



STUDIES OF VALMIKI NATIONAL PARK, BIHAR WITH REFERENCE TO AVIFAUNA

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AUTHORS' CONTRIBUTIONS

“This work was carried out in collaboration between both authors. Author AK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author RKS managed the analyses of the study and managed the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

The tract is very rich in avifauna. More than 250 bird species have been reported from Valmiki National Park (Valmiki Tiger Reserve). Almost all the bird species are likely to occur that are found in Dudhwa or the adjoining Sohagi Barwa Sanctuary in Uttar Pradesh [1]. The common birds are Peafowls, Partridges (Black and Gray), Quails, Pigeon, Mynas, Bulbul, Hornbill, Parrot, Woodpickers, Vultures, Eagles, Flycatchers, Sunbirds, among others. Nepal Kalij Pheasant locally known as Churcha is also found. In the night several owls, owlets and nightjars can be easily seen. Globally threatened species such as the Swamp Francolin (*Francolinus gularis*) and Sociable Lapwing (*Vanellus gregarius*) have been reported from the area [1]. The vulnerable Sarus Crane (*Grus antigone*) also occurs in small numbers [2]. There were records of White-rumped *Gyps bengalensis* and Slender-billed vultures. Historical records of Bengal Florican (*Houbaropsis bengalensis*) from the general area also exist. A large roost of migratory Amur Falcons (*Falco amurensis*) was also discovered just outside the Reserve. Details of important observations are presented. Conservation issues are also discussed briefly and recommendations are made for the protection of habitats and birds.

Keywords: Valmiki national park; conservation; avifauna; habitat.

1. INTRODUCTION

The Valmiki National Park is one of the nature's virgin forms the eastern most limit of the Himalayan Terai forests in India. The National Park is the 18th Tiger Reserve of the country and 2nd in Bihar located in the northern part of the West Champaran district

and to its north is the Chitwan National Park of Nepal. Together these contiguous tracts of protected areas (including Parsa Wild Life Reserve of Nepal) form a large wilderness area that is home to a variety of wild life [3,4,5]. Core area was declared as National Park in 1989. The National Park is unfragmented and inaccessible to people, which

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offers excellent potential for long term conservation of the tigers and other wildlife. The tract is located in the Himalayan Terai region of outer Siwalik Hill Range region. It is also the origination region of the great “Gandak” and “Masan” rivers that collect all the water from numerous tortuous tributaries. The highest point is 874 m asl in Someshwar on the Nepal border. The lowest elevations are in the river beds near Madanpur (less than 140 m asl).

The Valmiki Tiger Reserve extends over an area of 898.9 km² (589.8 km² being the core area and 309.1 km² the buffer zone). It has “Tropical Monsoon” type climate. Annual precipitation is 900 to 1700 mm. Greatest precipitation occurs in July. Annual temperature is 05°C to 40°C and May is the hottest month of the year. The Bhabar Dun Sal Forest, Dry Siwalik Sal Forest, Cane Brakes, Wet Alluvial Grassland and Barringtonia Swamp Forest dominate the forest type.

The avifauna of Valmiki National Park is inadequately studied. The tract has a rich diversity of birdlife. More than 240 bird species have been sighted in Valmiki National Park region, among them some are water birds and some live on earth and trees. Migratory birds also visit the tract during winter season [6,7].

2. MATERIALS AND METHODS

Two year visiting in the selected areas of the Park was performed to observe the nature of different types of floral and faunal distributions, including avifauna. Calls of some bird species were identified by the help of forest staffs, villagers and other knowledgeable persons. Seven main forest blocks; Valmikinagar, Madanpur, Manguraha, Gobardhana, Gonauli, Raghia and Chiutaha from Div-I and Div-II were selected for observation. I made 23 field trips in all four seasons within these two years, during which more than 95 bird species were recorded.

