

## GROUP COMPOSITION AND SEX RATIO IN HANUMAN LANGURS (*SEMNOPTHECUS ENTELLUS*) IN THE ARAVALI HILLS OF RAJASTHAN, INDIA

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### Abstract

In the present study a total 16 groups of Hanuman Langurs (*Semnopithecus entellus*), including 11 unimale bisexual troops and five all male bands with a population of 540 animals, were observed at Kumbhalgarh Wildlife Sanctuary in the Aravalli Hills. They were studied for their group size, composition, sex ratio, etc. For this three focal troops BS-2, BS-5 and BS-10 were observed in three different eco-systems. The mean troop size was 41.7 (range 19 to 113) and the mean band size was 15.6 (range 8 to 32). The adult male-female sex ratio comes to 1: 4.6 in the study area.

### Keywords

*Hanuman Langur*, *Semnopithecus entellus*, census, group size, focal troops, population, sex ratio, composition, Kumbhalgarh Wildlife Sanctuary (KWS), Aravalli Hills

### Introduction

The Hanuman Langur, *Semnopithecus entellus* (Primates: Cercopithecidae: Colobine), is the most widely distributed of the 19 non-human primate species found in the Indian subcontinent. It is a highly adaptive species (Roonwal & Mohnot, 1977; Wolfhemin, 1983; Chhangani, 2000). It is found from the snow clad peaks of the Himalaya (up to about 4100 m altitude) in the north to Cape Camorin in the south and from the fringe of the great Indian desert in the west to Bengal in the east (Roonwal & Mohnot, 1977; Mohnot 2001). The Hanuman Langur is largely a deciduous or dry deciduous forest animal and prefers dry tropical forest, scrub jungles and arid rocky area with xerophytic vegetation. Since the natural habitat of the langur is being eroded at a fast pace, its presence near human habitations and religious places is a common sight (Chhangani, 2000). Because of its ruminant-like digestion (Bauchop & Martucci, 1968), it can utilize a wide variety of food items.

Hanuman Langurs live in social groups of various sizes and compositions. There are "unimale bisexual groups" comprised of male infants, juveniles, and females of all ages and an adult male; "multimale bisexual groups" are comprised of males and females of all ages, "all male groups" (all-male band) are comprised of males of all ages except infant or breast feeders. The group size varies from 2-3 to 80-90, or in exceptional cases up to 125 or even more. A "unimale bisexual group" is generally composed of only one adult male, zero to a few sub adult males and females, zero to a few juvenile males and females, several adult females and infants of both sexes. The number of adult males in multimale bisexual groups may vary from one to several; the adult sex ratio being uneven as one male to nine females (average 1:1.8 to 1:5.6) (Winkler, 1981; Newton, 1984; Rajpurohit, 1992; Mohnot, 2001).

### Study area

The Kumbhalgarh Wildlife Sanctuary (KWS) lies between 20°5' & 23°3' N and 73°15' & 73°45' E about 200km south of Jodhpur in the west Aravalli hills of Rajasthan, India (Fig. 1). The total area of KWS is 585km. Its altitude varies from 274 to 1155m above sea level. KWS is characterized by distinct winter, summer and monsoon. During summer, temperature fluctuates between 30°C and 48°C. The minimum temperature in winter is 5°C, which may go down to 2°C in December – January. The average annual rainfall is 725mm, with a minimum 403mm and maximum 950mm. The forest is broadly dry deciduous or woodland type dominated by *Kala dhawa* (*Anogeisus pendula*), *Gorya dhawa* (*Anogeisus latifolia*), *Salar* (*Boswellia serrata*), *Godal* (*Lannea coromandelica*), *Kherni* (*Wrightia tinctoria*), *Dhawa* (*Anogisus pendula*), *Kumbat* (*Acacia Senegal*), *Khair* (*Acacia catechu*), *Ber* (*Ziziphus mauritiana*), *Dhonk* (*Butea monosperma*) etc. The undergrowth mainly consists of *Jharber* (*Ziziphus nummularia*), *Ardua* (*Adhatoda zeylanica*), *Gangan* (*Grewia tenex*), *Franger* (*Grewia flavescens*), *Kanter* (*Capparis separaia*), *Lantana* (*Lantana camara*), etc. Some climbers and grasses are also found. The main fauna of KWS includes Leopard (*Panthera pardus*), Hyena (*Hyaena hyaena*), Indian

