



**Report of Rapid Biodiversity Assessments at
Fusui Rare Animal Nature Reserve,
Southwest Guangxi, China, 1998 and 2001**

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in collaboration with
Guangxi Forestry Department
Guangxi Institute of Botany
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Report of Rapid Biodiversity Assessments at Fusui Rare Animal Nature Reserve, Southwest Guangxi, China, 1998 and 2001

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Background

The present report details the findings of a trip to Southwest 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.

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Common geographical descriptions and their Chinese phonetics

English meaning	Chinese phonetics (pinyin)
East	dong
South	nan
West	xi
North	bei
mountain	shan
range	ling
peak	feng, ding
valley	keng, gu
island	dao
river	he, chuan, jiang
stream	xi, yong
lake	hu, chi
sea	hai
harbour	gang
bay	wan
outlet	kou
city	shi
county	xian
village	xiang, cun
hamlet	tun
the Chinese system of geomancy	feng shui

Report of Rapid Biodiversity Assessments at Fusui Rare Animal Nature Reserve, Southwest Guangxi, China, 1998 and 2001

Objectives

The specific aim of the visits was to see the populations and habitats of the endangered leaf monkeys (or Langurs), *Trachypithecus leucocephalus* and *Trachypithecus francoisi*, and to consider their conservation status. The more general aims were to collect up-to-date information on the fauna and flora of Fusui, and to use this to help determine conservation priorities within South China.

Methods

After conducting rapid biodiversity assessments in nature reserves of Qinglongshan, Chunxiu and Nonggang (Kadoorie Farm and Botanic Garden, 2002a, 2002b, 2002c), the survey team (BH, BC, JRF, ML, LKS, GJC, P JL, KW, WFN, ZXG, LLR) travelled to Fusui County on 27 May 1998.. The team joined Li Zhaoyuan of Kunming Institute of Zoology and Edinburgh University, UK on 28 May in Fusui Rare Animal Nature Reserve. On 29 May the team returned to Nanning.

A second short visit was made to Fusui on 12 November 2001 by a small team from KFBG (Manab Chakraborty, Lawrence Chau and ML) together with Xu Zhihong of Guangxi Forestry Department and Zhou Qihai of Guangxi Normal University.

During fieldwork visual searching for plants (in 1998 only), mammals, birds, reptiles, amphibians, fish (in 1998 only), ants (in 1998 only), butterflies and dragonflies (in 1998 only) was conducted. Some birds and amphibians were also identified by their calls.

Plant records in the surveys were made by WFN and edited by NSC. Mammal records were made by BH and ML. Records of birds were made by GJC, P JL, LKS, KW or ML, reptiles and amphibians by ML, fish by BC, ants by JRF, butterflies by ML and BH and verified by GTR or ML, and dragonflies by KW.

Nomenclature in the report is standardised based, unless otherwise stated, on the following references:

- Flora (Pteridophyta, Gymnospermae and Angiospermae): Anon. (1959-2000); Anon. (1991); Anon. (1996-2000); Anon. (2001); and The Plant Names Project (2001);
- Mammals (Mammalia): Wilson & Cole (2000);
- Birds (Aves): Inskipp *et al.* (1996);
- Reptiles & Amphibians (Reptilia and Amphibia): 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). Protected status in China is based on Hua & Yan (1993) for animals, and State Forestry Administration & Ministry of Agriculture (1999) for plants. Certain taxa, including orchids, reptiles, amphibians, fish and invertebrates, have yet to be properly assessed for global status.

Location and management

Fusui Rare Animal Nature Reserve is in Fusui County, Southwest Guangxi, at 22° 24' - 22° 36'N, 107° 23' - 107° 41'E (Forestry Department of Guangxi Zhuangzu Autonomous Region, 1993; Liu *et al.*, 1996). The reserve, which has an area of 80 km², was established in 1981 to protect White-headed Leaf Monkey *Trachypithecus* (formerly *Presbytis*) *leucocephalus*, Francois's Leaf Monkey *T. francoisi*, Rhesus Monkey *Macaca mulatta* and other fauna. The region has a northern tropical monsoon climate with an annual mean temperature of 21.5°C, and mean precipitation of 1,151 mm (Forestry Department of Guangxi Zhuangzu Autonomous Region, 1993). The geology consists mainly of karst and sandy shale. The landscape comprises limestone hills about 400-600 m in altitude separated by flat depressions at about 200 m, which are now largely cultivated. It is listed as a Provincial-level Wild Animal Nature Reserve (Zhang, 1998) and is under the management of the Forestry Department. The Zuo River (Zuojiang) separates the range of Francois's Leaf Monkey (to the north) from that of White-headed Leaf Monkey (to the south).

