



Factors Influencing Interannual and Intersite Variability in the Diet of *Trachypithecus francoisi*

Qihai Zhou · Zhonghao Huang · Xiansheng Wei ·
Fuwen Wei · Chengming Huang

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Abstract Comparative studies of the diet of the same species in different habitats, and over the long term, are essential to understanding a species' behavioral and ecological plasticity. Moreover, such studies can help researchers and managers evaluate a species' capacity to cope with changes in habitat quality resulting from natural processes or human disturbance, which is important for developing conservation strategies. We compared dietary data for François' langur (*Trachypithecus francoisi*) collected at Nonggang and Fusui Nature Reserves, Guangxi Province, China, over 2 separate study periods to evaluate interannual and intersite variation in diet. Young leaves were the preferred staple foods for langurs, whereas mature leaves and seeds served as fallback foods in response to seasonal shortage in the abundance of young leaves. Species composition of the diets and the percentage of feeding records for plant species varied between the 2 study periods. The langurs at both study sites fed selectively, and they did not base their diet simply on the abundance of plant species in the habitat. However, the plant species eaten by langur groups inhabiting the 2 different reserves were markedly different, and the top 10 food species eaten by the Fusui group showed no overlap with those eaten by the Nonggang group. The variation may be related to differences in forest composition resulting from different level of human disturbance. In summary, our results indicate that François' langurs exhibit a comparable dietary pattern both temporally and geographically, but there is marked interannual and intersite difference in species composition of the langur diet.

Q. Zhou · Z. Huang · X. Wei · C. Huang (✉)
College of Life Science, Guangxi Normal University, Guangxi 541004, China
e-mail: cmhuang@ioz.ac.cn

Q. Zhou
e-mail: zhouqh@ioz.ac.cn

F. Wei · C. Huang
Key Laboratory of Animal Ecology and Conservation Biology, Institute of Zoology,
Chinese Academy of Sciences, Beijing 100864, China

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Introduction

Many studies have revealed considerable dietary variation among primate species (Bicca-Marques 2003; Campbell *et al.* 2007; Chapman and Chapman 1999; Chapman *et al.* 2002, 2006; Hanya *et al.* 2003; Harris and Chapman 2007; Olupot 1998; Tutin 1999). For example, whereas early researchers described colobines as folivorous, further study has shown that fruits and seeds contribute a large portion of the diet in most colobine species (Oates 1994; Yeager and Kool 2000). Even within a species and populations, marked dietary variation in terms of plant species and parts eaten may occur (Chapman *et al.* 2002; Guo *et al.* 2007; Harris and Chapman 2007). For example, Chapman *et al.* (2002) compared diet composition of 8 groups of *Procolobus badius* inhabiting different types of forest and documented considerable variation in the plant species and parts eaten. Much of the dietary variation reflects differences in the temporal availability and spatial distribution of food resources (Chapman *et al.* 2002). Moreover, increasing evidence documents marked long-term variation in a species dietary composition (Chapman *et al.* 2002; Li 2006; Olupot 1998; Tsuji *et al.* 2006). Comparative studies of the diet of the same species in different habitats, and over the long term, are therefore essential to understanding a species' behavioral and ecological plasticity. Moreover, such studies can help researchers and managers evaluate a species' capacity to cope with changes in habitat quality resulting from natural processes or human disturbance, which is important for developing conservation strategies (Chapman *et al.* 2002; Harris and Chapman 2007).

François' langurs (*Trachypithecus francoisi*) are an endangered colobine species, restricted to habitats characterized by karst topography ranging from the Red River in Vietnam across the Chinese border as far as the Daming Hills in Guangxi and Xingyi in Guizhou (Groves 2001). As a result of human activities, these limestone habitats have been modified, fragmented, and eliminated, and many populations are isolated in small island fragments (Li *et al.* 2007). Studies of the diet of François' langurs have documented seasonal changes in diet (Huang *et al.* 2008; Li *et al.* 2008; Luo *et al.* 2000; Zhou *et al.* 2006), but these studies are limited to ≤ 1 yr, and do not address the question of whether the diet shows long-term change. Studies of different groups have also shown differences in diet composition between different habitats (Huang *et al.* 2008; Li *et al.* 2008; Luo *et al.* 2000; Zhou *et al.* 2006). However, the studies were limited to a single geographical region and used different methods for data collection, making comparisons difficult. Systematic comparative studies of the diet of François' langurs in different habitats are generally lacking, limiting our ability to determine their dietary flexibility.

We collected data on the diet of François' langurs at Nonggang and Fusui Nature Reserves, in Guangxi province, China to improve our understanding of the species' dietary flexibility. First, we examined interannual variation in dietary composition in 1 group at Nonggang Nature Reserve using data from 2 separate study periods. Second, we examined geographical variation in diet by comparing the diets of 2 groups inhabiting 2 reserves during the same study period.

