Report of a Rapid Biodiversity Assessment at Diding Headwater Forest Nature Reserve, West Guangxi, China, July 1999

Kadoorie Farm and Botanic Garden
in collaboration with
Guangxi Zhuang Autonomous Region Forestry Department
Guangxi Institute of Botany
Guangxi Normal University
Guangxi Natural History Museum
South China Normal University
East China Normal University
Liuzhou Technical College

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Background

The present report details the findings of a visit to western Guangxi 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.

Citation

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Contents

Translation of common Chinese geographical terms

Chinese Romanizations	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, Gou	valley
Kou	outlet
Ling	range
Nan	south
Ping	flat
Shan	mountain
Shi	city
Tun	hamlet
Wan	bay
Xi	west
Xi, Yong	stream
Xian	county
Xiang, Cun	village

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Objectives

- The aims of the survey were to collect up-to-date information on the fauna and flora of Diding Headwater Forest Nature Reserve, and to use this to help determine conservation priorities within South China.

Methods

- On 7 July 1999 at 09.00 a team from Hong Kong (BH, PC, JRF, ML, LKS, GTR), Nanning (XZH), Guilin (LGZ, TSC), Liuzhou (CM), Guangzhou (XZ), Xinyang (LHJ) and Shanghai (TJR) left Chongzuo following a preliminary visit to Chongzuo Rare Animal Nature Reserve (Kadoorie Farm and Botanic Garden, in press).
- On 8-9 July, they conducted a rapid biodiversity survey at Diding 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 Diding 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 LGZ, and edited by NSC. Mammal records were made by LKS, GTR, ML, JRF, ZTF, MYM or XZM. Records of birds were made by LKS, ZTF, MYM or XZM, reptiles and amphibians by ML, fish by BC and CXL, ants by JRF, dragonflies by KW and GTR and butterflies by GTR.
- 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. (1991); Anon. (1996-2001); Anon. (2002a, 2002b); The Plant Names Project (2002);
  - Mammals (Mammalia): 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 H.L. *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 (2002). Certain taxa, including orchids, reptiles, amphibians, fish and invertebrates, have yet to be properly assessed for global status.
- 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

- Diding Headwater Forest Nature Reserve is situated in the southwest of Jingxi County, at 23°05'59"–23°08'42"N and 105°57'04"–105°58'52"E (ZTF, in litt., 16 January 2003) at the border with Napo County in west Guangxi. The size of the reserve is believed to be 8.6 km^2, although figures of 3.7 km^2 (Zhang W., 1998) and 10.7 km^2 (LGZ, in litt. 15 July, 1999) have also been cited.
- The geology of Diding is reported to be mainly granite and sandy shale. The landscape is hilly, with an altitude range from 780 to 1,441 m. The streams drain to the southeast, through Vietnam to the Zuo Jiang. This continues to flow east through Nanning to the Zhu Jiang (Pearl River).
- Diding has a northern tropical monsoon climate with annual mean temperature of 23°C; annual precipitation averages 1,660 mm, and occurs mainly from May to September.
- Diding was designated in 1980 (Lu Shinian, Reserve Director, in. litt., July 1999), or 1986 according to Zhang W. (1998), as a county-level nature reserve, to protect the headwater forest and endangered flora and fauna. In 2002 Diding was upgraded to a provincial-level nature reserve upon approval by the Guangxi Zhuang Autonomous Region Government (ZTF, in litt., 16 January 2003). At the time of our visit the reserve had 28 staff including three officers and two police officers, but no police station.

Results

Vegetation

- The zonal vegetation of the region would have been northern tropical monsoonal rainforest. The original forest, however, had been largely cleared. Most of the landscape at lower altitude had been transformed to secondary forest and shrubland, and plantation of *Cunninghamia lanceolata* (China Fir) and *Illicium verum* (Star Anise). Many of the hill slopes in the vicinity of the nature reserve management station, which is near Nanpo Village, had been deforested and left as grassland. Extensive but rather fragmented cover of mature and natural remnant forest up to 20 m in height and 60 cm dbh could be found.
- Major vegetation types of the nature reserve included the following (LGZ, in litt. 15 July, 1999):
  - Mixed evergreen and deciduous broadleaf shrubland was found mainly below medium altitude. This habitat is secondary and regenerated recently after clearance. Important species included *Macaranga denticulata*, *Saurauia tristyla*, *Dichroa febrifuga*, *Callicarpa rubella* and *Cibotium barometz*.
  - Evergreen broadleaf secondary forest, up to 15 m tall, was mainly below medium altitude. Important canopy species included *Bischofia polycarpa*, *Sterculia lanceolata*, *Schefflera octophylla* and *Exbucklandia populnea*. Major shrub species included *Clethra* spp., *Schizomussaenda dehiscens* and *Saurauia tristyla*. Most large trees had been felled, and the remaining trees were young, with an uneven and open canopy.
  - Mixed evergreen and deciduous broadleaf forest, up to 15 m in height, was mainly between 850 and 1,000 m. Important canopy species included evergreen *Manglietia megaphylla*, *Nyssa sinensis* and *Macaranga denticulata*, as well as deciduous *Alniphyllum fortunei* and *Albizia chinensis*. This forest had also been significantly affected by logging and had regenerated recently.
  - Evergreen broadleaf forest up to 15-20 m tall and up to 60cm dbh was mainly above higher altitude. This forest type was relatively mature and less affected by past logging. The canopy, which was more continuous, included *Castanopsis fabri*, *Cleyera pachyphylla*, *Manglietia insignis*, *Exbucklandia populnea*, *Machilus* spp. and some deciduous trees such as *Liquidambar acalycina* and *Itoa orientalis*.

Flora

- The present survey recorded 78 vascular plant species in 56 families, including four ferns in four families, one gymnosperm, and 73 flowering plant species in 51 families (Table 1). This is a relatively low figure given the rich flora of the region; the area visited was not exhaustively surveyed, and the figure should not be compared with the results of similar surveys by botanists more familiar with the study area.
- Among the species recorded, there were some species of conservation concern:
  – *Zenia insignis* is considered at Lower Risk (Near-threatened) globally, and is under Class II National Protection in China.
  – *Alsophila spinulosa* and *Cibotum barometz* are under Class II National Protection in China. *Alsophila spinulosa* is locally abundant at Diding especially in the relatively natural forest to the southwest of the reserve management station. Most of the trees were 2-5 m tall and some were up to 11 m. *Cibotum barometz* is common and widespread in South China.
  – *Fissistigma kwangxiense* is endemic to southern Guangxi and southeast Yunnan.

