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A comparative analysis of the avifauna of kalpathypuzha, kunthypuzha and Nila River basins

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Abstract
The Nila river basin of Kerala state with its two important tributaries, the Kalpathypuzha and Kunthipuzha, was surveyed (from 2005 January to 2007 December) for a comparative study of the avifauna selecting three study sites each in each basin. A total of 208 species of birds was recorded from the three basins. Of the 140 species recorded from the Nila basin, 70% were residents, 29% migrants and the rest local migrants. A good number of shore birds (25species) were the major constituent of the migrants. The majority of the shorebirds were seen at Manchady, the site close to the Ponnani coast. Three species recorded along the Nila, the Darter (*Anhinga melanogaster),* the Black-bellied tern (*Sterna auticauda*) and the Asian open-bill stork (*Anastomus oscitans*) are threatened species. In the Kalpathypuzha basin, of the total 157 species, 87% were residents and 10.82% migrants. Of these 49 species were forest birds. The two study sites in this basin, the Kava and Manthakkad, are adjacent to forests and hence the higher number of forest birds. Of the 188 species recorded from the Kunthypuzha basin, the resident- migrant ratio is 76.31:21.68. The number of forest birds is the highest here (55species) and the majority of these were seen at Pathrakkadavu site an extension of the Silent valley forests.

Keywords: *Avifauna, Bharathapuzha, Nila, Kalpathypuzha, Kunthypuzha, Kerala, Wetlands, Kole-lands, Silent Valley, Western Ghats*

Introduction
Rivers and adjoining riparian vegetation are often called as the aorta of an ecosystem because of their great import in the perpetuation of bioresources. Riparian vegetation, besides having its own value for unique and diverse floral elements, provides habitat for numerous faunal species and serves crucial ecosystem services. With respect to birds, riverine ecosystems provide habitat for quite a large number of species, resident and migratory, specialists as well as generalists. For their diverse ecological roles, birds exercise considerable influence on the overall structure and functioning of natural ecosystems. The avifauna in riverine systems, including riparian vegetations, constitutes a major proportion of the total bird species of a region. Therefore, studies on the biology, ecology, management and conservation of birdlife in freshwater marshes in the new world have been carried out by several authors, some of the early studies being Weller and Spatcher (1965) [36], Feare and High (1977) [9], Feare (1979) [10] and Weller (1981, 1982) [37]. MacArthur and MacArthur (1961) [18], Karr and Roth (1971) [14], Wilson (1974), Roth (1976) [14], Robinson and Sutherland (1999) [30] and Dunning *et al.,* (2000) were among the early works on relationships between vegetation structure and the avian species diversity demonstrating that bird spices diversity is related to vegetation structure and complexity, and the nature of the landscape. Of the later studies from India, Nikhil Raj *et al.,* (2010) [29] discussed about the avifauna of Pallikaranai marshes near Chennai, Sayyed and Dhamani (2017) [31] examined the avifaunal diversity of Pranhita River sub-basin in Maharashtra state, and Sinha and Adhikari (2018) [33] conducted a study of the bird community along the riverine areas in the Bhagirathi Valley, Uttarkhand.

The wetland and other aquatic habitats of Kerala have been explored widely by many including Ali (1969). Some of the other pioneering studies were Neelakantan (1950, 1969, 1970, 1981, 1982) [23], Neelakantan *et al.,* (1980) [24], Neelakantan and Suresh Kumar (1980) [25], Namassivayan and Venugopal (1989) [20], Namassivayan *et al.,* (1989) [21], Uthaman and Namassivayan (1991, 1992) [20], and Kurup (1991, 1996) [16, 17]. Aarif and Narayanan (2009) [1] investigated the birds of Kadalundy and Purathur Estuaries of the state. Mathew (2002) [19] conducted research on the environmental aspects of select wetlands in Malabar with special reference to birdlife. The avifauna of Vembanad and Kole wetlands, Ramsar sites, was studied by Jayson (2002) [8] and Nameer (2005) [22], and that of certain wetlands in Alapuzha by Anarkkaly and Manju (2017) [6], Calicut and Malappuram districts by Seedikkoya (2003) and Chullakkattil and Seedikkoya (2017). However, studies specific to birds along river courses and its immediate environs are much less (e.g., Kumar 2006, Vincy *et al* 2016) [28].

Bharathapuzha river basin is identified as an area of rich avifauna by a large number of professional ornithologists and amateur bird watchers. Gaston (1979) [11] made a detailed survey of the birds of Cheruthuruthi region of Bharathapuzha basin and Kumar (2006) [28] made a checklist. Nevertheless, comparative studies on bird diversity along the river course and across its tributaries are scarce.

