



# **Report of Rapid Biodiversity Assessments at Jianling and Shangxi Nature Reserves, Southeast Hainan, China, May 1999**

**Kadoorie Farm and Botanic Garden**  
in collaboration with  
**Hainan Provincial Forestry Department**  
**South China Institute of Botany**  
**Hainan Normal University**  
**South China Normal University**  
**Liuzhou Technical College**  
**Xinyang Teachers' College**

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# Report of Rapid Biodiversity Assessments at Jianling and Shangxi Nature Reserves, Southeast Hainan, China, May 1999

## Editors

John R. Fellowes, Bosco P.L. Chan, Ng Sai-Chit and Michael W.N. Lau

## Contributors

Kadoorie Farm and Botanic Garden:	John R. Fellowes	(JRF)
	Michael W.N. Lau	(ML)
	Lee Kwok Shing	(LKS)
	Graham T. Reels	(GTR)
	Gloria L.P. Siu	(GS)
	Bosco P.L. Chan	(BC)
Hainan Provincial Forestry Department:	Ng Sai-Chit	(NSC)
	Fu Jiping	(FJP)
	Yun Zhongda	(YZD)
South China Institute of Botany:	Wang Ruijiang	(WRJ)
	Xing Fuwu	(XFW)
Institute of Zoology (Beijing):	Chen Deniu	(CDN)
Hainan Normal University:	Xiong Yan	(XY)
South China Normal University:	Xiao Zhi	(XZ)
Liuzhou Technical College:	Chen Min	(CM)
Xinyang Teachers' College:	Li Hongjing	(LHJ)
Voluntary specialists:	Keith D.P. Wilson	(KW)

## Background

The present report details the findings of a visit to southeastern Hainan by members of Kadoorie Farm and Botanic Garden (KFBG) in Hong Kong and their colleagues, as part of KFBG's South China Biodiversity Conservation Programme. The overall aim of the programme is to minimise the loss of forest biodiversity in the region, and the emphasis in the first phase is on gathering up-to-date information on the distribution and status of fauna and flora.

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### Translation of common Chinese geographical terms

Chinese Romanization	English meaning
Bei	North
Dao	island
Dong	East
Feng shui	The Chinese system of geomancy
Feng, Ding	peak
Gang	harbour
Hai	sea
He, Chuan, Jiang	river
Hu, Chi	lake
Keng, Gu	valley
Kou	outlet
Ling	range
Nan	South
Shan	mountain
Shi	city
Tun	Hamlet
Wan	bay
Xi	West
Xi, yong	stream

# Report of Rapid Biodiversity Assessments at Jianling and Shangxi Nature Reserves, Southeast Hainan, China, May 1999

## Objectives

- The aims of the surveys were to collect up-to-date information on the fauna and flora of Jianling and Shangxi Nature Reserves, and to use this to help determine conservation priorities within South China. Emphasis was on groups that have not been extensively studied, including birds, amphibians, reptiles, fish, ants, dragonflies and butterflies. Only limited parts of the reserves could be surveyed in the time available; less than one day was spent at Jianling and less than two days at Shangxi. The two survey reports are combined here due to their close proximity.

## Methods

- On 17 May 1999 a team from Hong Kong (GS, JRF, ML, GTR, LKS, KW), Haikou (FJP, YZD, XY), Guangzhou (XFW, WRJ, XZ), Xinyang (LHJ) and Liuzhou (CM) assembled in Haikou. On 18 May, they set off for Southeast Hainan, driven by Huang Guoxiong (South China Institute of Botany) and Mr. Li (Hainan).
- On 18 May afternoon, they surveyed Jianling Nature Reserve and on 20 May, they surveyed Shangxi Nature Reserve.
- During fieldwork visual searching for plants, mammals, birds, reptiles, amphibians, fish, ants, butterflies and dragonflies was conducted. Frogs and birds were also identified by their calls. Plant records were made by field observation, with some specimens collected.
- Status of large and medium-sized mammals (excluding Insectivora, Chiroptera and Muridae) at Shangxi was inferred largely based on interviews with local people, with reference to colour pictures. For purposes of these interviews a list of South China mammals was compiled from various sources including Guangdong Forestry Department and South China Institute of Endangered Animals (1987), Corbet & Hill (1992) and Zhang Y. *et al.* (1997).
- Vascular plant records were made by XFW or WRJ, and edited by NSC. Mammal records were made by LKS, GTR, ML or JRF. Records of birds were made or verified by LKS, KW, ML or JRF, reptiles and amphibians by ML, fish by LHJ, ants by JRF, dragonflies by KW and GTR, butterflies by GTR and molluscs by CDN or XY.
- Nomenclature in the report is standardised based, unless otherwise stated, on the following references:
  - Flora (Pteridophyta, Gymnospermae and Angiospermae excluding Orchidaceae): Anon. (1959-2001); Anon. (1996-2001); Anon. (2002a, 2002b); The Plant Names Project (2002);
  - Orchids (Angiospermae: Orchidaceae): De Vogel & Turner (1992); Chen (1999); Lang (1999); Tsi (1999);
  - Mammals (Mammalia): D.E. Wilson & Cole (2000);
  - Birds (Aves): Inskipp *et al.* (1996);
  - Reptiles and Amphibians (Reptilia and Amphibia): Zhao E.-M. & Adler (1993); Zhao E. *et al.* (2000);
  - Fish (Actinopterygii): Nelson (1994); Wu *et al.* (1999);
  - Ants (Insecta: Hymenoptera: Formicidae): named species according to Bolton (1995); unnamed species with reference numbers according to the collection currently held by KFBG.
  - Dragonflies (Insecta: Odonata): Schorr *et al.* (2001a, 2001b);
  - Butterflies (Insecta: Lepidoptera): Bascombe (1995).
- Information on the global status of species is from IUCN publications, notably IUCN Species Survival Commission (2001). Certain taxa, including orchids, reptiles, amphibians, fish and

invertebrates, have yet to be properly assessed for global status. National conservation status of orchids is based on Wang *et al.* (in press).

- Protected status in China is based on Hua & Yan (1993) for animals, and State Forestry Administration & Ministry of Agriculture (1999) for plants.

### Location and management

- Jianling Nature Reserve is in Wanning County, Southeast Hainan, at 18 ° 50'–18 ° 59'N and 110 ° 15'–110 ° 16'E (MacKinnon *et al.*, 1996). It has an area of 109 km<sup>2</sup>, and was established in 1981 to protect tropical monsoon rainforest ecosystems. It apparently adjoins a smaller reserve (7 km<sup>2</sup>) of the same name, in Baoting County, established in 1983 to protect *Vatica mangachampoi* forest and Rhesus Monkey *Macaca mulatta*. The coordinates of Baoting Jianling are given as 18°41'N by 109°32'E (MacKinnon *et al.*, 1996).
- Jianling has an altitude range from 75 to 804 m (Mackinnon *et al.*, 1996). The present survey covered only the lower elevations, up to about 110 m.
- Shangxi Nature Reserve is also in Wanning, at 18°45'–18°49'N by 110°08'–110°13'E. The size is 117 km<sup>2</sup>. The reserve was established in 1981 to protect the tropical rainforest ecosystems (Mackinnon *et al.*, 1996). It is known locally as Niujaoling, or “Cow Horn Range”.
- Shangxi has an altitude range from 180 to 754 m (Mackinnon *et al.*, 1996). The present survey covered only lower elevations, up to 450 m.
- The region has a tropical monsoonal climate. Climatic data for the nature reserves were not available, but mean monthly temperature at Wanning City ranges from 17.8°C in January to 28°C in July; average annual precipitation is about 2,240 mm (Hainan Bureau of Surveying and Mapping, 1996).
- Both Jianling and Shangxi are classified as Forest Ecosystem nature reserves (Zhang W., 1998), and managed by the provincial Forestry Department.

