

## Evidence for a decline of François' langur *Trachypithecus francoisi* in Fusui Nature Reserve, south-west Guangxi, China

Gang Hu, Xin Dong, Yi Wei, Ying Zhu and Xihuan Duan

**Abstract** Between July 2000 and June 2001 we undertook a survey of François' langur *Trachypithecus francoisi* and its habitat in the Fusui Nature Reserve in south-west Guangxi, China, where 86 individual langurs were recorded in 1995. In our first survey period we located 45 individuals in 10 groups, but *c.* 12 months later, despite expending more effort, we were only able to locate three of the 10 groups, totalling 23 individuals. In all, in three separate surveys, we recorded densities that were 26–52% of the 1995 figures. Within the Reserve almost all of the valley bottoms and most flat areas in the hills have been cultivated and there is steady encroachment into the hills and forests. The majority of

local families depend on the forest for firewood. It appears that habitat loss and illegal hunting are responsible for the decline of François' langur. We recommend that alternative income generating activities and energy sources should be explored to reduce human pressure on these langurs and their habitat. More funding should also be made available to the Reserve to enable staff to adequately tackle issues of hunting and habitat destruction.

**Keywords** China, François' langur, Fusui Nature Reserve, Guangxi, population decline, *Trachypithecus francoisi*.

### Introduction

François' langur *Trachypithecus francoisi* is an Endangered species (IUCN, 2002) found in the forests of southern China and the border area with India and Vietnam. Several closely related species (Hatinh langur *T. hatinhensis*, Laotian langur *T. laotum*, Delacour's langur *T. delacouri* and white-headed langur *T. francoisi leucocephalus*) are found south of the Red River in northernmost Vietnam (Fooden, 1976; Groves, 2001). In southern China, François' langur was historically recorded from 23 counties in Guangxi Province and nine counties in Guizhou Province (Fig. 1) at altitudes of 120–1,400 m (Li & Ma, 1980; Ma & Wang, 1988; Ma *et al.*, 1989; Zhang *et al.*, 1992; Li, 1993). François' langur is threatened by habitat destruction and fragmentation, and poaching (Wang *et al.*, 1999). Since the 1980s François' langur has been listed as a Category I Species, the highest level of

protection, under the Wild Animal Protection Law in China.

Since 1955 there has been debate over the taxonomy of the François' and white-headed langurs. The white-headed langur was originally described by Tan (1955) as a new species of the genus *Presbytis*. Some authors have since suggested that the white-headed langur is a separate species in the genus *Trachypithecus* (*T. leucocephalus*; Eudey, 1987; Lu & Li, 1991), while others have considered it a subspecies of François' langur (*T. francoisi leucocephalus*; Li & Ma, 1980; Liu *et al.*, 1997; Wang *et al.*, 1997; Ding *et al.*, 1999; Wang *et al.*, 1999; Groves, 2001). In China, most recent ecological studies have concentrated on the white-headed langur (Li, 1993; Lu & Huang, 1993; Hu *et al.*, 1998, 1999; Huang *et al.*, 1995, 1998, 2000, 2001, 2002). In contrast less is known of the distribution, status and ecology of François' langurs (Li & Ma, 1980; Huang *et al.*, 1983; Ma *et al.*, 1989; Bennett & Davies, 1994; Yang, 1994; Li, 1995; Liu & Wei, 1995; Wang *et al.*, 1999; Luo *et al.*, 2000; Zhou *et al.*, 2001). Although poaching has been banned since the 1980s, habitat destruction in the François' langur's habitat has increased in recent years, and this threatens the survival of the species. Effective conservation action based on a full understanding of the species' current status is needed.

