

## **Preliminary Report on *Presbytis francoisi leucocephalus***

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*There is no long-term study on the white-headed leaf-eating monkey in Hua Shan, Guangxi Zhuang Autonomous Region, China. This subspecies probably numbers  $\leq 400$  animals (Wu, 1983; Jiang et al., 1991). Our preliminary study 15 km from the Vietnamese border documents group size and composition and habitat use based on 450 contact h. The study group may interact with the white-sideburned (white-cheeked or black) subspecies of *Presbytis francoisi*, and shares habitat with macaques. While the study site is contiguous with a provincial park and *P. francoisi* are under protective legislation, development of this area for tourism and occasional local hunting has consequences for conservation policy.*

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**KEY WORDS:** leaf-eating monkey; langur; conservation; China; interspecific associations.

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### **INTRODUCTION**

We describe one group of white-headed leaf monkeys that live sympatrically with macaques in a developing tourist area: the Longzhou Longgang Forest Reserve of Guangxi, established in 1979 (FAO, 1982). While surveys of *P. francoisi francoisi* and *P. francoisi leucocephalus* exist in neighboring areas (Jiang *et al.*, 1991; Lai, 1987; Li, 1993) and detailed stud-

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ies of the latter are underway in Fusui county (Huang *et al.*, 1992; Lu and Huang, 1993), we describe the Hua Shan study group for the first time.

### Nomenclature

Stanford (1991) reviewed the taxonomy of langurs and leaf monkeys via color of the neonatal pelage (Thorington and Groves, 1970) and cranial features. Accordingly, the white-headed langur or leaf monkey is a member of the *Presbytis cristata* group, distinguished by neonates with orange pelage (Thorington and Groves, 1970). The specific status of the white-headed leaf monkey is still being debated. The following generic, specific, and subspecific nomenclature is currently in use: *Presbytis francoisi leucocephalus* (Ma *et al.*, 1989); *P. leucocephalus* (Tan, 1957; Li, 1992; Lu *et al.*, 1993); *Trachypithecus francoisi* (Eudey, 1987), and *Semnopithecus leucocephalus* (Brandon-Jones, 1984).

Considered a relict assemblage of taxa (Brandon-Jones, 1978, Ma *et al.* (1989) describe a morphocline from central and northern Vietnam to southwestern China, containing six subspecies of *P. francoisi*. The white-headed leaf-eating monkey is closely related to the white-rumped black leaf monkey, *Semnopithecus delacouri* (Brandon-Jones, 1984), aka *P. francoisi delacouri* (Ma *et al.*, 1989), and the white-sideburned, white-cheeked, or black leaf monkey. *P. francoisi francoisi* (Ma *et al.*, 1989). The distinction between these groups is based on pelage color and patterns, typically in the amount of white hair on the face and over the shoulders. Li and Ma (1980, p. 5) preferred specific status for these forms, but noted that while the ranges of *Presbytis leucocephalus* and *Presbytis francoisi* do not overlap, "populations showing intergradation of varying degrees do exist in the area where the two . . . meet." They concluded that ". . . The white-headed langur is but a geographical race of the black langur." Li (1993) used ecological factors to distinguish them as separate species. Li (1993) found that altitude coincides with habitat use, and separates white-cheeked (aka black; *P. francoisi* from white-headed monkeys (*P. leucocephalus*). However, he noted that habitat destruction, especially logging, is the major contributor to the 56 m difference in altitude of habitat use. His sample of groups did not include the monkeys of our area, which include intermediate forms (Li and Ma, 1980; Ma *et al.*, 1989) with variable amounts of white hair over the face and shoulders and elsewhere postcranially and wholly black forms within the normally patterned group of white-headed monkeys. As local groups of *P. francoisi* become better known, the taxonomic status of the Hua Shan leaf-eating monkeys may be resolved. We follow Ma *et al.*

(1989), referring to the white-headed leaf-monkey as *P. francoisi leucocephalus*.

### Distribution

*P. francoisi* is distributed from central Laos to central and northern Vietnam and southwestern China (Wolfheim, 1983; Ma *et al.*, 1989). The two Chinese subspecies of *P. francoisi* are located in southwestern Guangxi Province (Wu, 1983; Wang and Quan, 1986; Jiang *et al.*, 1991) and extend into northern and southwestern Guizhou Province (Ma *et al.*, 1989). The white-headed subspecies (*P. francoisi leucocephalus*) is found in Guangxi Province in a triangular area extending from Longzhou County in the west, past Chongzhou County in the east to Fusui (Fuxi) County, and Ningming County in the south (Lai, 1987; Ma *et al.*, 1989; Jiang *et al.*, 1991, Lu *et al.*, 1993) (Fig. 1). Although they were thought once to number only 400 individuals (Wu, 1983), conservation efforts have increased the population to around 1000 (Anonymous, no date).

