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Comparison of Nesting site preferences of *Ratufa indica indica* in Umblebyle Range Forest 2021 and 2022

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ABSTRACT

Ratufa indica indica is a gaint arboreal squirrel species endemic to India, common to Western Ghats. The study is designed to compare Nesting site preferences of *Ratufa indica indica* conducted in 2022 with the studies from 2021 in the Umblebyle range forest of Shimoga. The study uses Line transect methodology which was plotted using Arc GIS that includes 20 line transects of 47.7 kms covering a total area of 8350.89ha. Study from 2021 showed a total of 406 dreys (nests) constructed on 385 trees while the one from 2022 showed a total of 455 dreys constructed on 415 trees. The nest trees from 2021 belonged to 20 families and 41 species while the one from 2022 belonged to 22 families and 36 species with highest preference Family Fabaceae that included 12 tree species in 2021 and 8 tree species in 2022 respectively. *Terminalia paniculata* was most preferred tree species that included 84 and 85 trees in 2021 and 2022 respectively.The study also showed the animal preferred average tree height of 16.18 ± 3.43 (2021) and 18.05 ± 3.485m (2022). The studies further showed preference of *Ratufa indica indica* for deciduous trees over semi-evergreen and evergreen trees.

Key words: *Ratufa indica indica, Dreys, Umblebyle range, Nest tree preferences, Shimoga.*

Introduction

Ratufa indica indica is a cat sized arboreal gaint squirrel species endemic to India common to deciduous, mixed deciduous and moist evergreen forests (Prater, 1980) of northern and central Western Ghats. The animal is classified under Subfamily Ratufinae of Family Sciuridae, and is categorized under Least Concern category of IUCN red list, listed in Appendix II of CITES 2005 and Schedule II of wildlife protection act 1972. Umblebyle Range Forest is a dry deciduous forest belonging to Bhadravathi division of Shimoga district, a semi-malnad region of Western Ghats. Feeding and Reproduction being two vital aspects of animal ecology, study focuses on documenting and comparing nesting site preferences of the animal in the study area form 2021 with 2022. This study being the first effort to document Nesting site preferences of *Ratufa indica indica* in Umblebyle Range Forest would provide baseline for future studies.

Study Area

The Umblebyle Range Forest of Bhadravathi division, Shimoga, Karnataka is located within the geographic coordinates of 14º 30' 0" to 13º 43' 0" N and 75º 30' 0" to 75º 47' 30" E in the foothills of Western Ghats. The area enjoys tropical climate of 20 ºC to 31 ºC for throughout the year with annual average rainfall of 769.4 mm. Tunga and Bhadra rivers form main seasonal rivers and watershed systems draining the (South-South-East) SSE part. The areas topography has undulating hills and hillocks varying between 500 and 1520 m above (Mean Sea Level)

MSL. The area includes 20 villages and four beats namely Umblebyle, Kydotlu, Lakkinkoppa and Sogane beats, Sogne beat being urbanized is deprived of forest cover. Prominent flora include *Terminalia paniculata, Terminalia tomentosa, Tectona grandis*, *Acacia auriculiformis*,*Cassia siamea*, *Dalbergia latifolia*, *Anogeissus latifolia*, *Ficus tsiela*, *Chloroxylon sweitenia*, *Lagerstroemia lanceolata*, *Xylia xylocarpa Careya arborea*, *Butea monosperma* and fauna include *Panthera tigris*, *Panthera pardus*, *Elephas maximus*, *Axis axis*, *Sus scrofa* and *Bos gaurus*.

Material and Methods

The survey was carried out using Line transect method (Buckland, 1993) in the months of February to April of 2021 and 2022 walking in line transects laid using ARC GIS Software covering the entire study area, keeping the transects equidistant, A total distance of 47.7 km was covered walking over 20 transects ranging from 2-3 km each. The transects were walked during morning 06:00 am – 10:00 am as the animal is active during this period (Pradhan, 2017). The number of nests and nesting trees species were documented considering different parameters like tree species, Height of tree, (Girth at Breast Height) GBH, number of nests, height of nest from the ground, age of the nest and (Global Positioning System) GPS location of the nest (Basanta, 2015). An Olympus 10 × 50 binocular was used to observe the nests and the species. The common names of the tree species were documented with the aid of the local personnel and their scientific names were ascertained from the books Forest plants of the Nilgiris and Endemic woody plants of the Western Ghats.