### Results

#### Vegetation

- The zonal vegetation of the region should be tropical seasonal evergreen rainforest. Original forest cover, however, had been destroyed in both areas.
- At Jianling, the vegetation outside the reserve was rubber tree (*Hevea brasiliensis*) plantation. Inside the reserve was secondary shrubland, dominated by *Melastoma candidum*, *M. sanguineum*, *Cratogeomys cochinchinense* and *Aporosa dioica*. Small patches of young secondary or remnant forest less than 10 m in height could be found in streamsides and ravines. Vegetation further inside and at higher elevations could not be assessed.
- The area surveyed at Shangxi included plantation of coffee trees (*Coffea* spp.) outside the reserve and secondary forest and shrubland, said to have been cleared 20 years earlier, inside. Below 300 m the forest canopy was generally 5-6 m in height and up to 30 cm dbh, with occasional larger trees (e.g. a *Bischofia javanica* 1.5 m dbh). This lower forest was dominated by sun-loving plants such as *Cratogeomys cochinchinense*, *Sterculia lanceolata*, *Mallotus anomalus*, *Ficus* spp. and *Arenga pinnata*, with *Calamus rhabdocladus* and *Alpinia* spp. dominant in the liana and herb layers respectively. Further inside, above 300 m, more mature and epiphyte-rich forest, with a closed canopy up to 15 m high could be found, but the flora was not recorded as the botanists did not reach this far.

## Flora

- The present survey recorded 105 species in 54 families (Table 1), at Jianling. No orchids were found. Despite the degraded nature of the vegetation, several plant species of conservation importance were found in streamside secondary forest patches:
  - *Vatica mangachapoi* is Globally Endangered and under Class II National Protection in China.
  - *Heritiera parvifolia*, *Hydnocarpus hainanensis* and *Litchi chinensis* var. *euspontanea* are Globally Vulnerable; *H. parvifolia* is also under Class II Protection nationally.
  - Several species found (*Cryptocarya metcalfiana*, *Medinilla arboricola*, *Hedyotis cryptantha* and *Nephelium topengii*) are endemic to Hainan.
  - The tree *Chieniodendron hainanense* is endemic to Hainan and southern Guangxi, and is rare and restricted to natural forest. Only a single remnant individual was found in this survey.
- One hundred and thirteen vascular plant species in 56 families were recorded at Shangxi. They included 13 orchid species. Orchids are listed in Table 2; all other vascular plants are shown in Table 1. Some species of conservation interest were found in the secondary forest:
  - *Hopea hainanensis* is Globally Critically Endangered and is under Class I National Protection in China. It is endemic to Hainan and northern Vietnam. Only a single individual of this species was found in this survey.
  - *Vatica mangachapoi* is Globally Endangered and under Class II National Protection in China. A single plant was found, in young secondary forest.
  - The orchid *Anoectochilus roxburghii* is listed as Endangered nationally.
  - *Aquilaria sinensis* and *Gmelina hainanensis* are both Globally Vulnerable and under Class II National Protection in China. Only a single individual of *A. sinensis* was found in this survey, although this species has a long history of planting as a tree crop in South China.
  - Several species, including *Peristrophe strigosa*, *Artabotrys hainanensis*, *Macaranga bracteata*, *Trigonostemon heterophyllus*, *Cryptocarya metcalfiana*, *Medinilla arboricola* and *Hedyotis cryptantha*, are endemic to Hainan.
  - *Amomum longipetiolatum* is endemic to Hainan and Guangxi.
  - *Goniothalamus howii* is endemic to Hainan and South Yunnan. It is rare in Hainan and only a single individual was found in this survey.
  - All orchids are regulated by CITES.

**Table 1.** Vascular plants (excluding Orchidaceae) of Jianling and Shangxi Nature Reserves recorded in the present surveys. Species which are Nationally Protected (Class I or II) (State Forestry Administration & Ministry of Agriculture, 1999), Globally Threatened or Lower Risk (Near-threatened) (IUCN Species Survival Commission, 2001) or narrowly restricted are indicated.

Family	Scientific name	Remarks
<b>ANGIOSPERMAE</b>		
<b>Dicotyledonae</b>		
Acanthaceae	<i>Peristrophe strigosa</i> C.Y. Wu & H.S. Lo	endemic to Hainan
	<i>Pseuderanthemum couderi</i> R. Benoist	
Actinidiaceae	<i>Actinidia latifolia</i> (Gardner et Champ.) Merr.	
Ancistrocladaceae	<i>Ancistrocladus tectorius</i> (Lour.) Merr.	
Annonaceae	<i>Alphonsea monogyna</i> Merr. et Chun	
	<i>Artabotrys hainanensis</i> R. E. Fries	endemic to Hainan
	<i>Chieniodendron hainanense</i> (Merr.) Tsiang & P. T. Li	endemic to Hainan & S. Guangxi
	<i>Desmos chinensis</i> Lour.	
	<i>Goniothalamus howii</i> Merr. et Chun	endemic to Hainan & S. Yunnan
	<i>Polyalthia nemoralis</i> Aug. DC.	
	<i>Polyalthia obliqua</i> J. D. Hooker & Thomson	
	<i>Popowia pisocarpa</i> (Blume) Endl.	
	<i>Uvaria microcarpa</i> Champ. ex Benth.	
Apocynaceae	<i>Hunteria zeylanica</i> (Retz.) Gardner ex Thwaites	

