

Bird diversity of protected areas in the Munnar Hills, Kerala, India

Praveen J. & Nameer P. O.

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Introduction

The Western Ghats, one of the biodiversity hotspots of the world, is a 1,600 km long chain of mountain ranges running parallel to the western coast of the Indian peninsula. The region is rich in endemic fauna, including birds, and has been of great biogeographical interest. Birds have been monitored regularly in the Western Ghats of Kerala since 1991, with more than 60 surveys having been carried out in the entire region (Praveen & Nameer 2009). This paper is a result of such a survey conducted in December 2012 supplemented by relevant prior work in this area.

Munnar Hills (10.083°–10.333°N, 77.000°–77.617°E), forming part of the High Ranges of Western Ghats, also known as the Kannan Devan Hills, have four protected areas (PAs) (Table 1, Fig. 1), three of which were notified after 2000; all within the jurisdiction of Munnar Wildlife Division. These hills, rising to altitudes ranging from 1600 m to 2685 m, form a part of the

Table 1. Protected Areas (PA) of Munnar Hills

Protected Area	Abbreviation	Area (in sq.km.)	Year of formation
Anamudi Shola NP	ASNP	75	2003
Eravikulam NP	ENP	97	1975
Kurinjimala WLS	KWLS	32	2006
Pampadum Shola NP	PSNP	11.753	2003

Anamalais sub-cluster in southern Western Ghats (Nair 1991; Das *et al.* 2006). Anamudi (2685 m), the highest peak in peninsular India, lies in these hills inside Eravikulam National Park (NP). Two other protected areas, namely Chinnar Wildlife Sanctuary, and Mathikettan Shola National Park, are also part of Munnar Wildlife Division, but are not technically part of the Munnar Hills, and are hence not covered in this paper.

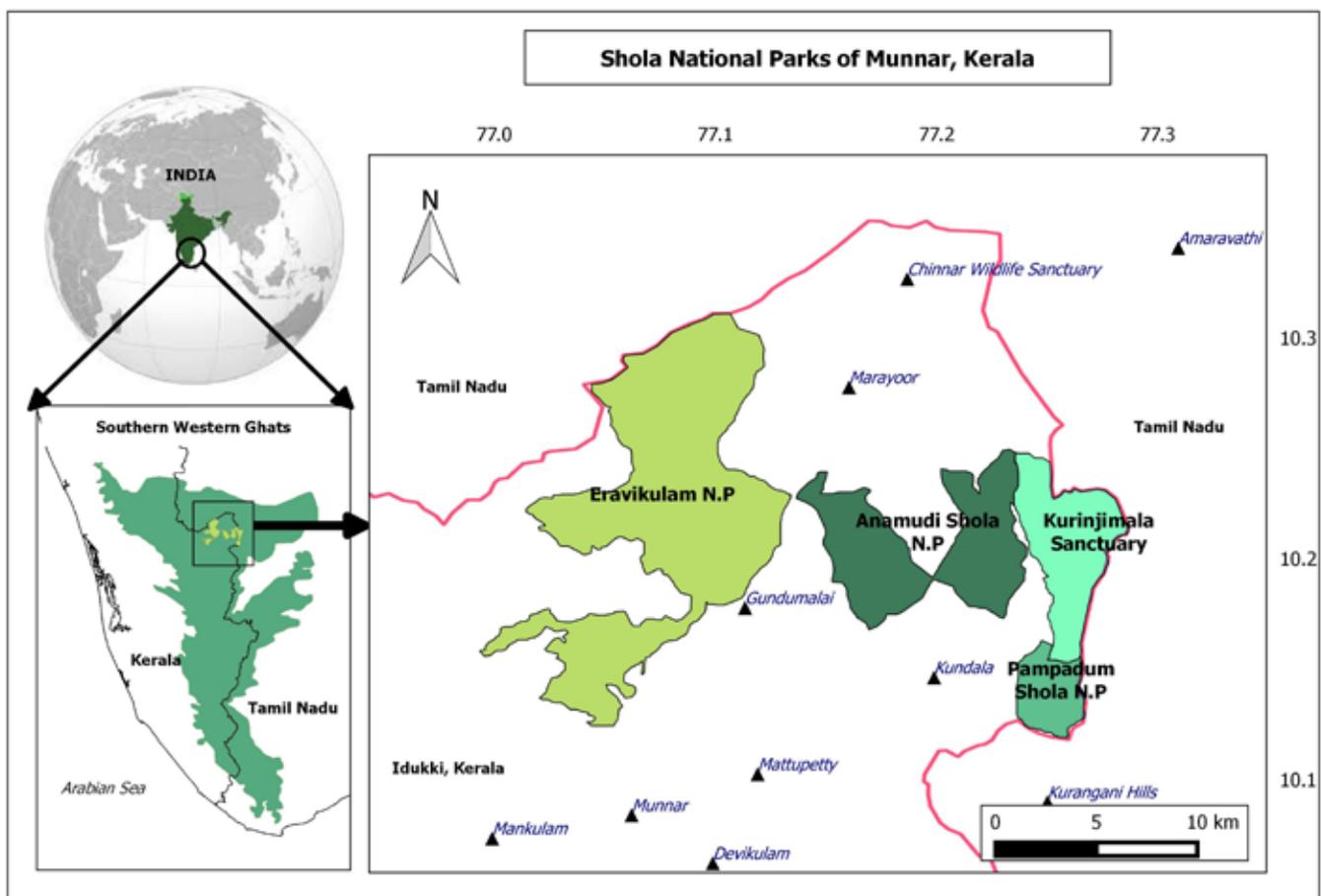


Fig 1: Protected areas under Munnar Forest Division

Munnar Hills enjoy a tropical montane climate. The average annual rainfall is c. 5000–6500 mm. The area receives both, the south-west, as well as the north-east monsoons. The mean monthly minimum temperature is 11.9°C, while the mean monthly maximum temperature is 22.5°C (Anonymous 2010).

Three major types of plant communities are found within these protected areas, namely grasslands, shrub lands, and forests. Primarily grasslands cover the terrain above 1800 m. Valleys are extensively forested. Shrub lands predominate along the bases of the cliffs and are interspersed in rocky slab areas. Grasslands cover 48% of the area, shola forests about 27%, while the rest of the habitat is under shrub lands, sub-tropical hill forests, wattle, and eucalyptus plantations (Menon 1997). The following vegetation types have been documented from this area (classification from Champion & Seth (1968) are provided within parentheses).

- Shola forests (Southern montane wet temperate forest).
- Grasslands (Southern montane wet temperate grass land).
- Transition forests (Southern sub-tropical broad leaved hill forest).
- Evergreen forests (Southern west-coast evergreen forest).
- Shrub lands.
- Deciduous forests (Southern tropical moist deciduous forests).

Though the most prominent mammal species in these hills is the Nilgiri tahr *Nilgiritragus hylocrius*, about 49 species of mammals, 33 reptiles, 22 amphibians, and 101 butterflies have been reported from Eravikulam NP (Anonymous 2010) alone. Similar inventories for the other three newer protected areas do not exist.