Methods

Study Sites and Subjects

We studied 2 langur groups in Guangxi Province, China. We studied 1 langur group living in a 200-ha continuous forest at Nonggang Nature Reserve ($106^{\circ}42'–107^{\circ}4'E$, $22^{\circ}13'–22^{\circ}33'N$) in 2003–2004 and 2005–2006, and a second group living in a 25-ha limestone hill fragment at Fusui Nature Reserve ($107^{\circ}23'–107^{\circ}41'E$, $22^{\circ}24'–22^{\circ}36'N$) in 2005–2006. The reserves are *ca.* 100 km apart (Fig. 1), and both consist of limestone hills, with altitudes ranging from 300 m to 700 m above sea level (Guangxi Forestry Department 1993). Annual rainfall was 977 mm (2003–2004) and 1373 mm (2005–2006) at Nonggang Nature Reserve (Huang *et al.* 2007; Zhou *et al.* 2006) and 1022 mm on average at Fusui Nature Reserve (Huang *et al.* 2008). There are 2 distinct seasons: a rainy season from April to September with >50 mm monthly rainfall and a dry season in the remainder of the year with <50 mm monthly rainfall. The habitats at both reserves are characterized as limestone seasonal rain forest (Guangxi Forestry Department 1993). However, as a result of human activities, the habitats at Fusui Nature Reserve have become highly fragmented and the vegetation on the limestone hills is severely disturbed (Huang 2002; Li and Rogers 2005). In contrast, the forest at Nonggang Nature Reserve is under limited anthropogenic pressure (Zhou *et al.* 2006).

A local field assistant monitored the focal group at Nonggang Nature Reserve from 2003 through 2006, allowing us to follow the same group during the 2 study periods. The size of the Nonggang group decreased from 12 individuals (4 adult males, 5 adult females, and 3 immatures) during 2003–2004 to 9 individuals (1 adult

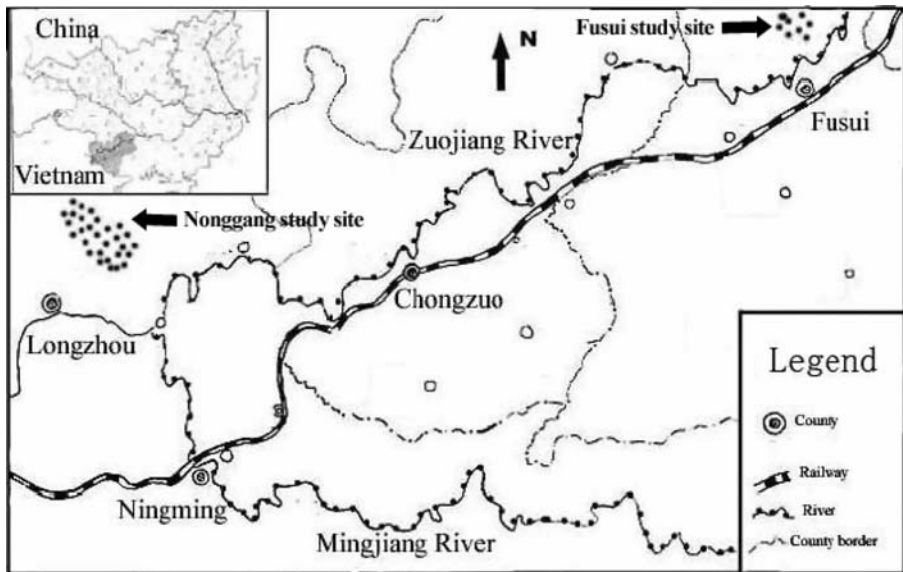


Fig. 1 Maps showing locations of Nonggang study site (right) and Fusui study site (left) where I studied the diet of François' langurs.

male, 5 adult females, and 3 immatures) during 2005–2006 as a result of group fission. The study group At Fusui Nature Reserve consisted of 1 adult male and 3 adult females during 2005–2006.

Data Collection

We made behavioral observations of the Nonggang group for 126 days in August 2003–June 2004 (7–18 days each month) and 126 days in October 2005–September 2006 (7–22 days each month) and of the Fusui group for 156 days in September 2005–August 2006 (10–15 days each month). We made few observations in July 2004 because many valley basins were flooded at Nonggang Nature Reserve, and follows were almost impossible. Thus, we used only 11 mo of data for analysis of interannual variation in diet.

Z.Q.H., H.Z.H., and W.X.S. collected behavioral data. To ensure consistent methodology, we conducted detailed training before we started collecting data. Each day, data collection began when the langurs were first encountered, and ended when they disappeared or entered the sleeping sites. We observed langurs with binoculars and a spotting scope at a distance of 10–200 m. We used scan sampling (Altmann 1974) with 15-min intervals. The scans lasted 5 min, followed by 10 min of inactivity until the next scan began. We recorded the activity of each individual seen during each scan. We watched each individual for 5 s after detection and recorded its predominant behavior during that interval. To avoid sampling bias toward certain individuals or a particular age-sex class, we tried to collect behavioral records on as many different individuals as possible during a scan so that all individuals in the focal group were included but we sampled no individual more than once. When the individual was feeding, we recorded plant species and parts eaten, e.g., mature leaves, young leaves, fruits, flowers, seeds, and petioles. We marked most plant species eaten and collected specimens for later identification.

We conducted vegetation surveys at the 2 study sites at the onset of behavioral data collection. We used a stratified random sampling method for placement of vegetation plots. We placed 13 plots (50×10 m) in the main study area of Nonggang Nature Reserve, including 4 at the valley basins and 9 on the hillsides. The plots covered most of the vegetation types described by Shu *et al.* (1988). Within the plots, we tagged all trees with ≥ 5 cm diameter at breast height (DBH) and measured DBH. We determined the limit of 5 cm from a pilot observation that showed that most foraging by langurs occurred in trees of this size and larger. We visually inspected all tagged trees ($n=312$) within the vegetation plots for the presence of young leaves, fruits, and flowers monthly to evaluate interannual variation in the abundance of potential food resources. We established 15 plots (20×20 m) in the Fusui study site: 5 on the hilltops and 10 on the hillsides. We recorded and measured each tree with ≥ 5 cm DBH within each plot.

