

Dramatic decline of François' langur *Trachypithecus francoisi* in Guangxi Province, China

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Abstract Interviews with local people and a survey were carried out in 23 counties of south-west Guangxi Province from April 2002 to June 2003 to evaluate the conservation status of François' langur *Trachypithecus francoisi* and assess the extent and nature of threats to the species' survival. François' langurs were found in only 10 counties compared with their presence in 23 counties before 1990. The total population size is estimated to be 307 individuals in 14 isolated populations. This represents a 90% decrease in population size since the early 1980s and an 85% decrease since the mid 1990s. The primary threat to the langur is hunting, mainly for traditional medicine. Our results suggest that conservation efforts for the species have been ineffectual

during the last decade and, even within reserves, few direct management measures seem to have been taken to protect and conserve the langurs. Without the instigation of such measures it seems likely that François' langur will disappear both inside and outside reserves. To ensure the long-term survival of François' langur in Guangxi Province increased investment and improved management, planning, and training of reserve managers and staff is required, with a particular focus on the key remaining reserves and sites for the langur. Some of this work is now underway.

Keywords China, François' langur, Guangxi, population size, threats, *Trachypithecus francoisi*.

Introduction

François' langur *Trachypithecus francoisi*, categorized as Vulnerable on the IUCN Red List (IUCN, 2006), is endemic to the limestone cliffs and caves of the tropical and subtropical zones of south-west China and northern Vietnam (Zhang *et al.*, 1992; Canh, 1996/1997). In China it is known historically from only three areas: Guangxi Province (Wu, 1983; Mei & Huang, 1987), Guizhou Province (Li, 1994) and Chongqing (Tang & Zhang, 1998). Guangxi Province has historically been considered the most important area for the species in China as the Province contains both the largest population and area of distribution of the species (Wu, 1987; Ye, 1993). However, the population size in Guangxi Province decreased from an estimated 4,000–5,000 in the 1980s

(Wu, 1983; Wu *et al.*, 1987) to 2,000–2,500 in the mid 1990s (Liu & Wei, 1995). A recent survey in Fusui Reserve provided further evidence that this langur has suffered a dramatic decline (Hu *et al.*, 2004), mainly as a result of heavy hunting. As a high priority species for protection in the Action Plan for conservation of Chinese primates (Chinese Primate Specialist Group, 1996), information about distribution and population size, and threats to the species' existence, are required. The aims of the survey reported here were to ascertain the current population size and distribution of François' langur in Guangxi Province and to assess the challenges for its conservation, thus providing a basis from which more effective management plans can be implemented.

Study area

The surveyed area covered 23 counties in south-west and west Guangxi Province where François' langur was known to have occurred during 1980–1999 (Fig. 1). These areas have a subtropical monsoon climate (mean annual temperature of 21.6°C and annual rainfall of c. 1,200 mm). The majority of the area consists of limestone mountains and hills and the main vegetation type is subtropical evergreen broad-leaf forest dominated by the plant families Cyadaceae, Lauraceae, Theaceae, Euphorbiaceae, Rosaceae and Orchidaceae (Xue, 2000). The area is part of the South-west Limestone Mountain Biodiversity Hotspot in China (Wang & Liu, 1994).