Results

Vegetation

The zonal vegetation of the region should be northern tropical monsoon rain forest dominated by *Cleistanthus* spp. (Forestry Department of Guangxi Zhuangzu Autonomous Region, 1993). However, the forest has been severely degraded and the dominant hillside vegetation is now secondary shrubland while some hills are simply barren. These hillside shrublands are fragmented by low-lying flatland that has been largely transformed to agricultural land. The dominant species include *Orophea anceps*, *Litsea glutinosa*, *Cocculus laurifolius*, *Sterculia eosma*, *S. nobilis*, *Alchornea trewioides*, *Streblus tonkinensis*, *Cudrania tricuspidata*, *Cipadessa cinerascens*, *Pegia sarmentosa*, *Ardisia thyrsoiflora* and *Embelia scandans*. Recently regenerated secondary forest, dominated by *Cinnamomum saxatile*, *Litsea monopetala*, *Syzygium cumini*, *Adenanthera pavonina* var. *microsperma*, *Zenia insignis*, *Broussonetia papyrifera*, *Dimocarpus confinis*, *Oroxylon indicum* and *Pistacia weinmannifolia*, can be found around Yixiunong. These patches of secondary forest are the main habitat for White-headed Leaf Monkey.

Flora

The present survey recorded only 88 species of vascular plants in 42 families (Table 1). The low number of species recorded reflects in part the low sampling effort, as less than one day was spent in the reserve, but also the degraded nature of the vegetation. Of these 88 species, 30 are eaten by White-headed Leaf Monkey according to local villagers and Li (2000: Table 5.1). Among the species recorded, *Zenia insignis* is considered Lower Risk globally and Class II Protected nationally. *Eriolaena kwangsiensis* is endemic to southwest Guangxi and southern Yunnan.

Table 1. Vascular plant species recorded in Fusui Nature Reserve on 28 May 1998. Species that are under National Protection (Class I or II) (State Forestry Administration & Ministry of Agriculture, 1999), globally Threatened or Lower Risk (Near-threatened) (IUCN Species Survival Commission, 2001) or endemic to South China are indicated. Sources: ¹ based on interview with local villagers; ² Table 5.1 of Li (2000).-