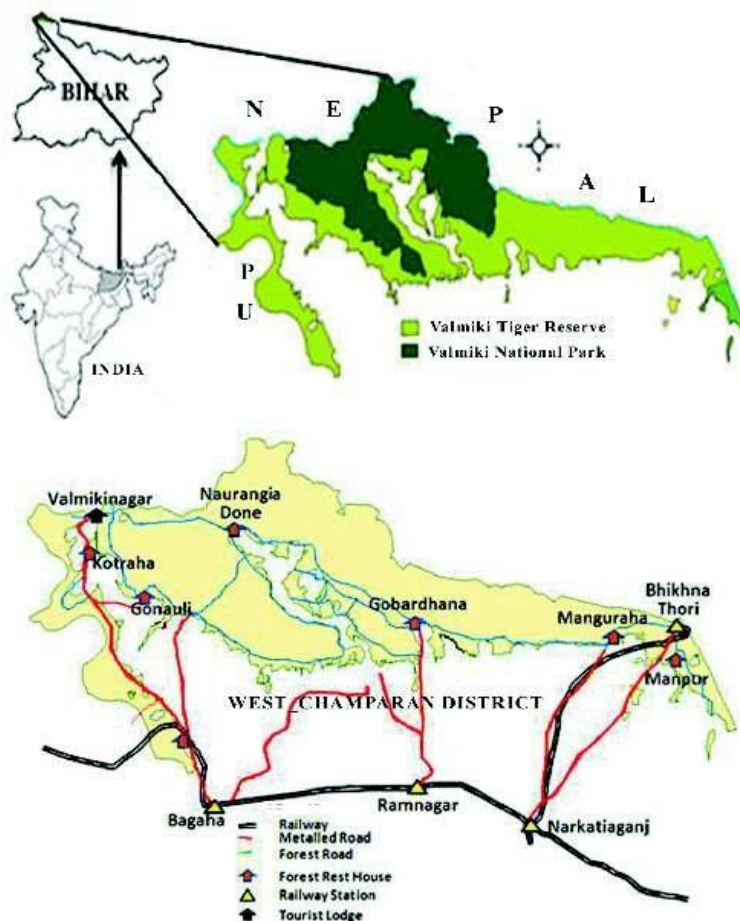


Fig. 1. Location map of study area- Valmiki Tiger Reserve, West Champaran Dist, Bihar

3. RESULTS AND DISCUSSION

The forest under the Valmiki National Park (Tiger Reserve) are located in the northernmost part of West Champaran district of Bihar. In a biogeographically point of view, the area falls in the Oriental Realm according to Wallace. Good describe the area on the basis of flora under the palaeotropical. The palaeotropical was subdivided in to the three subdivisions vide: African, Indomalayan and Polynesian. Wallace's faunal regions have been modified by Udverdy. It does not differ greatly from Wallace's original classification but also takes into accounts the distribution of plants as well as animals.

3.1 Flora

The forest of the Valmiki National Park and Wildlife Sanctuary can be broadly classified into seven types according to the Revised Survey of Forest Type by Champion and Seth [8] as under:

Table 1. Types of forest in Valmiki National Park (Wildlife sanctuary)

S.N. classification	Forest type
I	Bhabar-Dun Sal Forest
II	Dry Siwalik Sal Forest
III	West Gangetic Moist Mixed Deciduous Forest
IV	Khair Sissoo Forest
V	Cane Brakes
VI	Eastern Wet Alluvial Grassland
VII	Barringtonia Swamp Forest

Due to diverse topographical and edaphic factors the Reserve harbors varied vegetation type. The Botanical Survey of India has categorized seven vegetation type within the limits of sanctuary and National Park.

Table 2. Types of vegetation in Valmiki National Park (Wildlife sanctuary)

S.N.	Vegetation type
I	Moist Mixed Deciduous
II	Open Land Vegetation
III	Sub Mountainous Semi Evergreen Formation
IV	Fresh Water Swamps
V	Riparian Fringes
VI	Alluvial Grasslands And High Hill Savannah
VII	Wetlands.

3.2 Fauna

The tract is considerably rich in wildlife variety. Knowledge of the fauna has been acquired on the basis of actual sightings.