The aims of this study were to assess the status of François' langur in an important protected area for the species, Fusui Nature Reserve, to examine the socio-economic status of local human communities (because this may have a bearing on the conservation of the langur),

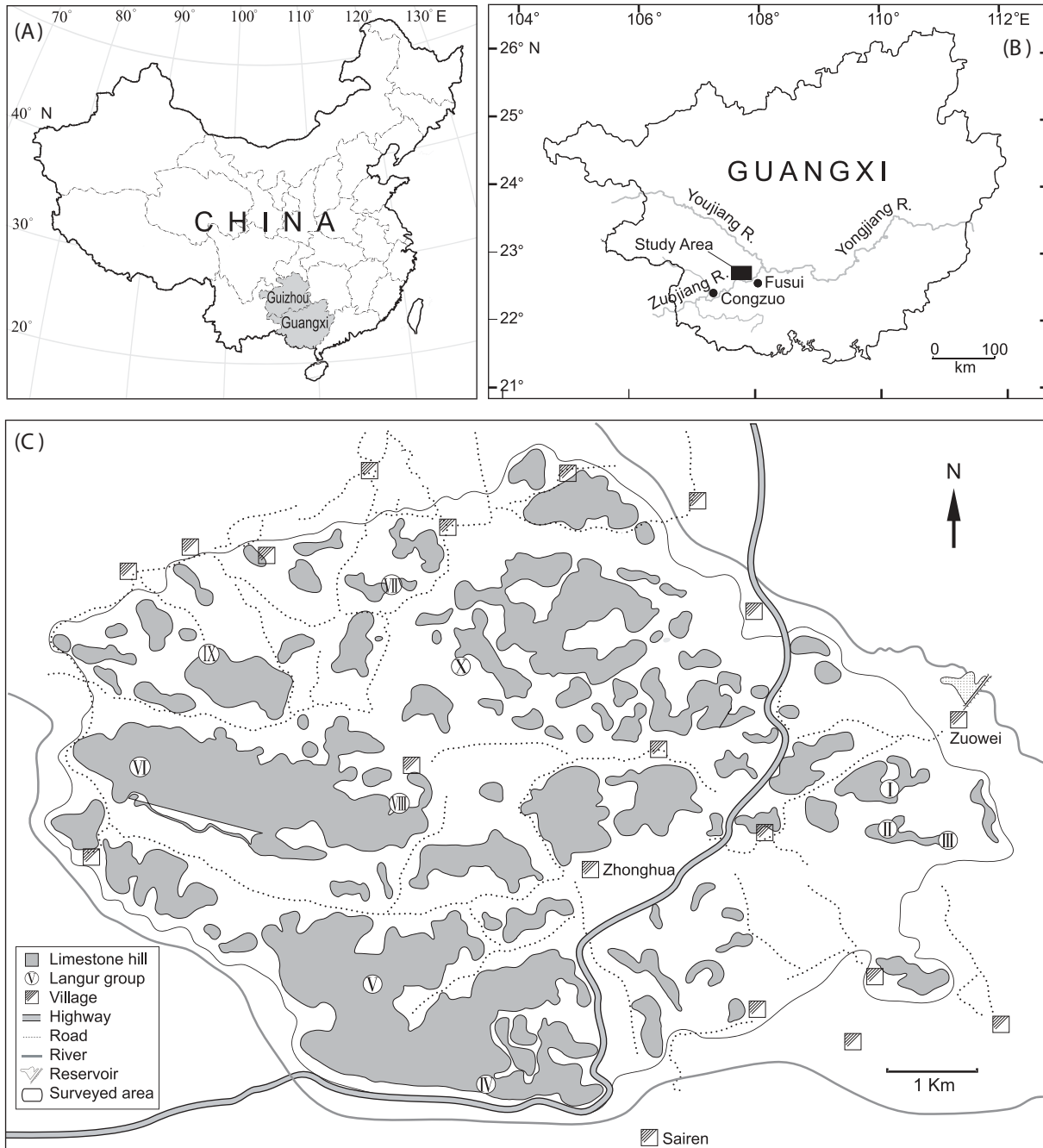
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**Fig. 1** (A) The historical range of François' langur in China (Guangxi and Guizhou Provinces). (B) The location of the surveyed area in Guangxi Province. (C) The surveyed area, with the limestone hills, locations of the 10 langur groups (I–X), and rivers, reservoirs, villages and roads.

and to provide management recommendations for local conservation agencies.

