishuangbanna by Crosby, Magill, Wu, Lou, Wang and myself is far from complete. Koponen has also collected in Xishuangbanna but, as far as I know, a list of his collections has not been published.

Six provinces in China contain tropical vegetation. These are Hainan, Guangdong, Guangxi, Taiwan, Yunnan, and Xizang. Excluding Xizang, which contains mostly high plateau and mountainous regions, there are approximately 1352 taxa of mosses recorded for these provinces. Many of these taxa occur in the extensive subtropical forests common in Yunnan, Guangxi, Guangdong and Taiwan. Seven hundred and thirty-three (55.3%) of these taxa are

recorded for Yunnan Province. One hundred and sixty-six (12.5%) taxa are recorded for Guangdong Province. One hundred and nineteen (9.1%) are recorded from Hainan Province. Only 54 (4.1%) taxa are recorded from Guangxi Province. The largest number of taxa, 831 (66.1%), are recorded from Taiwan. A comparison of these figures with the number of taxa specifically recorded from tropical regions indicates how little is known. Only 189 taxa are known specifically from Xishuangbanna, 119 taxa from Hainan Island and 55 taxa (mostly acrocarpous) are known from Hengchun in Taiwan. For the Medog area of Xizang, 421 taxa are reported Wu & Lou (1981). A list of these taxa has not been published. The number of taxa for the Medog area may be low since at least one large collection of mosses from this area by Y.-G. Su has yet to be cataloged and identified.

### **Geographical Analysis of the mosses of tropical regions of China**

For the purpose of this analysis I have included only those taxa that have been specifically cited in the literature as occurring in regions where tropical vegetation occurs [Hainan (Tan & Li, & Lin 1987), Hengchun in Taiwan (Chuang (1973), Xishuangbanna (Redfearn et al 1989), and Medog in Xizang (Wu & Lou, 1981)] or have been found in recent field studies by myself and others in Xishuangbanna. This provides a total of 329 taxa (Table 1) upon which to base an analysis. In actual number this may be adequate but its sources, except for Hainan, come from a highly skewed taxonomic sample. The Taiwan sample is limited primarily to acrocarpous mosses and the Xishuangbanna sample is based upon identifications in genera or families for which some reasonably good literature for the region is available such as the Meteoriaceae, Pottiaceae, Calymperaceae, Mniaceae, Neckeraceae, Leskeaceae, *Atrichum*, *Fissidens*, *Grimmia*, *Forsstroemia*,

Geographic Regions	All Taxa for China	Xishuang- banna	Hainan	Medog	Hengchun
	No. (%) Taxa	No. (%) Taxa	No. (%) Taxa	No. (%) Taxa	No. (%) Taxa
1. Eastern & Northern Asia (As1, As2)	184 (56)	110 (58)	67 (56)	8 (40)	34 (62)
3. India, Pakistan, Himalayas, Ceylon, Burma, Indochina (As3)	166 (51)	106 (56)	68 (57)	5 (25)	20 (36)
4. Indomalayan (Indonesia, Malaya, Philippines, New Guinea, As4)	135 (41)	72 (38)	71 (60)	3 (15)	19 (35)
5. Asiatic Middle-east (As5)	3 (2)	3 (2)	0	0	1 (2)
6. Oceania (Oc)	49 (15)	21 (11)	29 (24)	1 (5)	6 (11)
7. Australia & New Zealand (Austr1, Austr2)	28 (9)	13 (7)	20 (17)	1 (5)	3 (6)
8. Europe (Eur)	13 (4)	7 (4)	2 (2)	0	5 (9)
9. North America (Am1)	19 (6)	13 (7)	3 (3)	0	4 (7)
10. Central America & West Indies (Am2, Am3)	31 (9)	23 (12)	10 (8)	0	3 (6)
11. South America (Am4, Am5, Am6)	30 (9)	22 (12)	11 (9)	0	3 (6)
12. Africa (Afr1, Afr2, Afr3, Afr4)	32 (10)	20 (11)	16 (14)	0	2 (4)
13. Cosmopolitan	29 (9)	24 (13)	2 (2)	0	8 (15)
14. Pantropical (Am2, Am3, Am4, Am5, Afr2, As3, As4)	21 (6)	14 (7)	12 (10)	0	1 (2)
15. Endemic to tropical China	20 (6)	1 (.5)	5 (4)	10 (50)	4 (7)
Total Taxa	329	189 (58)	119 (36)	20 (6)	55 (17)

Table 2. World distribution of mosses that occur in the tropical regions of China.