Family	Species name	Remarks
GYMNOSPERMAE		
Gnetaceae	<i>Gnetum montanum</i> Markgr.	eaten by leaf monkeys ^{1,2}
ANGIOSPERMAE		
Dicotyledonae		
Alangiaceae	<i>Alangium chinense</i> (Lour.) Harms.	
Anacardiaceae	<i>Pegia sarmentosa</i> (Lecomte) Hand.-Mazz. <i>Pistacia weinmannifolia</i> J. Poiss. ex Franch. <i>Rhus chinensis</i> Mill.	eaten by leaf monkeys ²
Annonaceae	<i>Desmos chinensis</i> Lour. <i>Orophea anceps</i> Pierre	
Araliaceae	<i>Schefflera leucantha</i> R. Vig. <i>Trevesia palmata</i> (DC.) Vis.	
Asclepiadaceae	<i>Cryptolepis sinensis</i> (Lour.) Merr.	
Asteraceae	<i>Cirsium japonicum</i> Fisch. ex DC. <i>Eupatorium odoratum</i> L. <i>Senecio scandens</i> Buch.-Ham.	introduced from South America
Bignoniaceae	<i>Oroxylum indicum</i> (L.) Kurz	eaten by leaf monkeys ²
Boraginaceae	<i>Ehretia acuminata</i> (DC.) R. Br.	
Caesalpiniaceae	<i>Bauhinia championii</i> (Benth.) Benth. <i>Caesalpinia sinensis</i> (Hemsl.) J. E. Vidal <i>Zenia insignis</i> Chun	Lower Risk (IUCN); Protected II, eaten by langurs ²
Capparaceae	<i>Capparis membranifolia</i> Kurz <i>Crateva nurvala</i> Buch.-Ham.	eaten by leaf monkeys ^{1,2} eaten by leaf monkeys ¹
Combretaceae	<i>Combretum alfredii</i> Hance	
Convolvulaceae	<i>Argyrea capitiformis</i> (Poir.) Ooststr. <i>Cuscuta japonica</i> Choisy	
Ebenaceae	<i>Diospyros saxatilis</i> S.K. Lee	eaten by leaf monkeys ¹
Euphorbiaceae	<i>Alchornea trewioides</i> (Benth.) Müll. Arg. <i>Bischofia javanica</i> Blume <i>Cleidion brevipetiolatum</i> Pax & K. Hoffm. <i>Mallotus microcarpus</i> Pax & K. Hoffm. <i>Mallotus philippinensis</i> (Lam.) Müll. Arg. <i>Pristimera arborea</i> (Roxb.) A. C. Sm.	
Hippocrateaceae	<i>Gomphandra tetrandra</i> (Wall.) Sleum.	
Icaciniaceae	<i>Iodes ovalis</i> Blume var. <i>vitiginea</i> (Hance) Gagnep. <i>Mappianthes iodoides</i> Hand.-Mazz.	eaten by leaf monkeys ^{1,2} eaten by leaf monkeys ^{1,2}
Lauraceae	<i>Cinnamomum saxatile</i> H.W. Li <i>Litsea glutinosa</i> (Lour.) C. B. Rob. <i>Litsea monopetala</i> (Roxb. ex Baker) Pers.	eaten by leaf monkeys ¹
Meliaceae	<i>Cipadessa cinerascens</i> (Pellegr.) Hand.-Mazz.	
Menispermaceae	<i>Cocculus laurifolius</i> DC.	
Mimosaceae	<i>Adenanthera pavonina</i> L. var. <i>microsperma</i> (Teijsm. et Binnend.) I. C. Nielsen <i>Albizia chinensis</i> (Osbeck) Merr. <i>Albizia kalkora</i> (Roxb.) Prain	
Moraceae	<i>Broussonetia kazinoki</i> Siebold & Zucc. <i>Broussonetia papyrifera</i> (L.) L'Hér. ex Vent. <i>Cudrania tricuspidata</i> (Carrière) Bureau ex Lavalley <i>Ficus cyrtophylla</i> Wall. ex Miq. <i>Ficus glaberrima</i> Blume <i>Ficus hispida</i> L. f. <i>Ficus microcarpa</i> L. f.	eaten by leaf monkeys ^{1,2} eaten by leaf monkeys ¹ eaten by leaf monkeys ¹ eaten by leaf monkeys ¹ eaten by leaf monkeys ^{1,2}