### Study area

The 80 km<sup>2</sup> Fusui Nature Reserve is in south-west Guangxi, China (Guangxi Forestry Department, 1993)

near the Vietnamese border (Fig. 1). The Zuojiang River divides the reserve into two parts, and François' langurs occur only in the northern area, in the townships of Zhonghua and Sairen. White-headed langurs occur only south of the river. The area is dominated by a karst landscape of limestone hills with steep cliffs, sinkholes and caves. Groups of hills rise steeply from the plains



**Plate 1** Typical landscape of the area surveyed for François' langur in Fusui Nature Reserve (Fig. 1), with steep, forested limestone hills, villages and cultivated land.

and are separated from each other by farmland, rivers and roads (Plate 1). The maximum height of the hills surveyed was 600 m. Steep cliffs make most of the hill-sides inaccessible, and so it was necessary to undertake surveys from the base of the hills. It was also possible to use trails to reach central valleys within groups of hills. The vegetation in the Reserve is tropical forest typical of the Sino-Vietnamese plant province and is dominated by *Eberhardtia aurata*, *Hopea chinensis* and *Saraca chinensis* (Wang *et al.*, 1989), although the species composition varies depending on the degree of human impact. Semi-deciduous natural forest now occurs in <10% of Guangxi (WWF, 1996) and is found only on the hills, where trees are mostly small in size and covered with lianas. Almost all the flat ground both inside and outside the valleys has been cultivated. The natural habitat has become fragmented and the langurs occur in isolated populations with no connecting corridors of suitable habitat.

## Methods

It is difficult to carry out systematic surveys in this area because of the topography, but all groups of hills within the area were surveyed during three periods totalling 171 days. The survey techniques that we adopted have been used by others to survey for langurs in karst hills (Lu & Huang, 1993; Hu *et al.*, 1998). Local villagers were employed to work with us to survey all groups of hills (Lu & Huang, 1993); up to seven staff were in the field each day. In smaller groups of hills with no internal valleys staff divided into two teams, and surveyed each side of the hill from along its base. For larger groups of hills with internal valleys staff divided into three teams, one of which used trails to survey the valleys.

Each team recorded vegetation and degree of cultivation. When langurs were observed, records were

made of the time of detection, number of individuals, age and sex classes and duration of observation, and the locality was marked on 1:10,000 maps. The age and sex classes were identified according to fur colour, body size and secondary sexual characteristics. Infants have a distinct golden pelt, while both adults and juveniles have black pelts and are smaller. These features can be observed in the field, although sometimes it was difficult to fully distinguish the age or sex of particular groups. The langurs' wariness made it difficult to identify individuals. When no visual observations were made, we searched for fresh faeces left by langurs.

The reliability of individual counts depended largely on the frequency of repeat surveys. Each hill group was surveyed at least twice during each fieldwork period. Hill groups where langurs or fresh faeces were found were surveyed three times in the first period, twice in the second and six times in the third. Surveys started at 06.00 in summer and 06.30 in winter and finished at c. 19.00 at all times. There was a break in surveys from 11.00 to 15.00, a time when langurs usually hide in dense bushes or caves (Jiang *et al.*, 1991; Li, 1992; Li, 1994; Huang *et al.*, 2000).

An observation of one langur group was considered to be a record. Any records considered inaccurate, such as where the number of individuals in a group was not precisely recorded, were discarded. Any duplicate sightings were taken as one record. During each fieldwork period, records of the same langur groups at different times were used for comparison or for revising the data. The daily localities of langur sightings were transferred from the 1:10,000 maps to a 1:50,000 map.

Information on hunting was collected from records at the Fusui Reserve Station and from informally interviewing local residents. The records of the dates and places of hunting were compared to see if they referred to the same incident. Interviews with 46 families in 10 villages inside or adjacent to the survey area provided data on family size, area of cultivated land, fuel used and annual gross income. The villages visited and the families interviewed were chosen at random during the field season. We collected the socioeconomic information by interviews because, apart from a population census in 1998, there had been no other socioeconomic study since 1985.

## Results

There are 15 separate hill groups (c. 37 km<sup>2</sup>) within the survey area (55 km<sup>2</sup>). Hills within the five larger groups are in many cases connected by ridges, and some central valleys are inaccessible for cultivation. The forest is relatively intact on the larger hills. By comparison, the 10 smaller hill groups are surrounded by cultivated land, where the natural vegetation has been cleared. Almost all

gentle slopes are cultivated and there is encroachment into the hills and forests.

