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## **COMMUNICATION** STATUS OF RAPTORS IN THE MOYAR RIVER VALLEY, WESTERN GHATS, INDIA

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## STATUS OF RAPTORS IN THE MOYAR RIVER VALLEY, WESTERN GHATS, INDIA

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**Abstract:** This study examined the species composition and nest-tree characteristics of diurnal raptors in the tropical forests of Moyar Valley, Western Ghats between December 2012 and March 2013. We recorded 28 species of raptors including three species of vultures. Accipitridae was the dominant family comprising of 25 species followed by two from Falconidae and the monotypic Pandionidae. Among them, eight species fall under various threatened category: three Critically Endangered, one Endangered, two Vulnerable and two Near Threatened. The Critically Endangered *Gyps bengalensis* was frequently recorded during the survey (175 sightings) followed by *Milvus migrans* (39 sightings) and *Haliastur indus* (27 sightings). We located 53 active nests of four species of raptors, viz., *Gyps bengalensis* (42 nests), *Nisaetus cirrhatus* (4 nests), *Haliastur indus* (4 nests), and *Milvus migrans* (3 nests). A notable difference in the nest-tree characteristics among the sympatric raptors was observed. These results would be important to identify priority areas for developing future conservation and management programs for the long-term conservation of raptorial birds in the Western Ghats.

Keywords: Birds of prey, distribution, nest-tree characteristics, Moyar Valley, Western Ghats.

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#### INTRODUCTION

Raptors generally occupy the apex of terrestrial and aquatic food webs, and thus play key roles in balancing ecosystems (Paine 1966; Thiollay 1989; Anderson 2001; Thiollay 2006) by maintaining community structures of prey species (Keith et al. 1998; Ferguson et al. 2005; Roth & Weber 2008). Raptors typically have low population density and require large home ranges, and they serve as good indicators of ecosystem quality (Newton 1979; Thiollay 1992; Redpath & Thirgood 1999) for conservation and management efforts (Sergio et al. 2006). Raptor populations are reportedly declining throughout the world owing to their high vulnerability to environmental contaminants, habitat destruction, direct persecution and diminishing prey availability (Crocker-Bedford 1990).

Raptor distributions are influenced by a variety of factors, including landscape heterogeneity, interspecific competition, predation and the availability of nestsites and food resources (Thiollay 1989; Anderson 2001; Pearlstine 2006). Two-thirds of raptor species occur fully or partially in tropical regions (Bildstein et al. 1998; Ferguson et al. 2005), and India supports 69 raptor species together with several subspecies and races (Naoroji 2006). Information on raptors and their habitat associations are crucial for their conservation and management, but data on the distribution and populations of most Indian raptors are lacking due to difficulties in identification, low population densities and forest dwelling habits (Thiollay 1994; van Balen 1998; Naoroji 2006).

The Western Ghats biodiversity region (Myers et al. 2000) has lost nearly 50% of its forest cover since the early 1900s, and this trend is continuing with increased fragmentation and encroachment (Nair 1991; Jha et al. 2000) by agriculture, plantations, hydroelectric projects, logging, developmental activities, fire, grazing and overexploitation of forest produce (Nair 1991; Jha et al. 2000; WGEEP 2011). In spite of this high anthropogenic pressure, remnant forest patches in the Ghats remain important habitats for diverse species of resident and migratory raptors (Naoroji 2006; Sashikumar et al. 2011). Except for a coarse-grained population survey, no information is available for raptors of the Western Ghats. The Nilgiris represent a unique landscape within the Western Ghats owing to their topographical, climatic and habitat features, and the region is an important wintering area for several migrant raptors (Primrose 1904; Gokula & Vijayan 1996; Thirumurthi 1999; Naoroji 2006; Zarri et al. 2008). Data on population status and

ecological requirements of raptorial birds in the Nilgiris is poorly documented. In this context, we examined the distribution and nest-tree characteristics of raptors in Moyar Valley. The study results will provide baseline information for future conservation and management plans for raptorial birds in Moyar Valley.