Family	Species name	Remarks
	<i>Ficus tinctoria</i> subsp. <i>gibbosa</i> (Blume) Corner	
	<i>Morus australis</i> Poir.	eaten by leaf monkeys ^{1,2}
	<i>Streblus tonkinensis</i> (Dubard & Eberh.) Corner	
Myrsinaceae	<i>Ardisia thyrsoflora</i> D. Don	
	<i>Embelia scandens</i> (Lour.) Mez	
	<i>Maesa japonica</i> (Thunb.) Moritzi et Zoll.	
Myrtaceae	<i>Syzygium cumini</i> (L.) Skeels	
Oleaceae	<i>Ligustrum sinense</i> Lour.	eaten by leaf monkeys ¹
Papilionaceae	<i>Dalbergia pinnata</i> (Lour.) Prain	
	<i>Dendrolobium triangulare</i> (Retz.) Schindl.	eaten by leaf monkeys ¹
	<i>Millettia pachycarpa</i> Benth.	eaten by leaf monkeys ²
	<i>Pueraria lobata</i> (Willd.) Ohwi	eaten by leaf monkeys ^{1,2}
Rhamnaceae	<i>Berchemia floribunda</i> (Wall.) Brongn.	eaten by leaf monkeys ¹
	<i>Sageretia thea</i> (Osbeck) M.C. Johnst.	
	<i>Ventilago leiocarpa</i> Benth.	
Rosaceae	<i>Pyrus calleryana</i> (L.) Lindl.	eaten by leaf monkeys ¹
Rubiaceae	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	
	<i>Serissa serissoides</i> (DC.) Druce	
Rutaceae	<i>Clausena dunniana</i> H. Lévl.	
	<i>Murraya paniculata</i> (L.) Jack	eaten by leaf monkeys ^{1,2}
	<i>Zanthoxylum dissitum</i> Hemsl.	
Sapindaceae	<i>Dimocarpus confinis</i> (F.C. How & C.N. Ho) H.S. Lo	eaten by leaf monkeys ¹
Solanaceae	<i>Solanum erianthum</i> D. Don	
Staphyleaceae	<i>Bombax malabaricum</i> DC.	
Sterculiaceae	<i>Eriolaena kwangsiensis</i> Hand.-Mazz.	endemic to SW Guangxi & S. Yunnan
	<i>Pterospermum heterophyllum</i> Hance	
	<i>Sterculia euosma</i> W.W. Sm.	eaten by leaf monkeys ^{1,2}
	<i>Sterculia nobilis</i> Sm.	eaten by leaf monkeys ¹
Styracaceae	<i>Styrax faberi</i> Perkins	
Tiliaceae	<i>Microcos paniculata</i> L.	
Ulmaceae	<i>Celtis tetrandra</i> Roxb. subsp. <i>sinensis</i> (Pers.) Y.C. Tang	eaten by leaf monkeys ^{1,2}
	<i>Pteroceltis tatarinowii</i> Maxim.	eaten by leaf monkeys ²
Urticaceae	<i>Boehmeria nivea</i> (L.) Gaudich. var. <i>tenacissima</i> (Gaudich.) Miq.	eaten by leaf monkeys ¹
Verbenaceae	<i>Clerodendrum mandarinorum</i> Diels	
Verbenaceae	<i>Vitex negundo</i> L.	
Vitaceae	<i>Cayratia japonica</i> (Thunb.) Gagnep.	eaten by leaf monkeys ^{1,2}
Monocotyledonae		
Araceae	<i>Epipremnum pinnatum</i> (L.) Engl.	
	<i>Pothos chinensis</i> (Raf.) Merr.	
Areaceae	<i>Daemonorops margaritae</i> (Hance) Becc.	
Zingiberaceae	<i>Alpinia chinensis</i> (J. König) Roscoe	

Mammals

It was not possible during these brief surveys to interview local residents about the mammal fauna of the reserve. The only mammal species seen on 28 May 1998 was White-headed Leaf Monkey. This animal has been considered a subspecies of *Trachypithecus francoisi*, and even of *Trachypithecus poliocephalus* (Groves, 2001), but pending genetic clarification it is treated here as a distinct species, following Li (2000). A small group of six mature males were observed and photographed. Another solitary male was seen by part of the team, while another part of the team saw a second group. On 12 November 2001, three groups of White-headed Leaf Monkeys were observed. One Pallas's Squirrel *Callosciurus erythraeus* was seen. The same day at Zhonghua Cun, north of the Zuojiang, a group of at least three adults and one infant of Francois's Leaf Monkey *T. francoisi* was observed. A Pallas's Squirrel was also seen.

Birds

Twenty-seven bird species were recorded from Fusui (Table 2). The most abundant were Red-whiskered Bulbul *Pycnonotus jocosus*, Striated Yuhina *Yuhina castaniceps*, Mountain Tailorbird *Orthotomus cuculatus* and Scaly-breasted Munia *Lonchura punctulata*.

Table 2. Birds recorded at Bapen, Fusui, 28 May 1998 and 12 November 2001. Sequence follows Clements (2000).