## METHODS AND SITE

### The Site

Hua Shan is located along the eastern short of the Mingjiang River, 15 km from the Vietnamese border. *P. francoisi* occupy both sides of the river, with the predominantly black-coated and white-cheeked form on the west side, and the predominantly white-headed group to the east. The area is karst mountains, the typical habitat for this species. The forest is composed primarily of a subtropical broadleaf tree with a rain forest component. Due to the special formation of karst, only certain flora are supported, which limits the availability of resources for the monkeys (Wu, 1983; Fooden, 1976). Plant species, especially palms, which grow high on the karst are being removed for the benefit of tourists and profit for local entrepreneurs.

The plain along the river is farmland, and a village is nestled between the water's edge and the mountains. There are no settlements in the forest or mountains beyond the river's plain. Residents from the village, however, exploit the forest and mountains for their resources. It is peopled by several different "ethnic minorities," including the Yao and Zhuang, who have immigrated to farm and to have greater accessibility to markets because of the river. Commercial logging is via rudimentary hand tools.

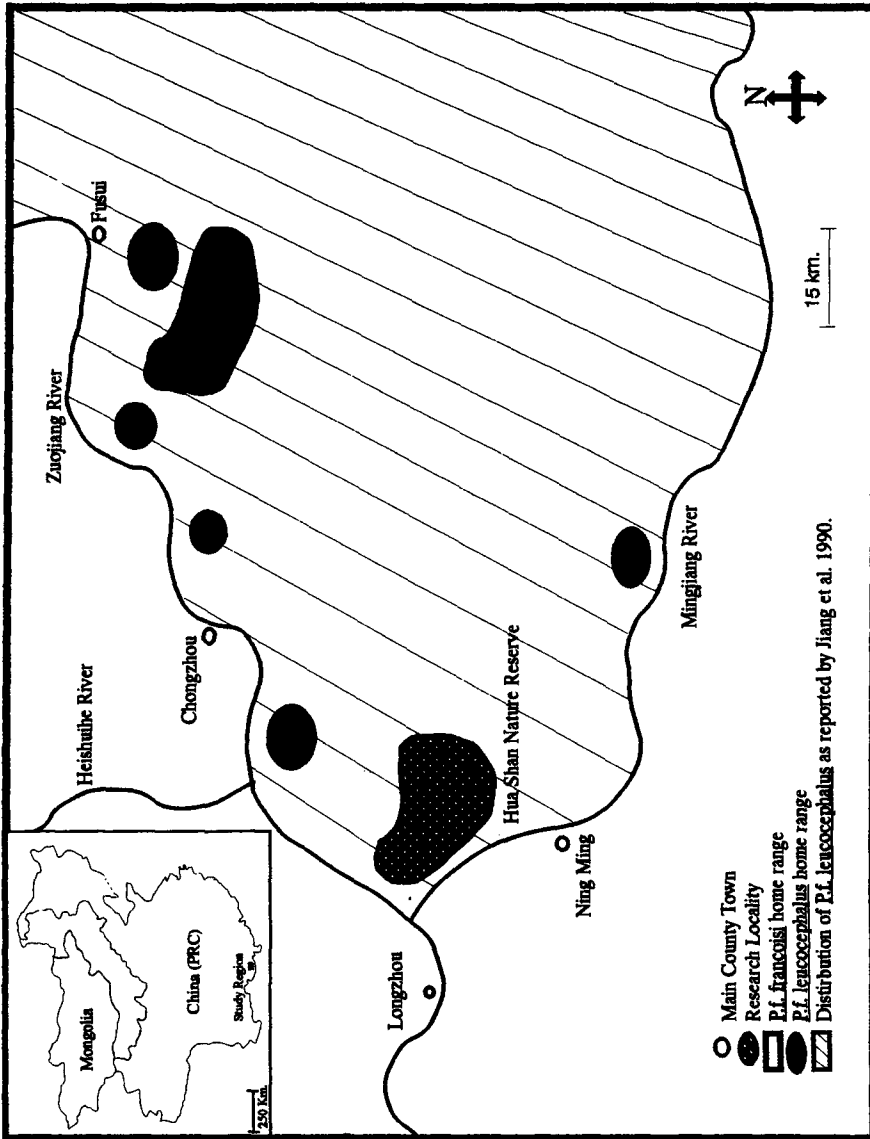


Fig. 1. Research locale in Guang Xi Autonomous Region, PRC.