Study area
Bharathapuzha popularly known as Nila is the second longest river in Kerala. One of its primary tributaries originates at Konttola Betta in Kundha reserve forests in the Western Ghats at 1964m above mean sea level. Nila flows mainly through Palakkad followed by Malappuram and Thrissur districts of Kerala State for 209 km and join the Arabian Sea at Ponnani on the west coast. The total basin

area of the river is 6,186 km^2 (4400 Km^2 is in Kerala and the rest in Tamil Nadu, CWRDM, 1991). Nila, the lifeline of more than 35 lakhs people in the state, is formed by four main tributaries namely Chitturpuzha, Kalpathypuzha, Gayathripuzha and Thoothapuzha / Kunthipuzha. The Chitturpuzha and Kalpathypuzha confluence at Parali and it is from there that the river gets its name Bharathapuzha.

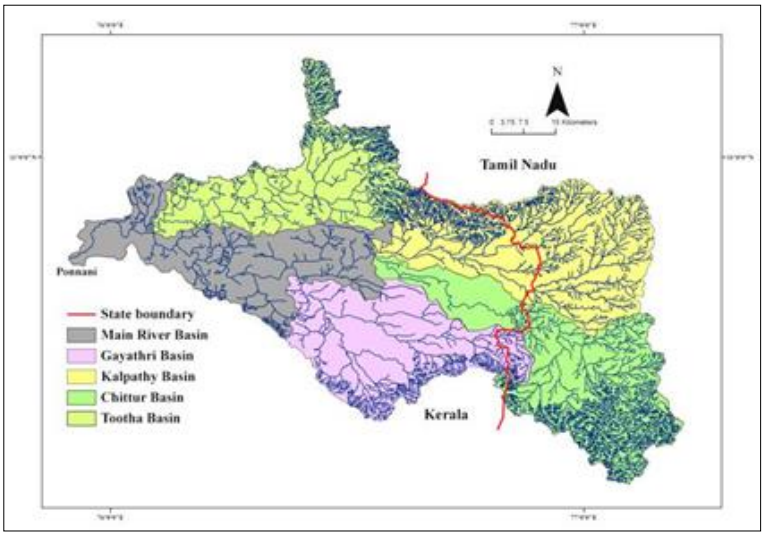

Fig 1: Total Nila river basin

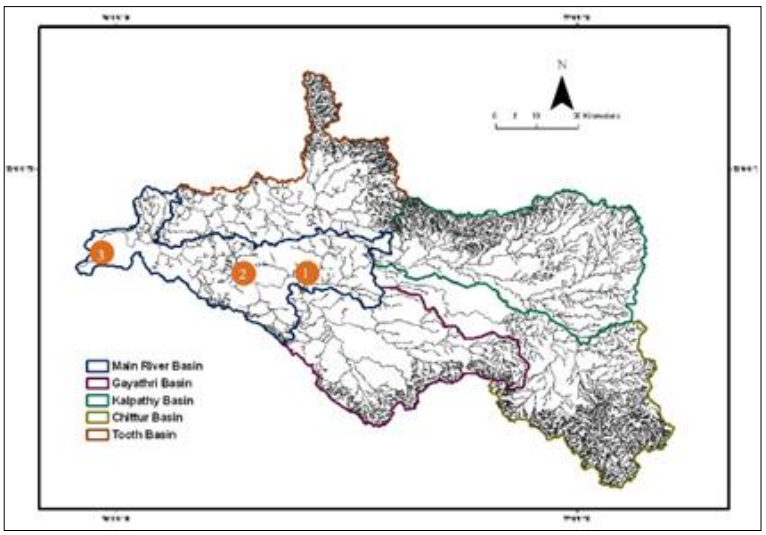

Fig 2: Nila river with study sites

The study sites along Bharathapuzha were (1) Ottapalam, (2) Pattambi and (3) Manchady. Ottapalam is in Palakkad district and the study site, located at 10^{0}48' N and 76^{0}22'E, is very close to the railway station. Here the river has a width of 240m with a steady flow. The second site, Pattambi, located at 10^{0}48'N and 76^{0}07^{0}E, is 25 km west of Ottapalam. Here the river although about 200m wide water flow is only 90m wide. The third site, Manchady, located at 10^{0}48' N and 76^{0}4'E, is about 2 km from Kuttipuram Bridge in Malappuram district. The river is very wide here but the water flow is restricted to only 80m wide channel.