Scientific name	English name
<i>Falco subbuteo</i>	Eurasian Hobby
<i>Chalcophaps indica</i>	Emerald Dove
<i>Treron sieboldii</i>	White-bellied Green Pigeon
<i>Ducula badia</i>	Mountain Imperial Pigeon
<i>Cuculus micropterus</i>	Indian Cuckoo
<i>Cuculus canorus</i>	Common Cuckoo
<i>Surniculus lugubris</i>	Drongo Cuckoo
<i>Motacilla alba</i>	White Wagtail
<i>Pycnonotus melanicterus</i>	Black-crested Bulbul
<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul
<i>Zoothera citrina</i>	Orange-headed Thrush
<i>Prinia rufescens</i>	Rufescent Prinia
<i>Cettia pallidipes</i>	Pale-footed Bush Warbler
<i>Orthotomus cuculatus</i>	Mountain Tailorbird
<i>Phylloscopus fuscatus</i>	Dusky Warbler
<i>Phylloscopus ricketii</i>	Sulphur-breasted Warbler
<i>Eumyias thalassina</i>	Verditer Flycatcher
<i>Cyornis hainanus</i>	Hainan Blue Flycatcher
<i>Garrulax chinensis</i>	Black-throated Laughingthrush
<i>Pomatorhinus ruficollis</i>	Streak-breasted Scimitar Babbler
<i>Stachyris ruficeps</i>	Rufous-capped Babbler
<i>Yuhina castaniceps</i>	Striated Yuhina
<i>Parus major</i>	Great Tit
<i>Nectarinia jugularis</i>	Olive-backed Sunbird
<i>Zosterops japonicus</i>	Japanese White-eye
<i>Urocissa erythrorhyncha</i>	Red-billed Blue Magpie
<i>Lonchura punctulata</i>	Scaly-breasted Munia

Some of the species recorded, such as Mountain Imperial Pigeon *Ducula badia*, White-bellied Green Pigeon *Treron sieboldii* and Orange-headed Thrush *Zoothera citrina*, are forest species which are now very rare in South China. Their presence indicates that some intact forest occurs in the vicinity and that hunting pressure is not extreme. Eurasian Hobby *Falco subbuteo*, Mountain Imperial Pigeon and White-bellied Green Pigeon are Class II protected species in China.

Reptiles and amphibians

Eight species of amphibians, three species of lizards and one species of snake were recorded (Table 3). The most abundant species was *Rana limnocharis*. A snake seen was probably *Dendrelaphis pictus* but its identity could not be confirmed. Li Zhaoyuan also reported finding a Chinese Kukri Snake *Oligodon chinensis* a couple of days earlier.

Table 3. Reptiles and amphibians recorded at Bapen, Fusui. Sequence follows Zhao E.-M. & Adler (1993).

Species	Habitat
<i>Occidozyga lima</i>	pool
<i>Rana guentheri</i>	forest
	cave
<i>Rana limnocharis</i>	pool
<i>Rana rugulosa</i>	pool
<i>Rana taipehensis</i>	pool
<i>Polypedates megacephalus</i>	pool

Species	Habitat
<i>Microhyla ornata</i>	pool
<i>Microhyla pulchra</i>	pool
<i>Gekko gekko</i>	cliff
<i>Calotes versicolor</i>	agricultural field
<i>Sphenomorphus indicus</i>	forest
<i>Dendrelaphis</i> sp.	agricultural field/shrubland

None of the species recorded are forest specialists, reflecting the lack of good forest in the area visited.

Fish

No permanent surface water was located at the time of the 1998 visit, so fish were not surveyed in the reserve. Three species of wild-caught fish, *Capoeta semifasciolata*, *Rhodeus ocellatus* and *Macropodus opercularis*, were purchased in the market at Fusui town; both species are widespread and common in lowland waterways of South China. During the short visit in November 2001, fish were seen. Reserve staff said that these are subterranean fish appearing during the wet season.

Ants

Most of the ant specimens collected at Fusui were lost in transit. Of the nine species recorded (Table 4), none are rare or forest-dependent. *Anoplolepis gracilipes* is an exotic species.

Table 4. Ants recorded at Fusui, 28 May 1998, with habitat type.

