

OPEN ACCESS



The Journal of Threatened Taxa is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at www.threatenedtaxa.org. All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use of articles in any medium, reproduction, and distribution by providing adequate credit to the authors and the source of publication.

Journal of Threatened Taxa

Building evidence for conservation globally

www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

COMMUNICATION

STATUS OF BIRDS IN AGASTHYAMALAI HILLS, WESTERN GHATS, KERALA, INDIA

Madhumita Panigrahi & V.J. Jins

26 January 2018 | Vol. 10 | No. 1 | Pages: 11166–11184

10.11609/jott.3259.10.1.11166-11184



For Focus, Scope, Aims, Policies and Guidelines visit <http://threatenedtaxa.org/index.php/JoTT/about/editorialPolicies#custom-0>
For Article Submission Guidelines visit <http://threatenedtaxa.org/index.php/JoTT/about/submissions#onlineSubmissions>
For Policies against Scientific Misconduct visit <http://threatenedtaxa.org/index.php/JoTT/about/editorialPolicies#custom-2>
For reprints contact info@threatenedtaxa.org





STATUS OF BIRDS IN AGASTHYAMALAI HILLS, WESTERN GHATS, KERALA, INDIA

Madhumita Panigrahi ¹ & V.J. Jins ²

ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

^{1,2} Sálim Ali Centre for Ornithology and Natural History (SACON), Anaikatty (Post), Coimbatore, Tamil Nadu 641108, India

¹ madhumita.panigrahi7@gmail.com (corresponding author), ² jinsvj@gmail.com

OPEN ACCESS



Abstract: The present study focused on the status of birds in two wildlife sanctuaries, Neyyar and Peppara, located in Agasthyamalai Biosphere Reserve, Kerala State, India. A total of 197 bird species representing 16 orders and 57 families are reported from the study area. According to the IUCN Red List, one Endangered, two Vulnerable, and nine Near Threatened bird species occur in the landscape. Black Bulbul was the most abundant species with highest density, followed by Yellow-browed Bulbul and Crimson-backed Sunbird. Despite many bird species being broadly distributed across elevations, most endemic species occur or breed at elevations above 1,200m, dominated by southern hilltop evergreen forest. This highlights the prominence of these high altitude species and their habitats. A customized conservation plan is needed for the whole elevation gradient with greater emphasis on high elevation forest.

Keywords: Bird community, density estimates, elevation, endemism, Neyyar, Peppara.

DOI: <http://doi.org/10.11609/jott.3259.10.1.11166-11184> | **ZooBank:** urn:lsid:zoobank.org:pub:ACE77578-1B4E-44FF-BF99-1AE9B13669E2

Editor: P.O. Nameer, Kerala Agricultural University, Thrissur, India.

Date of publication: 26 January 2018 (online & print)

Manuscript details: Ms # 3259 | Received 03 January 2017 | Final received 05 January 2018 | Finally accepted 14 January 2018

Citation: Panigrahi, M. & V.J. Jins (2018). Status of birds in Agasthyamalai Hills, Western Ghats, Kerala, India. *Journal of Threatened Taxa* 10(1): 11166–11184; <http://doi.org/10.11609/jott.3259.10.1.11166-11184>

Copyright: © Panigrahi & Jins 2018. Creative Commons Attribution 4.0 International License. JoTT allows unrestricted use of this article in any medium, reproduction and distribution by providing adequate credit to the authors and the source of publication.

Funding: Department of Biotechnology (DBT), Govt. of India.

Competing interests: The authors declare no competing interests.

Author details: MADHUMITA PANIGRAHI - PhD scholar with interest in bird communities, ecology and species distribution patterns. V.J. JINS - PhD scholar, interested in community ecology, herpetology and landscape level patterns in biodiversity.

Author Contribution: MP carried out field sampling, compiled data, analyzed and wrote the manuscript. JVI assisted in fieldwork and helped in revising the manuscript.

Acknowledgements: We are forever indebted to Late Dr. S. Bhupathy, Senior Principal Scientist (SACON) under whose able guidance we started this work. This paper is an offshoot of a larger project initially headed by Dr. Bhupathy. We would like to thank Department of Biotechnology (DBT), Govt. of India for funding, Kerala Forest Department for permission and logistic support, and our field assistants and the eco-development committee (EDC) of Kappukadu & Podium for their continuous help during the project. We are grateful to Dr. P.A. Azeed, Senior Principal Scientist-1, (SACON) for his continuous support and guidance. Dr. Rajah Jayapal, Principal Scientist, (SACON) for his valuable inputs for improving the manuscript and Ms. Aditi Mukherjee, Ph.D. Scholar (SACON) for helping in data analysis.



INTRODUCTION

Regional assessment of population status of any taxa is crucial for conservation planning of species and landscapes (Vetaas & Grytnes 2002). The mountain ranges of Western Ghats, are ranked high among the global biodiversity hotspots (Myers et al. 2000; Mittermeier et al. 2004). It is one of the 200 most important global ecoregions (Olson & Dinerstein 1998), and endemic bird areas of the world (Stattersfield et al. 1998). The Western Ghats form one of the 10 biogeographic zones of India (Rodgers et al. 2002) and are known to harbour more than 500 species of birds (Ali & Ripley 1996).

Of the 504 species of birds occurring in southwestern India, 360 species are terrestrial (Daniels 1997). A total of 16 species are endemic and restricted to the Western Ghats (Sattersfield et al. 1998, 2005). The range boundaries of many of the bird species is largely influenced by the Palghat Gap, a 30km wide low-elevation mountain pass at 10.0833°N latitude between Nilgiris in the north and Anaimalai Range in the south. Notably, the moist forests, particularly tropical montane evergreen rainforest in the southern Western Ghats, is a major habitat for over 100 species of birds, including 14 endemics (Mudappa & Raman 2008). In Kerala alone, 500 species of birds have been recorded belonging to 88 families and 22 orders, out of which 17 species are endemic to this region (Praveen 2015). In the light of new taxonomic revisions, 24 species are considered to be endemic to the Western Ghats (Rasmussen & Anderton 2012).

The present study was carried out in Agasthyamalai Biosphere Reserve (ABR), particularly in two wildlife sanctuaries namely, Neyyar and Peppara in Kerala State which have been listed among the Important Bird Areas (Birdlife international 2015; Rahmani & Zafar-Ul Islam 2004). Nair (1993) has recorded 172 bird species belonging to 39 families from Neyyar Wildlife Sanctuary (NWS) alone. A concise checklist by Sashikumar et al. (2011) has enlisted a total of 221 and 215 birds from Neyyar and Peppara respectively making a total list of 227 birds in this area. There are many studies conducted in the eastern slope of the mountain range, i.e., mostly covering Kalakad-Mundanthurai Tiger Reserve (Johnsingh & Joshua 1994; Venkatraman 2011; Ramachandran & Ganesh 2013). However, no long-term studies on forest bird community are available from the western slopes apart from a few checklists. In light of the above-mentioned gap in information, the present study highlights the status of forest birds in the western

slope of Agasthyamalai Hills of Kerala.

MATERIALS AND METHODS

Study area

The intensive study area (250km²) is along the western slope of Agasthyamalai Hills in Kerala 8.55N-77.10E & 8.7166N-77.250E, and includes the areas of Neyyar and Peppara wildlife sanctuaries and the Agasthyavanam Biological Park (ABP) (Fig. 1). The area has an elevation range between 100–1,866 m above mean sea level. The forest types of this region include southern hilltop evergreen forest, west coast tropical evergreen forest, west coast semi-evergreen forest, southern secondary moist mixed deciduous forest and reed brakes (Champion & Seth 1968). The lower elevations (<600m) are dominated by mixed deciduous and semi-evergreen forests, and the zone 600–1,200 m is characterized by tropical evergreen forest. Southern hilltop evergreen forests and reed brakes occur near and above 1,200m (Varghese & Balasubramanyan 1999; Kunhi & Sankar 2000). Higher elevations are marked by steep undulating terrains and the area receives 2,000–5,000 mm annual rainfall with only two-three dry months in a year. The mean temperature of the coldest month ranges from 13.5°C to above 23°C (Pascal 1982). Besides the natural vegetation, these hill ranges also have vast stretches of tea, cardamom and rubber plantations. In 2016, ABR was included in UNESCO's World Network of Biosphere Reserves making it 10th Biosphere Reserve in the list, out of 18 from India. It falls within the Indo-Malayan realm and the Western Ghats biogeographic zone. This region is the traditional stronghold of 'Kanis', one of the oldest tribal groups living in the southern Western Ghats. This mountain peak is also of paramount spiritual and cultural significance for people in the states of both Tamil Nadu and Kerala and is an important pilgrim center.

Data collection

Sampling was carried out from October 2012 to December 2014. Variable circular-plot method was used to survey bird populations at each sampling plot (Reynolds et al. 1980; Bibby et al. 1998). Point count survey was carried out for a duration of 10 minutes on a clear day in the first three hours after sunrise (Ralph et al. 1995; Raman & Sukumar 2002; Raman 2003). Birds seen and heard up to a distance of 50m were recorded. Radial distance and perching height were recorded by the help of Nikon Forestry Pro laser range finder. Other parameters like group sizes, sex, and type of contact