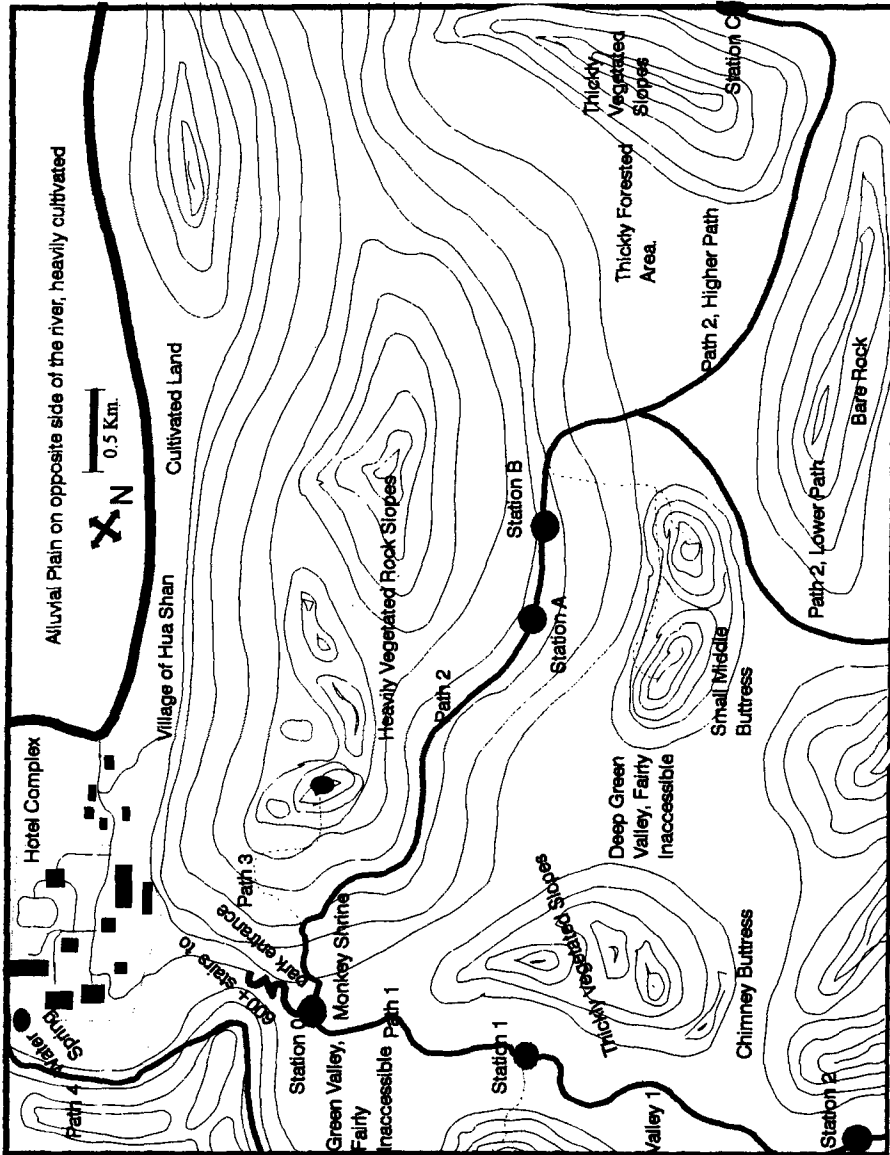


Fig. 2. Detailed map of Hua Shan and entrance to Longzhou Nature Reserve.

This region is designated both a tourist area and a park. It comprises 40 square kilometers of land, much of which is original stands of rain forest (Fig. 2). Some planting is recent, and intended by the park's authorities to entice monkeys to the area as a tourist attraction. The hotel complex includes 5 buildings on the river plain. The ascent rises steeply to the plateau, approximately 95 m above the plain. Above the plateau and surrounding it, karst peaks rise another 30 m. Deciduous trees grow laterally and diagonally from the karst face.