Table 1. Vascular plants of Diding Nature Reserve recorded in the present survey. Species which are Nationally Protected (Class I or II) (State Forestry Administration & Ministry of Agriculture, 1999), globally Threatened or Lower Risk (Near-threatened) (IUCN, 2002) or globally restricted are indicated.

Family	Scientific name	Remarks
PTERIDOPHYTA		
Cyatheaceae	*Alsophila spinulosa* (Wall. ex Hook.) R.M.Tryon	Protected II
Dicksoniaceae	*Cibotium barometz* (L.) J. Sm.	Protected II
Equisetaceae	*Equisetum debile* Roxb.	
Marattiaceae	*Angiopteris fokiensis* Hieron.	
GYMNOSPERMAE		
Taxodiaceae	*Cunninghamia lanceolata* (Lamb.) Hook.	planted
ANGIOSPERMAE		
Dicotyledonae		
Acanthaceae	*Mananthes patentiflora* (Hemsl.) Bremek.	
Actinidiaceae	*Saurauia napaulensis* DC.	
	Saurauia tristyla DC.	
Anacardiaceae	*Choerospondias axillaris* (Roxb.) B.L. Burtt & A.W. Hill	
Annonaceae	*Fissistigma kwangsiense* Tsiang & P.T. Li	endemic to SE Yunnan and southern Guangxi
Apocynaceae	*Trachelospermum brevistylum* Hand.-Mazz.	
	Wrightia pubescens R. Br.	
Araliaceae	*Schefflera octophylla* (Lour.) Harms	
	Tetrapanax papyriferum (Hook.) K. Koch	
Balsaminaceae	*Impatiens* sp. (Li & Tang 248)	
Begoniaceae	*Begonia handelii* Irmsch.	
Betulaceae	*Betula luminifera* H.J.P. Winkl.	
Caesalpiniaceae	*Zenia insignis* Chun	Lower Risk (nt) Protected II
Caprifoliaceae	*Sambucus chinensis* Lindl.	
Caryophyllaceae	*Drymaria cordata* (L.) Willd. ex Roem. & Schult.	
Chenopodiaceae	*Chenopodium ambrosioides* L.	
Chloranthaceae	*Chloranthus henryi* Hemsl.	
Clethraceae	*Clethra* sp.	
Cucurbitaceae	*Gynostemma pentaphylla* (Thunb.) Makino	
Euphorbiaceae	*Bischofia polycarpa* (H. Lév.) Airy Shaw	
	Macaranga denticulata (Blume) Müll. Arg.	
	Macaranga henryi (Pax & K. Hoffm.) Rehder	
Fagaceae	*Castanopsis fabri* Hance	
Flacourtiaceae	*Itoa orientalis* Hemsl.	
Hamamelidaceae	*Exbucklandia populnea* (R. Brown) R. W. Brown	
	Liquidambar acalycina H.T. Chang	
Hydrangeaceae	*Dichroa febrifuga* Lour.	

Family	Scientific name	Remarks
Illiciaceae	*Illicium verum* Hook. f.	planted
Lamiaceae	*Gomphostemma lucidum* Wall. ex Benth.	
Lauraceae	*Lindera communis* Hemsl.	
	Litsea monopetala (Roxb. ex Baker) Pers.	
	Machilus sp.	
Magnoliaceae	*Manglietia insignis* (Wall.) Blume	
	Manglietia megaphylla Hu & W.C. Cheng	
Melastomataceae	*Melastoma dodecandrum* Lour.	
Mimosaceae	*Albizia chinensis* (Osbeck) Merr.	
Moraceae	*Ficus cyrtophylla* Wall. ex Miq.	
	Ficus semicordata Buch.-Ham. ex Sm.	
	Ficus variegata Blume var. *chlorocarpa* (Benth.) King	
Myrsinaceae	*Ardisia corymbifera* Mez	
	Embelia vestita Roxb.	
	Maesa membranacea A. DC.	
Nyssaceae	*Nyssa sinensis* Oliv.	
Passifloraceae	*Adenia chevalieri* Gapnep.	
Rhamnaceae	*Chaydaia rubrinervis* (H. Lév.) C. Y. Wu ex Y. L. Chen	
Rosaceae	*Rubus leucanthus* Hance	
	Rubus xanthoneurus Focke	
Rubiaceae	*Mussaenda esquirolii* H. Lév.	
	Schizomussaenda dehiscens (Craib) H.L. Li	
	Uncaria rhynchophylla (Miq.) Miq. ex Havil.	
Rutaceae	*Evodia glabrifolia* (Champ. ex Benth.) C.C. Huang	
	Evodia lepta (Spreng.) Merr.	
Sapindaceae	*Koelreuteria bipinnata* Franch.	
Scrophulariaceae	*Paulownia fortunei* (Seem.) Hemsl.	
Simarubaceae	*Ailanthus altissima* (Mill.) Swingle	
Sterculiaceae	*Sterculia lanceolata* Cav.	
Styracaceae	*Alniphyllum fortunei* (Hemsl.) Makino	
Theaceae	*Cleyera pachyphylla* Chun ex H.T. Chang	
Tiliaceae	*Grewia biloba* G. Don	
Ulmaceae	*Trema angustifolia* (Planch.) Blume	
Urticaceae	*Oreocnide obovata* (C.H. Wright) Merr.	
Verbenaceae	*Callicarpa rubella* Lindl.	
	Clerodendrum serratum (L.) Moon	
	Premna fulva Craib	
Monocotyledonae		
Amaryllidaceae	*Curculigo capitulata* (Lour.) Kuntze	
Areaceae	*Caryota ochlandra* Hance	
	Daemonorops margaritae (Hance) Becc.	
Marantaceae	*Phrynium rheedei* Suresh & Nicolson	
Musaceae	*Musa balbisiana* Colla	
Pandanaceae	*Pandanus tectorius* Parkinson	
Zingiberaceae	*Alpinia zerumbet* (Pers.) B.L. Burtt & R.M. Sm.	
	Amomum tsaoko Crevost & Lemarié	
	Costus speciosus (J. Koenig) Smith	

Mammals

- Three Maritime Striped Squirrels *Tamiops maritimus* were seen on 9 July.
- A brown white-bellied rat, possibly Chinese White-bellied Rat *Niviventer confucianus*, was seen on 8 July.
- The status of mammals was inferred (Table 2) based on an interview with a warden of Diding Nature Reserve, and on recorded distributions, including past records from Diding and/or Jingxi County (Wang *et al*., 1962; Wang, 1964; Wei & Wu, 1985; Wu, 1993; Zhang Y. *et al* . 1997).