Manuscript received 5 January 2002; Revised manuscript received 17 May 2002; Accepted for publication 21 June 2002

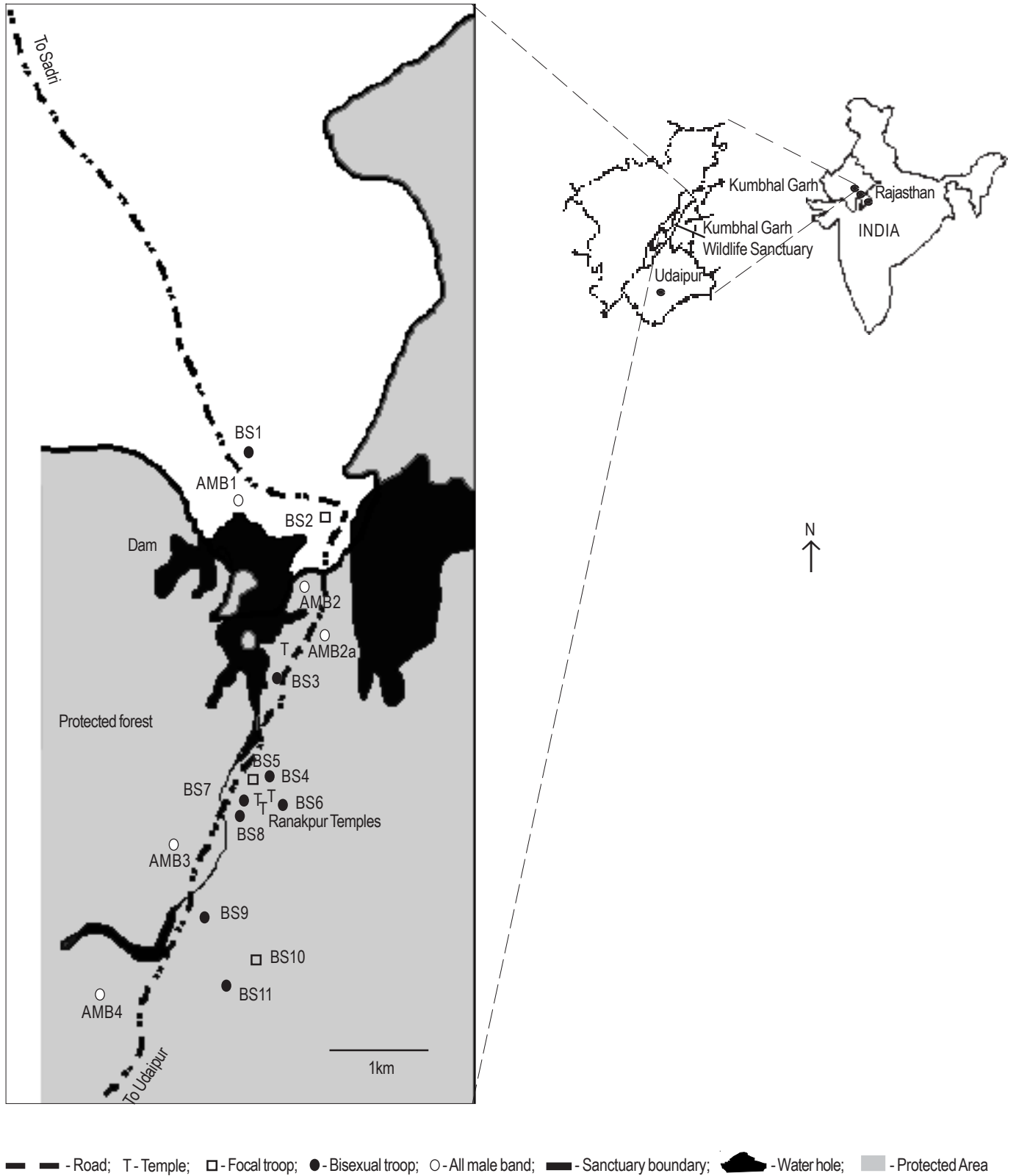


Figure 1. Location of Hanuman Langur troops and bands in Kumbhalgarh Wildlife Sanctuary

Wolf (*Canis lupus*), Jackal (*Canis aureus*), Sloth Bear (*Melursus ursinus*), Four-horned Antelope (*Tetracerus quadricornis*), Chinkara (*Gazella gazella*), Porcupine (*Hystrix indica*), Sambar (*Cervus unicolor*), Blue Bull (*Boselaphus tragocamelus*), Toddy Cat (*Paradoxorus hermaphroditus*), Jungle Cat (*Felis chaus*), Fox (*Vulpes bengalensis*), Crocodile (*Crocodilus palustris*) and Rock Python (*Python molurus*).