#### MATERIALS AND METHODS

#### Study area

The study was carried out in Moyar River valley and adjacent Sigur Plateau (11.70128°N–76.58706°E and 11.47244°N–77.147608°E) in the Nilgiri Biosphere Reserve, which links the Western and Eastern Ghats (Venkitachalam & Senthilnathan 2016). It is a wide south-east facing valley located at the junction of four plateaus: the Sigur in the northwest, the Nilgiri in the west, the Mysore in the north and the Thalamalai Plateau in the northeast. The valley is within the borders of the Satyamangalam Tiger Reserve and the Nilgiris north forest division in Tamil Nadu, and Bandipur Tiger Reserve in Karnataka State. A deep gorge, the Moyar gorge or ditch, in the northern boundary of the Nilgiri District separates the Sigur and Mysore plateaus.

The terrain is hilly and the altitude of the study area ranges from 300-950 m; the main ridge of the Nilgiri Plateau is above 2,000m. The study area receives rain from both the northeast and southwest monsoons, with more rain coming during the former from September to December. The entire valley receives water from several perennial and seasonal rivers, and it forms an important drainage basin of the Moyar River, a tributary of the river Cauvery. The Moyar meets the Bhavani River in the east of the Nilgiri Plateau. The major vegetation types of the valley are tropical dry deciduous, southern tropical thorn forest, and tropical moist deciduous forest includes riparian forests along the streams interspersed with cultivated areas and reservoirs (Champion & Seth 1968; Prabhakar & Pascal 1994). Semi-evergreen and evergreen forests skirt along the eastern slope of the Nilgiri Plateau. At a comprehensive level, the thorn forest and dry deciduous are the general vegetation in the valley.

#### METHODS

#### **Population survey**

Study was carried out between December 2012 and March 2013. To survey the raptors we placed 16



Figure 1. Map of the study area.

vantage points in the valley (Fig. 1). The points for the survey were selected in elevated places or locations with maximum visibility to detect the soaring raptors (Thiollay 1989; Nijman 2004; Eduardo et al. 2007) but no effort was made to sample canopy dwelling species. The survey locations were established in all major habitats of the study area. The surveys were carried out from 09:00hr to 17:00hr and all the raptors were identified and counted within the identifiable radius (ca. 700m) from the sampling locations (Eduardo et al. 2007; Kurup 2011). Altogether, we carried out 288 hours of observations across five different habitats, viz. 108 hours in open dry thorn forest (6 locations), 36 hours in mountain cliffs (2 locations), 54 hours in the reservoir (3 locations), 36 hours in the riparian forest (2 locations) and 54 hours in human habitations (3 locations). The raptors were observed by using Olympus (10×50) binocular and photographs were taken for the identification of the difficult species (Sony HX 200V Prosumer Camera, 30x optical zoom). Standard field guides were used for the identification based on the plumage, shape, and size of the raptors (Grimmett et al. 2011; Ferguson-Lees &

Christie 2005; Naoroji 2006). Taxonomy follows BirdLife International (2017).

#### Nest survey and nest-tree characters

The nests of different raptors were located through intensive ground surveys by exploring all probable trees suitable for nesting. The secondary information from forest officials, field biologists, and settlers of the forest hamlets were also collected. Nest locations were geocoded with a global positioning system (Garmin eTrex 10) and the same was plotted on a forest boundary map using Q-GIS. The characteristic features of nesting trees were measured to understand the habitat signature of nesting trees opted by the raptors (Table 1).

#### RESULTS

We recorded 28 species of diurnal raptors, including seven migrants (Images 1–25). Family Accipitridae was dominant, contributing 25 species, followed by family Falconidae (2 species) and the monotypic family

Pandionidae (Table 2). Of the 28 species recorded, eight have high global conservation significance: three Critically Endangered (White-rumped Vulture Gyps bengalensis, Red-headed Vulture Sarcogyps calvus, and Indian Vulture Gyps indicus), one Endangered (Steppe Eagle Aquila nipalensis), two Vulnerable (Indian Spotted Eagle Clanga hastata and Greater Spotted Eagle Clanga clanga), and two Near-Threatened (Greyheaded Fish-Eagle Icthyophaga ichthyaetus, Lesser Fish Eagle Icthyophaga humilis). The White-rumped Vulture (42.2% of total sightings), Black kite Milvus migrans (9.4% of total sightings) and Brahminy Kite Haliastur indus (6.5% of total sightings) were detected commonly during sampling. Species such as Grey-headed Fish-Eagle, Western Marsh-Harrier Circus aeruginosus, Eurasian Sparrow Hawk Accipiter nisus, Crested Goshawk Accipiter trivirgatus, Steppe Eagle and Indian Spotted Eagle were encountered once during the study whereas Rufous-bellied Eagle Lophotriorchis kienerii, and Tawny Eagle Aquila rapax were recorded twice.