*Ctenidium*, and *Brachymenium*. Many difficult groups including the Amblystegiaceae, Brachytheciaceae, Hypnaceae, Sematophyllaceae (except *Glossadelphus*), *Sphagnum*, *Bryum*, *Pogonatum*, and *Plagiothecium*, are yet to be studied. In many cases we simply have not had the time to study collections that might otherwise be readily identified.

I would now like to examine the distribution pattern of the taxa of mosses found in the tropical vegetational regions of China. For this purpose I have included As 2 in As 1, combined Am 2 & 3, combined Am 4, 5, & 6, combined Afr 1, 2, 3, & 4, and combined Austr 1 & 2. The floristic affinities for the combined tropical taxa and for the taxa of each, Xishuangbanna (Xb), Hainan (Ha), Medog (Me), and Hengchun (He), are shown in Table 2 and Figure 2. The affinities shown by Table 2 & Figure 2 clearly indicate that there is, as one might expect, a strong representation of Eastern Asian, India-Himalayan, and Indo-Malayan taxa. The moss flora for each of the areas with tropical vegetation, i.e. Xishuangbanna, Hainan, Medog in Xizhang, and Hengchun in Taiwan, with the exception of the Medog area, have similar floristic affinities. That the Medog area appears different is, I suspect, due to the fact that I have not been able to get a list of taxa for this area. Nevertheless, it may still be different because of its location on the Tibetan Plateau where extreme elevation differences provide both montane and lowland habitats.

A tentative list of the taxa assigned to each of the floristic regions is included in Appendix I. Many taxa occur in several floristic regions. This should be expected since the tropical regions of China are areas that lie along the boundary between eastern Asia, Indian-Himalayan and Indo-Malayan regions. And, these areas have been subject to many interesting dispersal patterns and environmental changes. First

and foremost, one must consider the consequence of the Indian plate as it drifted northward and collided with the Laurasian plate forcing the uplift of the Himalayan mountains. Not only did this tectonic event result in the possible rafting of Gondwanan taxa into southern Laurasia (Schuster 1983), but the tremendous elevation changes that developed in the southern part of Laurasia also influenced major weather patterns in Southeast Asia. Strong easterly air flow created the monsoon conditions necessary for the development of the tropical rainforests (Chang 1983). Furthermore, such a strong easterly air flow was probably the vector for long range dispersal of bryophytes to Southeast Asia and to the oceanic islands in the Pacific. Add to all this the influence of the Arcto-Tertiary events that established remarkable relationships between eastern North America and eastern Asia, and the migration patterns stimulated by the Pleistocene and it is understandable why the mosses of the Chinese tropics have such diverse geographic affinities.

The large number of endemic species reported from the Medog region of Xizang is noteworthy. This may be the result of the topographic diversity and isolation of the region that have combined to produce both 'biotic islands' and 'stress', conditions that promote rapid speciation (Schuster 1983).

The islands of Hainan and Taiwan are considered continental. In the case of Hainan, the floristic affinities seems to be equally divided between eastern Asiatic, India-Himalayan, and Indomalayan (Figure 2). Wu & Lou (1978) noted that the same floristic elements exist for the Hepaticae. On the other hand, the floristic affinities of Hengchun on Taiwan, based on acrocarpous mosses, has a weaker representation of India-Himalayan and Indomalayan taxa than Hainan. Similar conclusions were reached by Wang (1970) in his monumental study of the



Fig. 3. *Garkea flexuosa*



Fig. 4. *Octoblepharum albidum*



Fig. 5. *Calymperes erosum*



Fig. 6. *Aerobryidium filamentosum*



Fig. 7. *Barbella cubensis*



Fig. 8. *Acroporium oxyporum*



Fig. 9. *Meteoropsis reclinata*



Fig. 10. *Zygodon obtusifolius*





Fig. 11. *Pseudoleskeopsis zippelii*



Fig. 12. *Brothera leana*

Phytogeography of the Mosses of Formosa. He noted that 'The flora is largely a combination of eastern Asiatic, Himalayan and Indomalaysian types...' He further pointed out that the flora "...is much more strongly Sino- Japanese than Himalayan or Indomalayan in affinity."

Many of the mosses of the tropics of China have ranges extending to subtropical vegetation of northern Yunnan, Guizhou, Hunan, Guangxi, Guangdong, Fujian, Taiwan, Xizang, and Sichuan. Representative of such taxa are *Garkea flexuosa* (Figure 3), *Octoblepharum albidum* (Figure 4), *Calymperes erosum* (Figure 5), *Aerobryidium filamentosum* (Figure 6), *Barbella cubensis* (Figure 7), *Acroporium oxysporum* (Figure 8), *Meteoriopsis reclinata* (Figure 9), *Zygodon obtusifolius* (Figure 10) and *Pseudoleskeopsis zippelii* (Figure 11). Likewise, many species, such as *Brothera leana* (Figure 12), with an Asian and North American distribution, extend into the Chinese tropics.