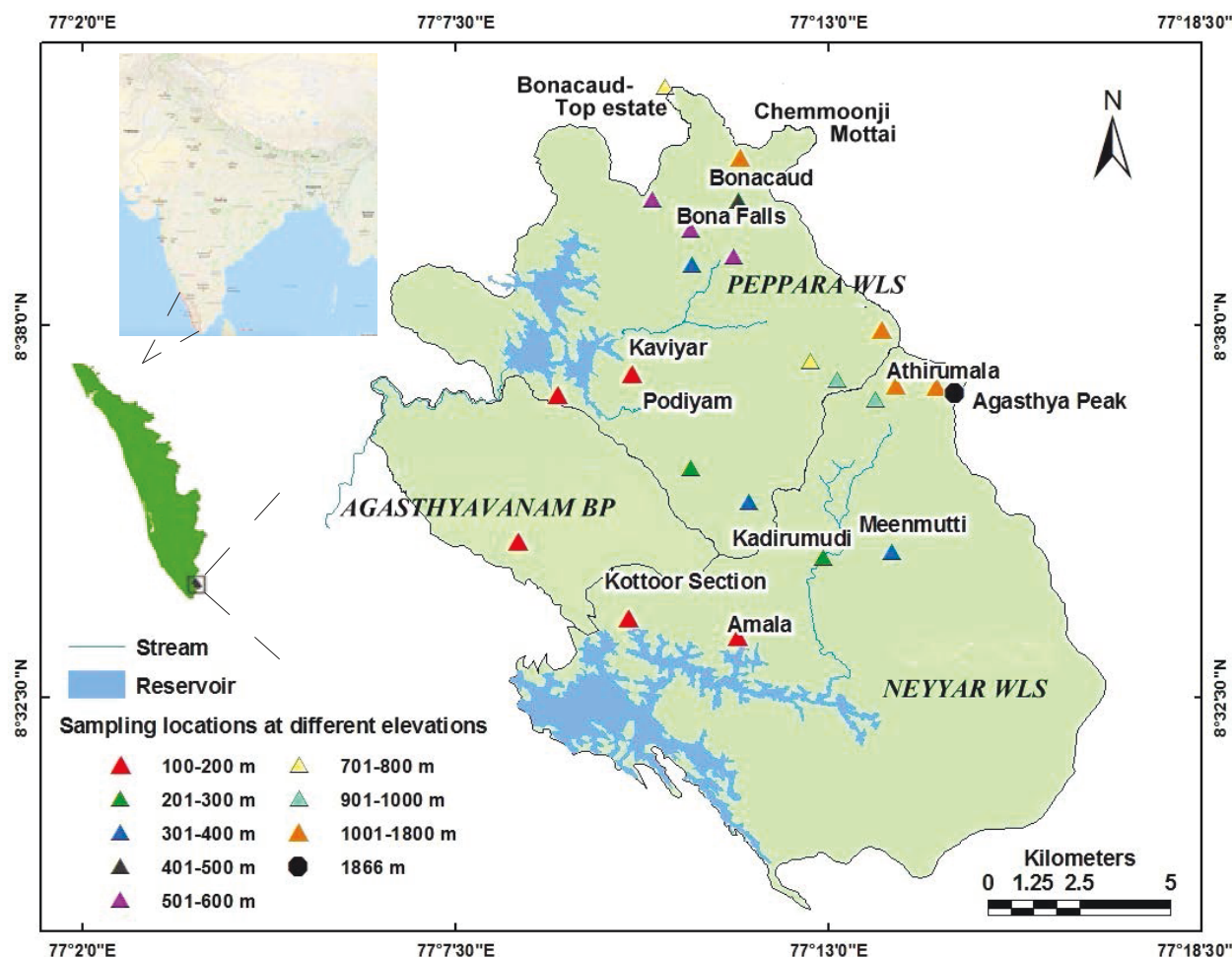


Figure 1. Location of sampling points in Neyyar and Peppara wildlife sanctuaries, and Agasthyavanam Biological Park

were also recorded. Primarily, sampling plots were placed on the basis of elevation and accessibility at each 100m elevation, except the elevation classes between 600–700 and 800–900 meters due to unapproachability. Transects of one kilometer length were laid in each elevation band mostly along the existing paths or animal trails. The transect was divided into each 250m and the permanent sampling point were taken perpendicular to the transect line at a distance of 50m on either side of transect to avoid habitat edges (Jones et al. 1995). A total of 122 point count stations were laid representing all possible habitat types and elevational ranges in the study area. Bird counts in each point were repeated with number of replications varying between 2–16 depending on accessibility and logistic support which resulted in 746 point count efforts in total. Sampling points were marked using colour paint and GPS coordinates were noted. We followed Praveen et al. (2016) for taxonomic classification and nomenclature. For subspecies identification we followed Rasmussen &

Anderton (2012). Recent taxonomic changes for Kerala Laughingthrush *Trochalopteron fairbanki meridionale* (Ashambu Chilappan *Montecincla meridionale*) and white-bellied Shortwing *Brachypteryx major* (Ashambu Sholakili, *Sholicola ashambuensis*) have also been considered (Robin et al. 2017) although the old names have been maninated in the text.

Data analysis

For assessing the status of birds; in addition to our systematic sampling, opportunistic sightings of species were also included. IUCN criteria (IUCN 2015) were used to assign conservation status at a global level.

Density estimates were calculated using Distance 6.2 Release 1, for the overall bird population density for Agasthyamalai Hills and also density of 18 species of birds for which we had adequate number of detections, i.e. >28. For density estimates of specific species, select point count stations were included with suitable habitats based on prior knowledge of species biology. The best-

fit model was examined using Akaike's Information Criterion (AIC) value and goodness of fit tests (Thomas et al. 2010; Buckland et al. 2001). The best possible model with lowest AIC values was then selected. Variables like encounter rate, average probability of detection, cluster density were computed on the basis of priori estimator models namely uniform, half-normal, hazard-rate and negative exponential along with cosine adjustments. Depending on the outliers, the detection distances for each species were truncated to achieve the best-fitted model.

Relative density was calculated to evaluate the most dominant species in the landscape and in different elevational zones. Since sufficient numbers of detections for certain species in all elevational zones was not available for calculating absolute density, relative abundance was calculated as the number of individuals in proportion of the total number of individual of all species.

RESULTS

The present study reports 197 bird species from 16 orders and 57 families from both Neyyar and Peppara Wildlife Sanctuaries (Appendix 1; Images 1–101). This list does not include many species of waterbirds, as the study focused on forest habitats. According to the IUCN criteria 5% ($n = 9$) species are under Near Threatened category including Black-and-orange Flycatcher *Ficedula nigrorufa*, Great Hornbill *Buceros bicornis*, Grey-headed Bulbul *Brachypodius priocephalus*, Grey-headed Fish Eagle *Ichthyophaga ichthyaetus*, Kerala Laughingthrush *Montecincla meridionale*, Lesser Fish Eagle *Ichthyophaga*

humilis, Nilgiri Flycatcher *Eumyias albicaudatus*, Oriental Darter *Anhinga melanogaster*, and River Tern *Sterna aurantia*. The study recorded two Vulnerable species, i.e., Woolly-necked Stork *Ciconia episcopus* and Nilgiri Woodpigeon *Columba elphinstonii*, and one Endangered species i.e. White-bellied Shortwing (Ashambu Sholakili) *Sholicola ashambuensis*.

Other species though common in other areas are categorized as rare because of their limited sight records. Some interesting sightings from the study area where of: *Milvus migrans* Black Kite which have been observed in periphery of forest in Neyyar WLS but not recorded from interior forest. Lesser Fish-eagle *Ichthyophaga humilis* was sighted only once in flight in Neyyar WLS, while the Grey-headed Fish-eagle *Ichthyophaga ichthyaetus* is quite common site in Kaviyar river, Peppara WLS. A single individual of Pied Harrier *Circus melanoleucos* was sighted at an elevation of 1300 m among grassland and southern hilltop forest. Brown-headed Barbet *Psilopogon zeylanicus* has been often sighted from Peppara WLS.

Density Estimates: A total of 3151 individuals of birds were recorded in 1997 detections in overall Agasthyamalai range (Table 1). To estimate the density of birds 'Half normal key' function was selected as the best fit model based on its lowest AIC value. The cluster density was estimated to be 1137.9 clusters/km² with a mean cluster size of 1.59 clusters/km². The estimated density of individuals was 1643.6 individuals/km² with a coefficient of variation of 10.97%, which accounts for a population range size from 334,030–412,530 birds in the entire region (intensive study area). The highest bird density was recorded at high elevations (2988.7 individuals/km²) followed by low elevations (1833.8

Table 1. Estimate of density for bird species along different elevational range of Agasthyamalai Hills

Elevation	n	ER	P	EDR (m)	Detection Functions		Density Estimate					
					Selected Model	Min. AIC	DS (km ²)	MCS	E (S)	D (km ²)	% CV (D)	95% CI
Overall	1997	0.60	0.13	12.95	Half-normal	7812.03	1137.9	1.59	1.44	1643.6	10.79	1330.8-2029.8
Low (100–700 m)	1510	0.57	0.11	11.83	Uniform	5563.73	1315	1.50	1.39	1833.8	12.99	1422.7-2363.7
Medium (701–1,200 m)	312	0.68	0.25	17.67	Half-normal	1058.32	695.77	1.65	1.69	1176.5	18.11	825.48-1676.7
High (>1,200 m)	172	0.65	0.12	9.86	Half-normal	544.89	2148.3	1.43	1.39	2988.7	20.14	2017.4-4427.7

n - No. of Detections; ER(n/k) - Encounter rate; P - average detection probability between the point count and truncation distance; EDR - Effective Detection Radius; DS - Estimate density of cluster; AIC - Akaike's Information Criterion; MCS - Mean Cluster size; E(S) - Estimate of expected value of cluster size; D - Density of individuals; %CV - Percent coefficient of variation; 95%CI - 95% confidence interval.

individuals/km²) and least in the middle elevation (1176.5 individuals/km²).

Density estimates of 18 species, which provided minimum possible detections to run the Distance program (Table 2), were calculated. The highest cluster density was of Black Bulbul *Hypsipetes leucocephalus ganeesa* (459.63 clusters/km²), followed by Plain Flowerpecker *Dicaeum concolor* (370.97 clusters/km²) and Crimson-backed Sunbird *Leptocoma minima* (358.72 clusters/km²). The highest density of 958.57 individuals/km² was of Black Bulbul, followed by Yellow-browed Bulbul *Acritillas indica* 722.12 individuals/km² and Crimson-backed Sunbird 506.74 (individuals/km²). The details of detection functions and density estimates for all 18 species are provided in Table 2.

Relative abundance: The highest relative abundance along all elevational bands was for Yellow-browed Bulbul (0.08), followed by Greenish Leaf warbler *Seicercus trochiloides* (0.066), and 0.06 each for Greater Racket-tailed Drongo *Dicrurus paradiseus* and Black Bulbul. In case of three different elevation classes, in lower elevation (100–700 m) Yellow-browed Bulbul had the highest relative abundance (0.08); Greater Racket-tailed Drongo (0.068) and Greenish Leaf Warbler is 0.065. In the middle elevation (701–1,200 m), the highest relative density was of Black Bulbul (0.123), Yellow-browed Bulbul (0.12); White-cheeked Barbet *Psilopogon viridis* is (0.06). In higher elevation (Above 1201m), Black Bulbul again dominated with a relative density of 0.18; Kerala Laughingthrush *Montecincla meridionale* (0.16) and Greenish Leaf Warbler (0.1).

Species account of threatened and endemic species in Agasthyamalai Hills are given below:

Great Hornbill: The species was mostly recorded in and around evergreen patches at 500–1,000 m elevation ranges. Seasonal movements were observed which could be influenced by the availability of fruits. Though we did not record its nesting during our study, but mating calls and sub-adult were seen in suitable localities.

Malabar Grey Hornbill *Ocyrceros griseus*: Among the two hornbill species recorded from Neyyar and Peppara, this species was the most abundant. It was found in almost all habitat type, in accordance with other studies from the Western Ghats (Balasubramanian et al. 2004; Mudappa & Raman 2008).

Malabar Pied Hornbill *Anthracoceros coronatus*: This species has not been recorded in the present study. Balasubramanian et al. (2004), however, have reported its rare presence from NWS and Thenmala Reserve Forest in Agasthyamalai Hills, which are considered as

the southernmost distribution record for this species. Absence of this species in Neyyar during our study is of great concern as the species is Near Threatened under IUCN Red List of Threatened Species.

Nilgiri Wood Pigeon *Columba elphinstonii*: This species had a wider distribution across the elevation compared to other endemic bird species in the area. It has been sighted in almost all forest types except grasslands and fire prone areas. In particular, it was seen in higher numbers in high-elevation preferring hilltop forests where nesting has also been recorded. Few sightings were recorded from rubber plantations and adjoining highly disturbed forest patches in lower elevations.

Malabar Barbet *Psilopogon malabaricus*: This species was fairly common in comparison to Coppersmith Barbet. It was observed to be widespread from low elevational forest up to 1000m.