## Material and Methods

The study was initiated in December 1995. During a period of three and half years (up to August, 1999), over 6500 hours of field observations were devoted to this study in an area of 40 sq km in and around some parts of KWS. More than 4500 hours were devoted to focal troop study and the rest for census, phenology of plants and scat collection. In addition to the annual census of population, groups were followed periodically. Census data was obtained during progressions from one site to another during early mornings and late evenings. Besides, occasional counting was undertaken when troops were at rest in the afternoon. Efforts were made to recognize sex of all individuals including infants and juveniles. The large-sized troops were counted twice or thrice enabling correct identification of young animals. However, there may be some chance of moderate degree of error in determining age classification

**Table 1. Census of Hanuman Langur study groups in and around Kumbhalgarh Wildlife Sanctuary**

Locations	1997	1998	1999
Filter House	16	18	19
Ranakpur Dam	4	5	8
Savika Restaurant	38	40	43
Near Amba Temple	34	37	32
Near Amba Temple (Census 1999)	-	-	9
At Amba Temple	17	17	18
Forest Naka	36	38	42
Ranakpur Maingate	31	34	37
Ranakpur Dharamshala	20	24	26
Ranakpur Main temple	24	26	30
Sun temple	105	110	113
Dargah	9	8	9
Milestone Malgarh 2km	80	75	74
River side	33	34	32
River turn	23	21	20
Milestone Malgarh 2 km	27	26	28
Total	497	513	540

especially when the animals confined themselves in tree canopies in the interior of the forest, and individuals who were in the transitional phase, between sub adult and young adult, between juvenile to sub adults and between infants to juvenile phase. In this study, group data was collected on libitum basis as well as by scan and focal sampling methods of Altmann, 1974.

## Results

Annual census carried out at KWS during the study period showed an increasing trend in the Hanuman Langur population. The census of 1997 covering 11 bisexual troops and four all male bands yielded 497 animals. In 1998, this population increased to 513 with a net gain of 16 individuals. In 1999, the population reached to 540 with an increase of 27 individuals (Table 1).

**Focal troops:** Out of 16 study groups (11 bisexual and 5 bands) three troops were selected as focal troops living in different ecosystems for long-term behavioural study. These three focal troops were living in three different ecological conditions. By and large, the three ecological sets were uniform as far as climate, rainfall, topography, altitude, vegetation, etc. were concerned, but, there were variations in biotic factors like, predation pressure, artificial feeding, cattle grazing, wood cutting, agricultural activity, human settlement, etc. These focal bisexual troops were B-2 located near Savik Restaurant, troop B-5 was located near Ranakpur temple and troop B-10 was found in the interior of the forest of KWS. Factors that influence these troops are as follows:

Factors	I	II	III
Human interference	Present	Present	Absent
Human settlements	Present	Present	Absent
Grazing	Allowed	Allowed	Not allowed
Tree cutting	Present	Present	Absent
Artificial feeding	Absent	Present	Absent
Agricultural activity	Present	Absent	Absent
Highway traffic	Present	Present	Absent
Predators	Panther, Jackals, Wolf, dog, etc.	Dogs only	Panther, Hyaena, Wolf, Jackals, etc.

I - Ecosystem-I - Focal Troop 1 (B-2) Ranakpur Dam;  
II - Ecosystem-II - Focal Troop 2 (B-5) Ranakpur main gate  
III - Ecosystem-III - Focal Troop 3 (B-10) interior forest

These 16 troops belonged to three different ecosystems. Troops 1-6 belonged to disturbed forest ecosystem; troops 7-11 belonged to temple ecosystem and troops and bands 12-16 were in undisturbed forest ecosystem (Fig. 1).

