

**Studies on the Comparative Ecology of the
Riverine Systems of Kalpathi, Kunthipuzha and
Nila Rivers with Emphasis on Avifauna**



**Ph.D. Thesis submitted to the
UNIVERSITY OF CALICUT
For the award of Degree of
DOCTOR OF PHILOSOPHY
In
ZOOLOGY**

By

M P ISHAK M.Sc, M.Phil.

**PG & Research Department of Zoology
Farook College, Feroke
Calicut**

2019

CERTIFICATE

This is to certify that the thesis, entitled "**Studies on the comparative ecology of the riverine systems of Kalpathi, Kunthipuzha and Nila rivers with emphasise on Avifauna**" submitted to the Calicut University, in partial fulfillment of the requirements for the award of the **Degree of Doctor of Philosophy in Zoology** is a record of original work done by **Mr. M P Ishak** during the period of September 2004 – August 2007 of his research in the Department of Zoology at PG & Research Department, Farook College, Feroke under my supervision and guidance. I further certify that this research work has not previously formed the basis for the award of any other Degree /Diploma /Associateship /Fellowship or other similar title to any candidate in any University.

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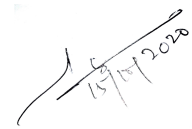
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15 October 2020

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This is to certify that Mr M P Ishak has incorporated all the essential corrections / suggestions from the adjudicators in the thesis, entitled “**Studies on the comparative ecology of the riverine systems of Kalpathi, Kunthipuzha and Nila rivers with emphasise on Avifauna**” and he is resubmitting the same herewith.

A handwritten signature in black ink, appearing to read 'Dr P A Azeez', with the date '15/10/2020' written below it.

Dr P A Azeez
(Signature of the Research Guide)

Countersigned
(Head of the Department)

Countersigned
(Principal)

DECLARATION

I, **M P Ishak** hereby declare that the thesis entitled “**Studies on the comparative ecology of the riverine systems of Kalpathy, Kunthipuzha and Nila rivers with emphasise on Avifauna**”, submitted to the **Calicut University**, for the award of the Degree of **Doctor of Philosophy in Zoology**, is a record of original and independent research work done by me during the period of September 2004 – August 2007 under the guidance and supervision of Dr. P. A. Azeez (Former Director and Senior Principal Scientist -1, Salim Ali Centre for Ornithology and Natural History) and it has not previously formed the basis for the award of any other Degree or Diploma or Associateship or Fellowship or other similar title to this or any other University.

Signature of the Candidate

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CHAPTER I

INTRODUCTION

Fresh water habitats occupy much smaller area of the earth's surface (about 0.78%) compared to the other major aquatic habitat, the marine system; the largest ecosystem on earth that cover almost 71% of the surface. However, the importance of freshwater ecosystems to the biotic as well as the abiotic world is proportionately far greater than its extent. For humankind, they form one of the critical habitats, as the most accessible, convenient and cheapest source of water for domestic and industrial needs. The fresh water bodies are said to be the 'bottle neck' in the hydrological cycle (Odum, 1983). They have a vital role in the flux of nutrients and minerals from higher to lower land and finally to the sea (Allan and Flecker, 1993).

Among fresh water bodies, rivers form the most important heterogeneous ecosystems. Rivers have played a pivotal role in the socio-economic and cultural heritage of countries all over the world. In fact, from ancient ages, rivers have been synonymous with culture and civilization. It is noteworthy that all major civilizations of the world had originated and flourished on the banks of great rivers. The Indus valley civilization, the Gangetic plains, Euphrates-Tigris, Nile valley etc are best examples.

Rivers and their banks form highly fragile and dynamic systems. Fresh water biodiversity is very important in nature and the riverine systems are subject to tremendous economic, social and environmental impacts. The latest World Bank report on the fresh water bio-diversity in Asia with respect to fish have highlighted rivers and streams originating from Western Ghats among the most important bio-diversity hotspots in the world with high degrees of endemism (Kottelat and Whitten, 1996).

Birds being one of the most numerous and mobile of vertebrates exercise considerable influence on the community structure. The avifauna along the riverine systems constitutes a prominent part of the total bird species of the region. Riverine ecosystems provide an excellent habitat to many numbers of endemic as well as migratory birds. The avifaunal studies related to riverine ecosystems are of great importance due to several reasons. Species abundance and the presence of certain specific species are good ecological indicators. The modernization, industrial and technological advancements, and consequent changes in lifestyles, all have caused acute pollution and deterioration of our rivers and subsequently the species dependent on such ecosystems. Therefore, a comparative study of the avifauna in relation to habitat quality of riverine systems is of much relevance to day. The extensive ecological degradation and biodiversity loss especially of avifauna in riverine ecosystems is eliciting widespread concern for conservation and restoration of healthy river ecosystems throughout the world (Karr, Toth and Dudley 1985; Hughes and Noss, 1992; Allan and Flecker, 1993; Williams and Smith, 1996). Rivers and wetlands have received more attention among fresh water ecosystems due to its avifaunal importance especially after the Ramsar convention (1971) that considered the protection of wetland and river as waterfowl habitats.

The Indian scenario of the degrading quality of rivers and fresh water habitats is alarming. The major river basins of India, Indus, Ganges, Brahmaputra, Mahanadi, Narmada, Krishna and Cauvery etc are facing high degree of quality deterioration. The smaller ones such as Jhelum, Chenab, Ravi, Beas, Sutlej, Yamuna, Ramganga, Ghaghara, Gandak, Gomethi, Kosi, Dihang, Dibang, Subansiri, Dhansiri, Burhner, Banjar, Hiran, Purna, Amaravathi and Sabarmathi etc are also subject to diverse threats. The five top polluted rivers of India are Yamuna, Ganges, Sabarmati, Oshiwara and Damodar (CPCB report 2016). In Kerala, the major rivers, Periyar, Pampa, Nila, Chalakkudy, Kadalundy, Meenachilar, Neyyar and Chandragiri are also polluted in varying degrees, if not much from industries, but from municipal and domestic sources, solid wastes, encroachments and catchment changes.

Broad Review of Literature

Ecological studies on rivers had been carried out from early 20th century (Shelford, 1911; Muttowski, 1929; Butcher, 1932, 1933, 1940; Ricker, 1934; Davis, 1938). A hydrological study of the River Lieve in Belgium was conducted by William, De Smet, Frans and Evens (1972). Studies on the limnology on lotic systems have been carried out by Marliter (1973) and Rupprecht (1988). Petts (1996) conducted studies on the effect on lotic and riparian ecosystem by the changes in seasonal flow below dams and reservoirs, reduction in flow caused by water abstraction and diversion of rivers in a range of geographical regions. Wilber, Tighe and O'Neil (1996) investigated the impact to the hydrology of Cache River in Mississippi alluvial valley by increased rice farming in the basin. A study on the post fire environment and biological responses of twenty streams in yellow stone National park, USA was conducted by Minshall, Robinson and Lawrence (1997). Sawidis (1997) investigated physico-chemical parameters of four rivers of Macedonia, Greece. Collin, Jarvie, Howrath, Whitehead, Williams and Wickhams (2000) carried out studies on water quality of river Thames, River Pang- a tributary of Thames and in the river Kennel. Limnological studies of Tattapani hot spring and river Punch in Pakistan was conducted by Leghari, Kushw, Kushw M.Y and Jahangir et al (2000). Odum (1983) observed that, of the wetland habitats, coastal fresh water marshes and riverine ecosystems supported the largest populations of birds.

Studies on bird species diversity has been concerned primarily with nesting bird communities (MacArthur and MacArthur, 1961; Recher, 1969; Karr, 1977; Roth, 1977; Smith and MacMohan, 1981). The relationship between vegetation structure and the avian species number in their respective study areas were conducted by MacArthur and MacArthur (1961), Karr and Roth (1971), Wilson (1974) and Roth (1976) concluding that avian community diversity is related to vegetation complexity. Status and population assessment of Palearctic waders that winter in tropical Asia and Australia were carried out by Stewart and Kantrud (1972, 1974).

Studies on the ecology, management and conservation of the bird life of fresh water marshes in the new world have been carried out by Weller and Spatcher (1965), Weller (1981). Feare and High (1977) and Feare (1979) conducted detailed studies on the Ecology and migrant shore birds of Seychelles Islands. Fogden (1972), and Herman and Douglas (1973) have carried out several studies on the seasonality, abundance, land use-dynamics, energetics and ecological succession of the bird populations.

The first survey of the forest birds of Travancore, now part of Kerala state, was conducted by Ali and Whistler (1935-1937). Neelakantan (1958) conducted extensive research on birds in various parts of Kerala and published a very remarkable treatise, entitled “Karalathile Pakshikal”, later revised and updated (Neelakantan, Sashikumar and Venugopalan, 1993). Thus he is another pioneer, instrumental in developing scientific bird watching in the state. Ramakrishnan (1983) studied various parameters of bird communities in the forests of Silent valley, Mukkali and Wayanad. He made a good attempt to work out species composition, diversity, guild structure and feeding ecology of birds. Ali and Ripley (1949, 1983 and 1987) have shown that the Palearctic migrants that enter the Indian subcontinent through the Indus Valley and Brahmaputra basin, converge in peninsular India before spreading out to the neighboring Srilanka, Maldives and Lakshadweep archipelago (Hoffmann, 1983). In this connection, the wetlands of Kerala and adjoining riverine systems seem to be of enormous importance to birds as major refueling stations. Kurup (1989) have considered entire midland and coastal Kerala as a composite wetland unit taking together the large number of river systems, backwaters, unique fresh water and brackish water puddles, ponds and large stretches of paddy fields. A study of the birds occurring in the different midland rivers and their coastal endings, thus become highly relevant.

Goss-Custard et al (1970) have shown that shore birds concentrate where their preferred prey is most abundant while studying on Redshanks in the Ythan estuary, Aberdeen shire. A study on the effect of habitat type and degradation on avian species richness in great basin riparian habitats revealed that habitat

degradation significantly influenced bird species richness; however, the impact was dependent on habitat type. While meadow bird communities were affected adversely by habitat degradation, with significant drops in species richness on degraded sites; bird species richness in forested riparian habitats was relatively greater on degraded sites (Warkentin and Reed, 1999).

Robinson and Sutherland (1999) have shown that the decline in farmland birds in Europe have been paralleling the major changes in agricultural management, which have resulted in major changes in habitat structure. A study by Hanowski et al (1999) revealed that breeding bird species and community composition were similar among all managed sites but differed in unmanaged sites in the emergent wetlands in the America Midwest.

Franklin and Noske (2000) during the study on the nectar sources used by birds in monsoonal northwestern Australia have proved that variation between bird species in patterns of use of different floral structures primarily reflected the habitats occupied rather than shared or co-evolved morphology. The relationship between avian nectarivores and the availability of nectar was explored at three spatio-temporal scales in tropical woodland near Darwin, Australia (Franklin and Noske, 1999). Carlos M Herrera (1998) made twelve year studies on the dynamics of Mediterranean frugivorous birds and fleshy fruits. Maloney, Keedwell, Wells, Rebergen and Nillson (1999) studied the effect of Willow removal on habitat use by five bird species in braided rivers of Mackenzie basin, New Zealand and found that willow removal increased foraging and nesting habitat for some river bird populations. Impact of forest type and management strategy on avian densities in the Mississippi Alluvial Valley, USA was investigated by Twedt et al (1999). Baldi (1999) studied on the microclimate and vegetation edge effects in a reed bed in Hungary. Area requirements of passerine birds in the Reed archipelago of Lake Velence, Hungary were studied by Baldi (2004). A Study on the breeding season on demography and movements of eastern Towhees at the Savannah River site, South Carolina was conducted by Krementz and Powell (2000).

Dunning et al (2000) attempted to study landscape influence on avian population dynamics at the Savannah River site. Norment et al (1999) made a well documented study on important bird and mammal species in the Thelon River Valley, North west territories and their range expansions and possible causes for the same. Baldi and Kisbenselek (1998) examined factors influencing the occurrence of Great white Egret, Mallard, Marsh Harrier and Coot in the reed archipelago of lake Velence, Hungary. The relationship between offspring size as an index of habitat degradation was shown by Warkentin et al (2004).

A study on avifaunal density at three different regions of North Bengal, India namely, Gorumara National Park (GNP), Buxa Tiger Reserve (BTR) and Rasik Beel Wetland complex was carried out by Roy and Mukhopadhyay (2008). A documentation of the avifauna of Pallikaranai marshes near Chennai metropolis, South India was done by Nikhil Raj et al (2010). The diversity and status of avifauna from Pranhita river sub basin in Maharashtra State, India was carried out by Sayyad and Dhamani (2017). Sihanova and Rahimov (2008) studied the avifauna of the lake systems in the delta of the Syr Darya River (lake Cartma, Russia). Bird diversity along riverine areas in the Bhagirathi Valley, Uttarakhand, was studied by Sinha and Adhikari (2018). Thanusanth et al (2018) made a detailed study on the avifaunal diversity and composition of Vellakkattukulam, Batticoloa, Srilanka. Bellanthudawa et.al (2019) carried out a study on the diversity variation of avifauna, in different vegetative habitat types in a human modified area, University of Kelaniya, Srilanka.

Aims and Objectives

The present study is aimed at obtaining detailed data on the habitat quality of the second longest river in Kerala, the Nila river (commonly known as Bharathapuzha) and its two main tributaries the Kalpathypuzha and Kunthipuzha (known downstream as Thoothapuzha); together with the survey and study of the avifauna of the three rivers and comparison of these data. The research was started in 2005 January and the fieldwork was completed in 2007. The work was carried out at three sites on each river. Along the course of Nila river, Ottappalam, Pattambi and Manchady were selected as study sites. Along the Kalpathy river, Kava,

Manthakkad and Parali were taken as the study sites, and in the course of the Kunthi river, Pathrakkadavu, Thootha and Kariyannur were selected. During the study, the following objectives were selected for detailed investigation.

1. Explore the habitat quality of terrestrial environs of the rivers up to a perpendicular distance of 1500 m from the waterline.
2. Compare the water and habitat quality of the different sites of three rivers representing different types of habitats,
3. Explore the avifauna of the three sites on the three rivers, its seasonality and comparison.
4. Explore community ecology of the avian species.
5. To assess the seasonal variation of the hydrological parameters of the three rivers at the nine sites for a period of one year.
6. Compare the water quality of the study sites of the three rivers based on the results of the estimation of the physico – chemical parameters.

Significance of the Study

The state of Kerala is said to be very rich in fresh water bodies. However, the real fact is different. It is proudly said that the state have 44 rivers; but if the universally accepted criteria of a river is taken into account the number will be merely four. These major rivers of the state, the Periyar, the Pampa, the Nila (Bharathapuzha) and the Chaliyar exert profound influence in the socio-economic, cultural and ecologic realm of the state.

Today most of the riverine ecosystems across the world are subject to extensive ecological degradation and bio-diversity loss and other changes resulting from over exploitation. This has elicited widespread concern for conservation and rejuvenation of viable river ecosystems (Karr et al 1985; Hughes and Noss 1992). Rivers of India are deteriorating both qualitatively and quantitatively due to human intervention. It is a well-known fact that free flowing waters provide habitat for

diverse and unique groups of species, both flora and fauna, including some of the most threatened and endangered ones. Some avian species are reliable ecological indicators and are of great value to the biotic world. Any loss in bio-diversity is undesirable based on aesthetic, ecological and economic values (Ehrlich and Wilson, 1991). Therefore, a comprehensive study on the rich biodiversity especially of the avian communities related with fresh water ecosystems is a prime necessity. Compared to high attention rain forest ecosystems and oceans received in recent years, the fresh water systems especially rivers were relatively ignored. While world bodies such as IUCN and G8-Climate summit deliberated much on ozone depletion, El Niño, green house effect, glacier depletion; not much comparable attempts were enunciated to protect the riverine systems and its associated bio-diversities. Avian community loss in fresh water environment in many parts of the world is considerably more compared to that in terrestrial ones (Moyle and Williams, 1990, Leidy and Moyle, 1997). Most of the riverine systems are under severe stress due to anthropogenic interventions (Beaverton, 1992; Kottelat and Whitten, 1996).

Studies on the riverine systems of Kerala are little and not yet well documented and at the same time, Kerala is identified as a 'hotspot' of biodiversity in the report on the fresh water biodiversity of the World Bank (Kottelat and Whitten, 1996). As per the report of National Bureau of Fish Genetic Resources (NBFGR, 2000) the Chalakkudy river of central Kerala has been considered as one of the richest in India in terms of fish diversity and abundance. Such studies are an eye-opener to those who show much negligence to riverine system studies and its conservation. Such observations demand urgent steps for detailed investigation in the riverine ecosystems of Kerala.

The composite aquatic belt composed of the tropical seas, bordering the peninsular India, the estuaries, backwaters, mangroves, coral reefs, associated rivers and wetlands constitute one of the most- productive ecosystems of the world that harbor a very rich and diverse assemblage of animal and plant species. The 42 west flowing and 2 east flowing rivers of Kerala are enriched by a high influx of nutrients

brought in by the South-west and North-east monsoons; flourishes the habitat quality of the riverine systems and enhances the bio-diversity in and around it.

However, the negligence, and ignorance of the importance of species composition and distribution of the water dependant organisms has resulted in over exploitation of the riverbeds and useful organisms, especially birds. Besides natural phenomena such as climatic changes, disasters and severe pollutions etc have also been instrumental to destruction and deterioration of biotic communities in and around riverine habitats. Sand mining is the most recent and horrible threat to riverine systems in addition to over fishing, tourism, industrialization etc.

Habitat protection, improvement of the habitat quality, conservation of living natural resources along with sustained development should be taken the most attention from the scholastic society. To achieve this goal a thorough knowledge on the habitat quality and composition and distribution of the species is vital.

Ishak M. P. “Studies on the Comparative Ecology of the Riverine Systems of Kalpathi, Kunthipuzha and Nila Rivers with Emphasis on Avifauna.” Thesis. PG & Research Department of Zoology Farook College, Feroke, University of Calicut, 2019.

CHAPTER II

STUDY AREA

A. Nila River

Nila river is one of the very important rivers in the southwest region of India. One of its primary tributaries originates at Konttola Betta in Kundha reserve forests in the Western Ghats at an elevation of 1964 m above main sea level. In Kerala, it flows mainly through Palakkad, Malappuram and Thrissur districts. The Nila river empties in to the Arabian Sea at Ponnani. It has a total length of 209 Km and a total basin area of 6,186 Km². Of this, 4400 Km² is in Kerala state and the remaining in Tamil Nadu (CWRDM, 1991). About 80% of Palakkad district falls in the Nila river basin. The topography and drainage of the basin indicate a pronounced fracture through the cardamom hills, south of Anamalai hills and between the cardamom hills and the southern-most plateau. There are also indications of fractures in the other principal direction SW-NE such as between Anamalai and Palani hills and again south of Palani hills.

The Nila river is formed by four main tributaries, namely (1) Gayathripuzha, (2) Chitturpuzha (Kannadi or Amaravathi), (3) Kalpathipuzha and (4) Thoothapuzha. Kalpathipuzha and Chitturpuzha confluence at Parali in Palakkad and from there the main course is known as Nila. It then flows westwards along the midland. During its course, it is enriched by the waters of the other tributaries, the Thoothapuzha, at Koottakadavu near Pallippuaram. Nine irrigation dams are operational on the Kerala side of the river intended for irrigating a second crop of paddy, while the first crop is raised based on first monsoon showers. Nila river basin is synonymous with a very rich cultural legacy and is known for a glorious historical background. This river is intimately associated with a population (rather the lifeline) of more than 35 lakhs of people spread in the districts of Palakkad, Thrissur and Malappuram.

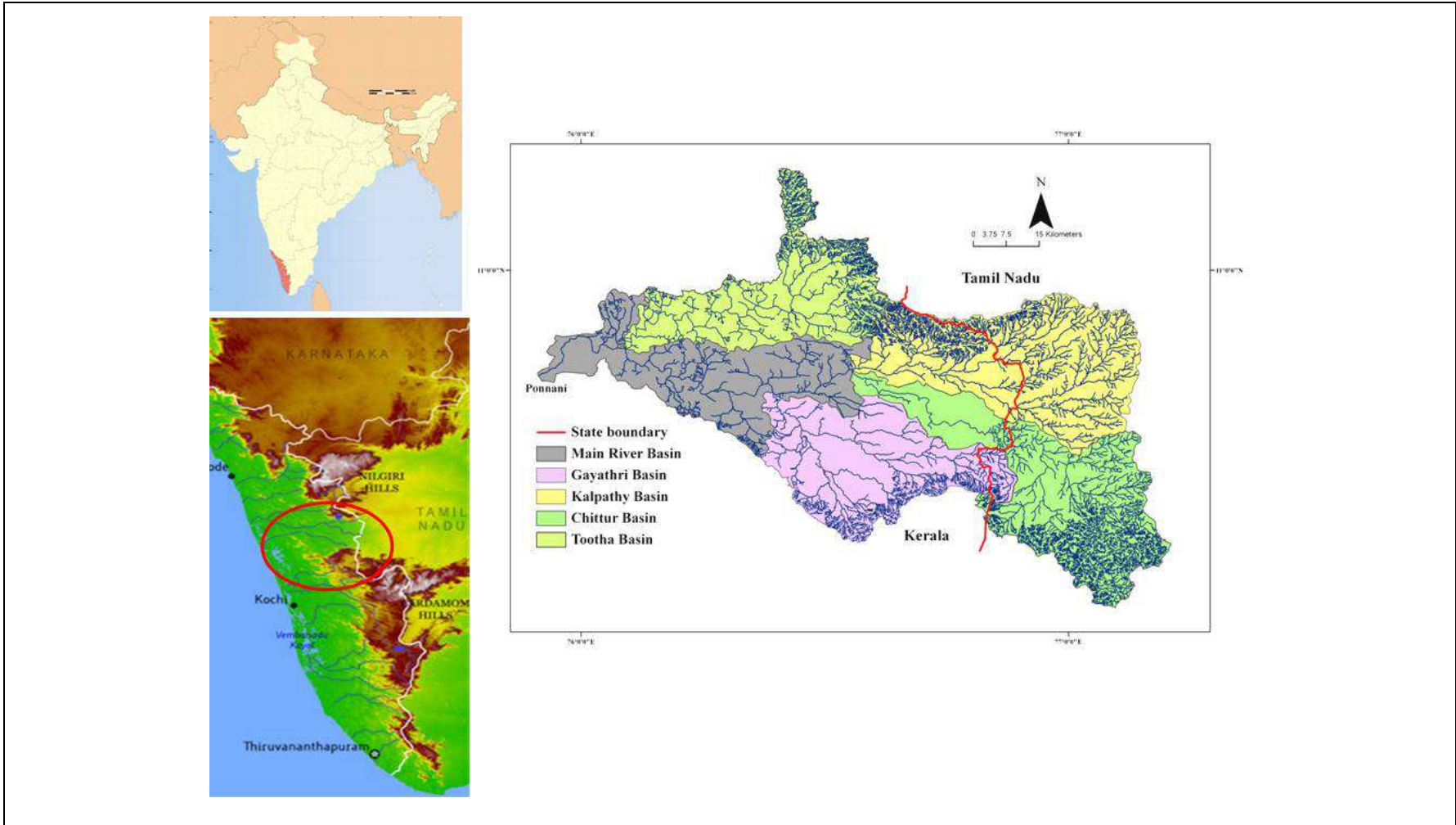


Fig 1: Nila river basin

Nila river throughout its course, through the plains is characterized by a substratum of broad alluvial flats and the shallow nature of the stream winding its way down to the sea. The river has extensive sandy shores that are flanked by trees, clusters of bamboos, pandanus, grass patches and other thickets. Except during the couple of months that follows the south-west monsoon, which begins in June, the discharge in the river is minimal. During winter, the river is so lean that it is possible to cross at several places in knee-deep channels. However, the unscrupulous sand mining and over exploitation of riverbeds have created deep channels and dips in the river floor. This poses threat to life when crossing the river especially to strangers.

Nowadays from the beginning of January itself, the river dries up and only narrow stream winds through the broad sandy riverbed. During March and April the riverbed throughout, except for a few pockets, is almost like desert. The hot summer wind blowing from Tamilnadu plains across the Palakkad Ghats makes the atmosphere too hot that very often the shallow water of the river gets heated up considerably.

Physiographically, the basin can be divided into three natural zones: the coastal belt, the midland and the highland. These zones form parallel belts running across the width of the basin. The coastal belt is characterized by alluvial sandy deposits, paddy fields and coconut groves. The estuarine area is subject to periodic saline inflow. In the coastal belt, a network of canals helps in inland navigation in the region.

A few kilometers from the sea to the east, the surface features slopes and clustering hills with numerous valleys in between. This undulating midland with lateritic formation is characterized by a number of '*elas*' or small cultivated watersheds, peculiar to this region of Kerala. A number of low lateritic hills in this region are interspersed with paddy fields, coconut and areca nut groves. Most of the reserve forests in the Nila river basin are situated in the highland region. The Silent valley forest area, famous for the people's movement in 1970s against a proposed dam, is situated in this zone. The Palakkad Gap, the largest pass in the Western Ghats, also in the highlands, has a width of about 32 km (CWRDM, 1983).

Study sites in the main course of the Nila

1. Ottapalam

The site is located very close to the railway station near the Ottapalam town. The sampling station is located between $10^{\circ} 48'N$ and $76^{\circ} 22'E$. The Mayannur village is on the other side of the river. Here the width of the river is around 240 m and the flow is steady. It can be seen that it takes a little meandering course here. It is 35 km west of Palakkad town (Fig 2). The site is easily approachable by rail and road. The riverbed is very wide and the water flow is limited to an average width of 60m. During monsoon season, the flow is very strong and fast. Thus, the study area includes a considerable portion of the riverbed, where the substratum is predominantly sandy. It consists of uniformly graded sand. However, due to heavy sand excavation, patches of muddy areas have developed in the riverbed. On these patches, a species of giant grass *Chloris barbata* have become predominant.

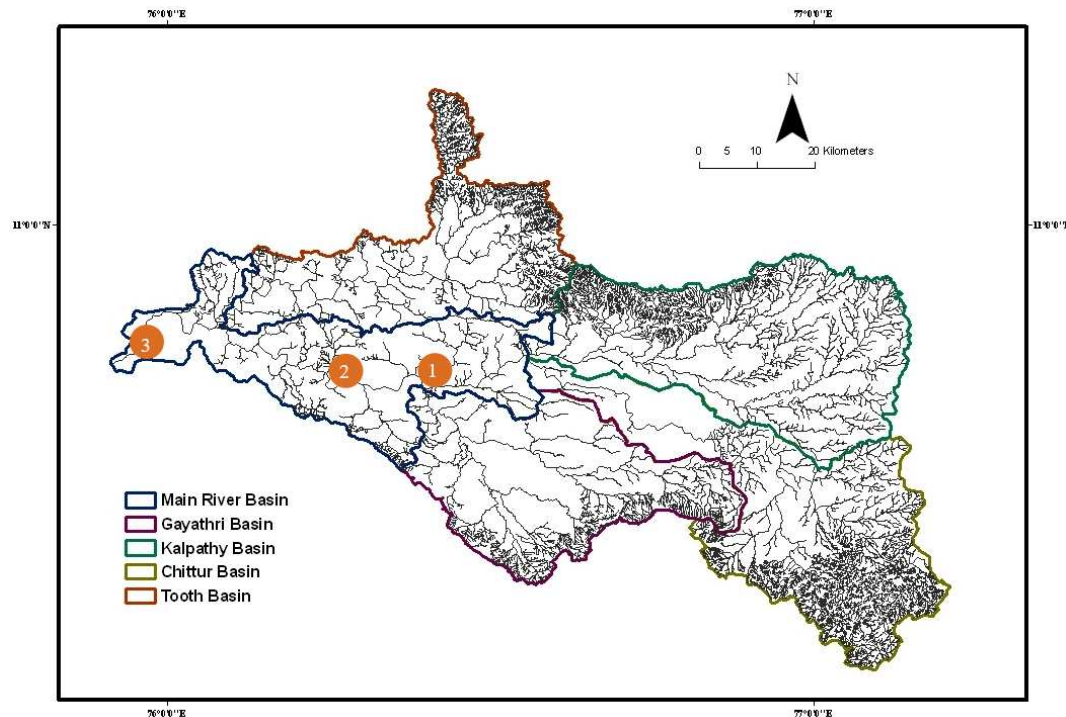


Fig 2 Study sites in the main course of Nila river

The flow of water is smooth and gentle. The slope of the river all along the length of the site is low. The bank slope is also low, and the water flow is clear and

fast. The study area comprises riverbed and cultivation land. The banks have a vegetative cover with grasses and sedges.

2. Pattambi

The site is located between 10⁰ 48'N and 76⁰ 07'E. Here the river has a width of 200m and the flow is restricted to an area of 90m. However, during heavy monsoon, the river gets flooded and both sides are submerged. Pattambi site is 25 km west of Ottappalam and is located below the Pattambi bridge on the south of Pattambi town. The railway station is only 1km away from the site. Here, the river is very vast and from November to June, a vast sandy riverbed is seen exposed. The Pattambi - Guruvayoor road forms the eastern boundary of the site. The Pattambi - Thrithala road cut the total study site across the B band. The river substratum is sandy. Here the water flow is restricted to 90m in width. Bottom sediment consists of fine sand since the riverbed is dangerously exploited and is much deepened due to excessive sand mining. Along the study site many parts of the river bed has developed large pits because of sand excavation. This area of Nila river basin is famous for the finest sand available in Kerala and is a heaven for illegal sand mining. Sand is even transported to Tamilnadu and other states (CESS, 1997). The river is also highly polluted here due to the sewage from town, hotels, human settlements, hospitals etc. The sand mining has attained alarming levels as the pillars and basement of the bridge are exposed. Here also the rapid growth of the giant grass is seen. The flow of water is smooth and calm. The river slope is low. The bank is elevated and its slope is high and water is clear and flow fast. During the monsoon rains, the water becomes muddy. The flow is smooth but during summer, some parts of the area form pools, puddles, ditches and swamps.

In the band A, comprising an area of 500m (Fig.5) from the riverbank, paddy, vegetable and banana cultivations is practiced. Human settlements have also begun, converting paddy fields into house plots. At the first part of this band, coconut plantation is seen. The Band-B starting from 500m to 1000m from the riverbank, also have paddy as the main crop. In addition, banana, plantain and vegetables are grown. One brick factory and lot of human settlements are seen here.

The third band (C) has mixed vegetation with paddy banana, rubber, coconut and areca nut plantations. During summer, the whole area is very dry and no irrigated cultivation is practiced. In Band-A, at the edge of the river bank a pile of waste materials comprising chicken, fish and meat wastes from the nearby Pattambi town is dumped. Here the area is dominated by highly ferocious dogs. Moreover, certainly a high population of different raptors and crows are a common sight here.

3. Manchady

This site is about 2 km from Kuttippuram bridge and here the width of the river is about 140 m. It is about 3 km from the Kuttippuram town, on the north side the railway line and a state highway marks the boundary. The south side is highly populated and also under cultivation. The area is located between 10° 48'N and 76° 4'E. The river is very wide but the water flow is restricted to 80m. The Mangalore rail line passes across the 'B' band. Parallel to the rail line the State highway connecting Kuttippuram and Tirur also cut across the B band. From this site, the location famous for migrant birds, Purathur is only 35 km away. At this point Nila debouches into the Arabian Sea. The river substratum is sandy. It consists of uniformly graded fine sand. Here also indiscriminate sand mining is going on. This area has an approved sand mining 'Kadav'. The river here is branched into long stretches of muddy channels due to sand mining. The small patches of land surrounded by these branches now have flourishing wild grass. Along the banks, the ditches and pits form marshy patches. The river here is clear and less polluted. The human settlement is less and so waste disposal and discharge is minimal. The water flow is smooth. The slope of river is lowest. The riverbank is also low so that the boundary between river and land is difficult to demarcate. It results in over flooding along the banks during monsoon rains submerging the adjoining areas. During this period, the river is ferocious and muddy. The flow of water is slow as it is approaching its final destination, the Arabian Sea. The river here takes a meandering course.

B. Kalpathypuzha

The Kalpathypuzha (Kalpathy river) is formed by four main tributaries, namely, Koraiyar, Varattar, Walayar and Malampuzha. The Malampuzha has four main tributaries; Onnampuzha, Kallampuzha, Kochuthodu and Myladipuzha. All these streams draining in to the Malampuzha reservoir, built around early 1950s. The Koraiyar and the Varattar originating from Anamalai hills after confluence flow towards west where the Walayar stream joins near Tampalam. The river is thereafter known as Koraiyar. The Malampuzha river joins Koraiyar about 10km downstream. The largest irrigation reservoir existing in the state, the Malampuzha River Valley project, is located on this river. The Walayar is the second storage reservoir constructed on this tributary. Three stations were selected in the basin of Kalpathy river, Kava, Manthakkad and Parali for survey. From Malampuzha dam, the river flows south for about 30 km and joins with Nila river at Parali.

Study sites on the course of Kalpathypuzha

1. Kava

This is situated between $10^{\circ} 52'N$ and $76^{\circ} 41'E$. The station is northeast of Malampuzha reservoir and forms the part of a Valley of the Dhoni hills. The area is interspersed by the four streams, Onnampuzha, Kallampuzha, Kochuthodu and Myladipuzha. From Palakkad town the station is 20 km away, with north boundary the Western Ghats and south the Malampuzha reservoir, motorable road is intersecting the area (.Fig. 3)

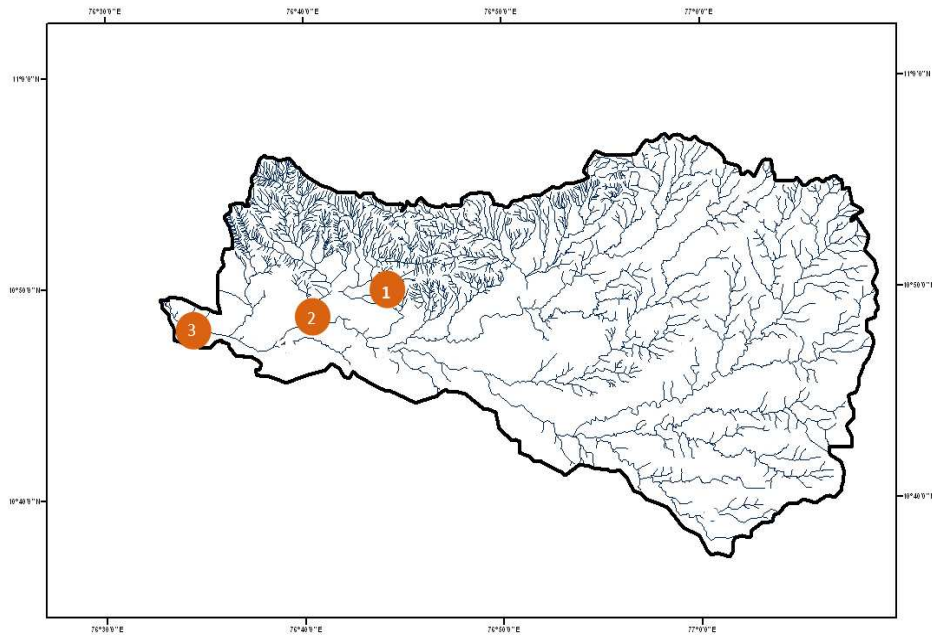


Fig 3 Kalpathy river with study sites

Situated 15 km from Olavakkode town in the northeast of Malampuzha reservoir, the site consists of a part of Western Ghats with high hills in the north and east. The Malampuzha reservoir forms the Southern boundary, and on the west, is the Kava village. The four streams viz. Onnampuzha, Kallampuzha, Kochuthodu and Myladipuzha, originate from the Northern hills and discharge into the Malampuzha reservoir. The blacktopped road from Malampuzha to Kava stretches across the site along the sides of the reservoir. Here the streams are perennial, water flowing in plenty during South West and North East Monsoon periods. From January to May, the streams are almost dry and then only a narrow string of water flows on. The substrata of the streams are rocky and undulant. The part of the study site contained in Malampuzha reservoir area has a muddy substratum. The water flow in the streams is in fast ripples during rainy seasons and then somewhat gentle during summer. The slopes of the streams are high as for most they flow along hill slopes. The banks of the streams are with low slopes.

2. Manthakkad

Manthakkad is about 10 km downstream of the Malampuzha reservoir about 6 km away from Olavakkode railway station. On either side of the river are paddy and banana cultivations. The area is not densely populated. Here, the river is calm and has a width of 60m and flow area of 45m. Here the river is with rocky substratum, with lot of pools and water flow is slow. Rocks of different sizes are seen jutting out of water along the river giving a patchy look to the river. The open surface of the river is covered by the invasive weeds locally known as African payal (*Salvinia molesta*) and *Eicchornia*. The slope of the river is low. Human settlements present only in the B and C bands.

3. Parali

Parali is located between 10⁰ 48'N and 76⁰ 33'E. The site is 15 km west of Palakkad town and Southwest of Olavakkode railway station. Here, the Kalpathy river confluence with the Chittoor puzha forming the Nila river and then it flows westwards. North of this site is the Parali railway station and the site is interrupted by the Palakkad – Ponnani Highway. The area is having cultivations of paddy and banana. The railway line, the roads and bridges create a noisy atmosphere. The width of the river here is about 65m with interruption of grassy vegetation.

The Manthakkad study area is about 25 km northeast from here. The Palakkad-Ponnani high way is cutting across the area along the west direction. The Thrissur – Palakkad rail line is also passing though the North-South direction. A bridge across the Kalpathy river and a railway over bridge are present in the site. Here the Kalpathy river empties into the Nila river. Actually, the commonly known Nila river begins here. Until this point, Nila is known in many names like Chittoor Puzha, Korayar and Varattayar. Here the river is calm almost like a wide pool. The width of the river is about 85 meters almost full with water. Patches of grassy areas and aquatic as well as water loving plants are plenty. The substratum consists of rocky and sandy areas.

C. Kunthipuzha

Kunthipuzha alias Thoothapuzha originates from the Silent valley hills. It has three main tributaries; Kanchirapuzha, Ambankadavu and Thuppandupuzha. Actually, it starts as a mountain stream from the western Silent valley hills where it is known by the name Kunthipuzha. After following a meandering course, it joins with other tributaries and forms Thoothapuzha. It is approximately 60 km long. The first part of its course up to Mannarghat is in the form of a jungle stream with full rocky substratum, steep, narrow and mighty flow. From Mannarghat it attains a gentle and moderate flow since the substratum is of an average slope. A small stream known as the Kanjiramukku stream also empties into this river. The Thoothapuzha after nurturing a vast basin of Palakkad and Malappuram districts joins the main Nila river at Kariyannur about 2 km west of Pallippuram. Three stations were selected along the banks of this river, at Pathrakkadavu, Thootha and Kariyannur.