3.3 Mammals

Tract is very rich in Tiger (*Panthera tigris*) population. The important prey animals are Chital, Sambar and Nilgai. Among other carnivores there are Leopard, Hyena, Jungle cat, Indian Civet, Wild dog, Jackal, Sloth bear, Wild boar and Wolf. Among herbivores are spotted deer, Barking deer and Hogdeer. Beside Monkey and Langoores; Squirrels, Rats and Mongoose are commonly found [9].

3.4 Reptiles

Gharials are found in Gandak River. Among snakes, Python, Cobra, Krait, Dhamin are commonly found. Beside this, Tortoises are also found.

3.5 Fish

Labeo rohita, *Cirrhinus mrigala*, *Channa punctata*, *Arripis trutta*, *Catla catla*, *Mystus cavasius*, *Clarias batrachus* and several other edible fishes are found in various nallah, dabras, (pool), Streams, Rohua and in Gandak river.

3.6 Birds

Who doesn't love birds with their multi-hued feathers and different forms of the body flying high in the sky, perched on branches of trees, swimming effortlessly on the still water of the swamps or diving in to the water in search of their prey? The sight of these beautiful avian, one of God's most attractive gifts to man, always gladdens one's mind and soul. The tract is very rich in avifauna. The common birds are Peafowls, Partridges (black and grey), Quails, Pigeon, Mynas, Bulbul, Hornbill, Parrot, Woodpeckers, Vultures, Eagles, Fly catchers and Sunbird. Kalij Pheasant, locally known as Churcha is also found [10,11].

The avifauna of this reserve is inadequately studied, but it can be said that where the forest is intact, almost all the terai forest species are likely to occur that are found in Dudhwa or the adjoining Sohagi Barwa Sanctuary in Uttar Pradesh [1]. Presently the grasslands are not in good condition due to grazing and plantation, but they could be revived with effective management. We might even get back the Bengal Florican (*Houbaropsis bengalensis*) that has become locally extinct in the Reserve. Mukherjee [12], claims to have seen one bird in 1980. In Nepal's Royal Chitwan National Park, where this species is still found [13,14].

Globally threatened species such as the Swamp Francolin (*Francolinus gularis*) and sociable Lapwing

(*Vanellus gregarius*) have been reported from the area [1]. The vulnerable Sarus Crane (*Grus antigone*) also occurs in small numbers [2]. The Greater Adjutant (*Leptoptilos dubius*) has not been seen for many decades, but the Lesser Adjutant (*L. javanicus*) is still found in streams and ponds.

3.7 Amur Falcon (*Falco amurensis*)

Four to five birds were seen flying over the Pandai river in the Manguraha range. Thousands of birds were seen roosting in shrubs and in cultivated lands of Bholapur-Kharhat of Gonauli range.

3.8 Himalayan Buzzard (*Buteo refectus*)

One was seen in the Manguraha Range. It flew low through a patch of deciduous forest and then repeatedly perched in trees, allowing good views. The Buzzard observed in Valmiki Tiger Reserve looked like a *refectus* but is treated here as tentative. It appeared noticeably smaller than Upland Buzzard (*B. hemilasius*). It was distinguished from Long-legged Buzzard (*B. rufinus*) by its smaller size and the lack of any rufous on the underwing, lower breast and belly.

3.9 Red Jungle Fowl (*Gallus gallus*)

The Red Jungle Fowl is an herbivorous and insectivorous member of the Phasianidae family. It is the closest wild ancestor of the domesticated chicken and can be seen in all the ranges of the Reserve feeding alone or in the group of four to eight birds.

3.10 Kalij Pheasant (*Lophura leucomelanos*)

Locally known as Churcha. The adult male of nominate race has glossy blue black plumage with purplish to greenish wash, and with distinctive broad white scales on lower back to upper tail coverts. Wings and vent are blackish-brown and mostly glossless. The tail is glossy blue-black above and black below. The head, forehead, crown and throat are black, whereas the nape is glossy blue-black. The female has reddish-brown to dark brown plumage with whitish-edged feathers giving scalloped appearance. The tail is black and flight feathers are brown. The Kalij Pheasant is mainly heard at dawn and dusk, uttering loud whistling chuckle or chirrup like calls.