Species	Habitat
<i>Anoplolepis gracilipes</i>	shrubland
<i>Camponotus</i> (cf. <i>mitis</i>) sp. 11	open forest
<i>Diacamma</i> (nr. <i>rugosum</i>) sp. 1	open forest
<i>Odontoponera</i> (cf. <i>denticulata</i>) sp. 1	low forest
<i>Pachycondyla</i> (cf. <i>nigrita</i>) sp. 17	low forest
<i>Polyrhachis latona</i>	shrubland
<i>Pristomyrmex pungens</i>	open forest
<i>Pseudolasius</i> sp.	open forest
<i>Tapinoma</i> sp. 1	field

Dragonflies

Twenty-four dragonfly species were recorded (Table 5). Most are typical of lentic habitats. Notable finds included *Indocypha* sp. and *Dysphaea* sp., which have yet to be identified.

Table 5. Dragonfly species at Fusui, 28 May 1998. Sequence of genera follows Schorr *et al.* (2001a, 2001b).

Species	Notes
<i>Indocypha</i> sp.	pending identification
<i>Libellago lineata lineata</i>	
<i>Ceriagrion auranticum</i>	
<i>Pseudagrion pruinatum</i>	
<i>Pseudagrion spencei</i>	
<i>Pseudagrion rubriceps</i>	
<i>Dysphaea</i> sp.	pending identification
<i>Copera marginipes</i>	
<i>Prodasineura autumnalis</i>	
<i>Anax guttatus</i>	
<i>Epophthalmia elegans</i>	
<i>Ictinogomphus pertinax</i>	
<i>Sinictinogomphus clavatus</i>	
<i>Brachydiplax farinosa</i>	

Species	Notes
<i>Orthetrum pruinatum</i>	
<i>Orthetrum sabina sabina</i>	
<i>Acisoma p. panorpoides</i>	
<i>Brachythemis contaminata</i>	
<i>Crocothemis servilia</i>	
<i>Neurothemis fulvia</i>	
<i>Trithemis aurora</i>	
<i>Pantala flavescens</i>	
<i>Tholymis tillarga</i>	
<i>Zygonyx iris insignis</i>	

Butterflies

Twenty-six butterfly species were recorded at Fusui (Table 6), the majority of which are generalist species. The most notable record was of *Surendra vivarna*, which has not, apparently, been recorded from Guangxi previously.

Table 6. Butterfly species at Bapen, Fusui. Sequence of genera follows Bascombe (1995).

Species	Habitat
<i>Hasora anura</i>	cave/shrubland
<i>Odontoptilum angulatum</i>	agricultural field
<i>Potanthus</i> sp.	abandoned field
<i>Lamproptera meges</i>	agricultural field
<i>Pachliopta aristolochiae</i>	agricultural field
<i>Papilio (Chilasa) clytia</i>	abandoned field
<i>Catopsilia pyranthe</i>	abandoned field
<i>Cepora nerissa</i>	forest edge
<i>Eurema blanda</i>	abandoned field
<i>Eurema hecabe</i>	agricultural field
<i>Ixias pyrene</i>	shrubland
<i>Heliophorus epicles</i>	forest edge
<i>Jamides bochus</i>	agricultural field
<i>Surendra vivarna</i>	forest edge
<i>Apatura (Rohana) parisatis</i>	forest edge
<i>Euploea core</i>	shrubland
<i>Euploea midamus</i>	forest edge
<i>Euploea mulciber</i>	forest edge
<i>Ideopsis similis</i>	forest edge
<i>Parantica melanea</i>	agricultural field
<i>Lethe europa</i>	agricultural field
<i>Melanitis leda</i>	agricultural field
<i>Precis (Junonia) almana</i>	agricultural field
<i>Precis (Junonia) orithya</i>	agricultural field
<i>Polygonia (Kaniska) canace</i>	cave/shrubland
<i>Polygonia c-aureum</i>	agricultural field

Summary of flora and fauna

The vegetation of Fusui is fairly degraded and fragmented. The low-lying flatland has been largely transformed into agricultural land. Only small patches of young secondary forest can be seen, on low hills and valley edges. The dominant vegetation on hillsides is shrubland and some hills are barren. The low number of vascular plant species recorded (88 species) reflects the degraded nature of the vegetation as well as the low sampling effort. While most large animals are undoubtedly extirpated, a small number of White-headed Leaf Monkeys and Francois's Leaf Monkeys survive. The White-headed Leaf Monkeys, along with birds such as Mountain Imperial Pigeon and White-bellied Green Pigeon in the core area, have apparently received a measure of protection against hunting. However, poaching still occurs outside the core area and has caused

the decline of the Francois's Leaf Monkey population. The overall diversity and richness of fauna is apparently unexceptional due to the lack of forest. The reserve was given a biodiversity importance rating of 'D' by MacKinnon *et al.* (1996), implying its nature reserve status should be re-evaluated. But in view of the continued great importance of the site to the endangered leaf monkeys, reserve status is fully justified.