The three sites along the Kalpathypuzha basin selected for the study were (1) Kava, (2) Manthakkad and (3) Parali. Kalpathypuzha is formed by four main tributaries, namely Koraiyar, Varattar, Walayar and Malampuzha. Malampuzha, in turn, is formed by four large streams namely Onnampuzha, Kallampuzha, Kochuthodu and Myladipuzha. All these tributaries drain into the Malampuzha reservoir. The largest reservoir in Kerala state, the Malampuzha river valley project is located in this river. From the Malampuzha dam, the river flows south for about 30 Km and joins the Nila river at Parali. The study station, Kava, located at10^{0}52'N and 76^{0}41'E, is on the northeast of the Malampuzha reservoir and adjoins the Dhoni hills. Manthakkad, the second site is about 10 Km downstream of the Malampuzha reservoir and 6 Km away from Olavakkode railway station. The third study site, Parali located between 10^{o}48'N and 76^{0}33'E, is where the Kalpathypuzha confluences with Chitturpuzha and takes a course westward.

Three study sites selected along the Kunthipuzha were (1) Pathrakkadavu, (2) Thootha and (3) Kariyannoor. Kunthipuzha alias Thoothapuzha originates from Silent Valley hills. This river, approximately 60 Km long, is formed of three main tributaries, Kanchirapuzha, Ambankadavu and Thuppandupuzha. After nurturing a vast area in Palakkad and Malappuram districts, Kunthipuzha joins the main Nila river at Kariyannoor about 2 Km west of Pallippuram village. The first study site, Pathrakkadavu is situated close to the place where the Pathrakkadavu

hydroelectric project, later abandoned because of protests from environmentalists, was proposed in the 2000s. The site is located at $10^0$59' N and $76^0$28'E on the western side of the Silent Valley National Park. It is around 10 Km northeast of Mannarghat town. The second study site, Thootha, located at $10^0$4'N and $76^0$19'E, is about 6 Km north of Cherpulassery town and 12 Km southeast of Perinthalmanna. The river here is 80 m wide, with the flow restricted to 60 m. The third site Kariyannoor, located at 10°48'N and $76^0$07'E, is about 2 Km away from the Pallippuram railway station towards its west. The eastern part of the study area is in Palakkad district and the western part in Malappuram district. At this point, the Kunthi river joins the Nila. The width of the river is 50 m and the water flow is moderate.