Fig. 2. Himalayan Buzzard *Buteo refectus*



Fig. 3. Kalij pheasant *Lophura leucomelanos*

3.11 Common Peafowl (*Pavo cristatus*)

Peafowls are found over the entire area of the Reserve. Male often occurs singly or in flocks. It roosts in tree and feeds upon seeds, new shoots, insects and lizards. Its nest is shallow scrape in the ground normally in dense thicket. Peafowls are most notable for the males extravagant tail also known as a train, a result of sexual selection, which it displays as a part of courtship.

3.12 Common Babbler (*Turdoides caudata*)

Found over the entire area of the Reserve. It feeds upon ants, caterpillars, beetles, grasshoppers, termites and also grains.

3.13 Large Cormorant (*Phalacrocorax carbo*)

A flock of few birds was seen on a small islet in the Gandak river near Valmikinagar.

3.14 Oriental Darter (*Anhinga melanogaster*)

A single bird was seen in flight near the Gandak river near Valmikinagar. This species is near threatened [15].

3.15 Asian Openbill (*Anastomus oscitans*)

A flock of 20-25 birds was seen near grasslands of Madanpur Range. Few birds were also seen near waterlogged area in Madanpur range.

3.16 Red-vented Bulbul (*Pycnonotus cafer*)

It is a member of bulbul family. It is medium sized, dark, sleek bird with a black Crest and a white rump. The red color under the tail is often difficult to see. It eats fruit, flower buds and insects. Often seen high in trees or perched on wires. Calls include a variety or chirps and whistles.

3.17 Red-whiskered Bulbul (*Pycnonotus jocosus*)

It is medium sized songbird brown above and whitish below, with a tall black crest and dark spur on the side of the breast. It has a small red patch on ear, and a red under tail coverts. It can be seen entire area of the Reserve.

3.18 Indian Robin (*Saxicoloides fulicatus*)

Males are primarily black with chestnut bottom feathers. Males also have a white shoulder patch and a

relatively long tail. Its female is ashy brown without the wing patch. It can be seen in pairs in dry open lightly wooded country. Mostly saw near grasslands in the Reserve.

3.19 White-spotted Fantail (*Rhipidura albogularis*)

It is a flycatcher with white throat, spotted breast and white belly. Upper parts are salty brown, while wings are gray and tail dark with narrow buff tips to all tail feathers, except the central pair. Juvenile are like adults, but has dull rufous tips to wing coverts. Call is a short nasal "cherr". They were mostly seen near grasslands and thicket in almost all ranges of the Reserve.

3.20 Golden Oriole (*Oriolus oriolus*)

Golden Orioles are small birds perching on small trees and bushes. Males are bright yellow overall save for the black wings and inner tail feathers. It has a yellow patch on the wings, a yellow outer tail feathers, and a black stripe through the eye that gives it a masked appearance and the fleshy pink bill. The female is dull greenish-yellow overall with dirty brown/green wings and a completely yellowish tail. Most often found feeding in tree canopies either singly or in pairs. They generally give a harsh "Krrrrr" call while feeding.

3.21 Black Drongo (*Dicrurus macrocercus*)

It is an adaptable songbird of open areas such as farmland, forest edge, wetlands and fields, feeding on insects, perching conspicuously on a bare perch or along power or telephone lines. The species is famous for its aggressive behavior towards much larger birds, such as crows, never hesitating to dive-bomb any bird of prey that invades its territory. Smaller birds often nest in the well-guarded vicinity of a nesting Black Drongo. They are capable of producing a wide range of calls but a common call is a two note "tee-hee" call.

3.22 Lesser Adjutant (*Leptoptilos javanicus*)

One bird perched on top of a Jamun (*Syzygium cumini*) tree in Madanpur Range. In IUCN Red List [15] it is a vulnerable species. The adult face is red and the neck is yellow while the juvenile has a brownish head and a white thinly feathered neck. The upper parts are all dark while the under parts are mostly white. Often found in shallow marshes, fields and swamps.