In summary, in spite of the incompleteness of our knowledge of the tropical moss flora of China, I strongly expect that as this flora becomes better known, the geographical affinities indicated by this analysis will be strengthened. That is, the affinities of the moss flora of tropical regions in China are largely associated with Eastern Asia, India-Himalayan, and Indomalayan. Species found in the Australian area may be the result of long range dispersal or, in some cases, be due to rafting of taxa on the Indian plate from Gondwana to Laurasia. Certainly long-range dispersal is responsible for affinities with Pacific Oceanic islands. Arcto-tertiary elements in the tropical moss flora are probably related to migration patterns established during the Pleistocene (Schuster 1983).

### Prospects for future bryological work

### in the Chinese tropics

Establishing a research program in China is never easy. Many negotiations need to be made with the specific persons you want to work with in China, and they in turn have to negotiate with Provincial and County officials for permission to collect. Many areas are still not open to foreigners. Once one has gained permission to collect in an area travel is not particularly difficult. Four-wheel vehicles are available through most of China. However, you will sometimes wonder if they do not have their frames welded to the axils. Lodging and food is no problem if you like or at least can tolerate Chinese food and hard beds. As in other tropical areas it is wise to take anti-malarial medication before entering China. In southern China schistosomiasis is present and the vectors are found in the rice paddies. Leeches are a constant problem in the tropical and subtropical regions so one must wear appropriate clothing. I find that they are more a nuisance than a real danger.

There is no region in China that does not need more field studies. Certainly the tropical and subtropical regions of the southern provinces of Yunnan, Guangxi, Guizhou, Guangdong, Hainan, and southern Xizang need much more careful investigation. In order to efficiently arrange for field work one must have a contact or contacts within the established research institutes in China such as the South China Institute of Botany in Guangzhou (Canton), the Institute of Botany in Beijing, or the Institute of Botany in Kunming. All these Institutes are part of the Chinese Academy of Sciences (Academia Sinica).

One of the most promising ways to gain a better understanding of the bryoflora of China is through extended visits of Chinese bryologists and their students to western Universities and research institutions. When they return, to China they not only provide us with established contacts in

China, but they take back many new ideas and methods for their bryological studies in China.

Recently there has been established under Academia Sinica the concept of the Open Laboratory. Though this Open Laboratory was established to promote the study of vascular plants, bryophytes may also be included. Dr. Raven of the Missouri Botanical Garden is the best person to contact about how this Open Laboratory functions.

Finally, I must remind you of the vastness of China, its tremendous ecological diversity and topography, its juxtaposition to the tropical regions of southeast Asia, Indochina, and Malaysia and the fact that there are relatively few Chinese who devote their time to the study of bryophytes. Cooperation between European, American, and Asian bryologists with each other and with our Chinese colleagues is necessary. We must be patient with the problems they face and remember that the purpose of cooperation is to further the knowledge of tropical bryology.

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## APPENDIX I

*Taxa with predominantly East Asian distribution*

*Andreaea rupestris* var. *fauriei*  
*Anomodon minor* var. *integerrimus*  
*Atrichum yakushimense*  
*Barbula indica*  
*Barbula subcomosa*  
*Brachythecium wichurae*  
*Campylopus japonicus*  
*Claopodium aciculum*  
*Dicranum hamulosum*  
*Dicranum japonicum*  
*Fissidens aldephinus*  
*Fissidens gymnogynus*  
*Fissidens tosaensis*  
*Giraldiella levier*  
*Gollania ruginosa*  
*Grimmia delcavata*  
*Handeliobryum sikkimense*  
*Horikawaea nitida*  
*Hydrogonium dixonianum*  
*Hyophila propagulifera*  
*Lopidium nazeense*  
*Neacroporium flagelliferum*  
*Neckeropsis calcicola*  
*Oedocladium fragile*  
*Orthotrichum consobrinum*  
*Physcomitrium coorgense*  
*Pinnatella makinoi*  
*Pogonatum takao-montanum*  
*Ptychomitrium formosicum*  
*Racomitrium fasciculare* var. *atroviridie*  
*Racomitrium fasciculare* var. *orientale*  
*Racopilum aristatum*

*Rhaphidostichum macrostictum*  
*Splachnobryum giganteum*  
*Regmatodon orthostegius*  
*Thamnobryum plicatulum*  
*Thamnobryum sandei*  
*Thuidium kanedae*  
*Thuidium talongense*  
*Trichostomum platyphyllum*  
*Weissia longidens*