During the surveys we made a total of 82 observations of langurs, of which five were unclear and 28 were duplicates, giving 49 unique records of groups and individuals. During the first fieldwork period we located 45 individuals (Table 1), of which two were solitary old males (VIII and IX), two were a pair of young males (X), and 41 were living in seven mixed sex groups (I–VII). Three mixed sex groups (I–III) were found in a small hill group where the vegetation was comparatively poor and isolated by large-scale cultivation. The other four mixed sex groups (IV–VII) were distributed among three larger hill groups. The solitary males and the all-male group were close to where the vegetation was comparatively poor. The solitary males and the all-male group were not included in calculation of group size and density but were used to calculate population density (Table 1).

During the second fieldwork period we located only six of the langur groups, totalling 26 individuals (Table 1). Two individuals had disappeared: an infant from group I and an adult female from group II. The total number of langurs could have been underestimated during this period due to the fewer number of days of fieldwork.

During the third fieldwork period we recorded only three of the groups, despite this being the longest of the three fieldwork periods: mixed sex groups (II, V and VI), totalling 23 individuals (Table 1). The three groups occurred as isolated populations in two larger and one smaller hill group. During this period we were unable to locate the other seven groups: four mixed sex groups and

all solitary males. An interview with a villager suggested that Group III had been hunted in late January 2001 but this could not be confirmed. The number of langurs appeared to have declined by c. 50% within one year (i.e. between the first and third periods of fieldwork).

The Fusui Reserve Station did not have any records of the hunting of François' langurs, but from 1997 to 2001 poaching was said to have occurred six times, twice in 1997 and 1998, and once in 2000 and 2001 (information from interviews with 14 villagers). We did not observe any hunting of langurs during our fieldwork but we heard shooting within the survey area on three occasions.

There were 19 villages within or adjacent to the survey area, with a total population of c. 2,500. The interviews with 46 families living within or adjacent to the Reserve showed that 19 (41.3%) had three or more children, 12 (26.1%) had two, 12 had one, and three (6.5%) had none. The average family size was four (range 2–7). On average each family owned c. 3 ha (c. 40 *mu*, 1 *mu* = 0.068 ha) of cultivated land, of which 2 ha was for sugarcane and 1 ha for other crops. Forty-one of the families used firewood for cooking and heating, and five used gas. The average family annual gross income was c. US \$2,800 (c. 23,000 Yuan), of which two thirds (c. US \$1,800) came from sugarcane plantations.

## Discussion

In 1995 there were 86 François' langurs in the northern part of Fusui Reserve, in the area we surveyed (Fusui Reserve Station, unpub. data; Liu & Wei, 1995). The population density was 2.3 individuals km<sup>-2</sup>, whereas

**Table 1** The number of individuals and group composition<sup>1</sup> of 10 groups (I–X) of François' langur recorded in the surveyed area of Fusui Nature Reserve (Fig. 1) during three surveys from July 2000 to June 2001.

Group no.	First survey (July–September 2000)	Second survey (November–December 2000)	Third survey (March–June 2001)	Remark
I	5 (1 AM, 3 AF, 1 I)	4 (1 AM, 3 AF)		
II	4	3 (1 AM, 2 AF)	4 (1 AM, 3 AF)	
III	7 (1 AM, 3 AF, 2 J, 1 I)	7 (1 AM, 3 AF, 3 J)		Possibly hunted in Jan. 2001
IV	6 (1 M, 2 F, 2 J, 1 I)	6 (1 M, 2 F, 3 J)		
V	7 (5 A, 2 J)		8 (1 AM, 2 AF, 3 J, 2 I)	
VI	5 (4 A, 1 J)	5	11 (at least 5 A, J2, 1I) <sup>2</sup>	
VII	7 (1 AM, 2 AF, 2 J, 2 I)			
VIII	1 AM			
IX	1 AM	1 AM		
X	2 AM			
<i>Total</i>	45	26	23	
No. survey days	60	21	90	
Mean group size	5.9	5.2	7.7	
Group density (km <sup>-2</sup> )	0.2	0.14	0.1	
Population density (km <sup>-2</sup> )	1.2	0.7	0.6	

<sup>1</sup>AM, adult male; AF, adult female; J, juvenile; I, infant; A, adult (when sex could not be recognized).