Among three species of vultures recorded, Whiterumped Vulture had the maximum number of sightings (n=175) followed by Red-headed Vulture (n=8) and Indian Vulture (n=6). All the vulture sightings were recorded in the middle and lower ranges of the valley that has extensive open habitat. Maximum of 172 White-rumped Vulture, four Red-headed Vulture and three Indian Vulture were observed in a flock near Moyar Village. The vultures were observed feeding on different animal carcasses, viz., four Elephants *Elephas maximus*, four Chitals *Axis axis*, three Gaurs *Bos gaurus*, one Sambar Deer *Rusa unicolor*, and four livestock carcasses.

#### **Nest-trees**

We located 53 active nests of four sympatric raptors, namely: White-rumped Vulture (42), Crested Hawk-Eagle (4), Brahminy Kite (4), and Black Kite (3). Of these, nests of White-rumped Vulture and Crested Hawk-Eagle were exclusively recorded on live trees of Terminalia arjuna along the riparian forests of the valley. The nests of White-rumped Vulture were recorded from two different colonies such as Syriur (14 nests) and Jagalikadavu-Chemmanatham (28 nests) in Sigur Plateau. Both Black Kite and Brahminy Kite nested on smaller trees and all nests were recorded close to human habitation. Brahminy Kite nested on live trees of Cocos nucifera and Albizia spp. and nests of Black Kite were recorded on Ficus religiosa and Albizia spp. We also observed breeding activities such as courtship display, mounting and collection of nesting materials by

Table 1. List of the variables measured for nest-trees and description of quantification method.

	Parameter	Quantification method	
1	Altitude	GPS	
2	Tree species		
3	Height of the nest tree	Ocular estimation	
4	GBH	Handled measuring tape	
5	Number of primary branches	Ocular estimation	
6	Height of the first primary branch	Ocular estimation	
7	Pacing distance	Measuring tape	
8	Height of the nest above ground	Ocular estimation	
9	Number of branches on which nest was built	Ocular estimation	
10	Distance to the closest nesting tree	Measuring tape	
11	Distance to the nearest water body	Ocular estimation/GIS	
12	Distance to the nearest human habitation	GIS	

Oriental Honey-buzzard.

#### **Nest-tree characteristics**

Among the observed nests, White-rumped Vulture selected the tallest trees (42.21 ( $\pm$ 6.827m) with a higher gbh 1.92 ( $\pm$ 0.39m) for nesting than other raptors (Table 3). The nests were placed at a mean height of 37.45 ( $\pm$ 7.969m). Crested Hawk-Eagle preferred comparatively shorter trees for nesting 29 ( $\pm$ 8.8m) with a smaller gbh 1.23 ( $\pm$ 0.47m) and their nests were placed at a mean height of 22m from the ground. All their nests were supported by three branches. Brahminy Kite and Black Kite preferred small trees with thin branches for carrying their nests. They preferred shortest trees with a small gbh when compared with other species. Almost the same trend was seen in other characteristics features (Table 3).

#### DISCUSSION

The raptors of the Western Ghats biogeographic zone have not been extensively studied (Naoroji 2006). Within the short span of this study we recorded 28 species of diurnal raptors, including eight globally threatened species: three Critically Endangered, one Endangered, two Vulnerable and two Near Threatened. Of the raptors observed in this study, three species were common, and five were fairly common with Whiterumped Vulture outnumbering all others. Comparison with other published literature from the Western Ghats region of Tamil Nadu reveals a high richness of raptors in