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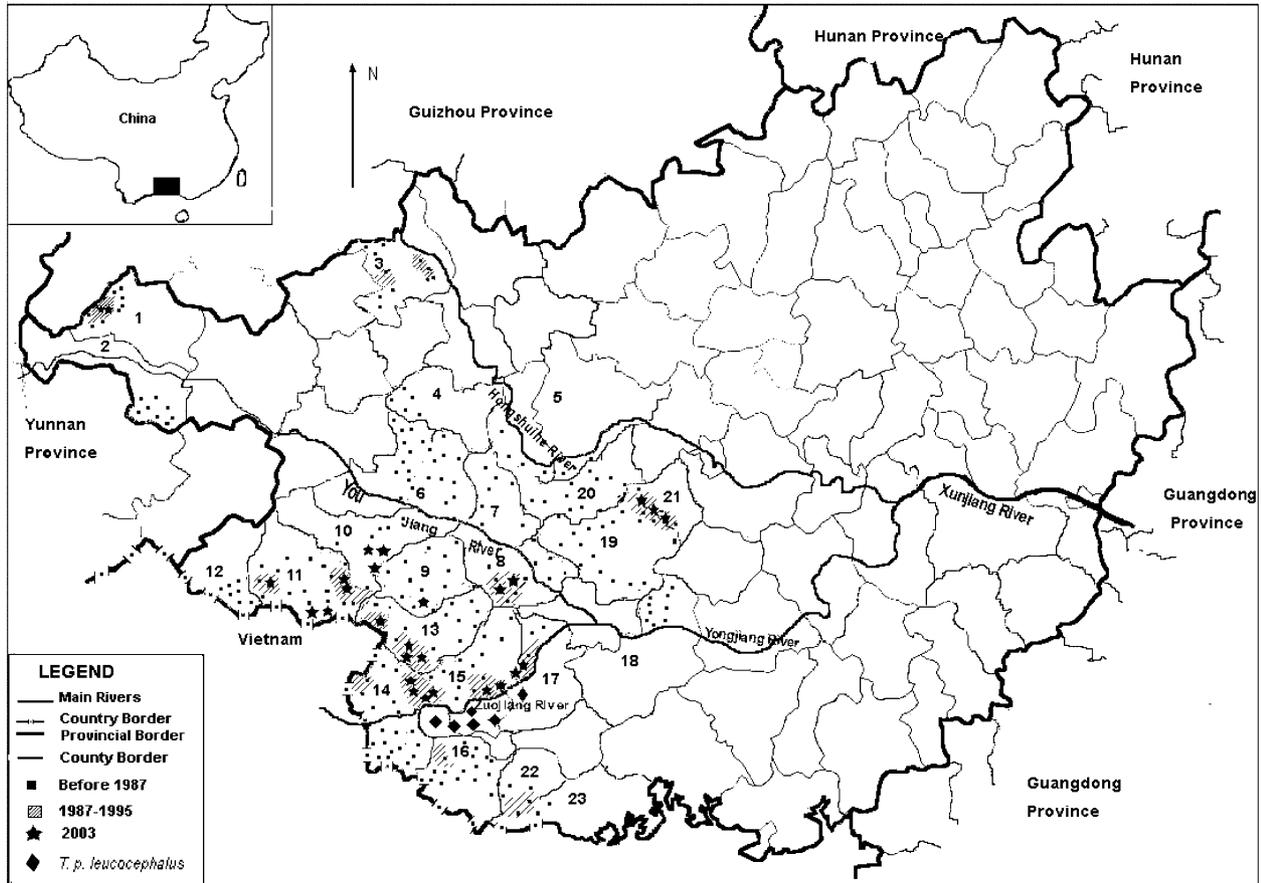


Fig. 1 The known range of François' langur *Trachypithecus francoisi* in Guangxi Province before 1987, 1987–1995, and in 2003 (this survey; points indicate survey locations), and including the range of *Trachypithecus poliocephalus leucocephalus*. Counties: 1, Longlin; 2, Xilin; 3, Tian'e; 4, Bama; 5, Du'an; 6, Tiandong; 7, Pingguo; 8, Long'an; 9, Tiandeng; 10, Debao; 11, Jingxi; 12, Napo; 13, Daxin; 14, Longzhou; 15, Chongzuo; 16, Ningming; 17, Fusui; 18, Yongning; 19, Wuming; 20, Mashan; 21, Shanglin; 22, Shangsi; 23, Fangcheng. The shaded rectangle in the inset indicates the location of Guangxi Province in China.

Seven other primate species or subspecies have been recorded in the area: *Macaca mulatta*, *Macaca assamensis*, *Macaca arctoides*, *Macaca thibetana*, *Trachypithecus poliocephalus leucocephalus* (Ross, 2004), *Nycticebus coucang* and *Hylobates concolor* (Wu, 1983; Wu *et al.*, 1987; Liu & Wei, 1995). However, there have been no recent reports of *H. concolor* in this region, and records for *M. thibetana* may have arisen out of confusion with *M. arctoides* with which it was once taxonomically grouped and with which it still shares the same Chinese name. *T. poliocephalus leucocephalus* and François' langur are allopatric species (Fig. 1), whereas the other species are only sympatric with François' langur.