### Methods

Our study spanned five months, from midwinter to late spring, 1992–1993. January was the coldest month, with an average temperature of 12°C, while March had an average temperature of 27°C. Rainfall was heaviest in February. Despite inclement weather, we averaged 3 contact h per day, for a total >450 h. Observations were possible once the monkeys left their sleeping area and migrated to the karst face. The mountain terrain made observation difficult; monkeys could be behind a tree, or deep on a ledge and not be visible. Therefore, two of us mountaineered and harness climbed up the mountain faces so that our views were not obscured by foliage. From these vantage points, we could share the monkeys' spatial perspective, and more precisely note their use of terrain, though details of face and gender were unclear. It took approximately one hour along mountains paths to reach observation areas (Fig. 2).

We recorded on a continuous basis and took scan samples per our protocol at 10-min intervals and focal samples supported by video. We set up a Hi-8 video camera with a 3× telescopic lens to record automatically. We also used it to spot-record significant, unusual, or symptomatic behavioral sequences. Our protocol includes (a) the composition of the group as they arrived onto the karst face, (b) the place of observation from permanently designated viewing stations from which compass bearings were mapped, (c) climatic variables, and (d) the presence or absence of other humans. In the scan samples throughout the daily observation period the protocol was used to record the location and activities of each visible member from left to right. Since the viewing distance precluded aging and sexing individuals, we categorized activities as feed, groom, present, sit/rest, vocalize, movement, and play. We transcribed these data on a laptop computer utilizing commercial software (Paradox, Excel 4.0, Lotus 1-2-3, and SPSS PC+).

## RESULTS

### Physical Characteristics

*Presbytis francoisi* is not sexually dichromatic and only minimally sexually dimorphic, with males marginally larger and more robust than females. Lai (1987) gave the weight for captive white-headed monkeys as 7–8 k and the height as 85 cm. Lai (1987) also noted that tail length is 73 cm, which accords with the range for tail length of 765–890 mm given by Ma *et al.* (1989).

The white-headed leaf monkey of Hua Shan resembles other members of the Vietnam-Guangxi morphocline in having glossy black hair over its body. It differs in the distribution of white hairs, which cover from 1/3 to 1/2 of the body (Lai, 1987). Some individuals had white hair extending to the pectoral girdle. On the occasions that it was possible to see the limbs clearly, we observed white patches on the dorso distal aspects of the cheiridia.

We also noted two patterns of white on the rump and legs: the white cloverleaf pattern extends over the rump. This was the most prominent pattern, in which 4 white rounded shapes covered the perineum, but were separated from each other by wedges of black, resembling a 4-leaf clover. Alternatively, some individuals have white streaks of hair along the back of the thigh to the popliteal fossa.

The tails were generally two-thirds white with the base and proximal third being black. There were distinctive variations: (a) a dark line of black bordered the ventrum of the tail and continued close to the distal end, (b) the tail was predominantly black with only a small portion of white, and (c) rarely ( $n = 3$ ) tails were entirely black.

Some subjects had a peak of black hair in the cap, circled by a crown of white hair. This crest was found to be either completely white or black-tipped. When a black-tipped monkey lowered its head, it was like looking at a bull's eye with a black dot in the middle of a white circle. Black-tipped and completely white-crested monkeys occurred in the same groupings. The white cranial hair terminated either just at the mandible or at the distal end of the neck where the pectoral girdle begins. There were at least two animals that had no white hair on their heads. We also saw an individual that had a black head with white only on the face instead of over the entire head.

Via records in the Nanning Zoo, Lai (1987) and Jiang *et al.* (1991) calculated gestation at about 214 days. The neonatal pelage changes initially by lightening in color, and the tail hair appears wavy; the change in coloration then extends to the distal portion of the limbs and toward the head. The neonatal pelage is bright orange. Then white appears on the

tail, limbs, and in a halo around the face. The full coat lightens at the same time as the coat darkens from underneath, giving a buffy appearance. This darkening is the first aspect of the adult coat. It continues until finally the adult pattern is reached at about 6 months. Developmental stages of independence correspond to these color differences (Table I).