- The following species, not confirmed during the present survey, were reported to be present in Diding during the survey conducted by Guangxi Natural History Museum in December 2002: Clouded Leopard *Neofelis nebulosa* (prey remains on trees), Sambar *Cervus unicolor* (reported by villagers), Large Indian Civet *Viverra zibetha* (confirmed), Red and White Giant Flying Squirrel *Petaurista alborufus* (confirmed) and Crab-eating Mongoose *Herpestes urva* (confirmed).
- A gibbon was caught around Mingxue Cun near Nanpo Xiang in 1984 (ZTF, in litt., 16 January 2003). It is likely to have been Eastern Crested Gibbon *Nomascus* (cf. *nasutus*) sp.

Table 2. The inferred status of mammals at Diding Nature Reserve, based on interviewing a warden of the Nature Reserve, recent records from Guangxi Natural History Museum and on past distribution records. "+" = rare, "++" = quite common, "+++" = abundant. Sequence follows D.E. Wilson & Cole (2000).

Scientific name	English name	Previous records from Diding and/or Jingxi	Warden's rating	Records from ZTF, MYM and XZM	Probable status
Crocidura attenuata	Indochinese Shrew	(Jingxi)	(not asked)	-	unknown
Crocidura fuliginosa (recorded as *C. dracula*)	Southeast Asian Shrew	(Jingxi)	(not asked)	-	unknown
Mogera insularis	Insular Mole	(Jingxi)	(not asked)	-	unknown
Tupaia belangeri	Northern Tree Shrew	(Jingxi)	-	-	insecure or extirpated
Rousettus leschenaulti	Leschenault's Fruit Bat	(Jingxi)	(not asked)	-	unknown
Hipposideros armiger	Himalayan Roundleaf Bat	(Jingxi)	(not asked)	-	unknown
Hipposideros bicolor	Bicolored Roundleaf Bat	(Jingxi)	(not asked)	-	unknown
Nyctalus noctula (recorded as *N. velutinus*)	Noctule	(Jingxi)	(not asked)	-	unknown
Macaca assamensis	Assam Macaque	(Jingxi)	-	-	extirpated or absent
Macaca mulatta	Rhesus Monkey	(Jingxi)	++	+	present
Macaca nemestrina	Pig-tailed Macaque	(Jingxi)	-	-	extirpated or absent
Macaca arctoides	Stump-tailed Macaque	(Jingxi)	-	-	extirpated or absent
Nomascus (cf. *nasutus*) sp.	Eastern Crested Gibbon	(Jingxi)	-	+	insecure or extirpated
Trachypithecus francoisi (recorded as *Presbytis francoisi*)	Francois's Leaf Monkey	(Jingxi)	-	-	extirpated or absent
Cuon alpinus	Dhole	(Jingxi)	+	-	insecure or extirpated
Nyctereutes procyonoides	Raccoon Dog	(Jingxi)	-	-	extirpated or absent
Vulpes vulpes	Red Fox	(Jingxi)	-	-	extirpated or absent
Catopuma temminckii (recorded as *Felis temmincki*)	Asiatic Golden Cat	(Jingxi)	-	-	extirpated or absent
Prionailurus bengalensis (recorded as *Felis bengalensis*)	Leopard Cat	(Jingxi)	+++	++	present
Neofelis nebulosa	Clouded Leopard	(Jingxi)	-	+	insecure or extirpated
Panthera pardus	Leopard	(Jingxi)	+	-	insecure or extirpated
Panthera tigris	Tiger	(Jingxi)	-	-	extirpated or absent

Scientific name	English name	Previous records from Diding and/or Jingxi	Warden's rating	Records from ZTF, MYM and XZM	Probable status
Herpestes javanicus	Javan Mongoose	(Jingxi)	-	-	extirpated or absent
Herpestes urva	Crab-eating Mongoose	(Jingxi)	-	+++	present
Lutra lutra	Eurasian Otter	(Jingxi)	-	-	extirpated or absent
Amblonyx cinereus (recorded as *Aonyx cinerea*)	Oriental Small-clawed Otter	(Jingxi)	-	-	extirpated or absent
Arctonyx collaris	Hog Badger	(Jingxi)	-	-	extirpated or absent
Meles meles	Eurasian Badger	(Jingxi)	-	-	extirpated or absent
Melogale moschata	Chinese Ferret-badger	(Jingxi)	+++	+	present
Martes flavigula	Yellow-throated Marten	(Jingxi)	-	-	extirpated or absent
Mustela kathiah	Yellow-bellied Weasel	(Jingxi)	+++	-	present
Mustela sibirica	Siberian Weasel	(Jingxi)	-	-	insecure, extirpated or absent
Mustela strigidorsa	Black-striped Weasel	(Jingxi)	-	-	insecure, extirpated or absent
Ursus thibetanus (recorded as *Selenarctos thibetanus*)	Asiatic Black Bear	(Jingxi)	-	-	extirpated or absent
Viverra zibetha	Large Indian Civet	(Jingxi)	-	+	present
Viverricula indica	Small Indian Civet	(Jingxi)	+++	+	present
Paguma larvata	Masked Palm Civet	(Jingxi)	+++	+	present
Paradoxurus hermaphroditus	Asian Palm Civet	(Jingxi)	++	-	insecure
Chrotogale owstoni	Owston's Palm Civet	(Jingxi)	-	-	doubtful
Sus scrofa	Wild Boar	(Jingxi)	+++	+	present
Moschus berezovskii	Chinese Forest Musk Deer	(Jingxi)	+++	-	present
Cervus unicolor	Sambar	(Jingxi)	-	+	Insecure or extirpated
Muntiacus muntjak	Indian Muntjac	(Jingxi)	++	+++	present
Muntiacus reevesii	Reeves's Muntjac	(Jingxi)	++	-	unknown
Naemorhedus sumatraensis (recorded as *Capricornis sumatraensis*)	Serow	(Jingxi)	-	-	extirpated or absent
Manis pentadactyla	Chinese Pangolin	(Jingxi)	+	+	present
Callosciurus erythraeus	Pallas's Squirrel	(Jingxi)	++	-	present
Dremomys pernyi	Perny's Long-nosed Squirrel	(Jingxi)	-	-	insecure, extirpated or absent
Dremomys rufigenis	Asian Red-cheeked Squirrel	(Jingxi)	-	-	insecure or extirpated
Ratufa bicolor	Black Giant Squirrel	(Jingxi)	+++	+++	present
Tamiops maritimus (recorded as *T. swinhoei*)	Maritime Striped Squirrel	(Jingxi)	+++	-	present
Belomys pearsonii	Hairy-footed Flying Squirrel	(Jingxi)	+++	-	present
Hylopetes phayrei (recorded as *Petinomys electilis*)	Indochinese Flying Squirrel	(Jingxi)	(not asked)	-	unknown

