A Comparison of the Sleeping Behavior of Three Sympatric Primates

A Preliminary Report

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Introduction

The initial findings on the sleeping habits of three sympatric primates, the Nilgiri langur (Trachypithecus johnii), the Hanuman langur (Semnopithecus entellus) and bonnet macaque (Macaca radiata) are described. Hanuman langurs are a highly adaptable species, found throughout the Indian subcontinent; Nilgiri langurs are endemic to the forests of the Western Ghats in southern India [1]. Bonnet macaques, like the Hanuman langurs, are highly adaptable and are distributed throughout peninsular India [2]. In regions of sympathy, bonnet macaques are often found in association with Hanuman langurs and Nilgiri langurs. Nilgiri langurs and Hanuman langurs, although found in contiguous patches of forest, usually occupy mutually exclusive areas within these forests. The social structures of these three species differ; bonnet macaques form multimale-multifemale social groups [3], Nilgiri langurs usually form single-male-multifemale social groups [4] and Hanuman langurs form both types of social groups [5].

Methods

Data collection was conducted between June 1996 and October 1997, in the Kalakad-Mundanthurai Tiger Reserve in southern India (8°25' to 8°53' N, 77°10' to 77°35' E). To compare sleeping behavior among these primates, individuals were classified into one of four age categories — infants, juveniles, subadults and adults. We measured tree height, bole height and height of major branches of
the sleeping trees using a clinometer. This information was used to create a schematic diagram of each sleeping tree. Other information recorded was the proximity of the sleeping tree to a stream or river, as well as its distance to the nearest human settlement. For each species, we selected one troop for observation and recorded the location, age and sex of all individuals within each sleeping tree, using binoculars (x 7 magnification) equipped with a narrow-beamed flashlight. Sampling occurred for 5 nights randomly throughout the study period.

Results

We initially confirmed that the three sympatric primates face similar predatory threats by analyzing leopard and tiger scat collected at the park [6]. While no evidence of primate predation was found in tiger scat, we found evidence of all three species in leopard scat. The bonnet macaque troop selected for observation used the same sleeping tree every night, for all 5 nights of observation (tree height = 21 m, bole height = 10 m). The Hanuman langur troop selected the same tree for 4 nights of observation (tree height = 23 m, bole height = 6 m), and a second tree for the fifth night of observation (tree height = 20 m, bole height = 6 m). The Nilgiri langur troop selected 3 different sleeping trees on the 5 nights of observation (tree height = 19 m, bole height = 8 m; tree height = 20 m, bole height = 8.5 m, and tree height = 23 m, bole height = 12 m, respectively).

For analyses of sleeping behavior, we randomly selected one night of observation for each species and applied one-factor analyses of variance (ANOVA) to each measure (data were normally distributed), followed by Bonferroni pairwise comparisons of mean values between species. Analyses of the sleeping behavior found that the three species differed significantly in the mean height of branches selected to sleep on (F = 22.45; d.f. = 2; p < 0.01). Bonferroni pairwise comparisons between species revealed that bonnet macaques selected branches that were significantly lower than either of the langur species. The three species also differed significantly in the mean distance of individuals from the main trunk (F = 8.09; d.f. = 2; p < 0.01), with bonnet macaques selecting locations significantly closer to the main trunk. A comparison of the size of sleeping clusters on a branch revealed significant differences between species (F = 80.04; d.f. = 2; p < 0.01), with bonnet macaques forming significantly larger sleeping clusters on a branch than either langur species. The langur species did not differ significantly from each other for these measures. While the sample sizes precluded statistical analysis, it appeared that Nilgiri langurs selected sleeping trees that were further away from human settlements than either Hanuman langurs or bonnet macaques. All three species selected trees adjacent to water.

Comparisons of sleeping behavior within species revealed that, among the langurs, adults slept significantly higher than subadults (F = 6.39, d.f. = 2; p < 0.01) and males slept higher than females (F = 4.26; d.f. = 2; p < 0.01). Bonnet macaques did not show this pattern of sex and age differences (p = n.s.).

Discussion

Our observations revealed that Nilgiri langurs, Hanuman langurs and bonnet macaques slept on tall trees with high boles, features that make the tree difficult for terrestrial predators to climb. By usually sleeping alone on separate branches, langurs
could select branches that were both higher and further from the main trunk than bonnet macaques that slept in clusters, constrained by cumulative body weight [7]. By sleeping away from the main trunk, individuals might be less accessible to heavier arboreal predators such as leopards. For bonnet macaques, sleeping in clusters might serve to dilute predation risk, as well as to afford predator deterrence via early predator detection and mobbing [3, 8]. Mobbing would likely be a more effective strategy among bonnet macaques than among langurs, since macaques have larger canines than langurs [9].

Adult langurs usually selected the highest branches of sleeping trees and we observed that smaller, presumably less dominant individuals were attacked if they tried to climb higher. Adult females were found on branches below adult males, with the lowest branches occupied by subadults. Bonnet macaques did not show such well-defined patterns in branch choice as a function of age and sex. These differences in sleeping pattern between bonnet macaques and langurs could be the result of differences in the social organization between these species.

Bonnet macaques and Hanuman langurs preferentially select sleeping trees close to human settlements [10], probably to reduce the risk of nighttime attacks from predators that tend to avoid humans. Nilgiri langurs, on the other hand, did not appear to choose sleeping sites close to human settlements. This could be the result of Nilgiri langurs being occasionally hunted by humans for folk medicine [4]. Future research on these primates will augment these initial findings, focusing on the social organization of sleeping behavior.

References