

Nesting sites of Indian giant squirrels in Sitanadi Wildlife Sanctuary, India

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The Indian giant squirrel *Ratufa indica* is distributed in peninsular India, south of the river Ganges. Although several ecological studies have been conducted on the species in India, little is known about its nesting behaviour in central India. The objective of this article is to give a brief account of its nesting sites in the Sitanadi Wildlife Sanctuary, Chhattisgarh. A total of 224 nests of Indian giant squirrels were located from February to June 2005 and in February 2006. The implications of the results for the conservation and management of the squirrel habitat in this sanctuary have been discussed in this article.

Keywords: Indian giant squirrel, nesting site, nesting tree, protected area, riparian habitat.

Introduction

THE Indian giant squirrel *Ratufa indica* is widely distributed in peninsular India, south of the River Ganges¹. There have been several studies on the ecology and behaviour of the species in southern India, including those on their foraging strategies and patterns of predation²⁻⁶. Ecological studies on the species in central India are, however, fewer and include those in the Bori Wildlife Sanctuary⁷⁻⁹ and Satpura National Park¹⁰. The objective of this article is to give a brief account of the Indian giant squirrel's nesting and feeding behaviour in Sitanadi Wildlife Sanctuary, Chhattisgarh, central India.

Study site

The Sitanadi Wildlife Sanctuary covers an area of 566.99 km² (reserved forests: 555.84 km², protected forests: 2.82 km² and six revenue villages: 8.33 km²)¹¹. There are also 29 forest villages within the reserved forests. The entire area is undulating (altitude ranging from 450 to 680 m asl) and lies in the basin of the Mahanadi River. The Sondhur River forms the eastern boundary of the sanctuary and a dam was constructed across it in 1988. According to Champion and Seth's classification of forests¹², the forest types identified in the sanctuary include dry teak forest, dry peninsular sal forest and north dry mixed deciduous

forest. Natural teak forests are mostly found in patches on the alluvial soil along the streams and rivers, while teak plantations have been established in other areas.

Methodology

Observations were conducted in the Sitanadi Wildlife Sanctuary from February to June 2005 and in February 2006, seasons when most trees are leafless. The large globular nests of the giant squirrels become conspicuous when these trees are bare¹. Observations on the squirrels and their nests were opportunistically conducted while patrolling and performing other fieldwork in the forest. Illustrations¹ of the animal and the nest were shown to the field staff and other personnel employed in the sanctuary, and they too were requested to locate nesting trees of the squirrels. The vernacular names of the tree species were recorded, while their scientific names and the phenology patterns were ascertained from other sources^{13,14}.

Results and discussion

Ten nesting sites of the Indian giant squirrel were identified in the Sitanadi Wildlife Sanctuary and all of these occurred in dense forest with closed canopies and crown density ranging from 0.6 to nearly 1.0. All the sites were along the annual rivers, which either retain pools of stagnant water at some places or sufficient moisture in summer. The vegetation was dominated by *Schleichera oleosa*, *Terminalia arjuna*, *Terminalia tomentosa*, *Mangifera indica*, *Syzygium cumini*, *Eugenia heyneana*, *Ficus racemosa*, *Ficus lacor*, *Ficus bengalensis* and *Stereospermum chelonoides*, all of which are characteristic of riverine or riparian areas.

Two hundred and twenty-four nests of Indian giant squirrels were located on 207 nest trees belonging to 30 species and 16 families (Table 1). Giant squirrels are known to build nests in several trees, sometimes even within a small area¹. The tree species with multiple nests were *Pterocarpus marsupium*, *S. chelonoides*, *Bridelia squamosa*, *T. arjuna*, *M. indica* and *S. oleosa*.