Fig. 4. Red-vented bulbul *Pycnonotus cafer*



Fig. 5. Golden oriole *Oriolus oriolus*



Fig. 6. Lesser adjutant *Leptoptilos javanicus*

3.23 Swamp Francolin (*Francolinus gularis*)

In IUCN Red List [15] it is a vulnerable species. Often difficult to see in tall vegetation, but emerges in to the open in the early morning and late evening, usually foraging in small flocks. This is a grassland specialist occurring in tall wet savannah grassland. It can also seen near flooded fields and paddy fields. Several coveys were seen and heard in the grassland area of Madanpur Range. They generally give a loud Gull like “Kree-ree” call while feeding.

3.24 Black-winged Kite (*Elanus caeruleus*)

This is a small and distinctive falcon like kite and are mostly pale grey above with a pure white head, body, tail and back shoulders. The wings are white underneath with black wing tips. Females are larger than males. The red eye is marked by a black comma that extends behind it. A single bird saw just outside the Reserve near the Madanpur Range. Two birds were seen once at Rampurwa. They feed upon grasshoppers, rats, small reptiles, birds and even rabbits. Black winged kites are generally silent, except in the breeding season. They primarily utter clear whistled “Che.....Che” calls in flight and while hovering, or a hoarse wheezing “Skree-ah” when perched.

3.25 Red-wattled Lapwing (*Vanellus indicus*)

This species is not globally threatened (Least Concern) [15]. This is a long-legged wader in the family Charadriidae. The wings and back are light brown, but head, chest and front part of neck are black. Prominently white patch runs between these

two colors from belly and tail, flaking the neck to the side crown. Short tail is tipped black. A red fleshy wattle in front of each eye, black tipped red bill and the long legs are yellow. It usually keeps in pairs or trios in well watered open country, grass lands and around rain filled depressions. Few birds were seen near Mashan River in Chiutaha Range. In the fields outside the reserve near Gonauli several birds were also seen. This species call is very noisy, including at night, giving a loud, raucous, creaking and strident “did-he-do it”, “kree-kree”.

3.26 Yellow-wattled Lapwing (*Vanellus malabaricus*)

They are dull grey brown with a black cap, yellow legs and a triangular yellow wattle at the base of the beak. Like other lapwing and plovers they are ground birds and their nest is a mere collection of tinny pebbles within which their well camouflaged eggs are laid. Birds can see near rain filled depressions, grass lands and well watered open country. Conservation status is “Least Concern” [15].

3.27 Spotted Redshank (*Tringa erythropus*)

A pair of birds saw near Masan River in Chiuntaha Range. This is a medium sized elegant wading bird. In summer plumage the adults are almost entirely black, save for some white spotting on the wings, a white ‘wedge’ on the back showing clearly in flight and barred tail. In winter they have a grey black and paler under parts, with a more prominent eye stripe. They feed upon insect larvae, shrimps, small fishes and worms.



Fig. 7. Swamp francolin *Francolinus gularis*

Table 3. Detailed list of birds recorded in Valmiki National Park, during this study, with inputs from Sinha and Director [16,17]