	Family/Common name	Binomial name	Migrant/resident (India)	IUCN	Abundance
	Accipitridae				
1	Black Eagle	Ictinaetus malayensis	BR	LC	R
2	Black Kite	Milvus migrans	BR	LC	С
3	Black-winged Kite	Elanus caeruleus	BR	LC	UC
4	Bonellis Eagle	Aquila fasciata	BR	LC	FC
5	Booted Eagle	Hieraaetus pennatus	w	LC	FC
6	Brahminy Kite	Haliastur indus	BR	LC	С
7	Changeable Hawk Eagle (Crested Hawk-Eagle)	Nisaetus cirrhatus	BR	LC	FC
8	Crested Goshawk	Accipiter trivirgatus	BR	LC	R
9	Crested Serpent-Eagle	Spilornis cheela	BR	LC	UC
10	Eurasian Sparrowhawk	Accipiter nisus	w	LC	R
11	Greater Spotted Eagle	Clanga clanga	w	VU	R
12	Grey-headed Fish-Eagle	Icthyophaga ichthyaetus	BR	NT	R
13	Indian Spotted Eagle	Clanga hastata	BR	VU	R
14	Indian Vulture	Gyps indicus	BR	CR	UC
15	Lesser Fish Eagle	Icthyophaga humilis	BR	NT	UC
16	Oriental Honey-buzzard	Pernis ptilorhyncus	BR	LC	FC
17	Red-headed Vulture	Sarcogyps calvus	BR	CR	UC
18	Rufous-bellied Eagle	Lophotriorchis kienerii	BR	LC	R
19	Shikra	Accipiter badius	BR	LC	UC
20	Short-toed Snake Eagle (Short-toad eagle)	Circaetus gallicus	BR	LC	FC
21	Steppe Eagle	Aquila nipalensis	w	EN	R
22	Western Marsh-Harrier (Eurasian Marsh-Harrier)	Circus aeruginosus	W	LC	R
23	White-eyed Buzzard	Butastar teesa	BR	LC	R
24	White-rumped Vulture	Gyps bengalensis	BR	CR	С
25	Tawny Eagle	Aquila rapax	w	LC	R
	Pandionidae				
26	Osprey	Pandion haliaetus	w	LC	R
	Falconidae				
27	Common Kestrel	Falco tinnunculus	BR	LC	UC
28	Shaheen Falcon	Falco peregrinus peregrinator	BR	LC	R

Table 2. List of diurnal raptors recorded during the study, their resident, IUCN, and abundance status (December 2012 to March 2013).

Status: BR - Breeding Resident, W - Winter Migrant, LC - Least Concern, NT - Near Threatened, VU - Vulnerable, EN - Endangered, CR - Critically Endangered, Abundance: C - Common (≥20 sightings), FC - Fairy Common (10–20 sightings), U - Uncommon (5–10 sightings), R - Rare (<5 sightings)

the Moyar Valley (Vijayan et al. 1992; Gokula & Vijayan 1996; Johnsingh 2001; Swami 2006; Bundell 2010; Ramesh et al. 2012; Ali et al. 2013; Babu & Bhupathy 2013). This could be attributed to habitat heterogeneity, resource availability and the geomorphological features of the valley.

Within the Nilgiris landscape, White-rumped Vultures breed in Wayanad Wildlife Sanctuary (Kurup 2011) and the Moyar Valley, which holds a large number of nests along the tributaries of the Moyar such as the Syriur and Jagalikadavu in the Sigur Plateau. Secondary data from longtime settlers in the valley revealed that White-rumped Vultures formerly bred in colonies at Arakadavupallam, Masikoil, Mangalapatty and Thotikadavu. Red-headed Vulture also used to breed near Anakkal Mariamman Koil of Nilgiri North Forest Division (Arulagam 2015). A recent study by Venkitachalam & Senthilnathan (2015) recorded four

	Range (min-max)				
Nest-site variables	Crested Hawk-Eagle (n=4)	White-rumped Vulture (n=42)	Black Kite (n=3)	Brahminy Kite (n=4)	
Altitude	376–929	817-864	907–955	960–961	
Height of the nest-tree (m)	20–37	25–53	16–19	17–30	
GBH (m)	0.59–1.6	1.1-2.70	0.7–2	0.35–0.60	
Number of primary branches	4–7	3–14	3–4	6	
Height of the primary branch (m)	2.5–19	3–21	4–6	5	
Pacing distance (m)	7–13	7.5–20	6–10.5	6–7	
Height of the nest (m)	19–35	18–52	15–18	16–29	
Number of branches on which nest was build	3	2-4	2–3	2–3	
The distance between closest nest in the same tree (m)	-	3–15	-	-	
Distance to the closest nesting tree (m)	-	12-1000	-	-	
Distance to the nearest water body (m)	2–15	2–10	20–50	1000-1500	
Distance to human habitation (m)	50–500	700–2000	0–50	0	

Table 3. Variations (Range) in the nest-tree characteristics among four species of raptors recorded during the study.

nesting sites of Indian Vulture from the valley.