Data Analysis

To examine the relative abundance and size of each species within vegetation plots, we calculated the dominance of each species by summing relative density, relative frequency, and relative coverage (Brower *et al.* 1990). We calculated the relative

density, relative frequency, and relative coverage for each species using the following formulae:

Relative density = number of stems of species *i*/total number of stems within all plots;

Relative frequency = number of plots of species *i*/total number of plots;

Relative coverage = sum of basal areas of species *i*/sum of basal areas of all species.

We expressed the relative abundance of different plant parts as the percentage of trees bearing the plant parts of interest each month, regardless of the size of the canopy (Britt *et al.* 2002; Estrada *et al.* 1999).

We excluded records for dependent infants and juveniles from analysis because they were not foraging independently, and infant and juvenile mouthing of prospective foods often cannot be differentiated from actual feeding. We calculated the percentage of different plant species in the diet of each focal group using the total feeding records. Similarly, we calculated the percentage of different plant parts in the monthly diet of the study group using monthly total feeding records. We used Wilcoxon signed-rank test to examine interannual and intersite variations in the overall pattern of use of different plant parts. We used Spearman rank correlation to test the relationship between the abundance and consumption of different plant species and parts. We used the Mann–Whitney *U* test to compare the monthly averages of the percentage of feeding records for various food items from 5 rainy season months versus 6 dry season months, as well as variations in forest composition of the 2 study sites. All tests were 2-tailed, with significance levels of 0.05.

Results

Interannual Variation in Diet

We collected 3668 feeding records for the Nonggang group during 2003–2004, of which there were 3528 of identified food items. During 2005–2006, we collected 1599 feeding records for the same group, of which there were 1563 of identified food items. Based on the average of monthly percentages of feeding records for different food items (Fig. 2), the langurs had a broadly similar diet during the 2 study periods ($Z = -0.169$, $n=7$, $p=0.866$). Leaves accounted for 53–71% of the diet, and young leaves were by far the most important in the diet (Fig. 2). Although fruits and seeds constituted a relatively small percentage of the langurs' diet, there was marked variation in the species of fruit and seed foods consumed between the 2 study periods. During 2003–2004, langurs fed mainly on the fruits of *Ficus nervosa*, *F. microcarpa*, *Securidaca inappendiculata*, and *Tetrastigma cauliflorum* (82% of fruit feeding records), as well as the seeds of *Pithecellobium clypearia*, *Bauhinia* sp., *Acacia pennata*, and *Wrightia pubescens* (99% of seed feeding records). During 2005–2006, 69% of observed fruit-feeding came from *Clausena anisum*, *Canthium*

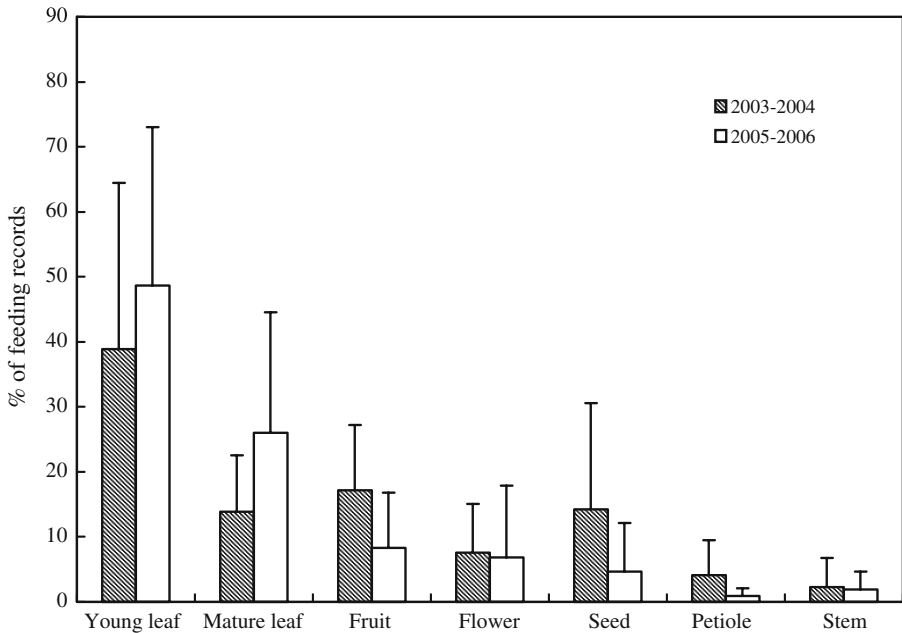


Fig. 2 Overall pattern of use of different plant parts by François' langurs in the Nonggang study site during 2003–2004 and 2005–2006.

dicoccum, *Ficus gibbosa*, *F. nervosa*, and *Sinosideroxylon pedunculatum* and langurs fed only on the seeds of *Pithecellobium clypearia* and *Wrightia pubescens*.

Langurs at Nonggang had a comparable number of species in their diet but ate different species during the 2 study periods. Of 76 plant species eaten during 2003–2004, 40 species were not eaten during 2005–2006, accounting for 24% of the diet. Of 56 species eaten during 2005–2006, 20, accounting for 25% of the diet, were not consumed during 2003–2004. There was also marked difference in the percentages of feeding records for plant species between the 2 study periods. Of the top 10 food species, only 3 species, *Pithecellobium clypearia*, *Ficus nervosa*, *Canthium dicoccum*, were present in the list of top 10 food species during both study periods (Table I).