Compared to several other regions in the Kerala Western Ghats, certain parts of the Munnar Hills have been reasonably well worked in terms of ornithology. However, detailed studies inside the protected areas are still patchy and comprehensive studies nil. Salim Ali's was the first formal study in 1933, of the avifauna of Munnar, during his legendary Travancore-Cochin Ornithological Survey. He spent four days around Munnar and recorded just 33 species (Ali & Whistler 1933). It is unclear whether his studies included the present day protected areas. Primrose (1938) followed up with some observations from Munnar that more or less matched Ali's work in terms of species and abundance. The same areas were covered after 75 years in 2009 by a team led by C. Sashikumar, as a part of the repeat survey along Ali's trail (Sashikumar *et al.* 2011b). During this survey, one transect each was inside Anamudi Shola NP, and Pampadum Shola NP. Apart from creating a checklist, they also estimated the density of birds; however, the results were not presented separately for the PAs. The repeat survey also covered several degraded habitats, including tea plantations and water bodies, and it recorded 111 species of which some were water birds. The lone bird survey in Eravikulam NP was conducted from five base-camps—Poovar, Eravikulam Hut, Lakkamkudi, Rajamala, and Anamudi—in 1997 and recorded 91 species (Uthaman 1999). The avifauna of Mannavan Shola [present day Anamudi Shola NP] was surveyed by P. Radhakrishnan as part of his M.Sc. dissertation, and by Nameer P. O., as a part of his doctoral studies (Nameer 2005). Their methodology was similar to the present survey, and 41 species were recorded. Zacharias & Gaston (1999) had included Munnar also as a field site for their studies on birds with disjunct distribution, though it is unclear whether their study site was inside one of the current PAs. Since 1980 Munnar has been on the itinerary of several international bird tours that focused

on endemics that resulted in publications by Harrap & Redman (1990), and Robertson (1991). Bird tour groups have frequently visited many parts of the Munnar Hills, particularly the Rajamala region of Eravikulam NP since 2000. Some of these, mainly led by K. V. Eldhose, have shown up several interesting sightings; those that were confirmed till 2010 were summarised in Sashikumar *et al.* (2011a). That publication also carried separate checklists for Eravikulam NP, and the Munnar Hills, including Anamudi Shola NP, and Pampadum Shola NP, apart from areas in current Munnar Forest Division (Sashikumar *et al.* 2011a: 115, 742). However, it should be noted that almost all interior regions of Eravikulam NP are inaccessible to a bird tourist and can only be covered through specific surveys like the present study.

The broad objective of our study was to collect baseline ornithological data in the four protected areas of Munnar Wildlife Division. The specific objectives were to try and ascertain the status of the indicator species in the Munnar Hills, such as

- Threatened/Near-threatened species
- Western Ghat endemics
- Birds of prey
- Ground birds
- Primary hole nesting birds
- Brood parasites

Methodology

Nine base camps were selected for the study of the birds of Munnar Hills (Table 2), in such a way that all PAs, representative habitats, and altitudes were covered. It is noteworthy that all

Table 2. Basecamp details of the Munnar Hills bird survey.

Camps	PA	Coordinates	Altitude Range in m (Camp altitude)	Habitats
Rajamala	ENP	10.015°N 77.033°E	1900–2685 (2100)	Shola, Grasslands, rocky out-crops and shrubs, adjacent to tea plantations
Eravikulam Hut	ENP	10.217°N 77.083°E	2000–2300 (2180)	Shola, Grasslands
Kolukkan	ENP	10.233°N 77.033°E	2000–2300 (2134)	Shola, Grasslands
Varattukulam	ENP	10.217°N 77.001°E	1900–2340 (2245)	Shola, Grasslands, adjacent to degraded grasslands
Poovar	ENP	10.283°N 77.083°E	1900–2300 (2135)	Shola, Grasslands
Methappu	ASNP	10.183°N 77.002°E	1800–2200 (2070)	Sholas [unique as this has tall trees also], shrubs, some abandoned wattle plantations.
Top Station	PSNP	10.133°N 77.025°E	1900–2200 (1910)	Sholas, wattle plantations, a small check-dam (waterbody)
Kadavari	KWLS	10.217°N 77.283°E	1600–2400 (2154)	Wattle plantations, degraded grasslands, shrubs, sholas
Neduvapp	KWLS	10.002°N 77.267°E	1700–2300 (2130)	Wattle plantations, degraded grasslands, shrubs, sholas

basecamps covered by Uthaman (1999) were included by us with one change—Varattukulam camp, which is inside the PA, was included in place of Lakkamkudi camp that was technically outside the PA and covered only slopes of the Eravikulam Plateau.

The intensive survey of four days was conducted from 07 to 10 December 2012 by c. 50 birdwatchers from various parts of southern India. Each survey team comprised at least one seasoned bird-watcher, who could identify all the forest and grassland birds with confidence. Prefixed transects radiating from the base camps were followed during 0700–1000 hrs, and 1530–1800 hrs. Each team of two–three members chose a three–four hour transect route in a base camp for a day. The same transect was worked upon during the morning as well as the evening. An average walking pace, of about two–three kilometers per hour, amenable to bird watching, was followed. The observations recorded included basic information, such as transect name, name of birdwatchers, start time, end time, date, and weather conditions. When a bird was sighted, notes on time of sighting, bird species, and number of individuals, habitat, and remarks were noted. After the three hour transect, the team was free to walk further to explore. While in this exploratory walk, the team recorded only those species which were not recorded during that particular transect. The birds were identified from sightings with the help of binoculars, and vocalisations; the following field guides (Grimmett *et al.* 2011; Kazmierczak 2000; Rasmussen & Anderton 2012) were used for confirming sightings. The data thus collected were recorded in the prescribed data sheet. On the last day of the survey there was a plenary in which the findings of each team was rigorously reviewed.

The data were analysed using the software BIODIVERSITY PRO Version2 (McAleece 1997). The bird species were then assigned to various feeding guilds such as 'aerial' (AER), 'aquatic' (AQ), 'bark surface feeders' (BAR), 'canopy insectivores' (CAN), 'carnivores' (CAR), 'frugivores' (FRU), 'nectarivore-insectivore' (NEC), 'omnivore' (OMN), 'piscivores' (PIS), 'terrestrial insectivores' (TER), 'understorey insectivores' (UND), modified after Raman *et al.* (1998), and Praveen & Nameer (2009).

At present, since there is no standard updated bird checklist for Kerala, or for that matter, India, that is in sync with the latest taxonomic inputs, we follow the IOC's World Checklist version 4.3 (Gill & Donsker 2014) for taxonomic sequence and English / scientific names. While compiling the checklist obtained from this survey, we also compared it with Uthaman (1999), Sashikumar

et al. (2011a), and Nameer (2005). We ensured that species that were recorded outside the PAs were excluded on a case-by-case basis; at times reviewing them with K. V. Eldhose who is familiar with the area. Additionally, none of the unconfirmed species from those lists figure here.

Overview of results

Survey teams worked on 72 transects (Table 3), counting 5816 birds of 120 species (Appendix). 79 species were recorded from the camps of Eravikulam NP, 55 from those in Kurinjimala WLS, 68 from Pampadum Shola NP, and 41 from Anamudi Shola NP. Combined with past studies (Ali & Whistler 1935, Uthaman 1999, Nameer 2005, Sashikumar *et al.* 2011a, 2011b), this takes the checklist to 143 species. All transect lists were uploaded into a web-based forum (www.ebird.org) for public access. The following were significant sightings of the survey.

Pallid Harrier *Circus macrourus*

All sightings were from the camps in Eravikulam NP, namely, Eravikulam Hut, Poovar, and Kolukkan, indicating its preference for vast and undisturbed grasslands. Considered an uncommon winter visitor to Kerala (Sashikumar *et al.* 2011a). The grasslands of Eravikulam NP are probably the best remaining habitat in the state for this 'Near-threatened' species.

Common (Steppe) Buzzard *Buteo [buteo] vulpinus*

A total of 14 independent sightings from Eravikulam Hut and rest of the sightings dispersed over various camps like Kolukkan, Poovar, Rajamala, Neduarpp – clearly a bird of the grasslands. Generally rare everywhere in southern India except in ideal grassland habitats of the Western Ghats, like the Nilgiris (Zarri *et al.* 2005), and Munnar hills.

Mountain (Legge's) Hawk-Eagle *Spizaetus [nipalensis] kelaarti*

Recorded only from Top Station, Pampadum Shola NP, by Dipu Karuthedathu. This distinct race is sometimes considered a split from the nominate of Himalayas and is endemic to Western Ghats and hill forests of Sri Lanka (Rasmussen & Anderton 2012). In Kerala, it appears to be widespread (Sashikumar *et al.* 2011a) but rare everywhere.