Family	Scientific name	Remarks
	<i>Rauvolfia verticillata</i> (Lour.) Baill.	
	<i>Wrightia pubescens</i> R. Br.	
Asclepiadaceae	<i>Hoya carnosa</i> (L.f.) R.Br.	
Asteraceae	<i>Vernonia solanifolia</i> Benth.	
Bignoniaceae	<i>Markhamia stipulata</i> (Wall.) Seem. ex K. Schum. var. <i>kerrii</i> Sprague	
	<i>Radermachera frondosa</i> Chun & F.C. How	
	<i>Radermachera hainanensis</i> Merr.	
Boraginaceae	<i>Cordia dichotoma</i> G. Forst.	
Burseraceae	<i>Canarium album</i> (Lour.) Raeusch.	
Caesalpiniaceae	<i>Bauhinia japonica</i> Maxim.	
Capparaceae	<i>Crateva trifoliata</i> (Roxb.) B.S. Sun	
	<i>Crateva unilocularis</i> Buch.-Ham.	
	<i>Stixis suaveolens</i> (Roxb.) Pierre	
Chloranthaceae	<i>Sarcandra glabra</i> (Thunb.) Nakai subsp. <i>brachystachys</i> (Blume) Verdc.	
Clusiaceae	<i>Cratoxylum cochinchinense</i> (Lour.) Blume	
Combretaceae	<i>Combretum punctatum</i> Blume subsp. <i>squamosum</i> (Roxb. ex G. Don) Exell	
Convolvulaceae	<i>Merremia umbellata</i> (L.) Hallier. f.	
Dilleniaceae	<i>Tetracera asiatica</i> (Lour.) Hoog.	
Dipterocarpaceae	<i>Hopea hainanensis</i> Merr. et Chun	Protected I, Critically Endangered, endemic to Hainan and N. Vietnam
	<i>Vatica mangachapoi</i> Blanco.	Protected II, Endangered
Ebenaceae	<i>Diospyros eriantha</i> Champ. ex Benth.	
Escalloniaceae	<i>Polyosma cambodiana</i> Gagnep.	
Euphorbiaceae	<i>Alchornea rugosa</i> (Lour.) Müll. Arg.	
	<i>Antidesma montanum</i> Blume	
	<i>Aporosa dioica</i> (Roxb.) Müll. Arg.	
	<i>Bischofia javanica</i> Blume	
	<i>Cleistanthus sumatranus</i> (Miq.) Muell. Arg.	
	<i>Glochidion lanceolarium</i> (Roxb.) Voigt	
	<i>Macaranga auriculata</i> (Merr.) Airy Shaw	
	<i>Macaranga bracteata</i> Merr.	endemic to Hainan
	<i>Macaranga denticulata</i> (Blume) Müll. Arg.	
	<i>Mallotus anomalus</i> Merr. et Chun	
	<i>Microdesmis caseariifolia</i> Planch.	
	<i>Phyllanthus parvifolius</i> Buch.-Ham. ex D. Don	
	<i>Sapium sebiferum</i> (L.) Roxb.	
	<i>Trewia nudiflora</i> L.	
	<i>Trigonostemon heterophyllus</i> Merr.	endemic to Hainan
Fagaceae	<i>Castanopsis indica</i> (Roxb. ex Lindl.) A. DC.	
Flacourtiaceae	<i>Casearia glomerata</i> Roxb.	
	<i>Hydnocarpus hainanensis</i> (Merr.) Sleumer	Vulnerable
Hippocrateaceae	<i>Salacia macrophylla</i> Blume	
Hydrangeaceae	<i>Dichroa febrifuga</i> Lour.	
Icaciniaceae	<i>Apodytes dimidiata</i> E. Mey. ex Arn.	
	<i>Gomphandra tetrandra</i> (Wall.) Sleum.	
	<i>Gonocaryum lobbianum</i> (Miers) Kurz	
Lauraceae	<i>Actinodaphne pilosa</i> (Lour.) Merr.	
	<i>Cryptocarya metcalfiana</i> C.K. Allen	endemic to Hainan
	<i>Litsea variabilis</i> Hemsl.	
	<i>Litsea verticillata</i> Hance	
Loganiaceae	<i>Strychnos angustiflora</i> Benth.	
Malvaceae	<i>Sida rhombifolia</i> L.	pantropical weed
Melastomataceae	<i>Medinilla arboricola</i> F.C. How	endemic to Hainan
	<i>Melastoma candidum</i> D. Don	
	<i>Melastoma sanguineum</i> Sims	
Meliaceae	<i>Aphanamixis grandifolia</i> Blume	
	<i>Melia azedarach</i> L.	

Family	Scientific name	Remarks
Menispermaceae	<i>Pericampylus glaucus</i> (Lam.) Merr.	
Mimosaceae	<i>Acacia pennata</i> (L.) Willd. <i>Entada phaseoloides</i> (L.) Merr. <i>Pithecellobium clypearia</i> (Jack) Benth.	
Moraceae	<i>Artocarpus nitidus</i> Trécul subsp. <i>lingnanensis</i> (Merr.) Jarr. <i>Ficus altissima</i> Blume <i>Ficus auriculata</i> Lour. <i>Ficus esquiroliana</i> H. Lév. ( <i>F. fulva</i> auct. non Reinw. ex Blume) <i>Ficus fistulosa</i> Reinw. ex Blume <i>Ficus hispida</i> L. f. <i>Ficus vasculosa</i> Wall. ex Miq. <i>Streblus ilicifolius</i> (Vidal) Corner	
Myrsinaceae	<i>Ardisia hanceana</i> Mez <i>Ardisia humilis</i> Vahl	
Myrtaceae	<i>Syzygium cumini</i> (L.) Skeels	
Ochnaceae	<i>Gomphia striata</i> (Tiegh.) C.F. Wei	
Opiliaceae	<i>Cansjera rheedii</i> J.F. Gmel.	
Papilionaceae	<i>Derris alborubra</i> Hemsl. <i>Millettia pachyloba</i> Drake	
Piperaceae	<i>Piper hancei</i> Maxim. <i>Piper hongkongense</i> C. DC.	
Proteaceae	<i>Helicia hainanensis</i> Hayata	
Rhamnaceae	<i>Sageretia lucida</i> Merr.	
Rhizophoraceae	<i>Carallia brachiata</i> (Lour.) Merr.	
Rosaceae	<i>Rubus alceaefolius</i> Poir.	
Rubiaceae	<i>Catunaregam spinosa</i> (Thunb.) Tirveng. <i>Chasalia curviflora</i> Thwaites <i>Hedyotis biflora</i> (L.) Lam. <i>Hedyotis cryptantha</i> Dunn <i>Hedyotis hedyotidea</i> (DC.) Merr. <i>Lasianthus chinensis</i> (Champ. ex Benth.) Benth. <i>Lasianthus wallichii</i> (Wight & Arn.) Wight <i>Morinda parvifolia</i> Bartl. ex DC. <i>Mussaenda erosa</i> Champ. ex Benth. <i>Mussaenda pubescens</i> W. T. Aiton <i>Psychotria straminea</i> Hutch. <i>Wendlandia uvariifolia</i> Hance	endemic to Hainan
Rutaceae	<i>Acronychia pedunculata</i> (L.) Miq. <i>Atalantia kwangtungensis</i> Merr. <i>Clausena excavata</i> Burm. f. <i>Evodia leptota</i> (Spreng.) Merr. <i>Luvunga scandens</i> (Roxb.) Buch.-Ham. ex Wight & Arn. <i>Micromelum falcatum</i> (Lour.) Tanaka <i>Zanthoxylum nitidum</i> (Roxb.) DC.	
Sabiaceae	<i>Meliosma angustifolia</i> Merr. <i>Sabia limoniacea</i> Wall. ex Hook. f. & Thomson	
Sapindaceae	<i>Allophylus viridis</i> Radlk. <i>Cardiospermum halicacabum</i> L. <i>Litchi chinensis</i> Sonn. var. <i>euspontanea</i> H.H. Hsue <i>Mischocarpus pentapetalus</i> (Roxb.) Radlk. <i>Mischocarpus sundaicus</i> Blume <i>Nephelium topengii</i> (Merr.) H.S. Lo	Vulnerable endemic to Hainan
Scrophulariaceae	<i>Lindernia crustacea</i> (L.) F. -Muell.	
Simarubaceae	<i>Bucea javanica</i> (L.) Merr.	
Solanaceae	<i>Datura metel</i> L.	introduced
Sterculiaceae	<i>Byttneria aspera</i> Colebr. ex Wall. <i>Erythropsis pulcherrima</i> (H.H. Hsue) H.H. Hsue <i>Helicteres isora</i> L. <i>Heritiera parvifolia</i> Merr.	Protected II, Vulnerable, endemic to Hainan