White-bellied Treepie *Dendrocitta leucogastra*: Observed mostly near semi-evergreen and evergreen forests from 500–1,100 m. Appeared to be locally common in suitable habitats.

White-bellied Blue Flycatcher *Cyornis pallidipes*: It was widely distributed from lower elevation to 1,200m and prefers well-wooded areas. Found to be fairly common in this region.

Nilgiri Flycatcher *Eumyias albicaudatus*: Restricted to the of hilltop evergreen patches between 1,100–1,860 m. Encountered commonly in undisturbed habitats mostly hilltop evergreen patches intermixed with grasslands and reeds compared to same kind of habitat in disturbed area.

Black-and-orange Flycatcher *Ficedula nigrorufa*: Restricted to hilltop evergreen patches and mostly sighted in the elevation belt of 1,100–1,860 m. This species shares same habitat as Nilgiri Flycatcher, but was always observed in lower abundance. This also appears to avoid disturbed areas.

Crimson-backed Sunbird *Leptocoma minima*: A widely distributed endemic species and has been recorded from lower elevation to 1,600m. We recorded a density of 506.74 individuals/km² (Table 2). Found in almost all forest types and among the most abundant species in the study area.

Malabar Parakeet *Psittacula columboides*: Though one of the common endemics of the lower reaches of Western Ghats, was rarely observed in present study. A few records were made from semi-evergreen and moist-deciduous forests near Bonacaud tea estate at an elevation of 700–750 m.

Grey-headed Bulbul *Brachypodius priocephalus*:

Table 2. Estimate of density for 18 bird species in their suitable habitats.

Species	n	(ER)	Detection Functions				Density Estimate					
			P	EDR (m)	Selected Model	Min. AIC	D (km ²)	MCS	E(S)	D (km ²)	% CV (D)	95% CI
AFBB	61	0.08	0.47	24.1	Hazard rate	223.13	44.66	1.29	1.34	60.25	20.19	40.62–89.36
BNMR	37	0.05	0.31	14.1	Uniform	138.96	79.3	1.27	1.23	98.26	21.98	64.00–150.88
CBSB	67	0.09	0.06	8.9	Uniform	270.29	358.72	1.50	1.41	506.74	25.92	306.34–838.22
BCBB	30	0.04	0.33	18.43	Uniform	120.84	44.59	1.33	1.72	76.7	20.62	51.23–114.83
GRTD	123	0.16	0.25	20.26	Half-normal	514.89	128.92	1.82	1.66	214.02	18.18	150.06–305.24
HLMN	47	0.07	0.30	19.19	Uniform	184.04	64.16	4.21	4.24	272.49	25.53	165.78–447.90
LSHT	39	0.05	0.10	9.75	Half-normal	120.71	174.28	1.05	1.12	195.77	32.57	104.50–366.76
PLFP	106	0.14	0.12	11.02	Uniform	417.13	370.97	1.11	1.11	412.03	18.02	289.70–586.02
SCMV	72	0.10	0.11	11.9	Half-normal	249.89	246.36	1.93	1.9	470.36	21.52	309.05–715.87
BKBB	119	0.32	0.21	14.98	Half-normal	431.37	459.63	2.39	2.08	958.57	18.82	663.31–1385.3
WCBR	87	0.13	0.23	14.65	Negative Expo	334.94	197.45	1.22	1.14	225.56	25.49	137.35–370.41
YBBB	160	0.24	0.30	15.41	Uniform	532.9	323.49	2.00	2.23	722.12	10.82	583.69–893.39
GNWR	135	0.18	0.21	13.88	Half-normal	487.97	297.73	1.32	1.34	399.49	14.51	300.66–530.81
MLTR	30	0.04	0.23	19.32	Half-normal	102.68	39.04		1	39.04	29.29	29.29–69.03
MGHB	23	0.03	0.14	10.89	Half-normal	93.69	94.75	1.86	2.3	224.33	39.11	104.98–479.35
LBLW	67	0.09	0.37	21.44	Hazard Rate	246.86	64.59	1.07	1.08	70.308	19.95	47.61–103.82
BTBF	56	0.08	0.17	16.72	Half-normal	192.9	100.73	1.16	1.27	128.54	20.37	86.28–191.49
MWTH	31	0.02	0.23	21.89	Half-normal	128.33	57.99	1.03	0.96	56.19	27.99	32.52–97.08

AFBB: Asian Fairy-bluebird; BNMR: Black-naped Monarch; CBSB: Crimson-backed Sunbird; BCBB: Black-crested Bulbul; GRTD: Greater Racket-tailed Drongo; HLMN: Hill Myna; LSHT: Little Spiderhunter; PLFP: Plain Flowerpecker; SCMV: Scarlet Minivet; BKBB: Black Bulbul; WCBR: White-cheeked Barbet; YBBB: Yellow-browed Bulbul; GNWR: Greenish Leaf Warbler; MLTR: Malabar Trogon; MGHB: Malabar Grey Hornbill; LBLW: Large-billed Leaf Warbler; BTBF: Blue-throated Flycatcher; MWTH: Malabar Whistling Thrush.

n - No. of Detections; ER(n/k) - Encounter rate; P - average detection probability between the point count and truncation distance; EDR - Effective Detection Radius; DS - Estimate density of cluster; AIC - Akaike's Information Criterion; MCS - Mean Cluster size; E(S) - Estimate of expected value of cluster size; D - Density of individuals; %CV - Percent coefficient of variation; 95%CI - 95% confidence interval.

Locally common, encountered from low elevation up to 1,000m preferably in patches dominated by reed bamboo (*Ochlandra* sp.).

White-bellied Shortwing *Sholicola ashambuensis*: Rarely seen and restricted to above 1,000m and evergreen biotope.

Broad-tailed Grassbird *Schoenicola platyrus*: Though said to be breeding in areas of Pandipath and Ponmudi by local bird watchers; we did not record this generally rare species in the present study.

Kerala Laughingthrush *Montecincla meridionale*: Locally common, restricted to altitude above 1,100m in high elevation evergreen forest. It was one of the most common birds encountered at higher altitude. Often found feeding on the offerings left behind by visitors.

The subspecies found here is having a very restricted distribution and reported to be sensitive to habitat alterations (Praveen & Nameer 2012).

Wayanad Laughingthrush *Garrulax delesserti*: Flocks were recorded near the forest edges and tea plantation prefers semi-evergreen forest. Found to be locally common.

Rufous Babbler *Argya subrufa*: Mostly encountered in area intermixed with grasses along the forest edges and abandoned tea plantations above 400m.

Nilgiri Thrush *Zoothera dauma neilgherriensis*: A sulking species, found in the areas having some undergrowth and good litter cover. It has been recorded from 500m up to the top of the hill. May be under-reported due to its sulking behaviour.

DISCUSSION

Despite the fact that many bird species are broadly distributed, most of the endemic species occur or breed only in restricted elevation ranges, i.e., above 1,200m dominated by southern hilltop evergreen forest. Though higher elevation had few species (27) compared to medium (47) and lower elevation (87), it showed highest density of 2988.7 individuals/km². This higher density of birds at higher elevations may be due to several reasons. Firstly number of detections is less compared to other elevations with 20.14% CV with a very high % CI (2017.4–4427.7). More detection might have improved the density estimates. The geographic area at higher elevations is significantly less (9.71km²) compared to medium (35.51km²) and lower altitudes (206.95km²) thereby augmenting the density in a smaller area. Besides, several Western Ghats endemics like Kerala Laughingthrush, Black-and-orange Flycatcher, and Nilgiri Flycatcher are only found in higher elevations and other species that have widest elevational amplitude further augment the density. Black Bulbul having the highest density (958.57 individuals/km²) among all the bird species was mostly recorded in large groups at higher elevation. These may be some of the reasons for the inflation in density at higher elevation. Since much of the bird detection where through calls, calculating absolute density may not give very good results. Density estimates of 18 species in table 2, shows that despite having low CV in 11 species, a higher value of 95% CI was obtained. Hence absolute density measures should be used carefully.

Present study reported 1643.6 birds/km² compared to 1122 birds/km² in the Silent Valley in Nilgiris (Jayson & Mathew 2000). Mudappa & Raman (2008) have reported White-cheeked Barbet and Crimson-backed Sunbird to be widely distributed in a study conducted in the selective places in Western Ghats from Goa to Tamil Nadu. In the current study, Yellow-browed Bulbul, Crimson-backed Sunbird and White-cheeked Barbet were found to be widely distributed in Agasthyamalai landscape.

In a hill range, species are often restricted or distributed across particular elevation bands, as their distribution may be governed by bioclimatic or vegetation attributes; since these environmental parameters are vulnerable to climate change and habitat alteration, montane species are at greater risk of extinction in the long run (White & Bennett 2015). Apart from this, the number of endemics found in specific habitats has to be taken as important criterion for landscape level

conservation actions (Aliabadian et al. 2008). Impacts of human factors on the montane ecosystem with respect to the distribution and population status of endemic species are well documented (Vijayan & Balakrishnan 2005; Vijayan et al. 2005). Agasthyamalai and specifically Agasthyarkoodam attract a lot of pilgrims from both Tamil Nadu and Kerala and the trend is increasing every year especially during January to April. The visitation has increased from 5,490 visitors in 2007 to 7,055 visitors in 2011. (Management Plan 2012–2013 to 2021–2022). Increased and unchecked pilgrimage activity may have a detrimental effect not only on the endemic birds but on other fauna as well. Generally, it was observed that areas with least disturbance hold a good number of endemic species compared to same kind of forest type in areas frequented by visitors. Among the six forest types, the southern hilltop evergreen forest appears to be the most important habitat for the endemic birds (Robin & Nandini 2012) which are currently under pilgrimage pressure in the Agasthyamalai Hills. An urgent management intervention is needed to regulate the flow of the tourist and pilgrims in this area before it severely affects these biodiversity rich high altitude forests.