Methods

To obtain historical information about threats to François' langur and the species' habitat status we reviewed the relevant literature and the county forestry annals of the south and south-west counties of Guangxi

Province for 1980–2000. Interviews were then conducted with staff of local forestry bureaus and reserves, directors of local village committees, hunters and village elders. In the interviews, using photographs of several primate species including François' langur, we gathered preliminary data about the number, group size, site and date of observations of François' langur, methods and seasonality of hunting, number of individuals taken and uses. Interviews were usually carried out in the home of the village leader. It was common practice for hunters and village elders, as well as male adults from other households, to gather at the leader's homes during our visits. Thus almost all households were interviewed in this process. Other households within the village or settlement were then visited at random to reaffirm findings, and some questions were worded differently and repeated to cross-check answers (Boonratana & Canh, 1998).

The survey was carried out using distribution information obtained from the interviews. Transect-based

surveys are not suitable for estimating numbers of François' langur due to the inaccessibility of their limestone outcrop habitat and the uneven distribution of langur groups. We therefore used the sampling method of Shen & Li (1980). Using a 1:10,000 map, areas to be surveyed were divided into 1 km² units. The survey team was divided into several sub-teams comprising 2–3 individuals, each including a local guide. Each sub-team was designated a specific survey unit and arrived at the prearranged observation area before the time that the monkeys would be leaving their sleeping caves in the early morning (c. 06.00). Observers occupied high positions to scan with binoculars and listen for langur vocalizations. Detected groups were followed for as long as possible to record group size, sleeping cave location and, if the group disappeared from sight, the time of disappearance from the observers sight. Observations continued until dark.

Each 1 km² unit was surveyed continuously for 2 days. Individual groups were distinguishable and thus double counting was avoided. Although the limestone hills occupied by langur groups were in some cases inaccessible, the groups were easily located when feeding or moving because the vegetation cover on the middle and upper parts of most hills consisted mainly of shrubs and small trees, rarely exceeding 3 m in height, and thus provided little visual cover for the langurs. From April 2002 to June 2003 a total of 160 days of surveys in 647 survey units were carried out.

Results

François' langurs were found in limestone mountains and hills in only 10 counties of Guangxi Province.

Within these counties the langurs occurred in 14 disconnected subpopulations, separated by natural obstacles and areas of human disturbance (Fig. 1). Three of the subpopulations occur outside reserves and 11 within reserves. The extent of occurrence was estimated to be c. 516 km² (Table 1). A total of 44 groups were recorded, comprising a total of 307 individuals (Table 1). The largest subpopulation size (75) was in Nonggang National Nature Reserve, Longzhou County, and the smallest (four) in Diding Water Conservation Forest Reserve, Jingxi County. The mean group size was seven.

From literature and interviews we know that a great number of François' langurs have been hunted since 1972 for medicine, furs and captive breeding (Table 2). The main purpose of this hunting was for medicine. Information gathered in the interviews suggested hunting has not yet fully abated despite the langur being listed as a Chinese National Protected Species of Class I since 1988.

Discussion

Decline in area of distribution

François' langur was once considered to be an extremely widespread primate species throughout Guangxi Province (Wu *et al.*, 1987; Zhang *et al.*, 1992). However there has been a steady decline in the area of distribution since 1990 (Liu & Wei, 1995). During the 1980s François' langurs were known to be widespread in Guangxi Province (Wu, 1983; Wu *et al.*, 1987; Ye, 1993; Fig. 1) with a distribution that coincided with the distribution of limestone forests (Limestone Research

Table 1 The 14 locations (Fig. 1) where François' langur was found in Guangxi Province from April 2002 to June 2003, with population sizes and sizes of individual groups, and the extent of occurrence of each subpopulation.

Sites (County)	Population size (sizes of individual groups)	Extent of occurrence (km ²)
Chongzuo Wildlife Reserve (Chongzuo)	11 (5,6)	20
Daxin Wildlife Reserve (Daxin)	34 (4,5,8,5,8,4)	209
Xialei Water Conservation Forest Reserve (Daxin)	8 (8)	8
Niande Water Conservation Forest Reserve (Debao)	30 (12,7,5,6)	12
Fusui Wildlife Reserve (Fusui)	31 (8,11,4,7,1)	40
Yuxu* (Jingxi)	20 (4,10,6)	10
Gulongshan Water Conservation Forest Reserve (Jingxi)	15 (5,10)	40
Xinxing* (Jingxi)	6 (6)	4
Diding Water Conservation Forest Reserve (Jingxi)	4 (4)	4
Longhushan Nature Reserve (Long'an)	18 (8,5,5)	20
Dahongbao Nature Reserve (Longlin)	17 (8,9)	5
Nonggang National Nature Reserve (Longzhou)	75 (6,11,8,7,8,12,9,4,10)	80
Damingshan Nature Reserve (Shanglin)	30 (8,10,6,6)	60
Longjun* (Tiandeng)	8 (8)	4
<i>Total</i>	307 individuals in 44 groups	516

*Not within a reserve

Table 2 Hunting and trapping of François' langur in Guangxi Province over 1972–2002, with numbers hunted, County, source of information and relevant notes.