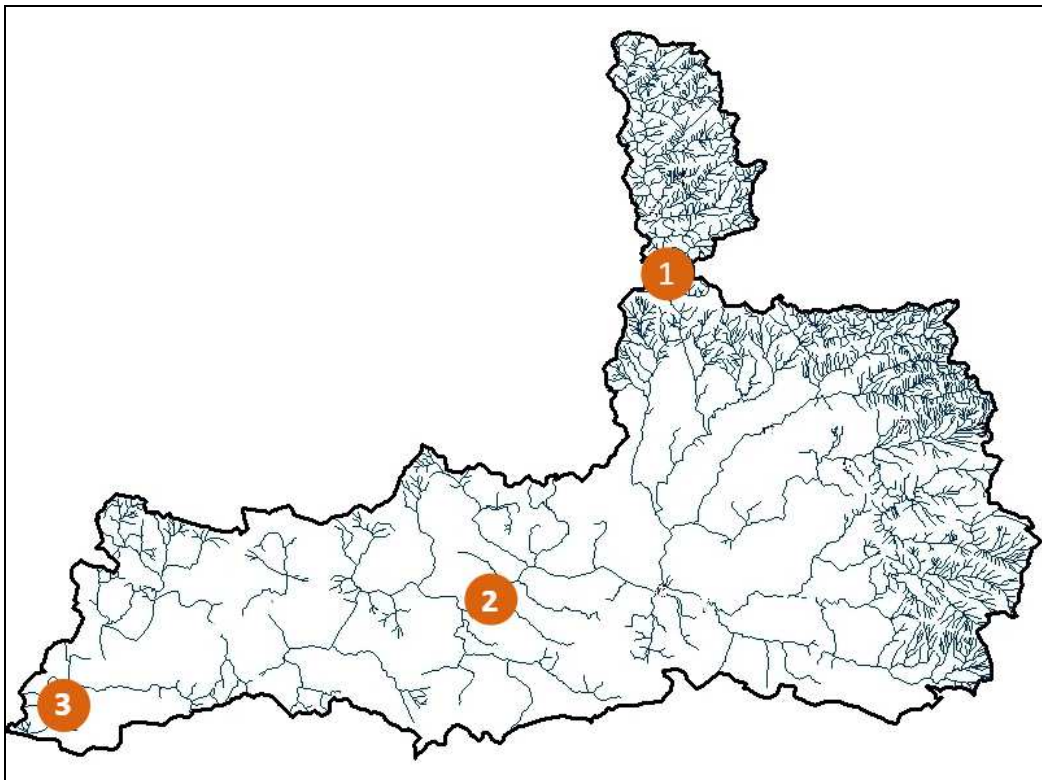


Fig 4 : Study sites along the course of Kunthipuzha

1. Pathrakkadavu

The study site is exactly at the place where the Pathrakkadavu hydro- electric project was proposed in early 2000s. It is situated between 10° 59'N and 76° 28'E in the western side of the Silent valley national park. The area falls in the villages of Karappadam and Kuruthichal. It is about 10 km northeast of Mannarghat town. A major part of the site falls in Silent valley forest. The Thiruvazhiyod range of forests forms the western boundary, the north and east, the Silent valley forests and towards the south, human settlements with varied cultivations. Village roads and a cashew nut plantation are adjoining the site. Motorable road from Palakkad -Calicut highway is reaching the site at about 200m. The area is about 750m below the proposed dam site. An area is earmarked by the Kerala State Electricity Board (KSEB) for installing a power station in this site. The Kunthipuzha originating from Silent Valley forests is flowing with its wildness through the study area. The river is a forest stream with steep slopes and rippling flow of water. Riverbed is highly uneven with rocks of different magnitudes and intermittent pits and potholes. The substratum is rich with pebbles of different size. Average width of the river along the band is 25m. Beautiful pebbles are being taken away from the riverbed for garden flooring, courtyard beautification and other decorative purposes. During monsoon season, the river turns into a raging torrent with strong flow of water making frightful sound. The water during all seasons except monsoon is crystal clear. During monsoon, the water is muddy, denser in color. A small check dam is built in this point of the river.

2. Thootha

Thootha (10° 41'N and 76° 19'E) is on the wayside of Perinthalmanna - Palakkad highway. The study site is about 6 km north of Cherpulassery town and 12 km southeast of Perinthalmanna. The site is spread along the two sides of the Thootha bridge. The nature of the river in the area is rocky and the lower side sandy and slow flowing. The river has a width of 80m and the flow is restricted to 60m. The site is about 25 km west of the Pathrakkadavu site.

The site is approachable from Cherpulassery and Perinthalmanna by road. There is a bridge across the river connecting Palakkad and Malappuram districts. Here the Kunthipuzha is known as Thoothapuzha. The river has a width of 50m with highly uneven and rocky substratum. Huge rocks of different sizes interspersing shallow channels give a panoramic view of nature here. During monsoon season, the river shows strong wavy motion but never covering the huge rocks. During winter and summer, water is crystal clear all along and attracts passengers and tourists to have a dip in the river. At the western part of the study area, the river is somewhat calm with an even pebbly substratum without rocks. Here the water flow is uniform and steady. The slope of the banks is about 30°. A temple of fame is seen in the Western side. In the Malappuram side a masjid and a small town, the Thootha angadi is situated.

3. Kariyannur

Kariyannur is the point where Thoothapuzha confluence with Nila river. It is situated at 10° 48'N and 76° 07'E. It is about 2 km west of Pallippuram railway station. The railway bridge intercepts the area. Nila River, in the north long stretches of paddy and other cultivations. East boundary is marked by village road and paddy fields and west with hilly terrains.

The study area is situated in the villages of Pallippuram and Perassannur. The eastern part is in Palakkad District and western side is in Malappuram District. The Shornur- Mangalore railway line cuts across the area. It is the junction where Kunthi river (Thootha river) joins the Nila river. Kunthi river from Thootha side flows towards west for about 20 km and then takes a southward turn at Thiruvegappura and flows southwards till it discharges in the Nila river at Kariyannur. Here the river is about 50m wide. During summer, although it becomes lean relatively more water flows in it as it originate from Silent valley. During monsoon, it has mighty flow of water. Road access is unavailable to this site, but it is reachable by cartroads from the neighboring village Irimbilyam and from Pallippuram village.

Here, the river substratum is pebbly; but at the last stretch of the river where it joins Nila river on the west there is sandy substratum. Bottom sediment consists of pebbles of smaller size. The river is clean in this area as human settlements are less than other study sites. The flow of water is slower during summer and winter, but it shows strong flow during monsoon period with highly muddy water. The slope of the river is low. The bank at Pallippuram side shows heavy sliding during monsoon period as the river over flows with heavy current.

As in the other study sites, the area was studied dividing into A, B and C bands. The band-A comprises the riverbed and outward up to 500m from the river. Here banana and paddy cultivation is practiced. Band-B starts from 500m up to 1500m from the riverbank. Paddy is the main crop with vegetables as short-term crops. A portion of this band has Acacia plantation along the sides of the railway line. The third band, C is predominantly paddy on one side and a hillock with rocks and intermittent plantations of cashew, coconut and areca nut.

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CHAPTER III

HABITAT CHARACTERIZATION

In this chapter, detailed description and the habitat characterization of the study sites is intended. The climate, soil characteristics, the terrain, the total fauna, the land use including cultivation of crops and cropping pattern, seasonal variations etc. are described collecting maximum information based on frequent observations.

Methodology

The study locations were distinguished into three bands, A, B and C, starting from the riverbank (Fig. 5). The A band comprises an area of 500m in width from the riverbank. The Band-B starts from 500m to 1000m from the riverbank and the third band (C) starts from 1000 m to 1500 m. Observations were done in each band to study the flora, the soil nature, river flow, and birds using quadrates and line transects.

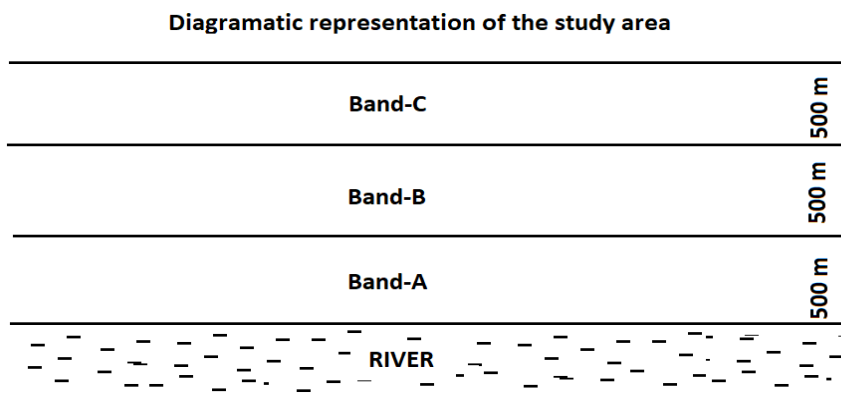


Fig 5: Diagrammatic representation of the study area

Study sites along Nila river course

1. Ottappalam

Climate

The study site experiences a humid climate with hot summer extending from March to May. The main rainy season is during South West monsoon, which sets in the first week of June and continues up to September. The northeast monsoon extends from second half of October to November. From the second half of October the temperature gradually increases to its peak in May, which happens in the hottest month of the year. The mean maximum and minimum temperature at Ottappalam for the entire study period is given in table 1. Monthly rainfall in Ottappalam during the study period is shown in Fig 6. Logan (1887) and Gaston et al (1979) have studied the climate of Malabar area in detail.

Table 1: Monthly mean maximum and minimum temperature at Ottappalam in degree Celsius

Month/Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2005	Max	30.8	31.6	32.4	33.2	33.6	30.2	28.8	29.2	30.4	30.6	31.4	31.2
	Min	22.4	22.6	25.2	26.2	26.4	26.6	24.4	23.8	24.2	24.00	24.1	22.8
2006	Max	31.1	31.8	32.2	33.6	33.8	30.4	29.1	29.4	30.6	30.8	31.2	31.1
	Min	21.8	22.4	24.8	26.0	26.2	26.8	24.6	23.6	24.1	24.2	24.6	23.1

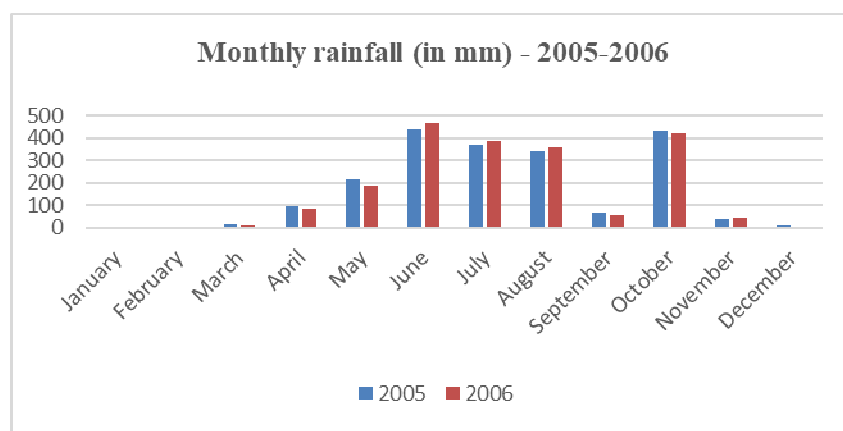


Fig 6: Monthly rainfall (in mm) of Ottappalam (2005 – 2006)

The study area received an annual rainfall of 2030 mm during 2005 and 2019.2 mm during 2006. Mean maximum temperature of 33.6⁰C were experienced during May 2005 and minimum temperature of 22.4⁰C were shown during January – 2005. In 2006 the mean maximum temperature of 33.8⁰C attained during May and mean minimum of 21.8⁰C shown during the month of January.

Soil Characteristics

Climate, biota and geology of the parent material are the key elements that dictate the soil forming process of a region. Wide variations in the climate, from the humid -tropical to the semi arid - tropical, cause sharp changes in the temperature and moisture conditions. Vegetation regime, as well as the human interferences such as deforestation and agricultural activities, contributes to the changes in the soil characteristics.

The study site showed two types of soils. The first band comprising the riverbed has riverine alluvium (tropofluents) consisting of single grained soil and laterite soil. Single grained soil is broken into individual particles that do not stick together. It always has a loose consistence. Laterite soil is a typical weathering product under humid tropical conditions. It resembles cookie crumbs, usually less than 0.5 cm in diameter and abundant in the surface horizons. This type of soil is present in the B and C bands of the study area.

Land use

Ottappalam study area comprises cultivable and fallow lands. The Band-A is 500m from the riverbed is having no cultivation. It comprises swampy patches and bushes with minimum number of trees. The list of flora and fauna is described in detail in chapter III. The Band-B is 500m to 1000m from the riverbank has paddy cultivation, human settlements, roads and railway line. Here paddy cultivation is practiced during May to August (Virippu) and September to December (Mundakan – second winter crop). The third summer crop i.e. punja is not raised here. My observation was in an area of 2 km length along the three bands. In addition to paddy, vegetables, pulses, banana and plantain are also cultivated. The Band C is predominantly paddy fields, besides coconut, arecanut and banana cultivations are also seen. At the west end of the Band C, Ottappalam town is situated.

2. Pattambi

Climate

The study area has a humid climate with dry season extending from March to May. The rainy season coincides with that of north Kerala and makes its appearance during June to September. The second rainy season i.e. the Northeast monsoon extends from October to November. From November onwards, the temperature gradually increases and attains the maximum during May. Anyhow, summer rains are frequent along the Nila river basin, which is an effect of Tamilnadu weather reaching through Palakkad gap in the Western Ghats. The mean maximum and minimum temperature at Pattambi is given in table 2. Monthly rainfall at Pattambi during the study period is given in Fig.7.

Table 2: Monthly mean maximum and minimum temperatures (degree Celsius) at Pattambi

Month/Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2005	Max	30.6	31.4	32.6	33.4	33.8	30.1	28.00	28.6	29.2	30.2	31.1	31.2
	Min	22.1	21.8	25.2	26.4	26.6	26.2	26.4	24.2	23.6	24.2	24.00	24.1
2006	Max	31.2	31.6	32.2	33.6	33.9	30.4	29.2	29.4	30.6	30.8	32.00	31.6
	Min	21.4	22	24.8	26.2	26.6	24.8	23.8	24.2	24.4	24.6	23.2	22.8

Source: Fields studies circle, Department of Irrigation, Thrissur

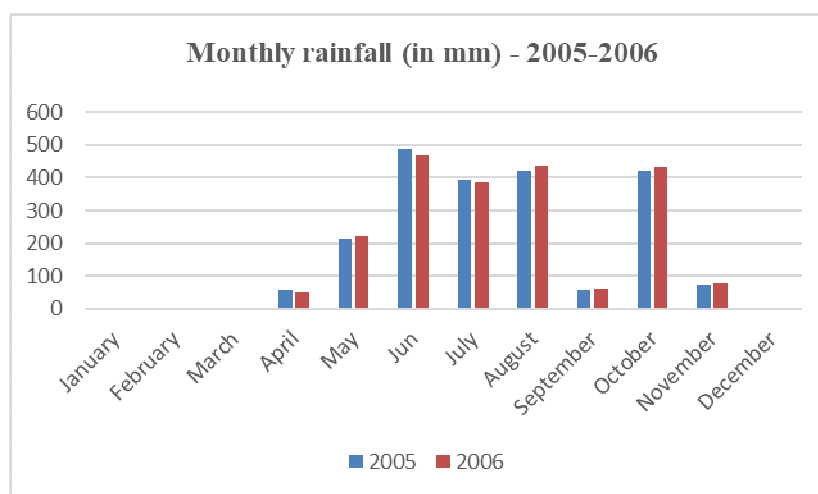


Fig 7: Monthly rainfall (in mm) at Pattambi (2005-2006)

Source: Fields studies circle, Department of Irrigation, Thrissur

Pattambi received an annual rainfall of 2132.4mm during 2005 and 2138.2 during 2006. The mean maximum temperature was 33.8⁰C during May and mean minimum temperature was 22.1⁰C during January. In 2006, the mercury level reached 33.9⁰C during May and the level touched the lower mark of 21.4⁰C during January. Thus, the total meteorological features of the area conform to that of the general trend of central Kerala.

Soil Characteristics

Pattambi site has a vast riverbed with the finest sand available in Kerala. Hence, the Band-A has single grained sandy soil in the riverbed. Soil color is light creamy. The soil consistency is of loose nature. The area of about 1000m from the bank shows granular soil with cookie crumbs. It is blackish in color and with friable consistence. The texture is almost clay. The third region i.e. up to 500m from the second boundary has a granular and blocky structured soil. Here the granular type is blackish in color and friable. However, the blocky structured soil was reddish in color with a firm consistence. The soil texture is silky clay.

Land Use

Pattambi study site is having a land use pattern with short-term crops as well as plantations. The Band-A has paddy fields, banana and vegetable cultivations. Paddy is grown during the local Viruppu (May to August) and Mundakan (September to December) season. Banana cultivation is in a very limited area i.e. about 4 Acres. Vegetables cultivations are only seasonal i.e. during summer (February to May). The Band-A has a coconut plantation in an area of 8 Acres. Band-B is predominantly with paddy cultivation and with more of human settlements. The human habitats have all types of vegetation with common trees, vegetable, bushes, herbs etc. The band 'C' is having a small stretch of paddy, a large area of rubber plantation, and the remaining with coconut, areca nut and other common trees.

3. Manchady

Climate

Much like that of the other study stations, here also the climate is humid experiencing the scorching heat during summer (March to May). Heavy downpour is

seen from June to September. Good showers are also seen during northeast monsoon in October-November. Mean monthly temperatures and rainfall here are given in tables 3 and Fig 8.

Table 3: Monthly mean maximum and minimum temperatures (degree Celsius) at Manchady

Month/Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2005	Max	31.6	31.8	32.4	33.2	34.6	30.00	29.5	28.8	29.2	30.1	31.5	32.0
	Min	20.8	21.3	23.2	26.0	26.4	25.2	24.8	24.2	23.0	24.4	24	23.6
2006	Max	32.00	32.2	32.6	33.0	34.8	21.2	29.6	27.4	28.6	29.8	30.2	31.8
	Min	21.1	21.6	23.8	26.5	26.6	25.0	25.2	24.6	23.4	24.4	24.2	23.8

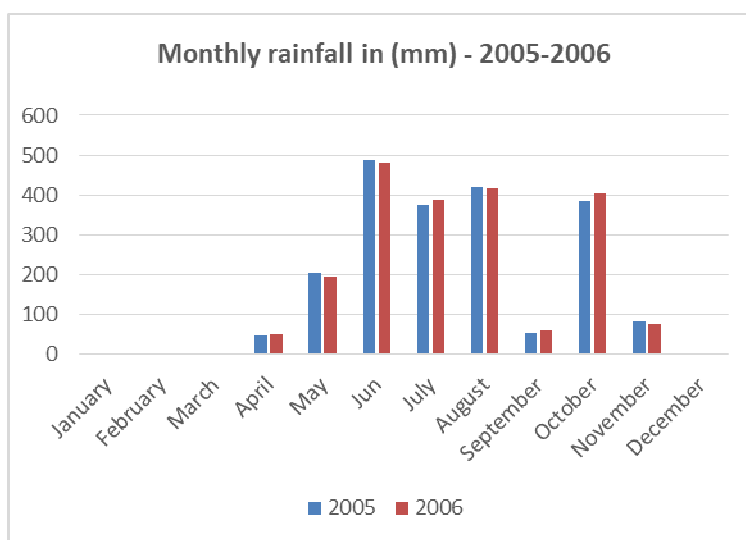


Fig 8: Monthly rainfall in (mm) at Manchady

The maximum temperature was seen in May with a mercury reading of 34.6⁰C and the minimum was during January with a lowest reading of 20.8⁰C in the year 2005. During 2006, the maximum temperature was 34.8⁰C during May and the minimum, 21.1⁰C was seen in January.

The total rainfall of 2063.2mm was received in 2005, whereas the rainfall received was 2083.2mm in 2006.

Soil Characteristics

The Band-A has single grained sandy soil in the riverbed. Color of the soil is light cream. The soil consistency is loose. The area beyond the riverbed in the Band-A has granular soil with crumbs of less than 0.5cm in diameter. Here the color is blackish and muddy. In the Band-B, also the soil is granular and blackish. It is loose in consistency and the texture is of clay type. In band C, beyond 1000m from the bank, the soil loses its granular nature and blackish color. Here the site is hilly and the soil is blocky with irregular blocks of 1.5 to 5cm in diameter. Some areas are with prismatic soil consisting of vertical columns. Yet in some other parts, massive soil with no visible structure in very large clods is seen. Here large rocks cover a considerable area. The color is red and soil consistency is firm. Soil texture is silty clay and silt.

Land use

The study area is very close to road and rail line. The Band-A, is with minimum cultivation. About 80 hectares of this land is with acacia plantation under the social forestry project. This area is actually in the midst of the river, an islet, in Malayalam known as 'thuruth'. The remaining part of the islet has some paddy cultivation and human settlement. In the households, varieties of common trees are seen. Coconuts, Areca nut, jackfruit, mango etc. are the major ones. In the Band-B, the predominant cultivation is paddy.

The paddy cultivation is in two seasons i.e. virippu and mundakan. No other cultivation is noticed here. Anyhow, during the last span of my field survey here human settlements coming up in the paddy fields and illegal conversion of cropping land into households were seen. In these patches, different types of vegetables and other common trees have started growing. The Band C is predominantly hilly. The valleys are with thick human settlement and hill is almost covered with trees like *Syzigium cumini*, *Anacardium occidentale* etc. The valley is having thick vegetation of coconut, areca nut, jackfruit, mango, tamarind and other common trees.

Study Sites along Kalpathy river

Site – I Kava

Climate

Climate during the study period was humid; good rains during the southwest and northeast monsoon, colder climate from November to February, and hot days from March until end of May. The mean monthly maximum and minimum temperatures are shown in table 4. The monthly rainfall data is given in Fig 9.

Table4: Monthly mean maximum and minimum temperature (degree Celsius) at Kava

Month/Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	Maximum	32.6	33.4	35.5	36.8	32.5	29.7	29.5	29.4	30.1	30.2	31.4	32.2
	Minimum	20.8	21.3	23.7	25.1	24.2	23.5	23.5	23.2	23.5	23.2	22.3	20.9
2006	Maximum	31.8	32.5	34.2	26.4	33.1	29.6	29.4	29.2	30.2	30.4	30.8	32.4
	Minimum	20.6	21.00	23.4	25.4	24.2	22.8	23.2	23.1	23.4	22.6	22.4	21.8

The maximum temperature felt during the study period in 2005 was 36.8⁰C in April and minimum 20.8⁰C in January. In 2006, the maximum temperature was recorded in April with 36.4⁰C and minimum with 20.6⁰C in January. The total rainfall during 2005 was 1673.8mm and the maximum downpour measured was in June with 408.5mm. In 2006, the total rainfall was 1718.8mm, and the maximum rain was 22.8mm in June.

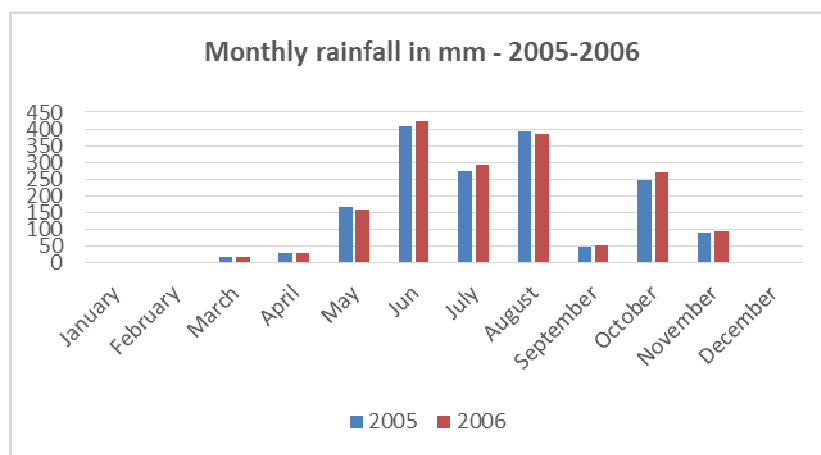


Fig 9: Monthly rainfall at Kava

Soil Characteristics

Band C is hilly with an elevated slope. The soil here is blocky and granular. The area is stony with different sizes of pebble along the riverside. In the substratum of the streams, sandy soil is present. The color of sand is cream to black. The granular soil is reddish in color. The soil consistency is friable. The granular soil is silky in texture. Band-B is an area with cultivations and human settlement. The sand is formed of riverine alluvium and granular. The color is black in the paddy fields and red in other parts. The soil consistency is friable and texture is clay. Band-A is part of the Malampuzha reservoir. Here the soil is sandy with single grained soil structure. Soil color is black having a muddy and loose consistency. The texture is clay.

Land use

The area is a part of Malampuzha reservoir in Western Ghats. So in Band-A, no cultivation is permitted. Here the area gets submerged during monsoon and water plants and marshy species are predominant. Large trees are not seen. The Band-B area is spread along the two sides of a motorable road. Here paddy is the main crop. Human settlements are seen in certain patches. The households have mixed vegetation with coconut, areca nut, jackfruit, mango, papaya, and other common varieties. Paddy is cultivated in two seasons, the Virippu and Mundakan from May to October. In only very few plots the third crop, Punja, was seen. Band 'C' is predominantly hilly and forms a part of Western Ghats. The area has forest with different species of plants and shrubs. The forest is of moist deciduous in nature. The detailed nature of the flora is described in the next Chapter. No cultivation is present here.

Site – II Manthakkad

Climate

Climate is humid. The site is not very far from the first site of this river i.e. Kava and shows more or less the same climatic features. The rainy season and average rainfall almost resembles that of Kava. Summer exhibited good hot days.

The mean monthly maximum and minimum temperatures are shown in table 5. The monthly rainfall data is presented in Fig.10

Table 5: Monthly mean – temperatures (Degree Celsius) at Manthakkad

Month/ Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	Maximum	32.5	33.4	35.5	36.8	32.4	29.6	29.6	29.2	30.1	30.4	31.2	32.4
	Minimum	20.8	21.3	23.7	25.2	24.1	23.5	23.4	23.5	23.2	23.5	23.2	20.9
2206	Maximum	31.8	32.5	34.2	36.4	33.2	29.6	29.4	29.2	30.2	30.4	30.8	32.4
	Minimum	20.6	21.1	23.3	25.4	24.2	22.8	23.2	23.1	23.4	22.6	22.4	21.8

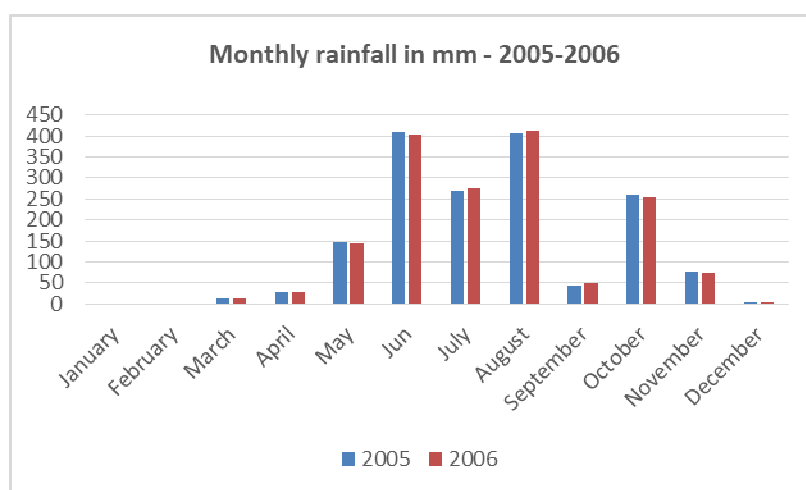


Fig 10: Monthly rainfall at Manthakkad

The maximum temperature recorded during 2005 here was 36.8⁰ C in April and minimum in January showing 20.8⁰C. The annual rainfall during 2005 was 1658.1mm with the highest shower 410.5mm in June. In 2006, the annual rainfall was 1654 mm with the maximum of 412.2mm during the month of August.

Soil characteristics

The Band-A adjoins the river and includes the riverbank and substratum. The substratum is rocky and with patches of muddy areas. The area beyond the bank is barren land with waterlogged patches. The soil here is blackish and muddy. It is seen in massive loose quantities. The consistency is loose and the texture clay. The

B band has marshy area with waterlogged patches and some paddy fields. The soil here is also blackish and muddy, with loose consistency and texture of clay. The C band is more dry and having paddy cultivation. There, the soil is moist and granular in structure, blackish in color with loose consistency. The texture is clay type.

Land Use

In the A band no cultivation is practiced. Here different types of water plants and marshy species are seen. In the B band, a small portion of the area is paddy field. Paddy cultivated twice in a year i.e. Virippu and mundakan crops. Another important crop is banana. This crop starts from October - November and harvested in August-September. In the banana cultivation, different vegetables are also grown as side crop, an example of compound cultivation. The band C is having more paddy fields, plantain cultivation, vegetables etc. Here more human settlements are present. In the households, all common trees like coconut, areca nut, jackfruit, mango, tamarind etc are grown.

Site – III Parali

Climate

The area enjoys a humid climate. The area is close to the Palakkad town so that the hot and arid climate of the district is very much prevalent here as well. The rainy season and rainfall are more or less the same as in the other study areas. The mean monthly temperatures and rainfall are shown in table 6 and Fig 11.

Table 6: Monthly mean temperatures (Degree Celsius) at Parali

Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	Max	33	32.6	34.2	35.8	33.2	29.8	29.6	28.8	30.2	30.3	31.3	32.8
	Min	20.2	21.4	23.5	25.4	24.3	23.2	23.2	23.00	23.2	23.2	22.8	20.4
2006	Max	33.2	32.8	34.0	36.00	34.1	29.4	29.5	28.4	30.3	30.6	30.8	32.6
	Min	20.4	20.8	23.6	25.2	24.1	23.6	23.6	23.8	22.6	23.0	22.4	21.00

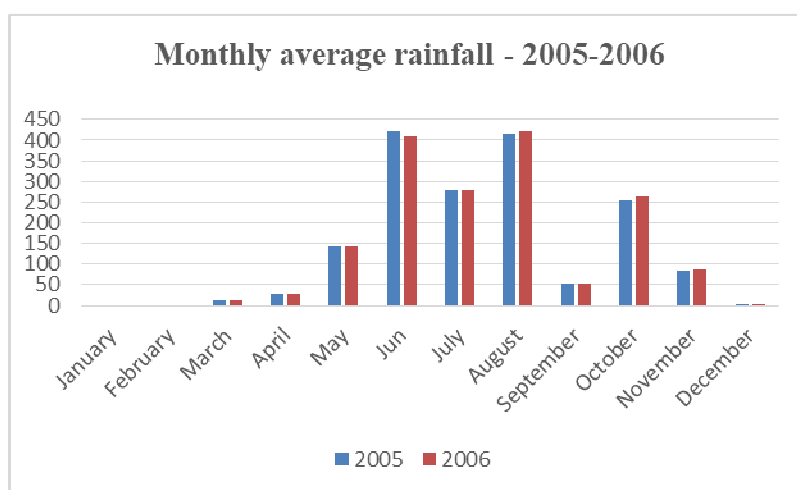


Fig 11: Monthly average rainfall at Parali

The data shows maximum temperature of 35.8°C was recorded in April 2005 and 36°C in 2006 also in April. The average minimum temperature was 20.2°C in January in the year 2005 and 20.4°C in January 2006. The highest amount of rainfall was in the month of June 2005 with a reading of 422.4mm and the total rainfall for that year was 1694.1mm. In 2006, the maximum rainfall was 420.2mm in the month of August and the total annual rainfall was 1700.2mm.

Soil Characteristics

The first band, i.e. Band-A is of muddy and marshy areas. A portion of the band is having isolated rocks in the riverbed. The soil is blackish muddy and splendid growth of marshy plants and aquatic vegetation is noted. Outward of the riverbed, stretches of paddy, coconut, plantain, etc are cultivated. The B band is having cultivable soil, blackish and loose, which can be called loam. Here a considerable number of local units manufacturing brick are operating seasonally. The soil seems very fertile. Band C is a drier and elevated area, but with cultivable soil of clay loam granular type.

Land use

In the Band-A, cultivation is patchy. A large area of the band is marshy with impressive growth of marsh plants and other, aquatic vegetation. Outward of the river bank paddy, coconut, plantain etc. are cultivated. Paddy is raised and harvested

twice a year. In the Band-B, a good portion is being utilized for railway line, roads etc. Coconut, areca nut plantation and human settlements are common. Band C is slightly elevated and with more human settlements. The Parali town also comes in this area. More of coconut and areca nut plantations occur here. Other common trees like mango, jack, tamarind, palm trees are richly grown.

Study sites along Kunthipuzha

Site – I Pathrakkadavu

Climate

The climate is more humid with heavy rain during southwest and northeast monsoon periods. Besides summer rain were also showered during March, April and May. Cold climate is experienced during November to February. The rainfall recorded was more than the average of the state. The monthly mean temperature and rainfall is shown in table 7 and Fig 12. The maximum temperature during 2005 was in April (35.6⁰C) and minimum temperature in January (20.2⁰C). During 2006, the maximum temperature was 35.4⁰C in April and minimum in January (20.4⁰C).

Table 7: Monthly mean maximum and minimum temperature (Degree Celsius) at Pathrakkadavu

Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	Max	30.1	31.6	34.8	35.6	32.2	28.4	29.2	29.4	30.1	30.4	31.3	29.2
	Min	20.2	21.2	23.4	25.1	24.6	22.8	23.4	22.6	23.5	22.3	21.8	19.8
2006	Max	30.3	31.8	34.3	35.4	32.2	28.6	29.1	29.6	30.4	30.2	31.6	29.4
	Min	20.4	21.6	23.4	25.2	24.8	22.6	23.5	22.5	23.8	22.5	21.6	20.1

The total rainfall during the year 2005 was 2814.8mm, which is above the state average. During this year maximum shower was experienced during July (760.8mm) and minimum rain during January (00). It is noteworthy that except January all the months received rain. During 2006, the total rainfall was 2480.2mm in which June was blessed with the highest of 660.4mm and January with zero rainfall. This year also all months got the shower except January.

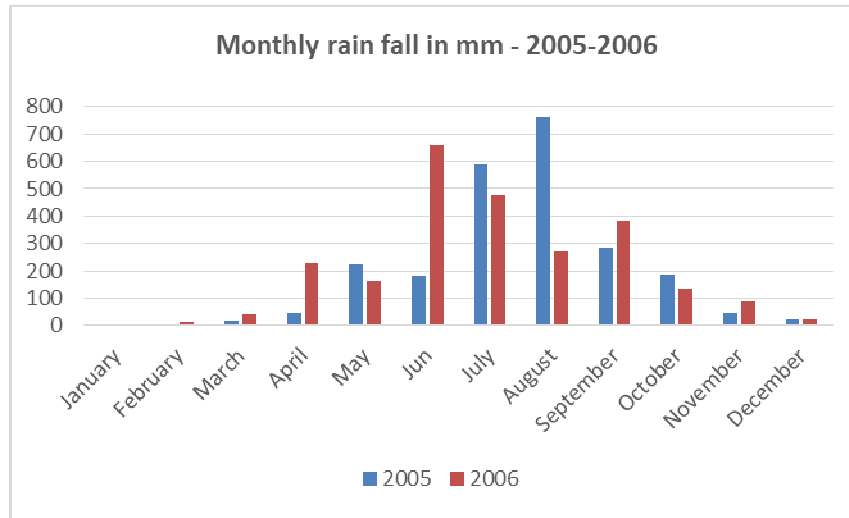


Fig 12: Monthly rain fall at Pathrakkadavu

Soil Characteristics

Band-A is continuous with the river substratum as there is no clear-cut demarcation between the riverbank and substratum. The substratum is highly uneven with large rocks, sandy pits and beautiful pebbles of different sizes. The bank side is lofty and the forests of Silent valley, Thiruvazhamkundu ranges cover the major part of Band-A. The soil here is blackish in color, granular all along the adjoining areas of the riverbank. It becomes blockier with irregular blocks of 1.5 – 5 cm in diameter towards the inner areas of the riverbank. Still inwards, the band has platy type of soil with thin, flat plates that lie horizontally. However, on the other side of the river close to the Mayilampadam area, more cultivation and human settlements are present, and the characteristics of the soil is different. Here the soil color is black and it is of granular type. In the B- Band, along the forest side, the sand is blocky and prismatic with vertical columns. In the opposite side rubber plantations and paddy, tapioca, vegetable etc. are grown along the B-band. Here the soil is blackish with loose consistence. Soil is broken to tiny particles. Band C is also a cultivable area. Here also the sand is similar to B band with black color and granular, loose consistence.

Land use

Band-A along the right side of the river is fully forest area with thick vegetation. A part of the area is having cashew plantation. All the bands A, B and C

are covered with forest. The left side of the river is close to the Mayilampadam village where human settlement and other anthropological practices are taking place. Band A has forest along the northern side and towards the south, a portion of which is earmarked for the proposed sub-station of KSEB. Rubber cultivation is the main crop raised here. In the B band that is a low land paddy, tapioca, vegetables banana etc. are grown. Paddy is cultivated in two seasons. C band is pre-dominantly with rubber cultivation. Human habitat shows all common types of trees – coconut, areca nut, jackfruit, mango, tamarind etc.

Site – II Thootha

Climate

As in other sites of Kunthi river, here also the climate is more humid with heavy rain during southwest and northeast monsoons. Summer rain is also blessed during March, April and May. From November to February winter cold is felt. The monthly mean temperature and rainfall is shown in table 8 and Fig 13.

Table 8: Monthly mean maximum and minimum temperatures (Degree Celsius) at Thootha

Month/Year		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	Maxi	30.4	30.8	32.4	34.6	35.2	28.6	28.9	29.2	30.1	30.6	31.2	28.8
	Mini	20.4	20.8	22.8	26.2	25.8	23.1	23.6	22.6	23.4	22.2	21.6	19.6
2206	Max	30.2	30.8	32.6	35.2	34.8	29.2	28.8	29.2	30.4	30.2	31.6	29.6
	Mini	21.00	20.6	22.4	26.4	25.2	23.4	22.8	22.4	23.4	22.4	21.80	20.0

The maximum temperature during 2005 was felt in the month of May (35.2⁰C) and minimum temperature of 19.6⁰C was in December. In 2006, maximum temperature seen was during April (35.2⁰) and minimum in the month of December (20⁰C).

During the year 2005, a total shower of 2246.8mm was poured in Thootha, the maximum being in July (560.4mm) and the minimum rainfall during January (8mm). In the year 2006, the total rainfall was 2171.6mm, with the highest amount of 510.2mm in June, and the lowest was in January (6mm).