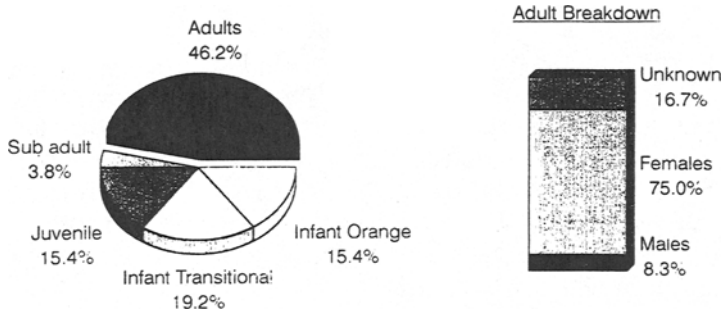
### Group Size and Composition

We identify five age categories based on pelage stages, which (Table I) concur with Stanford's analysis of *Presbytis pileata* in Bangladesh. Group size ranges from 3 to 18, but inclusion by age category varies. The average maximum number calculated by summing maximum visible animals per age category over the study period is 26 (Fig. 3). Fifty percent of this maximum are adults, of which 35% are adult females. Of the remaining adults, there is  $\geq 1$  adult male, but the sex of the remaining 3 monkeys could not be ascertained. Infants in natal pelage and juveniles each comprise 15.3%, while transitional infants constitute 19.2% of the group (Table I). Subadults are <1% of the population. Given the resemblance to adults in all except size it is likely that subadults are included among the three unknown adults (Table I).

Table I. Age Categories and Characteristics: Our Study and Stanford's (1991)

Burton <i>et al.</i>	Characteristics	Stanford	No. Observed
Adult	Glossy black coat with variable white markings, males larger and more robust than females.	Adults	M = 1 F = 9 UN = 2
Subadult	Adult pelage, slightly smaller than adults, more likely to engage in play behavior.	Subadult	1
Juvenile	Black coat underneath a buffy-white overcoat, independent of mother while maintaining close proximity.	Juvenile	4
Infant transitional	Orange buffy overcoat with dark coat pattern starting to emerge underneath, still very dependent on mother but engages in play and occasionally moves away to play.	Infant 2	5
Infant orange	Orange natal pelage. White feathering of tail and crest begins after 2-3 weeks of age.	Infant 1	4





**Fig. 3.** Population composition of *Presbytis francoisi leucocephalus*, Longzhou Nature Reserve formulated using the average number of individuals. Data from January–May 1993.

We inferred the presence of several groups on the basis of long-call vocalizations that resounded from different locations at various times of the day. While the exact location of these bark-like calls was difficult to determine for the human ear, monkeys probably discriminate direction and group membership from them.

### Locomotion and Ranging Behavior

The monkeys moved down along the rock face by bounding, with the tail extended behind and the arms outspread. They moved up the face by climbing. Leaping monkeys bounced off the rock face from hold to hold. They seemed to watch carefully before making such leaps, especially when an interim handhold was a tree branch that grew laterally in a crevice. They seemed to anticipate their movements as they looked from point to point along the path of the leap. For fast movement, they used trees instead of the rock face. The tail in adults functioned as a balance; it is extended during full leaps. Occasionally one monkey grasped the tail of another to aid in moving from one ledge to another. Like a tree branch, a tail permits the holder to gain momentum and to propel itself forward.

The monkeys appeared on the sun-warmed rock face, from  $\geq 0600$  h, and generally disappeared from sight in the late afternoon (1700–1800). Caves dotting the karsts reach depths of 20 m. In Fusui, white-headed langurs sleep and rest in caves with southeasterly facing narrow entrances during the winter (Huang *et al.*, 1992) and larger entrances facing north during the summer (Lai, 1987). We have no direct observations of the monkeys in caves at Hua Shan. We found monkey dung on the pinnacles of

mountains, a distance from cave entrances. Fresh, as well as decayed segmented stools, attest to their repeated and continuous use of these exposed areas. In addition, the monkeys use mountain ledges along the face, which are  $\leq 2$  m deep. Subjects occupying the depth of these ledges are not visible.

The greatest horizontal distance between members of the study group was approximately 30 m, and the greatest vertical distance approximately 20 m. Over the course of a day, the focal group might traverse two or three valleys, a linear distance across the mountains of approximately 2 km. However, this distance is actually much greater as they move over the mountain faces and down onto the thickly forested valley floors.

The speed of travel depended on several factors. Weather had an effect: at lower temperatures ( $<10^{\circ}\text{C}$ ), the monkeys moved swiftly, ate hastily, then moved to dry areas, such as the underbrush in stands of bamboo. At higher temperatures ( $11\text{--}30^{\circ}\text{C}$ ), they gathered on ledges, sunning, feeding, and resting. When other langur groups came into the area or were audible, the focal group responded usually they became agitated, calling or moving out of the area. When humans approached, they had two common responses. They would either stop what they were doing and sit quietly until the people passed or they would call and move out of sight in the trees.