Results and Discussion

The study compares Nesting site preferences of *Ratufa indica indica* conducted in 2022 with the studies from 2021 in Umblebyle Range Forest of Shimoga. The nest trees from 2021 belonged to 20 families including 41 species while the one from 2022 belonged to 22 families including 36 species. Among 22 Families of nesting tree species recorded, 20 and 22 families were recorded in year 2021 and 2022 (Table 1) and among 44 nesting tree species recorded 41 and 36 nesting tree species were recorded in the year 2021 and 2022 (Table 1) respectively.

Family Fabaceae (29.26%, 2021 and 22.22%, 2022) was the most preferred family including 12 (2021) and 8 (2022) nesting tree species followed by Family Combretaceae (12.19%, 2021and 11.11%, 2022) including 5 (2021) and 4 (2022) nesting tree species. *Terminalia paniculata* (21.81%, 2021 and 20.383%, 2022) was the most preferred nesting tree species followed by *Terminalia tomentosa* (11.68%, 2021 and 15.10%, 2022), *Schleichera trijunga* (10.64%, 2021 and 8.87%, 2022), *Pterocarpus marsupium* (8.83%, 2021 and 8.39%, 2022) *and Tectona grandis* (7.27%, 2021 and 4.07%, 2022). Similar observations were recorded in Karalpat wildlife sanctuary showing preferences for *Terminalia paniculata* (11.03%) and *Anogeissus latifolia* (8.82%), Sitanadi, Mudumalai, Dalma and Kuldiha Wildlife Sanctuaries showing preference for *Terminalia tomentosa* (14.73%) and Schleicheraoleosa (13.39%); *Terminalia arjuna* (10%), *Spondias Mangifera* (9%) and *Syzygium cumini* (7%); *Terminalia tomentosa* (23.97%) and *Anogeissus latifolia* (9.37%); *Shorearobusta* (20%), *Schleicheriaoleosa* (17.5%) and *Terminalia tomentosa* (15%) respectively.

The animal preferred Deciduous (70.73% and 83.33%) over Evergreen (26.82% and 5.55%) and Semi-Evergreen (2.43% and 11.11%) trees, in 2021 and 2022 respectively, similar preferences was observed in Kuldiha, Dalma, Karalpat and Sitanadi Wildlife Sanctuaries showing preference for deciduous trees 80%, 83.26%,69.9%, and 77.68% respectively

Further old and new nests were found along the transects, 92.36% (375 no), 93.62% (426no) were new and 7.63% (31 no), 6.37% (29 no) were old in 2021 and 2022 respectively, which is similar to observations from Dalma wildlife sanctuary where 73.35 percent dreys were new and 26.65 percent were old.

Dillenia pentagyna, *Pterocarpus marsupium*, *Schleichera trijunga*, *Terminalia pinaculata Garuga pinnata*, *Tamrindus indica, Terminalia bellerica* and *Terminalia tomentosa* were tree species used for multiple nesting which was similar to Dalma wildlife sanctuary where multiple nests were found on *Lannea grandis, Anogeissus latifolia, Terminalia bellirica, Terminalia chebula, Terminalia tomentosa*, *Bombax ceiba Dillenia pentagyna, Dillenia indica*, *Lagerstroemia lanceolata*, *Artocarpus lakoocha, Syzygium cumini* and *Sterculia urens,* and Mudumali Tiger reserve where *Terminalia arjuna*, *Spondias Mangifera* and *Syzigium cumini* and Sitanadi wildlife sanctuary that included *Pterocarpus marsupium, Stereospermum chelonoides, Bridelia squamosal, Terminalia arjuna, Mangifera indica and Schleicheraoleosa* were used for multiple nesting.

Among 44 nesting tree species recorded

Umblebyle beat was found to have highest nesting tree species diversity with 28 and 24 nesting tree species followed by Lakkinkoppa beat having 25 and 24 nesting tree species and Kydotlu beat having 13 and 12 nesting tree species in the year 2021 and 2022 respectively. The average nest tree height was estimated to be16.18 ± 3.43 (2021) and 18.05 ± 3.485m (2022). Most preferred tree height was found to be 11-20m and that supported 87.53% (2021) and 76.97% (2022) of the nests and GBH was found to be 0.6-1.5m that supported 87.27% (2021) and 87.29% (2022) of nests respectively.