Soil characteristics

Here the substratum along the eastern side is highly rocky with intermittent giant grass patches. In the shallow pits and channels between the rocks, pebbles and sandy substratum is seen. The bank side is highly lofty at the eastern side with a slope of 70°. The soil is reddish, towards the outer area and is single grained in nature. Consistency is loose. In the B band, large-scale cultivation is practiced. The soil is muddy and loose with a mixture of red to black color. It is massive in nature, with loose consistency. Band 'C' is drier having a soil structure of platy and columnar type. The color is reddish with friable consistency.

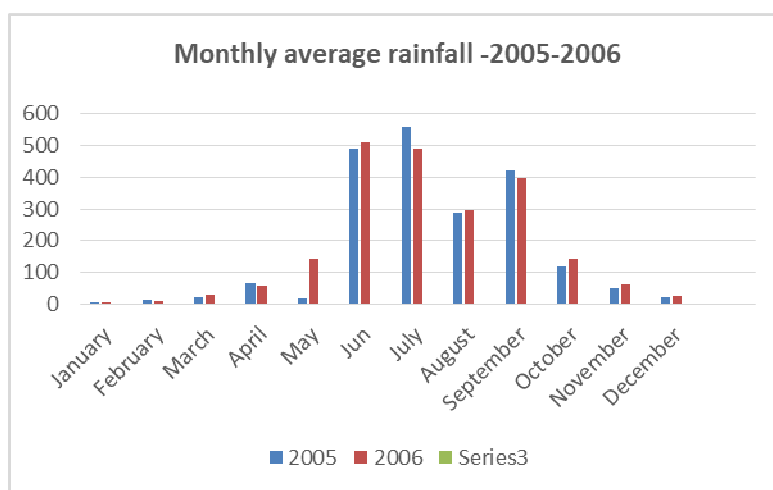


Fig 13: Monthly average rainfall at Thootha

Land use

The Thootha site is an important agricultural area with high productivity. Here short-term crops and plantations are seen. The eastern part of the site is a highly elevated area with a high slope bank beyond which the agricultural practices are observed. In the western part, it is plain area with a slope of about 20 degree. In the A-band, towards eastern side coconut, areca nut and banana plantations are seen. Towards the west banana, vegetables, coconut and areca nut are cultivated. Band-B is a more cultivable area in which coconut is the permanent crop. Paddy fields are also present here and tapioca, banana, vegetables etc are the short-term crops. Paddy is cultivated twice, May to August and September to December. Banana and

tapioca are more predominantly cultivated, because now-a-days paddy cultivation is getting more and more little preferred. Band C is predominately rubber, coconut, areca nut plantations. Besides, all local and common trees in the human habitats are also found here.

Site - III Kariyannur

Climate

The area experiences humid climate with hot and dry season during March to May. Rainy season conforms with other parts of Kerala with good shower from June to September. Northeast Monsoon also gives significant share during October to November. Winter cold is experienced as in other parts from November to February. During March to April, intermittent summer rain is experienced. The mean minimum and maximum temperature of this site and monthly rainfall is shown in table 9 and Fig 14.

Table 9: Monthly mean Maximum and Minimum temperature (degree Celsius) at Kariyannur

Month/Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
2005	Max	30.4	31.8	32.6	33.4	33.8	30.1	28.2	28.4	29.1	30.2	31.1	30.8
	Min	20.8	21.2	25.1	26.4	26.2	25.6	26	24.2	23.8	24.1	24.0	24.2
2006	Max	31.2	31.6	32.6	33.2	30.8	29.2	29.6	29.00	30.4	30.1	31.0	31.6
	Min	31.2	22.2	24.4	26.00	24.6	23.2	24.6	24.2	25.00	23.2	22.8	22.6

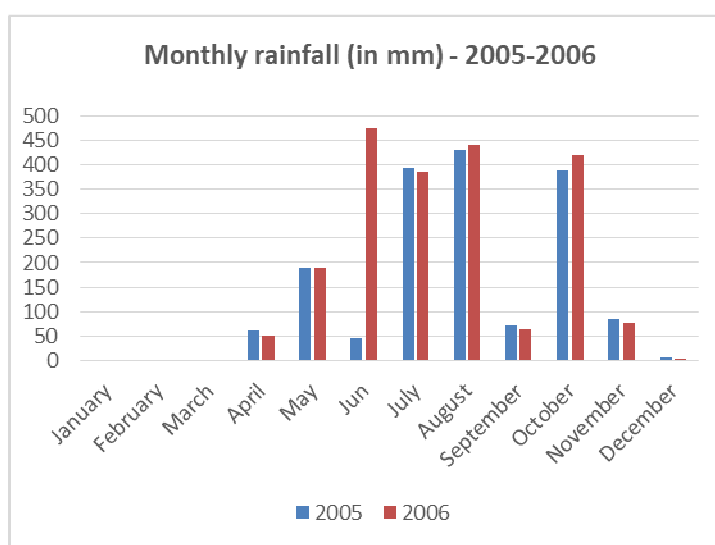


Fig 14: Monthly rainfall (in mm) at Kariyannur

The average maximum temperature during the year 2005 was experienced during the month of May (33.8⁰C) and minimum mean temperature in this year was 20.8⁰C during January. The highest shower of 466mm was received during June in the year 2005 and the total rainfall was 2091.3mm. During 2006 the highest rainfall of 474.6mm was recorded during June and the total shower was 2110.6mm

Soil Characteristics

Kariyannur is mainly an agricultural area. The soil is fertile and almost uniform in nature in A and B bands. The A band has loose soil with single grained structure in the initial parts and it changes into purely single grained with loose consistence as extends outward. The color is creamy to blackish. In the B band i.e. up to 1000m, the area is mostly paddy fields and with loose single grained blackish soil. The C band is partly with black, loose, single grained soil and the hillock region with reddish pebbly soil of firm consistency.

Land use

The A and B bands are practicing agriculture with short-term crops. In Band-A, banana and vegetables are the main crops. As the river overflows and major parts of the band get immersed in water paddy is not the prime crop here. Vegetables are cultivated intermittent in the banana cultivation during August – October, once the hazards due to overflow subsides. Banana crop will be saved during the flooding as they might have grown above the water level, so the planting starts early in April - May using irrigation from the river. Important vegetables grown are cowpea, ladies-finger, legumes, bitter guard etc.

Band-B is predominantly paddy field. The land is vast, uniformly plain. One crop, from September – December is done here as the first crop (June – August) is not possible as the overflow of river will submerge the land. The northern part of this band has an acacia plantation owned by railways. During the period December-June the band is dry and without any cultivation. The band C is also having some paddy fields and the remaining portion has rubber, coconut and cashew plantations. Some human settlement is present in the western side. Here mixed vegetation with all local trees are present.

Ishak M. P. “Studies on the Comparative Ecology of the Riverine Systems of Kalpathi, Kunthipuzha and Nila Rivers with Emphasis on Avifauna.” Thesis. PG & Research Department of Zoology Farook College, Feroke, University of Calicut, 2019.

CHAPTER IV

WATER QUALITY ASSESSMENT

Assessment of water quality of a habitat is very important for ecological studies, especially those relating to riverine systems. Riverine systems are one among the most important ecosystems of the globe. The hydrologic and chemical cycles of the environment is variously influenced by riverine systems. Of the many critical roles played by rivers, some of very evident ones are; they help purifying polluted water, prevent floods, determine the ecology of the riverbanks and nearby terrestrial habitats and recharge the ground water aquifers.

Some of the pioneers of river ecological studies have been mentioned in chapter I (Shelford, 1911, Butcher, 1933, 1940; Ricker, 1934; Davis, 1938 and so on). An important hydrobiological study of the polluted River Lieve in Belgium was carried out by Evans, (1972). Iscandri (1990) conducted a basic study on physico – chemistry of the rivers and lakes in Waange- Sewa basin, Sierra Leone. The physico – chemical conditions of rivers and lakes of Okomu forest in Benin City, Nigeria were carried out by Ogbeibu and Victor (1995), Wilber et al (1996) studied the effect of increased rice farming on the hydrology of the Cache River in the Mississippi Valley. Poulichet et al (1999), worked on the trace metal and nutrient distribution in a low pH river - estuarine system. Analysis of dissolved oxygen, pH and temperature of a tributary of Mississippi River was carried out by Sabo et al (1999).

Many studies have been conducted on the physico-chemical parameters of the Indian rivers and fresh water bodies (Ganapati, 1955; Abraham, 1962; Rai, 1974; Singh and Dobriyal, 1981; Varma et al 1984). Joshi (1988) analyzed the interactions of different physico-chemical parameters of three hill streams of Western Himalayas. Shohola et al (1988) carried out a study on the physico- chemical features of Varuna River at Varanasi. An important study on the physico –chemical and bacteriological pattern of River Ganga at Mirzapur were carried out by Tripathi

et al (1988). The hot springs of Suraj Kund and Chandrama Kund were subjected to an elaborate study on their physico - chemical features by Jha (1992). Hydro-chemical characterization and quality assessment of a Western Himalayan river, Munawar Tawi, flowing through Rajouri district, Jammu and Kashmir were carried out by Zeeshan and Azeez (2016).

In Kerala, elaborate studies on the hydrographic parameters of rivers & backwaters were carried out by various researchers. Unnithan et al (1975); Gore et al (1979) have published their findings on the alarming situation of quality deteriorations of the inland waters of Kerala. The habitat quality and physico – chemical nature of back waters of Cochin were done by Bristow (1938), Qasim and Gopinathan (1969), Narayanan and Qasim (1969), Wellershaus (1972), Haridas et al (1973), Balakrishnan and Shynamma (1975). The four estuaries of Kallai, Beypore Korapuzha and Mahe were studied for their hydrographic nutrient constitution by SralaDevi et al (1983). Thomas (1995), Bhadran (1997), Nair and Aziz (1987) conducted studies on the seasonal changes in physico – chemical parameters of water sediment nutrients of Ashtamudi Lake. The impact of monsoonal wetland on groundwater chemistry was assessed by Azeez et al (2000). Raj and Azeez (2009) examined spatial and temporal variations in surface water chemistry of Bharathapuzha. An analysis of the temperature rise in the river basin was done by Raj and Azeez (2011). An environmental change analysis of the river was also done by Raj and Azeez (2017).

Objective

This study intends to assess the seasonal variation of the hydrological parameters of the three rivers at the nine sites for a period of one year. The detailed methodology of the analyses is given in appendix I.

Results

Temperature

The water temperature at the nine stations were monitored once in every month for a period of one year from January - 2005 to December 2005. The results

are recorded in table –10. Among the Nila river sites, at Ottappalam highest aquatic temperature recorded was 29.74⁰C. The maximum aquatic temperature of 33.2⁰C was recorded at Manchady in May. The minimum temperature of 27.8⁰C was recorded at Pattambi during July. It was seen that during monsoon and post monsoon period until February the temperature was below 30⁰C, whereas during the summer months (March, April and May) the temperature was above 31⁰C (Table 10). Among the Kalpathy river sites, 33.8⁰C was the highest water temperature at Kava, recorded in April. The minimum temperature was recorded at Manthakkad with a reading of 27.4⁰C (Table 10). In all the three study sites, minimum temperature was above 27⁰C. Study sites in the Kunthi river, showed lower readings compared to other river sites. Pathrakadavu recorded 26.8⁰C, the lowest reading, in February. Of the three rivers, highest temperature recorded was at the sites in Kalpathy river ranging between 33.8⁰C and 33.6⁰C. The lowest temperature readings ranged from 26.8⁰C to 27.1⁰C at the sites of Kunthi river.

pH

pH is an important parameter in ecological studies and the value of pH is an indicator of the quality of water. The pH scale ranges from 0 to 14, 7 is considered neutral, below 7 is judged as acidic and above 7 as alkaline. Natural rivers are generally alkaline mainly due to the presence of carbonates. Many factors including various biological activities like photosynthesis, aquatic temperature, pollution due to domestic and industrial wastes etc. will alter the pH value of water. Changes occur due to variation in the quality of water over seasons and exposure to air. Photosynthetic activity has a role in determining pH values as during the process, CO₂ is consumed. In the present study the pH of the three rivers at 9 study sites were determined once in every month for a period of one year collecting water samples and was measured by Indicator paper method.

The result showed in all the 9 study sites the pH was almost neutral and always above 7. The mean pH at Ottapalam was 7.21, the highest during September (7.42) and the minimum (7.10) during December. Pattambi showed a mean value of 7.23, the highest during September (7.60) and the minimum (7.08) during

December. At Manchady 7.70 was the highest pH during September and the lowest (7.14) recorded during April and December. The mean pH of Manchady was 7.26 (Table 11). Among the Kalpathy river sites Kava had a mean pH of 7.16, the lowest pH (7.08) recorded during January, and the highest (7.32) during September. Manthakkad had a mean pH of 7.22 with the highest value (7.52) during September and the lowest (7.10) during December. Parali had a mean pH of 7.25 with the highest value of 7.60 during September and the lowest value of 7.12 during December (Table 11).

The Kunthi river sites showed much lower value of pH. At Pathrakkadavu, the mean pH was 7.17 and the highest value of 7.38 recorded during September. The minimum value of pH was 7.04 during January. At Thootha the mean pH was 7.23, the highest (7.54) seen during September and lowest value (7.10) recorded during December. At Kariyannur the mean pH was 7.24, the highest value of 7.58 recorded during September and the lowest, 7.12 recorded during December (Table: 11). Comparing the three rivers, lowest mean pH of 7.16 and 7.17 was recorded at Kava (Kalpathy river) and Pathrakkadavu (Kunthi river). The highest mean pH of 7.25 was at Parali (Kunthi river) (Table: 11).

Total Dissolved solvents (TDS)

The estimation of TDS was done in all the 9 stations, collecting water samples and using the evaporating technique (details given in appendix 1). The highest amount of TDS was found at Parali of Kalpathi river (0.388 gm/l). The lowest TDS was found at Pathrakkadavu in the Kunthi River (0.340 mg/lit). The TDS content was high during the period from June to October and the peak value was recorded during September (all stations, except one, has above 0.4 mg). The lowest TDS was seen during the month of March in all stations (from 0.22 to 0.33). A comparison of the river showed that Kunthi river had the lowest values and Kalpathi river had the highest value (Table: 12)

Dissolved Oxygen

A biological system needs oxygen to carry out the metabolic processes for the release of energy for all life activities. The amount of dissolved oxygen in an aquatic system is an indicator of the health of that system, and reflects the physical and biological processes prevailing in waters (Trivedy and Goel, 1984). The high contamination by organic matter depletes the concentration of oxygen and may eventually lead to zero level of oxygen in the system. This process is also influenced by other factors such as the water temperature, the volume of organic matter for microbial respiration and sometimes the presence of reductants such as ferrous ion which absorb oxygen for chemical reactions (Gambrell and Patrick, 1978)

A pure, non- polluted aquatic body will be having high concentration of oxygen. As oxygen is a feebly soluble gas the concentration varies from 14.6 mg/l at 0°C to 7mg/l at 35°C of water, 1 atmosphere of pressure (Sawyer & McCarthy, 1978). In the present study the dissolved oxygen of the water sample of 3 rivers at 9 study areas were estimated using Winkler's method for 12 consecutive months (from January 2005 to December 2005), once in every month (The details of methodology described in appendix I).

The mean value of oxygen content in Bharathapuzha river stations showed that Ottappalam had the highest (9.66 mg/l) and Manchady had the lowest value (8.15mg/l). From December to April, the oxygen content was less than 9 mg/l where as May onwards there was a steady increase up to September ranging from 9.42 mg/l to 12.2 mg/l in all stations. Highest value of 12.2 mg/l obtained during July at Ottappalam (Table 13). Among Kalpathy river station highest mean value of 10.18 mg/l was obtained from Kava, Manthakkad gave a data of 9.93 mg/l and Parali 9.60 mg/l. In all the stations from January to April, the oxygen concentration was below 9 mg/l. From May to December, there was a steady increase from 9mg/l to 12.84 mg/l. The highest values were obtained during July and September in the three stations. The minimum value of 7.46, 7.32 & 7.86 were shown in February. Kunthi river stations showed a higher value among the three river stations. The mean value of 10.47 was the highest at Pathrakadavu and the other two stations, Thootha with

10.43 mg/l and Kariyannur 10.39 mg/l. Lowest amount of dissolved oxygen was seen during January and February (below 9 mg/l). March onwards the concentration increased from 9 mg/l reaching 12.68 mg/l in July. Higher values were obtained during July, August & September.

Among the three rivers, Kunthi river showed the highest concentration in all the three stations, the average of highest values (10.47 mg/l) at Pathrakkadavu. The second high values were obtained from the study sites of Kalpathy river, where the maximum was 10.18 mg/l at Kava. At Nila river stations, all values were below 10mg/l.

Alkalinity

Alkalinity can be defined as the capacity of water to resist the changes in pH that would make the water more acidic. This capacity is known as “buffering capacity”. In other words, alkalinity is the ability of water to neutralize acid. The alkalinity of natural water bodies are determined by the nature of the substratum, it flows. The type of soil, bedrock, limestone etc will decide the alkalinity of the water flowing through such media. Carbonates, bicarbonates, hydroxide compounds are the main sources of alkalinity. If a water body is passing through granites and conglomerates or sandstones, the alkalinity will be low and therefore the water body has weak buffering capacity. The aquatic life is highly dependent on the alkalinity of the medium. Most aquatic life functions best in a pH range of 6.0 to 9.0. Therefore, to protect the aquatic life in its maximum functional levels the alkalinity should be maintained within the optimum range which is above 20mg/l.

Alkalinity was measured in this study, collecting samples from the 9 study stations once in a month for one year. The methodology is described in detail in appendix I. Two titrations are involved in this method using phenolphthalein and methyl orange as indicators. Therefore, two values are obtained one as phenolphthalein alkalinity and the other as methyl orange alkalinity.

The result showed that Ottappalam, Pattambi and Manchady, the study stations in Nila river had a mean alkalinity of 3.55, 3.65 and 3.78 mg/l in the

phenolphthalein method. The methyl orange alkalinity was 41.92, 44.91 and 45.73 mg/l respectively, in these stations. It can be seen that Manchady site had a high alkalinity among these stations. The alkalinity was highest during September and October months. It receded from November and lowest during January. The Kalpathy river sites, Kava, Manthakkad and Parali showed a mean value of 3.35, 3.49 and 3.8 respectively in the phenolphthalein titration. The methyl orange alkalinities of these stations were 39.6, 37.15, and 46.16 mg/l respectively. Therefore, Parali study site had a maximum value in both methods, and Kava have the minimum value in phenolphthalein titration and Manthakkad in the methyl orange method. Here also the highest value was obtained during September and October months. The lowest value was obtained during January. The Kunthi river sites had a mean value of 3.35, 3.64 and 3.65 mg/l in the phenolphthalein titration. The methyl orange titration gave the value 39.09, 42.45 and 44.39 mg/l at Pathrakkadavu, Thootha and Kariyannur respectively. Pathrakkadavu showed the least alkalinity and Kariyannur the highest. In these sites, also the highest values were seen during the month of September and October months. The lowest values were obtained during the month of January. Among all the 9 study sites, Parali had the highest values of 3.80 PPM and 46.16 PPM and Pathrakkadavu had the lowest value of 3.35 PPM and 39.09 PPM. Among the three rivers, Nila river showed a mean value of 3.664 and 44.1 PPM, Kalpathy river with a mean value of 3.54 and 40.97 and Kunthi river with 3.55 and 41.97 PPM. Thus, Kalpathy had the lowest alkalinity and Nila the highest alkalinity among the three rivers (Table 14).

Inorganic phosphate

Phosphorous is an important nutrient of living organisms. Natural waters contain phosphorous in the form of H_2PO_4^- , HPO_4^{2-} and PO_4^{3-} . In water bodies the main contribution of phosphorous are from domestic wastes, detergents, industrial wastes, manure, insecticides etc used in farming. Many studies have been reported confirming the role of phosphorous as an indicator of water pollution (Klopatek, 1978; Mitsch et al 1979; Brown, 1981). In this study, estimation of phosphate phosphorous was carried out at 9 study stations by color matching technique using Ammonium molybdate (Denige's reagent) solution and stannous chloride solutions (details in appendix I).

The result of the estimation showed Nila river stations, Ottappalam, Pattambi and Manchady as having phosphate contents 0.50 ug/l, 0.57 ug/l and 0.45 ug/l respectively; the highest at Pattambi and lowest at Manchady. During the monsoon months of June, July and August the value was lowest, ranging from 0.34 ug/l to 0.10 ug/l. The highest values were seen during September, October and December months ranging from 0.38 to 1.1/ug/l. During the month of March, also the value was higher at all the three stations. The sites in the Kalpathy river, Kava, Manthakkad and Parali had a mean value of 0.30, 0.35 and 0.39 ug/l respectively. The highest content was at Parali (0.39 ug/l) and the lowest at Kava (0.30 ug/l). During monsoon period, the quantity was very low with the content being zero in June at Kava and lesser than 0.2 ug/l in other stations. During the months of September, October and December the values were higher ranging from 0.44 to 0.58 ug/l at all sites. The sites along Kunthi river, Pathrakkadavu, Thootha and Kariyannur contained phosphate in low quantities (0.21 to 0.36 ug/l). The highest value was seen at Kariyannur (0.36 ug/l) and lowest at Pathrakkadavu (0.21 ug/l). In monsoon months of June and July Pathrakkadavu showed zero content. Other sites also showed a value ranging from 0.10 to 0.24 ug/l. The highest values were seen during the months of September, October, December, March and April (Table 15).

Comparative analysis of the water quality of the three rivers

The analysis of the water quality of the three rivers showed that Kunthi river showed the lowest mean temperature (28.83° C), the minimum temperature recorded at Pathrakkadavu (26.80° C) in the month of February. The highest mean temperature among the three rivers was recorded in Nila river (29.65°C). The maximum mercury reading was seen at Kava (33.8° C) during the month of April. This high temperature can be attributed to the closeness of the river to the Tamil Nadu border, where the summer heat is higher than the other parts of Kerala. Among the three rivers, the lowest mean pH of 7.21 was found in Kunthi and Kalpathy river waters. But the lowest monthly reading of pH was recorded at Kava site of Kalpathy river (7.08) during the month of January. The highest mean pH was seen in Nila river (7.23) where the top reading was 7.70 at Manchady during the month of September.

The TDS estimation of the three rivers showed that Kunthi river sites had the minimum mean value of 0.354gm/l. The highest TDS was found in the Kalpathy river with a mean value of 0.376gm/l. The lower values were experienced during December & January and higher values were seen during the month of September. Estimation of dissolved oxygen gave the result that Kunthi river had the highest concentration with the mean value 10.43mg/l at Pathrakadavu. The lowest oxygen concentration was in Nila river with the mean value of 9.11mg/l. As the Kunthi river originates from Silent Valley forest and the rainfall showered in the study sites recorded were maximum, the higher oxygen content is justified.

Alkalinity was highest in Nila river among the three rivers with a mean value of 3.664 and 44.19 ppm in the two methods and lowest in Kalpathy river with a mean value of 3.552 and 40.97ppm. The Manchady site in Nila river was frequently inundated by the contamination of sea water during high tide and this salt content water had its influence upto Thrithala close to Pattambi. Moreover the effluents and sewage from towns and households are relatively higher along Nila river banks. This could be the reason for a higher value of alkalinity in Nila river. The estimation of inorganic phosphate showed that Nila river had the highest amount with a mean value of 0.506ug/l. The lowest value was found in Kunthi river with a mean count of 0.301ug/l.

So based on these six parameters, the quality of water was purest in Kunthi river. Out of these six parameters, higher values of four (pH, dissolved oxygen, alkalinity, and inorganic phosphate) were negatively affecting the quality of water in Nila River. So it was found that Nila had the most impure water among the three rivers (Table 15A).

Table 10: Water temperature (°C) at the study sites in 2005

Rivers	Sites	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Nila	Ottappalam	28.40	28.60	31.2	32.40	32.60	29.1	28.20	28.10	29.60	29.50	29.40	29.80	29.74
	Pattambi	29.20	28.70	31.80	32.20	29.00	27.80	27.80	27.90	28.60	29.80	30.00	29.90	29.62
	Manchady	28.4	29.10	31.4	32.4	33.2	28.90	28.40	27.90	28.4	29.00	28.9	29.2	29.6
Kalpathy	Kava	28.4	28.8	33.6	33.8	30.9	28.2	28.1	28.00	27.6	28.4	27.20	28.00	29.29
	Manthakkad	29.1	28.8	32.4	33.5	30.7	27.9	28.1	28.4	27.8	28.8	29.6	27.4	29.38
	Parali	28.60	28.80	31.40	33.60	31.80	28.20	28.50	27.20	28.70	29.10	28.20	27.50	29.24
Kunthi	Pathrakkadavu	27.10	26.80	29.80	32.80	31.40	27.60	28.10	27.90	27.40	29.20	29.70	27.20	28.85
	Thootha	28.20	27.30	30.40	32.80	33.60	27.20	27.60	28.40	27.40	28.00	28.4	27.1	28.86
	Kariyannur	27.80	27.40	30.20	32.10	32.20	28.20	27.00	27.80	27.30	29.30	28.80	27.30	28.78

Table 11: pH in water at the study sites in 2005

Rivers	Sites	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Nila	Ottapalam	7.20	7.12	7.24	7.20	7.22	7.18	7.21	7.12	7.40	7.42	7.16	7.10	7.21
	Pattambi	7.18	7.13	7.22	7.10	7.14	7.25	7.18	7.24	7.60	7.54	7.16	7.08	7.23
	Manchady	7.15	7.18	7.20	7.14	7.16	7.24	7.26	7.22	7.70	7.56	7.18	7.14	7.26
Kalpathi	Kava	7.08	7.12	7.14	7.16	7.16	7.20	7.18	7.17	7.32	7.28	7.10	7.09	7.16
	Manthakkad	7.12	7.15	7.16	7.14	7.22	7.25	7.24	7.18	7.52	7.44	7.15	7.10	7.22
	Parali	7.14	7.18	7.20	7.19	7.23	7.26	7.26	7.20	7.60	7.48	7.18	7.12	7.25
Kunthi	Pathrakkadavu	7.04	7.08	7.14	7.12	7.18	7.20	7.22	7.16	7.38	7.28	7.16	7.08	7.17
	Thootha	7.12	7.15	7.18	7.18	7.20	7.26	7.25	7.19	7.54	7.42	7.22	7.10	7.23
	Kariyannur	7.14	7.16	7.20	7.16	7.22	7.23	7.25	7.18	7.58	7.46	7.21	7.12	7.24

Table 12: TDS (gm/l) in water at the study sites in 2005

Rivers	Sites	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Nila	Ottapalam	0.38	0.41	0.22	0.26	0.34	0.36	0.39	0.40	0.42	0.36	0.35	0.36	0.354
	Pattambi	0.34	.39	0.24	0.25	0.33	0.38	0.38	0.42	0.44	0.38	0.33	0.37	0.354
	Manchady	0.36	0.39	0.28	0.29	0.32	0.37	0.40	0.42	0.46	0.39	0.31	0.36	0.362
Kalpathi	Kava	0.35	0.38	0.27	0.26	0.33	0.38	0.41	0.44	0.45	0.38	0.33	0.38	0.363
	Manthakkad	0.36	0.39	0.29	0.28	0.36	0.39	0.42	0.46	0.48	0.39	0.34	0.39	0.379
	Parali	0.38	0.40	0.31	0.30	0.35	0.38	0.44	0.45	0.48	0.41	0.38	0.38	0.388
Kunthi	Pathrakkadavu	0.28	0.32	0.30	0.32	0.34	0.38	0.39	0.4	0.38	0.36	0.32	0.30	0.340
	Thootha	0.30	0.31	0.32	0.34	0.35	0.37	0.38	0.41	0.42	0.40	0.34	0.32	0.355
	Kariyannur	0.36	0.32	0.33	0.36	0.37	0.36	0.39	0.42	0.44	0.41	0.35	0.31	0.368

Table 13; Dissolved Oxygen (in mg/l) at the study sites in 2005

Rivers	Sites	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Nila	Ottapalam	8.62	8.12	7.16	8.56	9.42	10.64	12.20	10.66	11.86	10.46	9.48	8.76	9.66
	Pattambi	8.24	7.26	7.22	8.45	9.64	10.82	11.98	10.42	12.10	10.24	9.54	8.68	9.54
	Manchady	7.48	7.34	7.28	8.10	7.92	9.76	8.42	8.26	9.20	8.54	8.14	7.42	8.15
Kalpathy	Kava	8.84	8.42	7.86	8.58	9.76	11.24	12.62	11.44	12.84	11.58	9.66	9.34	10.18
	Manthakkad	8.75	8.22	7.46	8.35	9.65	10.88	12.23	11.18	11.94	11.48	9.58	9.46	9.93
	Parali	8.44	8.14	7.32	8.32	9.58	10.78	12.20	10.26	11.16	10.68	9.24	9.18	9.60
Kunthi	Pathrakkadavu	9.52	9.18	8.46	8.74	9.88	11.24	12.68	12.12	12.58	11.34	10.28	9.64	10.47
	Thootha	8.94	8.68	9.25	9.68	10.38	10.84	12.64	12.10	12.25	10.85	9.96	9.78	10.43
	Kariyannur	8.64	8.84	9.38	9.96	10.28	10.76	12.20	12.16	12.34	10.92	9.82	9.46	10.39

Table 14; Alkalinity (in PPM) in water at the study sites in 2005

Rivers	Sites		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Nila	Ottapalam	Ph	3.4	3.2	3.7	3.4	3.6	3.5	3.6	3.2	4.4	4.2	3.3	3.10	3.552
		Mo	38.7	38.4	43.2	38.6	42.0	38.8	40.4	38.4	55.6	52.2	38.6	38.2	41.925
	Pattambi	Ph	3.3	3.2	3.6	3.1	3.6	3.8	3.3	3.7	5.0	4.8	3.3	3.2	3.658
		Mo	38.4	38.6	42.40	38.2	42.0	44.4	38.4	43.2	68.6	68.2	38.6	38.4	44.916
	Manchady	Ph	3.10	3.4	3.4	3.3	3.3	3.7	3.8	3.6	6.00	4.9	3.3	3.6	3.783
		Mo	38.2	38.8	38.8	38.6	38.6	43.2	44.4	40.4	78.8	68.4	38.6	42.00	45.73
Kalpathi	Kava	Ph	3.00	3.2	3.3	3.2	3.3	3.4	3.5	3.4	4.00	3.9	3.10	3.00	3.358
		Mo	38.00	40.0	38.6	38.4	38.6	38.7	38.8	38.6	44.8	44.5	38.2	38.	39.60
	Manthakkad	Ph	3.10	3.3	3.3	3.2	3.4	3.5	3.5	3.3	4.7	4.3	3.10	3.10	3.491
		Mo	38.2	38.6	38.6	38.4	38.6	4.00	38.8	38.6	43.2	52.4	38.2	38.2	37.15
	Parali	Ph	3.3	3.5	3.7	3.7	3.8	3.9	3.9	3.7	5.00	4.8	3.3	3.10	3.808
		Mo	38.6	38.8	43.2	43.2	44.4	44.5	44.5	43.2	68.6	68.2	38.6	38.2	46.166
Kunthi	Pathrakkadavu	Ph	2.6	2.8	3.3	3.1	3.4	3.5	3.6	3.3	4.2	3.9	3.3	3.2	3.35
		Mo	31.00	31.2	38.6	38.2	38.6	38.8	40.4	38.6	52.2	44.5	38.6	38.4	39.091
	Thootha	Ph	3.10	3.3	3.5	3.5	3.6	3.9	3.6	3.7	4.8	4.2	3.4	3.10	3.641
		Mo	38.2	38.6	38.8	38.6	42.00	44.5	40.4	42.2	54.8	52.2	40.6	38.2	42.45
	Kariyannur	Ph	3.3	3.4	3.7	3.4	3.5	3.6	3.6	3.3	7.9	4.7	3.4	3.10	3.658
		Mo	38.7	38.8	43.2	38.6	38.8	40.4	40.4	38.6	68.4	68.00	40.6	38.2	44.391

Ph = Phenolphthalein alkalinity, MO = Methyl orange alkalinity

Table 15; Inorganic Phosphate in water (in ug/l) at the study sites in 2005

Rivers	Sites	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Nila	Ottapalam	0.52	0.29	0.82	0.36	0.54	0.12	0.10	0.28	0.84	0.65	0.38	1.1	0.50
	Pattambi	0.58	0.34	0.86	0.38	0.52	0.18	0.12	0.34	0.92	0.72	.64	0.96	0.57
	Manchady	0.54	0.24	0.58	0.28	0.44	0.12	0.10	0.28	0.78	0.68	0.54	0.86	0.45
Kalpathi	Kava	0.34	0.22	.41	0.24	0.38	0	0.10	0.18	0.44	0.52	0.36	0.48	0.305
	Manthakkad	0.42	0.28	0.46	0.31	0.41	0.10	0.12	0.21	0.46	0.58	0.42	0.52	0.357
	Parali	0.46	0.31	0.51	0.35	0.47	0.12	.14	0.26	0.56	0.52	0.44	0.58	0.393
Kunthi	Pathrakkadavu	0.18	.14	0.24	0.28	0.32	0.00	.00	.18	0.34	0.38	0.26	0.31	0.219
	Thootha	0.32	0.26	0.36	0.38	0.44	0.10	.12	0.20	0.42	0.48	0.35	0.46	0.324
	Kariyannur	0.48	0.30	0.44	0.36	0.48	0.12	0.14	0.24	0.51	0.42	0.38	0.48	0.36

Table 15A: Comparative data of water quality parameters of three rivers

Rivers	Mean Temp. in °C	Mean pH in ppm	Mean TDS in gm/L	Mean Diss. O ₂ in mg/L	Mean Alkalinity in ppm (Phen.)	Mean Alkalinity in ppm (Mo)	Mean In. phos. in ug/L
Nila	29.65	7.23	0.356	9.11	3.664	44.19	0.506
Kalpathy	29.30	7.21	0.376	9.90	3.552	40.97	0.351
Kunthi	28.83	7.21	0.354	10.43	3.549	41.98	0.301

Phen= Phenolphthalein method. Mo= Methyl orange method

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CHAPTER V

THE FLORA

In an ecological study, floristic composition, its different features and diversity are of utmost importance. It involves density of plant species, canopy cover, vertical stratification, floral characteristics like phenology, seasonality of different species etc. The vegetation is categorized into trees, herbs, shrubs and grasses. An elaborate search for all plant species is not practical in a large study area. So an appropriate sampling method is selected in such a way that it reflects the floristic composition of each study site for comparison.

In this study to analyse the vegetation structure, an overall checklist of flora was prepared. The vegetation type of each study site was categorized as tree dominated, shrub dominated, plantation, forest etc. Then the phenology of large trees, herbs and shrubs were observed at the different study sites. Species composition of plants and the seasonality of flowers and fruits were observed. The three rivers under study originate from the high peaks of Western Ghats, has very rich vegetation on their banks until they reach the plains. This floristic richness is mainly due to the different type of forests, which give these rivers an ecological support by balancing the different environmental parameters.

River Nila when it reaches at Parali after its confluence with Kalpathypuzha flows through the plains characterized by broad alluvial flats and the shallow nature of the stream heading its way down to the sea. The river has extensive sand shores and it is supported by trees, patches of bamboos, palms and other vegetative types. Besides the two sides of the river has been an area of best agricultural practices from long past.

The other two rivers, the Kunthipuzha and Kalpathy have very rich vegetation on its catchment area at their initial course blended with forest covers. However, when they reach the plains the riverbed is not as extensive as Nila, because they are narrow rivers and the coasts of the rivers are richly populated. The

sand beds in the plains are not extensive as the bank slopes are showing high slopes. The area is famous for agricultural crops of different varieties.

Methodology

A multiple stage quadrat method is used to assess the vegetation of each site. For this, each band at each site was observed for its general nature of the flora, whether dominated by trees, shrub or herb, cultivation, plantation or forests. The species composition was estimated using a quadrat of 20m x 20m for trees, 10m x 10m for shrubs and in 5m x 5m for herbs and 2mx2m for grasses. In each site, three quadrats for each type were selected (Barbour et al, 1987; Knapp, 1984; Mathew et al, 1993; Eberhardt et al, 1991; Rolecek et al, 2007). The phenological stages as fresh leaf, mature leaf, leaf shedding, flowers and fruits in each of the four different seasons were observed and recorded. Sykes and Horril (1997) described the multiple stage quadrat method. A quadrat is a typical square plot with a convenient dimension. In my study sites, quadrats were selected randomly and the corners of the quadrats were marked with poles so that field studies could be repeated. Plants were identified by spot identification using field guides. The unidentified species were taken as samples such as flowers, leafy twigs and photographs and identified in the herbarium. Assistance of taxonomists of Kerala Agricultural University and other centres were also sought for identification (Sivarajan, 1984, 1991; Jain and Rao, 1997; Sasidharan, 2004, 2006; NHBS, 2006; Sharma, 2011; Gupta, 2006; Vidyasagaran and Madhusoodanan, 20014).

The different phenological stages of the plants were observed for 4 seasons as shown below.

Season I	:	March to May
Season II	:	June to September
Season III	:	October to December
Season IV	:	Jan to March

The total number of tree species found in the three river basins was 75 (table 16). The total number of shrubs species counted was 39 (table 17) and the total number of herbs species counted was 53 (table 18).