Sr. No.	Common English name	Scientific name	Sr. No.	Common English name	Scientific name
1	Jungle Crow	<i>Corvus macrorhynchos</i>	23	Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>
2	Tree Pie	<i>Dendrocitta vagabunda</i>	24	Golden Oriole	<i>Oriolus oriolus</i>
3	Grey Tit	<i>Parus afer</i>	25	Black -hooded Oriole	<i>Oriolus xanthornus</i>
4	Jungle Babbler	<i>Turdoides striata</i>	26	Black-headed Myna	<i>Sturnus pagodarum</i>
5	Common Babbler	<i>Turdoides caudata</i>	27	Common Myna	<i>Acridotheres tristis</i>
6	Red-vented Bulbul	<i>Pycnonotus cafer</i>	28	Bank Myna	<i>Acridotheres ginginianus</i>
7	White-cheeked Bulbul	<i>Pycnonotus leucotis</i>	29	Yellow Wagtail	<i>Motacilla flava</i>
8	Red-whiskered Bulbul	<i>Pycnonotus Jocosus</i>	30	White-backed Munia	<i>Lonchura striata</i>
9	Indian Robin	<i>Saxicoloides fulicatus</i>	31	White-throated Munia	<i>Lonchura malabarica</i>
10	Magpie Robin	<i>Copsychus saularis</i>	32	Spotted Munia	<i>Lonchura punctulata</i>
11	Shama	<i>Copsychus malabaricus</i>	33	Red Munia	<i>Amandava amandava</i>
12	Common Blackbird	<i>Turdus merula</i>	34	Common Rosefinch	<i>Carpodacus erythrinus</i>
13	Verditer Fly catcher	<i>Eumyias thalassinus</i>	35	Yellow-throated Sparrow	<i>Gymnoris xanthocollis</i>
14	Paradise Fly catcher	<i>Terpsiphone paradisi</i>	36	House Sparrow	<i>Passer domesticus</i>
15	White-spotted Fantail	<i>Rhipidura albogularis</i>	37	Common Swallow	<i>Hirundo rustica</i>
16	Great Grey Shrike	<i>Lanius excubitor</i>	38	Grey Wagtail	<i>Motacilla caspica</i>
17	Bay-backed Shrike	<i>Lanius vittatus</i>	39	Citrine Wagtail	<i>Motacilla citreola</i>
18	Scarlet Minivet	<i>Pericrocotus speciosus</i>	40	Large-pied Wagtail	<i>Motacilla maderaspatensis</i>
19	Black-headed Cuckooshrike	<i>Coracina melanoptera</i>	41	White Wagtail	<i>Motacilla alba</i>
20	Large Cuckoo shrike	<i>Coracina macei</i>	42	Indian White-eye	<i>Zosterops palpebrosus</i>
21	Black Drongo	<i>Dicrurus macrocercus</i>	43	Purple Sunbird	<i>Nectarinia asiatica</i>
22	White-bellied Drongo	<i>Dicrurus caerulescens</i>	44	Tickell's Flowerpecker	<i>Dicaeum erythrorhynchos</i>
45	Yellow-fronted Pied Woodpecker	<i>Dendrocopos mahrattensis</i>	68	Crested Serpent Eagle	<i>Spilornis cheela</i>
46	Golden-backed Woodpecker	<i>Dinopium benghalense</i>	69	Shikra	<i>Accipiter badius</i>
47	Crimson-breasted Barbet	<i>Megalaima haemacephala</i>	70	Common Green -Pigeon	<i>Treron phoenicopterus</i>
48	Brain-fever Bird	<i>Cuculus varius</i>	71	Blue Rock Pigeon	<i>Columba livia</i>
49	Koel	<i>Eudynamys scolopaceus</i>	72	Spotted Dove	<i>Streptopelia chinensis</i>
50	Crow Pheasant	<i>Centropus sinensis</i>	73	Ring Dove	<i>Streptopelia capicola</i>
51	Large Indian Parakeet	<i>Psittacula eupatria</i>	74	Common Peafowl	<i>Pavo cristatus</i>
52	Rose-ringed Parakeet	<i>Psittacula krameri</i>	75	Red Junglefowl	<i>Gallus gallus</i>
53	Blossom-headed Parakeet	<i>Psittacula roseata</i>	76	Red Spurfowl	<i>Galloperdix spadicea</i>
54	Indian Roller	<i>Coracias benghalensis</i>	77	Jungle Bush-Quail	<i>Perdica asiatica</i>
55	Common Green Bee-eater	<i>Merops orientalis</i>	78	Black Partridge	<i>Melanoperdix niger</i>
56	Blue-tailed Bee-eater	<i>Merops philippinus</i>	79	Grey Partridge	<i>Perdix perdix</i>
57	Chestnut-headed Bee-eater	<i>Merops leschenaulti</i>	80	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>
58	Pied Kingfisher	<i>Ceryle rudis</i>	81	Sarus Crane	<i>Antigone antigone</i>
59	Common Kingfisher	<i>Alcedo atthis</i>	82	Stone-curlew	<i>Burhinus indicus</i>