*Taxa that occur primarily in the India-Himalayan and are not found in the Indo-Malayan region*

*Brotherella nictans*  
*Bryum recurvulum*  
*Calypothecium wrightii*  
*Cyathophorella tonkinensis*  
*Entodontopsis pygmaea*  
*Floribundaria sparsa*  
*Garkea flexuosa*  
*Macromitrium goniostomum*  
*Mitthyridium fasciculatum*  
*Racopilum orthocarpum*

*Taxa that occur primarily in the Indo-Malayan region and are not found in the India-Himalayan region*

*Acroporium alto-pungens*  
*Acroporium hamulatum*  
*Calymperes serratum*  
*Calypothecium ramosii*  
*Calypothecium urvilleanum*  
*Campylopus caudatus*  
*Cyathophorella hookeriana*  
*Dicranodontium fleischerianum*

*Distichophyllum tortile*  
*Ectropothecium dealbatum*  
*Exostratum blumei*  
*Garovaglia plicata*  
*Glossadelphus bilobatus*  
*Glossadelphus glossoides*  
*Hookeriopsis geminidens*  
*Lopidium trichocladon*  
*Pinnatella microptera*  
*Pseudoleskeopsis zippelii*  
*Pterobryopsis crassicaulis*  
*Trichosteleum pseudo-mammosum*  
*Wilsoniella decipiens* var. *acutifolia*

*Taxa that are occur in both Indian-Himalayan and Indo-Malayan regions. Many of these taxa also may range into Eastern Asia, Australian and the Pacific Islands regions*

*Acanthorrhynchium papillatum*  
*Acroporium oxyporum*  
*Acroporium secundum*  
*Acroporium turgidum*  
*Aerobryidium filamentosum*  
*Barbella cubensis*  
*Bartramidula bartramioides*  
*Bartramidula roylei*  
*Callicostella papillata*  
*Chaetomitriopsis glaucocarpa*  
*Claopodium prionophyllum*  
*Dicranoloma blumei*  
*Duthiella flaccida*  
*Duthiella wallichii*  
*Entodontopsis anceps*  
*Fissidens areolatus*