Table 16: Trees at the study sites and their phenological stages

S No	Species	Season I	Season II	Season III	Season IV
1	<i>Gliricidia sepium</i>	F, FR	LS	FL	ML, F
2	<i>Macaranga peltata</i>	FR	LS	FL, ML	F, FR
3	<i>Pongamia glabra</i>	ML, F, FR	ML, FR	ML, FR	LS, FL
4	<i>Syzygium cumini</i>	FR	LS	FL, ML	F, FR
5	<i>Erythrina indica</i>	F, FR	ML, LS	FL	F, FR
6	<i>Cocos nucifera</i>	AS			
7	<i>Mangifera indica</i>	ML, FR	ML, LS	FL, F	F, FR
8	<i>Morinda tinctoria</i>	F, FR	FR, LS	FL	ML, F
9	<i>Pavetta indica</i>	F, FR	FR, LS	FL, ML	ML, F
10	<i>Ervatamia heyneana</i>	ML, F	F, FR	FR, LS	FL, ML
11	<i>Eugenia recemosa</i>	FR, LS	ML, F, FR	F, FR, ML	FR, LS
12	<i>Areca catechu</i>	AS			
13	<i>Annona squamosa</i>	ML	F, FR	FR, LS	FL, ML
14	<i>Psidium guajava</i>	F, FR	LS, FL	ML	ML, F
15	<i>Eugenia jambolana</i>	FR, LS	FL, ML	ML, FR	FR
16	<i>Morinda tinctoria</i>	F, FR	FR, LS	FL, ML	ML, F
17	<i>Alstonia scholaris</i>	LS, FL	FL, ML	F, FR	FR, LS
18	<i>Strychnos nux-vomica</i>	F, FR	F, FR	FR, LS	FL, ML
19	<i>Ichnocarpus frutescens</i>	FR, LS	FL, F, FR	F, FR, ML	FR, ML
20	<i>Artocarpus heterophyllus</i>	FR, ML	ML, LS, FL	ML, F, FR	ML, FR
21	<i>Moringa pterygosperma</i>	FR, LS	ML	ML, F, FR	F, FR
22	<i>Carica papaya</i>	AS			
23	<i>Bambusa bambos</i>	LS, FL	FL, ML, F	F, FR	FR, LS
24	<i>Anacardium occidentale</i>	FR, LS	FL, ML	ML, F, FR	F, FR
25	<i>Ficus hispida</i>	FR, LS	FL, ML	ML, F, FR	F, FR
26	<i>Annona reticulate</i>	ML, F, FR	FR, LS	FL, ML	ML
27	<i>Bixa orellana</i>	ML	F, FR	FR, LS	FL, ML

S No	Species	Season I	Season II	Season III	Season IV
28	<i>Hevea braziliensis</i>	FR, LS	FR, FL	ML	ML,F, FR
29	<i>Tamarindus indica</i>	FR, LS	FL, F	F, FR, ML	F,FR, ML
30	<i>Nerium oleander</i>	AS			
31	<i>Ficus religiosa</i>	LS, FL	FL, ML	ML, F	F, FR, LS
32	<i>Cassia fistula</i>	F, FR	FR, ML	LS, FL	ML, F
33	<i>Pterocarpus marsupium</i>	ML	ML, F, FR	F, FR,LS	LS,FL, ML
35	<i>Tiliacora acuminata</i>	ML, F, FR	FR, ML	FR, LS	LS, FL
36	<i>Terminalia paniculata</i>	FL, ML	ML,F, FR	F, FR	FR, LS
37	<i>Grevillea robusta</i>	ML	F, FR	ML, LS	FL
38	<i>Dalbergia latifolia</i>	ML	ML, F, FR	ML, LS	FL
39	<i>Kydia calycina</i>	FL	ML	F, FR	FR, LS
40	<i>Terminalia bellirica</i>	LS, FL	ML	ML, F, FR	FR, LS
41	<i>Eucalyptus oblique</i>	FR, LS	FL, ML	ML, F	F, FR
42	<i>Erythrina stricta</i>	FR	LS, FL	ML	F, FR
43	<i>Terminalia chebula</i>	F, FR	FR, LS	FL, ML	FL, F, FR
44	<i>Embllica officinalis</i>	F, FR	FR, LS	FL, ML	FL,F, FR
45	<i>Schleichera oleosa</i>	F, FR	FR, LS, FL	ML	F, FR
46	<i>Albizia lebbeck</i>	F, FR	FR	FR,LS	FL, ML
47	<i>Syzygium cumini</i>	FR, LS	FL, ML	ML, F	F, FR
48	<i>Vateria indica</i>	FR	FR, LS	FL, ML	F, FR
49	<i>Glycosmis mauritiana</i>	FR, LS	FL, ML	F, FR	F, FR
50	<i>Artocarpus integrifolia</i>	FR, LS	FL	ML, F, FR	F, FR
51	<i>Spondias indica</i>	F, FR	F, FR	FR, LS	FL, ML
52	<i>Glochidium fagifolium</i>	FR, LS	LS, FL	ML	F, FR
53	<i>Legerstroemia indica</i>	FR, ML	ML, LS	LS	FL, F, FR
54	<i>Bombax malabarica</i>	F, FR, LS	FL, ML	ML	F, FR
55	<i>Peltophorum pterocarpum</i>	LS,FL	FL, ML	F, FR	F, FR
56	<i>Wendlandia thyrsoides</i>	FR, LS, F	FL	ML, F	F, FR
57	<i>Corypha umbraculifera</i>	FR	ML	FL	FL, F
58	<i>Borassus flabellifer</i>	FR	ML	FL	FL, F
59	<i>Acacia torta</i>	ML, F	F, FR	FR	LS, FL

S No	Species	Season I	Season II	Season III	Season IV
60	<i>Butea monosperma</i>	FR, FL	ML	F,FR	FR, LS
61	<i>Tylophora indica</i>	FR, LS	FL	ML, F	F, FR
62	<i>Cycas circinalis</i>	LS, FR, FL	ML, F	F, FR	FR
63	<i>Tectona grandis</i>	LS, FL	FL, ML,F	F, FR	FR, ML
64	<i>Albizia procera</i>	FR, LS	FL, F	ML, FR	FR, ML
65	<i>Oroxylum indicum</i>	FL, ML	F, FR	FR	LS
66	<i>Cinnamomum sulphuratum</i>	FR, LS	FL, F	ML	FR
67	<i>Calophyllum elatum</i>	ML, LS	FL, F	FR	FR
68	<i>Ziziphus rugosa</i>	LS, FR	FL	ML, F	F,FR
69	<i>Miliusa tomentosa</i>	F	FR	ML	LS, FL
70	<i>Pterospermum diversifolium</i>	F, FR	LS, FL	F, ML	F, FR
71	<i>Terminalia crenulata</i>	LS, FL	F, FR, ML	FR	FR
72	<i>Gracinia indica</i>	F, FR	FR, LS	F, FL	F, FR, ML
73	<i>Mesua ferrea</i>	F, FR, ML	FR	FR, LS	F, FL
74	<i>Gardonia obtuse</i>	F, FR	LS, FL	F, ML	F, FR
75	<i>Pittosporum undulatum</i>	F, FR	FR, LS	F, ML	F, FR

AS= All Seasons, F= Flowers, FR= Fruits, FL=Fresh leaves, ML= Mature leaves, LS= Leaf shedding

Table 17: Shrubs at the study sites and their phenological stages

S No	Species	Season I	Season II	Season III	Season IV
1	<i>Clerodendrum infortunatum</i>	LS	FL, ML	F, FR	F, FR
2	<i>Mussaenda frondosa</i>	FL, ML	ML, F, FR	F, FR	F, FR
3	<i>Eupatorium odoratum</i>	FR	LS, FL	ML, F, FR	F, FR
4	<i>Ichnocarpus frutescens</i>	LS, ML	ML, F, FR	F, FR	FR, LS
5	<i>Rauvolfia tetraphylla</i>	AS			
6	<i>Ervatamia coronaria</i>	F, FR	F	F	F, FR
7	<i>Calatropis gigantea</i>	AS			
8	<i>Datura stramonium</i>	ML	F, FR	LS, FL	FL, ML
9	<i>Stachytarphata indica</i>	FL, ML	F, FR	F, FR	LS, FL

S No	Species	Season I	Season II	Season III	Season IV
10	<i>Zizyphus jujube</i>	F,FR	FL	ML	FL,F
11	<i>Jasminum malabaricum</i>	F	ML	F	F
12	<i>Canthium parviflorum</i>	F, FR	FR, LS	FL	ML
13	<i>Vitis flexuosa</i>				
14	<i>Chassalia curviflora</i>	FL, ML	ML, F, FR	F, FR	F, FR, LS
15	<i>Lantana camara</i>	F,FR	FR, LS	FL	ML
16	<i>Aristolochia indica</i>	LS, FL	F, FR	F, FR	F, FR
17	<i>Ixora coccinia</i>	AS			
18	<i>Rauwolfia serpentina</i>	F,FR	F,FR	FR,LS	FL, ML
19	<i>Cryptolepis buchanani</i>	F,FR	F, FR	LS, FL	ML
20	<i>Solanum torvum</i>	FL, ML	F, FR	F, FR	FR, LS
21	<i>Clerodendrum inerme</i>	FL	ML	F, FR	FL
22	<i>Thunbergia mysorensis</i>	LS, FL	FL, ML	F, FR	F, FR
23	<i>Crotalaria laburnifolia</i>	F, FR, LS	FL, ML	ML	F, FR
24	<i>Hibiscus furcatus</i>	LS, FL	ML	F,FR	F, FR
25	<i>Urena sinuata</i>	ML	F,FR	F, FR	LS, FL
26	<i>Rotala indica</i>	FL, ML	F, FR	F, FR	LS, FL
27	<i>Synendrella nodiflora</i>	AS			
28	<i>Breynia retusa</i>	F, FR	LS, FL	FL, ML	F, FR
29	<i>Tinospora cordifolia</i>	F, FR	FR, FL	FL, ML	F, FR
30	<i>Scoparia dulcis</i>	AS			
31	<i>Clerodendron inerme</i>	FL, ML	ML	F, FR	LS, FL
32	<i>Ipomea obscura</i>				
33	<i>Ricinus communis</i>	F, FR	FR, LS	FL	ML
34	<i>Jatropha glandulifera</i>	FR	FR, LS	FL, ML	F
35	<i>Ocimum sanctum</i>	FR, F	FL, F	FL,ML	F,FL
36	<i>Tephrosia purpurea</i>	F,FR	FR,LS	FL	ML
37	<i>Xanthium strumarium</i>	F,FR	LS,FL	FL, ML	F, ML
38	<i>Tribulus terrestris</i>	FR,F	F,FL	F,FR	FR,ML
39	<i>Melochia corchorifolia</i>	FR,FL	ML,F	F,FR	FR

AS= All Seasons, F= Flowers, FR= Fruits, FL=Fresh leaves, ML= Mature leaves, LS= Leaf shedding

Table 18: Herbs at the study sites and their phenological stages

S No	Species	Season 1	Season II	Season III	Season IV
1	<i>Ageratum conyzoides</i>	AS			
2	<i>Eclipta alba</i>	AS			
3	<i>Leucas aspera</i>	LS	FL, F, FR	F, FR	FR
4	<i>Scoparia dulcis</i>	AS			
5	<i>Cleome monophylla</i>	F, FR, ML	FR, ML	LS, FL	FL, F
6	<i>Viola enneasperma</i>	FL, ML	F, FR	FR	LS, FL
7	<i>Polygala javana</i>	FR, LS	FL, F	FR	FR
8	<i>Portulaca grandiflora</i>	AS			
9	<i>Osbeckia hispidissima</i>	LS, FL	FL, ML	F, FR	FR, LS
10	<i>Melothria amplexicaulis</i>	LS, FL	ML, F, FR	F, FR	FR, LS
11	<i>Eupatorium odoratum</i>	FR, LS	FL	ML, F	F, FR
12	<i>Spilanthes calva</i>	FR, LS	FL	ML	F, FR
13	<i>Croton sparciflorus</i>	FR	LS, FL	ML	F, FR
14	<i>Urena lobata</i>	ML	ML, F, FR	FR	LS, FL
15	<i>Aerva lanata</i>	FR, LS	FL,F, FR	FR	FR, ML
16	<i>Sphaeranthus indicus</i>	FR, LS	FL,ML	ML	F, FR
17	<i>Desmodium triflorum</i>	AS	AS	AS	AS
18	<i>Ipomoea marginata</i>	AS	AS	AS	AS
19	<i>Mollugo pentaphylla</i>	ML	F, FR	LS	FL,ML
20	<i>Clitoria ternatea</i>	ML	F,FR	FR,LS	FL, ML
21	<i>Tridax procumbens</i>	AS			
22	<i>Oldenlandia corymbosa</i>	F, FR	FR	LS, FL	FL, ML
23	<i>Catharanthus pusillus</i>	F,FR	F,FR	FR, LS	FL, ML
24	<i>Cyclea peltata</i>	F, FR	LS, FL	FL, ML	ML
25	<i>Cleome viscosa</i>	F, FR	F,FR, LS	FL, ML	ML
26	<i>Sida cordata</i>	AS			
27	<i>Sebastiania chamaelea</i>	ML	F, FR	F, FR	LS, FL
28	<i>Urena sinuata</i>	ML	F, FR	F, FR	LS, FL
29	<i>Acmella oppositifolia</i>	LS, FL	F, FR	F, FR	ML
30	<i>Spiranthes sinensis</i>	AS	AS	AS	AS
31	<i>Cyanotis axillaris</i>	F, FR	LS, FL	FL, ML	F, FR

S No	Species	Season 1	Season II	Season III	Season IV
32	<i>Phyllanthus viogratus</i>	ML	F, FR	F, FR	LS, FL
34	<i>Mimosa pudica</i>	LS,FL	ML	F, FR	F, FR, LS
35	<i>Parthenium hysterophorus</i>	LS, FL	F, FR	F, FR	F, FR, LS
36	<i>Sesamum indicum</i>	FL, ML	F, FR	F, FR	LS, FL
37	<i>Acalypha rhomboidea</i>	F, FR	FR	LS, FL	ML
38	<i>Acalypha virginica</i>	F, FR	FR	LS	FL,ML
39	<i>Emilia sonchifolia</i>	LS	FL, ML	ML,F	F, FR
40	<i>Dactyloctenium aegyptium</i>	LS	FL	ML, F	F,FR
41	<i>Kyllinga brevifolia</i>	FL, ML	F,FR	F,FR	LS, FL
42	<i>Brachiaria ramosa</i>	LS	FL,ML	ML, F	F,FR
43	<i>Lindernia serrata</i>	FR, LS	FL	ML	F,FR
44	<i>Biophytum sensitivum</i>	ML	F, FR	FR	LS,FL
45	<i>Senna alata</i>	FR	LS, FL	ML, F	F, FR
46	<i>Nymphoides indica</i>	FR, LS	FL	ML	F,FR
47	<i>Eichhornia crassipes</i>	ML	F,FR	FR	FL
48	<i>Aconitum columbianum</i>	F, FR	FR	FL	ML,LS
49	<i>Actaea rubra</i>	FR	LS	FL	ML,F
50	<i>Agalinis linifolia</i>	F, FR	FR	FL	ML
51	<i>Agalinis oligophylla</i>	F, FR	FR	FL	ML
52	<i>Ruta graveolens</i>	ML	F	FR	FL
53	<i>Phyllanthus amarus</i>	ML	ML, FL	F, FR	FR

AS= All Seasons, F= Flowers, FR= Fruits, FL=Fresh leaves, ML= Mature leaves, LS= Leaf shedding

Nila river Site I: Ottappalam

The site is predominantly under agriculture and the bands B and C are thickly populated. I observed a total number of 28 species of trees in three bands. Band-A has 16 species, B- band has 23 species and C-band with 22 species. The total No. of trees in A- band is 24, in B-band 35 and in C-band 46 (Table 46).

Table 19: Ottappalam: Trees – Phenological stages over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	25	14	9	13
Fruits	25	14	9	13
Fresh leaf	12	12	11	4
Mature leaf	4	12	3	8
Leaf shedding	8	15	5	4

In Band-A, during season I (i.e. March to May), 25 species of trees were in flowering and fruiting stages, 12 species with fresh leaves, 8 species in leaf shedding stage, and 4 species with mature leaf. During Season II (i.e. June-Sept) 14 species were in the flowering and fruiting stages. 15 species were in the leaf shedding stage, 12 species were in the fresh leaf stage and another 12 species in the mature leaf stage. During Season III (Oct – Dec), 9 species were in the flowering and fruiting stage, 5 species in leaf shedding stage, 11 species in fresh leaf stage, 13 species in mature leaf stage and 5 species in flowering stage. During Season IV (Jan – Mar), 13 species were with flowers and fruits, 4 species in the leaf shedding stage, 4 species in the fresh leaf stage, 8 species in the mature leaf stage and seven species with flowers (Table 19).

Shrubs

Shrubs are more predominant in this site as cultivation is limited to B and C bands. In the Band-A the land comprises swampy patches and bushes. In total 22 species were observed in three quadrates of each band. The phenological stages of flowering, fruiting, fresh leaf, mature leaf and leaf shedding observed over four seasons is given in table 20.

Table 20: Shrubs - Phenological stages over the seasons at Ottappalam

Stages	Season I No. of species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	12	7	9	8
Fruits	13	10	9	8
Fresh leaf	8	7	6	6
Mature leaf	8	7	6	6
Leaf shedding	6	6	2	2

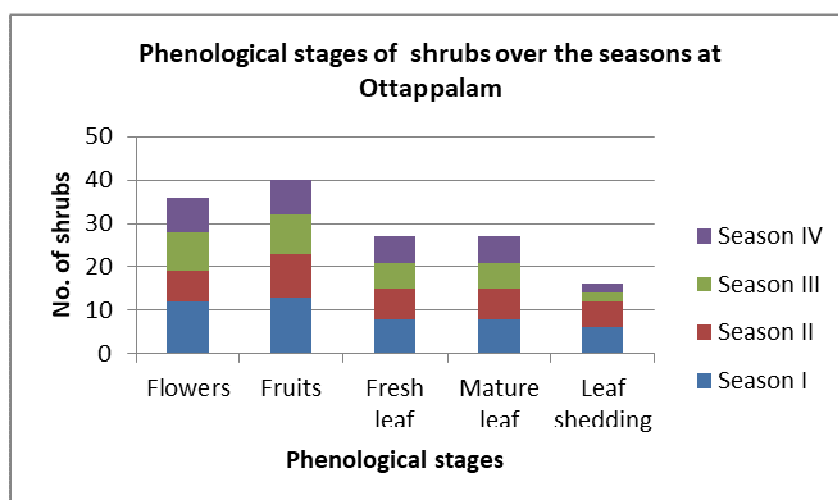


Fig 15

Band-A has 14 species with 27 numbers of plants. In the B-band 19 species were seen in three quadrates. The total number of plants counted was 39. In Band-C, 16 species were observed in three quadrates, with a total number of 34 Shrubs (Table 47). Of the 22 species, 12 species were seen in the flowering stage, 13 species were in the fruiting stage, 8 species in the fresh leaf stage, and 8 species in the mature leaf stage and 6 species in leaf shedding stage during season I. During Season II seven species were found in the flowering stage, ten species in the fruit bearing stage, 7 species with fresh leaves, seven species with mature leaves and 6 species in the leaf shedding stage. In the course of Season III, 9 species were in the flowering stage, another 9 in the fruiting stage, 6 species in the fresh leaf stage, another six species in the mature leaf stage and two species in the leaf shedding

stage. In the season IV, 8 species were in the flowering stages, 8 species in the fruiting stage, six species in the fresh leaf stage, another six in mature leaf stage and 2 species in leaf shedding stage (Table 20).

Herbs

In the study site at Ottappalam 24 species of herbs were recorded in the three bands; adopting quadrat sampling method. Of the 24 species, 16 species were found in the A-band, 19 species in the B-Band and another 19 species in the C-band (Table 48). During Season I, 9 species were in the flowering stage, 13 species in the fruiting stage, 9 species in the fresh leaf stage, 6 species having mature leaf and one species in the leaf shedding stage.

Table 21: Ottappalam – Herbs - Phenological stages over Seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	9	9	8	17
Fruits	13	10	10	13
Fresh leaf	9	11	6	9
Mature leaf	6	7	9	10
Leaf shedding	1	7	1	6

In the Season II, 9 species were in the flowering stage, 10 species in the fruiting stage, 11 species having fresh leaves, 7 species with mature leaves and 7 species in leaf shedding. During season III, 8 species were blooming, 10 species bearing fruits, six species in the fresh leaf stage, 9 species with mature leaf and 1 species shedding leaves. During season IV, 17 species were with flowers, 13 species having fruits, 9 species with fresh leaves, 10 species having mature leaf and 6 species in the leaf shedding stage (Table 21).

Grasses

At Ottappalam, 8 species of grasses were observed in three bands. Of this, 7 species were present in Band-A, another 6 in Band-B and 7 species in band C. In each band the mean number of each species in 3 quadrates were calculated. Band-A had a total number of 13 of the 7 species. In Band-B, 6 species had a count of 11 and in Band-C, 7 species comprise 15 numbers (Table 49).

Cultivation

At Ottappalam, 11 species of crops were seen being raised. Of this, 5 species were vegetables, one species (Paddy) as an important food crop, 2 species (*Cocos* and *Areca*) as long-term plantations and 3 species (*Musa* species) annuals (Table 50).

Nila river Site II – Pattambi

The land use pattern and climate of this site were discussed in Chapter II. The study area is having thick population and good vegetation.

Trees

In total 32 species were counted in the three bands A, B and C. In each band the number of species and total numbers were estimated. In Band-A, 21 species were recorded. In Band-B also 21 species and in Band-C, 26 species were seen. Band-A had a total of 35 trees, Band-B, 42 numbers and Band-C another 42 numbers (Table 51).

Table 22 Pattambi: Trees – Phenological stages over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	15	12	15	19
Fruits	28	16	14	21
Fresh leaf	7	16	12	9
Mature leaf	11	15	18	11
Leaf shedding	16	11	2	6

Of the 32 species during Season I, 15 were in the flowering stage, 28 were in the fruiting stage, 7 species with fresh leaves, 11 species in the mature leaf stage and 16 species showed leaf shedding. In Season II, 12 species were in blooming, 16 species with fruits, another 16 with fresh leaves, 15 species having mature leaves and 11 species in the leaf shedding stage. During Season III, flowers were observed on 15 species, fruits born by 14 species, 12 species with fresh leaves, and 18 species in the mature leaf stage, and 12 species showing leaf shedding. Season IV witnesses, 19 species in the flowering stage, 21 species in fruiting stage, 9 species with fresh leaves, 11 species having mature leaves and 6 species in leaf shedding condition. (Table 22)

Shrubs

At Pattambi, 28 species of shrubs were noted in 3 bands A, B and C. Of this 16 species were seen in Band-A, 18 species in Band-B and 11 species in band C, estimated in appropriate sampling method. Of the 16 species in Band-A, 40 individual shrubs were counted, in Band-B, 49 numbers and in Band-C, 29 individuals (Table 52).

Table 23: Pattambi: Shrubs – Phenological stages over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	13	16	17	15
Fruits	12	18	19	15
Fresh leaf	14	9	9	11
Mature leaf	9	13	7	10
Leaf shedding	6	3	3	6

During Season I, 13 species were in blooming stage, 12 species in fruit bearing stage, 8 species in fresh leaf condition, 6 species in leaf shedding stage and 8 were with mature leaves. Season II showed 16 species in flowering condition, 18 species in fruits, 9 species in fresh leaf stage, 13 species in mature leaves and 3

species shedding leaves. In Season III, 17 species were in blooming, 19 species with fruits, 9 species having fresh leaves, 7 species with mature leaves and 3 species in leaf shedding stage. Season IV witnessed, 15 species in flowering stage, another 15 with fruits, 11 species in fresh leaves, 10 species having mature leaves and 6 species in leaf shedding stage (Table 23).

Herbs

24 species of herbs were observed at Pattambi in three bands. Band-A had 13 species, Band-B with 14 and Band-C with 15 species. The total number of plants was 119, of which 42 plants were counted in Band-A, 36 in Band-B and 41 in Band-C (Table 53). During Season I, 10 species were in flowering stage, 15 species in fruiting stage, 8 were in the fresh-leaf stage, 10 species in mature leaf stage, and 6 species were in leaf shedding. In Season II, 11 species were in blooming, another 11 in the fruit bearing condition, 8 species in fresh leaves, 3 species with mature leaves and 2 species in the leaf shedding stage. Over Season III, 4 species were in flowers, 9 species in fruits, 4 species in the fresh leaf stage, another 4 each in mature leaf and leaf shedding stages. Season IV, witnessed 6 species in flowering 8 species fruiting, 7 species in fresh leaves, another 7 in mature leaves and 4 species in leaf shedding stages (Table 24).

Grasses

At Pattambi, 16 species were identified in three bands. Of this 5 were present in Band-A, 11 species in Band-B, and also 11 in Band-C. The mean of three quadrates in each band gave the number of individual grasses as 23 in Band-A, 31 in Band-B and 43 in Band-C (Table 54).

Table 24: Pattambi: Herbs – Phenological stages over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	10	11	4	6
Fruits	15	11	9	8
Fresh leaf	8	8	4	7
Mature leaf	10	3	4	7
Leaf shedding	6	2	4	4

Cultivations

19 species of different crops including paddy, vegetables and plantations of coconut and areca nut were cultivated in this site. Band-A had 15 species, Band-B 19 species and Band-C, 15 species: Majority of the crops were sown during April – May and harvested before December. Paddy was harvested in two seasons i.e. May to August and September to December. 3 species were cultivated in all seasons (Table 55).

Nila river – Site III: Manchady

This site is predominantly utilized for social forestry and the major plantation is *Acacia*. The remaining part is paddy field and hills with varieties of trees.

Trees

In total 28 species were found in 3 bands. Band-A had 16 species, Band-B, 23 species and Band-C, 22 species. The total number of plants counted was 105 of which Band-A contained 24 numbers, Band-B, 35 numbers and Band-C, 46 numbers (Table 56). The phenological stages were observed for four seasons. During Season I, i.e. from March – May, 17 species were found in flowering stage, 24 species in the fruiting conditions, 10 species in fresh leaves, another 10 species in mature leaf stage and 11 species in leaf shedding stage.

Table 25: Manchady: Trees – Phenological stages over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	17	4	12	22
Fruits	24	10	14	18
Fresh leaf	10	9	13	9
Mature leaf	10	16	15	7
Leaf shedding	11	9	4	5

During Season II (June – Sept) 4 species were seen in flowering stage, 10 species in fruit bearing stage, 9 species in fresh leaves, 16 species in mature leaves, and 9 species in leaf shedding. During season III (October – December) 12 species were in blooming, 14 species in fruiting, 13 species with fresh leaves, 15 species with mature leaves and 4 species in leaf shedding. Season IV (January – March) witnessed 22 species in flowering, 18 species in fruiting, 9 species in fresh leaves, 7 species with mature leaves and 5 species in leaf shedding (Table 25).

Shrubs

21 species of shrubs were identified in 3 bands. Of this, 13 species were found in Band-A, 18 species in Band-B, and 20 species in Band-C. Total number of plants counted was 70, of which Band-A had 19, Band-B 22, and Band-C 29 numbers (Table 57). During Season I, 14 species were in blooming, 13 species in fruit bearing stage, 4 species with fresh leaves, 3 species having mature leaves and 4 species in leaf shedding stage. During season II, 8 species were in flowering stage, 13 species were with fruits, 8 species in fresh leaf stage, 4 species with mature leaves and 5 species in leaf shedding condition. Season III witnessed 11 species in blooming, 10 species, with fruits, 7 species in fresh leaf stage, another 7 species with mature leaves and 3 species in leaf shedding. During Season IV, 13 species were in flowering stage, another 13 in fruiting condition, 3 species with fresh leaves, 6 species with mature leaves and 7 species in leaf shedding (Table 26).

Table 26: Manchady: Shrubs – Phenological stages over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	14	8	11	13
Fruits	13	13	10	13
Fresh leaf	4	8	7	3
Mature leaf	3	4	7	6
Leaf shedding	4	5	3	7

Herbs

24 species were identified in this study site. Out of this, 19 were seen in Band-A, 21 in Band-B and 20 in Band-C. The total number of plants counted was 99, of which 28 plants were seen in Band-A, 32 in Band-B and 39 in Band-C (Table 58). The phenological stages observed during Season I showed 10 species in flowering, 15 species in fruiting, 4 species in fresh leaves, 5 species in mature leaf stage and 8 species in leaf shedding. Season II had 11 species in flowers, 14 in fruits, 6 in fresh leaves, 7 in mature leaves and 2 in the leaf shedding condition. Season III witnessed 9 species in blooming, 10 species in fruiting, 6 species in fresh leaves, 8 species in mature leaves, and 5 species in leaf shedding. During Season IV, 13 species were in flowering, 12 in fruiting, 7 in fresh leaf stage, 6 in mature leaf stage and 4 in leaf shedding (Table 27).

Table 27: Manchady: Herbs – Phenological stages over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	10	11	9	13
Fruits	15	14	10	12
Fresh leaf	4	6	6	7
Mature leaf	5	7	8	6
Leaf shedding	8	2	5	4

Grasses

11 species of grasses were identified in this study site. Of which 8 species were found in Band-A, 9 in Band-B and 11 in Band-C. Total number of plants counted was 101. In Band-A, 33 plants were seen, in Band-B, 27 and in Band-C-41 (Table 59).

Cultivations

7 species of vegetables and crops were in cultivation in this site. In Band-A, no cultivation observed as this area was fully utilized for Acacia plantation. Band-B had 4 species, the predominant one being paddy. 2 species of vegetables also seen cultivated here. In Band-C, 6 species were cultivated. Of this, 2 species of plantation i.e. *Cocos* and *areca* were present in all seasons. The remaining was cultivated from May – January (Table 60).

Vegetation of Kalpathypuzha

Site I: Kava:

Here less cultivation was observed in band-A, and band - C. Human settlement is restricted to band –B and the cultivation is limited to this band. Major part of the site is part of Malampuzha reservoir.

Trees

35 species of trees were identified in three bands. Band-A had 4 species, band - B, 22 and band – C - 28 species. 63 numbers of trees were counted in all the three quadrates of each band. Band –A had 4 numbers, Band-B, 24 numbers and band – C 35 (Table 61). The Phenological Studies showed that, during season I, 14 species were in flowering condition 22 species in fruit bearing stage, 3 species in fresh leaf stage, 6 species with mature leaves and 12 species in leaf shedding condition. Season II appeared with 9 species of trees in flowering stage, 10 species in fruiting condition, 9 with fresh leaves, 17 with mature leaves and 8 in leaf shedding stage. Season III witnessed, 12 species in blooming, 15 species in fruiting, 11 species in fresh leaves, 10 species with mature leaves and 6 in leaf shedding .

During season IV, 20 species were in flowering condition, 16 species in fruiting, 11 with fresh leaves, and 12 with mature leaves and 6 in leaf shedding (Table 28).

Table 28: Phenological stages of trees at Kava

Stages	Season I No of species	Season II No of species	Season III No of species	Season IV No of species
Flowers	14	9	12	20
Fruits	27	10	15	16
Fresh leaf	3	9	11	11
Mature leaf	6	17	10	12
Leaf shedding	12	8	6	6

Shrubs

26 species were observed in 3 bands. Band –A with 15 species, Band-B with 23 and band–C with 25 species. In total 78 plants were counted, of this band –A contained 20 numbers, band –B, 33 numbers of shrubs and, band –C 25 plants (Table 62).

Of the Phenological stages recorded, Season I showed ,14 species in flowers, 15 species in the fruiting stage, 9 species with fresh leaves , 8 species in mature leaf stage and 6 species in leaf shedding stage. During season II, 13 species were in flowering, 16 in fruiting, 8 in fresh leaf stage, 10 in mature leaf stage and 2 in leaf shedding. Season IV witnessed 18 species in blooming, 12 species in fruiting, 11 in fresh leaves, 9 in mature leaves and 7 in leaf shedding (Table 29).

Table 29: Phenological stages of Shrubs at Kava

Stages	Season I No. of species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	14	13	15	18
Fruits	15	16	14	12
Fresh leaf	9	8	10	11
Mature leaf	8	10	8	9
Leaf shedding	6	4	2	7

Herbs

In total 27 species were identified in three bands. Of this, 14 were present in Band –A, 23 in Band – B, and 19 in Band C. Regarding numbers of individual plants, 95 herbs were counted in total. Of these, Band–A had 20 numbers, Band-B with 41 numbers and band–C with 34 (Table 63). Phenological stages observed over the four seasons gave the data as follows. Season I showed 13 species in flowering stage, 18 in fruit bearing stage, 6 with fresh leaves, 12 with mature leaves, and 7 in leaf shedding condition. During season II, 15 species were in blooms, 16 in fruiting stage, and 13 in fresh leaf stage, 5 in mature leaf stage and another 5 in leaf shedding condition. Season III witnessed 10 species in flowering, 12 in fruiting, 9 in fresh – leaf stage, 12 in mature leaf and 5 in leaf shedding. Season IV showed 14 species with flowers 15 with fruits, 8 with fresh leaves, 11 in mature leaves and 4 in leaf shedding (Table 30).

Table 30: Phenological stages of Herbs at Kava

Stages	Season I No of species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	13	15	10	14
Fruits	18	16	12	15
Fresh leaf	6	13	9	8
Mature leaf	12	5	12	11
Leaf shedding	7	5	5	4

Grasses

11 species of grasses were identified in three bands. Band-A had 5 species, band-B 10 and Band-C 11. The mean number of individuals of three quadrates of each band amounted 63. Of this Band-A had 12 numbers, Band-B 27 and Band-C, 24 (Table 64).

Cultivation

As major area is devoid of human inhabitations, cultivation is limited. 8 species of vegetables, 2 species of plantation trees and one crop (Paddy) were seen cultivated. In Band-A, no cultivation observed. In band-B all the 11 species, were seen cultivated and in band-C none. 4 species were seen in all seasons. Paddy cultivation during one season only, i.e. September- December. All other vegetables are cultivated and harvested between April and January (Table 65).

Kalpathy river - Site II Manthakkad

Here human inhabitation is limited to B and C bands, while agricultural practices were observed only in B and C bands.

Trees

A total of 26 species of trees were observed. Band-A had 9 species, Band-B, 19 species and band-C with 18 species. Of the total 58 trees counted in 9 quadrates

of the three bands, 9 trees were in band –A, 24 numbers in band –B and 24 in band C (Table 66). Regarding the phenological stages data of the four seasons, season I had 14 species in flowering condition, 19 in fruiting stage, 5 with fresh leaves, 7 species in mature leaves and 5 in leaf shedding stage. During season II, 9 species were in blooming, II species in fruiting stage, 9 in fresh leaves, 14 in mature leaf condition and 10 in leaf shedding stage. Season III showed 11 species with flowers, 12 species in fruits, 10 species in fresh leaf stage, 13 with mature leaves and seven in leaf shedding. Season IV had 17 species in flowering, 13 in fruiting, 9 in fresh leaf, 12 in mature leaf and 5 in leaf shedding (Table 31).

Table 31: Phenological stages of Trees at Manthakkad over seasons

Stages	Season I No. of species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	14	9	11	17
Fruits	19	11	12	13
Fresh leaf	5	9	10	9
Mature leaf	7	14	13	12
Leaf shedding	5	10	7	5

Shrubs

A total of 18 species of shrubs were indentified in 3 bands. Band-A had 11 species, Band-B, 16 species, Band-C, with 11 species. Total number of plants counted in 9 quadrates of 3 bands amounted 52. Of this, 18 were present in Band-A, 12 in Band-B and 13 in Band-C (Table 67).

The phenological stages of the species observed during four seasons showed that during season-I, 9 species were in flowering stage, 10 species in fruiting stage, 6 species in fresh leaf stage, 9 species in mature leaves and 3 species in leaf shedding condition. Season II witnessed 11 species with flowers, 13 species with fruits, -6 species in fresh leaves another 6 species in mature leaves and 3 species in leaf shedding. Season III showed 9 species in blooming state, II in fruiting, 9 in fresh

leaf stage, 6 in mature leaf state and 4 in leaf shedding condition. Season IV had 9 species in flowering, 7 species in fruiting, 8 in fresh leaf stage, 7 in mature leaf stage and 4 shedding leaves (Table 32).

Table 32: Phenological stages of Shrubs at Manthakkad over seasons

Stages	Season I No. of species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	9	11	9	9
Fruits	10	13	11	7
Fresh leaf	6	6	9	8
Mature leaf	9	6	6	7
Leaf shedding	3	3	4	4

Herbs

In 9 quadrates of three bands, 29 species of herbs were observed. Band-A had 20 species Band-B with 23 species and Band -C with 11. Total number of plants observed in these 9 quadrates amounts 77. Of this, 29 herbs were counted in band – A, in band -B also 29, and in band – C 19 numbers (Table 68). The phenological stages recorded during the four seasons showed that season I had 14 species in blooming, 19 in fruiting, 8 species in fresh leaves, 9 species in mature leaves and 7 in leaf shedding stage. During season II, 17 were with flowers, 18 with fruits, 9 in fresh leaves, 8 in mature leaves and 4 in leaf shedding. Season III showed, 11 species in flowering stage, 14 in fruiting stage, 12 with fresh leaves, 9 with mature leaves and 4 in leaf shedding. Season IV witnessed with 10 species in blooming, 11 species in fruiting, 5 species with fresh leaves, 12 species with mature leaves and 5 in leaf shedding (Table 33).

Table 33: Phenological stages of Herbs at Manthakkad over seasons

Stages	Season I No. of species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	14	17	11	10
Fruits	19	14	14	11
Fresh leaf	8	12	12	5
Mature leaf	9	9	9	12
Leaf shedding	7	4	4	5

Grasses

At this site 12 species of grasses were found in three bands. Of that, 7 species were seen in Band-A, 11 in Band-B and 8 in Band-C. Total number of individuals (mean of quadrates) was 59. Of this, 15 numbers were in Band-A, 26 in Band-B and 18 in Band-C (Table 69).

Cultivations

Band-A had no agriculture as the area was marshy interspersed with rocks. Band-B, and Band-C had human inhabitation and 12 different crops were observed in cultivation. Band-B and Band-C had all the 12 species cultivated. Of this, 9 species were vegetables, 2 species plantation trees and one paddy (*Oryza sativa*). Paddy was seen cultivated during 2 seasons, May-August and September-December. The vegetables were cultivated between March to January Season (Table 70).

Vegetation of Kalpathy river Site III – Parali

This site is thickly populated and as such more area was under agriculture. Hence, the vegetation showed more of domesticated species.

Trees

A total of 31 species were observed in three bands. Band –A had 15 species, band –B 21 species and band–C 26 species. The number of individual plants counted

in 9 quadrates of 3 bands accounted 64. Band-A had 16 numbers, Band-B 21 and Band-C 27 (Table 71). Phenological stages observed over the four seasons showed that during season I, 11 species were in blooming, 18 species in fruits, 8 species in fresh leaf stage, 9 species with mature leaves, and another 9 in leaf shedding. Season II had 10 species in flowering state, 12 in fruit bearing condition, another 12 species in fresh leaves, 15 species with mature leaves and 8 in leaf shedding. Season III showed 16 species with flowers, 17 in fruit bearing stage, 7 with fresh leaves, 14 with mature leaves, and 7 in leaf shedding. During season IV, 17 species were in flowering, 19 in fruiting, 9 in fresh leaf stage 11 with mature leaves and 7 in shedding (Table 34).

Table 34: Phenological of stages of Trees at Parali

Stages	Season I No. of species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	11	10	16	17
Fruits	18	12	17	19
Fresh leaf	8	12	7	9
Mature leaf	9	15	14	11
Leaf shedding	9	8	7	7

Shrubs

26 species of shrubs were identified in 3 bands. Band-A had 15 species, Band-B, 23 species and Band-C 16 species. Total plants counted were 60 in 9 quadrates of 3 bands. Out of this 20 in Band-A, 23 in Band-B and 17 in Band-C (Table 72). During Season I, flowers were seen in 15 species, fruits in 13 species, fresh leaves on 10 species, mature leaves on 8 species and leaf shedding observed in 3 species. Season II showed 13 species with flowers, 15 with fruits, 8 with fresh leaf 10 with mature leaf and 4 in leaf shedding. Season III had 13 species in blooming, 12 with fruits, 9 with fresh leaf, another 9 in mature leaves and 3 in leaf shedding.

Season IV witnessed 15 species in flowering stage, 10 in fruiting stage, 7 in fresh leaves, 8 in mature leaves and 2 in leaf shedding (Table 35).