Date	Numbers hunted	County	Source	Notes
1972–1980	409	Daxin	Zhang (1991)	Breeding purposes; 49% of the captive monkeys died due to disease
Before 1976	>1,000	Daxin	Wu <i>et al.</i> (1987)	>1,000 furs and >150 kg bone were bought by local trade department
c. 1985	>1,500	Daxin, Longzhou	Wu <i>et al.</i> (1987)	For medicine
1997	3	Ningming	Interviews (this study)	For medicine; 2 people sentenced to prison for 3 years
1998	2	Ningming	Interviews (this study)	For medicine; 4 people sentenced to prison for 2.5 years
2001	15	Longzhou	Interviews (this study)	For medicine; 8 people received a fine (the langurs used to make Wu-yuan wine were caught before the wildlife law came into force).
2001	c. 20	Fusui	Hu <i>et al.</i> (2004; confirmed by this study)	4 groups illegally captured
2002	1	Jingxi	Interviews (this study)	Later released

Team of Guangxi Academy Institute, 1994). The subsequent disappearance of François' langurs in Fangchen, Shangsi and Ningming Counties and areas to the south of Longzhou County represented a considerable decline in the extent of occurrence of at least 100 km² in Guangxi.

Population reduction

Guangxi Province once had the largest global population of François' langurs (Wu, 1983) with an estimated population size of 4,000–5,000 (Wu, 1983). However, the population size declined dramatically from 1990 onwards (Liu & Wei, 1995). Our count of 307 individuals represents a 90% decline since the 1980s (Wu, 1983). However, none of the earlier population estimates detailed the methods used and thus comparisons with earlier estimates (Table 3) must be interpreted cautiously.

Changes in population size varied between reserves (Table 3). Numbers increased in one reserve, were stable in another, decreased in seven reserves, and the species has disappeared from six reserves. Hu *et al.* (2004) found 23 individuals in 3 groups in Fusui reserve during 2000–2001, where we recorded 5 groups and 31 individuals. This apparent increase was due to our finding one group of 7 individuals and a solitary male on hills bordering another county that were not included in Hu *et al.*'s (2004) survey; results of the two surveys were otherwise identical.

Threats

Most local elders interviewed considered François' langur to have a high medicinal value. Wu-yuan wine, a local wine made from the bone of François' langur, supposedly has magical curative effects for fatigue and rheumatism (Ye, 1993). In China *T. poliocephalus leucocephalus* is also hunted mainly for medicinal purposes (Huang *et al.*, 2002). François' langur, like other langurs associated with limestone, sleep in caves, a behaviour that enables hunters to catch a whole group by blocking the entrance. Hunting records show that the number of langurs hunted ranged from >1,400 in the 1970s to >1,500 in 1980s (Table 2). When this is compared with a total population estimate of 4,000–5,000 in 1983 (Wu, 1983), it gives some indication of the effect that hunting had on population numbers (Table 2). The government confiscated many private guns in 1999 and this relieved the hunting pressure on the langur. Trapping for captive breeding and exhibition in zoos is also a threat. Captive breeding of the species in China began in the 1950s, and at least 12 zoos or research institutes have attempted to set up captive breeding programmes. Most failed, however, because of a lack of basic knowledge of the species (Zhang, 1991; Zhu *et al.*, 1991; Ye, 1993).

Globally, habitat destruction is the principle factor threatening primates (Mittermeier & Konstant, 1996/1997). The limestone habitat of François' langur is particularly vulnerable to fire, and it is common practice to light fires on the lower slopes to clear land for cultivation. If the fire spreads to the rocky substrate at higher

Table 3 Comparison of population sizes of François' langur in Reserves of Guangxi Province in 1993–1995 (Liu & Wei, 1995) and from this survey (2002–2003).