Scientific name	English name	Previous records from Diding and/or Jingxi	Warden's rating	Records from ZTF, MYM and XZM	Probable status
Petaurista philippensis (recorded as *P. petaurista* (Diding) and *P. yunnanensis* (Jingxi))	Indian Giant Flying Squirrel	(Diding, Jingxi)	+++	+++	present
Petaurista alborufus	Red and White Giant Flying Squirrel	(Jingxi)	-	+	present
Petaurista elegans (recorded as *P. marica*)	Spotted Giant Flying Squirrel	(Diding)	(not asked)	-	unknown
Trogopterus xanthipes	Complex-toothed Flying Squirrel	(Jingxi)	-	-	insecure or extirpated
Bandicota indica	Greater Bandicoot Rat	(Jingxi)	(not asked)	-	unknown
Chiropodomys gliroides	Pencil-tailed Tree Mouse	(Jingxi)	(not asked)	-	unknown
Hapalomys delacouri	Delacour's Marmoset Rat	(Jingxi)	(not asked)	-	unknown
Micromys minutus	Eurasian Harvest Mouse	(Jingxi)	(not asked)	-	unknown
Mus caroli	Ryukyu Mouse	(Jingxi)	(not asked)	-	unknown
Mus musculus	House Mouse	(Jingxi)	(not asked)	-	unknown
Mus pahari	Gairdner's Shrewmouse	(Jingxi)	(not asked)	-	unknown
Niviventer confucianus (recorded as *Rattus niviventer*)	Chinese White-bellied Rat	(Jingxi)	(not asked)	-	unknown
Niviventer eha (recorded as *Rattus eha*)	Smoke-bellied Rat	(Jingxi)	(not asked)	-	unknown
Niviventer fulvescens (recorded as *Rattus fulvescens*)	Chestnut White-bellied Rat	(Jingxi)	(not asked)	-	unknown
Rattus nitidus	Himalayan Field Rat	(Jingxi)	(not asked)	-	unknown
Rattus rattus	House Rat	(Jingxi)	(not asked)	-	unknown
Rattus tanezumi (recorded as *R. flavipectus*)	Tanezumi Rat	(Jingxi)	(not asked)	-	unknown
Rattus turkestanicus (recorded as *R. rattoides*)	Turkestan Rat	(Jingxi)	(not asked)	-	unknown
Rhizomys pruinosus	Hoary Bamboo Rat	(Jingxi)	+++	-	present
Hystrix brachyura (recorded as *H. hodgsoni*)	Malayan Porcupine	(Jingxi)	+	-	insecure
Atherurus macrourus	Asiatic Brush-tailed Porcupine	(Jingxi)	+++	-	present
Lepus sinensis or *Lepus comus*	East Chinese Hare or Yunnan Hare	(Jingxi)	+++	-	present

- Among the species suspected to occur, some are of particular conservation importance:
  - Dhole *Cuon alpinus* is listed as globally Vulnerable, and Class II Protected in China.
  - Malayan Porcupine *Hystrix brachyura* is globally Vulnerable.
  - Clouded Leopard *Neofelis nebulosa* is globally Vulnerable and Class I Protected in China.
  - Leopard *Panthera pardus* is Class I Protected in China.
  - Chinese Pangolin *Manis pentadactyla*, Rhesus Monkey *Macaca mulatta* and Chinese Forest Musk Deer *Moschus berezovskii* are globally at Lower Risk (Near-threatened), and Class II Protected in China.
  - Hairy-footed Flying Squirrel *Belomys pearsonii* is at Lower Risk (Near-threatened) globally.
  - Large Indian Civet *Viverra zibetha*, Small Indian Civet *Viverricula indica*, Sambar *Cervus unicolor*, Black Giant Squirrel *Ratufa bicolor* are Class II Protected in China.

Birds

- Sixty-one species of birds were recorded in Diding Nature Reserve during the survey (Table 3).
- The most frequently encountered species were Grey-cheeked Fulvetta *Alcippe morrisonia*, Mountain Bulbul *Hypsipetes mclellandii* and White-crowned Forktail *Enicurus leschenaulti*.
- Grey-cheeked Warbler *Seicercus poliogenys* has apparently not been previously recorded from Guangxi and was known only from Yunnan in China.
- Blue-throated Barbet *Megalaima asiatica* is apparently a new record for Guangxi, and previously only recorded from Yunnan in China. It was subsequently recorded at Dawangling Nature Reserve and Cenwanglaoshan Nature Reserve in northwest Guangxi.
- Mountain Bamboo Partridge *Bambusicola fytchii* is apparently a new record for Guangxi, previously recorded only from Yunnan, Sichuan and Guizhou in China. It was subsequently recorded at Nongxin Nature Reserve in west Guangxi.
- The following species, not confirmed during the present survey, were recorded in Diding during the survey conducted by Guangxi Natural History Museum in December 2002: Red Junglefowl *Gallus gallus*, Silver Pheasant *Lophura nycthemera*, White-winged Magpie *Urocissa whiteheadi*, Black-throated Sunbird *Aethopyga saturata*, and Streaked Spiderhunter *Arachnothera magna* (ZTF, in litt., 16 January 2003).

Table 3. Birds recorded at Diding Nature Reserve, July 1999. Sequence follows Clements (2000).