Table 35: Phenological stages of Shrubs at Parali over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	15	13	13	15
Fruits	13	15	12	10
Fresh leaf	10	8	9	7
Mature leaf	8	10	9	8
Leaf shedding	3	4	3	2

Herbs

24 species of herbs were identified in three bands. Of this, 18 species were present in Band-A, 16 in Band-B and 12 in Band-C. The total number of plants was 60 in 9 quadrates of the 3 bands. Band-A had 27 numbers, Band-B 21 and Band-C 12 plants (Table 73). Season I had 13 species with flowers, another 13 with fruits, 4 in fresh leaves, 9 in mature leaves and 9 in leaf shedding stage. During Season II, 15 species were in blooming stage, another 15 in fruiting stage, 11 with fresh leaves, 7 with mature leaves and 4 in leaf shedding. Season III showed 9 species in flowering, 12 species in fruiting, 5 in fresh leaves, 9 in mature leaves and 4 in leaf shedding. Season IV witnessed 9 species with flowers, 10 with fruits, 7 with fresh leaves, another 7 in mature leaf stage and 5 in leaf shedding (Table 36).

Grasses

Altogether 11 species of grasses were identified in the 3 bands of this study area. Of this Band-A had 8 species, Band-B with 11 species and Band-C with 11 species. Mean total of plants in 3 quadrates was 67. Of this, Band-A had 18 numbers, Band-B had 21 numbers and Band-C 28 numbers (Table 74).

Table 36: Phenological stages of Herbs at Parali over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	13	15	9	9
Fruits	13	15	12	10
Fresh leaf	4	11	5	7
Mature leaf	9	7	9	7
Leaf shedding	9	5	4	5

Cultivation

11 species of crops and vegetables were seen cultivated in this study site. Here Band-A had 3 species, Band-B, 10 species and Band-C 11 species. The crop, paddy was cultivated in all the three bands, but in Band-A, only in one season i.e. Sept – Dec. In the other two bands two season crop was done, i.e. May to August, and September to December. 8 species of vegetables and 2 plant crops were the other cultivations. All vegetables were cultivated between April and December. 3 plantain species were seen in all seasons (Table 75).

Vegetation of Kunthipuzha

Site I: Pathrakkadavu:

The study site is forest-dominated. It is situated on the western side of Silent Valley forests. The detailed land use and soil characteristics were discussed in Chapter II.

Trees

37 species of trees were identified in three bands. A band had 32 species, B-band 29 species and C-band 22 species. The total number of trees in 9 quadrates of 3 bands was 102. Of this, 37 were counted in Band-A, 35 in Band-B and 30 in Band-C (Table 76). During Season I, 13 species were in flowering condition, 24 species in fruiting stage, 9 species with fresh leaves, 11 species with mature leaves and 16

species in leaf shedding. Season II, showed 10 species with flowers, 9 species with fruits, 14 species in fresh leaves, 13 species with mature leaves and 9 species in leaf shedding. Season III had 17 species in blooming, 16 in fruiting, 8 with fresh leaves, 20 in mature leaves and 5 in leaf shedding stage. Season IV, showed 16 species flowering, 29 species bearing fruits, 8 species with fresh leaves, 6 with mature leaves and 9 in shedding leaves (Table 37).

Table 37: Phenological stages of Trees at Pathrakkadavu over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	13	10	17	16
Fruits	24	9	16	29
Fresh leaf	9	14	8	8
Mature leaf	11	13	20	6
Leaf shedding	16	9	5	9

Shrubs

25 species of shrubs were identified in three bands. Of this, 15 were in Band-A, 22 in Band-B and 23 in Band-C. The total number of shrubs counted was 76. Out of this, 18 were counted in Band-A, 29 in Band-B and 28 in Band-C (Table 77). During Season I, 14 species were in flowering, another 14 in fruiting, 6 species with fresh leaves, 9 species in mature leaves and 4 species in leaf shedding. Season II showed 12 species in blooms, 15 bearing fruits, 10 with fresh leaves, 7 with mature leaves, another 7 in leaf shedding. Season III had 14 species in flowering stage, 11 in fruiting, 10 in fresh leaf stage, 8 in mature leaf and two in leaf shedding. Season IV, witnessed 14 species with flowers, 8 with fruits, another 8 in fresh leaves, 7 in mature leaves and 3 in shedding leaves (Table 38).

Table 38: Phenological stages of Shrubs at Pathrakkadavu over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	14	12	14	14
Fruits	14	15	11	8
Fresh leaf	6	10	10	8
Mature leaf	9	7	8	7
Leaf shedding	4	7	2	3

Herbs

31 species of herbs were observed here. Of this, 27 species were present in Band-A, 25 species in Band-B, and 26 in Band-C. Total number of plants counted in three bands was 106. Out of this, 37 were counted in Band-A, another 37 in Band-B and 32 in Band-C (Table 78). During Season I, 11 species showed flowering, 18 with fruits, 6 in fresh leaves, 8 with mature leaves and another 8 in leaf shedding. Season II witnessed 19 in flowering, 18 in fruiting, 12 in fresh leaves, 7 with mature leaf stage and 8 in leaf shedding stage. Season III showed 12 in blooming, 19 in fruiting, 8 with fresh leaves, 11 with mature leaf stage and 4 shedding leaves. Season IV had 13 species with flowers, 16 with fruits, 11 with fresh leaves, 8 in mature leaves and 6 shedding leaves (Table 39).

Table 39: Phenological stages of Herbs at Pathrakkadavu over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	11	19	12	13
Fruits	18	18	19	16
Fresh leaves	6	12	8	11
Mature leaves	8	7	11	8
Leaf shedding	8	4	4	6

Grasses

11 species of grasses were identified in this site. In Band-A, 7 species, in Band-B 10 species and in Band-C, 11 species were recorded. Total number of plants counted was 74. In Band-A 14 in Band-B 29 and in Band-C 31 individuals were counted (Table 79).

Cultivation

Agricultural practice was limited to a portion of Band-B and almost whole parts of Band-C. 11 species were found cultivated. Of this, 8 species were vegetables cultivated during April to March. 3 species of plantain were cultivated in all seasons. Paddy was raised in Band-B and C in two seasons i.e. May to August and September to December. Coconut and areca nut were seen in all bands and in all seasons. Another important plantation was rubber, which was predominant in Band-C (Table 80).

Site II – Thootha

This is predominantly a cultivable area. Different varieties of crops, vegetables, plantations occur. The human inhabitation is also high.

Trees

Total number of species identified was 32. Band-A had 14 species, Band-B with 23 and Band-C 22. The count of number of individual trees was 70. Of this, 16 counted in Band-A, 27 in Band-B and another 27 in Band-C (Table 81). During the 1st season, 12 species were blooming, 20 species were fruiting, 5 species in fresh leaves, 8 in mature leaves and 8 in leaf shedding stages. Season II showed 10 in flowering, 12 in fruiting, 8 in fresh leaves, 12 in mature leaf and 7 in shedding leaves. Season III presented 11 species in flowers, 13 in fruits, 10 in fresh leaves, 10 in mature leaves and 25 in leaf shedding. Season IV had 15 species with flowers, 14 with fruits, 7 in fresh leaf stage, 12 in mature leaf stage and 6 in leaf shedding (Table 40).

Table 40: Phenological stages of trees at Thootha over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	12	10	11	15
Fruits	20	12	13	14
Fresh leaf	5	8	10	7
Mature leaf	8	12	10	12
Leaf shedding	8	7	5	6

Shrubs

Good numbers of shrubs were observed in this area. Majority of them were domesticated or medicinal varieties. A total of 25 species observed. Of this, 19 were present in Band-A, 23 in Band-B and 12 in Band-C. A total of 59 plants were counted. In Band-A 20 numbers present, in Band-B 25 and in Band-C 14 (Table 82). Phenological stages observed during the four seasons were recorded. During season I, 15 species were in flowering stage, 14 in fruiting stage, 8 in fresh leaf stage, 9 in mature leaf and 3 in leaf shedding. Season II presented 14 species with flowers, 18 with fruits 7 in fresh leaf, 8 in mature leaf and five in leaf shedding. During season III, 16 species were blooming, 13 bearing fruits, 10 in fresh leaves, 6 in mature leaf stage and 2 in leaf shedding stage. Season IV showed, 14 species in flowering, 12 in fruiting, 8 in fresh leaf, 9 in mature leaf and 4 leaf shedding (Table 41).

Table 41: Phenological stages of Shrubs at Thootha over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	15	14	16	14
Fruits	14	18	13	12
Fresh leaves	8	7	10	8
Mature leaves	9	8	6	9
Leaf shedding	3	5	2	4

Herbs

24 species of herbs were observed at Thootha. Of which, 18 species were found in Band-A, 21 species in Band-B and 17 species in Band-C. The numbers of plants observed were 67, which was distributed as 23 numbers in Band-A, 24 in Band-B and 20 in Band-C (Table 83).

Table 42: Phenological stages of Herbs at Thootha over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	14	10	6	13
Fruits	15	12	11	13
Fresh leaves	9	14	10	8
Mature leaves	11	7	11	10
Leaf shedding	7	5	4	4

The phenological stages observed during season I showed 14 species in flowering stage, 15 species in fruiting stage, and 9 in fresh leaves, 11 in mature leaves and 7 in leaf shedding stage. During season II, 10 species were in blooming 12 species in fruiting, 14 species in fresh leaves, 7 in mature leaf and 5 in leaf shedding. Season III showed 6 species in flowering, 11 in fruiting, 10 in fresh leaves, 11 in mature leaves and 4 showing leaf shedding. Season IV presented 13 species in blooming, another 13 in fruiting, 8 in fresh leaves, 10 in mature leaves and 4 in shedding leaf (Table 42).

Grasses

11 species of grasses were identified. Of this Band-A had 9, Band-B and Band- C with 10 species each. The mean total of 3 quadrates of each band gave the count as 64. Of this 16 were in Band-A, 25 in Band-B and 23 in Band-C (Table 84).

Cultivation

Thootha is a much fertile and thickly populated area. Many types of croppings are practiced here. 14 species of crops were seen during the study period. Paddy was seen in Band-B only cropped during two seasons i.e., May to August and September to December. Rubber, coconut and areca nut were seen as permanent plantations in band-B and band-C. 2 species of plantain, *Musa acuminata* and *Musa balbisiana* were raised in all seasons in all the 3 bands. *Musa paradisiaca* (banana) was cultivated as main crop in Band-A and Band-B from October to August. This site is an important cultivation point of tapioca (in Band-B and Band-C) during March to December. Seven different vegetables were cultivated in Band-B and Band-C in different stretches during April to December (Table 85).

Site III – Kariyannur

Kariyannur is the end of Kunthipuzha where it joins with Nila river. The detailed feature of the site is discussed in Chapter II. The site is predominantly an agricultural practicing area and human inhabitation is low.

Trees

29 species of trees were identified, of which 19 were present in Band-A, 24 in Band-B and 20 species in Band-C. The number of trees counted was 101. Of this, 24 were present in Band-A, 34 in Band-B and 37 in Band-C (Table 86). The phenological stages observed during season I were 14 species in flowering, 15 in fruiting, 9 in fresh leaf, 11 in mature leaf and 7 in leaf shedding stages. Season II witnessed 10 species in blooming, 12 in fruiting, 14 in fresh leaves, 7 in mature leaf stage and 5 in leaf shedding. Season III showed 6 species with flowers, 11 species with fruits, 10 with fresh leaves, 11 with mature leaf stage and 4 shedding leaves. Season IV presented 13 species in flowers, another 13 in fruits and 8 in fresh leaves, 10 in mature leaves, and 4 in leaf shedding (Table 43).

Table 43: Phenological stages of Trees at Kariyannur over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	14	10	6	13
Fruits	15	12	11	13
Fresh leaves	9	14	10	8
Mature leaves	11	7	11	10
Leaf shedding	7	5	4	4

Shrubs

The number of species identified in three bands was 28; 11 in Band-A, 18 in Band-B and 22 in Band-C. In total 68 plants were counted in 9 quadrates of the three bands. Of this, 13 were in Band-A, 22 in Band-B and 33 in Band-C (Table 87). Phenological stages observed during season I showed 14 species blooming, 17 species fruiting, 8 species with fresh leaves, 5 species in mature leaf and another 5 in leaf shedding. During season II, 13 were in flowering, 15 in fruiting, 13 in fresh leaves, 8 in mature leaves and 6 in leaf shedding stage. Season III witnessed 16 species with flowers, 13 with fruits, 10 with fresh leaves, 7 in mature leaves and 2 in leaf shedding stage. Season IV had 19 species in flowers, 15 in fruits, 5 in fresh leaves, 8 in mature leaves and 3 in shedding leaves (Table 44).

Table 44: Phenological stages of shrubs at Kariyannur over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	14	13	16	19
Fruits	17	15	13	15
Fresh leaves	8	13	10	5
Mature leaves	5	8	7	8
Leaf shedding	5	6	2	3

Herbs

Total number of species observed was 29. Of this, 19 were present in Band-A, 24 species in Band-B, and 20 in Band-C. The total number of plants counted was 101 of which, 24 plants were present in Band-A, 34 in Band-B and 37 in Band-C (Table 88). Phenological stages recorded for the 4 seasons gave the data as follows. Season I was with 12 species in flowers, 17 in fruits, 6 in fresh leaves, 10 in mature leaf stage and 8 in leaf shedding stage. Season II presented with 16 species in blooms, 17 species in fruits, 16 in fresh leaves, 8 in mature leaves and 6 with leaf shedding condition. Season III showed 10 species in blooms, 16 in fruits, 7 in fresh leaf, 9 in mature leaf and 5 in shedding leaves. Season IV had 16 species in blooms another 16 bearing fruits, 10 in fresh leaves, 8 in mature leaves and 7 shedding leaves (Table 45).

Table 45: Phenological stages of Herbs at Kariyannur over seasons

Stages	Season I No. of Species	Season II No. of species	Season III No. of species	Season IV No. of species
Flowers	12	16	10	16
Fruits	17	17	16	16
Fresh leaves	6	16	7	10
Mature leaves	10	8	9	8
Leaf shedding	8	6	5	7

Grasses:

11 species of grasses were identified. Band-A had 7 species, Band-B, 9 species and Band-C, 10 species. Mean of the total of 9 quadrates gave the number 62. Of this, 17 plants were present in Band-A, 25 in Band-B and 22 in Band-C (Table 89).

Cultivations:

10 species of crops and vegetable were found cultivated in this site. Paddy cultivation was prominent in all the three bands. However, the crop was limited to

one season, i.e. from September to December, as the area will be submerged during the first season due to the inundation from both Nila river and Kunthipuzha. Banana cultivation was also prominent in three bands. Coconut and areca were seen in Band-C only as the other two bands are paddy fields. 6 species of vegetables were found cultivated, variedly from April to February (Table 90).

Table 46: Vegetation of Nila River – Site I – Ottappalam - Trees

Quadrat: 20m x 20m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Gliricidia sepium</i>	1	A	1	2	1	A	1	2	1	2	1	4
2.	<i>Macaranga peltata</i>	A	1	1	2	1	1	1	3	A	A	1	1
3.	<i>Pongamia glabra</i>	1	1	1	3	A	A	2	2	1	1	A	2
4.	<i>Syzygium cumini</i>	A	A	A	-	1	1	A	2	-	1	A	1
5.	<i>Cocos nucifera</i>	A	1	A	1	1	1	A	2	1	1	2	4
6.	<i>Mangifera indica</i>	1	A	A	1	1	A	A	1	1	1	1	3
7.	<i>Pavetta indica</i>	2	A	1	3	1	1	A	2	1	1	1	3
8.	<i>Areca catechu</i>	-	-	-	-	2	1	A	3	2	2	1	5
9.	<i>Annona squamosa</i>	1	A	A	1	A	A	A	-	1	A	1	2
10.	<i>Morinda tinctoria</i>	A	A	1	1	A	1	A	1	1	1	A	2
11.	<i>Alstonia scholaris</i>	A	A	A	-	1	A	A	1	1	A	A	1
12.	<i>Psidium guajava</i>	A	A	A	-	A	A	1	1	1	1	A	2
13.	<i>Ichnocarpus frutescens</i>	A	A	A	-	A	1	A	1	1	1	A	2
14.	<i>Moringa pterygosperma</i>	1	A	A	1	1	1	A	2	1	A	1	2
15.	<i>Carica papaya</i>	A	A	A	-	1	1	A	2	1	1	A	2

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
16.	<i>Bambusa bambos</i>	A	A	1	1	A	A	A		A	A	A	-
17.	<i>Anacardium occidentale</i>	A	A	A	-	A	A	A	-	1	1	A	-
18.	<i>Ficus hispida</i>	1	1	A	2	1	A	A	1	1	A	A	1
19.	<i>Annona reticulata</i>	-	-	-	-	A	A	1	1	1	1	A	2
20.	<i>Tamarindus indica</i>	A	1	A	1	1	A	A	1	A	A	1	1
21.	<i>Holigarna arnottiana</i>	1	A	1	2	1	A	A	1	A	A	A	-
22.	<i>Nerium oleander</i>	A	A	A	-	1	1	A	2	1	1	A	2
23.	<i>Cassia fistula</i>	A	A	1	1	1	A	A	1	A	A	1	1
24.	<i>Tiliacora acuminata</i>	A	A	1	1	A	A	A	-	A	A	A	-
25.	<i>Eucalyptus obliqua</i>	A	A	A	-	A	A	1	1	A	A	A	-
26.	<i>Bombax malabarica</i>	A	A	A	-	A	1	A	1	A	A	A	-
27.	<i>Corypha umbraculifera</i>	A	A	1	1	A	A	A	-	1	A	A	1
28.	<i>Borassus flabellifer</i>	A	A	A	-	A	A	A	1	A	A	1	1

Table 47: Vegetation of Nila River – Site I: Ottappalam -Shrubs

Quadrat – 10m x 10m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Chasalia curviflora</i>	1	1	1	3	1	A	1	2	A	A	A	-
2.	<i>Zizyphus jujube</i>	1	A	A	1	1	1	A	2	1	A	A	1
3.	<i>Crotalaria laburnifolia</i>	A	A	A	-	1	1	1	3	A	1	A	1

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
4.	<i>Tephrosia purpurea</i>	1	A	A	1	1	A	A	1	1	1	A	2
5.	<i>Thunbergia mysorensis</i>	2	2	2	6	A	A	A	-	A	A	A	-
6.	<i>Mussaenda frondosa</i>	1	A	A	1	1	1	A	2	A	A	2	2
7.	<i>Eupatorium odoratum</i>	A	A	A	-	1	A	1	2	1	1	A	2
8.	<i>Ervatamia coronaria</i>	1	1	A	2	1	1	A	2	A	A	A	-
9.	<i>Datura stramonium</i>	1	A	A	1	2	1	A	3	1	1	A	2
10.	<i>Calatropis gigantea</i>	A	A	1	1	1	A	A	1	2	1	A	3
11.	<i>Clerodendrun infortunatum</i>	A	1	2	3	1	1	A	2	2	1	1	A
12.	<i>Lantana camara</i>	A	1	1	2	1	1	1	3	1	A	A	1
13.	<i>Ixora coccinia</i>	A	A	A	-	1	1	4	2	1	1	A	2
14.	<i>Canthinum parviflorum</i>	1	A	1	2	1	1	1	3	A	A	A	-
15.	<i>Rauwolfia serpentina</i>	A	A	A	-	1	1	A	2	A	A	A	-
16.	<i>Clerodendrone inerme</i>	1	1	A	-	2	1	A	3	A	2	2	4
17.	<i>Crotalaria laburnifolia</i>	A	A	1	1	1	1	A	2	1	1	A	2
18.	<i>Urena sinuata</i>	1	1	A	2	1	A	1	2	1	1	1	3
19.	<i>Scoparia dulcis</i>	A	A	A	-	1	A	A	1	A	A	1	1
20.	<i>Ipomea aquatica</i>	1	1	A	2	A	A	A	-	A	A	A	-
21.	<i>Jatropha glandulifera</i>	A	A	A	-	A	A	A	-	1	A	1	2
22.	<i>Rotala indica</i>	A	A	A	-	A	A	1	1	1	1	A	2

Table 48: Vegetation of Nila River – Site I: Ottappalam - Herbs

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Ageratum conyzoides</i>	A	A	A	-	1	1	A	2	2	1	1	4
2.	<i>Eclipta alba</i>	A	A	1	1	1	A	A	1	1	1	A	2
3.	<i>Leucas aspera</i>	1	1	A	2	1	A	A	1	1	1	1	3
4.	<i>Scoparia dulcis</i>	A	A	A	-	A	A	1	1	1	1	A	2
5.	<i>Viola enneasperma</i>	1	1	A	2	1	1	A	2	A	A	1	1
6.	<i>Polygala javana</i>	A	A	A	-	1	A	A	1	1	1	1	3
7.	<i>Osbeckia hispidissima</i>	1	A	1	2	1	A	A	1	1	A	1	2
8.	<i>Melothria amplexicaulis</i>	A	A	A	-	1	A	1	2	A	A	A	-
9.	<i>Spilanthes calva</i>	A	A	A	-	A	A	A	-	1	1	A	2
10.	<i>Croton spaciflorus</i>	1	1	1	3	1	A	A	1	A	A	A	-
11.	<i>Urena lobata</i>	1	A	A	1	1	1	2	4	A	1	A	1
12.	<i>Desmodium triflorum</i>	A	A	1	1	1	1	A	2	A	A	1	1
13.	<i>Ipomea aquatica</i>	1	1	1	3	1	A	A	1	A	A	A	-
14.	<i>Ipomea marginata</i>	1	1	A	2	A	A	A	-	1	A	A	1
15.	<i>Clitoria ternatea</i>	1	1	A	2	1	A	A	1	A	A	2	2
16.	<i>Tridax procumbens</i>	1	1	1	3	1	A	1	2	A	A	1	1
17.	<i>Cleome viscosa</i>	A	A	1	1	1	2	1	4	A	A	1	1
18.	<i>Sida cordifolia</i>	2	1	A	3	1	1	A	2	1	1	A	2
19.	<i>Phyllanthus viogratus</i>	A	A	1	1	A	A	A	-	1	A	1	2
20.	<i>Parthenium hysterophorus</i>	1	1	A	1	1	A	A	1	A	A	A	-
21.	<i>Emilia sonchifolia</i>	A	A	A	-	1	A	A	-	A	1	A	1
22.	<i>Mimosa pudica</i>	2	1	1	4	1	1	1	3	1	1	A	2
23.	<i>Brachiaria ramosa</i>	A	A	A	-	1	A	A	1	A	A	A	-
24.	<i>Senna alata</i>	A	A	A	-	A	A	A	-	1	1	A	2

Total No. of species	24	Total Nos. in 3 bands	98
Band –A	16	Band – A	32
Band – B	19	Band – B	32
Band – C	19	Band - C	34

Table 49: Vegetation of Nila River Site I – Ottappalam

Grasses

Sl. No.	Species	Band-A	Band-B	Band C
1.	<i>Eragrostis unioides</i>	2	2	4
2.	<i>Eleusine coracana</i>	1	-	-
3.	<i>Borreria auricularis</i>	2	2	4
4.	<i>Phyllanthus coracana</i>	1	-	1
5.	<i>Alloteropsis cimicina</i>	2	2	-
6.	<i>Cucumis satires</i>	2	2	3
7.	<i>Spermacoceo latifolis</i>	3	2	1
8.	<i>Spermacoceo mouritania</i>	-	1	2
	Total	13	11	15

Table 50: Cultivations at Ottappalam

Nila River – Site I

Sl. No.	Species	Band-A Season	Band-B Season	Band C Season
1.	<i>Oryza sativa</i>	-	May – Aug and Sept – Dec.	May – Aug.
2.	<i>Cocos nucifera</i>	✓	✓	✓
3.	<i>Musa paradisiaca</i>	Nov – Sept	✓	✓
4.	<i>Citrus lanatus</i>	Dec – May	-	-
5.	<i>Musa acuminata</i>	All seasons	All seasons	All seasons
6.	<i>Musa balbisiana</i>	All seasons	All seasons	All seasons
7.	<i>Lagenarias siceraria</i>	April – Dec	-	-

Sl. No.	Species	Band-A Season	Band-B Season	Band C Season
8.	<i>Arica catechu</i>	-	All seasons	All seasons
9.	<i>Colacasia esculenta</i>	-	-	April – Feb.
10.	<i>Momordica charantia</i>	-	-	April – Nov.
11.	<i>Vigna unguiculata</i>	-	-	April – Dec.

Table 51: Vegetation of Nila River – Site II – Pattambi -Trees

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Gliricidia sepium</i>	2	A	A	2	3	2	1	6	A	1	1	2
2.	<i>Macaranga peltata</i>	2	1	A	2	1	1	1	3	A	A	2	2
3.	<i>Pongamia glabra</i>	1	A	A	1	A	A	1	-	1	A	A	1
4.	<i>Syzygium cumini</i>	1	A	A	1	1	A	1	1	A	1	A	1
5.	<i>Erythrina indica</i>	2	A	A	2	2	A	1	2	1	1	A	2
6.	<i>Cocos nucifera</i>	1	2	A	3	2	A	A	2	1	1	A	2
7.	<i>Mangifera indica</i>	1	A	1	2	1	1	1	3	1	A	1	2
8.	<i>Pavetta indica</i>	1	1	2	4	A	A	A	-	1	A	A	1
9.	<i>Ervatamia heyneana</i>	A	2	A	2	A	A	A	-	A	A	A	-
10.	<i>Eugenia recemosa</i>	A	1	1	2	4	1	1	2	A	A	1	1
11.	<i>Areca catechu</i>	A	2	A	2	A	1	1	2	A	A	2	2
12.	<i>Annona squamosa</i>	A	1	A	1	A	A	1	1	A	A	1	1
13.	<i>Psidium guajava</i>	A	1	1	2	1	A	A	1	A	A	1	1
14.	<i>Eugenia jumbolana</i>	A	1	A	1	A	A	2	2	A	A	A	-
15.	<i>Morinda tinctoria</i>	A	1	1	2	A	1	1	2	A	A	A	-
16.	<i>Alstonia scholaris</i>	A	A	1	1	A	A	A	-	1	A	A	1
17.	<i>Strychnos nuxvomica</i>	A	A	1	1	A	A	1	1	A	A	A	1
18.	<i>Ichnocarpus frutescens</i>	A	A	1	1	1	1	A	2	A	A	A	2
19.	<i>Moringa pterygosperma</i>	A	A	1	1	1	2	1	4	1	A	A	1
20.	<i>Artocarpus</i>	A	A	1	1	1	A	A	1	A	A	A	-

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
	<i>heterophyllus</i>												
21.	<i>Carica papaya</i>	A	A	1	1	1	A	1	2	A	A	A	-
22.	<i>Tamarindus indica</i>	A	A	A	A	A	1	A	1	A	A	A	-
23.	<i>Anacardium occidentale</i>	A	A	A	A	A	A	1	1	1	1	A	2
24.	<i>Ficus hispida</i>	A	A	A	-	A	A	A	-	1	-	1	2
25.	<i>Hevea brasiliensis</i>	A	A	A	-	A	A	A	-	2	2	2	6
26.	<i>Nerium oleander</i>	A	A	A	-	A	A	A	-	A	1	A	1
27.	<i>Terminalia bellarica</i>	A	A	A	-	A	A	A	-	A	1	A	1
28.	<i>Peltophorum pterocarpum</i>	A	A	A	-	A	A	A	-	1	1	1	3
29.	<i>Cycas circinalis</i>	A	A	A	-	1	A	A	-	A	A	A	1
30.	<i>Dalbergia latifolia</i>	A	A	A	-	A	A	A	-	1	A	A	1
31.	<i>Tectona grandis</i>	A	A	A	-	1	A	1	2	A	1	A	1
32.	<i>Emblica officianalis</i>	A	A	A	-	A	1	A	1	1	A	A	1
					21				48				42

A indicates absence

Q = Quadrate

Size = 20m x 20m

Table 52: Vegetation of the Nila River – Site II – Pattambi- Shrubs

Quadrat – 10m x 10m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Chassalia curviflora</i>	2	-	-	2	-	-	2	2	-	-	-	-
2.	<i>Mussaenda frondosa</i>	2	2	-	4	-	-	1	1	1	2	2	5
3.	<i>Eupatorium odoratum</i>	2	3	-	5	-	2	2	4	2	1	-	3
4.	<i>Ichnocarpus frutescens</i>	1	-	-	1	-	1	2	3	-	-	-	-
5.	<i>Rauwolfia tetraphylla</i>	2	1	-	3	-	2	2	4	-	-	1	1
6.	<i>Ervatamia coronaria</i>	2	-	-	2	-	-	-	-	2	-	1	3
7.	<i>Calatropis gigantea</i>	1	2	-	3	-	2	2	4	1	1	1	3
8.	<i>Datura stramonium</i>	2	1	-	3	-	-	-	-	-	-	1	1
9.	<i>Clerodendron infortunatum</i>	1	2	2	5	-	-	-	-	-	1	1	2
10.	<i>Stachytarpheta indica</i>	2	-	-	2	-	-	-	-	-	-	-	-
11.	<i>Zizyphus jujube</i>	-	2	-	2	1	-	-	1	-	-	-	-
12.	<i>Jasminum malabaricum</i>	-	-	1	1	-	-	-	-	-	-	-	-
13.	<i>Canthinum parviflorum</i>	-	-	2	2	2	2	-	4	-	-	2	2
14.	<i>Vitis flexuosa</i>	-	-	2	2	1	2	-	3	-	-	-	-
15.	<i>Clerodendrone inerme</i>	-	-	-	-	2	-	-	2	-	-	-	-
16.	<i>Thunbergia mysorensis</i>	-	-	-	-	1	1	-	2	-	-	-	-
17.	<i>Crotalaria laburnifolia</i>	-	-	-	-	3	2	-	5	-	-	-	-
18.	<i>Hibiscus furcatus</i>	-	-	-	-	1	-	-	1	-	-	-	-

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
19.	<i>Urena sinuata</i>	-	-	-	-	2	2	-	4	-	-	-	-
20.	<i>Rotala indica</i>	-	-	-	-	2	2	-	4	-	-	-	-
21.	<i>Synendrella nodiflora</i>	-	-	-	-	2	-	-	2	-	-	-	-
22.	<i>Lantana camara</i>	-	-	-	-	-	-	2	2	1	-	-	1
23.	<i>Aristolochia indica</i>	-	-	-	-	-	-	1	1	-	-	-	-
24.	<i>Ixora coccinia</i>	-	-	-	-	-	-	-	-	2	2	1	5
25.	<i>Rauwolfia serpentina</i>	-	-	-	-	-	-	-	-	2	1	-	3
26.	<i>Cryptolepis buchanani</i>	-	-	-	-	-	-	-	-	1	2	2	
27.	<i>Solanum nigrum</i>	-	-	-	-	-	-	-	-	1	-	-	
28.	<i>Solanum torvum</i>	-	-	-	-	-	-	-	-	-	2	2	

Total No. of species	28	Total No. of trees	118
Band – A :	16	Band – A	40
Band – B :	18	Band – B	49
Band – C	11	Band – C	29

Table 53: Vegetation of the Nila River – Site II – Pattambi - Herbs

Quadrat – 5m x 5m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Ageratum conyzoides</i>	2	1	-	3	1	-	2	3	2	-	2	4
2.	<i>Eclipta alba</i>	2	-	1	3	2	2	-	4	-	2	-	2
3.	<i>Leucas aspera</i>	3	1	2	6	3	2	2	7	3	1	1	5
4.	<i>Scoparia dulcis</i>	3	2	-	5	-	-	2	2	2	1	-	3

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
5.	<i>Cleome monophylla</i>	2	-	2	4	2	-	1	3	-	-	-	-
6.	<i>Viola enneasperma</i>	2	-	-	2	-	-	1	1	-	-	-	-
7.	<i>Polygalia javana</i>	1	-	2	3	1	-	2	3	-	2	1	3
8.	<i>Portulaca grandiflora</i>	2	-	2	4	2	-	-	2	-	1	1	2
9.	<i>Melothria amplexicaulis</i>	1	-	2	3	-	-	-	-	-	2	-	2
10.	<i>Eupatorium odoratum</i>	-	2	-	2	-	-	-	-	-	2	-	2
11.	<i>Spilanthes calva</i>	-	2	-	2	-	-	-	-	-	-	-	-
12.	<i>Croton sparsiflorus</i>	-	2	-	2	-	-	-	-	-	-	-	-
13.	<i>Sida cordifolia</i>	-	-	3	3	-	-	1	1	-	-	-	-
14.	<i>Urena lobata</i>	-	-	-	-	1	1	-	2	-	-	-	-
15.	<i>Desmodium triflorum</i>	-	-	-	-	-	3	-	3	-	2	-	2
16.	<i>Sphaeranthus indicus</i>	-	-	-	-	-	2	-	2	-	-	-	-
17.	<i>Aerva lanata</i>	-	-	-	-	-	2	-	2	-	-	-	-
18.	<i>Osbeckia hispidissima</i>	-	-	-	-	-	-	1	1	-	-	-	-
19.	<i>Ipomea aquatica</i>	-	-	-	-	-	-	-	-	1	1	1	3
20.	<i>Mollugo pentaphylla</i>	-	-	-	-	-	-	-	-	2	-	2	4
21.	<i>Clitoria ternatea</i>	-	-	-	-	-	-	-	-	1	-	1	2
22.	<i>Tridax procumbens</i>	-	-	-	-	-	-	-	-	2	-	2	4
23.	<i>Catharanthus pusilles</i>	-	-	-	-	-	-	-	-	1	-	-	1
24.	<i>Oldenlandia corymbosa</i>	-	-	-	-	-	-	-	-	-	-	2	2

Total No. of species	24	Total No. of trees	119
Band –A	13	Band – A	42
Band – B	14	Band – B	36
Band – C	15	Band – C	41

Table 54: Vegetation of Nila River – Site II – Pattambi - Grasses

Quadrates 2m x 2m

Sl. No.	Species	Band-A	Band-B	Band C
1.	<i>Eragrostis uniolooides</i>	8	2	4
2.	<i>Eleusine coracana</i>	6	4	4
3.	<i>Borreria auricularis</i>	4	6	-
4.	<i>Arundinella furcata</i>	2	1	-
5.	<i>Bothriochloa pertusa</i>	3	-	-
6.	<i>Dimeria josephii</i>	-	2	-
7.	<i>Alloteropsis cimicina</i>	-	2	-
8.	<i>Spermacocea mouritiana</i>	-	4	3
9.	<i>Spermacocea latifolia</i>	-	3	6
10.	<i>Spermacocea articularis</i>	-	3	4
11.	<i>Cucumis satives</i>	-	2	3
12.	<i>Cymbopogon</i>	-	2	2
13.	<i>Dimeria raizadae</i>	-	-	6
14.	<i>Eleusine indica</i>	-	-	4
15.	<i>Echinochloa colona</i>	-	-	6
16.	<i>Heteropogon contortus</i>	-	-	1

Total No. of species	16
Band –A	5
Band – B	11
Band – C	11

Table 55: Cultivation of Nila River River – Site II – Pattambi

Sl. No.	Species	Band-A Season	Band-B Season	Band C Season
1.	<i>Oryza sativa</i>	May – Aug and Sept – Dec.	May – Aug and Sept – Dec.	May – Aug.
2.	<i>Abelmoschus esculentus</i>	April – Dec.	✓	✓
3.	<i>Vigna unguiculata</i>	May – Dec.	✓	✓
4.	<i>Solanum melongena</i>	May – April	✓	✓
5.	<i>Capsicum annum</i>	May – March	-	-
6.	<i>Cocos nucifera</i>	All seasons	✓	✓
7.	<i>Musa paradisiaca</i>	Nov – Sept.	✓	✓
8.	<i>Colacasia esculenta</i>	April – Feb	✓	✓
9.	<i>Amorphophallus paeoniifolius</i>	March – Jan.	✓	✓
10.	<i>Discorea alata</i>	-	March – Jan.	March – Jan.
11.	<i>Cucumis sativus</i>	March – Dec.	✓	-
12.	<i>Musa acuminata</i>	All seasons	All seasons	All seasons
13.	<i>Musa balbisiana</i>	✓	✓	✓
14.	<i>Ipomea batatas</i>	June – Dec.	✓	-
15.	<i>Trichosanthes cucumerina</i>	-	April – Feb	✓
16.	<i>Momodica charantia</i>	-	April – Dec.	✓
17.	<i>Benincasa cerifera</i>	April – Dec.	✓	✓
18.	<i>Lagenarias siceraria</i>	April – Dec.	✓	
19.	<i>Cucurbita pepo</i>	-	March-October	-

Total No. of species	19
Band – A	15
Band – B	19
Band – C	15

Table 56: Vegetation of Manchady - Nila River – Site III - Trees

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Gliricidia sepium</i>	-	-	1	1	2	1	-	3	1	1	1	3
2.	<i>Macaranga peltata</i>	1	1	-	2	1	1	-	2	2	1	1	4
3.	<i>Syzygium cumini</i>	-	-	-	-	-	-	-	-	1	-	-	1
4.	<i>Erythrina indica</i>	-	-	-	-	1	-	-	1	1	-	-	1
5.	<i>Cocos nucifera</i>	-	-	-	-	1	1	-	2	1	-	1	2
6.	<i>Mangifera indica</i>	-	-	-	-	-	1	-	1	1	-	1	2
7.	<i>Morinda tinctoria</i>	-	-	-	-	-	-	-	-	1	1	-	2
8.	<i>Pavetta indica</i>	1	-	1	2	1	-	-	1	1	-	1	2
9.	<i>Ervatamia heyneana</i>	-	-	-	-	-	-	-	-	1	-	-	1
10.	<i>Eugenia recemosa</i>	-	-	1	1	-	-	1	1	-	-	-	-
11.	<i>Areca catechu</i>	-	-	-	-	-	-	-	-	1	-	1	2
12.	<i>Annona squamosa</i>	-	-	-	-	-	-	1	1	-	-	1	1
13.	<i>Strychnos nuxvomica</i>	-	-	-	-	-	-	-	-	-	-	1	1
14.	<i>Artocarpus heterophyllus</i>	-	-	-	-	-	-	1	1	1	-	-	1
15.	<i>Moringa pterygosperma</i>	-	-	-	-	-	-	1	1	1	-	1	2
16.	<i>Carica papaya</i>	-	-	-	-	-	-	-	-	1	-	-	1
17.	<i>Anacardium occidentale</i>	-	-	-	-	-	-	1	1	1	-	1	2
18.	<i>Ficus hispida</i>	1	-	-	1	-	-	1	1	-	-	-	-
19.	<i>Holigarna arnottiana</i>	1	-	-	1	-	-	-	-	-	-	-	-
20.	<i>Nerium oleander</i>	-	-	-	-	-	-	1	1	-	-	1	1
21.	<i>Tiliacora acuminata</i>	-	-	1	1	-	-	1	1	-	-	-	-
22.	<i>Bombax malabarica</i>	-	-	-	-	-	-	1	1	-	-	1	1
23.	<i>Peltophorum</i>	-	-	-	-	-	-	-	-	-	-	1	1