Nilgiri Wood-Pigeon *Columba elphinstonii*

Most sightings are from outside Eravikulam NP – just a single one from Varattukulam being from inside the park. Most observations of this Vulnerable endemic were from Anamudi Shola NP (Methappu), and Kurinjimala WLS (Neduarpp).

Common (Northern) House Martin *Delichon urbica*

Though widespread elsewhere, this species is rare in Kerala with only a handful of sightings (Sashikumar *et al.* 2011a). Two sightings of four birds from Varattukulam, Eravikulam NP by MC Thajudeen is the only record from the survey.

Travancore Brown Rock (Long-billed) Pipit *Anthus similis travancoriensis*

Race endemic to the Western Ghats south of the Palakkad Gap,

Table 3. Survey effort details and total number of birds seen.

Camps	# Transects	# Transect hours	# Birds	# Species
Eravikulam Hut	8	19.13	472	38
Kadavari	8	14.32	402	38
Kolukkan	11	34.72	490	41
Methappu	8	20.30	446	41
Neduarpp	8	19.32	373	36
Poovar	5	07.50	400	25
Rajamala	5	13.75	291	57
Top Station	8	24.13	1365	68
Varattukulam	3	13.72	197	32
Total	64	166.88	4436	113

two sightings of three birds recorded from Kolukkan in Eravikulam NP by Shashank Dalvi are the only records from the survey.

Nilgiri Pipit *Anthus nilghiriensis*

A very good population from the camps of Eravikulam Hut (50 birds recorded during transects), Poovar (53), and Kolukkan (80) in Eravikulam NP, apart from records from Varattukulam, Methappu, and Neduvurpp. Partial to wet grasslands. This is probably one of the last strongholds of this Vulnerable, endemic species (Robin *et al.* 2014).

Olive-backed Pipit *Anthus hodgsonii*

Rare winter visitor to the Western Ghats of Kerala (Sashikumar *et al.* 2011a), the only report was a sighting from Neduvurpp by Rangaswamy M.

[[Common (Siberian) Chiffchaff *Phylloscopus [collybita] tristis]]*

A bird suspected to have been this species was recorded by Ginu George and Rinaz Mohammed from Kadavari. The details provided by the observer (Ginu) mention a small active bird, giving a warbler-impression, seen on a bare branch of a small tree about 25 m away from the observers. Observations through binoculars (Pentax 8x43 DCF-SP) revealed a fully brown warbler (unlike Blyth's Reed's longer head), no greenish tinge, and light brownish wash on the under parts. Legs and bill were black. White supercilium extended behind the eyes. A small white/buff crescent patch on the edge of the wings (alula) was also seen. The bird stayed in good view with excellent lighting in bare branches for a minute. The observers were quizzed for potentially confusing species like Tytler's *P. tytleri*- and Tickell's-Leaf Warblers *P. affinis* (no yellow or green tinge), Booted-*Iduna caligata* and Syke's- Warblers *I. rama* (all dark beak & legs) and the descriptions provided were clear enough to have eliminated these latter. None of the past sightings of Chiffchaff (Uthaman 1999; Sashikumar *et al.* 2011) from Eravikulam NP and Munnar Hills have been supported with photographs, as is the case with this one. We consider this species as provisional here.

Tytler's Leaf-Warbler *Phylloscopus tytleri*

Recorded from various camps in Eravikulam NP like Rajamala, Eravikulam Hut, and Kolukkan, and also from Top Station (Pampadum Shola NP). The first report of this species from Kerala was from Munnar (Harrap & Redman 1990), and subsequently others (Praveen 2007), including several visiting bird-watchers, have reported it. It appears that this 'Near-threatened' Leaf-Warbler winters in good numbers in the Munnar Hills.

Nilgiri (Scaly) Thrush *Zoothera [dauma] neilgherriensis*

Some works consider the distinctly plumaged race of the Western Ghats a separate species (Rasmussen & Anderton 2012); this bird is nowhere common and is restricted to certain pockets in the hills (Sashikumar *et al.* 2011a). Sightings of single individuals from Top Station by Dipu Karuthedathu and from Rajamala by Sandeep Das are the only reports from this survey. However, this species has been repeatedly sighted by visiting birdwatchers

in the Munnar Hills and must surely be more widespread than its secretive habits reveal, being the main reason for not encountering it more often.

White-bellied Shortwing (Blue Robin) *Myiomela albiventris*

Recorded from all the camps except Methappu (where it must have been overlooked, as it's been recorded breeding there) indicating a good population overall. These hills are the best refuge for this 'Endangered' species in the entire Western Ghats (Robin & Sukumar 2002).

Kerala (Palani) Laughingthrush *Trochalopteron [fairbanki] fairbanki*

One of the common birds, seen in all ten camps. This region seems to house a major population of this 'Near-threatened' taxon. The nominate race is a proposed split (Praveen & Nameer 2013) from the southern race of *meridionale*, and in view of this imminent status change, these hills will form the backbone of the global population.

Broad-tailed Grass-Warbler (Grassbird) *Schoenicola platyura*

This 'Vulnerable' yet secretive species was recorded only from the Kolukkan and Rajamala areas in Eravikulam NP. Grassy hilltops of the Munnar Hills are well known for this species, from where it is regularly reported by visiting birdwatchers.

Kashmir Flycatcher *Ficedula subrubra*

A first winter bird was recorded and photographed (Dalvi 2013) at the outskirts of Eravikulam NP, on the way to Eravikulam Hut. This was the first confirmed record of this 'Vulnerable' migratory species from the Western Ghats south of the Palakkad Gap.

Black-and-Orange Flycatcher *Ficedula nigrorufa*

This 'Near-threatened' species was recorded from all the camps and seems to be generally distributed everywhere in good numbers.

Black-throated (Jerdon's) Munia *Lonchura kelaarti jerdoni*

A flock of six birds was seen at Neduvurpp, being the only record for the survey. A bird of degraded grasslands and shrublands in the high-altitude region, this race is endemic to Western Ghats.

In terms of omissions, none of the high-altitude endemic species known from the Munnar Hills were missed out from the survey. However, about 20 species recorded during the previous survey at Eravikulam NP (Uthaman 1999) were not recorded this time. It is suspected that many of them could have been from sites outside the geographical boundaries of PAs and are marked in the checklist explicitly with a question mark.

Apart from this, some of the rare birds reported once or twice from the hills were not reported during the survey. These include Lesser Kestrel (Sashikumar *et al.* 2011a), Eastern Grass

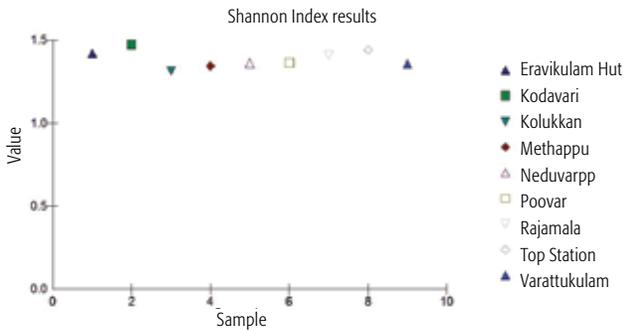


Fig. 2. Shannon's diversity index of basecamps

Owl (Sashikumar *et al.* 2011a), Eurasian Woodcock (Sashikumar *et al.* 2011a), Common Grasshopper Warbler (Sashikumar *et al.* 2011a), Eurasian Crag Martin (Sashikumar *et al.* 2011a, 2011b), and Pied Thrush (Jackson 1973; Sashikumar *et al.* 2011a).

Bird diversity

Bird diversity at the different base camps in the Munnar Hills is given in Table 3, Fig. 2. Highest species richness was recorded at Top Station (68), and Rajamala (68) base camps, while the maximum number of individual birds was also sighted at Top Station (1365). Shannon's Index is more or less the same across camps, indicating uniform bird diversity across the Munnar Hills.