REFERENCES

- Aliabadian, M., R. Sluys, C.S. Roselaar & V. Nijman (2008). Species diversity and endemism: Testing the mid-domain effect on species richness patterns of songbirds in the Palearctic Region. *Contributions to Zoology* 77(2): 99–108.
- Balasubramanian, P., V.S. Vijayan, N. Prasad, R. Ravi & N. Krishnakumar (2004). Report on status and distribution of Hornbills in the Western Ghats. Sálím Ali Centre for Ornithology and Natural History, Coimbatore, India, 38pp.
- Bibby, C., M. Jones & S. Marsden (1998). *Expedition Field Techniques Bird Surveys*. Geography Outdoors, London, 139pp.
- Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers & L. Thomas (2001). *Introduction to Distance Sampling Estimating Abundance of Biological Populations*. University Press, Oxford, 374pp.
- Champion, S.H. & S.K. Seth (1968). *A Revised Survey of the Forest Types of India*. Government of India, Delhi, xxiii+404pp.
- Daniels, R.J.R. (1997). *A Field Guide to the Birds of South Western India*. Oxford University Press, Oxford, xi+195pp.
- IUCN (2015). *The IUCN Red List of Threatened Species*. <<http://www.iucnredlist.org>>. Downloaded on 22 December 2015.
- Jayson, E.A. & D. N. Mathew (2000). Diversity and species abundance distribution of birds in the tropical forest of Silent Valley, Kerala. *Journal of the Bombay Natural History Society* 3(97): 390–399.
- Johnsingh, A.J.T. & J. Joshua (1994). Avifauna in three vegetation types on Mundanthurai Plateau, south India. *Journal of Tropical Ecology*. 10: 323–335.
- Jones, M.J., M.D. Linsley & S.J. Marsden (1995). Population sizes, status and habitat associations of the restricted-range bird species of Sumba, Indonesia. *Bird Conservation International* 5: 21–52.
- Kunhi, K.M. & S. Sankar (2000). Environmental impact assessment of pilgrimage in Agasthyamalai region. Technical Report No.238,

- Kerala Forest Research Institute, Peechi, 50pp.
- Mittermeier, R.A., P.R. Gil, M. Hoffmann, J. Pilgrim, T. Brooks, C.G. Mittermeier, J. Lamoureux & G.A.B. da Fonseca (eds.) (2004). *Hotspots Revisited - Earth's Biologically Richest and Most Endangered Ecoregions*. CEMEX, Mexico, 392pp.
- Mudappa, D. & T.R.S. Raman (2008). Hornbill and endemic birds: a conservation status survey across the Western Ghats, India. Technical Report no.17, Nature Conservation Foundation, Mysuru, 56pp.
- Myers, N., R.A. Mittermeier, C.G. Mittermeier, G.A. da Fonseca & J. Kent (2000). Biodiversity hotspots for conservation priorities. *Nature* 403(6772): 853–858; <http://doi.org/10.1038/35002501>
- Nair, M. (1993). Avifauna of Neyyar Wildlife Sanctuary. *Newsletter for Birdwatchers* 33(4): 62–65.
- Peppara Wildlife Sanctuary Management Plan 2012-2013 to 2021-2022. (2011). Published by Kerala forest department, Kerala, India, 80pp.
- Olson, D.M. & E. Dinerstein (1998). The Global 200: A representation approach to conserving the earth's most biologically valuable ecoregions. *Conservation Biology* 12(3): 502–515.
- Pascal, J.P. (1982). Bioclimates of the Western Ghats at 1/250,000 (2 sheets). French Institute, Pondicherry, India.
- Praveen, J. & P.O. Nameer (2012). Strophocincla laughingthrushes of South India: A case for allopatric speciation and impact on their conservation. *Journal of the Bombay Natural History Society* 109(1–2): 46–52.
- Praveen, J. (2015). A checklist of birds of Kerala, India. *Journal of Threatened Taxa* 7(13): 7983–8009; <http://doi.org/10.11609/jott.2001.7.13.7983-8009>
- Praveen, J., R. Jayapal & A. Pittie (2016). A checklist of the birds of India. *Indian Birds* 11: 113–170.
- Rahmani, A.R. & M. Zafar-ul Islam (2004). *Important Bird Areas in India: Priority Sites for Conservation*. Indian Bird Conservation Network. Bombay Natural History Society and Birdlife International (UK), xviii+1133pp.
- Ralph, C.J., S. Droege & J.R. Sauer (1995). Managing and Monitoring Birds Using Point Counts: Standards and Applications, pp. 161–175. In: Ralph, J.C., J. R. Sauer & S. Droege (eds.). *Monitoring Bird Populations by Point Counts*. U.S. Forest Service General Technical Report PSW-GTR.
- Ramachandran, V. & T. Ganesh (2013). Habitat structure and its effects on bird assemblages in the Kalad-Mundanthurai Tiger Reserve (KMTR), India. *Journal of the Bombay Natural History Society* 109(1&2): 87–95.
- Raman, T.R.S. & R. Sukumar (2002). Responses of tropical rainforest birds to abandoned plantations, edges and logged forest in the Western Ghats, India. *Animal Conservation* 5(3): 201–216; <http://doi.org/10.1017/s1367943002002251>
- Raman, T.R.S. (2003). Assessment of census techniques for interspecific comparisons of tropical rainforest bird densities: a field evaluation in the Western Ghats, India. *Ibis* 145(1): 9–21; <http://doi.org/10.1046/j.1474-919X.2003.00105.x>
- Rasmussen, P. & J. Anderton (2012). *Birds of South Asia. The Ripley Guide (Second)*. Washington, D.C. and Barcelona: Smithsonian Institution and Lynx Editions. 2 Volumes, 1–378pp; 1–683pp.
- Reynolds, A.R.T., J.M. Scott & R.A. Nussbaum (1980). A variable circular-plot method for estimating bird numbers. *The Condor* 82(3): 309–313.
- Robin, V. V., C. K. Vishnudas, P. Gupta, F. E. Rheindt, D. M. Hooper, U. Ramakrishnan & S. Reddy (2017). Two new genera of songbirds represent endemic radiations from the Shola Sky Islands of the Western Ghats, India. *BMC Evolutionary Biology* 17(1): 31.
- Robin, V.V. & R. Nandini (2012). Shola habitats on sky islands: status of research on montane forests and grasslands in southern India. *Current Science* 103(10): 1427–1437.
- Rodgers, W.A., H.S. Panwar & V.B. Mathur (2002). *Wildlife Protected Area Network in India: A Review. Executive Summary*. Wildlife Institute of India, Dehradun, 51pp.
- Sashikumar, C., J. Praveen, M.J. Palot & P.O. Nameer (2011). *Birds of Kerala: Status and Distribution (First edition)*. DC Books, 835pp.
- Stattersfield, A.J., M.J. Crosby, A.J. Long & D.C. Wege (1998). *Endemic Bird Areas of the World: Priorities for Biodiversity Conservation*. BirdLife International, Cambridge, United Kingdom, 848pp.
- Thomas, L., S.T. Buckland, E.A. Rexstad, J.L. Laake, S. Strindberg, S.L. Hedley, J.R. Bishop, T.A. Marques & K.P. Burnham (2010). Distance software: design and analysis of distance sampling surveys for estimating population size. *Journal of Applied Ecology* 47: 5–14; <http://doi.org/10.1111/j.1365-2664.2009.01737.x>
- Varghese, A.O. & K. Balasubramanyan (1998). Structure, composition and diversity of the tropical wet evergreen forest of the Agasthyamalai region of Kerala, Western Ghats. *Journal of South Asian Natural History* 4: 87–98.
- Venkatraman, C. (2011). Habitat preference of birds in Kalakad-Mundanthurai Tiger Reserve, southern Western Ghats. Status of Indian Birds and their Conservation: First International Conference on Indian Ornithology. Sálim Ali Centre for Ornithology and Natural History, Coimbatore, 288pp.
- Vetaas, O.R. & J.A. Grytnes (2002). Distribution of vascular plant species richness and endemic richness along the Himalayan elevation gradient in Nepal. *Global Ecology and Biogeography* 11: 291–301.
- Vijayan, L., J. Umamaheshwary & S. Somasundaram (2005). *Status and Ecology of the Nilgiri Wood Pigeon & Nilgiri Pipit in the Western Ghats*. Sálim Ali Centre for Ornithology and Natural History, Coimbatore, India, 91pp.
- Vijayan, V. S & P. Balakrishnan (2005). *Status, Distribution and Ecology of the Grey-headed Bulbul Pycnonotus priocephalus in the Western Ghats, India*. Sálim Ali Centre for Ornithology and Natural History, Coimbatore, India, 76pp.
- White, R.L. & P.M. Bennett (2015). Elevational distribution and extinction risk in birds. *PlosOne* 10(4): e0121849; <http://doi.org/10.1371/journal.pone.0121849>