Of two species of near-threatened raptors recorded during the study, the Lesser Fish Eagle is uncommon along the Moyar River but seldom seen along its tributaries. Ten observations of this species were made during vantage point count, and we had more than 30 sightings while searching for raptor nests along the Moyar River. The Moyar River supports a good concentration of fish fauna (Bhaskar & Karthik 2015) and hence ensures ample food resources for fishing eagles. We recorded the juvenile of this species twice near Thengumarahada Village, and we presume they may be breeding in the Moyar Valley. We have also recorded this species from adjacent protected areas such as the Tholpetty Range and Bathery Range of Wayanad Wildlife Sanctuary, along Nagarahole River in Nagarahole Tiger Reserve, along Moyar River in Mudumalai Tiger Reserve and Nugu River in Bandipur Tiger Reserve. Little is known about the status of this species from southern India, but recently it was found breeding in Eastern Ghats of Karnataka and Western Ghats region in Kerala (Ramarao 2011; Sashikumar 2011). Grey-headed Fish-Eagle was sighted once in Thengumarahada Village on 9 December 2012. Earlier studies reported this species from Tamil Nadu region of Nilgiri Landscape such as from Mudumalai Tiger Reserve (Gokula & Vijayan 1996) and Upper Nilgiris (Thirumurthy & Balaji 1999). We spotted this species once along Nugu River in Bandipur Tiger Reserve. A Western Marsh-Harrier was observed in the grassy meadow of Bhavanisagar Reservoir on 7 December 2012. We also observed one female harrier near Ebanadu Village almost similar to Pallid Harrier,

but we have labeled it as unidentified because of the confusion in identification with females of other harriers.

Of the two Vulnerable species recorded, Indian Spotted Eagle is an uncommon raptor that occurs at very low density across its distribution range and has been seldom recorded from the Western Ghats (Naoroji 2006; Birdlife International 2012). Previously, it was reported from Upper Nilgiris (Primrose 1904) and Mudumalai Tiger Reserve (Naoroji 2006), however, subsequent studies have not reported the species from Nilgiri landscape (Zarri et al. 2008; Thirumurthy & Balaji 2009). We recorded and photographed a single individual at Maravakandi dam near Masinagudi on 28 January 2013 at an altitude of 924m. It was mobbed by an Osprey during the observation. Greater Spotted Eagle has been recorded from 24 different sites of Tamil Nadu and Puducherry (Santhakumar et al. 2016) and frequently seen in the wetlands of Northern Kerala and also along Cauvery River basin of Karnataka (Naoroji 2006). This species was photographed four times around Bhavanisagar Reservoir. This reservoir supports a large concentration of wetland birds (Bharathidasan un-published data), which may ensure ample food source for this raptor. We observed and photographed the Steppe Eagle once near the Bhavanisagar Reservoir. This is a common Aquila Eagle in the northern Indian plains but rare in southern India (Sashikumar 2004; Naoroji 2006).

Tawny Eagle is a dry zone species found in the cultivated plains and plateau of Tamil Nadu (Naoroji 2006), and it was reported from Mudumalai Tiger Reserve and upper Nilgiris (Gokula & Vijayan 1996;

Thirumurthi & Balaji 1999). We recorded this species twice near Allimoyar Village on 25 December 2014 and at a waste dump in Masinagudi on 7 March 2013. The Brahminy Kite and Black Kite were sighted more often in and around towns and associated waste dumps. According to Naoroji (2006), these are common raptors in many parts of India and they are frequently found in human-dominated and disturbed habitats due to their high tolerance to human disturbance and scavenging trophic niche.

An earlier study has recorded the breeding of 13 species of raptors from upper Nilgiris (Thirumurthi & Balaji 1999), but the present study recorded only four species. Out of four species recorded, both Brahminy Kite and Black kite have strong fidelity to the human habitation for nesting and they select the young secondary woods for nesting. White-rumped Vulture and Crested Hawk-Eagle preferred live trees of Terminalia arjuna (primary forest trees) for nesting along the riparian forest in the valley. Terminalia arjuna is a hardwood tree, which provides support to the heavy nests, and their large spreading branches maximize nest height and reduce nest accessibility to predators. In addition, the riparian forest might reduce the thermal extremes by facilitating evapotranspiration during incubation and may be an important factor in nest-tree selection be these species. All nests of Whiterumped Vulture were located in the riverine forest of Sigur Plateau; hence, the protection of riverine habitat is very crucial for in situ conservation of the southernmost breeding population of White-rumped Vulture in the subcontinent. Lesser Fish Eagle and Grey-headed Fish-Eagle are well suited to riverine habitats of the valley and we have sighted a juvenile of Grey-headed Fish-Eagle. Riparian forests are complex ecosystems which play a crucial role in maintaining the water and habitat quality. Even though the riparian forests along many river systems in the country are devastated, there are still some good stretches of riverine forest remaining in the Western Ghats that requires the attention of policy managers (Johnsingh & Joshua 1989). Moyar River supports unharmed and extensive areas of riparian forest with more than 100 species of woody angiosperms, 120 species of birds, 90 species of fish and several threatened mammalian fauna having been recorded along the riparian forests of the river (Bhaskar & Karthik 2015). Construction of hydroelectric projects, tourism and pollution are considered as the major threat to the riparian forest of the valley (Bhaskar & Karthik 2015).