Similarity of basecamps

Bray-Curtis Cluster Analysis of similarity among the bird taxa of

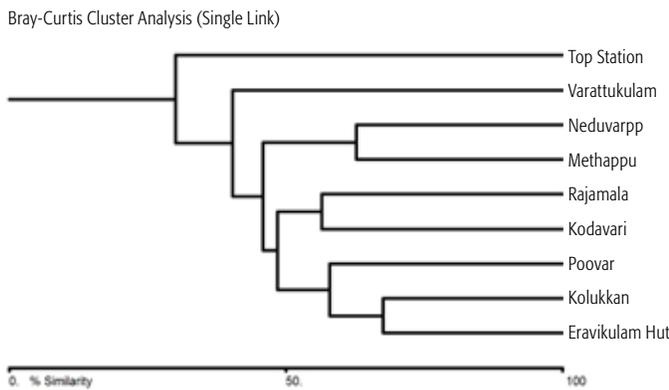


Fig. 3. Bray-Curtis cluster analysis of similarity based on population

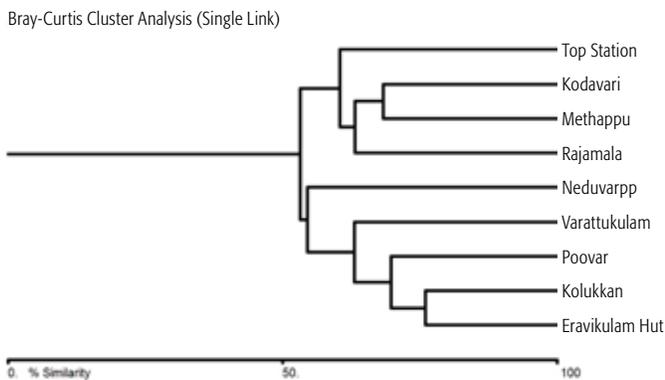


Fig. 4. Bray-Curtis Cluster analysis of similarity based on checklist

different base camps from the Munnar Hills is given in Figs. 3 & 4. It shows that a checklist-based similarity analysis need not be similar to a population-based one; hence, surveys that estimate population are more useful for comparing similar habitats. Certain patterns are clearly evident from this analysis. Kolukkan and Eravikulam Hut camps are more similar than others with their intact grassland-shola habitat. Poovar is more similar to Eravikulam Hut & Kolukkan than others—again indicating similar habitats inside the national park. Top Station, with slightly diverse and disturbed high-altitude habitat is most divergent in terms of population. Varattukulam, though inside the national park, seems to have a great amount of edge effect and is dissimilar from the camps inside the core area of Eravikulam NP. Rajamala, with its high tourist influx, is also divergent from the three core camps—being more similar to Kadavari in Kurinjimala WLS in terms of population. Though checklist-wise Methappu is similar to Kadavari, this is not the case in terms of population. Neduarpp is a strange case—though it is the most divergent of camps based on checklists, due to the excessive wattle plantations, it seems more similar to Methappu in terms of bird population. Hence, bird population patterns of camps like Methappu & Neduarpp need more detailed study to understand their position.

Feeding guild structure

The feeding guild structure throws open a lot of interesting facts about the birdlife of a place. Like elsewhere in the Western Ghats (Praveen & Nameer 2006, 2009), the most prominent guild that dominates the profile is 'Canopy-Insectivore' (41%) (Fig. 5, 6). However, 'Understory-Insectivores' (20%) and 'Terrestrial-Insectivores' (8%) are well represented in the Munnar Hills, which indicate a healthy ecosystem with low pesticide effects (Nameer & Praveen 2006). Quite interestingly, the 'Frugivores' (13%), and 'Nectarivore-Insectivore' (2%) guilds that are normally well represented in mid-altitude forests, are at much lower levels here. Other guilds represent a minority population of the forest birds.

IUCN's 'Threatened' / 'Near-Threatened' species

Ten 'Threatened' birds were recorded during the survey of which one is listed as 'Endangered' (EN), four "Vulnerable" (VU), and the remaining "Near-threatened" (NT) (Table 4) (BirdLife International 2014). The survey recorded extremely good numbers of Palani Laughingthrush (NT) from all over the hills. Nilgiri Pipit (VU) showed excellent population in Eravikulam NP and a reasonable population in Kurinjimala WLS. Robin *et al.* (2014) recently proposed uplisting the status of Nilgiri Pipit to "Endangered" based on their recent assessment of the distribution of this species across the Western Ghats and this would probably be the largest population of this species.

Nilgiri Flycatcher (NT) and Black-and-orange Flycatcher (NT) were present in both camps—however, interestingly, the latter showed a higher population—could Nilgiri Flycatchers be wintering at lower altitudes? Nilgiri Wood-Pigeon (VU) was found to be more common outside Eravikulam NP than inside, which is another strange observation as it was expected that the undisturbed sholas of Eravikulam plateau to be its stronghold vis-à-vis slightly degraded sholas outside it. Among the skulkers, the endangered White-bellied Blue Robin (EN) was also recorded from all the camps, however its 'abundance' may not make much sense as the actual sightings will be few for the bird.

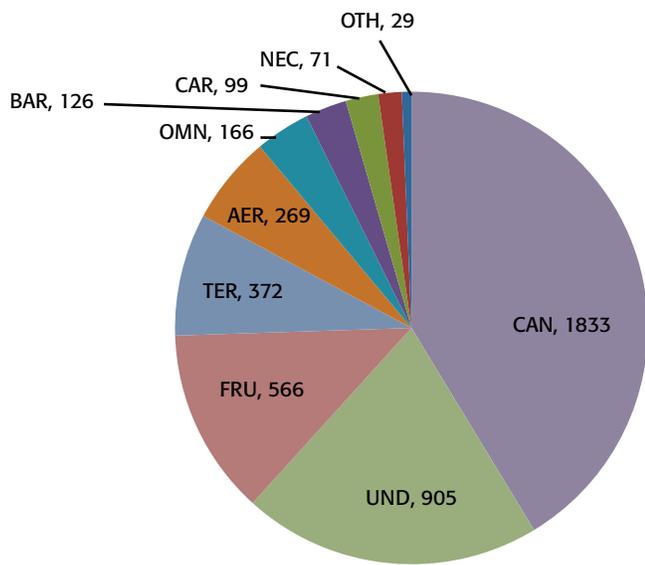


Fig. 5. Feeding guild structure of birds of Munnar Hills

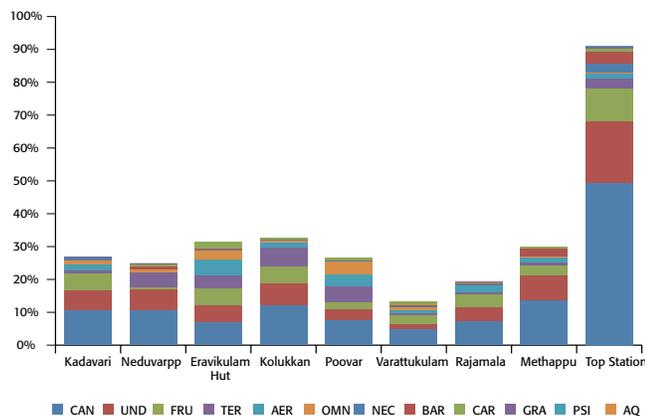


Fig. 6. Site-wise comparison of feeding guild structure of birds of Munnar Hills

Table 4. Frequency of sighting of threatened / near-threatened species

Species	IUCN	ENP	ASNP	PSNP	KWLS
Nilgiri Pipit	VU	189	2	0	15
Palani Laughingthrush	NT	128	81	153	54
White-bellied Blue Robin	EN	22	0	5	6
Black-and-orange Flycatcher	NT	16	11	23	17
Nilgiri Flycatcher	NT	16	1	9	2
Pallid Harrier	NT	11	0	0	0
Broad-tailed Grassbird	VU	7	0	0	0
Nilgiri Wood Pigeon	VU	1	11	2	7
Kashmir Flycatcher	VU	X	0	0	0
Tytlar's Leaf Warbler	NT	X	0	X	0

Tytlar's Leaf-Warbler (NT), one of the wintering warblers, was noted in a few camps but not during transects. The highlight of the survey, a first winter Kashmir Flycatcher (VU), was also not recorded during transects, but outside the time allotted to them (Dalvi 2013).