Image 1. *Columba elphinstonii*
Nilgiri Wood Pigeon



Image 2. *Treron pompadora*
Pompadour Green Pigeon

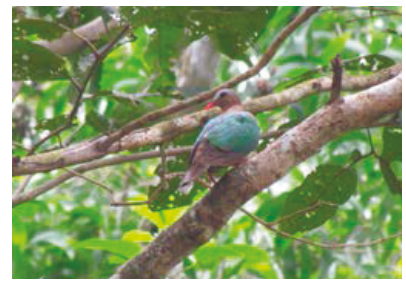


Image 3. *Chalcophaps indica*
Emerald Dove



Image 4. *Ducula badia*
Mountain Imperial Pigeon



Image 5. *Hemiprocne coronata*
Crested Treeswift



Image 6. *Tachymarptis melba* Alpine Swift

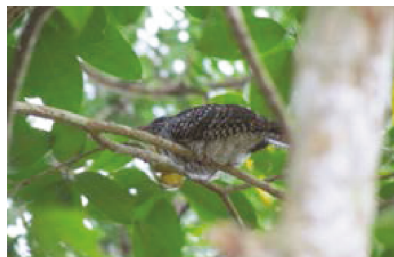


Image 7. *Eudynamys scolopaceus*
Asian Koel



Image 8. *Surniculus lugubris* Drongo Cuckoo



Image 9. *Hierococcyx sparveroides*
Large Hawk Cuckoo



Image 10. *Hierococcyx varius*
Common Hawk Cuckoo



Image 11. *Ardeola grayii* Indian Pond Heron



Image 12. *Butorides striata* Striated Heron

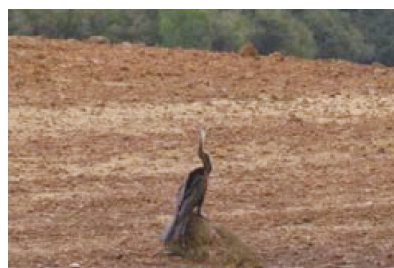


Image 13. *Anhinga melanogaster*
Oriental Darter

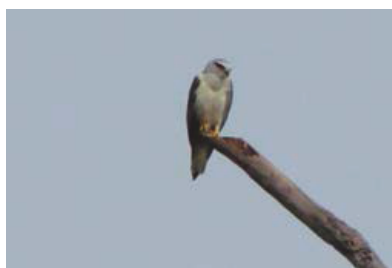


Image 14. *Elanus caeruleus*
Black-winged Kite

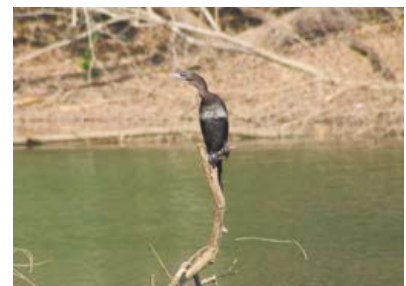


Image 15. *Microcarbo niger*
Little Cormorant



Image 16. *Glaucidium radiatum*
Jungle Owlet

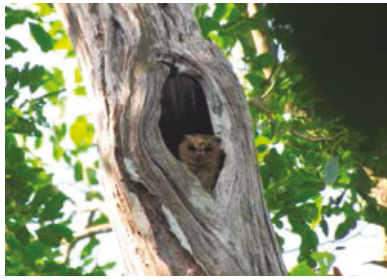


Image 17. *Otus bakkamoena*
Collared Scops Owl



Image 18. *Buteo buteo* Common Buzzard



Image 19. *Harpactes fasciatus*
Malabar Trogon

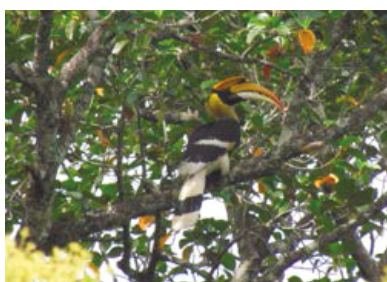


Image 20. *Buceros bicornis* Great Hornbill



Image 21. *Ocyrceros griseus*
Malabar Grey Hornbill

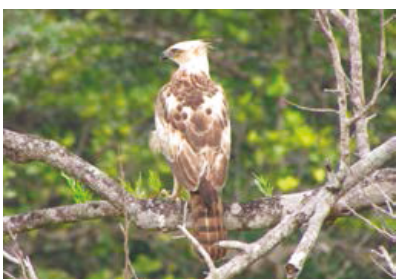


Image 22. *Nisaetus cirrhatus*
Changeable Hawk Eagle



Image 23. *Ictinaetus malaiensis* Black Eagle

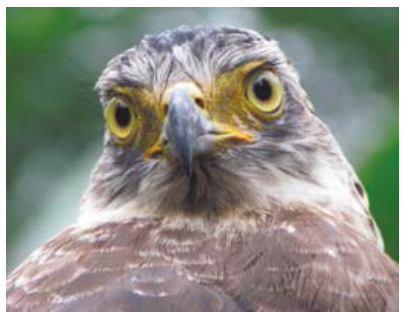


Image 24. *Spilornis cheela*
Crested Serpent Eagle



Image 25. *Hieraaetus pennatus*
Booted Eagle

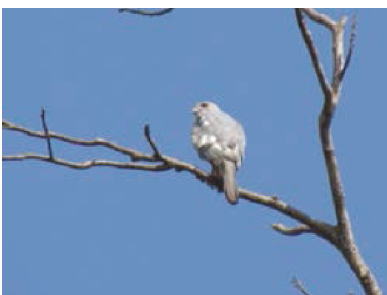


Image 26. *Accipiter badius* Shikra

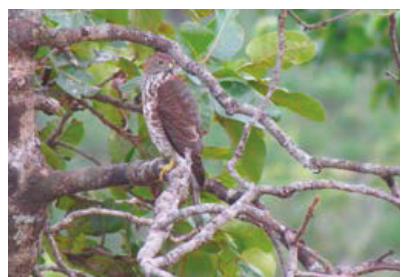


Image 27. *Accipiter trivirgatus*
Crested Goshawk

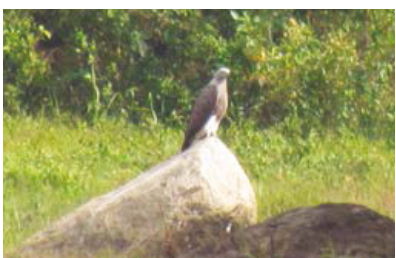


Image 28. Fish Eagle species

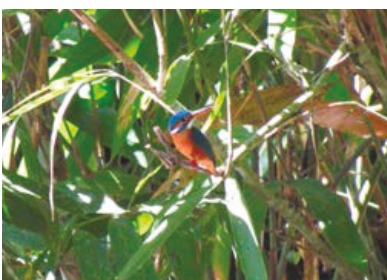


Image 29. *Alcedo atthis* Common Kingfisher

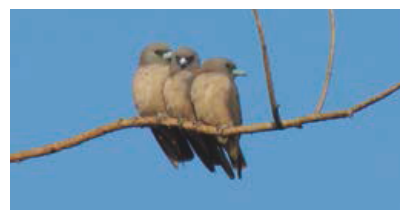


Image 30. *Artamus fuscus*
Ashy Woodswallow



Image 31. *Picus chlorolophus*
Lesser Yellow-naped Woodpecker



Image 32. *Picus xanthopygaeus*
Streak-throated Woodpecker

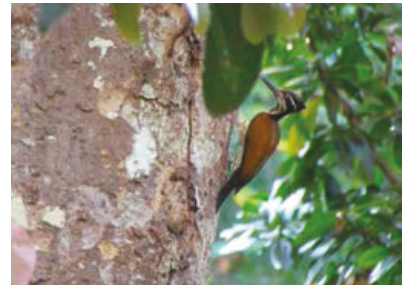


Image 33. *Chrysocolaptes lucidus*
Greater Golden-backed Woodpecker

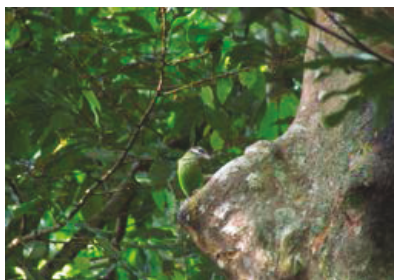


Image 34. *Psilopogon viridis*
White-cheeked Barbet



Image 35. *Psilopogon malabaricus*
Malabar Barbet



Image 36. *Ceyx erithaca*
Oriental Dwarf Kingfisher



Image 37. *Merops leschenaulti*
Chestnut-headed Bee-eater

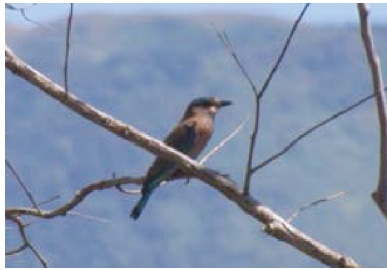


Image 38. *Coracias benghalensis*
Indian Roller



Image 39. *Falco tinnunculus*
Common Kestrel



Image 40. *Falco peregrinus* Shaheen Falcon

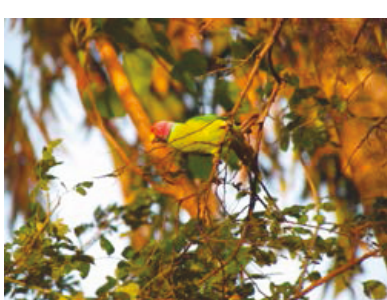


Image 41. *Psittacula cyanocephala* Plum-headed Parakeet

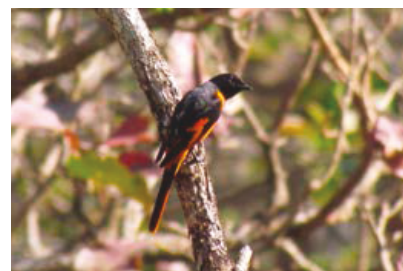


Image 42. *Pericrocotus flammeus*
Scarlet Minivet

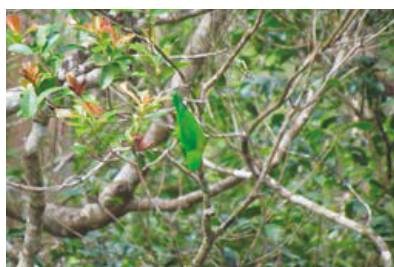


Image 43. *Loriculus vernalis*
Vernal Hanging Parrot

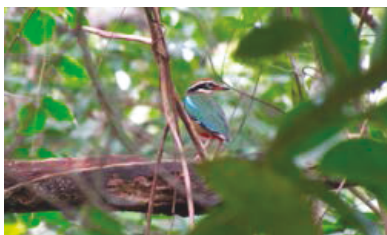


Image 44. *Pitta brachyura* Indian Pitta

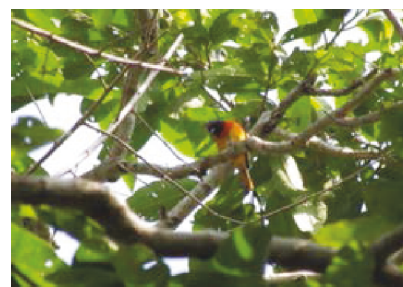


Image 45. *Pericrocotus cinnamomeus*
Small Minivet



Image 46. *Dicrurus leucophaeus*
Ashy Drongo



Image 47. *Dicrurus aeneus* Bronzed Drongo

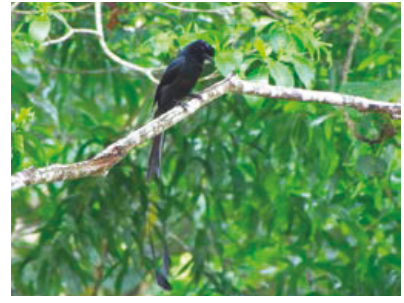


Image 48. *Dicrurus paradiseus*
Greater Racket-tailed Drongo



Image 49. *Corvus macrorhynchos*
Large-billed Crow

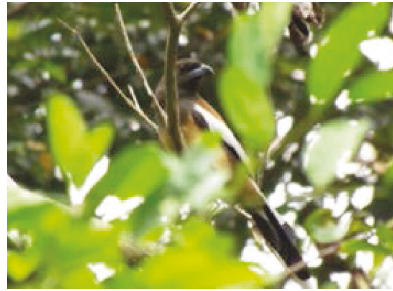


Image 50. *Dendrocitta vagabunda*
Rufous Treepie



Image 51. *Dendrocitta leucogastra*
White-bellied Treepie

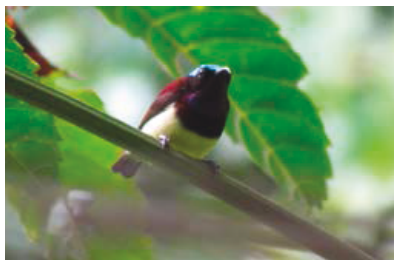


Image 52. *Leptocoma minima*
Crimson-backed Sunbird



Image 53. *Hypothymis azurea*