Though the langurs consumed a large number of plant species during both study periods, a large proportion of the total diet (54–62%) came from only 10 species (Table I). Only 3 of the top 10 food tree species (*Pithecellobium clypearia*, *Ficus microcarpa*, *Clausena anisum*) belonged to the 10 most predominant tree species in the Nonggang vegetation plots (Tables I and II), indicating that the majority of the langurs' diet was based on less abundant tree species.

Seasonal Changes in Abundance and Use of Food Items

At Nonggang, the abundance of young leaves, fruits, and flowers showed similar monthly changes between the 2 study periods, with lower abundance in the dry season months than in the rainy season months (Fig. 3). There were clear seasonal

changes in the diet of Nonggang group during the 2 study periods (Fig. 4). The consumption of young leaves showed significantly seasonal changes in the 2 study periods (2003–2004: $Z = -2.739$, $p=0.004$; 2005–2006: $Z = -2.373$, $p=0.017$), being lower in the dry season than in the rainy season (Fig. 4). The consumption of young leaves correlates positively with their abundance (2003–2004: $r_s = 0.955$, $n=11$, $p<0.001$; 2005–2006: $r_s = 0.865$, $p<0.001$). However, there was marked interannual variation in dietary shift in the dry season. During 2003–2004, seed ($Z = -2.872$, $p=0.004$) and petiole ($Z = -2.298$, $p=0.030$) consumption varied significantly according to seasons, and was higher in the dry season. Seeds, in particular, made up the majority of the diet between December 2003 and February 2004, and were main fallback foods in the dry season. The consumption of young leaves and seeds was correlates significantly negatively ($r_s = -0.925$, $n=11$, $p<0.001$). However, mature leaves accounted for the majority of the dry season diet during 2005–2006 (seasonal comparison: $Z = -2.739$, $p=0.004$). There is a significant and negative relationship between young leaf consumption and mature leave consumption ($r_s = -0.827$, $n=11$, $p=0.002$). Although langurs fed on more seeds in the dry season during 2005–2006 (Fig. 4, season comparison: $Z = -2.115$, $p=0.034$), the magnitude of variability was smaller than during 2003–2004. Fruit consumption did not show significant seasonal variation during the 2 study periods (2003–2004: $Z = -0.365$, $p=0.792$; 2005–2006: $Z = -0.548$, $p=0.662$). As with fruits, little seasonal variation occurred in flower consumption (2003–2004: $Z = -1.290$, $p=0.247$; 2005–2006: $Z = -1.869$, $p=0.082$). There is no significant relationship between the consumption and the abundance of fruits (2003–2004: $r_s = 0.483$, $n=11$, $p=0.132$; 2005–2006: $r_s = 0.137$, $p=0.688$) and flowers (2003–2004: $r_s = 0.207$, $n=11$, $p=0.541$; 2005–2006: $r_s = 0.029$, $p=0.932$) during the 2 study periods.

Intersite Variation in Forest Composition

Of 312 trees sampled in the 13 vegetation plots at Nonggang, there were 56 species belonging to 30 families. At Fusui we recorded 91 trees in 16 families and 30 species. There were marked differences in forest composition and structure between the 2 study sites. There was no overlap in the 10 dominant tree species in the 2 study sites (Table II). Mean DBH and density of dominant tree species were significantly greater in Nonggang than in Fusui (mean DBH: $Z = -3.781$, $n_1 = 10$, $n_2 = 10$, $p<0.001$; density: $Z = -2.962$, $n_1 = 10$, $n_2 = 10$, $p=0.002$).

Intersite Variation in Diet

We collected 2584 feeding records in Fusui and identified 2501 food items therein. Based on the average of monthly percentages of feeding records for different food items, the Fusui group had dietary pattern similar to the Nonggang group ($Z = 0.314$, $n=6$, $p=0.753$), and young leaves accounted on average for 65% of monthly feeding records (Fig. 5). Moreover, young leaves contributed the bulk of monthly diet of the Fusui group almost year-around (Fig. 6).

There is considerable variation in the plant species that were most important to both langur groups (Table I). In the Fusui group, the top 10 food species accounted

Table 1 The top 10 plant species consumed by François' langurs during 2 study periods at Nonggang and Fusui study sites. The top food species were ranked according to the percentage of feeding records for them among total feeding records (underline)

Species	Family	Life form	2003–2004		2005–2006	
			Parts eaten	No. of months used % (F)	Parts eaten	No. of months used % (F)
Nonggang						
<i>Pithecellobium chypearia</i>	Mimosaceae	Tree	YL,ML,S	6 13.82	YL,ML,FR,S	9 7.82
<i>Ficus nervosa</i>	Moraceae	Tree	YL,ML,FR	11 9.72	YL,ML,F,FR	11 9.39
<i>Garcinia paucinervis</i>	Guttiferae	Tree	P	6 6.28	P	3 0.5
<i>Sinosideroxylon pedunculatum</i>	Sapotaceae	Tree	YL	5 5.94	YL,FR	4 2.32
<i>Ficus microcarpa</i>	Moraceae	Tree	YL,ML	4 5.46	YL	3 0.5
<i>Mitlusa chumi</i>	Annonaceae	Tree	YL,ML,F	5 5.31		
<i>Securidaca inappendiculata</i>	Polygalaceae	Vine	YL,ML,FR	4 5.19		
<i>Bauhinia</i> sp.	Caesalpiniaceae	Vine	YL,S	4 4.59	YL	1 0.5
<i>Canthium dicoccum</i>	Rubiaceae	Tree	YL,ML,F	9 3.41	YL,ML,F,FR	7 5.76
<i>Tirpitzia ovoidea</i>	Linaceae	Tree	YL,F	5 2.5	YL,ML,F	6 1.75
<i>Aristolochia longgangensis</i>	Aristolochiaceae	Vine			YL,ML,ST	9 5.94
<i>Embelia scandens</i>	Myrsinaceae	Tree	YL,ML	4 0.72	YL,ML	8 5.57
<i>Ventilago calyculata</i>	Rhamnaceae	Vine			YL,ML,F,FR	8 4.57