Scientific name	**English name**
Accipiter trivirgatus	Crested Goshawk
Bambusicola fytchii	Mountain Bamboo Partridge
Surniculus lugubris	Drongo Cuckoo
Centropus sinensis	Greater Coucal
Centropus bengalensis	Lesser Coucal
Apus pacificus	Fork-tailed Swift
Halcyon smyrnensis	White-throated Kingfisher
Megalaima virens	Great Barbet
Megalaima franklinii	Golden-throated Barbet
Megalaima oorti	Black-browed Barbet
Megalaima asiatica	Blue-throated Barbet
Picus chlorolophus	Lesser Yellownape
Blythipicus pyrrhotis	Bay Woodpecker
Pitta soror	Blue-rumped Pitta
Hirundo daurica	Red-rumped Swallow
Motacilla alba	White Wagtail
Pericrocotus brevirostris	Short-billed Minivet
Pericrocotus solaris	Grey-chinned Minivet
Pycnonotus melanicterus	Black-crested Bulbul
Pycnonotus jocosus	Red-whiskered Bulbul
Pycnonotus aurigaster	Sooty-headed Bulbul
Alophoixus pallidus	Puff-throated Bulbul
Hemixos castanonotus	Chestnut Bulbul
Hypsipetes mcclellandii	Mountain Bulbul
Chloropsis hardwickii	Orange-bellied Leafbird
Zoothera citrina	Orange-headed Thrush
Prinia atrogularis	Hill Prinia
Prinia hodgsonii	Grey-breasted Prinia
Prinia inornata	Plain Prinia
Tesia cyaniventer	Grey-bellied Tesia
Phylloscopus reguloides	Blyth's Leaf Warbler
Seicercus poliogenys	Grey-cheeked Warbler
Niltava macgrigoriae	Small Niltava
Culicicapa ceylonensis	Grey-headed Canary Flycatcher
Copsychus saularis	Oriental Magpie Robin
Enicurus leschenaulti	White-crowned Forktail

Scientific name	English name
Saxicola ferrea	Grey Bushchat
Rhipidura albicollis	White-throated Fantail
Hypothymis azurea	Black-naped Monarch
Garrulax maesi	Grey Laughingthrush
Garrulax canorus	Hwamei
Garrulax sannio	White-browed Laughingthrush
Pomatorhinus ruficollis	Streak-breasted Scimitar Babbler
Stachyris ruficeps	Rufous-capped Babbler
Stachyris nigriceps	Grey-throated Babbler
Stachyris striolata	Spot-necked Babbler
Chrysomma sinense	Yellow-eyed Babbler
Actinodura ramsayi	Spectacled Barwing
Alcippe morrisonia	Grey-cheeked Fulvetta
Heterophasia melanoleuca	Black-headed Sibia
Yuhina castaniceps	Striated Yuhina
Yuhina zantholeuca	White-bellied Yuhina
Paradoxornis gularis	Grey-headed Parrotbill
Parus major	Great Tit
Dicaeum ignipectus	Fire-breasted Flowerpecker
Oriolus traillii	Maroon Oriole
Lanius schach	Long-tailed Shrike
Dicrurus leucophaeus	Ashy Drongo
Dicrurus aeneus	Bronzed Drongo
Dendrocitta formosae	Grey Treepie
Corvus macrorhynchus	Large-billed Crow

- Some species are of particular conservation importance:
  – Crested Goshawk *Accipiter trivirgatus*, Red Junglefowl *Gallus gallus*, Silver Pheasant *Lophura nycthemera*, Greater Coucal *Centropus sinensis*, Lesser Coucal *Centropus bengalensis* and Blue-rumped Pitta *Pitta soror* are Class II Protected species in China.
- The presence of many forest-dependent species, including certain babblers, flycatchers and woodpeckers, indicated that the forests at Diding have quite high integrity.

Reptiles and Amphibians

- Fourteen species of amphibian, three species of lizard and three species of snake were recorded during this survey (Table 4).
- The most frequently encountered species were *Rana limnocharis* and *Microhyla heymonsi* in the paddy fields. In the forest stream, *Megophrys palpebralespinosa* was most often recorded.
- Some species could not be firmly identified:
  – One frog, belonging to the *Odorana* group, is different from the known Chinese species. Its identity is being investigated.
  – An agamid lizard, probably *Acanthosaura armata*, of which only a female was found; the identity cannot be confirmed without examination of an adult male.
  – A snake, resembling *Dendrelaphis pictus*, was also seen by some of the team members.
- Three species are new records for Guangxi province: *Brachytarsophrys feae, Megophrys lateralis* and *Megophrys palpebralespinosa.* These species also occur in Yunnan and are representatives of the Southwest China biogeographic unit.
- The director of the reserve reported the occurrence of *Physignathus cocincinus* (Chinese Water Dragon) at Diding.
- *Varanus salvator* (Water Monitor Lizard) and *Python molurus bivittatus* (Burmese Python) were reported to occur at Diding (ZTF, in litt., 16 January 2003).

Table 4. Amphibians and reptiles of Diding. Sequence follows Zhao E.-M. & Adler (1993).

Species	Habitat	Records
Brachytarsophrys feae	not known (regurgitated by a snake)	✓
Leptolalax pelodytoides	stream	tadpole
Megophrys lateralis	forest stream	✓
	stream	✓
Megophrys palpebralespinosa	stream	✓
	forest stream	✓
Bufo melanostictus	paddy field	✓
Rana guentheri	paddy field	✓
Rana kuhlii	stream	✓
Rana limnocharis	paddy field/grassland	✓
Rana (Odorana) sp.	forest edge	✓
Philautus odontotarsus	forest stream	✓
	ditch	✓
Polypedates megacephalus	forest/bamboo	✓
	paddy field	✓
Microhyla butleri	paddy field	✓
Microhyla heymonsi	paddy field	✓, tadpoles
Microhyla pulchra	paddy field/grassland	✓
	paddy field	✓
Acanthosaura (cf. *armata*) sp.	foerst	✓
Tropidophorus sinicus	forest	✓
Amphiesma boulengeri	forest	✓
Cyclophiops major	paddy field	✓
Dendrelaphis pictus ?	forest stream	✓
Trimeresurus stejnegeri	forest stream	✓

- The presence of many forest species and forest stream specialists, such as *Brachytarsophrys feae*, *Leptolalax pelodytoides*, *Megophrys lateralis*, *Megophrys palpebralespinosa*, *Tropidophorus sinicus*, *Amphiesma boulengeri* and *Trimeresurus stejnegeri* indicated that the forests and the streams are still intact.