Family	Scientific name	Remarks
	<i>Pterospermum heterophyllum</i> Hance	
	<i>Sterculia lanceolata</i> Cav.	
Styracaceae	<i>Styrax suberifolius</i> Hook. et Arn.	
Symplocaceae	<i>Symplocos cochinchinensis</i> (Lour.) S. Moore	
Theaceae	<i>Eurya ciliata</i> Merr.	
Thymelaeaceae	<i>Aquilaria sinensis</i> (Lour.) Spreng.	Protected II, Vulnerable
Tiliaceae	<i>Microcos paniculata</i> L.	
Ulmaceae	<i>Gironniera subaequalis</i> Planch.	
Verbenaceae	<i>Clerodendrum hainanensis</i> Hand.-Mazz.	
	<i>Clerodendrum japonicum</i> (Thunb.) Sweet	
	<i>Gmelina hainanensis</i> Oliv.	Protected II, Vulnerable
Vitaceae	<i>Ampelopsis heterophylla</i> (Thunb.) Siebold & Zucc. var. <i>vestita</i> Rehder	
	<i>Cayratia japonica</i> (Thunb.) Gagnep.	
	<i>Cissus repens</i> Lam.	
	<i>Leea indica</i> (Burm. f.) Merr.	
<b>Monocotyledonae</b>		
Amaryllidaceae	<i>Curculigo glabrescens</i> (Ridl.) Merr.	
Araceae	<i>Alocasia macrorrhiza</i> (L.) Schott	
	<i>Epipremnum pinnatum</i> (L.) Engl.	
	<i>Pothos repens</i> (Lour.) Druce	
	<i>Rhaphidophora hongkongensis</i> Schott	
Areaceae	<i>Arenga pinnata</i> (Wurmb) Merr.	
	<i>Calamus rhabdocladus</i> Burret	
	<i>Licuala spinosa</i> Thunb.	
	<i>Rhapis excelsa</i> (Thunb.) A. Henry ex Rehder	
Cyperaceae	<i>Hypolytrum nemorum</i> (Vahl) Spreng.	
	<i>Mapania wallichii</i> C.B. Clarke	
Dioscoreaceae	<i>Dioscorea hispida</i> Dennst.	
Liliaceae	<i>Smilax riparia</i> A. DC.	
Marantiaceae	<i>Phrynium oliganthum</i> Merr.	
Pandanaceae	<i>Pandanus austrosinensis</i> T. L. Wu	
Poaceae	<i>Dinochloa orenuda</i> McClure	
	<i>Schizostachyum pseudolima</i> McClure	
Taccaceae	<i>Tacca chantrieri</i> André	
Zingiberaceae	<i>Alpinia hainanensis</i> K. Schum.	
	<i>Alpinia intermedia</i> Gagnep.	
	<i>Amomum longipetiolatum</i> Merr.	endemic to Hainan and Guangxi
	<i>Zingiber zerumbet</i> (L.) Roscoe ex Sm.	

**Table 2.** Orchids recorded in Jianling and Shangxi Nature Reserves on 18 and 20-21 May 1999.

Scientific name	Habitat	Remarks
<i>Ania</i> (cf. <i>hongkongensis</i> (Rolfe) Tang & Wang) sp.	on forest floor, 200–250m	terrestrial
<i>Anoectochilus roxburghii</i> (Wall.) Lindl.	on bamboo & forest floor with rich humus, 280–400m	terrestrial, Endangered
<i>Apostasia odorata</i> Bl.	on forest floor with rich humus, 400m	terrestrial, primitive orchid
<i>Arachnis labrosa</i> (Lindl. et Paxt.) Rchb.f.	on tree trunk in forest, 390–400m	epiphytic
<i>Calanthe</i> (cf. <i>clavata</i> Lindl.) sp.	beside stream in forest, 270–310m	terrestrial
<i>Calanthe</i> sp.	on forest floor with rich humus, 270m	terrestrial
<i>Cheirostylis chinensis</i> Rolfe	on rock with rich humus in forest, 290m	terrestrial
<i>Cleisostoma parishii</i> (Hook.f.) Garay	on tree trunk in forest	epiphytic
<i>Goodyera velutina</i> Maxim.	on forest floor with rich humus, 400m	terrestrial
<i>Liparis stricklandiana</i> Rchb. f.	on base of tree trunk in forest, 280m	epiphytic
<i>Liparis</i> (cf. <i>bootanensis</i> Griff.) sp.	on mossy rock in forest, 280–310m	epiphytic
<i>Neuwiedia singaporeana</i> (Baker) Rolfe	on forest floor with rich humus, 400m	terrestrial, primitive orchid
<i>Zeuxine</i> sp.	on rock with rich humus in forest, 350m	terrestrial

### Mammals

- No direct records of mammals were made at either Jianling or Shangxi.
- A number of species were reported to occur at Shangxi by reserve warden Mr. Chen. No interview on mammal status was possible at Jianling. Status of mammals in the two reserves is inferred (Table 3) based on the observations of Mr. Chen and on past distribution records (Liu & Liu, 1976; Hsu & Wu, 1981; Xu *et al.*, 1983; Zhang Y. *et al.* (1997).

**Table 3.** The inferred status of mammals at Jianling and Shangxi Nature Reserves, Hainan, based on past records (summarized in Zhang *et al.*, 1997) and on an interview with a warden of Shangxi. “B” = Baoting County, “W” = Wanning County, “+” = rare, “++” = quite common, “+++” = abundant. Sequence follows D.E. Wilson & Cole (2000).

Scientific name	English name	Past records	Mr. Chen	Probable status
<i>Hylomys hainanensis</i>	Hainan Gymnure	-	+	insecure
<i>Crocidura pullata</i> (recorded as <i>C. russula</i> )	Dusky Shrew	B	(not asked)	unknown
<i>Tupaia belangeri</i>	Northern Tree Shrew	-	+++	present
<i>Scotomanes ornatus</i>	Harlequin Bat	B	(not asked)	unknown
<i>Nomascus</i> (cf. <i>nasutus</i> ) sp. (recorded as <i>Hylobates concolor</i> )	Eastern Crested Gibbon	B,W (“probably extirpated”)	-	extirpated
<i>Prionailurus bengalensis</i>	Leopard Cat	-	+++	present
<i>Herpestes javanicus</i>	Javan Mongoose	W	-	insecure or extirpated
<i>Martes flavigula</i>	Yellow-throated Marten	W	+	insecure
<i>Melogale moschata</i>	Chinese Ferret-badger	W	-	insecure or extirpated
<i>Mustela kathiah</i>	Yellow-bellied Weasel	B	-	insecure or extirpated
<i>Selenarctos thibetanus</i>	Asiatic Black Bear	B,W	-	extirpated
<i>Paguma larvata</i>	Masked Palm Civet	-	+++	present
<i>Paradoxurus hermaphroditus</i>	Asian Palm Civet	W	+++	present
<i>Viverra zibetha</i>	Large Indian Civet	B,W	-	extirpated
<i>Viverricula indica</i>	Small Indian Civet	B,W	-	insecure or extirpated
<i>Sus scrofa</i>	Wild Boar	-	+++	present
<i>Cervus unicolor</i>	Sambar	W	-	extirpated
<i>Cervus eldi</i>	Eld’s Deer	W	-	extirpated
<i>Muntiacus muntjak</i>	Indian Muntjac	B,W	-	extirpated
<i>Manis pentadactyla</i>	Chinese Pangolin	W	+++	present
<i>Callosciurus erythraeus</i>	Pallas’s Squirrel	W	-	extirpated
<i>Ratufa bicolor</i>	Black Giant Squirrel	B,W	-	extirpated
<i>Tamiops maritimus</i> (recorded as <i>T. swinhoei</i> )	Maritime Striped Squirrel	B	+++	present
<i>Rattus tanezumi</i> (recorded as <i>R. flavipectus</i> )	Tanezumi Rat	B,W	(not asked)	unknown
<i>Rattus turkestanicus</i> (recorded as <i>R. rattoides</i> )	Turkestan Rat	W	(not asked)	unknown
<i>Rattus norvegicus</i>	Brown Rat	B	(not asked)	unknown
<i>Niviventer fulvescens</i> (recorded as <i>Rattus fulvescens</i> )	Chestnut White-bellied Rat	B	(not asked)	unknown
<i>Atherurus macrourus</i>	Asiatic Brush-tailed Porcupine	W	-	unknown
<i>Hystrix brachyura</i> (recorded as <i>H. hodgsoni</i> )	Malayan Porcupine	B	+++	present

- Some species suspected to occur are of conservation concern:
  - Hainan Gymnure *Hylomys hainanensis* is listed as Globally Endangered by IUCN.
  - Chinese Pangolin *Manis pentadactyla* is Globally Near-threatened, and Class II Protected in China.
  - Yellow-throated Marten *Martes flavigula* is also Class II Protected nationally.