<i>Ficus galberrima</i>	Moraceae	Tree	YL,ML,FR,P	6	2.14	YL,ML,FR	8	<u>4.26</u>
<i>Pueraria thumbergiana</i>	Papilionaceae	Vine	YL,ML,S	5	0.69	YL,ML	9	<u>4.13</u>
<i>Wrightia pubescens</i>	Apocynaceae	Tree	YL,ML,F,S	5	1.81	YL,ML,F,FR,S	8	<u>3.5</u>
<i>Clausena anisum</i>	Rutaceae	Tree			62.22	FR	2	<u>3.32</u>
Sum of top 10 food species								54.26
Fusui								
<i>Celtis sinensis</i>	Ulmaceae	Tree				YL,ML	12	10.38
<i>Indocalamus calcitcolus</i>	Rubiaceae	Tree				YL,ML,S	12	6.56
<i>Letsia glutinosa</i>	Lauraceae	Tree				YL,ML,FR,F	9	4.52
<i>Pistacia weinmanni folia</i>	Tiliaceae	Tree				YL,ML,FR,S	3	4.24
<i>Unidentified vine</i>	Vine					YL,ML,S	7	3.13
<i>Pittosporum tobira</i>	Pittosporaceae	Tree				YL,ML,FR,F	10	3.04
<i>Meliosma henryi</i>	Sabiaceae	Vine				YL,ML	11	2.01
<i>Ficus virens</i>	Moraceae	Tree				YL,ML	8	1.48
<i>Ficus parvifolia</i>	Moraceae	Tree				YL,ML	4	1.28
<i>Ficus lacor</i>	Moraceae	Tree				YL,ML,FR	8	1.23
Sum of top 10 food species								37.86

^a Parts eaten: YL, young leaf; ML, mature leaf; FR, fruit; S, seed; F, flower; P, petiole; ST, stem;

^b % (F), percentage of total feeding records;

Table II Mean height, mean DBH, and dominance of the top 10 tree species in vegetation plots in Nonggang and Fusui study sites^a

Species	Family	Density (individuals/ha)	Mean DBH (cm)	Dominance
Nonggang				
<i>Deutzianthus tonkinensis</i>	Euphorblaceae	96.9	20.4	1.1638
<i>Bischofia javanica</i>	Euphorblaceae	56.9	22.2	1.0325
<i>Clausena anisum</i>	Rutaceae	16.9	19.7	0.5301
<i>Cleistanthus saichikii</i>	Euphorblaceae	20.0	15.4	0.5240
<i>Litsea monopetala</i>	Annonaceae	26.2	18	0.4821
<i>Pithecellobium clypearia</i>	Mimosaceae	10.8	25.3	0.4445
<i>Ficus fistulosa</i>	Moraceae	13.8	18.6	0.4397
<i>Dracontomelom duperreanum</i>	Anacardiaceae	9.2	44.9	0.4126
<i>Burretiodendron hsienmu</i>	Tiliaceae	15.4	16.1	0.3576
<i>Ficus microcarpa</i>	Moraceae	10.8	16.2	0.3422
Fusui				
<i>Litsea glutinosa</i>	Lauraceae	33.3	5.7	1.0433
<i>Celtis sinensis</i>	Ulmaceae	5.0	6.8	0.3658
<i>Tilia tuan</i>	Tiliaceae	5.0	6.7	0.3646
<i>Platycarya strobilacea</i>	Juglandaceae	11.7	9.7	0.3340
<i>Gosampinus malabarica</i>	Bombacaceae	5.0	5.8	0.3294
<i>Radermachera sinica</i>	Bignoniaceae	8.3	7.2	0.3184
<i>Chukrasia cinerascens</i>	Meliaceae	5.0	6.6	0.2470
<i>Phyllanthus emblica</i>	Euphorblaceae	3.3	6.0	0.2323
<i>Psidium guajava</i>	Myrtaceae	3.3	7.3	0.2301
<i>Pistacia weinmannifolia</i>	Anacardiaceae	6.7	5.7	0.1654

^a Species are presented in order of dominance

for only 38% of total feeding records, and were completely different from those eaten by the Nonggang group. However, as for the Nonggang group, only 3 tree species (*Celtis sinensis*, *Litsea glutinosa*, *Pistacia weinmannifolia*) among the top 10 food species eaten by the Fusui group belonged to the 10 most dominant tree species in the Fusui vegetation plots (Tables I and II).