Threats and problems

The land within the reserve belongs to the surrounding villages, and although the wild animals are legally protected, the trees and other plants that provide their habitat are not. Most of the lowland areas within the reserve have been converted into agricultural fields. The lower slopes of some of the limestone hills are also being cleared and there are plans to cultivate a couple of remote valleys in the core area of the reserve. Clearly, habitat encroachment is a threat to White-headed Leaf Monkey and Francois's Leaf Monkey. There seems to be little control over the activities of villagers within the reserve. Trees are cut for fuel and to make agricultural tools, such as yokes, with considerable wastage of wood. Recently a tunnel was built through one hill and now there is vehicular access to the core area. The survival of the leaf monkeys and other forest fauna is highly tenuous. The status of Francois's Leaf Monkey is particularly dire due to the lack of conservation and research attention until recently. The population in Fusui has apparently been reduced to a small number of highly fragmented groups (Zhou Qihai, Guangxi Normal University, pers. comm., November 2001). In addition to habitat destruction and degradation, illegal hunting poses a continual threat to its survival.

Opportunities and recommendations

It has been proposed (by LLR) to buy up some valleys in the core area in order to protect the prime habitat of the White-headed Leaf Monkey from further encroachment. This proposal should be seriously considered. Whether or not land purchase is possible, all destructive practices should cease and habitat restoration should be carried out in those valleys acquired, including reforestation using native species. Local people should be employed in growing and replanting tree species native to the southwest Guangxi limestone area, with special emphasis on those known to be food plants of the leaf monkeys.

There is also an urgent need to find out more about the status of Francois's Leaf Monkey in Fusui as this species has declined drastically throughout much of its range in Guangxi (Li Zhaoyuan, NatureWatch, pers. comm., 2001 and Li Youbang, Zhejiang University, pers. comm., 2001) and Vietnam (Barney Long, Fauna & Flora International, pers. comm., 2001). Regular patrol of its existing habitats should be initiated to prevent them from being further degraded and to protect the Francois's Leaf Monkeys from poaching. Dialogue should also be strengthened with researchers so that quick actions can be taken to counter any illegal activities or harmful events. The overall status of this wide-ranging species needs to be found out urgently. Li Youbang is looking into the Guangxi population with the support of a KFBG Biodiversity Studentship (2001-2004), while Hu Gang of Institute of Wildlife, Southwest Forestry University has also worked on the Francois's Leaf Monkeys at Fusui with support from the BP Conservation Programme. Once existing information has been gathered, the best way to save the Fusui population can be determined. Cooperation between relevant local and regional government departments and conservation organizations will be critical to the success of the conservation actions for this endangered primate.

The possibility of developing eco-tourism should be explored, as Fusui is close to Nanning and easily accessible; the reserve has a relatively easily seen population of the very rare White-headed

Leaf Monkey, and an interesting bird fauna. However, there are great potential impacts to the monkeys and other wildlife, both direct (i.e. disturbance by tourists) and indirect (infrastructure and increases in local population). These impacts should be seriously evaluated beforehand. The numbers and activities of visitors would need to be carefully regulated to avoid adverse impacts. Some of the proceeds gained from the visitors should go back to the villages (as stipulated in the Convention on Biological Diversity) to demonstrate that conserving the wildlife and their habitats are actually beneficial to the people. Professor Huang Chengming of Guangxi Normal University has suggested that provision of natural gas cooking facilities for local villages would reduce the demand for timber from the remaining forests. Costs and benefits of this proposal should also be considered.

Other aspects of nature reserve management should be addressed, including zoning based on biodiversity importance, policing based on the nature and degree of threats, and monitoring of ecosystem integrity. For White-headed Leaf Monkey, survival seems impossible without a well-coordinated and implemented action plan. This has been instigated by KFBG, and is being compiled by Dr. Li Zhaoyuan with the Guangxi Forestry Department and others. A similar plan will also be needed for Francois's Leaf Monkey.