Western Ghats endemics

Eleven species of birds (out of 25) that are endemic to the Western Ghats have been reported from the Munnar Hills (Table 5). Apart from these, there are endemic races of eight species (Rasmussen & Anderson 2012). Unlike most mid-altitude forests in Kerala, Palani Laughing-thrush and Nilgiri Pipit are the most dominant endemics in Munnar Hills. The other high-altitude endemic birds such as Nilgiri Flycatcher, White-bellied Blue-Robin, and Black-and-orange Flycatcher are also well represented. It can be seen that the endemic density in undisturbed habitats like Eravikulam NP is higher than degraded habitats of Kurinjimala WLS (Fig. 7).

Robin *et al.* (2011) found a certain degree of cultural divergence in the song structure of White-bellied Blue-Robin in their samples from the Palani- and Grass- Hills. They attributed this to the recent deforestation in the intervening connecting areas of the Sky Islands (i.e., Munnar Hills). However, our study did not find any discontinuity in the shola habitats and its birds including Palani Laughingthrush, White-bellied Blue Robin and, Black-and-Orange Flycatcher—from Poovar in the north till Kadavari in the east. Poovar is contiguous with Grass Hills of Tamil Nadu while Kadavari lies adjacent to Palani Hills. More studies are required to check if any narrow barriers, probably man-made, like roads, break this seemingly continuous stretch.

Birds of prey

Twelve species of raptors were recorded from the Munnar Hills of which the grassland specialists—Common Buzzard, Pallid Harrier, and Common Kestrel dominated the list (Table 6). Frequency of raptor sightings in PAs in Eravikulam NP, with grasslands, is much more than other PAs and is probably the best habitat in Kerala.

Table 5. Frequency of sighting of Western Ghat endemic species and subspecies

Species	ENP	ASNP	PSNP	KWLS
Palani Laughingthrush	128	81	153	54
Square-tailed Bulbul	211	14	59	14
Nilgiri Pipit	189	2	0	15
Black-and-orange Flycatcher	16	11	23	17
Indian Scimitar Babbler	19	7	25	7
Nilgiri Flowerpecker	14	1	31	0
White-bellied Blue Robin	22	0	5	6
Nilgiri Flycatcher	16	1	9	2
Nilgiri Wood Pigeon	1	11	2	7
Crimson-backed Sunbird	5	0	1	10
Indian Blackbird	14	0	1	0
Greater Flameback	5	3	5	0
Broad-tailed Grassbird	7	0	0	0
White-bellied Blue Flycatcher	0	0	0	6
Long-billed Pipit	3	0	0	0
Dark-fronted Babbler	1	0	0	1
Nilgiri Thrush	1	0	1	0
Puff-throated Babbler	0	0	1	0
Red Spurfowl	0	0	2	2

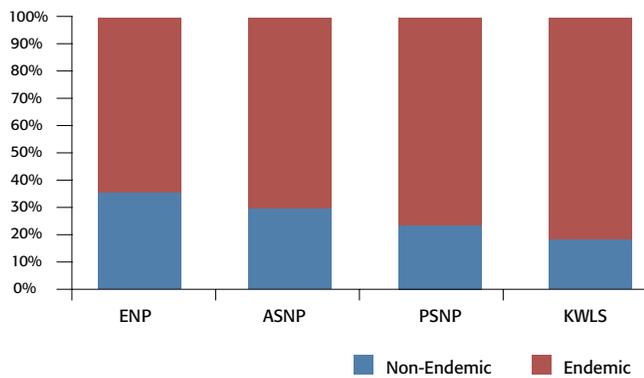


Fig. 7. Endemic vs Non-endemic species distribution

Table 6. Frequency of sighting of birds of prey

Species	ENP	ASNP	PSNP	KWLS
Common Kestrel	26	1	0	3
Common Buzzard	23	0	0	2
Pallid Harrier	11	0	0	0
Black eagle	2	0	4	0
Booted Eagle	4	0	0	1
Crested Goshawk	1	0	3	0
Black-winged Kite	2	0	1	0
Shikra	0	0	0	2
Crested Serpent Eagle	1	0	0	0
Rufous-bellied Hawk-Eagle	1	0	0	0
Changeable Hawk-Eagle	0	0	1	0
Short-toed Snake Eagle	0	0	0	1
Raptor sp.	1	0	3	0
Falcon sp.	0	3	0	0
Kite sp.	0	1	0	0
Harrier sp.	1	0	0	0

Ground birds

Ground birds are well represented in the Munnar Hills (Table 7). Of particular relevance is the excellent population of Nilgiri Pipit in Eravikulam NP and Kurinjimala WLS. Apart from this, the shola specialists like Indian Blackbird *Turdus simillimus bourdilloni* and White-bellied Blue Robin were well represented in all the camps. Elsewhere (Nameer & Praveen 2006), it has been noted that proximity of tea plantations can affect this guild negatively, apparently due to pesticide use.

Primary hole-nesting birds

Primary hole-nesting birds are ecologically significant birds and are regarded as keystone species as their services to the ecosystem are disproportionately large (Power *et al.* 1996). Their presence in an ecosystem is of great importance, as without them the secondary hole nesting birds would not be able to find enough cavities for nesting. Unlike most other forests, density of primary hole-nesting birds in high-altitude shola forests is quite patchy and there are only a few sightings of those (Table 8).

Table 7. Frequency of sighting of ground birds

Species	ENP	ASNP	PSNP	KWLS
Nilgiri Pipit	189	2	0	15
Grey Wagtail	20	6	35	42
White-bellied Blue-Robin	22	0	5	6
Grey Junglefowl	1	1	4	14
Indian Blackbird	14	0	1	0
Painted Bush Quail	7	0	0	0
Red Spurfowl	0	0	2	2
Long-billed Pipit	3	0	0	0
Blue-capped Rock Thrush	2	0	0	0
Indian Blue Robin	2	0	0	0
Nilgiri Thrush	1	0	1	0
Blue Rock Thrush	0	0	0	0
Forest Wagtail	0	0	1	0
Olive-backed Pipit	0	0	0	1

Table 8. Frequency of sighting of primary hole nesting species

Species	ENP	ASNP	PSNP	KWLS
White-cheeked Barbet	12	7	21	2
Greater Flameback	5	3	5	0
Common Flameback	3	0	1	0
Streak-throated Woodpecker	1	0	0	0
Woodpecker sp.	1	0	4	0
Flameback sp.	1	0	0	0

Brood parasites of birds

The abundance of parasitic cuckoos is an indicator of the breeding pressure exerted on its foster parents. A low abundance of brood parasites signifies lesser breeding pressure and healthier ecosystem for resident breeders (Brittingham & Temple 1983; Hoover & Brittingham 1993; Winfree 1999). As an example, pristine habitats like Silent Valley NP (Bashir & Nameer 1993) and Eravikulam NP (Uthaman 1999) hardly supports any parasitic cuckoo species while a disturbed habitat like Peechi-Vazhani WLS (Easa 1991; Santharam 2006; Nameer & Nirmal 2007), in Kerala, houses many species of parasitic cuckoos in good abundance. As a part of this survey, there were no parasitic cuckoos recorded from any of the camps—either in transects or otherwise—which is a treated as a good sign. Cuckoos are known to parasitise Laughingthrushes (Ali & Ripley 1987), and hence their total absence indicates the lack of pressure from them on the breeding success of its potential foster parents.

Conclusion

This is the first concerted effort to survey birds across several parts of the Munnar Hills apart from Eravikulam NP. The survey provided information on the continuity of habitat in the High Ranges. Together with the Grass Hills in the north and the Palani Hills in the east, the Munnar Hills form the core of the high altitude habitat south of the Palakkad Gap. Nilgiri Pipit and Broad-tailed Grassbird, both Vulnerable species, have one of its last strongholds in Eravikulam NP. Grassland management practices

at Eravikulam NP have to be tuned to their respective breeding seasons and their other habitat requirements.