## Birds

- A total of 22 species of birds were recorded in Jianling Nature Reserve during this survey (Table 4). The most frequently encountered species were Barn Swallow *Hirundo rustica*, Light-vented Bulbul *Pycnonotus sinensis*, Oriental Magpie Robin *Copsychus saularis* and Japanese White-eye *Zosterops japonica*.
- Thirty species were recorded in Shangxi Nature Reserve (Table 4). The most frequently encountered were Spotted Dove *Streptopelia chinensis*, Oriental Magpie Robin, Black-throated Laughingthrush *Garrulax chinensis* and Grey-cheeked Fulvetta *Alcippe morrisonia*.
- A call thought to be of a Hainan Partridge *Arborophila ardens* was heard at Shangxi, but the species was not firmly identified.
- A Eurasian Hoopoe *Upupa epops* was seen from the vehicle, halfway between Shangxi and Wanning county town.

**Table 4.** Birds recorded in Jianling and Shangxi Nature Reserves, 18 and 20-21 May 1999. Sequence follows Clements (2000).

Scientific name	English name
<i>Milvus migrans</i>	Black Kite
<i>Spilornis cheela</i>	Crested Serpent Eagle
<i>Francolinus pintadeanus</i>	Chinese Francolin
<i>Gallus gallus</i>	Red Junglefowl
<i>Streptopelia chinensis</i>	Spotted Dove
<i>Chalcophaps indica</i>	Emerald Dove
<i>Hierococcyx sparverioides</i>	Large Hawk Cuckoo
<i>Hierococcyx fugax</i>	Hodgson's Hawk Cuckoo
<i>Cuculus micropterus</i>	Indian Cuckoo
<i>Centropus sinensis</i>	Greater Coucal
<i>Centropus bengalensis</i>	Lesser Coucal
<i>Cypsiurus balasiensis</i>	Asian Palm Swift
<i>Alcedo atthis</i>	Common Kingfisher
<i>Halcyon smyrnensis</i>	White-throated Kingfisher
<i>Megalaima oorti</i>	Black-browed Barbet
<i>Hirundo rustica</i>	Barn Swallow
<i>Pycnonotus sinensis</i>	Light-vented Bulbul
<i>Pycnonotus aurigaster</i>	Sooty-headed Bulbul
<i>Alophoixus pallidus</i>	Puff-throated Bulbul
<i>Cyornis hainanus</i>	Hainan Blue Flycatcher
<i>Copsychus saularis</i>	Oriental Magpie Robin
<i>Enicurus schistaceus</i>	Slaty-backed Forktail
<i>Enicurus leschenaulti</i>	White-crowned Forktail
<i>Rhipidura albicollis</i>	White-throated Fantail
<i>Garrulax maesi</i>	Grey Laughingthrush
<i>Garrulax chinensis</i>	Black-throated Laughingthrush
<i>Garrulax canorus</i>	Hwamei
<i>Pomatorhinus ruficollis</i>	Streak-breasted Scimitar Babbler
<i>Napothera epilepidota</i>	Eyebrowed Wren Babbler
<i>Stachyris ruficeps</i>	Rufous-capped Babbler
<i>Alcippe morrisonia</i>	Grey-cheeked Fulvetta
<i>Yuhina zantholeuca</i>	White-bellied Yuhina
<i>Nectarinia jugularis</i>	Olive-backed Sunbird
<i>Aethopyga christinae</i>	Fork-tailed Sunbird
<i>Dicaeum cruentatum</i>	Scarlet-backed Flowerpecker
<i>Zosterops japonica</i>	Japanese White-eye
<i>Lanius schach</i>	Long-tailed Shrike
<i>Cissa hypoleuca</i>	Indochinese Green Magpie
<i>Lonchura striata</i>	White-rumped Munia

- Some species are of particular conservation concern:

- Hainan Partridge is Vulnerable globally, and Class II Protected nationally.
- Crested Serpent Eagle *Spilornis cheela*, Black Kite *Milvus migrans*, Red Junglefowl *Gallus gallus*, Greater Coucal *Centropus sinensis* and Lesser Coucal *Centropus bengalensis* are Class II Protected species in China.

### **Reptiles and Amphibians**

- Five species of amphibian and three species of lizard were recorded from Jianling (Table 5). The most frequently encountered was *Rana limnocharis*.
- Fourteen species of amphibian, four lizards and two snakes were recorded from Shangxi (Table 5). Most frequent was a *Philautus* tree frog that resembled *P. ocellatus* but is probably a new species. It has also been recorded from Diaoluoshan, Wuzhishan, Jiayi, Limushan and Lumuwan during KFBG surveys.

**Table 5.** Amphibians and reptiles recorded in and around Jianling and Shangxi Nature Reserves, May 1999. Sequence follows Zhao E.-M. & Adler (1993).

<b>Species</b>	<b>Habitat</b>	
<b>AMPHIBIA</b>		
<i>Leptobrachium hainanensis</i>	forest	✓
<i>Bufo melanostictus</i>	paddy field	✓
	parkland/garden	
<i>Pelophryne scalpta</i>	forest	✓
<i>Amolops torrentis</i>	forest stream	✓
	stream in plantation	tadpoles
<i>Occidozyga martensii</i>	marsh in forest	✓
	roadside pool	✓
	forest stream	✓
<i>Rana fragilis</i>	forest stream	✓
<i>Rana guentheri</i>	paddy field	✓
	parkland/garden	✓
<i>Rana limnocharis</i>	stream in agricultural field	✓
	stream in plantation	✓
	marsh/abandoned field	✓
	marsh in forest	✓
	parkland/garden	✓
<i>Rana rugulosa</i>	marsh in forest	✓
<i>Rana hainanensis</i>	forest stream	✓
	forest	✓
<i>Chirixalus doriae</i>	marsh in forest	✓
<i>Philautus</i> (nr. <i>ocellatus</i> ) sp.	marsh in forest	✓
<i>Philautus odontotarsus</i>	marsh in forest	✓
<i>Polypedates megacephalus</i>	paddy field	✓
<i>Polypedates mutus</i>	marsh in forest	✓
<i>Kalophrynus interlineatus</i>	marsh/abandoned field	✓
<i>Microhyla heymonsi</i>	marsh in forest	tadpoles
	forest stream	tadpoles
<i>Microhyla pulchra</i>	parkland/garden	✓
<b>REPTILIA</b>		
<i>Hemidactylus frenatus</i>	bamboo plantation	✓
	village	
<i>Acanthosaura lepidogaster</i>	forest	✓
<i>Calotes versicolor</i>	forest edge	✓
	plantation edge	
<i>Mabuya multifasciata</i>	village/plantation	✓
<i>Sphenomorphus incognitus</i>	stream in abandoned field	✓
<i>Tropidophorus hainanus</i>	forest stream	✓
	forest	✓
<i>Enhydris plumbea</i>	marsh in forest	✓
<i>Sinonatrix percarinata</i>	forest stream	✓

- Several species are of conservation concern:
  - *Leptobrachium hainanensis*, *Pelophryne scalpta*, *Amolops torrentis*, *Rana fragilis*, *Rana hainanensis* and the new *Philautus* sp. are endemic to Hainan. All were at Shangxi; *A. torrentis* also occurred in the stream at Jianling.
- The occurrence at Shangxi of many forest species, including *Leptobrachium hainanensis*, *Pelophryne scalpta*, *Acanthosaura lepidogaster* and *Tropidophorus hainanus*, indicated that the forest had high ecological integrity.