Reserve (County)	1993–1995	2002–2003
Chongzuo Wildlife Reserve (Chongzuo)	468	11 (2 groups)
Xialei Water Conservation Forest Reserve (Daxin)	50	8 (1 group)
Daxin Wildlife Reserve (Daxin)	580	34 (6 groups)
Shiwandashan Water Conservation Forest Reserve (Fangchen)	10	0
Fusui Reserve (Fusui)	86	31 (5 groups)
Dizhou Water Conservation Forest Reserve (Jingxi)	30	0
Gulongshan Water Conservation Forest Reserve (Jingxi)	30	15 (2 groups)
Buliuhe Water Conservation Forest Reserve (Leye)	30	0
Longhushan Nature Reserve (Long'an)	10	18 (3 groups)
Dahongbao Nature Reserve (Longlin)	130	17 (2 groups)
Nonggang National Nature Reserve (Longzhou)	263	75 (9 groups)
Qinglongshan Water Conservation Forest Reserve (Longzhou)	100	0
Longrui Nature Reserve (Ningming)	12	0
Damingshan Nature Reserve (Shanglin)	30	30 (4 groups)
Chuangdonghe Water Conservation Forest Reserve (Tian'e)	45	0

elevations the vegetation may be destroyed and some areas do not recover. François' langurs in such areas then face a food shortage because their main diet consists of leaves, flowers and buds (Huang *et al.*, 1983; Lu & Li, 1991; Li, 1994; Luo *et al.*, 2000). The 23 counties surveyed contain *c.* 31,390 km² of limestone hills, of which 2,505 km² (8%) was already degraded due to burning in the 1980s and 1990s, with degradation increasing at a rate of 3–6% per year (Limestone Research Team of Guangxi Academy Institute, 1994). Others threats include road construction, rock-quarries, mining and hydroelectric projects.

Conservation status

The continuing decline in population size and extent of occurrence, together with a lack of any conservation action, could cause the local extinction of François' langur in Guangxi Province. Reserves in Guangxi face a number of basic management problems (Liu & Wei, 1995). These include poor staff morale and discipline, limited capacity, inappropriate budget allocations, and a general low level of investment. As a consequence, illegal activities are widespread in many reserves, including logging, hunting, trapping and agricultural encroachment.

Most of the reserves in Guangxi Province were established for purposes other than the conservation of wildlife. In reserves established for water conservation staff have no experience in wildlife conservation and there is no conservation planning for wildlife. Most local extinctions since the 1990s were in such reserves (Table 3). In addition declines in François' langur have also occurred in National Nature Reserves and Wildlife Reserves. The Daxin Wildlife Reserve is the only reserve

created specifically for conservation of François' langur but, even there, the population size decreased because of heavy hunting before and during the 1980s (Table 2).

In 1996 a conservation Action Plan was drafted for François' langur that included planning for forest protection and a complete ban on hunting (Chinese Primate Specialist Group, 1996). However, this Plan was never implemented and by itself remains powerless to prevent continued threats to François' langur. Management of both the species and its habitat is required, including (1) increased investment and improvements in management planning and training of reserve managers and staff, (2) cessation of conversion of forests to agricultural plantations, and restoration of broadleaf forest, (3) enforcement of existing hunting and trading laws more strictly through increased patrolling, removal of snares, and control of gun ownership, (4) reduction of fuelwood collection aided by better provision of alternative energy resources, (5) development of more efficient and alternative agricultural practices to reduce the pressure on forest resources and remaining langur habitat, and (6) categorization of some reserves as key conservation areas for François' langur.

Both the government and NGOs have now acknowledged the rapid decline of the populations and habitat of François' langur and a combined conservation effort has begun. A number of measures are in place or underway: from 2003 the National Forestry Bureau has supported our population monitoring, the Provincial Forestry Bureau is increasing investment to reserves and improving law enforcement, with the support of the Bureau of Forestry of Guangxi Province we are identifying areas for the species' conservation, and the Asia Developmental Bank has helped residents in and

around reserves to build biogas facilities to reduce fuelwood collection. Finally, the Global Environmental Facility is authorizing a project to protect François' langur and its habitat in Nonggang National and Damingshan Natural Reserves in Guangxi.