Fish

- Six freshwater fish species were recorded from Diding Headwater Forest Nature Reserve; an additional four species were reported to be present but specimens have not been examined by specialists (Table 5).
- The species reported to be most abundant were the unidentified *Discogobio* sp. and *Misgurnus anguillicaudatus* (Oriental Paddy Loach).
- A number of species (*Discogobio* sp., the torrent loach *Schistura* and stream gobies *Rhinogobius*) do not fit any existing keys for Chinese fish and may prove of scientific and/or conservation interest.

Table 5. Freshwater fish recorded from Diding Nature Reserve, Guangxi, July 1999. Sequence of families follows Nelson (1994).

Species
Zacco platypus
Hemiculter leucisculus
Discogobio (cf. *yunnanensis*) sp.
Carassioides cantonensis
Misgurnus anguillicaudatus
Schistura sp.
Schistura fasciolata
Schistura incerta
Rhinogobius sp. 1 (unmarked opercle)
Rhinogobius sp. 2 (spotted opercle)

- The reported occurrence of *Carassioides cantonensis* is of interest because it is restricted to the northern Indochina region and has not previously been encountered on KFBG's South China surveys. However the record must be considered doubtful in the absence of a specimen.
- Villagers reported over 20 species of native freshwater fish at Diding, but the present rapid survey was unable to confirm this claim. The fish diversity we found was unexceptional but a high percentage of species found were possibly new to China or to science.

Ants

- Sixty-nine ant species were recorded from Diding (Table 6). Many could not be identified to named species. One taxon belongs to an undescribed formicine genus, known only from southwest Guangxi and Vietnam (J.R. Fellowes, unpublished data; S. Yamane, Kagoshima University, pers. comm., November 2000).
- The most frequently encountered were *Pachycondyla* sp. 1, *Odontomachus* sp. 3 and *Pristomyrmex pungens*.

Table 6. Ant species recorded in and around Diding Nature Reserve, July 1999. * Species with a strong forest association.

Species	**Habitat**
Aphaenogaster (cf. *hunanensis*) sp. 3 *	broadleaf forest
Calyptomyrmex (cf. *wittmeri*) sp. 1 *	broadleaf forest
Camponotus (cf. *jianghuaensis*) sp. 15	broadleaf/shrubland
Camponotus (cf. *mitis*) sp. 11	broadleaf
Camponotus nicobarensis	paddy
Camponotus (*variegatus* group) sp. 4	broadleaf
Camponotus sp. 48	forest, shrubland
Crematogaster (cf. *biroi*) sp. 4	broadleaf
Crematogaster (cf. *laboriosa*) sp. 3	broadleaf
Crematogaster (cf. *travancorensis*) sp. 2	vegetation
Crematogaster sp. 21 *	broadleaf/shrubland
Dolichoderus (cf. *flatidorsus*) sp. 6	open vegetation
Dolichoderus (nr. *taprobanae*) sp. 4	open vegetation
Dolichoderus sp. 9	broadleaf
Dolichoderus sp. 10	broadleaf forest
Dolichoderus sp. 12	broadleaf
Hypoponera (cf. *excoecata*) sp. 2 *	broadleaf
Hypoponera sp. 3 *	broadleaf forest
Hypoponera sp. 6 *	broadleaf & treeferns
Lepisiota rothneyi	broadleaf forest
Leptogenys peuqueti	broadleaf forest
Leptogenys sp. 22 *	forest, grassland
Monomorium floricola	broadleaf forest
Odontomachus monticola *	broadleaf forest
Odontomachus (cf. *silvestrii*) sp. 3	open vegetation
Odontomachus (cf. *xizangensis*) sp. 4	open vegetation
Odontoponera (cf. *denticulata*) sp. 1	meadow
Oligomyrmex (cf. *hunanensis*) sp. 3	forest, grassland
Oligomyrmex (cf. *wheeleri*) sp. 1 *	broadleaf forest
Oligomyrmex sp. 4 *	broadleaf forest
Pachycondyla (*javana* group) sp. 1 *	forest, shrubland, grassland
Pachycondyla (*javana* group) sp. 20 *	broadleaf/shrubland
Pachycondyla (cf. *luteipes*) sp. 2 *	broadleaf forest
Pachycondyla (cf. *nigrita*) sp. 17 *	broadleaf forest
Pachycondyla rufipes	forest, shrubland, grassland
Pachycondyla sp. 13 *	broadleaf forest
Paratrechina (cf. *bourbonica*) sp. 4	meadow
Paratrechina (nr. *indica*) sp. 9 *	broadleaf forest
Paratrechina (cf. *opaca*) sp. 26 *	broadleaf forest
Paratrechina sauteri	broadleaf/shrubland
Paratrechina sp. 36	broadleaf forest

Species	Habitat
Paratrechina sp. 41	broadleaf forest
Pheidole gatesi *	broadleaf forest
Pheidole (cf. *noda*) sp. 1	open vegetation
Pheidole smythiesi	broadleaf forest
Pheidole (cf. *yeensis*) sp. 40	meadow
Pheidole sp. 7 *	broadleaf forest
Pheidole sp. 13 *	broadleaf forest
Polyrhachis demangei	broadleaf/shrubland
Polyrhachis dives	grassland
Polyrhachis halidayi	grassland
Polyrhachis tyrannica	grassland
Prenolepis (cf. *emmae*) sp. 1 *	open vegetation
Prenolepis magnocula *	broadleaf forest
Pristomyrmex pungens	open vegetation
Pyramica sauteri	broadleaf forest
Pyramica sp. 8	broadleaf forest
Rhoptromyrmex wroughtonii	open vegetation
Strumigenys sp. 6 *	broadleaf forest
Tapinoma sp. 1	open vegetation
Technomyrmex sp. 2 *	broadleaf forest
Tetramorium (cf. *kraepelini*) sp. 4 *	broadleaf forest
Tetramorium (cf. *shensiense*) sp. 6 *	broadleaf forest
Tetramorium sp. 25 *	broadleaf forest
Tetramorium sp. 28 *	broadleaf forest
Tetramorium (cf. *tonganum*) sp. 12	broadleaf forest
Tetraponera modesta	shrubland/stream
Vollenhovia sp. 8	forest, shrubland
new formicine genus sp. 1	broadleaf forest

- *Paratrechina* sp. 36, *Paratrechina* sp. 41 and *Vollenhovia* sp. 8 are known only from Diding, while *Camponotus* sp. 48 is known only from Jingxi County.
- Excluding these unique species, 45% of ants found were forest-dependent. If only records above 1,000 m were considered, the proportion was 54%, indicating rather high integrity for a secondary forest area.