Sr. No.	Common English name	Scientific name	Sr. No.	Common English name	Scientific name
60	White-breasted Kingfisher	<i>Halcyon smyrnensis</i>	83	Red-wattled Lapwing	<i>Vanellus indicus</i>
61	Common Grey Hornbill	<i>Tockus birostris</i>	84	Yellow-wattled Lapwing	<i>Vanellus malabaricus</i>
62	Hoopoes	<i>Upupa epops</i>	85	Common Sandpiper	<i>Actitis hypoleucos</i>
63	Palm Swift	<i>Cypsiurus parvus</i>	86	Little Egret	<i>Egretta garzetta</i>
64	Common Indian Nightjar	<i>Caprimulgus asiaticus</i>	87	Cattle Egret	<i>Bubulcus ibis</i>
65	Brown Fish-Owl	<i>Ketupa zeylonensis</i>	88	Pond Heron	<i>Ardeola grayii</i>
66	Spotted Owlet	<i>Athene brama</i>	89	Pied Myna	<i>Sturnus contra</i>
67	King Vulture	<i>Sarcorampus papa</i>	90	Pygmy Woodpecker	<i>Dendrocopos nanus</i>

Table 4. Ducks commonly seen in winter

1	Common coot	<i>Fulica atra</i>	5	Dabchick	<i>Podiceps ruficollis</i>
2	Spotted Sandpiper	<i>Actitis macularius</i>	6	Purple Swamphen	<i>Porphyrio porphyrio</i>
3	Cotton Teal	<i>Nettapus coromandelianus</i>	7	Red-crested Pochard	<i>Netta rufina</i>
4	Ruddy Shelduck	<i>Tadorna ferruginea</i>	8	White-eye Pochard	<i>Aythya nyroca</i>

Fig. 8. Red-wattled lapwing *Vanellus indicus*Fig. 9. Spotted redshank *Tringa erythropus*

3.28 Common Grey Hornbill (*Tockus birostris*)

This is a common hornbill found in all over the Reserve area. It is mostly arboreal and is commonly sighted in pairs. They have grey feathers all over the body with a light grey or dull white belly. The horn is black or dark grey with a casque extending up to the point of curvature in the horn. They feed upon small fruits, various insects, lizard, mice and nestlings and rarely flower petals.

3.29 Common Indian Nightjar (*Caprimulgus asiaticus*)

This is cryptically coloured night bird with white “moustache” streak, golden brown collar and pointed buff-and-black feathers above the wing. Male shows bright white patches near the wing tips and on the tail tips in flight. Its diet includes moths, dung beetles, grass hoppers, crickets and bugs. During non-breeding season, also takes flowers of Euphorbia. Song of male is distinctive “chuk-chuk-chuk-k-k-roo” that starts slowly before.

3.30 Savanna Nightjars (*Caprimulgus affinis*)

This is well-camouflaged night bird, usually encountered roosting on gravel river beds, open areas in grasslands or roadside. Sometime found in small flocks when roosting. Only males have a fairly small white patch on the wing near the tip. Most often is detected by its distinctive, high-pitched, burry “Chree-ik” song, repeated over and over.

4. CONCLUSION

From the present study it is concluded that the avifauna of Valmiki National Park is unique. We must conserve the ecosystem of Valmiki National Park to conserve this unique avifauna. The main threat to the Reserve are biotic pressures from the fringe villagers, which include fire, wood collection, grazing of domestic stock in the grassland, presence of all-weather road and railway inside the Reserve. Poaching must be stopped in the Reserve. Wildlife Protection Act, the 1972 Act for the protection of wild animals, birds and plants must be enforce [18]. It shall be the duty of every citizen to protect and improve the natural environment including forests and wildlife.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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