### Activity Distribution

Resting was the most frequent behavior, comprising 33.7% of observations (Fig. 4). Monkeys rested along the rock ledges or in the trees growing from the karst. Feeding occupied 20.8% of observation time. Monkeys fed from trees along the rock face, or in the valleys. Play with another individual or a part thereof, such as its tail, constituted 20.2% of observation time. This large percentage is due to the numerous infants and juveniles in the focal group. We also scored mature individuals in play, but they were usually used as objects for play instead of being active participants. For example, an adult's tail may be swung on by juveniles (Fig. 4).

Movement was the third most frequent activity (13.6%). Movements include dramatic leaps as well as minor locational adjustments. Monkeys changed location not only to forage but also socially when traveling with reference to another group member.

Social grooming was relatively infrequent (7.3%). However, in the dense clusters of individuals that characterize resting patterns, we probably missed some grooming. We recorded vocalizations during 4.0% of scans. They included alarms when they heard humans or gunshots and when another primate species was nearby. We saw little (0.4%) sexual behavior (Fig. 4).

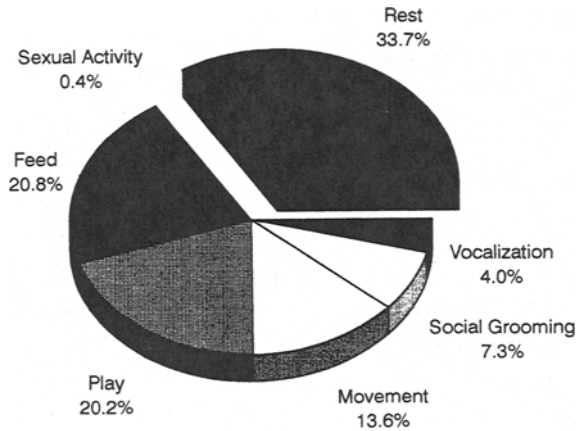


Fig. 4. Activity budget of *Presbytis francoisi leucocephalus*, Longzhou Nature Reserve. Taken from statistical averages over a four-month study period. Data from January–May 1993.

### Sympatric Associations

Sometimes we saw a species of macaques in the vicinity of the langurs. *Macaca mulatta*, *M. arctoides*, and *M. assamensis* all range within this area of southern Guangxi (Zhang *et al.*, 1991). Wu (1993) reported *M. mulatta*, *M. assamensis*, and *M. arctoides* sharing the same hill. Because macaques do not mix together (Zhang *et al.*, 1991) Burton and Chan (in manuscript) considered their association to be interspecific. *Macaca thibetana* is also found in Guangxi, where it is thought to number about 1500 individuals (Zhang *et al.*, 1991). We did not see them at Hua Shan.

When macaques and langurs were within sight of each other—100–125 m on opposite rock faces—they ignored one another. However, when we were threatened by a large golden macaque male (March 15, 1993), the langurs became agitated and moved closer to the macaques. From this vantage point they watched intently, but did not vocalize or threaten. In general, the macaques were considerably noisier than the leaf eaters were; they crashed through the foliage and vocalized. Whereas the leaf eaters moved on the rock face, macaque movements seemed to be restricted to the thicker trees (1–1.5 m) along the rock face, whose canopy reached  $\leq 40$  m from the valley floor. Both groups chose new buds on the trees and ate at a variety of heights, from the ground to the mountain peaks.

Among macaques, we most frequently observed a large-bodied species, whose tail length was about two-thirds the length of its thigh. The tail hair was fairly smooth and it had no tuft. The coat color was generally dark to golden brown with a lighter undercoat on the limbs, chest, and abdomen. Some individuals had darker faces and undercoats that did not contrast greatly with the back and shoulder pelage. The golden male that threatened us had hair on his cheeks though his face was glabrous. We consider them to be *Macaca assamensis*. Less frequently we probably observed *M. mulatta* that were of medium body size with a longer tail and a ruddy face. In mountains like those of Hua Shan, *Rhinopithecus roxellana* may be misidentified as *Macaca* spp. (Poirier, 1985). Given the lack of settlement beyond the river valleys in this mountainous area, there may be monkey species that have not yet been documented.

### Conservation

Within the past five years, the langurs were accustomed to a range that was closer to the edge of the mountains, nearer the village. However, with human encroachment their range is quickly diminishing. Since 1975, the landscape has changed considerably. This coincides with the end of the border conflicts with Vietnam, and the opening of Ning Ming to visitors, including tourists (Fairbank, 1992).