Dragonflies

- Sixteen dragonfly species were recorded at Diding over the period 8-9 July (Table 7).
- The most abundant included *Bayadera bidentata*, *Anisopleura qingyuanensis* and *Pantala flavescens*.

Table 7. Dragonflies recorded at Diding, 8-9 July 1999.

Species	Notes
Rhinocypha fenestrella	
Bayadera bidentata	
Euphaea decorata	
Anisopleura yunnanensis	
Anisopleura qingyuanensis	
Agriomorpha fusca	
Protosticta beaumonti	new provincial record
Anax guttatus	
Anisogomphus / Merogomphus sp.	awaiting identification
Davidius fruhstorferi guizhouensis	
Idionyx (nr. *optata*) sp.	awaiting identification
Orthetrum glaucum	
Orthetrum sabina	
Orthetrum triangulare	
Trithemis festiva	
Pantala flavescens	

- The fauna included a small number of species which may be considered rare or restricted in South China:
  – *Protosticta beaumonti*, known also from Hong Kong and Dinghushan in Guangdong.
  – *Idionyx* sp. which may be an undescribed species, closely allied to *I. optata*.

Butterflies

- Sixty-one butterfly species were recorded at Diding over the period 8-9 July (Table 8).
- The most abundant included *Zizeeria maha*, *Eurema hecabe* and *Heliophorus ira*.
- *Ochlodes crataeis* is apparently a new record for Guangxi, not recorded for the province by Chou (1994) or Bascombe (1995).

Table 8. Butterfly species recorded at Diding, 8-9 July 1999. Sequence of families follows Bascombe (1995).

Species	Habitat	Notes
Ampittia dioscorides	forest	
Ampittia virgata	forest	
Astictopterus jama	forest	
Halpe porus	farmland/grass/shrub	
Notocrypta curvifascia	forest	
Notocrypta sp.	forest	
Ochlodes crataeis	forest	new Guangxi record
Parnara bada	forest	
Pelopidas agna	farmland/grass/shrub	
Byasa polyeuctes	forest	
Graphium sarpedon	farmland/grass/shrub	
Lamproptera sp.	forest	
Papilio bianor	farmland/grass/shrub forest	
Papilio nephelus	farmland/grass/shrub forest	
Papilio protenor	forest	
Appias lyncida	farmland/grass/shrub forest	
Eurema hecabe	farmland/grass/shrub forest	
Eurema laeta	forest	
Hebomoia glaucippe	farmland/grass/shrub	
Ixias pyrene	farmland/grass/shrub forest	
Pieris (Artogeia) canidia	forest	
Prioneris thestylis	farmland/grass/shrub forest	
Caleta roxus	forest	
Chilades lajus	forest	
Curetis dentata	forest	
Heliophorus ila	forest farmland/grass/shrub	
Miletus boisduvali	forest	
Neopithecops zalmora	forest	
Prosotas nora	forest	
Hypolycaena (Zeltus) amasa	farmland/grass/shrub forest	
Zemeros flegyas	forest	
Zizeeria maha	farmland/grass/shrub forest	
Zizina otis	farmland/grass/shrub forest	
Argyreus hyperbius	farmland/grass/shrub	

Species	Habitat	Notes
Athyma jina	forest	
Athyma selenophora	farmland/grass/shrub	
Danaus genutia	farmland/grass/shrub	
	forest	
Discophora sondaica	farmland/grass/shrub	
Euploea midamus	farmland/grass/shrub	
	forest	
Euploea mulciber	forest	
Faunis aerope	forest	
Hestina nama	farmland/grass/shrub	
Kallima inachus	forest	
Lethe verma	forest	
Limenitis (Parasarpa) dudu	forest	
Melanitis leda	farmland/grass/shrub	
Neptis clinia	farmland/grass/shrub	
Neptis hylas	forest	
Pantoporia hordonia	forest	
Parthenos sylvia	farmland/grass/shrub	
Polyura narcaeus	farmland/grass/shrub	
	forest	
Precis (Junonia) iphita	forest	
Precis (Junonia) orithya	farmland/grass/shrub	
Stichophthalma sp.	forest	
Symbrenthia hypselis	forest	
Symbrenthia lilaea	forest	
Tirumala limniace	farmland/grass/shrub	
Tirumala septentrionis	forest	
Vagrans egista	farmland/grass/shrub	
Vindula erota	forest	
Ypthima sp.	forest	

- Among the species recorded were a small number that may be considered rare or restricted in South China, e.g. *Byasa polyeuctes*, *Hestina nama*, *Parthenos sylvia*, *Caleta roxus*, *Hypolycaena amasa* and *Ochlodes crataeis*. Of these, only *H. amasa* has previously been encountered on KFBG surveys.

Summary of flora and fauna

- The vegetation at Diding is of interest as a non-limestone forest in a region composed mainly of limestone. However the original forest had been largely cleared, especially at lower altitudes, and the majority of the landscape transformed to secondary forest, shrubland and plantation. Quite extensive but fragmented cover of relatively mature and natural forest could be found.
- The present survey recorded only 78 vascular plant species but the survey was not exhaustive, even in the limited area visited. Among the flora were three nationally Protected species (*Zenia insignis*, *Alsophila spinulosa*, *Cibotum barometz*) and one globally restricted species (*Fissistigma kwangxiense*). *Alsophila spinulosa* was relatively abundant in oen of the forests.
- The mammal fauna is likely to be depleted, though reports of large mammals, such as Sambar, Dhole, Clouded Leopard and Leopard, merit verification. Malayan Porcupine, Chinese Pangolin, Rhesus Monkey and Chinese Forest Musk Deer and Hairy-footed Flying Squirrel were also reported to occur. A number of large arboreal squirrels, usually restricted to high-integrity forest, were reported to be abundant.
- No globally Threatened vertebrates were recorded in the survey, but the presence of various forest-dependent birds (including babblers, flycatchers and woodpeckers), reptiles (*Tropidophorus sinicus, Amphiesma boulengeri* and *Trimeresurus stejnegeri*) and amphibians

(*Brachytarsophrys feae*, *Leptolalax pelodytoides*, *Megophrys lateralis* and *Megophrys palpebralespinosa*) indicated that the forests at Diding have quite high integrity.