The most common nesting trees were *T. tomentosa* and *S. oleosa*, which supported 14.73% and 13.39% of the nests respectively (Table 1). The other major species of nesting trees were *S. cumini*, *S. robusta*, *M. indica*,

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Table 1. Nesting trees of the Indian giant squirrel at Sitanadi Wildlife Sanctuary

| Family | Species | Habit | Leaf fall period | Leaf renewal period | Percentage of nests |
|------------------|---------------------------------|-------|------------------|---------------------|---------------------|
| Anacardiaceae | <i>Lannea coromandelica</i> | D | Nov–Dec | Jun | 1.34 |
| | <i>Mangifera indica</i> | E | – | Feb–Mar | 8.48 |
| Artocarpeae | <i>Ficus bengalensis</i> | E | – | Apr | 2.23 |
| | <i>Ficus infectoria</i> | D | Jan–Feb | Mar–Apr | 0.45 |
| | <i>Ficus racemosa</i> | D | Nov–Dec | Jan–Feb | 0.45 |
| Bignoniaceae | <i>Stereospermum suaveolens</i> | D | Feb–Mar | Jun | 3.13 |
| Burseraceae | <i>Garuga pinnata</i> | D | Dec–Jan | Jun | 0.89 |
| Combretaceae | <i>Anogeissus latifolia</i> | D | Jan–Feb | Mar–Apr | 2.23 |
| | <i>Terminalia arjuna</i> | D | Mar–Apr | Apr–May | 6.70 |
| | <i>Terminalia bellerica</i> | D | Feb–Mar | Apr–May | 0.45 |
| | <i>Terminalia tomentosa</i> | D | Feb–Mar | Jun | 14.73 |
| Dipterocarpaceae | <i>Shorea robusta</i> | D | Feb–Mar | Mar–Apr | 8.93 |
| Ebenaceae | <i>Diospyros melanoxylon</i> | D | Apr–May | May–Jun | 1.34 |
| Euphorbiaceae | <i>Bridelia squamosa</i> | D | Mar–Apr | Apr–May | 2.68 |
| | <i>Cleistanthus collinus</i> | D | Feb | May | 5.80 |
| | <i>Mallotus philippiensis</i> | E | – | – | 0.89 |
| Leguminaceae | <i>Bauhinia racemosa</i> | D | Mar–Apr | Apr–Jun | 0.45 |
| | <i>Ougeinia dalbergioides</i> | D | Jan–Feb | Apr | 3.13 |
| | <i>Pterocarpus marsupium</i> | D | Mar–May | Jun | 2.23 |
| | <i>Tamarindus indica</i> | E | – | – | 1.34 |
| Lythraceae | <i>Lagerstroemia parviflora</i> | D | Feb–Mar | May–Jun | 0.45 |
| Malvaceae | <i>Kydia calycina</i> | D | Feb | Apr–May | 0.89 |
| Myrtaceae | <i>Careya arborea</i> | D | Jan–Feb | Apr | 0.89 |
| | <i>Syzygium cumini</i> | E | – | Mar–Apr | 9.38 |
| Oleaceae | <i>Schrebera swietenoides</i> | D | Jan–Feb | Mar | 1.79 |
| Rubiaceae | <i>Adina cordifolia</i> | D | Mar–Apr | May–Jun | 1.34 |
| | <i>Mitragyno parvifolia</i> | D | Feb–Mar | May–Jun | 2.23 |
| Sapindaceae | <i>Schleichera oleosa</i> | D | Jan–Feb | Mar | 13.39 |
| Verbenaceae | <i>Gmelina arborea</i> | D | Feb–Mar | Apr–May | 0.45 |
| | <i>Tectona grandis</i> | D | Nov–Dec | Jul | 1.34 |

D – Deciduous, E – Evergreen.