Black-naped Blue Monarch

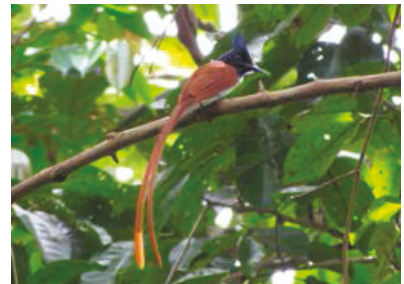


Image 54. *Terpsiphone paradisi*
Indian Paradise-flycatcher

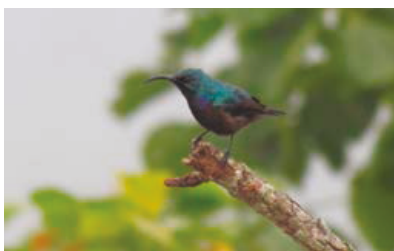


Image 55. *Cinnerys lotenius* Loten's Sunbird



Image 56. *Oriolus xanthornus*
Black-hooded Oriole

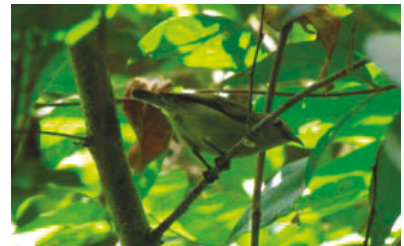


Image 57. *Dicaeum concolor*
Plain Flowerpecker

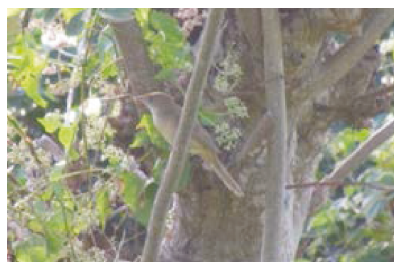


Image 58. *Arundinax aedon*
Thick-billed Warbler

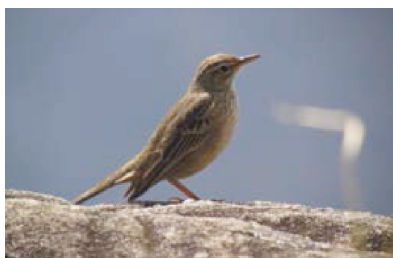


Image 59. *Anthus similis* Long-billed Pipit



Image 60. *Locustella naevia*
Grasshopper Warbler



Image 61. *Irena puella* Asian Fairy-bluebird

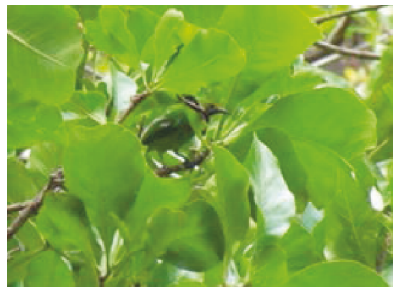


Image 62. *Chloropsis aurifrons*
Golden-fronted Leafbird

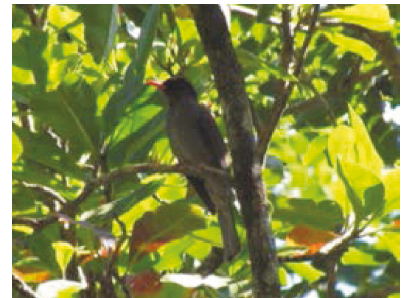


Image 63. *Hypsipetes leucocephalus*
Black Bulbul

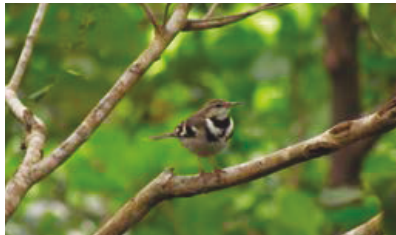


Image 64. *Dendronanthus indicus*
Forest Wagtail

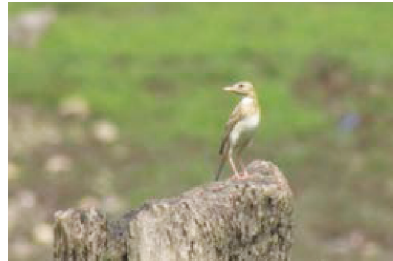


Image 65. *Anthus rufulus* Paddyfield Pipit



Image 66. *Brachypodius priocephalus* Grey-headed Bulbul



Image 67. *Motacilla cinerea* Grey Wagtail

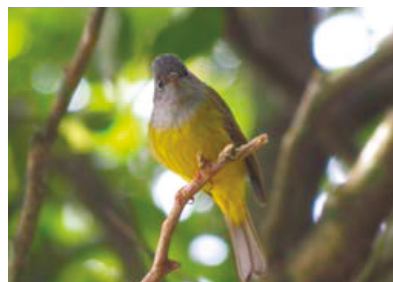


Image 68. *Culicicapa ceylonensis*
Grey-headed Canary-flycatcher

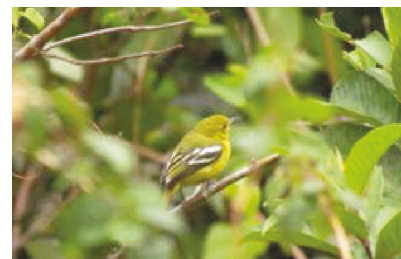


Image 69. *Aegithina tiphia* Common Iora

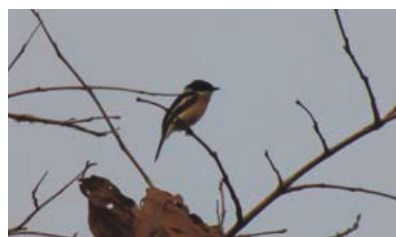


Image 70. *Hemipus picatus* Bar-winged Flycatcher-shrike



Image 71. *Tephrodornis virgatus*
Large Woodshrike



Image 72. *Pycnonotus melanicterus*
Black-crested Bulbul

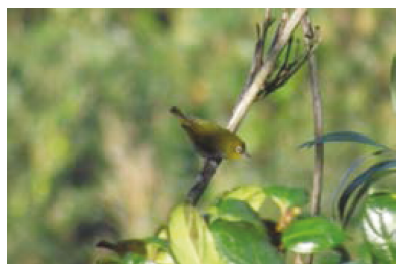


Image 73. *Zosterops palpebrosus*
Oriental White-eye



Image 74. *Pomatorhinus horsfieldii*
Indian Scimitar Babbler



Image 75. *Acritillas indica*
Yellow-browed Bulbul



Image 76. *Phylloscopus affinis*
Tickell's Leaf Warbler

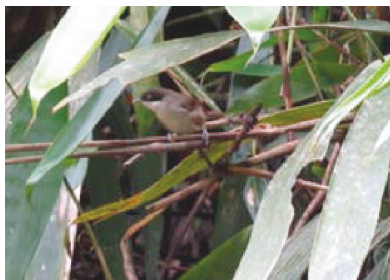


Image 77. *Rhopocichla atriceps*
Dark-fronted Babbler

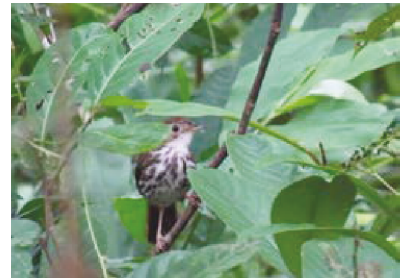


Image 78. *Pellorneum ruficeps*
Puff-throated Babbler



Image 79. *Alcippe poiocephala*
Quaker Tit Babbler

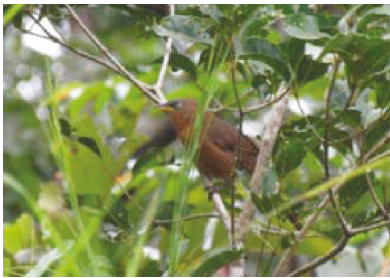


Image 80. *Argya subrufa* Rufous Babbler

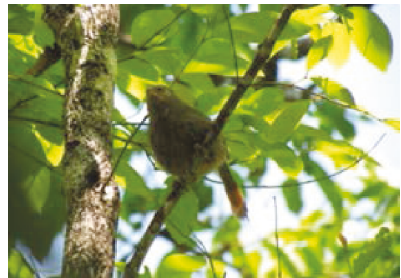


Image 81. *Turdoides striata* Jungle Babbler

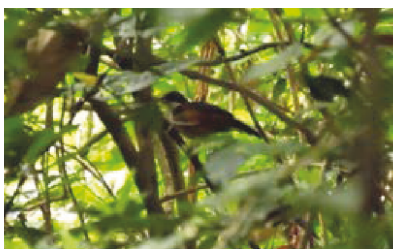


Image 82. *Garrulax delesserti*
Wynaad Laughingthrush

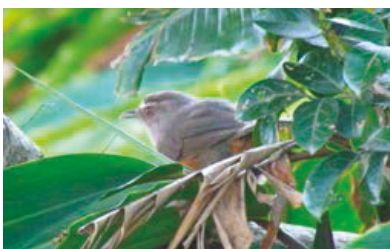


Image 83. *Montecincla meridionale*
Ashambu Chilappan



Image 84. *Sitta frontalis*
Velvet-fronted Nuthatch

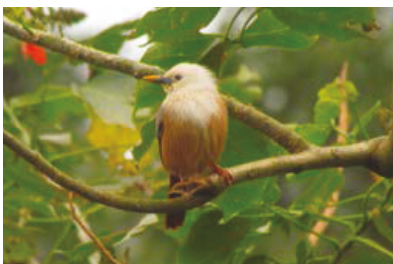


Image 85. *Sturnia malabarica*
Chestnut-tailed Starling

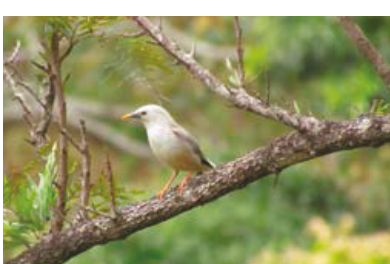


Image 86. *Sturnia blythii*
Malabar White-headed starling



Image 87. *Gracula religiosa indica*
Hill Myna

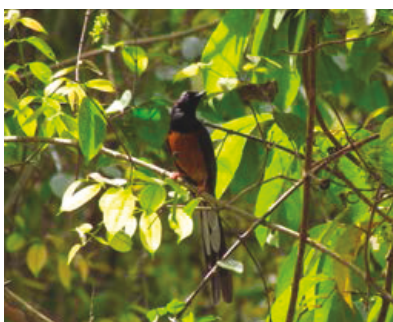


Image 88. *Kittacincla malabarica*
White-rumped Shama



Image 89. *Muscicapa dauurica*
Asian Brown Flycatcher



Image 90. *Muscicapa muttui*
Brown-breasted Flycatcher



Image 91. *Turdus simillimus*
Indian Blackbird



Image 92. *Cyornis pallidipes*
White-bellied Blue Flycatcher



Image 93. *Eumyias albicaudatus*
Nilgiri Flycatcher



Image 94. *Zoothera dauma* Scaly Thrush



Image 95. *Eumyias thalassinus*
Verditer Flycatcher



Image 96. *Ficedula nigrorufa*
Black-and-orange Flycatcher

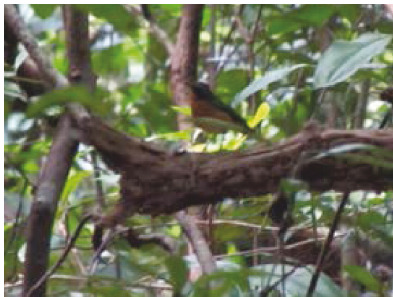


Image 97. *Larvivora brunnea*
Indian Blue Robin



Image 98. *Seicercus nitidus*
Green Leaf Warbler



Image 99. *Geokichla citrina*
Orange-headed Thrush

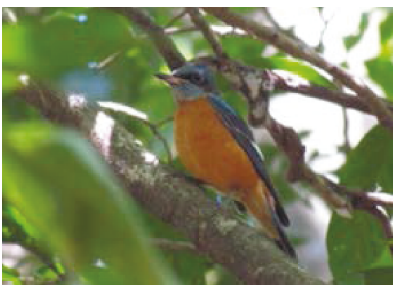


Image 100. *Monticola cinclorhyncha*
Blue-capped Rock Thrush



Image 101. *Seicercus magnirostris*
Large-billed Leaf Warbler

Appendix I. A checklist of birds observed from Agasthyamalai Hills.