The mountains are economically significant to the local population, who utilize its resources in the rain forest valleys, gathering bamboo, lumber, and medicinal herbs and wood. Wood for construction constitutes 68.1% of vegetation removed, followed by firewood (12.6%), fencing (10.4%), bamboo (6.7%), and items (2.2%) used for toys, household utensils, and cattle yokes. Woodcutting is often clear-cutting, as villages gather bundles of poles, 3–4 m long, which they wrap in green vines. The diminution of wood resources is noticeable: even the younger people in the village remember when “. . . a good piece of wood was only a 10-min walk away, now it is >30 min” (personal communication, March 1993). In addition, the karst mountains themselves are being exploited. Karst limestone a chief component of cement and concrete. About half a kilometer upriver from Hua Shan, the mountain is dynamited for rock to process at the cement factory, outside of Ning Ming. Blasting not only destroys the forest and ecosystem, but also disturbs wildlife. Finally, plants of commercial value are removed from the reserve. Wild peach trees and the golden chameleon—a popular plant that only grows in the narrow climatic zone around Hua Shan—are sold in Ning Ming.

Tourism is growing in Hua Shan. The provincial government sponsors tours to view rock paintings and the monkeys. In the early 1980s, a hotel was built on the plain above the village. It can accommodate 60 people. And two more buildings, which house 60 people, have been built. The hotel workers have few ties to the land. Banana trees were planted to attract the monkeys for the tourists along the valley floor amid the mountains. Some bananas are sold as a cash crop in the nearby town. The increase in tourism means an increase in human interaction with the monkeys, as well as an increase in debris.

Military personnel from Ping Xiang maneuver in Hua Shan. Middle (secondary) school groups of 50–100 students also visit the forest for overnight trips to study ecology and resource management. These people leave batteries, plastic bags, and other rubbish on trails throughout the forest, as at other tourist areas in China (Smil, 1984). More frequent contact with humans can change the range and habitual rhythms of the monkeys (Zhao and Deng, 1992).

Traditionally, people hunted leaf-eating monkeys for the presumed medicinal value of their carpal bones. Current legislation forbids hunting monkeys in protected natural parks in the People's Republic of China (Ross and Silk, 1987). Indeed, the drastic measures taken to inhibit forest and animal destruction range from huge fines (Conservation Atlas, 1991) to prison sentences. In the Province of Yunnan penalties are the most stringent with the punishment depending on the severity of the crime (Liu, 1990, p. 24), though the laws are seldom enforced.

The situation of the monkeys of Hua Shan contrasts sharply with that of *P. francoisi leucocephalus* further east, where the effects of logging and economic development have left areas devoid of vegetation with concomitant changes in rainfall and temperature (Li, 1993, p. 90). In Hua Shan, tourism and economic development are only beginning to have an impact: There may be time to institute a policy that would accommodate human economic interests while retaining habitat for the rare leaf monkeys.

## DISCUSSION

Tan (1957) proposed a separate species for the white-headed langur. We agree with Li and Ma (1980) that they are only a racial variant—one of six proposed subspecies based on regional variations in the amount of white in the coat (Ma *et al.*, 1989). The leaf monkeys of Hua Shan include intermediate forms between *Presbytis francoisi francoisi* and *P. francoisi leucocephalus* (Ma *et al.*, 1989). Within the Hua Shan study group, variation in hair coloring was extensive. Head and coats were all black, with a bit

of white or white mantled, white headed, and black crowned with white sides. Tails had varying amounts of white and black. The Hua Shan leaf-eating monkey are members of the *crinata* group (Thorington and Groves, 1970), whose infants have an orange neonatal pelage that follows developmental stages quite similar to those of the black capped langur, *Presbytis pileata*.

The average maximum group number, calculated by age category for the study period, is 26. The daily maximum of animals visible is 18, which is similar to Lai's maximum of 20 group members in large groups of white-headed leaf monkeys (Lai, 1987). Jiang *et al.* (1991) report a maximum of 22 individuals. The range of group size for 166 white-headed leaf-eating monkeys in 28 groups at Fusui is 2–16 (Lu *et al.*, 1993). Group sizes of southeast Asian colobines generally range from 3 to 50 members (Wolfheim, 1983), with most species having between 10 and 18 individuals (Stanford, 1991; Brandon-Jones, 1984; Burton, 1995). Lu *et al.* (1993) found that 68% of their total population were adults, with 20% young and 12% infants, whereas our group was more evenly balanced between adults and younger animals (Table I). The factors affecting group size are intimately related to ecological variables. With habitat destruction, group sizes are becoming more variable. Our data suggest that greatest loss occurs at the juvenile stage. This age class is particularly vulnerable because they are independent of their mothers and busy exploring, but are not yet experienced.