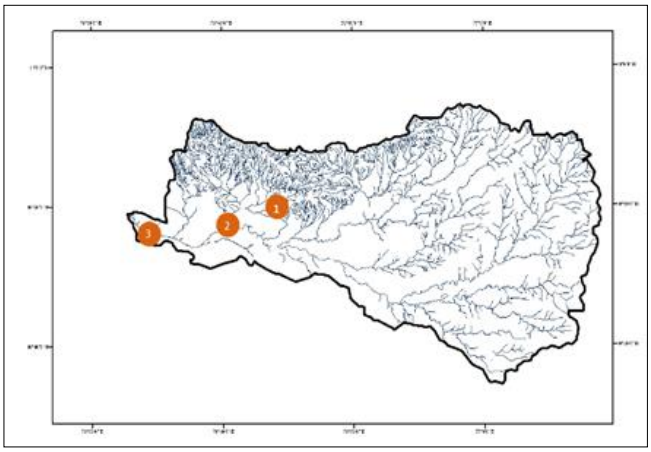

Fig 3: Kalpathy river with study sites

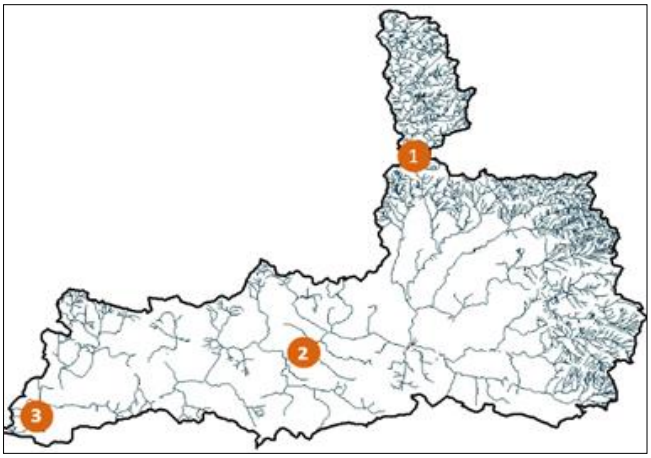

Fig 4: Kunthi river with study sites

The vegetation of the study sites along the Nila comprises paddy as the main crop. Besides, different types of vegetables, pulses and plantain are also cultivated. Coconut and arecanut are the main long-term crops. Among the study sites in the Kalpathypuzha, Kava has forest coverage along the northeastern side. Cultivation of paddy, mixed vegetation of coconut, arecanut, jackfruit, mango and other common varieties are also seen in the area. At Manthakkad, the main cultivation is paddy and banana mixed with different vegetables. At Parali, also paddy is the main crop, while coconut and arecanut plantations are seen outwards from the riverbank. Of the three study sites in the Kunthipuzha basin, Pathrakkadavu has predominantly forest vegetation. Besides paddy, vegetables, tapioca and varieties of plantain are also cultivated. Rubber is the main plantation in this area. Thootha is a predominantly cultivation area with high productivity. Major crops include tapioca, banana plantains, different vegetables and coconut, arecanut and rubber plantations. At Kariyannoor the major cultivation is paddy raised in two seasons. Banana and vegetables are also raised during summer.

Materials and Methods

This study was aimed at estimating the avifauna of the three rivers, the Nila, Kalpathypuzha and Kunthypuzha/Thoothapuzha and their comparison for similarity, species richness and other aspects such as migratory species. The vegetation associated with the study sites was also recorded. The study was conducted from 2005 January to 2007 December. Surveys were done at nine sites (3 along each river) mentioned above. The line transect method (Gaston 1971, 1973) was adopted to count the birds. Observations were carried out at each site along three parallel strips/bands (named A, B, and C) starting from the banks of the river extending outwards up to 1500m. Observations were conducted in each of these three bands for a length of 2 Km, keeping the time taken for all the counts constant. Altogether 48 counts were done in two years, twice in a month. Observations were done from 7 am to 9 am and then from 4 pm to 6 pm, using a Carl-Zeiss (8x40) binocular. Birds were identified mainly by sight, but also by their calls. Field guides used for spot identification of birds were Ali and Ripley (1983, 1999) [5], Grimmet *et al.*, (1999) and Karmierezak (2000).

Results and Discussion

The list of birds seen along the Nila, Kalpathypuzha and Kunthipuzha (Thoothapuzha) basins at the selected sites are presented in Table I. A diverse population of birds belonging to 20 families and 208 species was identified from all the three river basins. 140 species of birds belonging to 17 families were recorded from the three study sites in the course of Nila. Of the 140 species, 98 species were residents, 2 species local migrants and 40 species migrants; 70% of the total bird species residents and 29% migrants. Of the 40 migratory species recorded (Table I), 25 species were shorebirds. Majority of the migratory birds including shorebirds were present at Manchady that is only 12 Km from the Ponnani coast, whereas the least number of shorebirds were seen at Ottappalam, the site farthest from the seashore. It is noteworthy that 3 species of birds among the 140 species recorded along the Nila river basin, the Darter (*Anhinga melanogaster*), the Black-bellied tern (*Sterna acuticauda*) and the Asian open-bill stork (*Anastomus oscitans*) are threatened species as per the Red Data Book of Bird Life International. Species such as the Black-bellied tern, Asian open-billed stork, the small pratincole (*Glareola lactea*) were observed breeding at different spots along Nila banks during the study.

In the Kalpathypuzha basin, in total 157 species were observed (Table I). Of these 15 species were migrants, 2 species local migrants and 140 species residents; 87% residents,10.82% migrants and the rest local migrants. Here the shorebirds are few in number, whereas forest birds are comparably higher (49 species). It can be seen that this basin is far from the seashore, and closer to the Western Ghats forests at Malampuzha (especially the two sites selected for observation, Kava and Manthakad).

The total number of birds species recorded at Kunthipuzha

study sites was 188 (Table I). Of this, 130 species are residents, 37 migrants and 1 local migrant; 76.31% residents and 21.68% migrants. The last stretch of the river has higher proximity to the seashore as one of the study sites, Kariyannoor, is close to Ponnani - only 25Km away. Thus, a good number of migratory and shorebird species (18) were observed along the basin. The number of forest bird species is also high (55) as the river is flowing from the Silent Valley forests and one of the study sites, Pathrakkadavu, is just adjacent to and in fact an extension of the Silent Valley forests.

In this study, 15 species of birds were seen only along the Nila, 4 species unique to Kalpathy basin and 7 species unique to the Kunthi (Table II). Whereas 94 species were common to Nila and Kalpathy basins, 123 species were common to Nila and Kunthi basins, 149 species common to Kalpathy and Kunthi basin and 92 species were common to all the three basins (Table I). Kalpathy and Kunthi basins are relatively similar in terms of vegetation as both are close to the Western Ghats

This study shows that nature and ecology of the habitat convincingly influence bio-diversity, especially of the avifauna. The basins of the three rivers, examined here, are rich in habitats, agriculture and varieties of crops cultivated. Hence, groups of birds, omnivores, insectivores, nectarivores, granivores, frugivores, raptors, and shorebirds are present; however, in varying numbers relative to the presence of appropriate habitats. The abundance of forest birds at Kava and Pathrakkadavu also points to the fact that the nature of the habitat is closely related to avifauna diversity. Likewise, the abundance of shorebirds and migratory birds at Manchady and Kariyannoor is also a clear indicator of the habitat's importance to the avian composition.