	Order/ Family	English name	Scientific name
	GALLIFORMES		
1	Phasianidae (partridges, pheasants & grouse)	Indian Peafowl	<i>Pavo cristatus</i>
2		Jungle Bush Quail	<i>Perdica asiatica</i>
3		Grey Junglefowl	<i>Gallus sonneratii</i>
4		Red Spurfowl	<i>Galloperdix spadicea</i>
	COLUMBIFORMES		
5	Columbidae (pigeons)	Rock Pigeon	<i>Columba livia</i>
6		Nilgiri Wood Pigeon* (VU)	<i>Columba elphinstonii</i>
7		Spotted Dove	<i>Streptopelia chinensis</i>
8		Pompadour Green Pigeon/ Grey-fronted Green-pigeon#	<i>Treron pompadora</i>
9		Emerald Dove	<i>Chalcophaps indica</i>
10		Mountain Imperial Pigeon	<i>Ducula badia</i>
	CAPRIMULGIFORMES		
11	Caprimulgidae (nightjars)	Jerdon's Nightjar	<i>Caprimulgus atripennis</i>
12	Apodidae (swifts)	Crested Treeswift	<i>Hemiprocne coronata</i>
13		White-rumped Spinetail	<i>Zoonavena sylvatica</i>
14		Brown-backed Needletail	<i>Hirundapus giganteus</i>
15		Indian Swiftlet	<i>Aerodramus unicolor</i>
16		Asian Palm-swift	<i>Cypsiurus balasiensis</i>
17		Alpine Swift	<i>Tachymarpis melba</i>
18		Indian House Swift	<i>Apus affinis</i>
	CUCULIFORMES		
19	Cuculidae (cuckoos)	Greater Coucal	<i>Centropus sinensis</i>
20		Lesser Coucal	<i>Centropus bengalensis</i>
21		Chestnut-winged Cuckoo	<i>Clamator coromandus</i>
22		Asian Koel	<i>Eudynamis scolopaceus</i>
23		Drongo Cuckoo	<i>Surniculus lugubris</i>
24		Large Hawk Cuckoo	<i>Hierococcyx sparveroides</i>
25		Common Hawk Cuckoo	<i>Hierococcyx varius</i>
26		Indian Cuckoo	<i>Cuculus micropterus</i>
	GRUIFORMES		
27	Rallidae (rails & coots)	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>
	PELECANIFORMES		
28	Ciconiidae (Storks)	Woolly-necked Stork (VU)	<i>Ciconia episcopus</i>
28	Ardeidae (Herons & Egrets)	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>
29		Malayan Night Heron	<i>Gorsachius melanolophus</i>
30		Striated Heron	<i>Butorides striata</i>
31		Indian Pond Heron	<i>Ardeola grayii</i>
32		Cattle Egret	<i>Bubulcus ibis</i>
33		Little Egret	<i>Egretta garzetta</i>
34	Phalacrocoracidae (cormorants)	Little Cormorant	<i>Microcarbo niger</i>
35	Anhingidae (darters)	Oriental Darter (NT)	<i>Anhinga melanogaster</i>
	CHARADRIIFORMES		
36	Charadriidae (Plovers & lapwings)	Red-wattled Lapwing	<i>Vanellus indicus</i>
37	Scolopacidae (Sandpipers)	Snipe species	<i>Gallinago sp.</i>
38	Laridae (gulls & terns)	River Tern (NT)	<i>Sterna aurantia</i>
	ACCIPITRIFORMES		
39	Accipitridae (kites, hawks & eagles)	Black-winged Kite	<i>Elanus caeruleus</i>
40		Oriental Honey-buzzard	<i>Pernis ptilorhynchus</i>
41		Black Baza	<i>Aviceda leuphotes</i>
42		Crested Serpent Eagle	<i>Spilornis cheela</i>
43		Mountain Hawk Eagle/ Legge's Hawk Eagle	<i>Nisaetus nipalensis</i>
44		Changeable Hawk Eagle / Crested Hawk Eagle	<i>Nisaetus cirrhatus</i>
45		Rufous-bellied Eagle	<i>Lophotriorchis kienerii</i>
46		Black Eagle	<i>Ictinaetus malaiensis</i>
47		Bonelli's Eagle	<i>Aquila fasciata</i>
48		Booted Eagle	<i>Hieraetus pennatus</i>
49		Pied Harrier	<i>Circus melanoleucos</i>
50		Shikra	<i>Accipiter badius</i>
51		Crested Goshawk	<i>Accipiter trivirgatus</i>
		Lesser Fish Eagle ? (NT)	<i>Ichthyophaga humilis</i>
52		Grey-headed Fish Eagle (NT)	<i>Ichthyophaga ichthyaetus</i>
53		Brahminy Kite	<i>Haliastur indus</i>
54		Black Kite	<i>Milvus migrans</i>
55		White-eyed Buzzard	<i>Butastur teesa</i>
56		Common Buzzard	<i>Buteo buteo</i>
	STRIGIFORMES		
57	Tytonidae (barn owls)	Common Barn Owl	<i>Tyto alba</i>

58	Strigidae (owls)	Brown Hawk Owl	<i>Ninox scutulata</i>
59		Jungle Owlet	<i>Glaucidium radiatum</i>
60		Collared Scops Owl	<i>Otus bakkamoena</i>
61		Brown Wood Owl	<i>Strix leptogrammica</i>
62		Spot-bellied Eagle Owl	<i>Bubo nipalensis</i>
63		Brown Fish Owl	<i>Ketupa zeylonensis</i>
	TROGONIFORMES		
64	Trogonidae (trogons)	Malabar Trogon	<i>Harpactes fasciatus</i>
	BUCEROTIFORMES		
65	Bucerotidae (hornbills)	Great Hornbill (NT)	<i>Buceros bicornis</i>
66		Malabar Grey Hornbill [#]	<i>Ocyrceros griseus</i>
67	Upupidae (hoopoes)	Common Hoopoe	<i>Upupa epops</i>
	PICIFORMES		
68	Picidae (woodpeckers)	Speckled Piculet	<i>Picumnus innominatus</i>
69		Heart-spotted Woodpecker	<i>Hemicircus canente</i>
70		Common Golden-backed Woodpecker	<i>Dinopium javanense</i>
71		Lesser Golden-backed Woodpecker	<i>Dinopium benghalense</i>
72		Rufous Woodpecker	<i>Micropternus brachyurus</i>
73		Lesser Yellow-naped Woodpecker	<i>Picus chlorolophus</i>
		Streak-throated Woodpecker	<i>Picus xanthopygaeus</i>
74		White-bellied Woodpecker	<i>Dryocopus javensis</i>
75		Greater Golden-backed Woodpecker	<i>Chrysocolaptes lucidus</i>
76		Brown-capped Pygmy Woodpecker	<i>Dendrocopos moluccensis</i>
77	Ramphastidae (toucans & barbets)	Brown-headed Barbet	<i>Psilopogon zeylanicus</i>
78		White-cheeked Barbet	<i>Psilopogon viridis</i>
79		Malabar Barbet [#]	<i>Psilopogon malabaricus</i>
80		Coppersmith Barbet	<i>Psilopogon haemacephalus</i>
	CORACIIFORMES		
81	Meropidae (bee-eaters)	Blue-bearded Bee-eater	<i>Nyctornis athertoni</i>
82		Green Bee-eater	<i>Merops orientalis</i>
83		Chestnut-headed Bee-eater	<i>Merops leschenaulti</i>
84	Coraciidae (rollers)	Indian Roller	<i>Coracias benghalensis</i>

85	Alcedinidae (kingfishers)	Oriental Dwarf Kingfisher	<i>Ceyx erithaca</i>
86		Common Kingfisher	<i>Alcedo atthis</i>
87		Pied Kingfisher	<i>Ceryle rudis</i>
88		White-throated Kingfisher	<i>Halcyon smyrnensis</i>
89		Black-capped Kingfisher	<i>Halcyon pileata</i>
	FALCONIFORMES		
90	Falconidae (falcons & caracaras)	Common Kestrel	<i>Falco tinnunculus</i>
91		Peregrine Falcon / Shaheen Falcon*	<i>Falco peregrinus</i>
	PSITTACIFORMES		
92	Psittaculidae (Old World parrots)	Plum-headed Parakeet	<i>Psittacula cyanocephala</i>
93		Malabar Parakeet [#]	<i>Psittacula columboides</i>
94		Vernal Hanging Parrot	<i>Loriculus vernalis</i>
	PASSERIFORMES		
95	Pittidae (pittas)	Indian Pitta	<i>Pitta brachyura</i>
96	Campephagidae (minivets & cuckooshrikes)	Small Minivet	<i>Pericrocotus cinnamomeus</i>
97		Scarlet Minivet	<i>Pericrocotus flammeus</i>
98		Large Cuckooshrike	<i>Coracina javensis</i>
99	Oriolidae (orioles, figbirds & allies)	Black-hooded Oriole	<i>Oriolus xanthornus</i>
100		Indian Golden Oriole	<i>Oriolus kundoo</i>
101		Black-naped Oriole	<i>Oriolus chinensis</i>
102	Artamidae (woodswallows, Australian magpies and allies)	Ashy Woodswallow	<i>Artamus fuscus</i>
103	Vangidae (vangas & helmet-shrikes)	Bar-winged Flycatcher-shrike	<i>Hemipus picatus</i>
104		Large Woodshrike/ Malabar Woodshrike [#]	<i>Tephrodornis virgatus</i>
105		Common Woodshrike	<i>Tephrodornis pondicerianus</i>
106			
107	Aegithinidae (ioras)	Common Iora	<i>Aegithina tiphia</i>
108		Black Drongo	<i>Dicrurus macrocercus</i>
109		Ashy Drongo	<i>Dicrurus leucophaeus</i>
110		Bronzed Drongo	<i>Dicrurus aeneus</i>
111		Hair-crested Drongo	<i>Dicrurus hottentottus</i>
112		Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>
112	Laniidae (shrikes)	Brown Shrike	<i>Lanius cristatus</i>

113	Corvidae (Crows & jays)	Rufous Treepie	<i>Dendrocitta vagabunda</i>
114		White-bellied Treepie [#]	<i>Dendrocitta leucogastra</i>
115		House Crow	<i>Corvus splendens</i>
116		Large-billed Crow	<i>Corvus macrorhynchos</i>
117	Monarchidae (monarchs & paradise-flycatchers)	Black-naped Monarch	<i>Hypothymis azurea</i>
118		Indian Paradise-flycatcher	<i>Terpsiphone paradisi</i>
119	Dicaeidae (flowerpeckers)	Thick-billed Flowerpecker	<i>Dicaeum agile</i>
120		Pale-billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>
121		Plain Flowerpecker/ Nilgiri Flowerpecker [#]	<i>Dicaeum concolor</i>
122		Little Spiderhunter	<i>Arachnothera longirostra</i>
123	Nectariniidae (sunbirds)	Purple-rumped Sunbird	<i>Leptocoma zeylonica</i>
124		Crimson-backed Sunbird [#]	<i>Leptocoma minima</i>
125		Purple Sunbird	<i>Cinnyris asiaticus</i>
126		Loten's Sunbird	<i>Cinnyris lotenius</i>
127	Irenidae (fairy-bluebirds & leafbirds)	Asian Fairy-bluebird	<i>Irena puella</i>
128		Golden-fronted Leafbird	<i>Chloropsis aurifrons</i>
129		Jerdon's Leafbird	<i>Chloropsis jerdoni</i>
130	Estrildidae (waxbills)	Black-throated Munia	<i>Lonchura kelaarti</i>
131	Motacillidae (wagtails & pipits)	Forest Wagtail	<i>Dendronanthus indicus</i>
132		Paddyfield Pipit	<i>Anthus rufulus</i>
133		Long-billed Pipit	<i>Anthus similis</i>
134		Grey Wagtail	<i>Motacilla cinerea</i>
135		White-browed Wagtail	<i>Motacilla maderaspatensis</i>
136	Stenostiridae (fairy-flycatchers & crested-flycatchers)	Grey-headed Canary-flycatcher	<i>Culicicapa ceylonensis</i>
137	Paridae (tits, chickadees)	Cinereous Tit	<i>Parus cinereus</i>
138		Black-lored Tit	<i>Macholophus xanthogenys</i>
139	Cisticolidae (cisticolas)	Grey-breasted Prinia	<i>Prinia hodgsonii</i>
140		Jungle Prinia	<i>Prinia sylvatica</i>
141		Ashy Prinia	<i>Prinia socialis</i>
142	Locustellidae (bush warblers)	Grasshopper Warbler	<i>Locustella naevia</i>
143	Acerocephalidae (brush, reed & swamp warblers)	Thick-billed Warbler	<i>Arundinax aedon</i>
144		Booted Warbler	<i>Iduna caligata</i>
		Sykes's Warbler ?	<i>Iduna rama</i>
145		Blyth's Reed-warbler	<i>Acrocephalus dumetorum</i>
146		Paddyfield Warbler	<i>Acrocephalus agricola</i>