The present study brings out the importance of conservation of grassland-shola ecosystem to conserve the highly threatened and endemic species that exist within it. The following recommendations need to be taken up for the management of these habitats.

- Wattle plantations have to be phased out in shola-grassland ecosystem in Kurinjimala WLS.
- Physical continuity of shola habitats has to be strengthened from Kurinjimala WLS and Eravikulam NP by bringing in adjacent areas of the Munnar Hills into the PA network of one of the protected areas.
- Long-term monitoring of five montane species, namely, Palani Laughingthrush, White-bellied Bush Robin, Black-and-Orange Flycatcher, Nilgiri Pipit, and Broad-tailed Grassbird should be done in these hills.
- Automatic call recording equipment can be installed in select sites across the shola-grassland stretch to monitor White-bellied Blue-Robin and Palani Laughingthrush. The devices record a certain number of hours of forest sounds in morning and evening and they can be analysed offline to estimate density.
- A survey of this kind should be repeated every five years.

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References

- Ali, S., & Ripley, S. D., 1987. *Compact handbook of the birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka*. 2nd ed. Delhi: Oxford University Press. Pp. i-xlii, 1 I., 1-737, 52 II.
- Ali, S., & Whistler, H., 1935. The ornithology of Travancore and Cochin. Part I. *Journal of the Bombay Natural History Society* 37 (4): 814-843.
- Anonymous. 2010. Management Plan of Eravikulam National Park, 2011 to 2021. Kerala State Forest Department. Pp. 1-205.
- Bashir, C. A. A., & Nameer, P. O., 1993. Some observations on the birds of Silent Valley National Park. In: *Bird Conservation: Strategies for the Nineties and Beyond*. Verghese, A., Sridhar, S., & Chakravarthy, A. K., (eds.). Bangalore: Ornithological Society of India: Pp. 131-136.
- BirdLife International. 2014. Country profile: India. URL: <http://www.birdlife.org/database/country/india>. [Accessed on 16 September 2014.]
- Brittingham, M. C., & Temple, S. A., 1983. Have cowbirds caused forest songbirds decline? *Bioscience* 33: 31-35.
- Champion, H. G., & Seth, S. K., 1968. *Classification of Forest Types of India*. Dehra Dun: Natraj Publishers.
- Dalvi, S., 2013. Kashmir Flycatcher from Munnar Hills, Kerala. *Indian BIRDS* 8 (3): 82.
- Das, A., Krishnaswamy, J., Bawa, K. S., Kiran, M. C., Srinivas, V., Kumar, N. S., & Karanth, U., 2006. Prioritisation of conservation areas in the Western Ghats, India. *Biological Conservation* 133 (1): 16-31.
- Easa, P. S., 1991. *Birds of Peechi Vazhani Wildlife Sanctuary: A survey report*. Trichur: Nature Education Society.
- Grimmett, R., Inskipp, C., & Inskipp, T., 2011. *Birds of the Indian Subcontinent*. 2nd ed. London: Oxford University Press & Christopher Helm. Pp. 1-528.
- Harrap, S. C., & Redman, N. J., 1990. Some observations of scarce birds in Kerala and Tamil Nadu. *Journal of the Bombay Natural History Society* 86 (3): 460-461.
- Hoover, J. P., Brittingham, M. C., 1993. Regional variation in cowbird parasitism of Wood thrushes. *Wilson Bulletin* 105 (2): 228-238.
- Jackson, M. C. A., 1973. Pied Ground Thrush *Zosterora wardii* (Blyth) in Kerala State. *Journal of the Bombay Natural History Society* 69 (3): 652.
- Kazmierczak, K., 2000. *A field guide to the birds of India, Sri Lanka, Pakistan, Nepal, Bhutan, Bangladesh and the Maldives*. 1st ed. New Delhi: Om Book Service. Pp. 1-352.
- Menon, A. R. R., 1997. Vegetation mapping and analysis of Eravikulam National Park using remote sensing techniques. *KFRI Research Report* 130: 1-21.
- McAlece, N., 1997. *Bio-Diversity Professional*. The Natural History Museum and the Scottish Association for Marine Science. UK.
- Nair, S. C., 1991. *The Southern Western Ghats: a biodiversity conservation plan*. New Delhi: INTACH. Pp. 1-92.
- Nameer, P. O., 2005. Summary of Ph.D. Thesis: Bird community structure in selected forest types of Kerala. *Zoos' Print* 20 (11): 20-22.
- Nameer P.O., Nirmal, J. A., 2007. *Birds of Peechi-Vazhani Wildlife Sanctuary*. Kerala State Forest Department, Centre for Wildlife Studies, Nature Education Society, Trichur. Pp. 1-23.
- Nameer, P. O., & Praveen, J., 2006. *Bird diversity of Nelliampathies, southern Western Ghats*. 1st ed. U. K.: Oriental Bird Club. Pp. 1-42.
- Power, M. E., Tilman, D., Estes, J. A., Menge, B. A., Bond, W. J., Mills, L. S., Daily, G., Castilla, J. C., Lubchenco, J., & Paine, R. T., 1996. Challenges in the quest for keystones. *BioScience* 46 (8): 609-620.
- Praveen J., 2007. More wintering sites for the Near-threatened Tytler's Leaf-Warbler *Phylloscopus tytleri* in Peninsular India. *Indian Birds* 3 (4): 146-149.
- Praveen J., & Nameer, P. O., 2009. Monitoring bird diversity in Western Ghats of Kerala. *Current Science* 96 (10): 1390-1395.
- Praveen J., & Nameer, P. O., 2013. *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 (2012).
- Primrose, J. B., 1938. Supplementary observations on the Munnar section of the ornithological survey of Travancore and Cochin. *Journal of the Bombay Natural History Society* 40 (3): 500-507.
- Raman, T. R. S., Rawat, G. S., & Johnsingh, A. J. T., 1998. Recovery of tropical rainforest avifauna in relation to vegetation succession following shifting cultivation in Mizoram, north-east India. *Journal of Applied Ecology* 35: 214-231.
- Rasmussen, P. C., & Anderton, J. C., 2012. *Birds of South Asia: the Ripley guide*. 2nd ed. Washington, D.C. and Barcelona: Smithsonian Institution and Lynx Edicions. 2 vols. Pp. 1-378; 1-683.
- Robertson, A., 1991. Some altitudinal records of birds from the High Range, Kerala. *Journal of the Bombay Natural History Society* 87 (3): 456.
- Robin, V. V., & Sukumar, R., 2002. Status and habitat preference of White-bellied Shortwing *Brachypteryx major* in the Western Ghats (Kerala and Tamilnadu), India. *Bird Conservation International* 12 (4): 335-351.
- Robin, V. V., Katti, M., Purushotham, C., Sancheti, A., & Sinha, A., 2011. Singing in the sky: song variation in an endemic bird on the sky islands of southern India. *Animal Behaviour* 82: 513-520.
- Robin, V. V., Vishnudas, C. K., & Ramakrishnan, U., 2014. Reassessment of the distribution and threat status of the Western Ghats endemic bird, Nilgiri Pipit *Anthus nilghiriensis*. *Current Science* 107 (4): 622-630.
- Santharam, V., 2006. Birds of the Peechi-Vazhani Wildlife Sanctuary, Kerala (India). *Blackbuck* 17-18: 1-15 (2001-2002).
- Sashikumar, C., Praveen J., Palot, M. J., & Nameer, P. O., 2011a. *Birds of Kerala: status and distribution*. 1st ed. Kottayam, Kerala: DC Books. Pp. 1-835.
- Sashikumar, C., Vishnudas, C. K., Raju, S., Kannan, S., & Vinayan, P. A., 2011b. *Along the trail of Salim Ali: Travancore-Cochin Ornithological Survey-2009*. Kerala State Forests & Wildlife Department. Pp:1-220.
- Uthaman, P. K., 1999. Birds of the Eravikulam National Park—a survey report. *Blackbuck* 14 (2): 45-53.
- Winfree, R., 1999. Cuckoos, cowbirds and the persistence of brood parasitism. *Trends in Ecology and Evolution*. 14 (9): 338-343.
- Zacharias, V. J., & Gaston, A. J., 1999. The recent distribution of endemic, disjunct and globally uncommon birds in the forests of Kerala State, south-west India. *Bird Conservation International* 9: 191-225.
- Zarri, A. A., & Rahmani, A. R., 2005. Annotated avifauna of the Upper Nilgiris, Western Ghats, Tamil Nadu, India. *Buceros* 10 (1): i-iii, 1-46.