### Fish

- Ten species of freshwater fish were reported (Table 6); five species from each of the two reserves. The specimens have not been examined by specialists.
- Below Jianling, the most frequently encountered species reported were *Gambusia affinis* and *Micronemacheilus pulcher*. Near Shangxi, the most frequently encountered species were *Opsariichthys bidens* and *Capoeta semifasciolata*.

**Table 6.** Freshwater fish reported near Jianling and Shangxi, with rank of abundance: “+” = rare, “++” = average, “+++” = common. “\*” = Nomenclature follows Pan (1991). Sequence follows Nelson (1994).

Species	Habitat	Below Jianling	Below Shangxi
<i>Parazacco spilurus fasciatus</i>	small stream	+	
<i>Opsariichthys bidens</i>	stream		++
<i>Capoeta semifasciolata</i>	stream		++
<i>Sinilabeo discognathoides discognathoides</i>	small river	+	
<i>Osteochilus vittatus</i>	stream		+
<i>Pseudorasbora parva</i>	stream		+
<i>Micronemacheilus pulcher</i>	large stream	+++	
<i>Mystus guttatus</i>	stream		+
<i>Gambusia affinis</i> *	small waterway	++	
<i>Rhinogobius leavelli</i>	large stream	+	

- *Sinilabeo discognathoides discognathoides* is endemic to Hainan.

### Ants

- Fifteen ant species were recorded from Jianling (Table 7). The most frequently encountered were *Crematogaster* sp. 8, *Diacamma* sp. 1 and *Pheidole plagiaria*.
- Thirty-one ant species were recorded from Shangxi (Table 7). The most frequent were *Diacamma* sp. 1, *Anoplolepis gracilipes*, *Leptogenys kitteli*, *Pachycondyla* sp. 1 and *Pheidole plagiaria*.

**Table 7.** Ant species recorded in and around Jianling and Shangxi Nature Reserves, May 1999. \* Species with a strong forest association.

Species	Habitat
<i>Acropyga acutiventris</i> *	closed 15m broadleaf, 330m
<i>Aenictus (laeviceps)</i> group sp. 2	eroded grassland, 90m
<i>Anochetus risii</i>	closed 5m broadleaf, 340m
<i>Anoplolepis gracilipes</i>	open low vegetation, 50-450m
<i>Camponotus (cf. mitis)</i> sp. 11	forest, 450m
<i>Camponotus nicobarensis</i>	low forest, shrubland, 100-360m
<i>Camponotus rufoglaucus</i>	open vegetation, 40-450m
<i>Camponotus (variegatus)</i> group sp. 4	resort
<i>Crematogaster (cf. laboriosa)</i> sp. 3	closed tall shrubland, 450m
<i>Crematogaster (cf. dohmi)</i> sp. 8	open forest & shrubland, 50-100m
<i>Diacamma (nr. rugosum)</i> sp. 1	forest, shrubland, 40-450m
<i>Gnamptogenys bicolor</i>	forest, meadow, 400-450m
<i>Gnamptogenys binghami</i> *	forest, shrubland, 440-450m
<i>Hypoponera</i> sp. 6 **	closed broadleaf forest, 450m
<i>Leptogenys kitteli</i> *	closed broadleaf forest, 360-450m

Species	Habitat
<i>Leptogenys peuqueti</i>	closed broadleaf & shrubland, 270-450m
<i>Monomorium</i> (cf. <i>bimaculatum</i> ) sp. 9 *	closed tall shrubland, 280m
<i>Monomorium</i> (cf. <i>impexum</i> ) sp. 2 *	open vegetation, 50-200m
<i>Monomorium</i> sp. 12	agricultural/ village, 60m
<i>Odontomachus monticola</i> *	closed low broadleaf, 200m
<i>Odontoponera</i> (cf. <i>denticulata</i> ) sp. 1	forest & open plantation, 50-450m
<i>Oecophylla smaragdina</i>	closed 15m broadleaf, 300m
<i>Oligomyrmex</i> (cf. <i>wheeleri</i> ) sp. 1 *	open bamboo/shrubland, 50m
<i>Pachycondyla leeuwenhoekii</i> *	closed tall shrubland, 450m
<i>Pachycondyla</i> (javana group) sp. 1 *	closed broadleaf, 200-450m
<i>Pachycondyla</i> (cf. <i>luteipes</i> ) sp. 2 *	closed forest, shrubland, 280-440m
<i>Pachycondyla</i> (cf. <i>nigrita</i> ) sp. 17 *	low open broadleaf, 110m
<i>Pachycondyla</i> (cf. <i>sauteri</i> ) sp. 7	closed broadleaf forest, 450m
<i>Paratrechina longipes</i>	resort
<i>Paratrechina sauteri</i>	open bamboo/shrubland, 50m
<i>Pheidole plagiaria</i>	forest, meadow, 50-450m
<i>Pheidole</i> sp. 28	open shrubland, 100m
<i>Polyrhachis</i> sp. 20	closed forest, 290-360m
<i>Prenolepis</i> (cf. <i>emmae</i> ) sp. 1 *	closed 15m broadleaf, 330m
<i>Prenolepis magnocula</i> *	closed broadleaf forest, 450m
<i>Pristomyrmex pungens</i>	forest, shrubland, 50-420m
<i>Probolomyrmex</i> sp. 1 *	closed bamboo & broadleaf, 360m
<i>Recurvidris</i> sp. 1 *	open bamboo/shrubland, 50m
<i>Tetraoponera rufonigra</i>	agricultural/ village, 50m
<i>Vollenhovia</i> sp. 5	closed tall shrubland, 420m

- *Probolomyrmex* sp. 1 has been found only from Shangxi and from Kadoorie Farm and Botanic Garden in Hong Kong.
- The percentage of forest-dependent species was only about 27% at Jianling, indicating the low integrity of the habitats surveyed. The percentage at Shangxi was 39%, a typical figure for secondary forest.
- *Anoplolepis gracilipes*, an invasive species from Africa, was widespread in both reserves. It was observed undertaking a nuptial flight at Shangxi on 20 May at the forest campsite, indicating that sexual reproduction and dispersal by air are taking place.

### Dragonflies

- Fourteen species were recorded at Jianling, and twelve at Shangxi (Table 8). There was no species overlap between the sites.
- The most abundant species at Jianling was *Megalogomphus sommeri*. Most abundant at Shangxi were *Pseudolestes mirabilis*, *Coelliccia scutellum hainanense*, *Drepanosticta zhoui* and *Drepanosticta elongata*.
- Shangxi yielded four previously undescribed damselfly species (*Vestalis miao*, *D. zhoui*, *D. elongata* and *Sinosticta hainanense*). *Sinosticta* was previously a monotypic genus (K.D.P. Wilson, 1997).
- *Tetracanthagyna waterhousei*, *Stylurus amicus*, *Heliogomphus scorpio*, *Fukienogomphus prometheus*, *Megalogomphus sommeri* and *Lyriothemis tricolor* *Onychothemis testaceum tonkinensis* are new records for Hainan.