Table 1: Total Bird Species recorded in the three sub-basins

	Scientific Name	Common Name	Status	Location
1	*Accipiter badius*	Shikra	R	N, K, Ku
2	*Acridotheres fuscus*	Jungle myna	R	N, K, Ku
3	*Acridotheres tristis*	Common myna	R	N, K, Ku
4	*Acrocephalus stentoreus*	Indian great reed warbler	M	K, Ku
5	*Aegithina tiphia*	Ceylon iora	R	N, K, Ku
6	*Alcedo atthis*	Small blue kingfisher	R	N, K, Ku
7	*Amaurornis phoenicurus*	White-breasted waterhen	R	N, K, Ku
8	*Anastomus oscitans*	Asian open billed stork	R	N, Ku
9	*Anhinga melanogaster*	Darter	R	N, K, Ku
10	*Anhinga rufa*	Darter	R	N, Ku
11	*Anthracoceros coronatus*	Malabar pied hornbill	R	N, K, Ku
12	*Anthus hodgsoni*	Tree pipit	M	K, Ku
13	*Anthus novaeseelandiae*	Indian pipit	R	N, K, Ku
14	*Apus affinis*	House swift	R	N, K, Ku
15	*Ardea alba*	Large egret	R	N, K, Ku
16	*Ardea cinerea*	Grey heron	R	N, K, Ku
17	*Ardea purpurea*	Purple heron	R	N, Ku
18	*Ardeola grayii*	Pond heron	R	N, K, Ku
19	*Artamus fuscus*	Ashy swallow shrike	R	N, K, Ku
20	*Asio flammeus*	Short-eared owl	M	K, Ku
21	*Athene brama*	Southern Spotted owlet	R	N, K, Ku
22	*Bubo zeylonensis*	Brown fish owl	R	K, Ku
23	*Bubulcus ibis*	Cattle egret	R	N, K, Ku
24	*Buceros bicornis*	Great Indian horn bill	R	K, Ku
25	*Butorides striatus*	Little green heron	R	N, Ku
26	*Calidris alba*	Sanderling	M	N, K, Ku
27	*Calidris alpina*	Dunlin	M	N, K, Ku
28	*Calidris minuta*	Little stint	M	N, Ku
29	*Calidris temminckii*	Temminck's stint	M	N, Ku
30	*Calidris testaceous*	Curlew stint	M	N
31	*Carpodacus erythrinus*	Common rosefinch	M	K, Ku
32	*Centropus sinensis*	Crow pheasant	R	N, K, Ku
33	*Ceryl rudis*	Pied Kingfisher	R	N, K, Ku
34	*Chaetura gigantea*	Brown-throated spinetail swift	R	K, Ku
35	*Chaetura sylvatica*	White-rumped spinetail swift	R	K, Ku
36	*Chalcophaps indica*	Emerald Dove	R	Ku
37	*Charadrius alexandrinus*	Kentish plover	M	N, Ku
38	*Charadrius dubius*	Little ringed plover	M	N, Ku
39	*Charadrius leschenaulti*	Large sand plover	M	N, Ku
40	*Charadrius mongolus*	Pamirs lesser sand plover	M	N
41	*Chlidonias hybrida*	Indian whiskered tern	M	N, Ku
42	*Chloropsis aurifrons*	Gold fronted chloropsis	R	K, Ku
43	*Chloropsis cochinchinensis jerdoni*	Jerdon's chloropsis	R	N
44	*Ciconia episcopus*	White-necked stork	R	N, K, Ku
45	*Ciconia nigra*	Black stork	R	N, Ku
46	*Circus aeruginosus*	Marsh harrier	M	N