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References

- Boonratana, R. & Canh, L.X. (1998) Conservation of Tonkin snub-nosed monkeys (*Rhinopithecus* [*Presbytiscus*] *avunculus*) in Vietnam. In *The Natural History of Doucs and Snub-nosed Monkeys* (ed. N.G. Jablonski), pp. 315–322. World Scientific Publishing House, Singapore.
- Canh, L.X. (1996/1997) Endangered primate species in Vietnam. *Primate Conservation*, **17**, 117–126.
- Chinese Primate Specialist Group (1996) *Action Plan for Conservation of Chinese Primates*. Chinese Primate Specialist Group, Beijing, China. [in Chinese]
- Hu, G., Dong, X., Wei, Y., Zhu, Y. & Duan, X.H. (2004) Evidence for a decline of François' langur *Trachypithecus francoisi* in Fusui nature Reserve, south-west Guangxi, China. *Oryx*, **38**, 1–7.
- Huang, C.M., Wei, F.W., Li, M., Quan, G.Q. & Li, H.H. (2002) Current status and conservation of white-headed langur. *Biological Conservation*, **104**, 221–225.
- Huang, J.T., Huang, L.B. & Guo, Y.R. (1983) Ecology of black langur (*T. f. francoisi*). *Chinese Wildlife*, **4**, 11–13. [in Chinese]
- IUCN (2006) *IUCN Red List of Threatened Species*. IUCN, Gland, Switzerland [http://www.redlist.org, accessed 13 June 2006].
- Li, M.J. (1994) *Wildlife Resources of Guizhou Province*. China Forestry Publishing House, Beijing, China. [in Chinese]
- Limestone Research Team of Guangxi Academy Institute (1994) *Research on Feasibility of Ecological Restoration of Guangxi Limestone Region*. Guangxi Science and Technology Press, Nanning, China. [in Chinese]
- Liu, W.F. & Wei, Z.Y. (1995) Present status and protection of primate resources in Guangxi, China. In *Primate Research and Conservation* (eds W.P. Xia & R.Z. Zhang), pp. 123–132. China Forestry Publishing House, Beijing, China. [in Chinese]
- Lu, L.R. & Li, Z.Y. (1991) On the taxonomy of *Presbytis francoisi leucocephalus* - discussion with Ma Shilai. *Journal of Guangxi Normal University*, **9**, 67–70. [in Chinese]
- Luo, Y., Chen, Z.R. & Wang, S.X. (2000) Observation on the food habit of *Presbytis francoisi* in Mayanghe Region, Guizhou Province. *Chinese Journal of Zoology*, **35**, 44–49. [in Chinese]
- Mei, Q.N. & Huang, X.Y. (1987) Captive breeding of black langurs (*T. f. francoisi*). *Chinese Journal of Zoology*, **22**, 32–35. [in Chinese]
- Mittermeier, R.A. & Konstant, W.R. (1996/1997) Primate conservation: a retrospective and a look into the 21st century. *Primate Conservation*, **17**, 7–17.
- Shen, L.T. & Li, H.H. (1982) The white-headed langur in China. *Journal of Guangxi Normal University*, **1**, 27–32. [in Chinese]
- Tang, H.T. & Zhang, H.Z. (1998) Conservation and application of François' langur. *Journal of Sichuan Forestry Science and Technology*, **19**, 78–79. [in Chinese]
- Wang, X.P. & Liu, Y.K. (1994) *Theory and Application of Biodiversity*. Chinese Environment Science Press, Beijing, China. [in Chinese]
- Wu, M.C. (1983) On the distribution and population estimation of primates in Guangxi Province. *Acta Theriologica Sinica*, **3**, 16. [in Chinese]
- Wu, M.C., Wei, Z.Y. & He, N.L. (1987) Distribution and ecology of black langur (*T. f. francoisi*) in Guangxi Province. *Chinese Wildlife*, **4**, 12–13. [in Chinese]
- Xue, Y.G. (2000) *Guangxi Tropical Flora*. Guangxi Normal University Press, Guilin, China. [in Chinese]
- Ye, Z.Z. (1993) *Biology of Langurs (Presbytis)*. Yunnan Science and Technology Press, Kunming, China. [in Chinese]
- Zhang, G.D. (1991) Analysis of the cause of gastritis of newly-caught black langur (*T. f. francoisi*). *Chinese Wildlife*, **1**, 31–33. [in Chinese]
- Zhang, Y.Z., Quan, G.Q., Zhao, T.G. & Southwick, C.H. (1992) Distribution of primates (except *Macaca*) in China. *Acta Theriologica Sinica*, **12**, 81–95.
- Zhu, B.R., Cao, Y.Z., Xia, J.X. & Ni, A.D. (1991) Rearing black langurs. *Chinese Journal of Zoology*, **26**, 25–28. [in Chinese]

Biographical sketches

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