During June 1999, we found a split in focal troop AMB-2 forming two subtroops AMB-2 and AMB-2a as follows:

Date	Troop 2	Alpha	A	YA	SA	Ju	Total
June, 1998	AMB-2	2	13	6	9	6	37
June, 1999	AMB-2	1	7	6	7	8	32
	AMB-2a	0	5	2	1	1	9

A - adult; YA - young adult; SA - subadult; Ju - juvenile

**Composition of focal troops:** For better understanding of troop structure, all the three focal troops were studied for their composition during the study period.

Details of the study troops B-2, B-5 and B-10 are given in Table 2.

## Discussion

The census and social organisation studies conducted at KWS revealed a clear-cut existence of unimale bisexual and all-male pattern, which constitute the langur population. The same situation prevails in Jodhpur langur population as found in the last three decades. According to 1999 census at KWS based on 16 groups, 68.75% troops were unimale and 31.25% were all male and 28.4% all-male bands. About 150km from KWS, the langur population at Mt. Abu was comprised of 86% unimale and 16% male bands observed by Hardy (1977). Likewise, in Madhav National Park, 71.4% were unimale and 28.5% were male bands in 14 troops surveyed by Kankane (1984).

Kumbhalgarh, Jodhpur, Mt. Abu and Kanha are unimale troop habitats. There are habitats in India which represent only the

multimale troops, like Kaukori and Orcha (Jay, 1963), Bhimtal (Vogel, 1971) and Shimla (Sugiyama, 1976). In Nepal, at Melemchi (Bishop, 1975, 1979) and at Sukhumbu (Bogges, 1979), the groups were mostly multimale.

The population status and its fluctuation depend mainly on births, deaths and immigration in troops and bands. There appears to be some variation in troop composition from one habitat to another. The mean troop size at KWS was 41.72 (range, 19-113). Mean troop size of other areas are: Sariska, Rajasthan 64 (range 30-125) and Bhimtal (Kumaon Hills) 23 (range 15-30) (Vogel, 1971, 1973); Kanha 21 (range 15-30) (Newton, 1987); Gir forest, Gujarat 30 (range 16-48) (Rahman, 1973); Madhav National Park 21.2 and 21.7 (range 8-37) (Kankane, 1984); Ramnagar, Nepal 18.3 (range 6-41) (Koenig *et al.*, 1998); and Jodhpur, Rajasthan 44.9 (range 6-129) (Mohnot 1999).

The sex ratio in Hanuman Langur varies greatly from place to place and year to year. Comparison of data from several field sites (Sugiyama, 1964; Jay, 1965; Yoshiba, 1968; Mohnot, 1974; Newton, 1984; Agoramoorthy, 1987; Rajpurohit, 1987; Srivastava, 1989; Mohnot 1999; present study) suggests that the sex ratio in Hanuman langurs in female biased.

## Acknowledgement

This study is a part of Indo-US Primate Project, a collaborative programme of the Ministry of Environment and Forests, Government of India, and the U.S. Fish & Wildlife Service. (Grant

**Table 2. Composition of focal troops B-2, B-5 and B-10**

Year	Adult		Sub adult		Juvenile		WC		Infants		BC		Total
	M	F	M	F	M	F	M	F	M	F	M	F	
<b>Troop B-2</b>													
1997	1	15	0	0	0	2	7	4	2	2	3	2	38
1998	1	15	0	3	6	4	3	3	1	1	2	1	40
1999	1	18	0	2	5	4	4	3	2	2	1	1	43
<b>Troops B-5</b>													
1997	1	15	0	0	1	2	5	4	0	0	1	1	30
1998	1	14	1	2	4	2	4	2	1	0	2	1	34
1999	1	15	4	2	3	2	4	3	1	1	1	0	37
<b>Troops B-10</b>													
1997	1	17	0	0	0	2	4	2	2	1	2	2	33
1998	1	16		2	3	2	3	3	0	1	2	1	34
1999	1	16	0	2	0	3	3	4	1	0	1	1	32

M- male; F - female; WC - white coat; CC - changing coat; BC - black coat infants

Agreement No. INT/FWS-22). I would like to thank Prof. S.M. Mohnot, Director, Indo-US Primate Project, Dr. Ashok Purohit, Head, Department of Zoology, J.N.V. University., the State Forest Department staff and officials of Kumbhalgarh Wildlife Sanctuary, especially A.C.F. Shri Lalit Singh Ranawat and Shri Sukhdave and Shri Madan Mali, Field Assistants for their support during this field study.

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