Use of pesticide, forest fire, overfishing, spreading

of invasive species and urbanization are prevalent in the landscape and expected to be a major threat to the survival of the raptorial birds in the valley. Hence, the present study suggests to carry out long-term research on raptorial birds that targets priority information gaps and paying special attention to the management of the endangered species.

#### In situ conservation of vultures in Moyar Valley

Even though Gyps vultures have undergone very rapid population decline across their distribution range, a few breeding populations have survived in small pockets (Prakash et al. 2003; MOEF 2006). Nilgiri Plateau and the surrounding protected area networks spread over the three south Indian states recorded the existence of five species of vultures: White-rumped Vulture, Red-headed Vulture, Indian Vulture, Egyptian Vulture and Himalayan Griffon (Gokula & Vijayan 1996; Ramesh 2011; Venkitachalam & Senthilnathan 2016; P.A. Vinayan pers. comm. 2015 December). Moyar River Valley supports one of the largest breeding populations of White-rumped Vulture in the Western Ghats, and it is the southernmost breeding range of the species. A major part of the Moyar valley is not a part of the existing protected area network (National park or Sanctuary), and hence this study recommends declaring the Moyar Valley as a "vulture conservation Reserve". Also, special attention should be given to the continuous monitoring of the selected breeding colonies in order to understand their breeding success in the forested landscape.

Food is a limiting factor for the vultures in Moyar and adjacent forests of Nilgiri landscape, because vultures mostly depend on the wild ungulate carcass. The Nilgiri-Eastern Ghats landscape complex supports a good concentration of large carnivores and their prey in the country (Jhala et al. 2014). The large carnivore kills contribute a substantial portion of the food consumed by the vultures in the Nilgiri landscape (Ramesh 2011). Hence, the population size of the vultures in the landscape is directly dependent on the density of prey and predator and their interactions. Generally, if a contagious disease is suspected in the death of a large herbivore, the carcass will be subjected to necropsy and eventually buried or burned. This leads to a reduction of food availability for vultures. Cattle depredation by larger carnivores is common in this area, and sometimes the cattle owners respond by poisoning a carcass (WWF 2010). Vultures are colonial birds, and poisoning one carcass can potentially lead to the death of several individuals. Measures must be taken to address this problem.

Vulture breeding colonies are located very close to human habitations having large cattle populations. Hence, monitoring the prevalence of diclofenac in areas close to vulture habitats is important to provide a clear understanding of the potential threat to vulture populations. This study also suggests exploring the movement ecology of vultures in the study site to understand their foraging ecology in forested areas and Diclofenac pressure. Awareness programs need to be conducted in the valley to increase the knowledge about the importance of raptors and ensure community participation in the conservation activities.

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#### Anoop et al.



Image 1. Osprey



Image 2. Oriental Honey-buzzard



Image 3. Black Kite



Image 4. Brahminy Kite



Image 5. Lesser Fish Eagle



Image 6. Grey-headed Fish- Eagle



Image 7. White-rumped Vulture



Image 8. Indian Vulture



Image 9. Red-headed Vulture



Image 10. Short-toed Snake Eagle



Image 11. Crested Serpent Eagle



Image 12. Eurasian Marsh Harrier







Image 14. Shikra



Image 15. White-eyed buzzard



Image 16. Black eagle



Image 17. Indian Spotted Eagle



Image 18. Greater Spotted Eagle



Image 19. Tawny Eagle



Image 20. Steppe Eagle



Image 21. Bonellis Eagle



Image 22. Booted Eagle



Image 23. Rufous-bellied Eagle



Image 24. Crested Hawk-Eagle



Image 25. Common Kestrel

1055; https://doi.org/10.1111/j.1365-2664.2006.01218.x

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Author Contribuion: RN and NRA conceived and designed the work. NRA, NR and SB conducted field surveys and data collection. NRA led the writing of the manuscript with inputs from RN and SB. All the authors equally contributed in refining the manuscript drafts and approved the final version.