**Table 8.** Dragonfly species recorded from Jianling and Shangxi, 18-21 May 1999. Sequence of families follows Schorr *et al.* (2001a, 2001b).

Species	Notes
<i>Neurobasis c. chinensis</i>	
<i>Vestalis miao</i>	New species (Wilson & Reels, 2001)
<i>Rhinocypha b. biforata</i>	
<i>Rhinocypha f. fenestrella</i>	

Species	Notes
<i>Euphaea ornata</i>	
<i>Pseudolestes mirabilis</i>	Hainan endemic
<i>Pseudagrion pruinosum fraseri</i>	
<i>Coeliccia scutellum hainanense</i>	Hainan endemic subspecies
<i>Coeliccia cyanomelas</i>	
<i>Copera marginipes</i>	
<i>Drepanosticta zhoui</i>	New species (Wilson & Reels, 2001)
<i>Drepanosticta elongata</i>	New species (Wilson & Reels, 2001)
<i>Sinosticta hainanense</i>	New species (Wilson & Reels, 2001)
<i>Tetracanthagyna waterhousei</i>	
<i>Asiagomphus hainanensis</i>	
<i>Stylurus amicus</i>	
<i>Heliogomphus scorpio</i>	
<i>Fukienogomphus prometheus</i>	
<i>Paragomphus pardalinus</i>	
<i>Nihonogomphus thomassoni</i>	Hainan endemic
<i>Megalogomphus sommeri</i>	
<i>Lamelligomphus hainanensis</i>	
<i>Lyriothemis tricolor</i>	
<i>Onychothemis testaceum tonkinensis</i>	
<i>Tholymis tillarga</i>	
<i>Zygonyx iris insignis</i>	

- Some species recorded are of conservation significance:
  - *Vestalis miao* is a new species known only from Diaoluoshan National Forest Park and Shangxi. It was described by K.D.P. Wilson & Reels (2001), and named after the resident Miao people.
  - *Drepanosticta elongata* is a new species known only from Shangxi (the type locality, referred to as Niujialin) and Diaoluoshan. It was described by K.D.P. Wilson & Reels (2001).
  - *Sinosticta hainanense* is a new species known only from Shangxi (the type locality, referred to as Niujialin), Diaoluoshan and Bawangling.
  - *Nihonogomphus thomassoni* is known only from Hainan, and has been recorded only from Jianling and Diaoluoshan during KFBG surveys.
  - *Pseudolestes mirabilis* and *Coeliccia scutellum hainanense* and *Drepanosticta zhoui* are known only from Hainan forest areas.
  - *Lamelligomphus hainanensis* and *Zygonyx iris insignis* are known only from Hainan and Hong Kong.
  - *Megalogomphus sommeri* is known only from Fujian, Hainan, Hong Kong and Jiangxi.

### Butterflies

- A total of 45 butterfly species were recorded – 26 species at Jianling, and 33 at Shangxi (Table 9). The relatively low species numbers may be partly explained by the late start (15.00) at Jianling and the poor weather at Shangxi on 20 May.
- The most abundant species at Jianling was *Precis atlites*. No species was especially abundant at Shangxi.
- Four species (*Troides* sp., *Eurema* sp., *Parantica* sp. and *Vindula* sp.) could not be firmly identified.

**Table 9.** Butterflies recorded at Jianling (18 May 1999) and Shangxi (20-21 May 1999). Sequence of families follows Bascombe (1995).

Species	Habitat
<i>Matapa aria</i>	farmland/forest
<i>Graphium agamemnon</i>	scrubby track/stream farmland/forest

<b>Species</b>	<b>Habitat</b>
<i>Lamproptera curius</i>	farmland/forest
<i>Pachliopta aristolochiae</i>	scrubby track/stream
	farmland/forest
<i>Papilio (Chilasa) clytia</i>	farmland/forest
<i>Papilio demoleus</i>	scrubby track/stream
	farmland/forest
<i>Papilio helenus</i>	farmland/forest
<i>Papilio memnon</i>	scrubby track/stream
	farmland/forest
<i>Papilio nephelus</i>	scrubby track/stream
<i>Papilio paris</i>	farmland/forest
<i>Papilio polytes</i>	scrubby track/stream
	farmland/forest
<i>Troides aeacus</i>	farmland/forest
<i>Troides sp.</i>	scrubby track/stream
	farmland/forest
<i>Appias lyncida</i>	scrubby track/stream
<i>Eurema sp.</i>	scrubby track/stream
	farmland/forest
<i>Hebomoia glaucippe</i>	scrubby track/stream
<i>Prioneris thestylis</i>	scrubby track/stream
<i>Abisara echerius</i>	farmland/forest
<i>Dodona eugenes</i>	farmland/forest
<i>Jamides alecto</i>	scrubby track/stream
	farmland/forest
<i>Ariadne ariadne</i>	scrubby track/stream
	farmland/forest
<i>Cethosia cyane</i>	farmland/forest
<i>Danaus genutia</i>	scrubby track/stream
	farmland/forest
<i>Dichorragia nesimachus</i>	scrubby track/stream
<i>Discophora sondaica</i>	scrubby track/stream
<i>Euploea core</i>	farmland/forest
<i>Euploea midamus</i>	scrubby track/stream
<i>Euthalia niepelti</i>	scrubby track/stream
<i>Faunis eumeus</i>	farmland/forest
<i>Hypolimnas bolina</i>	farmland/forest
<i>Ideopsis similis</i>	scrubby track/stream
	farmland/forest
<i>Precis (Junonia) almana</i>	scrubby track/stream
	farmland/forest
<i>Precis (Junonia) atlites</i>	scrubby track/stream
	farmland/forest
<i>Precis (Junonia) iphita</i>	scrubby track/stream
<i>Precis (Junonia) lemonias</i>	scrubby track/stream
	farmland/forest
<i>Mycalesis mineus</i>	scrubby track/stream
<i>Mycalesis zonata</i>	farmland/forest
<i>Neptis hylas</i>	farmland/forest
<i>Parantica aglea</i>	scrubby track/stream
<i>Parantica sp.</i>	farmland/forest
<i>Polyura nepenthes</i>	farmland/forest
<i>Ragadia crisilda</i>	farmland/forest
<i>Apatura (Rohana) parisatis</i>	scrubby track/stream
<i>Thaumantis diores</i>	farmland/forest
<i>Vindula sp.</i>	farmland/forest

- *Ragadia crisilda* and *Thaumantis diores* (both at Shangxi) appear to be dependent on good natural forest.



### ***Molluscs***

- Four species of freshwater molluscs were recorded at Jianling (Table 10). The most frequently encountered species were *Semisulcospira jacquetiana* and *S. paludiformis*.
- One slug and three freshwater molluscs were recorded at Shangxi. Most frequent were *S. paludiformis* and *Melania tuberculata*.

**Table 10.** Molluscs recorded at Jianling and Shangxi, May 1999.

<b>Species</b>	<b>Habitat</b>
<i>Anodonta woodiana woodiana</i>	stream
<i>Brotia swinkoei</i>	stream
<i>Melania tuberculata</i>	stream
<i>Semisulcospira hainanensis</i>	stream
<i>Semisulcospira jacquetiana</i>	stream
<i>Semisulcospira paludiformis</i>	stream
<i>Vaginulus alte</i>	shrubland

- No terrestrial molluscs were detected at Jianling, and none in forest at Shangxi. This may reflect the effect of past deforestation.