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
	<i>pterocarpum</i>												
24.	<i>Corypha umbraculifera</i>	-	-	1	1	-	-	1	1	-	-	1	1
25.	<i>Borassus flabellifer</i>	-	-	-	-	1	-	-	1	-	-	1	1
26.	<i>Acacia longifolia</i>	1	-	1	2	-	-	1	1	-	-	-	-
27.	<i>Eucalyptus obliqua</i>	1	-	-	1	-	-	-	-	-	-	1	1
28.	<i>Emblica officianalis</i>	-	-	-	-	-	-	-	-	-	1	-	1
29.	<i>Artocarpus integrifolia</i>	-	-	-	-	-	-	1	1	-	1	-	1
	Total				12				23				36

Total No. of species:	29	Total no. of plants:	71
Band – A	10	Band – A	12
Band – B	19	Band – B	23
Band – C	21	Band - C	36

Table 57: Vegetation of Nila River – Site III – Manchady - Shrubs

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Mussaenda frondosa</i>	-	1	1	2	-	-	1	1	1	-	-	1
2.	<i>Eupatorium odoratum</i>	1	1	-	2	-	-	-	-	1	1	-	2
3.	<i>Rauwolfia tetraphylla</i>	-	-	-	-	1	1	-	2	-	1	-	1
4.	<i>Ervatamia coronaria</i>	-	-	-	-	1	-	-	1	1	1	-	2
5.	<i>Calatropis gigantea</i>	1	-	1	2	1	-	-	1	1	-	-	1
6.	<i>Datura stramonium</i>	1	-	1	2	-	-	-	-	1	1	-	2

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
7.	<i>Clerodendron infortunatum</i>	-	-	1	1	-	-	1	1	1	1	-	2
8.	<i>Zizyphus jujube</i>	1	-	-	1	1	-	-	1	-	-	-	-
9.	<i>Canthium parviflorum</i>	-	-	1	1	-	-	1	1	1	1	-	2
10.	<i>Lantana camara</i>	-	-	-	-	1	-	-	1	2	-	1	3
11.	<i>Ixora coccinia</i>	-	-	-	-	1	-	1	2	1	1	-	2
12.	<i>Cryptolepis buchmanii</i>	-	-	-	-	1	-	1	2	-	-	1	1
13.	<i>Thunbergia mysorensis</i>	1	-	1	2	1	-	-	1	-	-	-	-
14.	<i>Solanum nigrum</i>	-	-	1	1	-	-	1	1	1	-	-	1
15.	<i>Crotalaria laburnifolia</i>	1	-	-	1	-	-	1	1	1	1	-	2
16.	<i>Tinospora cordifolia</i>	-	-	-	-	1	1	-	2	-	-	1	1
17.	<i>Scoparia dulcis</i>	1	-	1	2	1	-	-	1	2	-	-	2
18.	<i>Ipomea aquatica</i>	1	-	-	1	-	-	-	-	-	-	-	-
19.	<i>Ricinus communis</i>	-	-	1	1	1	-	-	1	1	-	-	1
20.	<i>Hibiscus furcatus</i>	-	-	-	-	-	-	1	1	1	1	-	2
21.	<i>Synendrella nodiflora</i>	-	-	-	-	-	1	-	1	1	-	-	1
	Total				19				22				29

Total No. of species:	21	Total no. of plants:	70
Band –A	13	Band – A	19
Band – B	18	Band – B	22
Band – C	20	Band - C	29

Table 58: Vegetation of Nila River – Site III – Manchady - Herbs

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Cyanotis axillaris</i>	1	-	1	2	1	-	-	1	1	1	-	2
2.	<i>Eclipta alba</i>	1	-	-	1	-	-	1	1	1	1	1	3
3.	<i>Leucas aspera</i>	1	1	-	2	1	1	1	3	1	1	-	2
4.	<i>Scoparia dulcis</i>	-	-	-	-	1	1	-	2	1	-	1	2
5.	<i>Cleome monophylla</i>	-	-	1	1	1	-	-	1	2	-	-	2
6.	<i>Viola enneasperma</i>	1	-	-	1	2	-	-	2	-	-	1	1
7.	<i>Portulaca grandiflora</i>	-	-	-	-	-	1	-	1	-	-	1	1
8.	<i>Melothria amplexicaulis</i>	-	-	1	1	-	-	1	1	-	-	-	-
9.	<i>Eupatorium odoratum</i>	1	-	1	2	1	-	1	2	-	1	-	1
10.	<i>Spilanthes calva</i>	-	-	-	-	1	-	1	2	1	1	-	2
11.	<i>Aerva lanata</i>	1	-	-	1	-	-	-	-	-	-	-	-
12.	<i>Sphaeranthus indicus</i>	-	-	1	1	1	-	-	1	-	-	1	1
13.	<i>Ipomea marginata</i>	-	-	1	1	1	-	-	1	-	1	1	2
14.	<i>Ipomea aquatica</i>	1	-	1	2	-	-	-	-	-	-	-	-
15.	<i>Mollugo pentaphylla</i>	1	1	-	2	1	-	-	1	-	-	1	1
16.	<i>Tridax procumbens</i>	1	1	1	3	1	-	1	2	1	1	1	3
17.	<i>Clitoria ternatea</i>	1	-	-	1	1	-	1	2	1	-	-	1
18.	<i>Nymphoides indica</i>	1	-	1	2	-	-	-	-	-	-	-	-
19.	<i>Lindernia serrata</i>	1	-	-	1	1	1	-	2	1	-	1	2
20.	<i>Emilia sonchifolia</i>	-	-	-	-	1	-	-	1	-	-	1	1
21.	<i>Mimosa pudica</i>	2	2	1	5	1	1	-	2	2	2	2	6
22.	<i>Phyllanthus viogratus</i>	-	-	1	1	-	-	1	1	-	-	1	1
23.	<i>Oldenlandia</i>	-	1	-	1	1	-	-	1	1	1	-	2

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
	<i>corymbosa</i>												
24.	<i>Cyclea peltata</i>	-	-	-	-	1	1	-	2	1	1	1	3
					28				32				39

Total No. of species:	24	Total no. of plants:	99
Band –A	19	Band – A	28
Band – B	21	Band – B	32
Band – C	20	Band - C	39

Table 59: Vegetation of Nila River Site III – Manchady - Grasses

Quadrates - 2m x 2m

Mean of 3 quadrates

Sl. No.	Species	Band-A	Band-B	Band C
1.	<i>Eragrostis unioides</i>	8	6	4
2.	<i>Eleusine coracana</i>	3	2	4
3.	<i>Cymbopogan</i>	2	2	4
4.	<i>Heteropogan contortus</i>	4	2	2
5.	<i>Themeda triandra</i>	-	2	6
6.	<i>Arundinella furcata</i>	-	2	4
7.	<i>Borreria auricularis</i>	4	6	4
8.	<i>Bothriochloa pertusa</i>	6	3	2
9.	<i>Dimeria josephii</i>	2	-	2
10.	<i>Spermacocece latifolis</i>	-	2	6
11.	<i>Spermacocece articularis</i>	4	-	3
	Total	33	27	41

Total No. of species:	11	Total Nos. in 3 bands	101
Band –A	8	Band – A	33
Band – B	9	Band – B	27
Band – C	11	Band - C	41

Table 60: Vegetation at Nila River Site III – Manchady - Cultivations

Sl. No.	Species	Band-A Season	Band-B Season	Band C Season
1.	<i>Oryza sativa</i>	-	May – Aug and Sept – Dec.	Sept – Dec.
2.	<i>Cocos nucifera</i>	-	All seasons	All seasons
3.	<i>Musa paradisiaca</i>	-	May – March	-
4.	<i>Areca catechu</i>	-	-	All seasons
5.	<i>Colacasia esculenta</i>	-	April – Feb.	April – Feb. Vigna
6.	<i>Vigna unguiculata</i>	-	-	May-Dec.
7.	<i>Amorphophallus paeoniifolius</i>	-	-	March-Jan

Total No. of species	7
Band –A	Nil
Band – B	4
Band – C	6

Table 61: Vegetation of Kalpathy River – Site I – Kava - Trees

Quadrat: 20m x 20m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Gliricidia sepium</i>	-	-	-	-	1	-	-	1	1	1	-	2
2.	<i>Macaranga peltata</i>	-	-	1	1	1	1	1	-	2	1	1	1
3.	<i>Pongamia glabra</i>	-	-	-	-	1	1	-	2	-	-	1	1

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
4.	<i>Syzygium cumini</i>	-	-	-	-	-	-	1	1	1	-	1	2
5.	<i>Erythrina indica</i>	-	-	-	-	-	-	1	1	-	-	1	1
6.	<i>Cocos nucifera</i>	-	-	-	-	-	-	1	1	-	-	-	-
7.	<i>Mangifera indica</i>	-	-	-	-	-	-	1	1	-	-	-	-
8.	<i>Morinda tinctoria</i>	-	-	-	-	-	-	-	-	1	1	-	2
9.	<i>Pavetta indica</i>	-	-	1	1	1	-	-	1	1	1	-	2
10.	<i>Annona squamosa</i>	-	-	-	-	-	-	1	1	-	-	-	-
11.	<i>Psidium guajava</i>	-	-	-	-	-	-	1	1	-	-	-	-
12.	<i>Alstonia scholaris</i>	-	-	-	-	-	-	1	1	-	-	1	1
13.	<i>Moringa pterygosperma</i>	-	-	-	-	-	1	-	1	-	-	-	-
14.	<i>Carica papaya</i>	-	-	-	-	-	-	1	1	-	-	-	-
15.	<i>Anacardium occidentale</i>	-	-	-	-	1	-	-	1	1	-	-	1
16.	<i>Ficus hispida</i>	-	-	1	1	1	-	-	1	-	1	-	1
17.	<i>Tamarindus indica</i>	-	-	-	-	1	-	-	1	-	-	1	1
18.	<i>Cassia fistula</i>	-	-	-	-	1	-	-	1	-	-	1	1
19.	<i>Terminalia bellerica</i>	-	-	-	-	-	-	-	-	1	-	-	1
20.	<i>Pterocarpus marsupium</i>	-	-	-	-	-	-	-	-	-	1	-	1
21.	<i>Tiliacora acuminata</i>	-	-	-	-	-	-	-	-	-	1	-	1
22.	<i>Emblica officianalis</i>	-	-	-	-	-	-	1	1	-	1	-	1
23.	<i>Lagerstroemia indica</i>	-	-	-	-	-	-	-	-	1	-	-	1
24.	<i>Peltrophorum pterocarpum</i>	-	-	-	-	-	1	-	1	1	-	-	1
25.	<i>Corypha umbraculifera</i>	-	-	-	-	1	-	-	1	1	-	-	1
26.	<i>Borassus flabellifer</i>	-	-	1	1	1	-	-	1	-	-	-	-

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
27.	<i>Albizia lebbek</i>	-	-	-	-	-	-	-	-	1	-	-	1
28.	<i>Butea monosperma</i>	-	-	-	-	-	-	-	-	1	-	-	1
29.	<i>Albizia procera</i>	-	-	-	-	-	-	-	-	-	1	-	1
30.	<i>Tectona grandis</i>	-	-	-	-	-	1	-	1	1	-	1	2
31.	<i>Oroxylum indicum</i>	-	-	-	-	-	-	-	-	-	1	-	1
32.	<i>Cinnamomum sulphuratum</i>	-	-	-	-	-	-	-	-	1	-	-	1
33.	<i>Ziziphus rugosa</i>	-	-	-	-	-	-	-	-	-	-	1	1
34.	<i>Calophyllum elatum</i>	-	-	-	-	-	-	-	-	1	-	-	1
35.	<i>Cycas circinalis</i>	-	-	-	-	-	-	-	-	-	1	-	1
					4				24				35

Q = Quadrates

Total No. of species	35	Total no. of plants	63
Band - A	4	Band - A	4
Band - B	22	Band - B	24
Band - C	28	Band - C	35

Table 62: Vegetation of Kalpathy River – Site I – Kava - Shrubs

Quadrat 10m x 10m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Croton sparsiflorus</i>	-	-	1	1	1	1	-	2	-	-	-	-
2.	<i>Parthenium hysterophorus</i>	-	-	-	-	1	-	1	2	-	-	1	1
3.	<i>Scoparia dulcis</i>	-	1	1	2	1	-	-	1	1	-	-	1
4.	<i>Datura stramonium</i>	-	1	1	2	1	-	-	1	-	-	-	-

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
5.	<i>Calatropis gigantea</i>	1	-	-	1	1	1	-	2	-	-	1	1
6.	<i>Rauwolfia tetraphylla</i>	1	-	-	1	-	-	1	1	-	1	-	1
7.	<i>Clerodendrun infortunatum</i>	-	-	1	1	-	-	-	-	1	1	-	2
8.	<i>Jasminum malabaricum</i>	-	-	1	1	1	1	-	2	-	-	-	-
9.	<i>Zizyphus jujube</i>	1	-	-	1	1	-	1	2	1	-	-	1
10.	<i>Ichnocarpus frutescens</i>	-	-	-	-	-	1	-	1	-	1	-	1
11.	<i>Chassalia curviflora</i>	-	-	1	1	-	1	-	1	-	-	-	-
12.	<i>Stachytarpheta indica</i>	-	-	-	-	-	1	1	2	-	1	-	1
13.	<i>Rauwolfia serpentina</i>	-	-	1	1	-	1	-	1	-	-	-	-
14.	<i>Cryptolepis buchananii</i>	-	-	-	-	-	-	-	-	1	1	-	2
15.	<i>Solanum nigrum</i>	-	-	1	1	1	-	1	2	1	-	-	1
16.	<i>Thunbergia mysorensis</i>	1	-	1	2	1	-	-	1	-	-	-	-
17.	<i>Crotalaria laburnifolia</i>	-	-	-	-	1	-	1	1	-	-	1	1
18.	<i>Rotala indica</i>	-	-	-	-	-	1	-	1	-	1	1	2
19.	<i>Ricinus communis</i>	1	-	1	2	1	-	-	1	-	-	1	1
20.	<i>Ipomea aquatica</i>	1	-	1	2	-	-	-	-	-	-	-	-
21.	<i>Jatropha glandulifera</i>	-	-	-	-	1	1	-	2	1	-	-	1
22.	<i>Tinospora cordifolia</i>	-	-	-	-	1	1	-	2	1	-	1	2
23.	<i>Synendrella nodiflora</i>	-	-	-	-	1	-	-	1	-	-	1	1
24.	<i>Hibiscus furcatus</i>	-	-	1	1	1	1	-	2	1	-	1	2
25.	<i>Clerodendrum</i>	-	-	-	-	1	-	-	1	1	1	-	2

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
	<i>inerme</i>												
26.	<i>Ixora coccinia</i>	-	-	-	-	1	-	1	2	1	-	-	1

Total No. of species :	26	Total no. of plants :	78
Band – A	15	Band – A	20
Band – B	23	Band – B	33
Band – C	25	Band - C	25

Table 63: Vegetation of Kalpathy River – Site I – Kava - Herbs

Quadrat 5m x 5m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Eclipta alba</i>	-	1	1	2	2	1	1	4	-	1	1	2
2.	<i>Scoparia dulcis</i>	-	1	-	1	1	-	1	2	1	1	-	2
3.	<i>Leucas aspera</i>	-	1	-	1	1	-	1	2	-	-	1	1
4.	<i>Cleome monophylla</i>	-	-	-	-	1	-	1	2	1	-	1	2
5.	<i>Eupatorium odoratum</i>	1	1	-	-	1	1	-	2	1	1	-	2
6.	<i>Polygala javana</i>	-	-	-	-	-	1	-	1	1	-	-	1
7.	<i>Osbeckia hispidissima</i>	-	-	-	-	1	1	-	2	-	1	1	2
8.	<i>Spilanthes calva</i>	-	-	1	1	-	1	-	1	1	1	1	3
9.	<i>Desmodium triflorum</i>	-	-	-	-	1	-	-	1	1	-	-	1
10.	<i>Ipomea marginata</i>	1	1	1	3	-	1	-	1	-	-	-	-
11.	<i>Ipomea aquatica</i>	-	1	-	1	1	-	-	1	-	-	-	-
12.	<i>Mollugo pentaphylla</i>	-	-	-	-	1	1	-	2	1	-	1	2
13.	<i>Tridax procumbens</i>	1	-	1	2	1	1	-	2	-	-	1	1
14.	<i>Clitoria ternatea</i>	-	-	-	-	1	-	-	1	1	1	-	2
15.	<i>Oldenlandia</i>	-	-	1	1	1	1	-	2	-	-	-	-

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
	<i>corymbosa</i>												
16.	<i>Catharanthus pusillis</i>	-	-	-	-	1	-	1	2	-	-	1	1
17.	<i>Cleome viscosa</i>	-	-	1	1	1	-	-	1	1	1	-	2
18.	<i>Sida cordifolia</i>	-	-	-	-	1	1	-	2	-	-	-	-
19.	<i>Sebastiania chamaelea</i>	-	-	-	-	1	1	-	2	-	-	1	1
20.	<i>Urena sinuata</i>	-	-	1	1	1	-	1	2	1	1	-	2
21.	<i>Cyanotis axillaris</i>	-	-	-	-	-	-	-	-	1	-	-	1
22.	<i>Phyllanthus viogratus</i>	1	-	1	2	-	-	-	-	-	-	-	-
23.	<i>Kyllinga brevifolia</i>	-	-	-	-	1	1	-	2	-	-	1	1
24.	<i>Lindernia serrata</i>	-	-	1	1	1	-	-	1	-	-	-	-
25.	<i>Brachiaria ramosa</i>	-	-	1	1	-	-	-	-	1	1	-	2
26.	<i>Senna alata</i>	-	-	-	-	1	-	1	2	-	-	1	1
27.	<i>Nymphoides indica</i>	1	1	-	2	-	-	-	-	-	-	-	-

Total no. of species :	27	Total no. of plants :	95
Band –A	14	Band – A	20
Band – B	24	Band – B	41
Band – C	20	Band - C	34

Table 64: Vegetation of Kalpathy River – Site I – Kava - Grasses

Quadrat: 2m x 2m

Sl. No.	Species	Band-A	Band-B	Band C
1.	<i>Eragrostis unioloides</i>	4	5	2
2.	<i>Eleusine coracana</i>	-	2	3
3.	<i>Cymbopogan</i>	-	4	3
4.	<i>Borreria auricularis</i>	2	2	2
5.	<i>Phyllanthus viogratus</i>	-	-	4
6.	<i>Cucumis satires</i>	-	4	2

Sl. No.	Species	Band-A	Band-B	Band C
7.	<i>Spermacocecece latifolis</i>	4	3	1
8.	<i>Spermacocecece mouritania</i>	-	2	1
9.	<i>Arundinella furcata</i>	-	2	2
10.	<i>Dimeria raizadae</i>	-	2	2
11.	<i>Heteropogon contortus</i>	2	1	2

Total No. of species	11
Band-A	5
Band-B	10
Band C	11
Total No. of Plants	63
Band-A	12
Band-B	27
Band C	24

Table 65: Cultivations at Kalpathy River – Site I – Kava

Table 65

Sl. No.	Species	Band-A Season	Band-B Season	Band C Season
1.	<i>Oryza sativa</i>	-	Sept – Dec.	-
2.	<i>Cocos nucifera</i>	All seasons	All seasons	All seasons
3.	<i>Mussa paradisiaca</i>	-	Nov – Sept.	-
4.	<i>Musa acuminata</i>	All seasons	All seasons	All seasons
5.	<i>Musa balbisiana</i>	All seasons	All seasons	All seasons
6.	<i>Areca catechu</i>	All seasons	All seasons	All seasons
7.	<i>Colacasia esculenta</i>	-	April – Feb.	-
8.	<i>Momordica charantia</i>	-	April – Dec.	-
9.	<i>Amorphophallus paeoniifolius</i>	-	March – Jan	-
10.	<i>Vigna unguiculata</i>	-	May – Dec.	-
11.	<i>Abelmoschus esculentus</i>	-	April – Dec.	-

Table 66: Vegetation of Kalpathy River – Site II – Manthakkad - Trees

Quadrates – 20m x 20m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1	<i>Gliricidia sepium</i>	-	-	1	1	1	1	-	2	1	1	1	3
2	<i>Macaranga peltata</i>	-	-	-	-	1	-	-	1	1	1	-	2
3	<i>Pongamia glabra</i>	-	-	-	-	1	1	-	2	1	-	-	1
4	<i>Syzygium cumini</i>	-	-	-	-	-	-	-	-	1	-	-	1
5	<i>Erythrina indica</i>	-	-	1	1	1	-	-	-	1	-	-	1
6	<i>Cocos nucifera</i>	-	-	-	-	1	1	-	2	-	-	1	1
7	<i>Mangifera indica</i>	-	-	-	-	1	-	-	1	-	-	1	1
8	<i>Morinda tinctoria</i>	-	-	-	-	-	-	-	-	1	1	-	2
9	<i>Pavetta indica</i>	-	-	1	1	1	-	1	2	-	-	-	-
10	<i>Ervatamia heyneana</i>	-	-	1	1	1	-	-	1	1	-	-	1
11	<i>Eugenia recemosa</i>	1	-	-	1	1	-	1	2	1	1	-	2
12	<i>Areca catechu</i>	-	-	-	-	-	-	1	1	1	1	-	2
13	<i>Annona squamosa</i>	-	-	-	-	-	-	1	1	1	-	-	1
14	<i>Psidium guajava</i>	-	-	-	-	-	-	-	-	1	-	-	1
15	<i>Artocarpus heterophyllus</i>	-	-	-	-	-	-	-	-	1	-	-	1
16	<i>Carica papaya</i>	-	-	-	-	1	-	-	1	-	1	-	1
17	<i>Bambusa bambos</i>	-	-	-	-	-	1	-	1	-	-	-	-
18	<i>Ficus hispida</i>	1	-	-	1	-	-	-	-	-	1	-	1
19	<i>Tamarindus indica</i>	-	-	-	-	-	1	1	-	-	1	-	1
20	<i>Holigarna arnottiana</i>	1	-	-	1	-	-	-	-	-	-	-	-
21	<i>Ficus religiosa</i>	-	-	1	1	-	-	-	-	-	-	-	-
22	<i>Cassia fistula</i>	-	-	-	-	-	-	1	1	-	-	-	-
23	<i>Tiliacora acuminata</i>	-	1	-	1	1	-	-	1	-	-	-	-
24	<i>Pterocarpus marsupium</i>	-	-	-	-	-	1	-	1	-	-	1	1
25	<i>Borassus flabellifer</i>	-	1	-	1	-	-	1	1	-	-	-	-
26	<i>Artocarpus integrifolia</i>	-	-	-	-	1	-	-	1	-	-	-	-

Q = Quadrates

Total No. of species:	26	Total no. of plants:	58
Band –A	9	Band – A	9
Band – B	19	Band – B	24
Band – C	18	Band - C	25

Table 67: Vegetation of Kalpathy River – Site Ii – Manthakkad - Shrubs

Quadrat – 10m x 10m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1	<i>Clerodendrum infortunatum</i>	1	-	-	1	1	1	-	2	1	-	1	2
2	<i>Calatropis gigantea</i>	1	1	-	2	1	-	-	1	-	-	-	-
3	<i>Datura stramonium</i>	1	1	-	2	1	1	1	3	1	1	-	2
4	<i>Parthenium hysterophorus.</i>	1	-	1	2	1	-	-	1	-	-	-	-
5	<i>Zizyphus jujube</i>	-	-	1	1	-	1	-	1	-	-	1	1
6	<i>Sesamum indicum</i>	1	-	1	2	-	-	-	-	-	-	-	-
7	<i>Ervatamia coronaria</i>	-	-	1	1	-	-	1	1	1	-	-	1
8	<i>Mussaenda frondosa</i>	1	-	1	2	1	-	-	1	-	1	-	1
9	<i>Rauwolfia tetraphylla</i>	1	-	-	1	-	-	-	-	1	-	-	1
10	<i>Canthinum parviflorum</i>	-	-	-	-	1	-	-	1	-	-	-	-
11	<i>Solanum nigrum</i>	-	1	-	1	1	-	1	2	1	-	-	1
12	<i>Chassalia curviflora</i>	-	-	-	-	-	-	1	1	-	1	-	1
13	<i>Rauwolfia serpentina</i>	1	-	1	2	-	-	-	-	-	-	-	-
14	<i>Cryptolepis buchanani</i>	-	-	-	-	-	-	1	1	-	-	-	-
15	<i>Thunbergia mysorensis</i>	1	1	-	2	-	-	1	1	-	-	-	-
16	<i>Rotala indica</i>	-	-	-	-	1	1	-	2	-	-	1	1
17	<i>Urena sinuata</i>	-	-	1	1	-	-	1	1	-	-	-	-
18	<i>Ipomea aquatica</i>	1	1	-	2	-	1	-	1	-	-	-	-
19	<i>Jatropha glandulifera</i>	-	-	-	-	1	-	-	1	-	-	1	1
20	<i>Ricinus communis</i>	-	-	-	-	1	-	-	1	1	-	-	1
					21				23				13

Vegetation of Kalpathy River – Site II – Manthakkad - Herbs

Table 68 Quadrata: 5m x5m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1	<i>Ageratum conyzoides</i>	-	-	-	-	1	1	-	2	-	-	-	-
2	<i>Eclipta alba</i>	-	-	1	1	1	-	1	2	-	1	1	2
3	<i>Leucas aspera</i>	-	-	1	1	1	-	-	1	1	1	-	2
4	<i>Scoparia dulcis</i>	1	-	-	1	1	-	-	1	-	1	1	2
5	<i>Cleome monophylla</i>	1	-	1	2	1	-	-	1	-	-	-	-
6	<i>Polygala javana</i>	-	-	-	-	1	-	-	1	1	-	-	1
7	<i>Osbeckia hispidissima</i>	-	1	-	1	-	1	-	1	-	-	-	-
8	<i>Eupatorium odoratum</i>	1	-	-	1	-	-	1	1	-	-	-	-
9	<i>Acalypha virginica</i>	1	1	-	2	1	-	-	1	-	-	-	-
10	<i>Acalypha rhomboidea</i>	1	1	-	2	1	-	-	1	-	-	-	-
11	<i>Acmella oppositifolia</i>	-	-	-	-	1	-	1	1	1	1	-	2
12	<i>Aconitum columbianum</i>	1	1	-	2	-	-	-	-	-	-	-	-
13	<i>Actaea rubra</i>	-	-	1	1	1	-	-	1	-	-	-	-
14	<i>Agalinis linifolia</i>	1	1	-	2	-	-	-	-	-	-	-	-
15	<i>Agalinis oligophylla</i>	-	1	1	2	-	-	-	-	-	-	-	-
16	<i>Croton sparsiflorus</i>	-	-	-	-	1	-	1	2	-	-	-	-
17	<i>Aerva lanata</i>	1	-	-	1	1	-	-	1	-	-	-	-
18	<i>Ipomea marginata</i>	1	-	-	1	1	-	-	1	-	-	-	-
19	<i>Ipomea aquatica</i>	-	1	1	2	-	-	-	-	-	-	-	-
20	<i>Desmodium triflorum</i>	-	-	-	-	1	-	-	1	1	-	-	1
21	<i>Tridax procumbens</i>	-	-	1	1	1	-	1	2	1	1	-	2
22	<i>Clitoria ternatea</i>	-	-	-	-	1	-	-	-	1	-	-	1
23	<i>Cleome viscosa</i>	1	-	1	2	-	-	-	-	-	-	-	-
24	<i>Urena sinuata</i>	-	-	-	-	-	1	-	1	2	-	-	2
25	<i>Emelia sonchifolia</i>	-	-	-	-	1	-	-	1	-	1	-	1
26	<i>Cyanotis axillaris</i>	-	-	-	-	1	-	1	2	-	-	-	-
27	<i>Seasamum indicum</i>	1	-	1	2	1	-	-	1	-	-	-	-
28	<i>Mimosa pudica</i>	-	-	1	1	1	-	1	2	2	-	1	3
29	<i>Phyllanthus viogratus</i>	-	-	1	1	-	-	1	1	-	-	-	-

Total no.of species :	29
Band – A	20
Band – B	23
Band – C	11
Total no.of plants :	77
Band – A	29
Band – B	29
Band – C	19

Vegetation of Kalpathy River – Site II – Manthakkad - Grasses

Table 69

Sl. No.	Species	Band-A	Band-B	Band C
1	<i>Eragrostis uniolooides</i>	-	4	2
2	<i>Eleusine coracana</i>	-	3	3
3	<i>Borreria auricularis</i>	3	2	1
4	<i>Arundinella furcata</i>	2	2	3
5	<i>Botrichloa pertusa</i>	-	2	-
6	<i>Cucumis satires</i>	-	2	4
7	<i>Dimeria josephii</i>	2	2	1
8	<i>Alloteropsis cimicina</i>	-	-	2
9	<i>Cymbo pogon</i>	3	1	-
10	<i>Spermacocece latifolia</i>	2	4	2
11	<i>Hedyolis articularis</i>	1	2	-
12	<i>Echinochloa colona</i>	2	2	-
Total species:		7	11	8

Total species :	12
Total No. of plants :	59
Band – A	15
Band – B	26
Band – C	18

Cultivations at Kalpathy River – Site II – Manthakkad

Table 70

Sl. No.	Species	Band-A Season	Band-B Season	Band C Season
1	<i>Oryza sativa</i>	-	May - Aug and Sept –Dec	May - Aug and Sept –Dec
2	<i>Musa paradisiaca</i>	-	Oct – Aug	Oct – Aug
3	<i>Musa acuminata</i>	All seasons	All seasons	All seasons
4	<i>Colacasia esculenta</i>	-	April- Feb	April –Feb
5	<i>Amorphophallus paeonifolius</i>	-	March – January	March – Janu
6	<i>Plectranthus rotundifolius</i>	-	June – Feb	June – Feb
7	<i>Dioscorea alata</i>	-	March – Jan	March – Jan
8	<i>Musa balbisiana</i>	All seasons	All seasons	All seasons
9	<i>Cocos nucifera</i>	All seasons	All seasons	All seasons
10	<i>Areca catechu</i>	All seasons	All seasons	All seasons
11	<i>Vigna unguiculata</i>	-	May- Dec	May- Dec
12	<i>Abelmoschus esculentus</i>	-	April – Dec	April – Dec

Vegetation of Kalpathy River – Site III Parali- Trees

Table 71

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Macaranga Peltata</i>	-	-	1	1	1	-	-	1	1		1	1
2.	<i>Pongamia glabra</i>	-	-	1	1	-	1	-	1	-	-	1	1
3.	<i>Erythrina indica</i>	-	-	-	-	-	-	1	1	-	-	1	1
4.	<i>Mangifera indica</i>	-	1	1	2	1	-	-	1	-	-	1	1
5.	<i>Cocos nucifera</i>	-	-	-	-	1	-	-	1	1	-	1	2
6.	<i>Pavetta indica</i>	1	-	-	1	-	1	-	1	-	1	-	1
7.	<i>Areca catechu</i>	-	-	-	-	1	-	-	1	1	1	-	2
8.	<i>Annona squamosa</i>	1	-	-	1	-	-	-	-	1	-	-	1
9.	<i>Psidium guajava</i>	-	-	-	-	-	1	-	1	-	1	1	2
10.	<i>Eugenia jumboflava</i>	-	1	-	1	-	-	-	-	1	-	-	1
11.	<i>Alstonia scholaris</i>	-	-	-	-	-	-	1	1	-	-	1	1
12.	<i>Ichnocarpus frutescens</i>	-	-	-	-	-	-	-	-	1	-	1	2
13.	<i>Moringa pterygosperma</i>	-	1	-	1	1	-	-	1	-	-	1	1
14.	<i>Carica papaya</i>	1	-	-	1	-	-	-	-	-	-	-	-
15.	<i>Anacardium occidentale</i>	-	-	-	-	-	-	-	-	-	1	-	1
16.	<i>Tamarindus indica</i>	-	-	-	-	-	1	-	1	-	1	-	1
17.	<i>Holigarna arnottiana</i>	1	-	-	-	1	-	-	1	-	-	-	-
18.	<i>Nerium oleander</i>	-	-	-	-	-	-	-	-	-	1	-	1
19.	<i>Pterocarpus marsupium</i>	-	-	-	-	1	-	-	1	-	-	1	1
20.	<i>Tiliacora acuminate</i>	-	1	-	1	-	-	-	-	1	-	-	1
21.	<i>Grevillea robusta</i>	-	-	-	-	-	-	1	1	-	-	-	-
22.	<i>Dalbergia latifolia</i>	-	-	1	1	-	1	-	1	-	-	-	-
23.	<i>Kydia calycina</i>	-	-	1	1	-	-	-	-	-	-	1	1
24.	<i>Terminalia bellerica</i>	-	1	-	1	1	-	-	1	1	-	-	1
25.	<i>Corypha umbraculifera</i>	-	-	1	1	-	1	-	1	-	-	-	-
26.	<i>Borassus flabellifer</i>	-	-	1	1	1	-	-	1	1	-	-	1
27.	<i>Emblica officianalis</i>	-	-	-	-	1	-	-	1	-	-	1	1
28.	<i>Albizia lebeck</i>	-	-	-	-	-	-	-	-	-	1	-	1

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
29.	<i>Acacia longifolia</i>	-	1	-	1	-	-	1	1	-	-	-	-
30.	<i>Butea monosperma</i>	-	-	-	-	1	-	-	1	-	-	-	-
31.	<i>Artocarpus integrifolia</i>	-	-	-	-	-	-	-	-	-	-	1	1

Q = Quadrant	
Total no. of species	31
Band –A	15
Band – B	21
Band – C	26
Total no. of trees	
Band – A	16
Band – B	21
Band - C	27

Table 72 : Vegetation of Kalpathy River – Site III Parali - Shrubs

		Band A				Band B				Band C			
		Q1	Q2	Q3	Total	Q1	Q2	Q3	Total	Q1	Q2	Q3	Total
1	<i>Clerodendrum infortunatum</i>	1	-	-	1	1	-	-	1	-	-	-	-
2	<i>Mussaenda frondosa</i>	-	-	1	1	-	-	1	1	-	-	-	-
3	<i>Rauvolfia tetraphylla</i>	-	1	-	1	-	1	-	1	-	-	-	-
4	<i>Ervatamia coronaria</i>	-	-	-	-	1	-	-	1	1	-	-	1
5	<i>Calatropis gigantea</i>	1	-	-	1	-	-	1	1	-	1	-	1
6	<i>Datura stramonium</i>	-	1	-	1	1	-	-	1	-	1	-	1
7	<i>Stachytarpheta indica</i>	2	-	-	2	-	-	1	1	-	-	1	1
8	<i>Zizyphus jujube</i>	-	-	-	-	-	1	-	1	1	-	-	1
9	<i>Jasminum malabaricum</i>	-	1	-	1	-	-	-	-	-	-	-	-
10	<i>Canthium parviflorum</i>	-	-	1	1	1	-	-	1	1	-	-	1
11	<i>Vitis flexuosa</i>	-	-	-	-	-	-	1	1	-	1	-	1
12	<i>Ocimum sanctum</i>	-	1	1	2	-	1	-	1	-	-	-	-
13	<i>Chassalia curviflora</i>	-	-	-	-	1	-	-	1	1	-	1	2
14	<i>Rauvolfia serpentina</i>	-	-	-	1	-	-	1	1	-	-	-	-
15	<i>Cryptolepis buchanani</i>	-	1	-	1	-	1	-	1	-	-	-	-
16	<i>Solanum nigrum</i>	-	-	-	-	1	-	-	1	-	-	1	1

		Band A				Band B				Band C			
		Q1	Q2	Q3	Total	Q1	Q2	Q3	Total	Q1	Q2	Q3	Total
17	<i>Thunbergia mysorensis</i>	1	-	1	2	-	-	-	-	-	-	-	-
18	<i>Crotalaria laburnifolia</i>	-	-	-	-	-	1	-	1	1	-	-	1
19	<i>Tinospora cordifolia</i>	-	-	-	-	1	-	1	2	1	-	-	1
20	<i>Synedrilla nodiflora</i>	-	-	-	-	-	1	-	1	1	-	-	1
21	<i>Ipomea aquatic</i>	1	-	1	2	-	-	-	-	-	-	-	-
22	<i>Clerodendrum inerme</i>	-	1	-	1	-	1	-	1	-	1	-	1
23	<i>Ricinus communis</i>	-	-	-	-	1	-	-	1	-	-	1	1
24	<i>Jatropha glandulifera</i>	-	-	-	-	-	1	-	1	1	-	-	1
25	<i>Ervatamia coronaria</i>	-	-	-	-	1	-	-	1	-	1	-	1
26	<i>Parthenium hysterophorus</i>	1	-	1	2	-	-	1	1	-	-	-	-
					20				23				17

Total No. of species	26
Band –A	15
Band – B	23
Band – C	16
Total no. of Plants	60
Band – A	20
Band – B	23
Band - C	17
Q = Quadrature	

Table 73: Vegetation of Kalpathy River – Site III – Parali-Herbs

Quadrature - 5m x 5m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Eclipta alba</i>	1	-	-	1	-	-	1	1	-	-	-	-
2.	<i>Leucas aspera</i>	-	-	-	-	1	-	1	1	1	-	-	1
3.	<i>Spilanthes calva</i>	1	-	1	2	1	-	1	2	-	-	-	-
4.	<i>Croton sparsiflorus</i>	-	1	-	1	1	-	-	1	-	-	1	1
5.	<i>Sesamum indicum</i>	1	-	2	2	-	-	-	-	-	-	-	-
6.	<i>Phyllanthus viogratus</i>	1	1	-	2	-	1	-	1	-	-	-	-

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
7.	<i>Cleome monophylla</i>	1	-	-	1	-	1	-	1	-	-	-	-
8.	<i>Polygala javana</i>	-	-	-	-	1	-	-	-	1	-	-	1
9.	<i>Viola enneasperma</i>	-	1	-	1	-	-	1	1	1	-	-	1
10.	<i>Melothria amplexicaulis</i>	-	1	-	1	1	-	1	2	-	-	1	1
11.	<i>Urena lobata</i>	1	-	-	1	-	-	1	1	-	-	-	-
12.	<i>Aerva lanata</i>	-	-	1	1	-	-	-	-	1	-	-	1
13.	<i>Sphaeranthus indicus</i>	-	-	1	1	1	-	-	1	-	1	-	1
14.	<i>Ipomea marginata</i>	1	-	1	2	-	-	-	-	-	-	-	-
15.	<i>Ipomea aquatica</i>	1	1	-	2	-	-	-	-	-	-	-	-
16.	<i>Desmodium triflorum</i>	-	-	1	1	-	1	-	1	-	-	-	-
17.	<i>Clitoria ternatea</i>	-	-	-	-	-	1	-	1	-	1	-	1
18.	<i>Tridax procumbens</i>	-	-	1	1	-	-	1	1	1	-	-	1
19.	<i>Nymphoides indica</i>	1	1	1	3	-	-	-	-	-	-	-	-
20.	<i>Eichhornia crassipes</i>	2	-	1	-	3	-	-	-	-	-	-	-
21.	<i>Emilia sonchifolia</i>	-	-	-	-	1	-	1	2	1	-	-	1
22.	<i>Lindernia serrata</i>	-	-	-	-	-	1	1	2	-	1	-	1
23.	<i>Sida cordifolia</i>	-	-	-	-	1	-	1	2	1	-	-	1
24.	<i>Cleome viscosa</i>	1	-	-	1	-	-	-	-	-	-	-	-