#### Tamil abstract:

மேற்குத் தொடர்ச்சி மலையைச் சேர்ந்த வெப்ப மண்டலக் காட்டுப் பகுதியுள் ஒன்றான மாயாறு படுகையில்வேட்டையாடி இனத்தைச் சேர்ந்த பறவைகள் எப்படித் தங்களுக்குள் ஒன்று கலந்து வாழ்ந்து வருகின்றன என்பதுகுறித்தும் கூடமைக்க அவை தேர்ந்தெடுக்கும் மரங்கள் குறித்தும் திசம்பர் 2012 முதல் மார்ச்சு 2013 வரையானகாலகட்டத்தில் மேற்கொள்ளப்பட்ட பதிவு இது. இந்த கால கட்டத்தில் 28 வகையான வேட்டையாடிப் பறவைகள் பதிவு செய்யப்பட்டன. இதில் 3 வகையான பாறு கழுகினங்களும் அடக்கம். பதிவுசெய்யப்பட்டவற்றுள் வில்லேந்திரன் குடும்பத்தைச் சேர்ந்த 25 வகையான சிறப்பினங்கள் அதிகளவிலும் அதனைத்தொடர்ந்து வைரி வம்சத்தில் 2 சிறப்பினங்களும் விரால் அடிப்பான் வம்சத்தில் 1 சிறப்பினமும் இருந்தன. இதில்எட்டு வகையான சிறப்பினங்கள் அழிந்துவரும் அபாயத்தில் உள்ளதாகத் தெரிய வந்த து. வெண்முதுகுப் பாறுகள்அதிகளவாக 175 முறை பார்க்கப்பட்டன. அதற்கடுத்தாற்போல, கள்ளப்பருந்து 39 முறையும் கருடன் 27 முறையும்பார்க்கப்பட்டன. மொத்தம் 53 கூடுகள் பதிவு செய்யப்பட்டதில் 42 கூடுகள் வெண்முதுகுப் பாறுகழுகினத்தைச் சேர்ந்தவையாகவும், 4கூடுகள் முறையே செம்பருந்தினதாகவும் குடுமிப் பருந்தினதாகவும், 3 கூடுகள் கள்ளப்பருந்தினதாகவும் இருந்தன. இக் களப் பயணத்தில் ஒரே பேரினத்தைச் சேர்ந்த வேட்டையாடிப்பாவைகள் கூடமைக்க மாக்கையம் இடத்தையும் எப்படி தேர்ந்தெடுக்கின்றன போன்ற வேறுபாடுகளும் பதிவுசெய்யப்படன. இதன் மூலம் எதிர்காலத்தில் அவை எப்படிப்பட்ட இடங்களைக் கூடமைக்கத் தேர்ந்தெடுக்கும்என்பதை அனுமானித்து மேற்குத் தொடர்ச்சி மலையில் அவை வாழ்வாங்கு வாழத் தொலை நோக்குப்பாவையோடுதிட்டமிட இப்பதிவு உதவும்.





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#### Communications

Urban biodiversity: an insight into the terrestrial vertebrate diversity of Guwahati. India

-- Jayaditya Purkayastha, Pp. 12299-12316

Status of raptors in the Moyar River Valley, Western Ghats, India -- N.R. Anoop, S. Babu, S. Bharathidasan & R. Nagarajan, Pp. 12317–12327

Species composition and abundance estimates of reptiles in selected agroecosystems in southern Western Ghats, India -- Abhirami Mini Jayakumar & Paingamadathil Ommer Nameer, Pp. 12328–12336

Comparison of beach profiles conducive for turtle nesting in Andaman -- Subramanian Narayani, Sasidharan Venu & Andrea Joan D'Silva, Pp. 12337 -12343

#### **Short Communications**

A new record of the rare Hardwicke's Woolly Bat Kerivoula hardwickii (Horsefield, 1824) (Mammalia: Chiroptera: Vespertilionidae) after 23 years from a lowland rainforest of Sri Lanka