### **Summary of flora and fauna**

- The vegetation in the part of Jianling Nature Reserve covered in this survey was mainly shrubland and young secondary forest.
- The present survey was inadequate to give a good representation of ecological integrity of Jianling, but rather few forest specialists were found among the fauna, reflecting the impact of extensive deforestation. Mollusc populations may also have been impacted by the application of pesticide in the rubber plantation and by over-collecting for duck feed in recent years.
- Some species of conservation importance were found at Jianling, including the Globally Endangered tree *Vatica mangachapoi* and three Vulnerable plants (*Heritiera parvifolia*, *Hydnocarpus hainanensis* and *Litchi chinensis* var. *euspontanea*). The forest also contained a number of species with very restricted ranges, including five plants and the endemic dragonfly *Nihonogomphus thomassoni*, known only from Jianling and Diaoluoshan in Southeast Hainan.
- MacKinnon *et al.* (1996) predicted Jianling to be of local significance to biodiversity conservation, considering it to be in fine condition. The inner part of the reserve was not visited during this survey, but the findings suggest the site remains of local significance.
- At Shangxi the vegetation was also secondary, but more mature than that encountered at Jianling. Integrity was higher, judging by the higher proportion of forest-specialist fauna.
- Plants of conservation importance recorded at Shangxi included the Critically Endangered *Hopea hainanensis*, the Endangered *Vatica mangachapoi*, two Vulnerable species (*Aquilaria sinensis* and *Gmelina hainanensis*) and ten other species of narrow global range. Animals endemic to Hainan included five frog species and a number of dragonflies. Of these *Vestalis miao* and *Drepanosticta elongata* have been found only from Southeast Hainan, at Shangxi and Diaoluoshan, while *Sinosticta hainanense* is known only from these two sites and Bawangling.
- The presence of the Endangered Hainan Gymnure could not be confirmed, but the species was reported to occur at Shangxi. A call attributed to the globally Vulnerable Hainan Partridge was also heard, though the identification could not be confirmed.
- MacKinnon *et al.* (1996) considered Shangxi's protected status should be re-evaluated due to the unclear boundaries and condition. This survey confirms that the site is of high local importance in biodiversity conservation.

### Threats and problems

- Both Jianling and Shangxi Nature Reserves have suffered past deforestation and habitat disturbance. While both have regenerating vegetation, this process was hampered by continued clearance for plantations of crop plants.
- At the time of the visit there seemed to be insufficient staff to control illegal activities at either Jianling or Shangxi.

### Opportunities

- Shangxi Nature Reserve contains some good secondary forest. Although some of the larger animal species have been lost, the forest retains a large element of the forest biota. Both Jianling and Shangxi still support globally Threatened species.
- If it is possible to prevent disturbance, including logging, forest clearance and planting of exotic species, the conservation value of both sites could be greatly increased through natural regeneration.
- Regeneration, in old plantations and open shrubland, could be accelerated by planting trees native to southeast Hainan. Seeds for such reforestation should be collected locally.
- Individual trees of locally rare and important species could be fenced and labeled, especially in the case of plants that are easily accessible. Seeds collected from existing rare trees could also contribute to reforestation, reinforcing their populations in the reserves, but seeds should be collected from as many parent plants as possible to avoid loss of genetic diversity.
- The reported presence of threatened vertebrates, including Hainan Gymnure and Hainan Partridge, merits further investigation.

### Acknowledgements

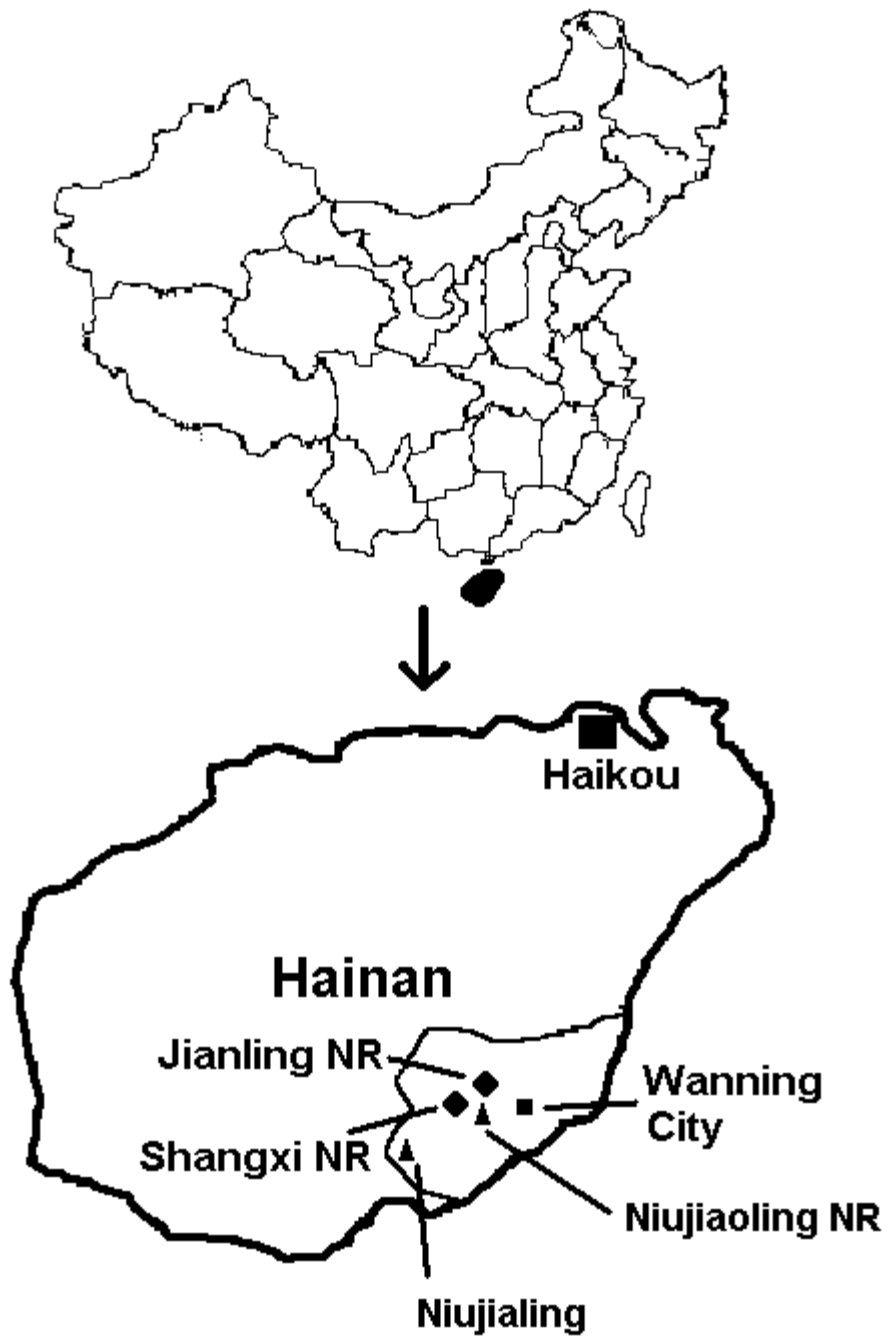
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**Figure 1.** Map showing location of Jianling Nature Reserve and Shangxi Nature Reserve, Southeast Hainan, China.