47	*Cisticola juncidis*	Streaked fantail warbler	R	N, Ku
48	*Columba elphinstonii*	Nilgiri wood pigeon	R	K, Ku
49	*Columba livia*	Blue rock pigeon	K	N, K, Ku
50	*Copsychus saularis*	Magpie robin	R	N, K, Ku
51	*Coracias benghalensis*	South Indian roller	R	N, K, Ku
52	*Coracina melanoptera*	Black-headed cuckoo shrike	R	K, Ku
53	*Corvus macrorhynchos*	Indian jungle crow	R	N, K, Ku
54	*Corvus splendens*	House crow	R	N, K, Ku
55	*Cuculus canorus*	Cuckoo	R	N, K, Ku
56	*Cuculus micropterus*	Indian cuckoo	R	N, K, Ku
57	*Cuculus varius*	Common hawk cuckoo	R	N, K, Ku
58	*Cypsiurus parvus*	Palm swift	R	N, K, Ku
59	*Dendrocitta leucogastra*	Southern tree pie	R	K, Ku
60	*Dendrocitta vagabunda*	Tree pie	R	N, K, Ku
61	*Dicaeum agile*	Thick-billed flowerpecker	R	K, Ku
62	*Dicaeum erythrorhynchos*	Tickell's flowerpecker	R	N, K, Ku
63	*Dicrurus adsimilis*	Black drongo	R	N, K, Ku
64	*Dicrurus aeneus*	White-bellied drongo	R	K, Ku
65	*Dicrurus paradiseus*	Racket-tailed drongo	R	N, K, Ku
66	*Dinopium benghalensis*	Malabar golden-backed woodpecker	R	N, K, Ku
67	*Dinopium javenense*	Golden-backed three woodpecker	M	N, K, Ku
68	*Dryocopus javenensis*	Great black woodpecker	R	K, Ku
69	*Ducula aenea*	Green imperial pigeon	R	K, Ku
70	*Ducula badia*	Imperial pigeon	R	K, Ku
71	*Egretta garzetta*	Little egret	R	N, K, Ku
72	*Egretta intermedia*	Smaller egret	R	N, K, Ku
73	*Elanus caeruleus*	Black winged Kite	R	N, K, Ku
74	*Eudynamys scolopaceae*	Indian koel	R	N, K, Ku
75	*Eurystomus orientalis*	Broad-billed roller	LM	N, K, Ku
76	*Falco peregrines*	Shaheen falcon	M	K, Ku
77	*Galerida malabarica*	Malabar crested lark	R	N, K, Ku
78	*Gallinago gallinago*	Fantail snipe	M	N, Ku
79	*Galloperdix spadicea*	Red spur fowl	R	K, Ku
80	*Gallus sonnerattii*	Grey jungle fowl	R	K, Ku
81	*Gelochelidon nilotica*	Gull-billed tern	M	N, Ku
82	*Glareola lactea*	Small Indian pranticole	R	N, K, Ku
83	*Glaucidium radiatum*	Malabar jungle owlet	R	K, Ku
84	*Gracula religiosa*	Indian hill myna	R	N, K, Ku
85	*Halcyon smyrnensis*	White-breasted kingfisher	R	N, K, Ku
86	*Haliastur Indus*	Brahminy kite	R	N, K, Ku
87	*Harpactes fasciatus*	Malabar trogon	R	K, Ku
88	*Hemicircus canente*	Heart spotted woodpecker	R	K, Ku
89	*Hemiprocne longipennis*	Indian crested free swift	R	K, Ku
90	*Hemipus picatus*	Black-backed pied flycatcher shrike	R	N, K, Ku
91	*Hirundo concolor*	Dusky crag martin	R	Ku
92	*Hirundo daurica*	Red-rumped swallow	R	N, K, Ku
93	*Hirundo rustica*	Co mmon eastern swallow	R	N, K, Ku
94	*Hirundo tahitica*	Nilgiri House swallow	R	Ku
95	*Hydrophasianus chirurgus*	Pheasant-tailed Jacana	R	K
96	*Hypsipetes indicus*	Yellow-browed bulbul	R	K, Ku
97	*Hypsipetes madagascariensis*	South Indian black bulbul	R	K, Ku
98	*Irena puella*	Fairy blue bird	R	K, Ku
99	*Ixobrychus cinnamomeus*	Yellow bittern	R	N, K, Ku
100	*Ixobrychus flavicollis*	Black bittern	R	K, Ku
101	*Ixobrychus sinensis*	Yellow bittern	R	N, K, Ku
102	*Lanius cristatus*	Brown shrike	M	K, Ku
103	*Larus brunnicephalus*	Brown-headed gull	M	N
104	*Larus fuscus*	Lesser black-backed gull	M	N
105	*Larus ichthyaetus*	Great black-headed gull	M	N
106	*Limosa lapponica*	Bar-tailed godwit	M	N, Ku
107	*Lonchura kelaarti*	Rufous bellied munia	R	K, Ku
108	*Lonchura malabarica*	White throated munia	R	K, Ku
109	*Lonchura Malacca*	Black-headed munia	R	Ku
110	*Lonchura punctulata*	Spotted munia	R	N, K, Ku
111	*Lonchura striata*	White backed munia	R	N, Ku
112	*Loriculus vernalis*	Malabar lorikeet	R	K, Ku
113	*Megalaima haemocephala*	Coppersmith barbet	R	N, K, Ku
114	*Megalaima viridis*	Small green barbet	R	K, Ku