Vegetation of Kalpathy River – Site III – Parali-Grasses

Quadrat - 2m x 2m

Table 74 Mean of 3 quadrates

Sl. No	Species	Band-A No's	Band-B No's	Band C No's
1.	<i>Arundinella furcata</i>	4	3	2
2.	<i>Heteropogon contortus</i>	3	1	2
3.	<i>Botrichloa pertusa</i>	1	2	1
4.	<i>Cymbopogon</i>	2	2	3

Sl. No	Species	Band-A No's	Band-B No's	Band C No's
5.	<i>Themeda triandra</i>	1	1	1
6.	<i>Eragrostis uniolooides</i>	-	2	2
7.	<i>Eleusine coracana</i>	2	1	2
8.	<i>Borreria auricularis</i>	3	2	3
9.	<i>Alloteropsis cimicina</i>	-	3	4
10.	<i>Cucumis satives</i>	2	2	4
11.	<i>Spermacoea latifolia</i>	-	2	2
		18	21	28

Total Species :	11
Band – A :	8
Band – B :	11
Band – C :	11
Total No's :	67
Band – A :	18
Band – B :	21
Band – C :	28

Table 75 : Cultivations at Kalpathy River – Site III Parali

Sl. No	Species	Band-A Season	Band-B Season	Band C Season
1.	<i>Oryza sativa</i>	Sept – Dec	May – Aug Sept – Dec	May – Aug Sept – Dec
2.	<i>Musa acuminata</i>	All season	All season	All season
3.	<i>Musa paradisiaca</i>	-	Oct-Aug	Oct – Aug
4.	<i>Musa balbisiana</i>	All season	All season	All season
5.	<i>Amorphophallus paeoniifolius</i>	-	-	March – Jan
6.	<i>Colacasia esculenta</i>	-	April – Feb	April – feb
7.	<i>Plectranthus rotundifolius</i>	-	June – Feb	June – Feb
8.	<i>Cocos nucifera</i>	All seasons	All season	All season
9.	<i>Areca catechu</i>	All seasons	All season	All season
10.	<i>Vigna unguiculata</i>	-	May – Dec	May – Dec
11.	<i>Abelmoschus esculentus</i>	-	April – Dec	April – De

Table 76: Vegetation of Kunthipuzha – Site I Pathrakadavu - Trees

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Albizia procera</i>	1	-	-	1	1	-	-	1	-	-	-	-
2.	<i>Acacia torta</i>	-	-	1	1	1	-	-	1	-	1	-	1
3.	<i>Bambusa bambos</i>	-	1	-	1	1	-	-	1	-	-	1	1
4.	<i>Bombax malabarica</i>	-	1	-	1	-	1	-	1	-	-	1	1
5.	<i>Cycas circinalis</i>	-	-	-	-	-	1	-	1	-	-	-	-
6.	<i>Dalbergia latifolia</i>	1	1	-	2	-	1	-	1	-	-	-	-
7.	<i>Phyllanthus emblica</i>	1	-	1	2	1	-	-	1	1	-	1	2
8.	<i>Milusa tomentosa</i>	1	-	-	1	-	1	-	1	-	-	-	-
9.	<i>Oroxylum indicum</i>	-	1	1	2	1	-	-	1	-	-	1	1
10.	<i>Pterospermum diversifolium</i>	1	-	-	1	-	1	-	1	-	-	-	-
11.	<i>Tectona grandis</i>	1	-	1	2	1	-	1	2	1	-	-	1
12.	<i>Terminalia bellerica</i>	1	-	-	1	1	-	-	1	-	-	1	1
13.	<i>Terminalia paniculata</i>	-	-	1	1	-	-	1	1	1	1	-	2
14.	<i>Terminalia crenulata</i>	-	1	-	1	-	1	-	1	-	1	-	1
15.	<i>Calophyllum elatum</i>	-	1	-	1	-	-	1	1	-	1	-	1
16.	<i>Cinnamomum sulphuratum</i>	-	-	1	1	1	-	-	1	-	-	-	-
17.	<i>Garcinia cambogia</i>	1	-	-	1	-	-	1	1	-	1	-	1
18.	<i>Mesua ferrea</i>	-	-	1	1	-	-	-	-	-	-	-	-
19.	<i>Gardonia obtuse</i>	1	-	-	1	-	1	-	1	-	-	-	-
20.	<i>Pittosporum tobira</i>	1	-	-	1	1	-	-	1	1	-	-	1
21.	<i>Wendlandia thyrsoides</i>	-	1	1	2	-	1	-	1	-	-	-	-
22.	<i>Ziziphus rugosa</i>	1	-	-	1	-	-	1	1	-	-	-	-
23.	<i>Syzygium cumini</i>	-	-	1	1	-	1	-	1	-	-	1	1
24.	<i>Anacardium occidentale</i>	-	1	-	1	1	-	-	1	1	1	-	2
25.	<i>Macaranga peltata</i>	-	1	-	1	-	-	1	1	-	-	1	1
26.	<i>Erythrina indica</i>	-	-	1	1	-	-	-	-	-	1	-	1
27.	<i>Ficus hispida</i>	-	1	-	1	1	-	-	1	-	-	-	-
28.	<i>Alstonia scholaris</i>	-	-	-	-	-	-	-	-	-	1	-	1

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
29.	<i>Artocarpus heterophyllus</i>	-	-	-	-	-	-	-	-	-	-	1	1
30.	<i>Strychnos nuxvomica</i>	-	-	-	-	-	1	-	1	-	-	-	1
31.	<i>Holigarna arnottiana</i>	-	-	1	1	-	-	-	-	-	-	-	-
32.	<i>Lagerstroemia indica</i>	-	1	-	1	-	1	-	1	-	-	-	-
33.	<i>Peltroforum pterocarpum</i>	-	-	1	1	-	-	1	1	-	-	-	1
34.	<i>Tiliacora acuminata</i>	-	-	1	1	-	-	-	-	-	-	1	1
35.	<i>Corypha umbraculifera</i>	-	1	-	1	-	-	-	-	-	-	-	-
36.	<i>Butea monosperma</i>	1	-	-	1	-	-	-	-	-	-	-	-
37.	<i>Hevea braziliensis</i>	-	-	-	-	2	2	2	6	2	2	2	6

Total No. of species :	37	Total no. of trees :	102
Band – A :	32	Band – A :	37
Band – B :	29	Band – B :	35
Band – C :	22	Band – C :	30

Vegetation of Kunthipuzha – Site I Pathrakadavu

Shrubs

Table 77 Quadrate 10m x 10m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Clerodendrum infortunatum</i>	-	-	-	-	1	-	1	2	1	-	-	1
2.	<i>Mussaenda frondosa</i>	-	-	-	-	1	-	-	1	-	1	-	1
3.	<i>Eupatorium odoratum</i>	-	1	-	1	-	1	-	1	1	-	1	2
4.	<i>Scoparia dulcis</i>	-	-	1	1	1	-	-	1	1	-	-	1
5.	<i>Eclipta alba</i>	-	1	1	2	-	1	-	1	-	-	-	-
6.	<i>Calatropis gigantea</i>	-	-	1	1	-	1	1	2	-	-	1	1
7.	<i>Ervatamia coronaria</i>	1	-	-	1	-	-	1	1	-	-	1	1

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
8.	<i>Jasminum malabaricum</i>	-	-	1	1	-	1	1	2	-	1	-	1
9.	<i>Rauvolfia tetraphylla</i>	-	-	-	-	1	-	1	2	-	1	-	1
10.	<i>Datura stramonium</i>	-	-	-	-	1	-	-	1	1	-	1	2
11.	<i>Stachytarpheta indica</i>	-	-	-	-	-	1	-	1	1	-	-	1
12.	<i>Zizyphus jujube</i>	-	-	-	-	1	-	-	1	1	-	-	1
13.	<i>Vitis flexuosa</i>	-	-	-	-	-	-	-	-	-	-	1	1
14.	<i>Canthium parviflorum</i>	-	-	-	-	1	-	-	1	1	-	-	1
15.	<i>Aristolochia indica</i>	-	-	1	1	-	-	-	-	1	1	-	2
16.	<i>Ixora coccinia</i>	-	-	1	1	1	1	-	2	1	-	-	1
17.	<i>Cryptolepis buehneri</i>	-	1	-	1	1	-	-	1	1	-	-	1
18.	<i>Solanum nigrum</i>	-	-	1	1	-	1	-	1	-	1	-	1
19.	<i>Clerodendrum inerme</i>	-	1	-	1	1	-	-	1	-	1	-	1
20.	<i>Thunbergia mysorensis</i>	1	-	1	2	-	-	-	-	-	-	-	-
21.	<i>Crotalaria laburnifolia</i>	-	-	1	1	-	1	-	1	1	-	-	1
22.	<i>Urena sinuata</i>	-	-	-	-	1	-	1	2	1	-	-	1
23.	<i>Ipomea aquatica</i>	1	-	1	2	-	-	1	1	-	-	-	-
24.	<i>Ricinus communis</i>	-	-	-	-	-	1	-	1	1	-	1	2
25.	<i>Jatropha glandulifera</i>	-	-	1	1	1	-	1	2	-	1	-	1
26.	<i>Ocimum sanctum</i>	1	-	1	2	1	1	-	2	-	-	1	1
27.	<i>Tephrosia purpurea</i>	-	-	1	1	-	-	1	1	1	1	-	2

Total No. of species :	27	Total no. of plants :	82
Band –A :	17	Band – A :	21
Band – B :	24	Band – B :	32
Band – C :	24	Band – C :	29

Vegetation of Kunthipuzha – Site I Pathrakkadavu

Herbs

Table 78 Quadrata : 5m x 5m

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Eclipta alba</i>	-	-	1	1	2	-	-	2	-	1	-	1
2.	<i>Leucas aspera</i>	-	1	-	1	-	1	1	2	-	1	1	2
3.	<i>Scoparia dulcis</i>	-	-	-	-	1	-	1	2	-	1	-	1
4.	<i>Cleome monophylla</i>	1	-	-	11	-	1	-	1	1	-	-	1
5.	<i>Viola enneasperma</i>	1	-	-	1	-	1	1	2	-	1	1	2
6.	<i>Polygala javana</i>	-	1	-	1	1	-	-	1	1	-	-	1
7.	<i>Portulaca grandiflora</i>	-	-	1	1	-	-	1	1	-	-	1	1
8.	<i>Osbeckia hispidissima</i>	-	1	1	2	-	-	-	-	-	1	-	1
9.	<i>Melothria amplexicaulis</i>	1	1	-	2	1	1	-	2	-	-	1	1
10.	<i>Eupatorium odoratum</i>	-	-	-	-	-	1	-	1	1	-	-	1
11.	<i>Spilanthes calva</i>	-	-	1	1	-	-	1	1	1	-	-	1
12.	<i>Croton sparsiflorus</i>	1	-	1	2	-	-	-	-	-	-	1	1
13.	<i>Urena lobata</i>	-	-	-	-	-	-	1	1	-	1	-	1
14.	<i>Aerva lanata</i>	1	-	-	1	1	1	-	2	1	-	-	1
15.	<i>Mollugo pentaphylla</i>	-	1	1	2	1	-	-	1	-	1	-	1
16.	<i>Clitoria ternatea</i>	1	-	-	1	1	-	1	2	1	-	-	1
17.	<i>Tridax procumbens</i>	-	-	-	-	-	-	-	-	1	1	-	2
18.	<i>Oldenlandia corymbosa</i>	-	1	-	1	1	1	-	2	-	-	-	-
19.	<i>Catharanthus pusillus</i>	1	1	-	2	-	-	1	1	1	-	-	1
20.	<i>Cyclea peltada</i>	-	1	-	1	1	1	-	2	1	-	-	1
21.	<i>Cleome viscosa</i>	1	-	-	1	-	-	-	-	-	1	-	1
22.	<i>Sebastiania chamaelea</i>	-	1	1	2	-	1	-	1	1	1	-	2
23.	<i>Urena sinuata</i>	1	1	-	2	-	-	-	-	-	-	-	-
24.	<i>Cyanotis axillaris</i>	1	-	-	1	1	1	-	2	-	1	-	1
25.	<i>Emilia sonchifolia</i>	1	-	1	2	1	-	-	1	-	1	1	2
26.	<i>Kyllinga brevifolia</i>	1	-	-	1	-	1	-	1	-	-	-	-
27.	<i>Ruta graveolens</i>	-	1	-	1	1	-	-	1	-	1	1	2

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
28.	<i>Phyllanthus amarus</i>	-	1	1	2	-	1	1	2	-	1	-	1
29.	<i>Senna alata</i>	1	-	-	1	1	-	1	2	-	-	-	-
30.	<i>Nymphoides indica</i>	1	1	-	2	-	-	-	-	-	-	-	-
31.	<i>Lindernia serrata</i>	-	-	1	1	-	1	-	1	-	1	-	1
					27				25				26

Total No. of species :	31	Total no. of plants :	106
Band – A :	27	Band – A :	37
Band – B :	25	Band – B :	37
Band – C :	26	Band – C :	32

Vegetation of Kunthipuzha – Site I Pathrakkadavu- Grasses

Table 79

Sl. No.	Species	Band-A	Band-B	Band C
1.	<i>Arundinella furcata</i>	-	3	3
2.	<i>Botrichloa pertusa</i>	2	4	3
3.	<i>Heteropogan contortus</i>	-	6	2
4.	<i>Cymbopogon</i>	2	2	4
5.	<i>Themeda triandra</i>	1	2	2
6.	<i>Eragrostis unioloides</i>	2	-	2
7.	<i>Eleusine coracana</i>	-	3	3
8.	<i>Borreria auricularis</i>	2	2	4
9.	<i>Dimeria josephii</i>	3	2	4
10.	<i>Spermacocea latifolis</i>	2	4	2
11.	<i>Spermacocea mouritania</i>	-	1	2

Total No. of species :	11	Total no. of plants :	74
Band – A :	7	Band – A :	14
Band – B :	10	Band – B :	29
Band – C :	11	Band – C :	31

Cultivations at Kunthipuzha – Site I – Pathrakkadavu

Table 80

Sl. No.	Species	Band-A Season	Band-B Season	Band C Season
1.	<i>Oryza sativa</i>	-	May – Aug. Sept – Dec.	May – Aug. Sept – Dec.
2.	<i>Cocos nucifera</i>	All seasons	All seasons	All seasons
3.	<i>Musa paradisiaca</i>	-	May – March	May – March
4.	<i>Manihot esculenta</i>	-	✓April -	✓Feb.
5.	<i>Musa acuminata</i>	-	-	✓All seasons
6.	<i>Musa balbisiana</i>	-	-	All seasons
7.	<i>Areca catechu</i>	✓All seasons	✓All seasons	✓All seasons
8.	<i>Colacasia esculenta</i>	-	April – Feb.	✓
9.	<i>Vigna unguiculata</i>	-	May – Dec.	-
10.	<i>Lagenarias siceraria</i>	-	April – Dec.	-
11.	<i>Havea braziliensis</i>	All seasons	All seasons	All seasons

Total No. of species	11
Band-A	3
Band-B	8
Band C	8

Vegetation of Kunthipuzha – Site II – Thootha

Trees

Table 81

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1	<i>Gliricidia sepium</i>	-	1	-	1	-	1	1	2	-	1	1	2
2	<i>Macaranga peltata</i>	1	-	1	2	1	-	1	2	1	1	-	2
3	<i>Pongamia glabra</i>	-	1	-	1	-	-	-	-	-	-	1	1
4	<i>Syzygium cumini</i>	-	-	-	-	-	-	-	-	1	-	-	1
5	<i>Erythrina indica</i>	-	-	-	-	-	1	-	1	-	-	1	1
6	<i>Cocos nucifera</i>	1	-	1	2	1	1	-	2	-	1	1	2
7	<i>Mangifera indica</i>	-	-	-	-	-	1	-	1	1	-	1	1
8	<i>Pavetta indica</i>	1	-	-	1	-	-	1	1	-	-	-	-
9	<i>Areca catechu</i>	-	-	-	-	1	1	-	2	-	1	1	2

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
10	<i>Eugenia jumboflana</i>	-	-	1	1	-	-	1	1	-	1	-	1
11	<i>Moringa pterygosperma</i>	-	-	-	-	1	-	-	1	-	-	-	-
12	<i>Alstonia scholaris</i>	-	1	-	1	-	-	-	-	-	-	-	-
13	<i>Strychnos nuxvomica</i>	-	-	-	-	-	1	-	1	1	-	-	1
14	<i>Ichnocarpus frutescens</i>	-	-	-	-	-	-	-	-	1	-	-	1
15	<i>Artocarpus heterophyllus</i>	-	-	-	-	1	-	-	1	1	-	-	1
16	<i>Moringa pterygosperma</i>	-	-	-	-	-	1	-	1	-	1	-	1
17	<i>Carica papaya</i>	-	1	-	1	-	-	1	1	1	-	-	1
18	<i>Bambusa bambos</i>	-	-	2	1	2	-	-	1	-	-	-	-
19	<i>Anacardium occidentale</i>	-	-	-	-	-	-	-	-	1	-	-	1
20	<i>Ficus hispida</i>	1	-	-	1	-	-	1	1	-	1	-	1
21	<i>Bixa orellana</i>	-	-	-	-	1	-	-	1	-	-	-	-
22	<i>Hevea brasiliensis</i>	-	-	-	-	-	1	-	1	-	1	-	1
23	<i>Tamarindus indica</i>	-	-	-	-	-	-	-	-	1	-	-	1
24	<i>Holigarna arnottiana</i>	1	-	-	1	-	-	-	-	-	-	-	-
25	<i>Ficus religiosa</i>	-	1	-	1	-	-	-	-	-	-	-	-
26	<i>Cassia fistula</i>	-	-	1	1	-	-	-	-	-	-	-	-
27.	<i>Pterocarpum marsupium</i>	-	-	-	-	-	1	-	1	-	-	-	-
28.	<i>Tiliacora acuminata</i>	-	-	-	-	1	-	-	1	1	-	-	1
29.	<i>Tectona grandis</i>	-	-	-	-	1	-	-	1	-	1	-	1
30.	<i>Bombax malabarica</i>	-	-	-	-	-	-	1	1	-	-	1	1
31.	<i>Peltroforum pterocarpum</i>	-	-	-	-	1	-	-	1	1	-	-	1
32.	<i>Corypha umbraculifera</i>	-	-	-	-	-	1	-	1	-	-	-	-
33.	<i>Mallotus philippensis</i>	-	1	-	1	-	-	-	-	-	-	-	-

Total No. of species :	33	Total no. of trees :	70
Band –A :	14	Band – A :	16
Band – B :	23	Band – B :	27
Band – C :	22	Band – C :	27

Vegetation of Kunthipuzha – Site I1– Thootha

Shrubs

Table 82 **Quadrat – 10m x 10m**

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1	<i>Clerodendrum infortunatum</i>	-	-	1	1	1	-	-	1	-	-	-	-
2	<i>Eupatorium odoratum</i>	-	1	-	1	1	1	-	2	-	1	-	1
3	<i>Rauwolfia tetraphylla</i>	-	-	1	1	1	-	-	1	-	-	-	-
4	<i>Ervatamia coronaria</i>	-	-	-	-	-	-	1	1	-	-	-	-
5	<i>Calatropis gigantea</i>	1	-	-	1	-	1	-	1	1	-	-	1
6	<i>Datura stramonium</i>	-	1	-	1	1	-	1	2	-	1	-	1
7	<i>Stachytarpheta indica</i>	1	-	-	1	-	1	-	1	-	-	-	-
8	<i>Zizyphus jujube</i>	-	1	-	1	-	-	1	1	-	-	-	-
9	<i>Jasminum malabaricum</i>	1	-	-	1	-	1	-	1	-	1	-	1
10	<i>Canthinum parviflorum</i>	-	-	1	1	1	-	-	1	-	-	-	-
11	<i>Lantana camara</i>	1	-	-	1	-	-	1	1	1	-	-	1
12	<i>Aristolochia indica</i>	-	-	-	-	1	-	-	1	-	1	1	2
13	<i>Ixora coccinia</i>	-	-	1	1	-	1	-	1	-	-	-	-
14	<i>Cryptolepis buchanani</i>	-	-	1	1	-	-	1	1	-	-	-	-
15	<i>Solanum nigrum</i>	-	-	-	-	-	1	-	1	-	1	-	1
16	<i>Clerodendrum inerme</i>	-	1	-	1	1	-	1	1	-	-	-	-
17	<i>Thunbergia mysorensis</i>	-	-	-	-	-	1	-	1	-	-	-	-
18	<i>Urena sinuata</i>	-	1	-	1	1	-	-	1	-	-	-	-
19	<i>Rotalia indica</i>	1	-	-	1	-	-	-	-	1	-	-	1
20	<i>Synedrella nodiflora</i>	-	-	-	-	-	1	-	1	1	-	-	1

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
21	<i>Tinospora cordifolia</i>	-	-	-	-	-	-	-	-	1	-	-	1
22	<i>Scoparia dulcis</i>	1	-	-	1	-	1	-	1	-	1	-	1
23	<i>Ricinus communis</i>	-	-	1	1	1	-	-	1	-	-	-	-
24	<i>Ocimum sanctum</i>	1	1	-	2	1	-	-	1	-	-	-	-
25	<i>Tephrosia purpurea</i>	-	-	1	1	-	1	-	1	1	1	-	2

Total No. of species :	25	Total no. of plants:	59
Band – A :	19	Band – A :	20
Band – B :	23	Band – B :	25
Band – C :	12	Band – C :	14

Vegetation of Kunthipuzha – Site II – Thootha

Herbs

Table 83

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1	<i>Eclipta alba</i>	1	-	-	1	1	-	1	2	1	-	-	1
2	<i>Leucas aspera</i>	-	-	1	1	-	1	-	1	-	-	1	1
3	<i>Scoparia dulcis</i>	1	-	-	1	1	-	1	1	-	-	-	1
4	<i>Cleome monophylla</i>	1	1	-	2	-	-	-	-	-	-	-	-
5	<i>Viola enneasperma</i>	-	1	-	1	1	-	-	1	1	-	-	1
6	<i>Polygala javana</i>	-	-	-	-	-	1	-	1	-	1	-	1
7	<i>Portulaca grandiflora</i>	-	-	1	1	-	1	-	1	-	-	-	-
8	<i>Osbeckia hispidissima</i>	-	-	-	-	1	-	1	2	-	1	-	1
9	<i>Spilanthes calva</i>	-	1	1	2	1	-	-	1	1	-	-	1
10	<i>Croton sparsiflorus</i>	1	-	-	1	-	1	-	1	-	1	-	1
11	<i>Urena lobata</i>	-	1	-	1	-	-	1	1	-	-	-	-
12	<i>Aerva lanata</i>	-	-	-	-	1	-	-	1	-	-	1	1
13	<i>Sphaeranthus indicus</i>	-	1	-	1	-	-	1	1	-	-	1	1

14	<i>Desmodium triflorum</i>	-	-	-	-	-	1	-	1	-	-	1	1
15	<i>Ipomea marginata</i>	1	-	-	1	-	-	-	-	-	-	-	-
16	<i>Ipomea aquatica</i>	1	-	1	2	-	-	-	-	-	-	-	-
17	<i>Mollugo pentaphylla</i>	1	-	-	1	-	1	-	1	1	1	-	2
18	<i>Tridax procumbens</i>	-	1	1	2	1	1	-	2	1	1	1	3
19	<i>Oldenlandia corymbosa</i>	-	-	-	-	-	1	-	1	1	-	-	1
20	<i>Catharanthus pusillus</i>	-	-	1	1	1	-	-	1	-	-	-	-
21	<i>Cyclea peltada</i>	1	-	-	1	-	-	1	1	-	-	1	1
22	<i>Sida cordifolia</i>	-	-	-	-	1	-	-	1	-	1	-	1
23	<i>Emilia sonchifolia</i>	-	1	-	1	-	1	-	1	1	-	-	1
24	<i>Nymphoides indica</i>	-	1	1	2	1	-	-	1	-	-	-	-

Total No. of species :	24	Total no. of plants:	
Band – A :	18	Band – A :	23
Band – B :	21	Band – B :	24
Band – C :	17	Band – C :	20

Vegetation of Kunthipuzha – Site III – Thootha

Grasses

Table 84

Sl. No.	Species	Band-A	Band-B	Band C
1	<i>Arundinella furcata</i>	3	3	2
2	<i>Eleusine coracana</i>	2	2	3
3	<i>Bothriochloa pertusa</i>	1	2	2
4	<i>Cymbopogon</i>	2	3	1
5	<i>Themeda triandra</i>	2	2	4
6	<i>Eragrostis uniolooides</i>	2	3	2
7	<i>Dimeria josephii</i>	1	4	2
8	<i>Cucumis satives</i>	1	2	2
9	<i>Spermacoce latifolia</i>	-	2	-
10	<i>Spermacoce mouritania</i>	-	-	4
11	<i>Alloteropsis cimicina</i>	2	2	1

Total No. of species :	11	Total no. of plants:	62
Band –A :	9	Band – A :	16
Band – B :	10	Band – B :	25
Band – C	10	Band - C :	23

Cultivations at Kunthipuzha – Site II– Thootha

Table 85

Sl. No.	Species	Band-A Season	Band-B Season	Band C Season
1	<i>Oryza sativa</i>	-	May - Aug and Sept –Dec	-
2	<i>Cocos nucifera</i>	All seasons	All seasons	All seasons
3	<i>Musa acuminata</i>	All seasons	All seasons	All seasons
4	<i>Musa paradisiaca</i>	Oct – Aug.	Oct – Aug.	-
5	<i>Musa balbisiana</i>	All seasons	All seasons	All seasons
6	<i>Manihot esculenta</i>	-	March – Dec.	March – Dec
7	<i>Areca catechu</i>	-	All seasons	All seasons
8	<i>Vigna unguiculata</i>	-	May – Dec.	May – Dec.
9	<i>Abelmoschus esculentus</i>	-	April – Dec.	April – Dec.
10	<i>Lagenaria siceraria</i>	-	April – Dec.	-
11	<i>Cucurbita pepo</i>	-	April – Sept.	April – Sept.
12	<i>Colacasia esculenta</i>	-	April - Feb.	-
13.	<i>Momordica charantia</i>	-	April – Nov.	-
14.	<i>Havea braziliensis</i>	-	All seasons	All seasons

Total species :	14
Band –A :	4
Band – B :	14
Band - C :	9

Vegetation of Kunthipuzha – Site III Kariyannur

Trees

Table 86 **Quadrat: 20m x 20m**

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Gliricidia sepium</i>	-	-	1	1	-	-	1	1	1	-	-	1
2.	<i>Macaranga peltata</i>	1	1	-	2	1	1	1	3	1	1	-	2
3.	<i>Syzygium cumini</i>	-	-	-	-	-	-	-	-	1	-	1	2
4.	<i>Cocos nucifera</i>	-	-	-	-	-	-	1	1	1	-	1	2
5.	<i>Mangifera indica</i>	-	-	-	-	-	-	1	1	-	1	1	2
6.	<i>Morinda tinctoria</i>	-	1	-	1	-	1	-	1	1	1	-	2
7.	<i>Pavetta indica</i>	-	-	1	1	1	-	-	1	-	-	1	1
8.	<i>Ervatamia heyneana</i>	-	-	-	-	-	1	-	1	1	-	-	1
9.	<i>Eugenia recemosa</i>	-	-	-	-	-	-	-	-	-	-	1	1
10.	<i>Areca catechu</i>	-	-	-	-	-	-	-	-	1	-	1	2
11.	<i>Annona squamosa</i>	-	-	-	-	-	-	-	-	-	-	1	1
12.	<i>Psidium guajava</i>	-	-	-	-	-	-	-	-	1	-	-	1
13.	<i>Eugenia jambiflana</i>	-	-	-	-	-	-	-	-	-	-	1	1
14.	<i>Artocarpus heterophyllus</i>	-	-	-	-	-	-	-	-	1	-	-	1
15.	<i>Moringa pterygosperma</i>	-	-	-	-	1	-	-	1	-	1	-	1
16.	<i>Carica papaya</i>	-	-	-	-	-	-	-	-	-	1	-	1
17.	<i>Bambusa bambos</i>	-	-	-	-	-	-	-	-	1	-	-	1
18.	<i>Anacardium occidentale</i>	-	-	-	-	-	-	-	-	1	1	1	3
19.	<i>Ficus hispida</i>	1	-	-	1	1	-	-	1	1	-	-	1
20.	<i>Bixa orellana</i>	1	-	-	1	-	-	-	-	-	-	-	-
21.	<i>Tamarindus indica</i>	-	-	-	-	-	-	-	-	-	-	1	1
22.	<i>Holigarna arnotiana</i>	1	-	-	1	-	-	-	-	-	-	-	-

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
23.	<i>Tiliacora acuminata</i>	-	-	-	-	-	-	-	-	1	-	-	1
24.	<i>Pterocarpus marsupium</i>	-	-	-	-	-	-	-	-	-	1	-	1
25.	<i>Eucalyptus obliqua</i>	-	-	-	-	1	1	-	2	-	-	-	-
26.	<i>Borassus flabellifer</i>	-	1	-	1	-	1	-	1	-	-	1	1
27.	<i>Albizia lebeck</i>	-	-	-	-	-	-	-	-	-	-	1	1
28.	<i>Erythrina stricta</i>	-	-	-	-	-	1	-	1	1	-	-	1
29.	<i>Emblica officianalis</i>	-	-	-	-	-	-	-	-	-	1	-	1
30.	<i>Tectonia grandis</i>	-	-	-	-	-	-	-	-	1	-	-	1
31.	<i>Butea monosperma</i>	-	-	-	-	-	-	-	-	-	-	1	1
32.	<i>Cycas circinalis</i>	-	-	-	-	-	-	-	-	-	1	-	1

Total No. of species :	32	Total no. of plants:	61
Band – A :	7	Band – A :	9
Band – B :	11	Band – B :	15
Band – C :	29	Band – C :	37

Vegetation of Kunthipuzha – Site III Kariyannur

Shrubs

Table 87 **Quadrat : 10m x 10m**

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Clerodendrum infortunatum</i>	-	-	1	1	-	-	-	-	1	-	-	1
2.	<i>Mussaenda frondosa</i>	1	-	1	2	1	-	-	1	-	-	-	-
3.	<i>Eupatorium odoratum</i>	-	1	-	1	1	-	-	1	-	1	-	1
4.	<i>Rauvolfia tetraphylla</i>	-	-	-	-	1	-	-	1	1	-	1	2

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
5.	<i>Ervatamia coronaria</i>	-	-	-	-	-	1	-	1	1	-	1	2
6.	<i>Calatropis gigantea</i>	-	1	-	1	1	-	1	2	1	-	1	2
7.	<i>Datura stramonium</i>	1	-	-	1	-	1	1	2	1	-	-	1
8.	<i>Zizyphus jujube</i>	-	-	1	1	-	1	-	1	-	1	-	1
9.	<i>Vitis species</i>	-	-	-	-	-	-	-	-	1	-	1	2
10.	<i>Chassalia curviflora</i>	-	-	1	1	1	-	-	1	-	-	-	-
11.	<i>Aristolochia indica</i>	-	-	-	-	1	-	-	1	-	1	-	1
12.	<i>Ixora coccinia</i>	-	-	-	-	-	-	-	-	1	-	1	2
13.	<i>Cryptolepis buehanani</i>	-	-	-	-	1	-	-	1	1	-	-	1
14.	<i>Solanum nigrum</i>	1	-	-	1	-	1	1	2	1	-	1	2
15.	<i>Clerodendrum inerme</i>	-	-	-	-	1	-	-	1	1	-	-	1
16.	<i>Thunbergia mysorensis</i>	1	-	-	1	-	-	1	1	-	-	-	-
17.	<i>Crotalaria laburnifolia</i>	-	-	-	-	-	-	-	-	1	1	-	2
18.	<i>Hibiscus furcatus</i>	-	1	-	1	-	-	-	-	1	-	-	1
19.	<i>Urena sinuata</i>	-	-	-	-	-	-	1	1	-	-	-	-
20.	<i>Tinospora cordifolia</i>	-	-	-	-	-	-	-	-	1	1	-	2
21.	<i>Scoparia dulcis</i>	-	-	-	-	-	1	-	1	1	-	1	2
22.	<i>Ipomea aquatica</i>	1	-	1	2	-	-	-	-	-	-	-	-
23.	<i>Ricinus communis</i>	-	-	-	-	-	-	1	1	1	-	-	1
24.	<i>Jatropha glandulifera</i>	-	-	-	-	-	-	-	-	1	-	1	2
25.	<i>Tephrosia purpurea</i>	-	-	-	-	-	-	-	-	-	1	-	1
26.	<i>Xanthium strumarium</i>	-	-	-	-	1	-	-	1	-	-	-	-
27.	<i>Tribulus</i>	-	-	-	-	-	-	-	-	1	1	-	2

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
	<i>terrestris</i>												
28.	<i>Melochia corchorifolia</i>	-	-	-	-	-	-	1	1	1	-	-	1

Total No. of species :	28	Total no. of plants:	68
Band – A :	11	Band – A :	13
Band – B :	18	Band – B :	22
Band – C :	22	Band – C :	33

Vegetation of Kunthipuzha – Site III Kariyannur

Herbs

Table 88 **Quadrat: 5m x 5m**

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
1.	<i>Scoparia dulcis</i>	-	-	-	-	1	-	-	1	1	1	-	2
2.	<i>Eclipta alba</i>	-	-	-	-	-	1	1	2	1	1	-	2
3.	<i>Viola enneasperma</i>	1	-	-	1	-	-	1	1	1	-	-	1
4.	<i>Polygala javana</i>	1	-	-	1	1	1	-	2	1	-	-	1
5.	<i>Cleome monophylla</i>	-	-	1	1	-	-	-	-	-	-	-	-
6.	<i>Osbeckia hispidissima</i>	-	-	-	-	1	-	-	1	1	1	-	2
7.	<i>Melothria amplexicaulis</i>	-	-	1	1	-	-	-	-	-	-	-	-
8.	<i>Phyllanthus viogratus</i>	-	-	1	1	1	-	-	1	1	1	-	2
9.	<i>Spilanthes calva</i>	-	1	-	1	1	-	-	1	-	-	-	-
10.	<i>Ipomea aquatica</i>	1	1	-	2	1	-	-	1	-	-	-	-
11.	<i>Ipomea marginata</i>	1	-	1	2	-	1	-	1	-	-	-	-
12.	<i>Sebastiania chamaelea</i>	-	-	-	1	1	-	-	1	-	-	-	-

Sl. No.	Species	Band-A				Band-B				Band C			
		Q I	Q II	Q III	Total	Q I	Q II	Q III	Total	Q I	Q II	Q III	Total
13.	<i>Clitoria ternatea</i>	1	1	-	2	1	1	-	2	1	1	-	2
14.	<i>Mullugo pentaphylla</i>	-	-	-	-	1	-	-	1	1	1	-	2
15.	<i>Tridax procumbens</i>	1	1	1	3	1	1	2	4	2	1	2	5
16.	<i>Desmodium triflorum</i>	-	-	-	-	1	-	-	1	1	1	-	2
17.	<i>Spilanthus calva</i>	1	-	-	1	-	1	1	2	-	-	-	-
18.	<i>Aerva lanata</i>	-	-	-	-	-	-	1	1	-	1	2	3
19.	<i>Catharanthus pusillus</i>	-	1	-	1	1	1	-	2	-	1	-	1
20.	<i>Cyclea peltada</i>	1	-	-	1	-	-	1	1	1	1	-	2
21.	<i>Sida cordifolia</i>	-	-	-	-	-	-	-	-	1	-	1	2
22.	<i>Ageratum conyzoides</i>	-	1	-	1	-	1	1	2	1	-	-	1
23.	<i>Kyllinga brevifolia</i>	-	-	-	-	1	-	1	2	-	1	1	2
24.	<i>Lindernia serrata</i>	-	-	-	-	1	-	-	1	-	1	-	1
25.	<i>Brachiaria ramosa</i>	-	-	1	1	-	1	-	1	-	-	-	-
26.	<i>Biophytum sensitivum</i>	-	-	1	1	-	-	-	-	1	-	-	1
27.	<i>Urena sinuata</i>	-	-	1	1	-	1	-	1	-	1	-	1
28.	<i>Emilia sonchifolia</i>	-	1	-	1	1	-	-	1	-	-	-	-
29.	<i>Croton sparsiflorus</i>	-	-	-	-	-	-	-	-	1	1	-	2

Total No. of species :	29	Total no. of plants :	95
Band – A :	19	Band – A :	24
Band – B :	24	Band – B :	34
Band – C :	20	Band – C :	37

Vegetation of Kunthipuzha – Site III Kariyannur

Grasses

Table 89

Sl. No	Species	Band-A No's	Band-B No's	Band C No's
1.	<i>Eragrostis unioides</i>	2	2	1
2.	<i>Eleusine coracana</i>	1	3	2
3.	<i>Urena lobata</i>	4	3	2
4.	<i>Borreria auricularis</i>	3	3	2
5.	<i>Arundinella furcata</i>	2	3	1
6.	<i>Bothrichloa pertusa</i>	3	3	2
7.	<i>Cucumis satives</i>	-	-	2
8.	<i>Cymbopogan</i>	-	2	4
9.	<i>Heteropogan contortus</i>	-	2	2
10.	<i>Dimeria josephii</i>	-	-	4
11.	<i>Dimeria raizadae</i>	2	4	-

Total No. of species :	11	Total no. of plants :	62
Band – A :	7	Band – A :	17
Band – B :	9	Band – B :	25
Band – C :	10	Band – C :	22

Cultivations at Kariyannur-Kunthipuzha-site III

Table 90

Sl. No	Species	Band-A Season	Band-B Season	Band C Season
1.	<i>Oryza sativa</i>	Sept – Dec.	Sept – Dec.	Sept – Dec.
2.	<i>Cocos nucifera</i>	-	-	✓
3.	<i>Areca catechu</i>	-	-	✓
4.	<i>Musa paradisiaca</i>	✓	✓	✓
5.	<i>Musa acuminata</i>	✓	✓	✓
6.	<i>Manihot esculenta</i>	✓	✓	-
7.	<i>Vigna unguiculata</i>	-	May – Dec	May – Dec.
8.	<i>Lagenaria siceraria</i>	-	April – Dec.	-
9.	<i>Colacacia esculenta</i>	-	April – Feb.	-
10.	<i>Momordica charantia</i>	-	April – Nov.	-

Total No. of species :	10
Band –A :	4
Band – B :	9
Band – C :	6

Comparative analysis of the vegetation

The comparative analysis showed that high vegetation was at Kunthi river in terms of trees, shrubs and herbs. At Kunthi river basin the mean number of trees was 34, that of shrubs 26.66 and that of herbs 28. In the case of grasses and cultivations, Nila river was richer with a mean value of 15.33 and 12.33. The next more vegetated basin in terms of trees, shrubs and herbs was Kalpathy river basin with mean values of 30.66, 24 and 26.66 respectively. The Nila river basin had the lowest values in terms of trees, shrubs and herbs. Cultivations were also better with 11.66 species in the Kunthi river sites. So the overall analyses showed that in terms of vegetation Kunthi river is the richest, next coming the Kalpathy river and Nila river the lowest (Table 90A and Fig. 15A).