Table 2. Food habits of the Indian giant squirrel at Sitanadi Wildlife Sanctuary

| Tree species | Part consumed |
|-------------------------------|---------------|
| <i>Tamarindus indica</i> | Leaf |
| <i>Bauhinia purpuria</i> | Leaf |
| <i>Mangifera indica</i> | Fruit |
| <i>Bridelia squamosa</i> | Fruit |
| <i>Terminalia tomentosa</i> | Fruit |
| <i>Terminalia arjuna</i> | Fruit |
| <i>Mallotus philippiensis</i> | Fruit |
| <i>Diospyros malabarica</i> | Fruit |
| <i>Diospyros melanoxylon</i> | Fruit |
| <i>Schleichera oleosa</i> | Fruit |
| <i>Ventilago denticulata</i> | Fruit |
| <i>Garuga pinnata</i> | Fruit |
| <i>Bombax ceiba</i> | Flower |
| <i>Cordia obliqua</i> | Flower |
| <i>Ficus bengalensis</i> | Fruit |
| <i>Ficus racemosa</i> | Fruit |
| <i>Ficus religiosa</i> | Fruit |
| <i>Ficus virens</i> | Fruit |

T. arjuna and *Cleistanthus collinus*, with a total of 39.29% of the nests. Approximately 77.68% of the nests were on deciduous trees (25 species), while only five species of nesting trees were evergreen (22.32% of the

nests). In this sanctuary, the squirrels thus nested in deciduous trees significantly more than in evergreen trees ($\chi^2 = 68.64, P < 0.0001$).

About 60% of the nesting trees were found to be clad with climbers of *Spatholobous parviflorus*, *Ventilagocauliculata* sp. and *Butea superba*. One nest was found in a dead standing tree of *S. robusta* without bark and clad with climbers in the marshy tail area of the Sondhur Reservoir.

During the study period, the squirrels were observed to eat newly flushed leaves of *Tamarindus indica* and *Bauhinia purpuria*, ripe fruit pulp of *M. indica*, figs, and fruits and flowers of a variety of other trees (Table 2). Overall, they fed on a total of 18 tree species and three different plant parts (fruits, leaves and flowers). About 37% (11 species) of the nesting trees served as food trees for the squirrels as well.

Various pressures within the sanctuary threaten the habitat used by the giant squirrels. Frequent forest fires in the summer season, intensive grazing by cattle and faulty agricultural practices in some of the 34 villages inside the sanctuary are rapidly accelerating soil erosion in many areas. The Sitanadi river and its tributaries have progressively filled up with sand and silt, become shallow and have even changed their course in the low-lying plain areas.

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The embankments of the rivers are unstable and prone to erosion, with trees often uprooted during the monsoons.

About 945 ha of forest has been submerged by the Sondhur Reservoir. In addition, many trees have died in its marshy tail areas. A recent proposal has suggested increasing the full reservoir level from 463 to 471 m, which would further submerge another 1080 ha of prime forest habitat for wildlife, including the giant squirrels.

The local people often exploit the climber *Bauhinia vahllii* for its bark and leaves, the fibrous bark being used for making rope and its leaves for plates. The other species that are often felled include young trees of *Emblica officinalis*, *Buchanania angustifolia* and *Diospyros melanoxylon* for their edible fruits, and *D. melanoxylon* for its leaves, which are used to wrap tobacco to make 'bidis' (country-made cigarettes). Young trees of *T. tomentosa* and *S. robusta* are cut to collect tusser cocoon; *B. purpuria* lopped to harvest new shoots and floral buds of *Cordia obliqua* plucked heavily to be sold in the local markets as vegetables. Old and hollow trees are also damaged or felled during the extraction of honey. While such activities do sustain local economies, they clearly impact the status of the forests as well.

It is essential to conserve the forest habitats of the sanctuary if we are to save the giant squirrels and other wildlife from local extinction. The villages inside the sanctuary should be rehabilitated outside, while grazing should be banned. Soil conservation and riverbank stabilization projects need to be implemented immediately and forest fires prevented. Finally, research needs to be urgently initiated on the wildlife of the sanctuary and their habitat requirements in order to accurately forecast the impacts of disturbance on the native flora and fauna.

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