115	*Megalaima zeylanica*	Large green barbet	R	N, K, Ku
116	*Merops leschenaulti*	Chestnut-headed bee-eater	R	K, Ku
117	*Merops orientalis*	Small green bee-eater	LM	N, K, Ku
118	*Merops phillippinus*	Blue-tailed bee-eater	R	N, K, Ku
119	*Metopidius indicus*	Bronze-winged Jacana	R	N, K, Ku
120	*Milvus migrans*	Common pariah kite	R	N, K, Ku
121	*Mirafra assamica*	Bush lark	R	N, Ku
122	*Monticola solitarius*	Blue rock thrush	M	N, K, Ku
123	*Motacilla alba*	White wagtail	M	N, Ku
124	*Motacilla capsica*	White wag tail	M	K, Ku
125	*Motacilla cinerea*	Grey wagtail	R	N, K, Ku
126	*Motacilla flava*	Yellow wagtail	M	K, Ku
127	*Motacilla indica*	Forest wagtail	M	K, Ku
128	*Motacilla maderaspatensis*	Large pied wagtail	R	N, K, Ku
129	*Muscicapa albicaudata*	Nilgiri flycatcher	R	K, Ku
130	*Muscicapa latirostris*	Brown flycatcher	R	K, Ku
131	*Muscicapa mutti*	Brown flycatcher	R	K, Ku
132	*Muscicapa pallipes*	White-bellied blue flycatcher	M	K, Ku
133	*Muscicapa tickelliae*	Tickell's blue flycatcher	R	N, K, Ku
134	*Myiophoneus horsfieldii*	Malabar whistling thrush	R	K, Ku
135	*Nectarinia asiatica*	Purple sunbird	R	N, K, Ku
136	*Nectarinia lotenia*	Loten's sunbird	R	K, Ku
137	*Nectarinia minima*	Small sunbird	R	K, Ku
138	*Nectarinia zeylonica*	Indian Purple rumped sunbird	R	N, K, Ku
139	*Numenius arquata*	Curlew	M	N
140	*Nycticorax nycticorax*	Night heron	R	N, K, Ku
141	*Ocyceros birostris*	Common grey hornbill	R	N, Ku
142	*Oriolus chinensis*	Black naped oriole	M	Ku
143	*Oriolus oriolus*	Golden oriole	M	N, K, Ku
144	*Oriolus xanthornus*	Black-headed oriole	R	N, K, Ku
145	*Orthotomus sutorius*	Tailorbird	R	N, K, Ku
146	*Pandion haliaetus*	Osprey eagle	R	N, K
147	*Parus major*	Grey tit	R	N, K, Ku
148	*Parus xanthogenys*	Yellow cheeked tit	R	K, Ku
149	*Passer domesticus*	House sparrow	R	N, K, Ku
150	*Pelargopsis capensis*	Brown-headed stork	R	N
151	*Pellorneum ruficeps*	Spotted babbler	R	K, Ku
152	*Perdicula erythrorhyncha*	Painted bush quail	R	K, Ku
153	*Pericrocotus cinnamomeus*	Malabar small minivet	R	N, K, Ku
154	*Pericrocotus flammeus*	Scarlet minivet (Orange)	R	K, Ku
155	*Petronia xanthocollis*	Yellow-throated sparrow	M	N, K, Ku
156	*Phalacrocorax niger*	Little cormorant	R	N, K, Ku
157	*Phylloscopus affinis*	Tickell's leaf warbler	R	K, Ku
158	*Phylloscopus trochiloides*	Greenish leaf warbler	M	Ku
159	*Pitta brachyura*	Indian pitta	M	N, K, Ku
160	*Ploceus philippinus*	Baya weaver bird	R	N, K, Ku
161	*Pluvialis dominica*	Golden plover	M	N, Ku
162	*Pluvialis fulva*	Pacific golden plover	M	N
163	*Pluvialis squatarola*	Grey plover	M	N, Ku
164	*Pomato-rhinus schisticeps*	Scimitar babbler	R	Ku
165	*Prinia inornata*	Nilgiri Plain wren-warbler	R	N, Ku
166	*Prinia socialis*	Ashy wren-warbler	R	N, K, Ku
167	*Prinia subflava*	Plain wren warbler	R	N
168	*Psittacula columboides*	Blue-winged parakeet	R	K, Ku
169	*Psittacula cyanocephala*	Blossom headed parakeet	R	N, K, Ku
170	*Psittacula krameri*	Rose-ringed parakeet	R	N, K, Ku
171	*Pycnonotus cafer*	Red-vented bulbul	R	N, K, Ku
172	*Pycnonotus jocosus*	Red-whiskered bulbul	R	N, K, Ku
173	*Pycnonotus luteolus*	White-browed bulbul	R	N
174	*Pycnonotus melanicterus*	Ruby-throated yellow bulbul	R	K, Ku
175	*Rhipidura aureola*	White-browed fantail flycatcher	R	N, K, Ku
176	*Rhopocichla atriceps*	Black-headed babbler	R	K, Ku
177	*Saxicola caprata*	Pied bush chat	R	K, Ku
178	*Saxicoloides fulicata*	Indian robin	R	N, K, Ku
179	*Spilornis cheela*	Crested serpent eagle	R	K, Ku
180	*Spizaetus cirrhatus*	Indian crested hawk-eagle	R	N, K, Ku
181	*Sterna aurantia*	River tern	M	N, Ku
182	*Sterna auticauda*	Black-bellied tern	M	N, Ku