-- Dinesh Gabadage, Gayan Edirisinghe, Madhava Botejue, Kalika Perera, Thilina Surasinghe & Suranjan Karunarathna, Pp. 12344–12349

Alarming population status of the Grizzled Giant Squirrel Ratufa macroura (Mammalia: Rodentia: Sciuridae) in Chinnar Wildlife Sanctuary, the Western Ghats. India

-- Kiran Thomas & Paingamadathil Ommer Nameer, Pp. 12350–12356

Distribution and population status of Sambar Rusa unicolor (Mammalia: Cetartiodactyla: Cervidae) from Aravalli landscape with a note on its first record from Aravalli Hills of Haryana, India

-- Paridhi Jain, Anchal Bhasin, Gautam Talukdar & Bilal Habib, Pp. 12357-12362

#### Delayed peracute capture myopathy in a Himalayan Ibex Capra sibirica (Mammalia: Cetartiodactyla: Bovidae)

-- Umar Nazir Zahid, Latief Mohammad Dar, Umar Amin, Showkat Ahmad Shah, Rashid Yahya Naqash, Dil Mohammed Makhdoomi, Shayuaib Ahmad Kamil & Intesar Suhail, Pp. 12363-12367

Checklist of the avifauna of Sagareshwar Wildlife Sanctuary, Maharashtra, India -- Sharad Datt Apte, Vijay Bhagwan Tuljapurkar & Girish Avinash Jathar, Pp. 12368-12375

The rediscovery of Rurk's Cat Skink Ristella rurkii Gray, 1839 (Reptilia: Ristellidae) with remarks on distribution and natural history -- Sumaithangi Rajagopalan Ganesh, Pp. 12376–12381

#### Dietary assessment of five species of anuran tadpoles from northern Odisha, India

-- Syed Asrafuzzaman, Susmita Mahapatra, Jasmin Rout & Gunanidhi Sahoo, Pp. 12382-12388

#### Inventory of prong-gilled mayflies (Ephemeroptera: Leptophlebiidae) of India with records of endemic taxa

-- C. Selvakumar, Kailash Chandra & K.G. Sivaramakrishnan, Pp. 12389–12406

First record of a coreid bug Anhomoeus fusiformis Hsiao (Hemiptera: Heteroptera: Coreidae: Coreinae: Anhomoeini) from India -- Sadashiv V. More & Hemant V. Ghate, Pp. 12407–12412

The gilled mushroom Amanita spissacea (Amanitaceae): a new report for India -- Hmar Lalrinawmi, John Zothanzama, Benjamin W. Held, Josiah M.C. Vabeikhokhei, Zohmangaiha & Robert A. Blanchette, Pp. 12413-12417

#### Notes

Foraging habits of the Red Fox Vulpes vulpes (Mammalia: Carnivora: Canidae) in the Himalava. India

-- Aishwarya Maheshwari, Pp. 12418–12421

First record of Yellow-Rumped Flycatcher Ficedula zanthopygia (Hay, 1845) (Aves: Passeriformes: Muscicapidae) in eastern India -- Manaranjan Das & Subrat Debata, Pp. 12422–12424

Additional field records provide further resolution of the distribution of the Water Monitor Varanus salvator (Squamata: Varanidae) in northwestern Mvanmar

-- Steven G. Platt, Myo Min Win & Thomas R. Rainwater, Pp. 12425–12428

The first record of The Blue Admiral Kaniska canace Linnaeus, 1763 (Nymphalidae: Lepidoptera) from Bangladesh -- Amit Kumer Neogi, Md Jayedul Islam, Md Shalauddin, Anik Chandra Mondal & Safayat Hossain, Pp. 12429–12431

First record of Hislopia malayensis Annandale, 1916 (Bryozoa: Gymnolaemata) from freshwaters of India

-- Ananta Dnyanoba Harkal & Satish Sumanrao Mokashe, Pp. 12432–12433

An extended distribution record of Western Ghats species Litsea oleoides (Meissn.) Hook.f. (Lauraceae) from Matheran, Maharashtra, India -- Radha Veach & Gurumurthi Hegde, Pp. 12434–12438

Notes on Jasminum andamanicum N.P. Balakr. & N.G. Nair (Oleaceae) from Andaman & Nicobar Islands, India

-- P. Murugan & K. Karthigeyan, Pp. 12439–12441

#### Miscellaneous

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