Discussion

Young leaves contributed the highest proportion of the annual diet for François' langurs at Nonggang and Fusui Nature Reserves, Guangxi Province. For the Nonggang group, the consumption of young leaves correlates positively with their abundance during both study periods. These findings are similar to those of Hu (2007), who found that young leaves accounted for 43% of the annual diet of François' langurs at Mayanghe Nature Reserve, Guzhou Province, and that the proportion of young leaves in the diet correlate significantly with young leaf

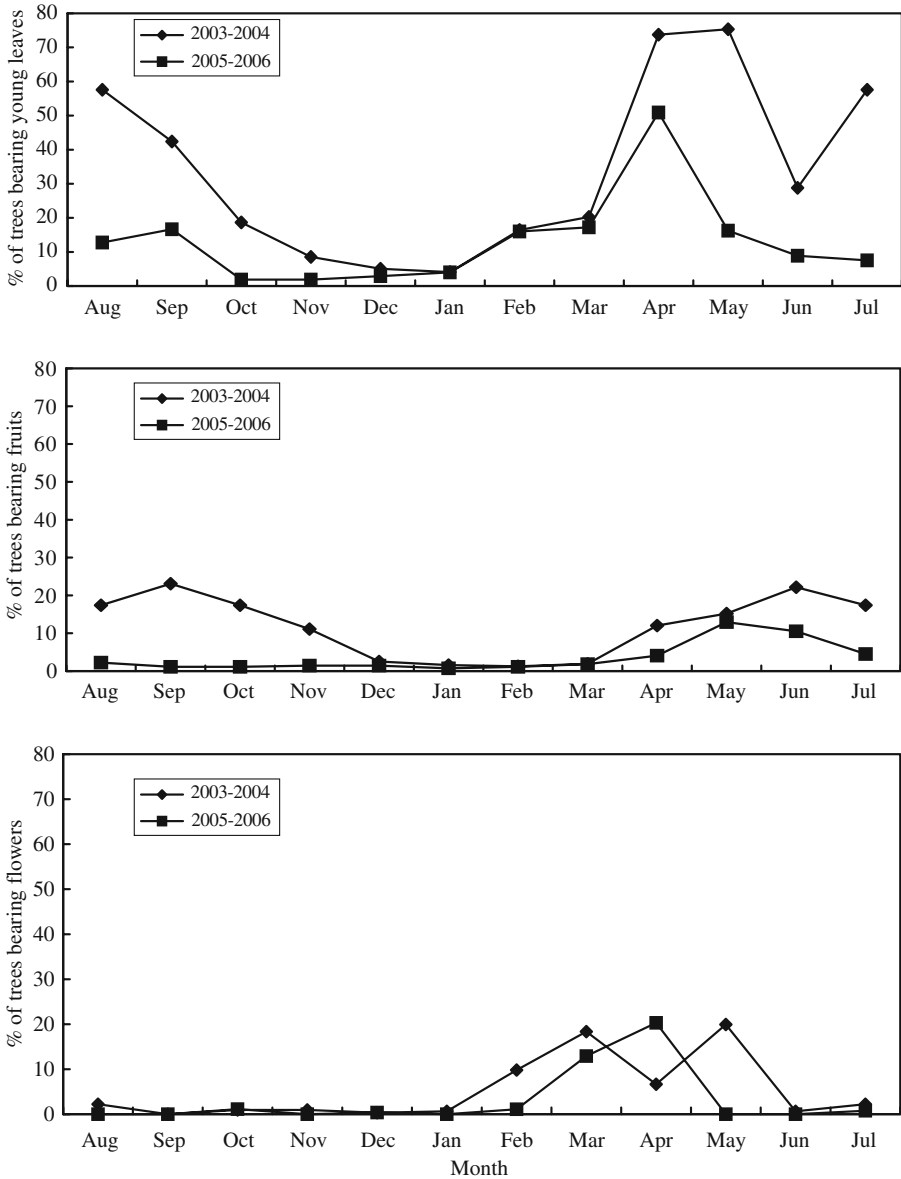


Fig. 3 Monthly abundance of young leaves, fruits, and flowers in Nonggang study site during 2003–2004 and 2005–2006.

availability. Although phenology data were not available for the Fusui study site, young leaves were still preferred foods for langurs, as shown by the predominance of young leaves in most months.

Mature leaves are abundant and essentially available, but rich in cellulose and poor in nutrition (Richard 1985). They usually serve as fallback foods for primates