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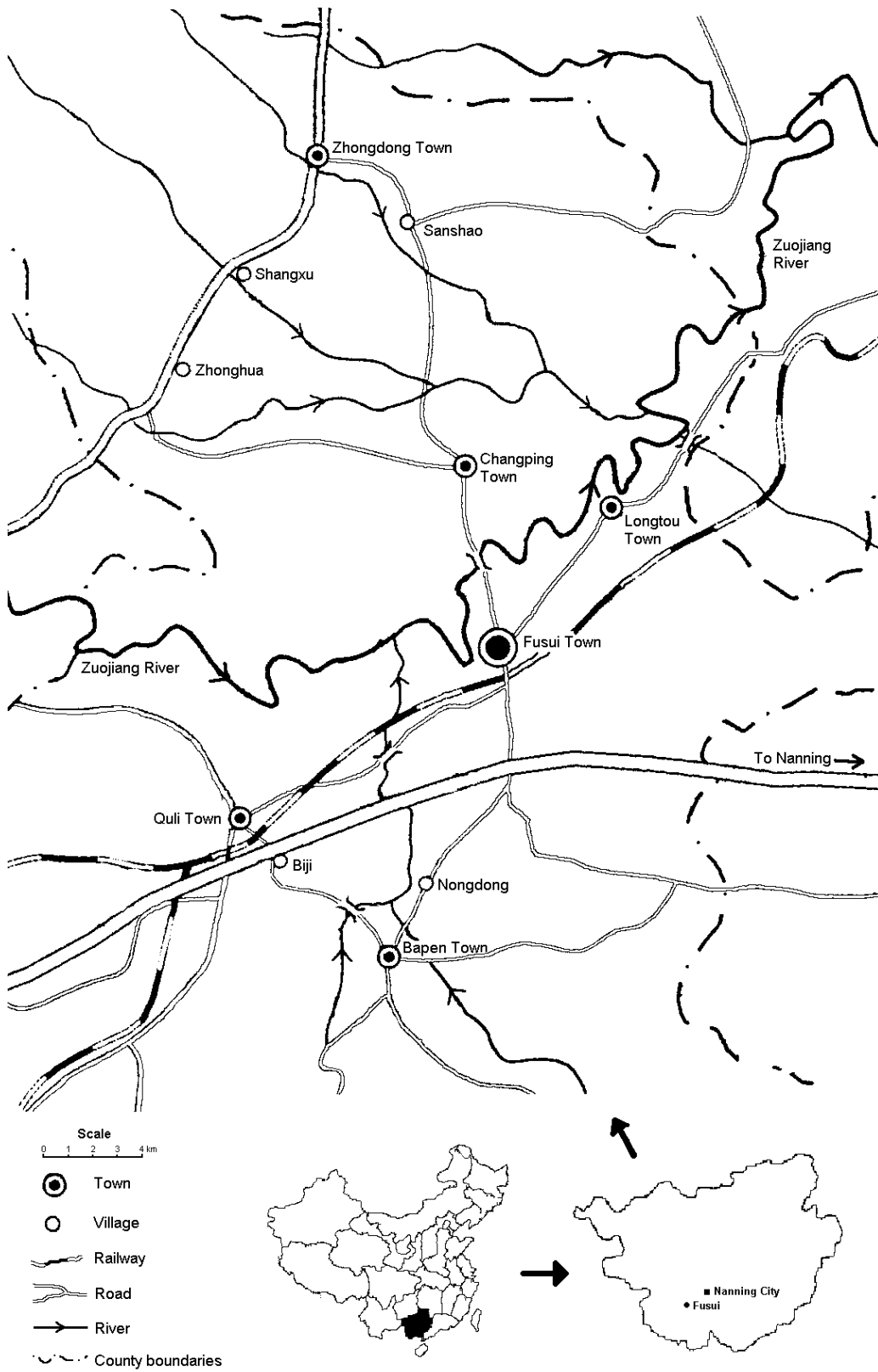


Figure 1. Map showing Fusui County, Southwest Guangxi, China and locations where field surveys were conducted.