- The fish fauna recorded was of low to moderate diversity but had a high percentage of unidentifiable species. In-depth sampling might reveal more species and the conservation significance of this reserve.
- The insect fauna was quite rich, and included quite a high proportion of species that are forest-dependent and/or restricted in South China.
- The significance of Diding Headwater Forest Nature Reserve was not assessed by MacKinnon *et al*. (1996), but the present findings confirm it to be of high local biodiversity importance, justifying its recent approval as a provincial-level nature reserve. It is particularly important as a regional gene pool in view of the recent dramatic loss of natural forest in the border region of Guangxi and Vietnam.

Threats and problems

- At the time of the survey, the nature reserve was reported to be under-funded; owing to the recent deficit of the county Forestry Bureau, the reserve had received annual funding of only about RMB 10,000, whereas it reportedly needed RMB 180,000 for salary and maintenance. Staff, formerly forest farm employees, were apparently not trained or equipped to carry out enforcement or habitat management.
- Income had been supplemented through logging of China Fir and Pine trees in recent years, but remaining stocks were inadequate to sustain this harvesting (Jingxi County Forestry Bureau, in litt., 1999).

Opportunities

- Though the original forests in the reserve have been degraded, the remaining forests retained high ecological integrity. This was probably due to the restriction of logging in recent years to areas near the nature reserve stations. No major logging trails were seen inside the nature reserve.
- The forests need to be protected against degradation through hunting, grazing and over-collection.
- The local community has a strong desire to protect the remaining natural forest; this was expressed in law cases and violent protests regarding logging activities near Nanpo Xiang in 1982 and 1999 (ZTF, in litt., 16 January 2003). Thus there appears to be a good foundation to promote participatory community forestry and conservation.
- Sources of income are needed. In recognition of Diding's water conservation function, a proportion of funds from urban water users should be returned to forest protection. Small-scale agroforestry could also be developed near the reserve management station to boost the income of the staff.
- The possibility of extending the reserve to cover natural forests in neighbouring counties, and linking to those in Vietnam (such as Pac Bo and Trung Khanh in Cao Bang province), should be explored. The possibility of reforestation using native tree species should be explored; forests on the Vietnam side are also degraded (Geissman *et al*., 2000).
- There are many scenic spots in Jingxi County. Diding has a rich birdlife and herpetofauna that contains species from both South China and Southwest China units. There is thus potential to link Diding with other tourist attractions and develop eco-tourism for the whole county.

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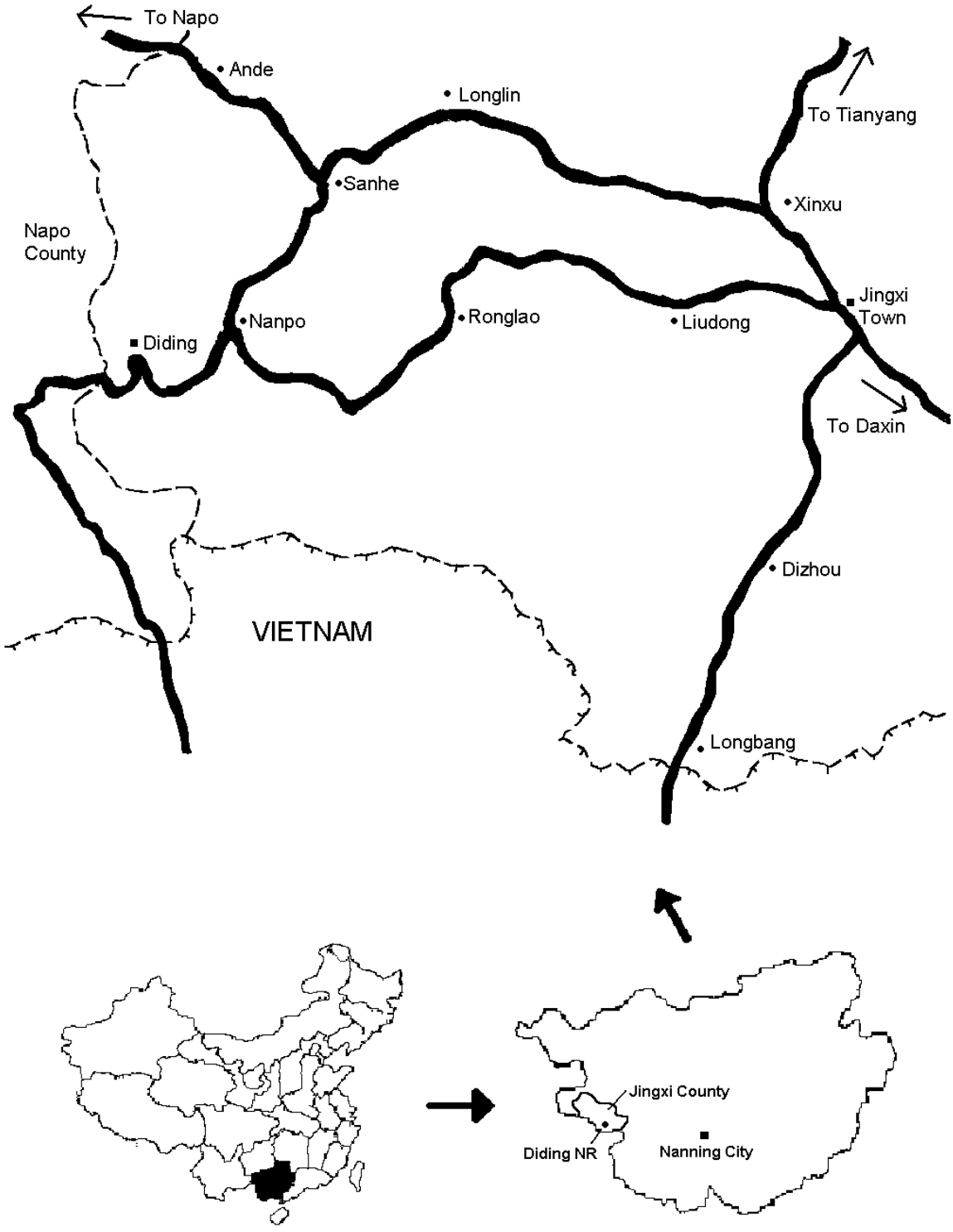

Figure 1. Map showing location of Diding Headwater Forest Nature Reserve, West Guangxi, China.