<i>Fissidens crenulatus</i>	<i>Pseudospirodentopsis</i>	<i>Taxa that occur in the</i>
<i>Fissidens hollianus</i>	<i>horrida</i>	<i>Pacific Islands of Oceana</i>
<i>Fissidens javanicus</i>	<i>Reimersia inconspicua</i>	
<i>Fissidens laxus</i>	<i>Schoenobryum concavi-</i>	
<i>Fissidens nobilis</i>	<i>folium</i>	<i>Bryum giganteum</i>
<i>Fissidens plagiochiloides</i>	<i>Sematophyllum</i>	<i>Calymperes serratum</i>
<i>Fissidens robinsonii</i>	<i>tristiculum</i>	<i>Calymperes tahitense</i>
<i>Floribundaria walkeri</i>	<i>Sphagnum</i>	<i>Calyptothecium</i>
<i>Foreauella orthothecia</i>	<i>junghuhnianum</i>	<i>urvilleanum</i>
<i>Homaliodendron</i>	<i>Syrrhopodon</i>	<i>Campylopus caudatus</i>
<i>flabellatum</i>	<i>flameonervis</i>	<i>Dicranoloma blumii</i>
<i>Homaliodendron micro-</i>	<i>Syrrhopodon spiculosus</i>	<i>Distichophyllum mittenii</i>
<i>dendron</i>	<i>Syrrhopodon</i>	<i>Ectropothecium</i>
<i>Homaliodendron scalpel-</i>	<i>trachyphyllum</i>	<i>dealbatum</i>
<i>lifolium</i>	<i>Taxithelium nepalense</i>	<i>Ectropothecium</i>
<i>Hydrogonium javanicum</i>	<i>Tayloria indica</i>	<i>zollingeri</i>
<i>Hymenostomum</i>	<i>Thuidium plumulosum</i>	<i>Exostratum blumei</i>
<i>edentulum</i>	<i>Trichosteleum</i>	<i>Fissidens ceylonensis</i>
<i>Hyophila javanica</i>	<i>mammosum</i>	<i>Fissidens obscurirete</i>
<i>Hypopterygium tenellum</i>		<i>Foreauella orthothecia</i>
<i>Leucobryum aduncum</i>		<i>Glossadelphus laevifolius</i>
<i>Leucobryum bowringii</i>	<i>Taxa whose range</i>	<i>Homaliodendron</i>
<i>Leucobryum javense</i>	<i>extends into the</i>	<i>exiguum</i>
<i>Leucobryum</i>	<i>Australian area</i>	<i>Homaliodendron</i>
<i>neilgherrense</i>		<i>flabellatum</i>
<i>Leucobryum scalare</i>	<i>Barbula cubensis</i>	<i>Homaliodendron scalpel-</i>
<i>Leucoloma molle</i>	<i>Callicostella papillata</i>	<i>lifolium</i>
<i>Leucoloma walkeri</i>	<i>Claopodium assurgens</i>	<i>Isopterygium albescens</i>
<i>Leucophanes albescens</i>	<i>Ditrichum difficile</i>	<i>Leucobryum aduncum</i>
<i>Leucophanes candidum</i>	<i>Fissidens ceylonensis</i>	<i>Leucobryum bowringii</i>
<i>Leucophanes octoblepha-</i>	<i>Homaliodendron</i>	<i>Leucobryum candidum</i>
<i>rioides</i>	<i>exiguum</i>	<i>Leucobryum</i>
<i>Macromitrium</i>	<i>Homaliodendron</i>	<i>teysmannianum</i>
<i>fasciculare</i>	<i>flabellatum</i>	<i>Leucophanes candidum</i>
<i>Macromitrium nepalense</i>	<i>Isopterygium albescens</i>	<i>Leucophanes octoble-</i>
<i>Macrothamnium macro-</i>	<i>Leucobryum</i>	<i>pharioides</i>
<i>carpum</i>	<i>teysmannianum</i>	<i>Lopidium struthiopteris</i>
<i>Meteoriopsis reclinata</i>	<i>Leucophanes candidum</i>	<i>Mitthyridium</i>
<i>Microdus brasiliensis</i>	<i>Leucophanes octoblepha-</i>	<i>fasciculatum</i>
<i>Mitthyridium flavum</i>	<i>rioides</i>	<i>Mitthyridium flavum</i>
<i>Neckeropsis crinita</i>	<i>Lopidium struthiopteris</i>	<i>Plagiomnium rhyncho-</i>
<i>Neckeropsis gracilentia</i>	<i>Mitthyridium</i>	<i>phorum</i>
<i>Pelekium bifarium</i>	<i>fasciculatum</i>	<i>Plagiomnium rostratum</i>
<i>Philonotis mollis</i>	<i>Mitthyridium flavum</i>	<i>Powellia involutifolia</i>
<i>Philonotis thwaitesii</i>	<i>Powellia involutifolia</i>	<i>Trichosteleum hamatum</i>
<i>Pinnatella alopecuroides</i>	<i>Trichosteleum hamatum</i>	<i>Vesicularia montagnei</i>
<i>Pinnatella ambigua</i>	<i>Vesicularia montagnei</i>	<i>Vesicularia reticulata</i>
<i>Pinnatella intralimbata</i>	<i>Vesicularia reticulata</i>	
<i>Pseudobarbella</i>		
<i>ancistrodes</i>		<i>Taxa that occur in the</i>

*Australian region*

*Barbella cubensis*  
*Callicostella papillata*  
*Calymperes graeffanum*  
*Calymperes tahitense*  
*Claopodium assurgens*  
*Fissidens ceylonensis*  
*Homaliiodendron*  
*exiguum*  
*Homaliiodendron*  
*flabellatum*  
*Isopterygium albescens*  
*Leucobryum cabdidum*  
*Leucobryum*  
*teysmannianum*  
*Leucophanes candidum*  
*Leucophanes octoblepharioides*  
*Lopidium struthiopteris*  
*Mitthyridium*  
*fasciculatum*  
*Mitthyridium flavum*  
*Pinnatella intralimbata*  
*Plagiomnium rhynchosporum*  
*Plagiomnium rostratum*  
*Powellia involutifolia*  
*Syrrhopodon*  
*trachyphyllus*  
*Trichosteleum hamatum*  
*Vesicularia montagnei*  
*Vesicularia reticulata*

*Taxa with an Eastern*  
*Asia - Eastern North*  
*American distribution*

*Barbella pendula*  
*Brothera leana*  
*Dicranodontium*  
*asperulum*  
*Entodon macropodus*  
*Erpodium biseriatum*  
*Hyophila involuta*  
*Fissidens microcladus*  
*Fissidens zollingeri*  
*Leucobryum glaucum*  
*Molendoa sendteriana*  
*Myurella sibirica*  
*Paraleucobryum enerve*  
*Pohlia prolifera*  
*Schwetschkeopsis*  
*fabronia*  
*Syrrhopodon parasiticus*  
*Thuidium minutulum*

*Pantropical taxa*

*Bryum billarderi*