Appendix. Checklist of birds of Protected Areas in Munnar Hills (based on IOC 4.3 Master List)

Common English Name	Species	HUT	VAR	KOL	POV	RAJ	MET	KAD	NED	TOP	ENP	KWLS	ANSP	PSNP	UTH	OTH
Painted Bush Quail	<i>Perdica erythrorhyncha</i>					7					X				X	
Red Spurfowl	<i>Galloperdix spadicea</i>								2	2		X	X			
Grey Junglefowl	<i>Gallus sonneratii</i>	X		X		1	1	1	13	4	X	X	X	X	X	
Indian Pond Heron	<i>Ardeola grayii</i>									1			X			
Black-winged Kite	<i>Elanus caeruleus</i>	1	1						X	1	X	X	X		X	
Crested Honey Buzzard	<i>Pernis ptilorhynchus</i>								X			X			X	
Jerdon's Baza	<i>Aviceda jerdoni</i>															BOK
Crested Serpent Eagle	<i>Spiormis cheela</i>		1								X				X	
Short-toed Snake Eagle	<i>Circaetus gallicus</i>								1			X			X	
Changeable Hawk-Eagle	<i>Nisaetus cirrhatus</i>									1			X			
Legge's Hawk-Eagle	<i>N. kelaarti</i>									X			X			
Rufous-bellied Hawk-Eagle	<i>Lophotriorchis kienerii</i>		1								X				X	
Black Eagle	<i>Ictinaetus malaiensis</i>	2				X				4	X		X			
Booted Eagle	<i>Hieraetus pennatus</i>	1		2		1		1			X	X				
Bonelli's Eagle	<i>Aquila fasciata</i>															ELD
Crested Goshawk	<i>Accipiter trivirgatus</i>	1								3	X		X		X	
Shikra	<i>A. badius</i>								2			X				
Pallid Harrier	<i>Circus macrourus</i>	2	6	2	1						X				X	
Common Buzzard	<i>Buteo buteo</i>	14	X	1	6	2	X		2	X	X	X	X	X	X	
Eurasian Woodcock	<i>Scolopax rusticola</i>															BOK
Green Sandpiper	<i>Tringa ochropus</i>							X				X			X	
Rock Dove	<i>Columba livia</i>							2				X				
Nilgiri Wood Pigeon	<i>C. elphinstonii</i>	X	1	X		X	11		7	2	X	X	X	X	X	
Spotted Dove	<i>Spilopelia chinensis</i>			1							X					
Grey-fronted Green Pigeon	<i>Treron affinis</i>															MAN
Green Imperial Pigeon	<i>Ducula aenea</i>									1			X			
Mountain Imperial Pigeon	<i>D. badia</i>					X			1		X	X			X	
Greater Coucal	<i>Centropus sinensis</i>						1	3		1		X	X	X	X	
Lesser Coucal	<i>C. bengalensis</i>														X	
Eastern Grass Owl	<i>Tyto longimembris</i>															BOK
Brown Fish Owl	<i>Ketupa zeylonensis</i>									X			X		X	
Brown Wood Owl	<i>Strix leptogrammica</i>									X			X			
Jungle Nightjar	<i>Caprimulgus indicus</i>															ELD
Jerdon's Nightjar	<i>C. atripennis</i>														X	
Indian Swiftlet	<i>Aerodramus unicolor</i>					X	4				X			X		
White-rumped Spinetail	<i>Zoonavena sylvatica</i>	X		X			8				X			X	X	
Brown-backed Needletail	<i>Hirundapus giganteus</i>					X					X				X	
Alpine Swift	<i>Tachymartus melba</i>	8	7								X				X	
Blyth's Swift	<i>Apus leuconyx</i>														X	
Little Swift	<i>A. affinis</i>						X							X		
Malabar Trogon	<i>Harpactes fasciatus</i>						1			3			X	X	X	
White-throated Kingfisher	<i>Halcyon smyrnensis</i>									X			X			

Appendix. Checklist of birds of Protected Areas in Munnar Hills (based on IOC 4.3 Master List)

Common English Name	Species	HUT	VAR	KOL	POV	RAJ	MET	KAD	NED	TOP	ENP	KWLS	ANSP	PSNP	UTH	OTH
Common Kingfisher	<i>Alcedo atthis</i>									2			X			
Green Bee-eater	<i>Merops orientalis</i>									X			X			
Chestnut-headed Bee-eater	<i>M. leschenaulti</i>														X	
Eurasian Hoopoe	<i>Upupa epops</i>			X							X					
White-cheeked Barbet	<i>Megalaima viridis</i>	4	2		4	2	7	2		21	X	X	X	X	X	
Speckled Piculet	<i>Picumnus innominatus</i>					X				X	X		X			
Brown-capped Pygmy Woodpecker	<i>Dendrocopos nanus</i>															MAN
Lesser Yellownape	<i>Picus chlorolophus</i>														X	
Streak-throated Woodpecker	<i>P. xanthopygaeus</i>					1					X				X	
Common Flameback	<i>Dinopium javanense</i>		1	1		1			X	1	X	X	X			
Greater Flameback	<i>Chrysocolaptes guttacristatus</i>	5					3	X		5	X	X	X	X	X	
Lesser Kestrel	<i>Falco naumanni</i>															BOK
Common Kestrel	<i>F. tinnunculus</i>	9	6	2	9	X	1	2	1	X	X	X	X	X	X	
Peregrine Falcon	<i>F. peregrinus perigrinator</i>															PO1
Bar-winged Flycatcher-shrike	<i>Hemipus picatus</i>					3	9	3	X	28	X	X	X	X	X	
Malabar Woodshrike	<i>Tephrodornis sylvicola</i>															MAN
Orange Minivet	<i>Pericrocotus flammeus</i>					1		10		16	X	X	X		X	
Brown Shrike	<i>Lanius cristatus</i>														X	
Long-tailed Shrike	<i>L. schach</i>						1	14		5		X	X	X		
Black-naped Oriole	<i>Oriolus chinensis</i>									1			X			
Ashy Drongo	<i>Dicrurus leucophaeus</i>			X						5	X		X		X	
Asian Paradise Flycatcher	<i>Terpsiphone paradisi</i>					X		3			X	X			X	
House Crow	<i>Corvus splendens</i>									1			X			
Indian Jungle Crow	<i>C. culminatus</i>	39	13	11	62	2	1	12	12	5	X	X	X	X	X	
Grey-headed Canary-flycatcher	<i>Culicicapa ceylonensis</i>	36	20	37	59	13	49	35	10	161	X	X	X	X	X	
Cinereous Tit	<i>Parus cinereus</i>						1							X	X	
Indian Black-lored Tit	<i>Machlolophus aplonotus</i>		1			4	X	X	8	22	X	X	X	X		
Oriental Skylark	<i>Alauda gulgula</i>	2		1	16						X				X	
Malabar Lark	<i>Galerida malabarica</i>															BOK
Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	11	1	X	16	27	14	53		38	X	X	X	X	X	
Red-vented Bulbul	<i>P. cafer</i>							12				X				
Yellow-browed Bulbul	<i>Acritillas indica</i>									28			X		X	
Square-tailed Bulbul	<i>Hypsipetes ganeesa</i>	65	35	73	11	27	14	10	4	59	X	X	X	X		
Hill Swallow	<i>Hirundo domicola</i>	45	5	19	52	28	15	29		24	X	X	X	X	X	
Eurasian Crag Martin	<i>Ptyonoprogne rupestris</i>															BOK
Dusky Crag Martin	<i>P. concolor</i>														X	
Common House Martin	<i>Delichon urbicum</i>		4								X					