147	Hirundinidae (swallows)	Red-rumped Swallow	<i>Cecropis daurica</i>
148		Pacific Swallow	<i>Hirundo tahitica</i>
149		Barn Swallow	<i>Hirundo rustica</i>
150		Dusky Crag Martin	<i>Ptyonopronce concolor</i>
151	Pycnonotidae (bulbuls)	Black Bulbul/ Square-tailed Bulbul [#]	<i>Hypsipetes leucocephalus</i>
152		Black-crested Bulbul/ Flame-throated Bulbul [#]	<i>Pycnonotus melanicterus</i>
153		Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>
154		Red-vented Bulbul	<i>Pycnonotus cafer</i>
155		Grey-headed Bulbul [#] (NT)	<i>Brachypodius priocephalus</i>
156		Yellow-browed Bulbul	<i>Acritillas indica</i>
157	Phylloscopidae (Old World leaf warblers)	Tickell's Leaf Warbler	<i>Phylloscopus affinis</i>
158		Green Leaf Warbler	<i>Seicercus nitidus</i>
159		Greenish Leaf Warbler	<i>Seicercus trochiloides</i>
160		Large-billed Leaf Warbler	<i>Seicercus magnirostris</i>
161		Western Crowned Warbler	<i>Seicercus occipitalis</i>
162	Sylviidae (sylvia warblers, parrotbills & allies)	Lesser Whitethroat	<i>Curruca curruca</i>
163	Zosteropidae (white-eyes & yuhinas)	Oriental White-eye	<i>Zosterops palpebrosus</i>
164	Timaliidae (scimitar babblers and allies)	Indian Scimitar Babbler	<i>Pomatorhinus horsfieldii</i>
165		Tawny-bellied Babbler	<i>Dumetia hyperythra</i>
166		Dark-fronted Babbler	<i>Rhopocichla atriceps</i>
167	Pellorneidae (smaller babblers)	Puff-throated Babbler	<i>Pellorneum ruficeps</i>
168	Leiothrichidae (babblers, laughingthrushes & allies)	Quaker Tit Babbler	<i>Alcippe poioicephala</i>
169		Rufous Babbler [#]	<i>Argya subrufa</i>
170		Jungle Babbler	<i>Turdoides striata</i>
171		Yellow-billed Babbler	<i>Turdoides affinis</i>
172		Wynaad Laughingthrush [#]	<i>Garrulax delesserti</i>
173		Kerala Laughingthrush [#] / Ashambu Chilappan (NT)	<i>Trochalopteron meridionale/ Montecincla meridionale</i>
174	Sittidae (nuthatches, spotted creepers & wallcreeper)	Velvet-fronted Nuthatch	<i>Sitta frontalis</i>
175	Sturnidae (starlings)	Chestnut-tailed Starling	<i>Sturnia malabarica</i>
176		Malabar White-headed starling [#]	<i>Sturnia blythii</i>
177		Common Myna	<i>Acridotheres tristis</i>
178		Hill Myna / Southern Hill Myna [*]	<i>Gracula religiosa</i>

179	Muscicapidae (Chats & flycatchers)	Oriental Magpie Robin	<i>Copsychus saularis</i>
180		White-rumped Shama	<i>Kittacincla malabarica</i>
181		Asian Brown Flycatcher	<i>Muscicapa dauurica</i>
182		Brown-breasted Flycatcher	<i>Muscicapa muttui</i>
183		Rusty-tailed Flycatcher	<i>Muscicapa ruficauda</i>
184		White-bellied Blue Flycatcher #	<i>Cyornis pallidipes</i>
185		Tickell's Blue-flycatcher	<i>Cyornis tickelliae</i>
186		Blue-throated Flycatcher	<i>Cyornis rubeculoides</i>
187		Verditer Flycatcher	<i>Eumyias thalassinus</i>
188		Nilgiri Flycatcher# (NT)	<i>Eumyias albicaudatus</i>
189		White-bellied Shortwing# / Ashambu Sholakili (EN)	<i>Brachypteryx major / Sholicola ashambuensis</i>
190		Indian Blue Robin	<i>Larvivora brunnea</i>
191		Malabar Whistling Thrush	<i>Myophonus horsfieldii</i>
192		Black-and-orange Flycatcher# (NT)	<i>Ficedula nigrorufa</i>
193		Blue-capped Rock Thrush	<i>Monticola cinclorhyncha</i>
194		Blue Rock-thrush	<i>Monticola solitarius</i>
195	Turdidae (thrushes)	Scaly Thrush / Nilgiri Thrush**	<i>Zoothera dauma</i>
196		Orange-headed Thrush	<i>Geokichla citrina</i>
197		Indian Blackbird	<i>Turdus simillimus</i>

Note: 1) *Not recognized as a species by Birdlife international 2015 list, but are recognized as subspecies under nominate race

2) # Endemic to Western Ghats

3) ? Species for which sight record is not confirmed. Serial number has not been given for the species with unconfirmed sightings





OPEN ACCESS



The Journal of Threatened Taxa is dedicated to building evidence for conservation globally by publishing peer-reviewed articles online every month at a reasonably rapid rate at www.threatenedtaxa.org. All articles published in JoTT are registered under [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) unless otherwise mentioned. JoTT allows unrestricted use of articles in any medium, reproduction, and distribution by providing adequate credit to the authors and the source of publication.

ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

January 2018 | Vol. 10 | No. 1 | Pages: 11105–11244

Date of Publication: 26 January 2018 (Online & Print)

DOI: 10.11609/jott.2018.10.1.11105-11244

www.threatenedtaxa.org

Articles

On the reproductive ecology of *Premna latifolia* L. and *Premna tomentosa* Willd. (Lamiaceae)

-- B. Dileepu Kumar, D. Sandhya Deepika & A.J. Solomon Raju, Pp. 11105–11125

Stream macro-invertebrate diversity of the Phobjikha Valley, Bhutan

-- Jigme Wangchuk & Kuenzang Dorji, Pp. 11126–11146

Communications

Population characteristics of *Silaum silaus* (L.) Schinz & Thell. (Apiaceae) in Mordovia, a highly threatened plant species at the northern limit of its range

-- Anatoliy A. Khapugin, Pp. 11147–11155

Distribution of *Nanhaipotamon hongkongense* (Shen, 1940) (Crustacea: Brachyura: Potamidae), a freshwater crab endemic to Hong Kong

-- David John Stanton, Michael Robertson Leven & Tommy Chung Hong Hui, Pp. 11156–11165

Status of birds in Agasthyamalai Hills, Western Ghats, Kerala, India

-- Madhumita Panigrahi & V.J. Jins, Pp. 11166–11184

A short-term survey report on the post-winter avian diversity in Corbett National Park and associated areas, Uttarakhand, India

-- Srinjana Ghosh & Tanmay Bhattacharya, Pp. 11185–11191

Short Communications

Rhododendron diversity along the Kusong-Panch Pokhari transect in Khangchendzonga Biosphere Reserve, the eastern Himalaya: a conservation perspective

-- Prem K. Chhetri, Bijoy Chhetri & Hemant K. Badola, Pp. 11192–11200

Report of a longhorn beetle *Cyrtanops punctipennis* White, 1853 (Coleoptera: Cerambycidae) from Maharashtra, India

-- Narendra M. Naidu & Hemant V. Ghate, Pp. 11201–11204

Butterflies of Peringome Vayakkara Panchayath, Kerala, India

-- C. Sneha, Pp. 11205–11209

A new subspecies of the Malayan Bamboo Bat (Chiroptera: Vespertilionidae: *Tylonycteris malayana eremtaga*) from the Andaman Islands, India

-- Chelmala Srinivasulu, Aditya Srinivasulu, Bhargavi Srinivasulu & Gareth Jones, Pp. 11210–11217

Small carnivores of Wayanad Wildlife Sanctuary, the southern Western Ghats, India

-- E.R. Sreekumar & P.O. Nameer, Pp. 11218–11225

Observations on the Nilgiri Marten *Martes gwatkinsii* (Mammalia: Carnivora: Mustelidae) from Pampadum Shola National Park, the southern Western Ghats, India

-- G. Anil, Navaneeth Kishor, Naseef Gafoor, Naseer Ommer & P.O. Nameer, Pp. 11226–11230

Notes

Record of the endemic orchid *Biermannia jainiana* (Asparagales: Orchidaceae: Epidendroideae) from its type locality, India

-- Krishna Chowlu & Jeewan Singh Jalal, Pp. 11231–11233

Sighting of the Common Shelduck *Tadorna tadorna* (Linnaeus, 1758) (Aves: Anseriformes: Anatidae) in Shettikeri Tank, Karnataka, India

-- Darwin Dasan Tamiliniyan, Santhanakrishnan Babu & Honnavalli Nagaraj Kumara, Pp. 11234–11236

Ceylon Kentish Plover *Charadrius alexandrinus seebohmii* breeding in Vani Vilasa Sagara, Hiriya Taluka, Karnataka, India

-- Golusu Babu Rao, Santhanakrishnan Babu, Honnavalli Nagaraj Kumara & Mahesh Bilaskar, Pp. 11237–11239

A new sight record and range extension of the Grizzled Giant Squirrel *Ratufa macroura dandolena* (Mammalia: Rodentia: Sciuridae) in the Eastern Ghats of southern peninsular India

-- Sivangnanaboopathidoss Vimalraj, Kothandapani Raman, Damodar Atmavadan Reddy, Bakthavachalam Hari Krishnan, Bawa Mothilal Krishnakumar & Kanagaraj Muthamizh Selvan, Pp. 11240–11242

First record of the Dhole *Cuon alpinus* (Mammalia: Carnivora: Canidae) in Barandabhar Corridor Forest, Chitwan, Nepal

-- Saneer Lamichhane, Aashish Gurung, Chiranjibi Prasad Pokheral, Trishna Rayamajhi, Pabitra Gotame, Pramod Rai Regmi & Babu Ram Lamichhane, Pp. 11243–11244

Miscellaneous

National Biodiversity Authority