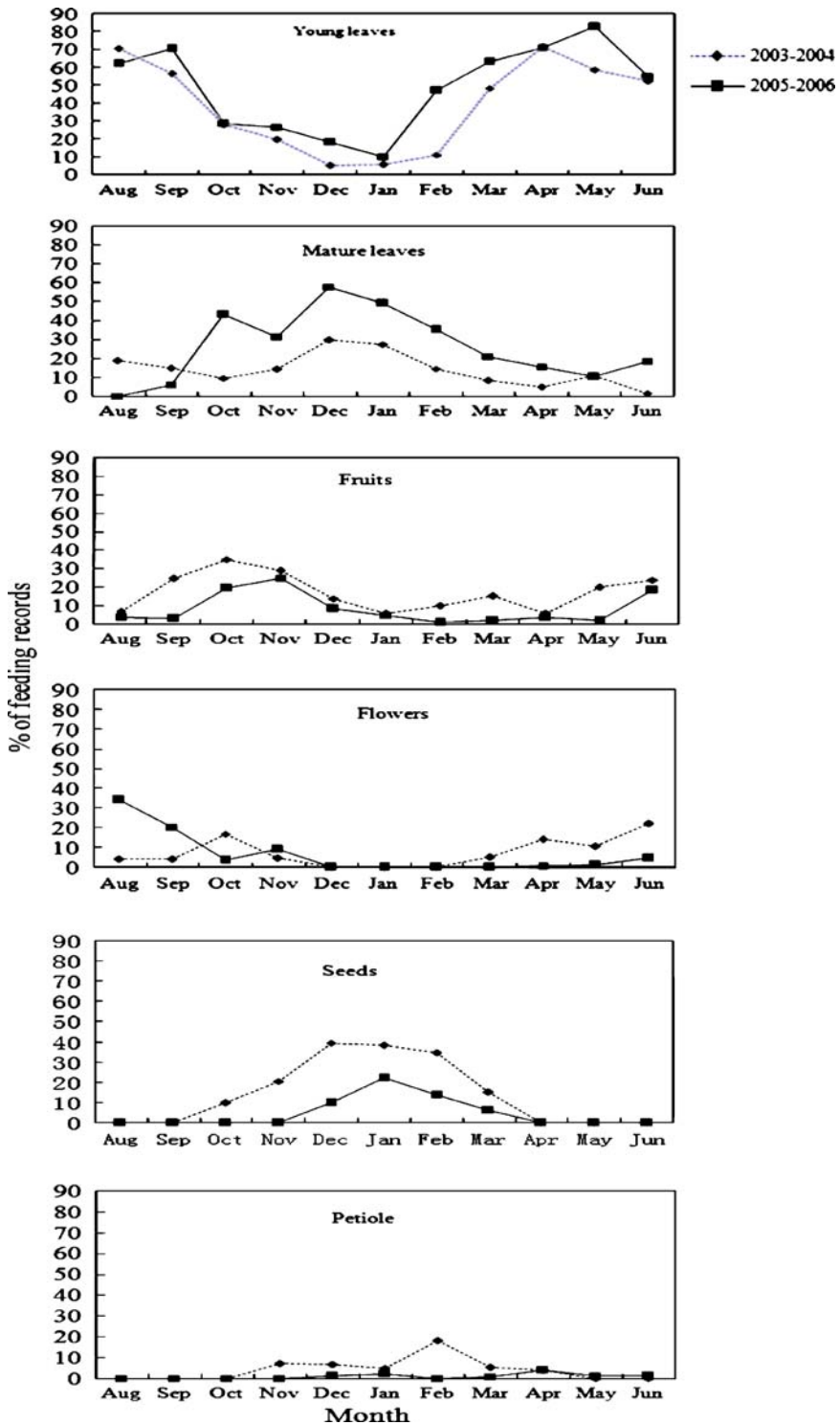


Fig. 4 Monthly percentage of feeding records devoted to different food items in the diet of François' langurs during 2003–2004 and 2005–2006.

during periods of preferred food scarcity (Lambert 2007; Marshall and Wrangham 2007). The fact that François' langurs consumed mature leaves in large quantities only when young leaves became scarcer during the lean season both in our study sites and at Mayanghe Nature Reserve (Hu 2007) suggests that this is also true for langurs.

Although we did not test the relationship between seed consumption and seed availability, seeds clearly were important supplementary foods for langurs in the dry season, when young leaves and fruits were scarce. Seeds are rich in fats and starch, and form one of the most important energy resources for primates (Richard 1985). They can provide alternative high-quality foods during the seasonal scarcity of other important resources in the seasonal rain forests of the karst regions. Many researchers have reported that primates consume seeds in large quantities during the lean period for preferred foods (Kaplin *et al.* 1998; Poulsen *et al.* 2001; Strier 1999). However, seed abundance varies substantially year to year because the phenology of seed-producing plants differs annually, which seems likely to influence not only the consumption of specific species, but also seed

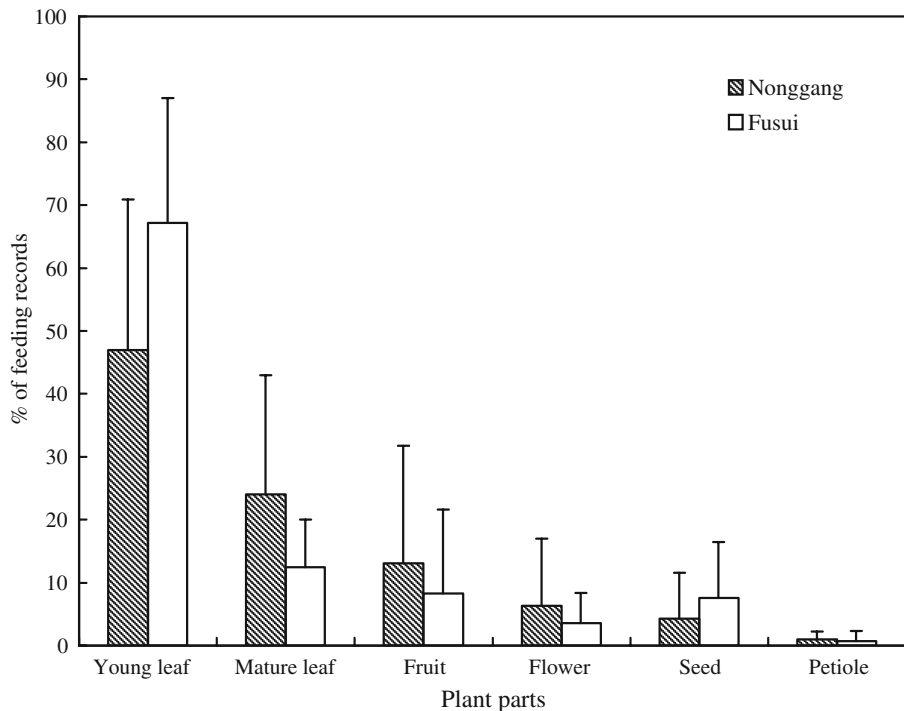


Fig. 5 Overall pattern of use of different plant parts by François' langurs in Nonggang and Fusui study sites.