Appendix. Checklist of birds of Protected Areas in Munnar Hills (based on IOC 4.3 Master List)

Common English Name	Species	HUT	VAR	KOL	POV	RAJ	MET	KAD	NED	TOP	ENP	KWLS	ANSP	PSNP	UTH	OTH
Red-rumped Swallow	<i>Cecropis daurica</i>	20	X								X				X	
Streak-throated Swallow	<i>Petrochelidon fluvicola</i>														X	
Tickell's Leaf Warbler	<i>Phylloscopus affinis</i>	3		17	13	4	3	23	8	12	X	X	X	X	X	
Greenish Warbler/ Green Warbler	<i>P. trochiloides/nitidus</i>	15		25	9	11	41	24	26	70	X	X	X	X		
Large-billed Leaf Warbler	<i>P. magnirostris</i>	4		19		4	8	12	21	40	X	X	X	X	X	
Tytler's Leaf Warbler	<i>P. tytleri</i>	X		X		X				X	X		X			
Western Crowned Warbler	<i>P. occipitalis</i>			1						2	X		X		X	
Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i>				11	X	2	1		20	X	X	X	X	X	
Thick-billed Warbler	<i>Iduna aedon</i>														X	
Common Grasshopper Warbler	<i>Locustella naevia</i>															BOK
Broad-tailed Grassbird	<i>Schoenicola platyurus</i>			X		7					X				X	
Zitting Cisticola	<i>Cisticola juncidis</i>															ELD
Grey-breasted Prinia	<i>Prinia hodgsonii</i>					X					X					
Jungle Prinia	<i>P. sylvatica</i>					X		X	18		X	X			X	
Ashy Prinia	<i>P. socialis</i>								2	8		X	X		X	
Plain Prinia	<i>P. inornata</i>	X	X	1	6	1	1	1			X	X		X	X	
Common Tailorbird	<i>Orthotomus sutorius</i>			X							X					
Indian Scimitar Babbler	<i>Pomatorhinus horsfieldii</i>	4	10	2		3	7	2	5	25	X	X	X	X	X	
Tawny-bellied Babbler	<i>Dumetia hyperythra</i>														X	
Dark-fronted Babbler	<i>Rhopocichla atriceps bourdilloni</i>					1			1		X	X				
Brown-cheeked Fulvetta	<i>Alcippe poioicephala</i>	5		6			1			24	X		X	X	X	
Puff-throated Babbler	<i>Pellorneum ruficeps</i>					X				1	X		X		X	
Rufous Babbler	<i>Turdoides subrufa</i>														X	
Wynaad Laughingthrush	<i>Garrulax delesserti</i>					X					X				X	
Palani Laughingthrush	<i>Trochalopteron f. fairbanki</i>	26	12	57	7	26	81	9	45	153	X	X	X	X	X	
Oriental White-eye	<i>Zosterops palpebrosus</i>	34	38	68	25	58	82	44	77	290	X	X	X	X	X	
Asian Fairy-bluebird	<i>Irena puella</i>					X				16	X		X			
Velvet-fronted Nuthatch	<i>Sitta frontalis</i>	2	2			1	34		18	44	X	X	X	X	X	
Southern Hill Myna	<i>Gracula indica</i>					2				9	X		X			
Jungle Myna	<i>Acridotheres fuscus</i>							3				X				
Pied Thrush	<i>Geokichla wardii</i>															BOK
Nilgiri Thrush	<i>Zoothera neilgherriensis</i>					1				1	X		X			
Bourdillon's Blackbird	<i>Turdus simillimus bourdilloni</i>	8		5	1	X	X			1	X		X	X	X	
Oriental Magpie-Robin	<i>Copsychus saularis</i>									2			X			
Asian Brown Flycatcher	<i>Muscicapa latirostris</i>									2			X			
Brown-breasted Flycatcher	<i>M. muttui</i>														X	
Rusty-tailed Flycatcher	<i>M. ruficauda</i>								1			X			X	

Appendix. Checklist of birds of Protected Areas in Munnar Hills (based on IOC 4.3 Master List)

Common English Name	Species	HUT	VAR	KOL	POV	RAJ	MET	KAD	NED	TOP	ENP	KWLS	ANSP	PSNP	UTH	OTH
White-bellied Blue Flycatcher	<i>Cyornis pallipes</i>					X		6			X	X			X	
Tickell's Blue Flycatcher	<i>C. tickelliae</i>															MAN
Verditer Flycatcher	<i>Eumyias thalassinus</i>		2							1	X		X		X	
Nilgiri Flycatcher	<i>E. albicaudatus</i>	2		3	7	4	1		2	9	X	X	X	X	X	
Indian Blue Robin	<i>Larivora brunnea</i>					2					X				X	
White-bellied Blue Robin	<i>Myiomela albiventris</i>	1	4	9	1	7	X	5	1	5	X	X	X	X		
Malabar Whistling Thrush	<i>Myophonus horsfieldii</i>		2	1	2	1	3	5		2	X	X	X	X	X	
Kashmir Flycatcher	<i>Ficedula subrubra</i>										X					
Black-and-orange Flycatcher	<i>F. nigrorufa</i>	2	4	5	2	3	11	11	6	23	X	X	X	X		
Blue Rock Thrush	<i>Monticola solitarius</i>					X					X				X	
Blue-capped Rock Thrush	<i>M. cinclorhynchus</i>					2					X				X	
Siberian Stonechat	<i>Saxicola maurus</i>			X							X					
Pied Bush Chat	<i>S. caprata</i>	39	5	24	20	16	15	42	21	9	X	X	X	X	X	
Golden-fronted Leafbird	<i>Chloropsis aurifrons</i>															MAN
Thick-billed Flowerpecker	<i>Dicaeum agile</i>		1								X				X	
Nilgiri Flowerpecker	<i>D. concolor</i>	6	5	3		X	1		X	31	X	X	X	X	X	
Crimson-backed Sunbird	<i>Leptocoma minima</i>			1	1	3		10		1	X	X	X		X	
Little Spiderhunter	<i>Arachnothera longirostra</i>															MAN
Black-throated Munia	<i>Lonchura kelaarti</i>							X	6	X		X	X			
Forest Wagtail	<i>Dendronanthus indicus</i>									1			X			
Grey Wagtail	<i>Motacilla cinerea</i>	4	X	5	6	5	6	6	36	35	X	X	X	X	X	
White-browed Wagtail	<i>M. maderaspatensis</i>						1	5		3		X	X	X		
Paddyfield Pipit	<i>Anthus rufulus</i>															X
Long-billed Pipit	<i>A. similis</i>			3							X				X	
Olive-backed Pipit	<i>A. hodgsoni</i>								1			X			X	
Nilgiri Pipit	<i>A. nilghiriensis</i>	50	6	80	53	X	2		15		X	X		X	X	
Common Rosefinch	<i>Carpodacus erythrinus</i>					7	X			11	X		X	X	X	

Legend: HUT: Eravikulam Hut, VAR: Varattikulam, KOL: Kolukkan, POV: Poovar, RAJ: Rajamala, MTH: Methappu, KAD: Kadavari, NED: Neduvapp, TOP: Top Station, ENP: Eravikulam NP, KWLS: Kurinjimala WLS, ANSP: Anamudi Shola NP, PSNP: Pampadum Shola NP, ENP97: Uthaman (1999), OTH: Other Reference, BOK: Sashikumar et al. (2011a), MAN: Nameer (2005), ELD: K. V. Eldhose pers. comm. September 2014

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