Ratufa indica indica was found to use large variety of trees for nesting (n = 41) and (n = 36) in 2021 and

Table 1. Nesting Tree species diversity with their Families and Relative Abundance in the year 2021 and 2022

Family	Tree Species	No of trees	
		2021	2022
Anacardiaceae	*Semecarpus anacardium*	3	2
Annonaceae	*Saccopetalum tomentosum*	3	1
Apocynaceae	*Wrightia tinctoria*		2
Bignoniaceae	*Sterospermum xylocarpus*	2	
Boraginaceae	*Cordia macleodii*	2	1
Burseraceae	*Garuga pinnata*	4	3
Combretaceae	*Anogeissus latifolia*	14	43
	Terminalia arjuna	1	
	Terminalia bellerica	14	13
	Terminalia paniculata	84	85
	Terminalia tomentosa	45	63
Dilleniaceae	*Dillenia pentagyna*	20	23
Ebenaceae	*Diospyros monata*	1	1
Fabaceae	*Acacia auriculiformis*	1	
	Albizia odoratissima	6	4
	Albizia procera	1	
	Bahunia malabarica	4	4
	Butea monosperma	1	1
	Cassia siamea	1	
	Dalbergia latifolia	12	13
	Dalbergia paniculata	3	3
	Pterocarpus marsupium	34	35
	Pongamia pinnata	1	3
	Tamrindus indica	2	
	Xyliaxylocarpa	7	10
Lamiaceae	*Gmelina arborea*	1	2
	Tectona grandis	28	17
Lecythidaceae	*Careya arborea*	1	
Loganiaceae	*Strychnos nux-vomica*	1	2
Lythraceae	*Lagerstroemia lanceolata*	7	8
Malvaceae	*Bombax ceiba*	1	2
	Grewia tillifolia,	6	6
	Kydia calycina	9	4
Moraceae	*Ficus bengalensis*	3	4
	Ficus tsiela	1	1
Mythraceae	*Eucalyptus globulus*		4
	Syzigium cumini	1	1
Rubiaceae	*Adina cordifolia*	11	6
	Hymenodicatyon excelsum	3	8
	Mitragina parviflora	1	1
Rutaceae	*Chloroxylon swietenia*	2	2
Sapindaceae	*Schleichera trijunga*	41	37
Sapotaceae	*Bassia latifolia*	1	
Vetrbenaceae	*Vitex altissima*		1

2022 respectively, which is similar to Dalma Wildlife Sanctuary (n = 59)(Mishra, 2011), Mudumalai Tiger Reserve (n = 19) (Nagarajan, 2011), Karalpat Wildlife Sanctuary (n = 37)(Pradhan, 2017), Kuldiha Wildlife Sanctuary (n = 27) (Basantha, 2015) and sitanadi Wildlife Sanctuary (n = 30)(Ravi, 2008).

Ratufa indica is a top canopy dwelling species that rarely visits ground (Ramachandran, 1988; Borges, 1989). In the study area 83.89% and 88.48% of dreys were found in trees with height 11-20m in the year 2021 and 2022 respectively, similar preferences was observed in Karalpat wildlife sanctuary with preference for tall trees with mean height of 11.08 (± 2.11 SD) m, Dalma Wildlife Sanctuary with preference for 12 m to 21 m accommodating 86.15% of dreys. Further 0.6-1.5 m was the most preferred GBH which supported 87.27% (2021) and 87.29% (2022) of nests. *Ratufa indica* prefers tall trees with greater GBH, canopy contiguity and height for construction of dreys (Basasnta, 2015) this preference provides easy access also helps in avoiding and escaping predators in the home range (Basanta, 2015; Mishra, 2011).

Conclusion

The study compares nesting site preference of *Ratufa indica indica* conducted in 2022 with study from 2021 in Umblebyle Range Forest. A total of 406 and 455 dreys were constructed on 385 and 415 tree species in the year 2021 and 2022 respectively. Although 24 families and 44 nesting tree species were recorded the animal preferred to build dreys on trees from certain families (Fabaceae and Combretaceae) and tree species (*Terminalia pinaculata, Terminalia tomentosa, Schleicheratrijunga* and *Pterocarpus marsupium*) accommodated maximum number of dreys. Maintaining the population of these species would help to sustain the animal in its habitat which would further help in conservation of the forest as the animal is found to a potential pollinator and a good indicator of forest health.

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