We observed infants in neonatal pelage, and the presence of very young juveniles beginning to develop adult pelage, which accords with the findings of Lai (1987) and Jiang *et al.* (1991). They note that while there appear to be more births in early spring, there is no sharply demarcated birth season. The Hua Shan leaf monkeys are not top heavy in age-grade distribution, suggesting that human economic activities have not altered the relationship between them and their food resources. Jiang *et al.* (1991) listed the plants utilized by this species in nearby areas. In Table II we note some plants that the monkeys at Hua Shan also use. *Presbytis francoisi leucocephalus* extensively exploit plant life in all stages of growth at a variety of locations: diagonal to rock faces, in lush valleys, and on the ground.

Their use of habitat is reminiscent of other rock-dwelling colobines, particularly *Presbytis francoisi delacouri* of North Vietnam (Brandon-Jones, 1984). However, the Hua Shan leaf monkeys appear to occupy a greater range across the mountains, spending part of their time on the peaks as well as on the ground. They sit in trees growing from the karst face or rock ledges. Sometimes they walk on the ground.

The percentages of observation time that they spent in different activities are broadly comparable to those of other Asian colobines (e.g.,

Table II. Diet of *Presbytis francoisi* According to Jiang *et al.* (1991, p. 237)<sup>a</sup>

Kind of Plant	Part Eaten				Season of Eating			
	LE	St	Fl	Fr	Sp	Su	Au	Wi
<i>Gossampinus malabarica</i> <sup>b</sup>			+		-			
<i>Cassytna filiformis</i> <sup>b</sup>		+			-	-	-	-
<i>Bridelia monoica</i> <sup>b</sup>	+				-	-	-	-
<i>Ficus microcapa</i> <sup>b</sup>	++			++	-	-	-	-
<i>Vimus parvifolia</i>	++				-	-	-	-
<i>Pyrus pyrifolia</i>	++			++	-	-		
<i>Pyrus serrulata</i>	+			+				
<i>Dracomlomon dao</i>	+				-	-	-	-
<i>Citrus grandis</i> <sup>b</sup>	+			++			-	-
<i>Celtis sinensis</i> <sup>b</sup>	++				-	-	-	-
<i>Ligustrum sinense</i> <sup>b</sup>	+++		+++		-	-	-	-
<i>Ligustrum lucidum</i> <sup>b</sup>	+++			+++	-	-	-	-
<i>Jasminum sambac</i> <sup>b</sup>	++		+++			-		
<i>Paederia scandens</i>	+				-	-	-	-
<i>Morus alba</i>	+++		+++		-	-	-	-
<i>Ficus benamina</i> <sup>b</sup>	++			++	-	-	-	-
<i>Polygonum chinense</i>	+	+	+	+	-	-	-	-
<i>Hibiscus rosa sinensis</i> <sup>b</sup>	+		+		-	-	-	-

<sup>a</sup>Le = leaf, St = stem, Fl = flower, Fr = fruit, Sp = spring, Su = summer, Au = autumn, Wi = winter.

<sup>b</sup>Plants consumed at Hua Shan.

Islam and Husain, 1982; Stanford, 1991). Local variables, such as climate, habitat, and other species (including humans), influence behavior patterns even within the same taxon. Huang and Lu (1993) showed how sun and rainfall influence the behavior strategies of white-headed langurs at Fusui. At Hua Shan, variables like the presence of other monkey species and human visitors affect their daily patterns of ranging and activity.

The commensal relationship of the leaf monkeys with large and small-bodied macaque species is consistent with interspecific associations among other species (Richard, 1985; Waser, 1987; Burton and Chan, in manuscript). While the colobines listened to and looked at the macaques, they did not react to them otherwise. The macaques appeared entirely indifferent to the presence of the colobines.

On the basis of monkey populations at Mt. Emei, (Zhao and Deng, 1992), Lushan (Smil, 1984), and Praben (Li, 1992, 1993), the progressive destructive of habitat due to tourism and use of lumber will cause changes in demography and social behavior. Predictably, group size should increase as local groups amalgamate. Social methods of tolerance (grooming, ignoring) and space-increasing behaviors should occur. The People's Republic

of China recently included the environment and wildlife in the constitution of the country (Ross *et al.*, 1987; Liu, 1990, p. 24). However, there is reluctance to accept protective policies.

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