183	*Streptopelia chinensis*	Spotted dove	R	N, K, Ku
184	*Sturnus malabaricus*	Blyths myna	R	N, K, Ku
185	*Tachybaptus ruficollis*	Little grebe	R	N, K
186	*Tephrodornis gularis*	Malabar wood shrike		K
187	*Tephrodornis pondicerianus*	Common wood shrike	R	N, K, Ku
188	*Tephrodornis virgatus*	Malabar wood shrike	R	K
189	*Terpsiphone paradisi*	Paradise flycatcher	M	N, K, Ku
190	*Tockus griseus*	Malabar grey heron	R	N, Ku
191	*Treron phoenicoptera*	Green pigeon	R	N, Ku
192	*Treron pompadora*	Grey fronted green pigeon	R	K, Ku
193	*Tringa glareola*	Spotted sandpiper	M	N, Ku
194	*Tringa hypoleucos*	Common sandpiper	M	N, Ku
195	*Tringa nebularis*	Green shank	M	N, Ku
196	*Tringa ochropus*	Green sandpiper	M	N, Ku
197	*Tringa stagnatilis*	Marsh sandpiper	M	N
198	*Tringa tetanus*	common redshank	M	N
199	*Turdoides affinis*	White-headed babbler	R	N, K, Ku
200	*Turdoides caudatus*	Common babbler	R	K
201	*Turdoides striatus*	Jungle babbler	R	N, K, Ku
202	*Turdoides subrufa*	Rufus babbler	R	K, Ku
203	*Tyto alba*	Burnout	R	N, K, Ku
204	*Upupa epops*	Ceylon hoopoe	R	N, K, Ku
205	*Vanellus indicus*	Red-wattled lapwing	R	N, K, Ku
206	*Vanellus malabaricus*	Yellow wattled lapwing	R	N, K, Ku
207	*Zoothera citrina*	White-throated ground thrush	R	N, K, Ku
208	*Zosterops palpebrosa*	Nilgiri white-eye	R	K, Ku
R=Resident, M=Migrant, LM=Local migrant, N=Nila basin, K=Kalpathypuzha basin, Ku=Kunthypuzha basin				

Table 2: Unique Birds of Nila, Kalpathy and Kunthy Rivers

Unique to Nila		**Unique to Kalpathy**	**Unique to Kunthy**
1.	*Calidris alba*	*Hydrophasianus chirurgus*	*Chalcophaps indica*
2.	*Calidris testaceous*	*Tephrodornis gularis*	*Hirundo concolor*
3.	*Charadrius mongolus*	*Tephrodornis virgatus*	*Hirundo tahitica*
4.	*Chloropsis cochinchinensis jerdoni*	*Turdoides caudatus*	*Lonchura Malacca*
5.	*Circus aeruginosus*		*Oriolus chinensis*
6.	*Larus brunnicephalus*		*Phylloscopus trochiloides*
7.	*Larus fuscus*		*Pomatorhinus schisticeps*
8.	*Larus ichthyaetus*		
9.	*Numenius arquata*		
10.	*Pelargopsis capensis*		
11.	*Pluvialis fulva*		
12.	*Prinia subflava*		
13.	*Pycnonotus luteolus*		
14.	*Tringa stagnatilis*		
15.	*Tringa tetanus*		

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