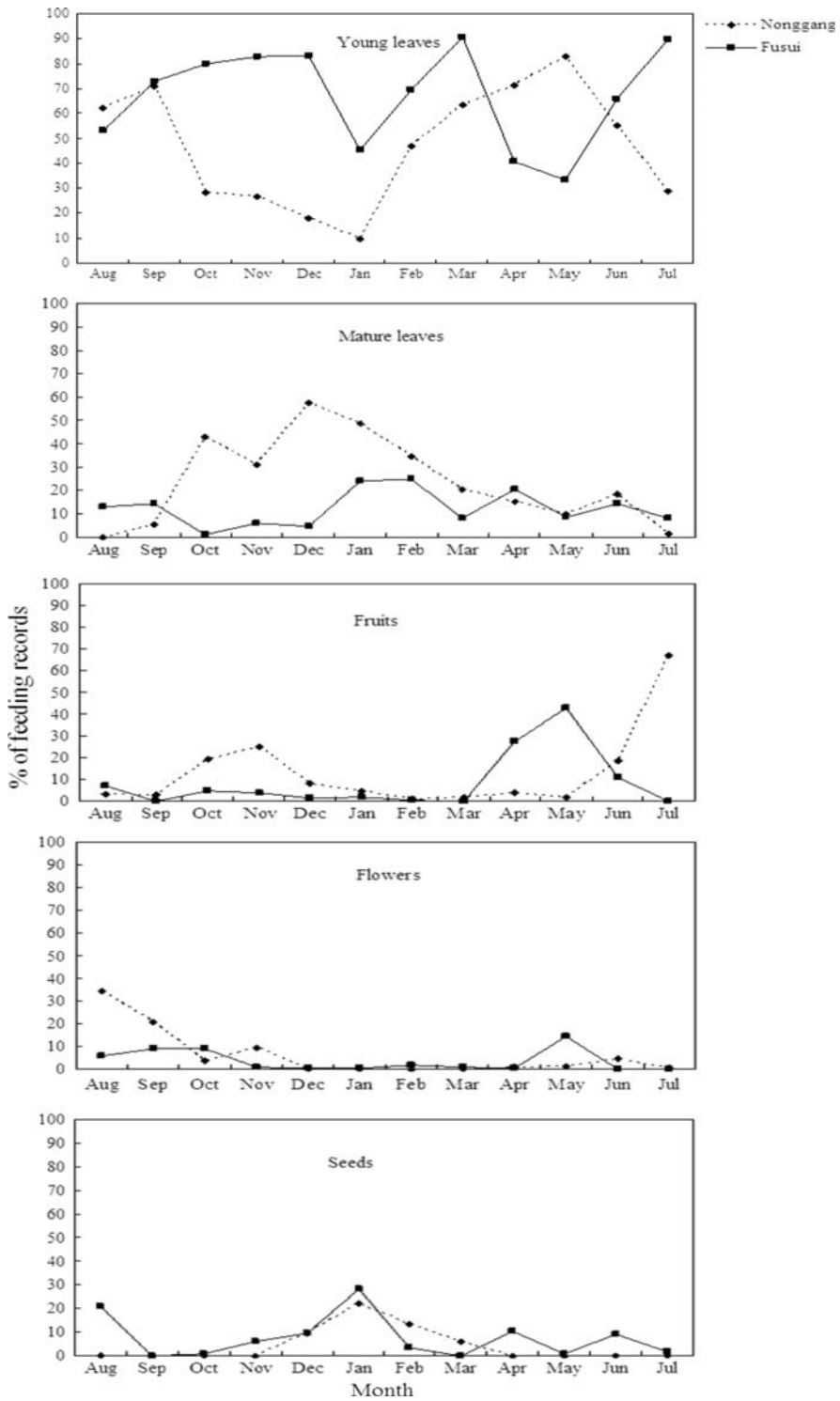


Fig. 6 Monthly percentage of feeding records for different food items for François' langurs in Nonggang and Fusui study sites.

consumption by langurs. For example, one can attribute the decrease of *Bauhinia* sp. in the langur diet in 2005–2006 to the failure of that species to seed during that time (Q. H. Zhou, *pers. obs.*). Data on the phenology of all seed-producing plants eaten by langurs are needed to examine the interannual variation in seed consumption.

The Nonggang group significantly increased petiole consumption during the 2003–2004 dry season. This may be related to water requirements because petioles have relatively higher moisture than the lamina (Waterman and Kool 1994) and the 2003–2005 study period was the driest year in the last 50 yrs with very little rainfall during the dry season (Zhou *et al.* 2006).

We also documented considerable variation in plant species consumed by 2 widely separated study groups. Much of this variation probably reflects differences in forest composition between the 2 study sites. At Fusui Nature Reserve, human activities, e.g., sugar cane plantation and firewood cutting, have led to large-scale forest clearance and fragmentation (Li and Rogers 2005), which has a significant effect on forest composition (Arroyo-Rodríguez and Mandujano 2006; Laurance *et al.* 2000). We found marked differences in species composition, density, and mean DBH of dominant tree species between the 2 study sites, which may explain the variation in the consumption of plant species by the langurs. For example, *Pithecellobium clypearia*, the second major food species in Nonggang, is one of 10 most dominant tree species in that study site, but did not occur in the Fusui vegetation plots. However, our study indicated that François' langurs did not select favored foods based on the abundance of the species in the habitat in either study site. Researchers have reported similar findings for other colobines, e.g., *Trachypitecus johnii* (Oates *et al.* 1980), *Presbytis melalophos* (Bennett 1983), and *T. leucocephalus* (Li *et al.* 2003).

In conclusion, our results suggest that François' langurs exhibited a comparable dietary pattern both temporally and geographically, with a preference for young leaves, and selection in the species from which foods are chosen. However, there were considerable interannual and intersite differences in species composition of the langur diet, which was probably related to differences in phenology and forest composition.

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