<sup>2</sup>The other three individuals could not be distinguished due to a short observation time and the density of vegetation.



in 2000–2001 we recorded mean densities of 0.6–1.2 individuals  $\text{km}^{-2}$ , i.e. 26–52% of the 1995 figures. We do not know the survey methods used by the Fusui Reserve Station and Liu & Wei (1995) and their reports do not contain data on the numbers of langur groups, and thus it is difficult to make comparisons between the two time periods.

In our third survey period, of 90 days, we recorded a population density that was only 50% of that recorded in our first survey period, which was *c.* 12 months earlier and lasted 60 days. The same survey methods were used in both periods, and the same surveyors undertook the work. It seems unlikely that individual langurs emigrated from the area, as it is bordered to the south by the Zuojiang River and elsewhere by a highway and extensive farmland with intensive human activity.

Although we were not able to locate any records of the hunting of François' langurs other than from our interviews with villagers, the Fusui Reserve Station has recorded four cases of hunting of white-headed langurs (Huang *et al.*, 2002). The lack of recorded information on hunting within the area surveyed is probably because the Reserve Station is *c.* 70 km to the south. The staff appear to rarely visit the northern area due to funding limitations.

Habitat loss and destruction, hunting and the limitations of current conservation management appear to be threatening François' langur. Globally, habitat destruction is a significant factor contributing to the decline of primates (Mittermeier, 1984). Habitat destruction and fragmentation cause reduced population viability in primates (Kirkpatrick, 1996), changes in home ranges (Li *et al.*, 1999) and disruption of normal activities (Huang *et al.*, 2000). Native habitat is seriously threatened in Fusui Reserve because of the increasing demand of residents for cultivated land and firewood. Within the survey area, there are 15 forested hill groups, of which the largest is no more than 10  $\text{km}^2$  and the smallest *c.* 1  $\text{km}^2$ . According to Huang *et al.* (2000) white-headed langurs spend two thirds of their feeding and resting time at the foot of hills where most of their food-plant species are found. François' langurs, which use similar habitats, may behave in a similar way and thus encounter problems of food supply, which is the main limiting factor to colobine populations (Davies, 1994).

Habitat destruction in this area was mainly due to the demand for cultivated land and firewood. Birth control legislation appears not to be strictly enforced and the average family size is four, increasing the demand for cultivated land and firewood over and above what would be required for the legislated family size of 3 (parents and one child). Information from interviews showed that most of the local families meet their cooking and heating needs by collection of firewood from the forest.

We make a number of recommendations that would help improve the current conservation status of François' langur in Fusui Nature Reserve: (1) the introduction of a methane-generating facility would reduce the need for firewood gathering and consumption; (2) the revision of local government policies, which are in favour of sugarcane plantation, could halt further encroachment into the forest, as would the improved development of the available high-quality agricultural land rather than the continued cultivation of marginal land; (3) the encouragement of the cultivation of more economically valuable crops, such as watermelon, pineapple, litchi, mulberry trees and hemp, could reduce the need to bring more land into cultivation; (4) the provision of increased financial support to the Reserve Station from both Guangxi Forestry Department and the Fusui local government could improve the monitoring and prevention of any hunting.

There are laws for the control of hunting in Fusui Nature Reserve but not for the control of logging or cultivation conducted by local residents, who are the owners of the forest and the land. If this situation cannot be altered, the future for François' langur in the Reserve is bleak. The authorities of the Reserve need to be given the ability to protect both the animals and their habitat, and this issue will require the collaboration of both Guangxi Forestry Department and Guangxi Government. The Guangxi Forestry Department now has plans to merge the Fusui and Congzuo Nature Reserves (Fig. 1) and upgrade them to a National Class Nature Reserve, which has laws for the protection of both animals and their habitats.

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