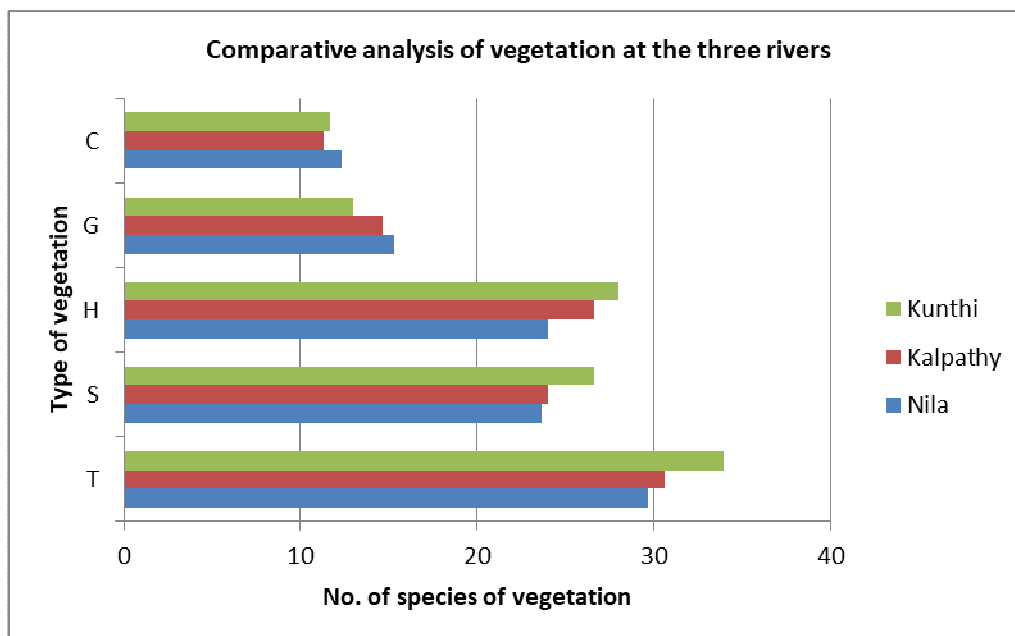


Fig 15A

T=Trees, S=Shrubs, H=Herbs, G=Grasses, C=Cultivations

Comparative analysis of vegetation of the three rivers

Table 90A

River	Mean no. of Tree species	Mean no. of shrub species	Mean no. of herb species	Mean no. of grass species	Mean no. of cultivation
Nila	29.66	23.66	24	15.33	12.33
Kalpathy	30.66	24	26.66	14.66	11.33
Kunthi	34	26.66	28	13	11.66

Ishak M. P. “Studies on the Comparative Ecology of the Riverine Systems of Kalpathi, Kunthipuzha and Nila Rivers with Emphasis on Avifauna.” Thesis. PG & Research Department of Zoology Farook College, Feroke, University of Calicut, 2019.

CHAPTER VI

AVIFAUNA

This study was aimed at assessing the avifauna of 9 study areas of the three rivers, its seasonality, species richness, its correlation with vegetation, feeding habits etc.

Methodology

Different methods are used for estimating and studying the varied aspects of bird communities. Line transects, point transects, nest searching, area mapping, and mist netting are used by different ornithologists depending on the objective of the study. Of these line transects and point transects are the most common methods adopted to count the birds of a specific area (Gaston, 1973). Point transect gives a more precise estimation of bird communities in small areas. For counting of birds in a larger area Line transect is more suitable as it provides good result by covering the area in a unit census time (Emlen, 1971 and 1974, Gaston ,1973 and 1978). In my study Line transect method was adopted for bird counting (Happanen, 1965; Eberhardt, 1978).

Line transect method

This is a simple but widely accepted method, with less rigidity and requires no special devices. In this, the observer traverses along a predetermined transect and record the birds that he / she see or hear on both sides of the line. A bird sighted or heard from the back side of the observer is not recorded. Repeated calls from a spot are recorded as one individual bird. Censuses are done in opposite directions alternatively. The time taken for all counts is kept constant. I started the observations in January 2005 up to December 2006. Two counts were done in every month for the two years. Heavy rainy days and misty days were avoided as this climatic factors hinder the visibility by large. The transects in each band was 2 km long and the strip

width was 150M (75m on either side of the line). The time of the counting was morning hours 7am to 9.30 am, and in the evening 4 pm to 6 pm. A Carl-Zeiss binocular (8x40) was used for observations and birds flying above 40m height were ignored.

The counting was done walking slowly and uniformly along the transects, stopping at times to observe birds on either side. When a bird is encountered, its species, activity, feeding, foraging, etc. were noted. The observed birds were categorized according to its status as resident, if the species is seen almost in all visits, regular if the species were present during many months but generally less than 50% of the observations in any particular month, Local migrant, if they were seen occasionally and as migrant, the transient birds performing long distance journeys or winter visitors.

The line transect observations conducted by a single observer has 50% chance of missing. Thus, the efficiency of this method is 50% as the density calculated by this method can be an under estimation. Anyhow, the relative frequency of different species of birds and the relative frequencies of same species in various habitats can be calculated from the data obtained from this method.

Species composition of Birds

This chapter presents my observations on the occurrence of birds, species composition, the community structure, the different groups, feeding habits etc. Seasonal changes in the climate results in influx of migrant species. The changes in the vegetation as per climatic seasons also influence the distribution and occurrence of birds. Even the resident birds show local migrations to neighboring areas, for overcoming undesirable conditions, for food etc. resulting variations in the species composition of a particular area.

In my study, avian communities were observed in 9 study sites of 3 riverine systems. Checklists of the total birds were prepared, band wise. From this the birds particular to each band, resident species, migrant species, local migrants, raptors, insectivorous birds, nectarivorous birds, granivorous birds, birds feeding on aquatic

species, frugivorous birds, forest birds etc. were found out. Observations were carried out twice in every month. Altogether 48 line transect observations were conducted for the period from January 2005 to December 2006 at all the study areas.

Avifauna of Nila river sites

1. Ottappalam

At Ottappalam, in total 74 species were counted in 3 bands (Table: 90). Of this, 16 species were found in Band- A alone in which 11 species were residents and 5 species migratory (Table: 100). 6 species were observed in Band-B alone of this 5 species resident and one migratory (Table: 101). In Band-C, 2 species observed specific to that band, 1 resident and 1 migratory (Table: 102). 45 species were common to Band-A and Band-B of which 44 were residents and one migratory. . Band-A and Band-C had 39 species in common, out of which 38 were residents and 1 migratory. Bands B and C also had 39 species common, of which 38 are residents and 1 migratory. A, B and C bands had 37 species in common of which 36 were residents and 1 migratory. 3 granivorous species were seen in this site and all 3 were present in all the three bands. In Band-A 470 birds were sighted, in Band-B, 498 and in Band-C, 577 (Table: 92). 8 species of frugivorous birds were identified, of which all the 8 species present in Band-A and Band-B and 6 species in Band-C. In terms of the number of birds feeding on fruits, 330 individuals were counted in Band-A, 296 in Band-B and 257 in Band-C (Table: 93).

5 species of shore birds were recorded here; while Band-A harbors all the 5, none was found in band B and C (Table: 94). The number of migrant species at Ottappalam was 8, of which 6 species seen in Band-A, 2 species in Band-B, another 2 in Band-C. The count of the number of birds gave 240 in Band-A, 30 in Band-B and 28 in Band-C (Table: 100,101and102). Species of raptors recorded at Ottappalam was 5, and all the 5 species occurred in Band-A, and 4 each in Band-B and Band-C. The total number of birds counted was 453 of which Band-A harbored 131, Band-B, 150 and Band-C, 172 (Table 95).

In total 25 species of omnivorous birds were found at Ottappalam, of which Band-A had 23, Band-B 21, Band-C 17. Total of 3877 birds were counted of which 1206 were present in Band-A, 1353 in Band-B and 1318 in Band-C (Table: 96). 25 species of insectivorous birds were observed. Band-A had 16, Band-B 12 and Band-C 10. Total number counted was 1395 of which 462 in Band-A, 518 in Band-B and 415 in Band-C (Table: 97). 12 species of birds were seen feeding on aquatic fauna. In band-A all the 12 species were seen, while only 4 each were seen in band-B and in band-C. A total of 878 birds were counted of which 431 in Band-A, 226 in Band-B and 233 in Band-C (Table: 98). 7 species of nectarivorous birds were observed at this site; Band-A with all the 7 species, B and C bands with 6 species each. Total of 966 birds counted, of which Band-A with 395, Band-B with 382 and Band-C with-189 (Table: 99).

Seasonal occurrence of birds

Band-A showed the presence of 65 species. Of this, 62 species were present during pre-monsoon period (from January to May), 19 species observed during monsoon period (from June to September) and all the 65 species were present during post monsoon period (from October to December) (Table 100). In Band-B, 51 species were observed. Of this, all 51 were present during pre-monsoon period, 36 species marked their presence in monsoon and full squad was present during post-monsoon (Table 101). In Band-C, 50 species marked their presence. During pre-monsoon, all the 50 species were seen, during monsoon 36 species were present and during post monsoon, all 50 species were sighted (Table 102).

2. Pattambi

The total number of bird species counted was 100. Of this 19 species were migratory, 3 species local migrants and the rest residents (Table: 103). Band-A, B and C had 33 species in common. Of this 31 were residents, 1 species migrant and 1 local migrant (Table: 112). Number of bird species common to bands A and B was 43. Of this 5 were migrants, 1 local migrant and 36 species residents (Table: 112 and 113). 36 species were common to bands A and C. Of this, 2 species were migrants, 1 local migrant and 33 were residents (Table: 112, 113 and 114). Bands B and C had 40

species in common. In this 3 were migrants, 1 local migrant and 36 were residents (Table: 114). 23 species were observed in band- A alone, of which 15 were migrants and 8 were residents (Table: 113). 17 species were observed in Band-B alone, of which '1' were a migrant and 6 residents (Table: 114). 14 species were observed in Band-C alone, of which '1', was a migrant and 13 residents (Table: 114).

The total number of migratory species observed at Pattambi was 19. Band-A had 16 species, Band-B, 6 and Band-C, 4. The number of migratory birds counted in Band-A was 713, in Band-B 291 and in Band-C, 138 (Table: 112,113and114). 14 species of shore birds were found at Pattambi. In this, 12 were migrants and 2 residents. All of these species were present in Band-A, only 1 species in Band-B and none in Band-C (Table: 104). 5 species of raptors were recorded at this site. In Band-A, 4 species and 125 birds, in Band-B, 5 species and 320 birds and in Band-C, 2 species and 61 birds (Table: 105). 11 species of birds feeding on aquatic animals were observed at Pattambi. In this, all the 11 were present in Band-A, 5 in Band-B and 2 in Band-C. A total of 800 birds were counted in which 368 were present in Band-A, 254 in Band-B and 178 in Band-C (Table: 106).

The number of omnivorous species was 25. In Band-A, 17 were present, in Band-B, 14 species and in Band-C, 24. The total number of birds counted was 6594, of which 3163 were counted in Band-A, 1848 in Band-B and 1583 in Band-C (Table: 107). 43 Species of insectivorous birds were identified, of which 28 were seen in Band-A, 21 in Band-B and 24 in Band-C. Total number of birds counted was 4952. This was distributed as 2444 in Band-A, 1654 in Band-B and 859 in Band-C (Table: 108). Granivorous bird species recorded was 5, in Band-A 3, in Band-B 4 and in Band-C 1. Total number of birds counted was 1235. In Band-A 424, in Band-B 515 and in Band-C 296 (Table: 109). 8 species of frugivorous birds were found of which 5 in Band-A, 4 in Band-B and 8 in Band-C. Total number of birds counted was 617, distributed as 170 in Band-A, 174 in Band-B and 273 in Band-C (Table: 110). Nectarivorous bird species recorded was 7, in Band-A 3 and 5 each in bands B and C. Total number of birds counted was 613, which was split as 124 in Band-A, 238 in Band-B and 251 in Band-C (Table: 111).

Seasonal occurrence of birds

A total of 67 species of birds were found in Band-A. In this, 65 species were present during pre-monsoon season, 58 species were present in monsoon period and all 67 species were present during post- monsoon period (Table: 112). In Band-B, 61 species were observed. During pre-monsoon period, 60 species were found during monsoon 53 species made their appearance and during post monsoon, all the 61 species were observed (Table: 113). In Band-C, 61 species were recorded. All the species were present during pre-monsoon, 56 species were present during monsoon and all 61 made their appearance in post monsoon period (Table: 114).

3 Manchady

At Manchady a total of 114 species were recorded, of which 37 species were migrants, 2 species local migrants and 75 species residents. 28 species were common to A, B and C bands. In this, 3 were migrants and 25 species residents. 53 species were common to bands A and B, of which 12 were migrants and 41 residents. 30 species were common to A and C bands of which 4 were migrants and 26 residents. 46 species were common to bands B and C, of which 3 were migrants, 1 local migrant and 42 were residents. 23 species were present in Band-A alone of which 19 were migrants and 4 residents. Only 1 species was specific to Band-B, it being a resident. 13 species were specific to Band-C. Of this 1 was migrant and 12 were residents (Tables 125,126 and 127).

Of the 37 migrant species of birds observed, Band-A had 34, Band-B gave habitat to 15 and Band-C to 6 species. The total number of migrant birds counted was 1014. In this Band-A presented 1014 birds, Band-B, 471 and Band-C, 304 (Table 116). 29 species of shore birds were counted of which all were present in Band-A, 10 species in Band-B and 2 species in Band-C. The total number of birds counted was 1275, which was split as 1010 in Band-A, 208 in Band-B and 57 in Band-C (Table: 117).

36 species of birds were observed as aquatic animal feeders of which 35 were present in Band-A, 19 in Band-B and 4 in Band-C. The number of aquatic

feeding birds counted was 1992, of which Band-A had 1168 individuals, Band-B 718 and Band-C 106 (Table : 118). 6 species of raptors were observed here. Band-A had 5 species, Band-B, 4 and Band-C 4. The total number of birds counted was 254, which was distributed as 111 in Band-A, 90 in Band-B and 53 in Band-C (Table: 119). The omnivorous species counted was 24, in which Band-A had 12, Band-B-15 and Band-C, 20. Total number of birds counted was 2740, where in 2468 were counted in Band-A, 2468 in Band-B and 1931 in Band-C (Table: 120). 47 species of insectivorous birds were identified in which 33 were present each in Band-A and Band-B, 24 in Band-C. Of the 5291 birds counted, 2016 were present in Band-A, 2060 in Band-B and 1215 in Band-C (Table: 121). Of the 4 species of granivorous birds found, Band-A, Band-B and Band-C had all the 4. A total number of 1511 granivorous birds were counted of which 447 numbers were in Band-A, 508 in Band-B and 556 in Band-C (Table: 122). Number of nectarivorous species seen was 8, of which 1 each were in Band-A and B and 7 species in Band-C. Total of 306 individuals were counted, in which 13 were present in Band-A, 31 in Band-B and 262 in Band-C (Table: 123). 7 species of frugivorous birds were found of which 1 in Band-A, 5 in Band-B and 7 in Band-C. Of the 376 birds counted, 13 were from Band-A, 108 from Band-B and 255 in Band-C (Table: 124).

Seasonal occurrence of birds

In Band-A, 80 species were present. During pre monsoon and post monsoon periods all species showed their presence. Only 42 species were present during Monsoon. *Corvus splendens* was the most numerous with a count of 1915 individuals. *Artamus fuscus* (770) and *Corvus macrorhynchos* (506) were the next more numerous species. 43 species presented more than 100 in numbers. All other species count was less than 100 (Table: 125). In Band-B, 71 species were present. All of these were present during pre monsoon and post monsoon periods. During monsoon period, only 44 species showed their presence. 11 species were relatively numerous with 100 numbers or above (Table: 126). In Band-C, 62 species were present. All of them appeared during pre monsoon and post monsoon periods.

During monsoon season, only 45 species made their presence. In this band, 8 species were more numerous with 100 individuals or above (Table: 127).

The presence of higher number of migrant bird species (37) and shore birds (29) at Manchady is very significant. The proximity to Ponnani sea shore and Chamravattom, where large number of migrants and shore birds make their asylum is one of the reasons for the higher numbers. The number of bird species feeding on aquatic animals was also higher (36). Most of these birds are migrant and shore birds. The vast sand bed and water logged areas in Band-A and Band-B was a reason for the higher number of species.

Avifauna of Kalpathy river sites

1. Kava

In total 127 species were identified at Kava. In this, 13 species were migrants, 3 species local migrants and 112 species residents. In Band-A, 2 species were specific and they being residents. 1 resident species was found in Band-C alone. 96 species were common to bands A, B and C, of which 82 were residents, 11 migrants and 3 local migrants. 10 species were present in bands A and B only and all were residents. 14 species were observed in B and C bands only, of which 13 were residents and 1 migrant (Table: 128). 5 species of raptors were present here and all the 5 were present in both A and B bands, and 2 species in Band-C. Total number of birds present was 138, 75 in Band-A, 53 in Band-B and 10 in Band-C (Table: 129).

Migrant bird species recorded was 13. Of which 11 were present in Band-A and all 13 were present in bands B and C. Of the 651 birds counted, 211 were seen in Band-A, 206 in Band-B and 234 in Band-C (Table: 130). 36 species of omnivorous birds were observed. Band- A harbored 31 species, Band- B 36 species and Band-C 35 species. Of the 4228 individuals counted, 1297 was in Band-A, 1454 in Band-B and 1472 in Band-C (Table: 131). Insectivorous bird species counted was 46. Band-A had 38 species with 722 individuals, Band-B with 46 species with 870 individuals and Band-C had 42 species with 807 individuals (Table: 132).

9 species of nectarivorous birds were seen here and all the 9 were present in all the bands. Of the 938 birds counted Band-A presented 264 numbers, Band-B 312 numbers and Band-C 362 (Table:133). 6 species of granivorous species were identified, of which Band-A had 5 species and Band-B and Band-C had all the 6 species. 863 individuals were counted, 338 in Band-A, 295 in Band-B and 230 in Band-C (Table: 134). Frugivorous bird species identified was 15. Band-A had 13 species and Band-B and C harbored all the 15 species. Of the 1320 birds counted, 329 were in Band-A, 457 in Band-B and 534 in Band-C (Table: 135). 6 species were seen feeding on aquatic fauna, and all the 6 were present in Band-A with 344 individuals, 4 species in Band-B with 149 birds and 4 in Band-C with 90 birds (Table : 136). Kava provided habitat for 49 species of forest birds. Band-A had 35, Band-B 48 and Band-C 49. Of the 2813 birds counted, 621 were present in Band-A, 992 in Band-B and 1200 in Band-C (Table: 137).

Seasonal occurrence of birds

Of the 127 species, Band-A provided asylum to 112 species, out of which 98 were residents, 11 migrants, 3 local migrants. All the 112 species were present during pre-monsoon and post-monsoon seasons and only 69 species during monsoon (Table: 138). 123 species were present in Band-B, of which 13 were migrants, 3 were local migrants and 107 resident. All the 123 species were present during pre-monsoon and 66 species during monsoon period, whereas 121 species were seen during post-monsoon. In Band-C, 114 species were present. Of this, 111 were seen during pre-monsoon season; only 55 species were seen during monsoon period whereas 109 species were recorded during post-monsoon period. 4 species in Band-A showed the frequency of more than 100. 12 species were represented by 50-100 individuals. In Band-B, 3 species were having a frequency of more than 100. 18 species were in the frequency of 50 to 100. In Band-C, 2 species were in the frequency of above 100 and 12 species were present in numbers between 50 and 100 (Table: 138).

2. Manthakkad

At Manthakkad, 78 species were identified. Of this, 55 species were present in Band-A, 75 in Band-B and 70 in Band-C. In Band-A 3 species were migrants, 1 species local migrant and 51 residents. In Band-B, 5 species were migrants, 1 local migrant and 70 resident. In Band-C, 6 species were migrants, 1 local migrant and 63 resident (Table: 139). 2 species were specific to Band-A, who were residents. A total of 61 birds were counted of these two species. No bird species were specific to Band-B. In Band-C, 1 species was specific being a resident presented a count of 13 individuals (Table: 149). 46 species were common to A, B and C bands out of which 43 were residents, 2 migrants and 1 local migrant. 7 species were common to A and B bands only, and all were residents (Table: 149). 21 species were common to B and C bands, of which 18 were residents and 3 migrants (Table: 149). 3 species of raptors were observed and all 3 were present in A and B bands. In C-band 2 species were seen. Out of the 171 birds counted, the appearance was 60 in Band-A, 76 in Band-B and 35 in Band-C (Table: 140). 6 species of migrant birds were identified of which Band-A harbored 3, with a count of 123, Band-B presented 6 species with a count of 167 and Band-C gave habitat to 6 species with a count of 150 birds (Table : 141). The total number of migrants was 440.

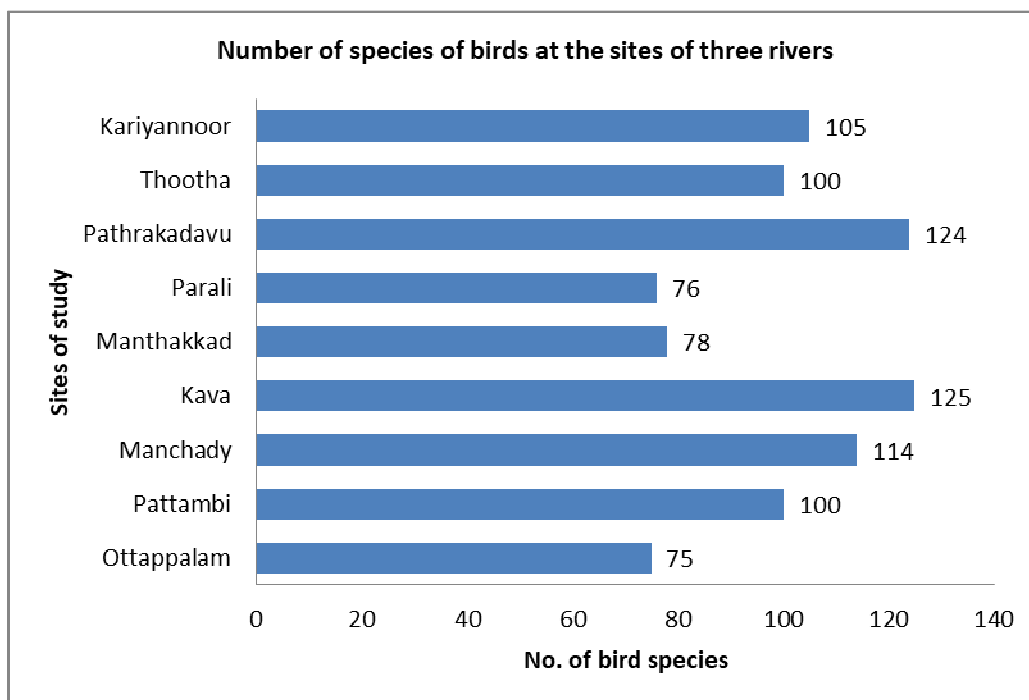


Fig 16

Number of omnivorous species observed was 22 out of which Band-A had 16 species with an individual count of 545, Band-B harbored all the 22 species with a count of 829 birds and Band-C had 22 species with a total of 778 birds (Table:142). 27 species of insectivorous birds were found, of which 16 in Band-A, 26 each in bands B and C. In Band-A 471 birds were counted, in Band-B 776 individuals and in Band-C, 731 numbers. Total count of birds was 1988 (Table: 143). 7 species of nectarivorous birds were observed of which 2 species in Band-A with a count of 42 birds, 7 species with a count of 226 birds in Band-B and 6 species with 148 birds in Band-C (Table : 144). The total number of birds was 416.

Number of granivorous species was 5. All the 5 species were present in A, B and C bands. Of the total 1487 birds counted 479 were present in Band-A, 610 individuals in Band-B and 398 birds in Band-C (Table: 145). The number of frugivorous species present was 6. Band-A with, 2 species and a count of 70 individuals, Band-B and C with 6 species each with a count of 209 and 250 respectively (Table: 147). 8 species of birds feeding on aquatic animals were identified, of which Band-A with 8 species, Band-B with 6 and Band-C with 3 species. Of the total 555 birds, counted 310 were present in Band-A, 170 in Band-B and 75 in Band-C (Table: 148).

Seasonal occurrence of birds

As already mentioned, 78 species of birds present were distributed as 55 in Band-A, 75 in Band-B and 70 in Band-C. All the 55 species in Band-A were present during pre monsoon period, 37 species present during monsoon and 55 during post monsoon period. In Band-B, all 75 species were present during premonsoon and post monsoon whereas 41 species were present during monsoon. In Band-C, the full 70 were present during pre monsoon and post monsoon periods and 41 species during monsoon (Table: 149). 15 species of birds showed higher number of presence (>100). *Columba livia*, *Bubulcus ibis*, *Artamus fuscus*, *Corvus species*, *Turdoides striatus* etc. were the species in abundance. The number of omnivorous species and insectivorous species were higher compared to other groups. At the same time migrants and raptors numbers were less, 6 and 3 species respectively.

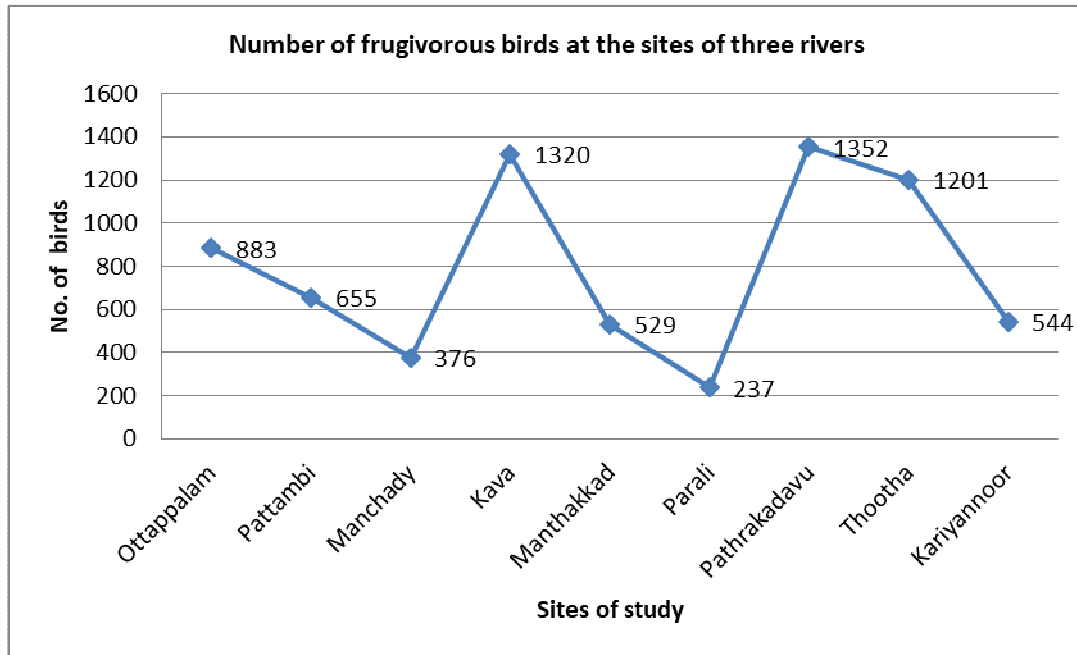


Fig. 17

3. Parali

Parali presented an estimation of 76 species of birds, of which 4 were migrants and 72 residents. No local migrants were observed (Table: 150). 4 species of raptors were observed, 4 species each in Band-A and Band-B and 3 in Band-C. Out of the total of 275 birds counted Band-A harbored 91 birds, Band-B, 100 and Band-C 84 (Table : 151). 4 species of migrant birds were identified, of which both A and C bands showed the presence of 3 species and Band-B with 4 species. Of the total 129 birds counted 41 were from Band-A, 52 from Band-B and 36 from Band-C (Table: 152). Only one species of forest bird, *Cuculus canorus* was present here. 15 species of birds feeding on aquatic fauna were identified in this site of which all 15 were present in Band-A, 13 in Band-B and 4 in Band-C. Of the 846 birds counted, 426 were from Band-A, 306 from Band-B and 114 from Band-C (Table: 153). Omnivorous species observed were 22, of which 15 in Band-A, 19 in both Band-B and Band-C. Of the 2812 birds counted, 782 were from Band-A, 1013 from Band-B and 1017 from Band-C (Table: 154). 27 species of insectivorous birds were identified. Of this, 18 species were present in Band-A, 26 in Band-B and 23 in Band-C. A total of 1714 birds were counted of which 572 were from Band-A, 691 from Band-B and 451 from Band-C (Table: 155). 4 species of nectarivorous birds

found here was present in all the 3 bands. Total of 216 birds were counted of which 83 were from Band-A, 73 from Band-B and 60 from Band-C (Table: 156). Number of granivorous birds identified was 4 and all the 4 were present in the three bands. Total number of birds counted was 694 and distributed as, Band-A 232, Band-B, 206 and Band-C, 256 (Table: 157). 5 species of frugivorous birds were identified and the presence was 2 each in Band-A and Band-B and 5 in Band-C. Of the total 237 birds counted Band-A presented 53, Band-B, 65 and Band-C 119 (Table : 158).

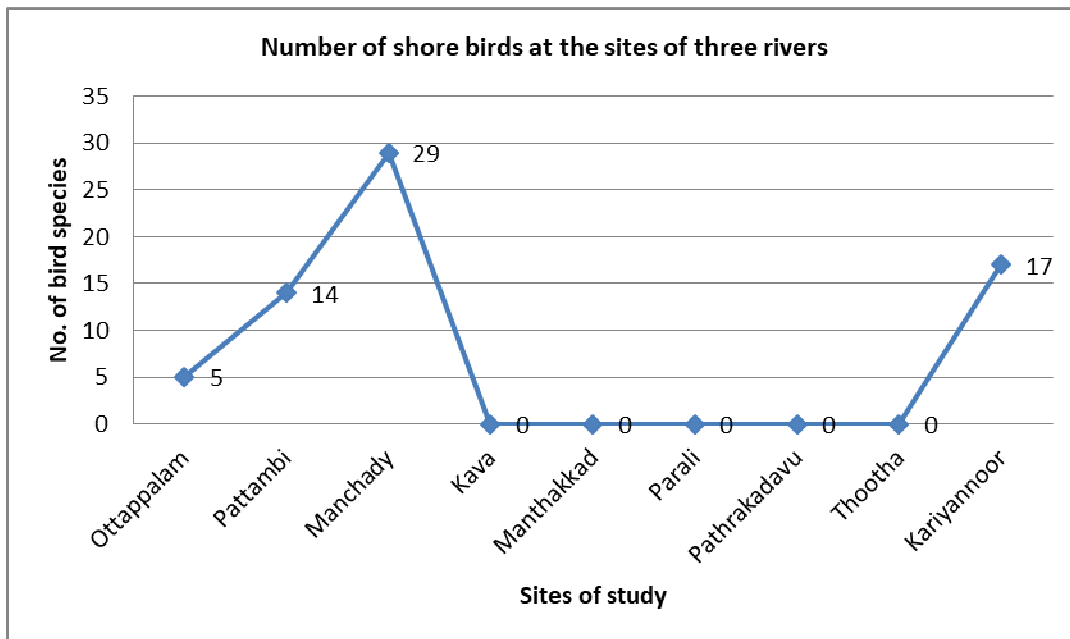


Fig. 18

Seasonal occurrence of birds

76 species of birds were present as 59 species in Band-A, 69 in Band-B and 60 in Band-C. In Band-A 2 species were migrants, 57 residents and the total number of birds counted was 2318. In Band-B, 4 species were migrants, 65 residents and the total number of birds counted was 2642. In Band-C, 3 were migrants and 57 residents. The total number of birds counted was 2231. 2 species of birds were present in Band-A alone and they were residents. 5 species were present in Band-C alone and all were residents. No species were seen specific to Band-B. 43 species of birds were seen in A, B and C bands. Of this, 2 were migrants and 41 residents. 14 species were seen in Band-A and B, of which, 1 was a migrant and 13 residents. 10

species were seen in B and C bands only, of which, 1 was a migrant and the rest 9 residents (Table: 159).

In Band-A, 75 species were present during pre-monsoon, 55 species during monsoon and all the 76 species were present during post monsoon. In Band-B, all the 76 species were present during pre-monsoon and post-monsoon period, whereas 52 species were present during monsoon season. In Band-C also all the 76 species were present during pre-monsoon and post-monsoon periods where as 53 were present during monsoon period. 24 species of birds were relatively more abundant with 100 or more in number (Table: 159).

Avifauna of Kunthipuzha sites

1. Pathrakkadavu

124 species of birds were observed at Pathrakkadavu. Of this, 106 species were residents, 14 migrants and 4 local migrants (Table: 160). In Band-A, 112 species were found, of which 13 were migrants, 4 local migrants and 51 residents. In Band-B, 108 species were present that included 12 migrant species, 2 local migrants and 94 residents. In Band-C, 92 species were recorded, that included 10 species of migrants, 2 local migrants and 83 residents. In this study site, a total of 14 species of migrants were found, of which 13 were seen in Band-A, 12 in Band-B and 10 in Band-C. Of the 615 birds counted, 218 were from Band-A, 202 from Band-B and 195 from Band-C (Table 161). 5 species of raptors were recorded in this site. All were present in Band-C, with a total count of 80 (Table: 162). Omnivorous species recorded was 37, of which 36 were in Band-A, 35 in Band-B and 26 in Band-C. Of the total 2386 birds counted, 852 were from Band-A, 854 in Band-B and 688 in Band-C (Table: 163).

Of the 45 species of insectivorous birds sighted, Band-A had 44 species, Band-B 42 species and Band-C 32 species. Of the 2408 total birds counted, 795 birds were from Band-A, 894 from Band-B and 719 from Band-C (Table: 164). 14 Species of frugivorous birds were found here and of these 14 were present in Band-A, 13 in Band-B and 12 in Band-C. In total, 1352 birds of this category were

counted. Of this, 502 were from Band-A, 452 from Band-B and 398 from Band-C (Table: 165). Nectarivorous bird species identified was 9, of which Band-A and Band-B had all the 9 species and 8 were seen in Band-C. In total 1015 birds were counted which were distributed as 356 in Band-A, 326 in Band-B and 333 in Band-C (Table: 166). 7 Species of granivorous birds were observed, of which 6 species present in both A and C bands and all the 7 species were seen in Band-B. Out of the 806 total birds counted 204 were from Band-A, 291 from Band-B and 311 from Band-C (Table: 167). 4 species of birds were seen feeding on aquatic fauna of which Band-A and Band-C, housed 4 species and Band-B, 2 species. Total birds counted were 343, of which 123 in Band-A, 35 in Band-B and 185 in Band-C (Table: 168). The number of forest bird species found was 55. All these 55 species were present in Band-A, 47 in Band-B and 30 in Band-C. In total 3202 forest birds were counted, of which 1341 were from Band-A, 1126 from Band-B and 740 from Band-C (Table169).

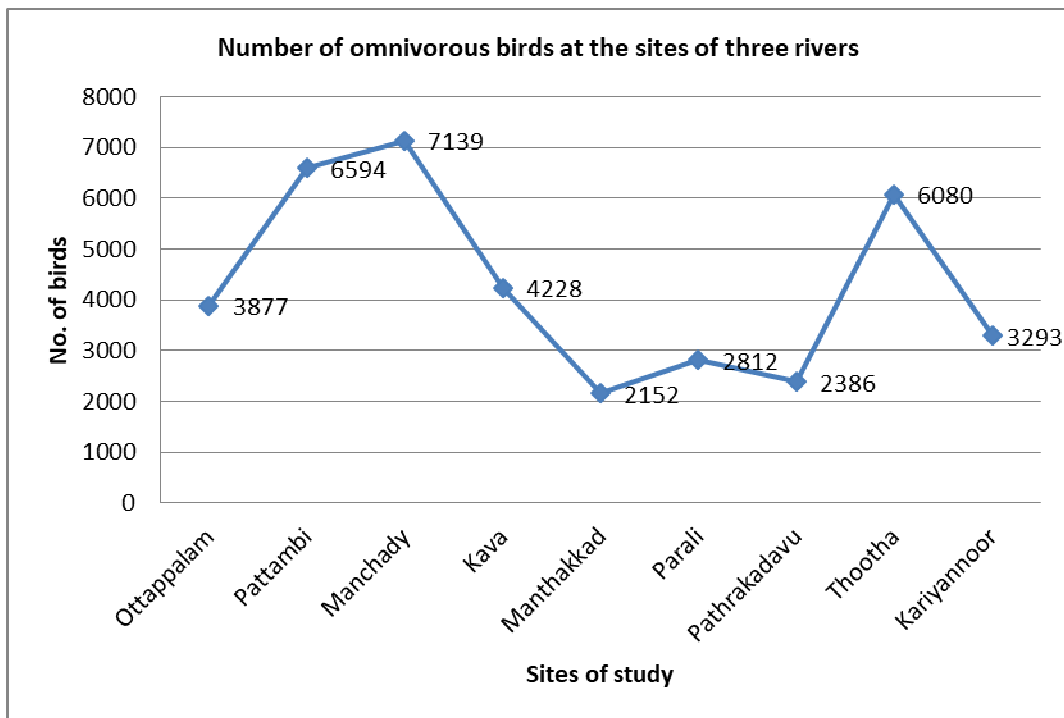


Fig. 19

Seasonal occurrence of birds:-

Of the 124 species, Band-A harbored 112, Band-B 108 and Band-C 95. In Band-A, all the 112 species were present during pre-monsoon, 58 species during monsoon and 110 species during post-monsoon. In Band-B, all the 108 species were present during pre-monsoon, 59 during monsoon and 108 during post-monsoon. In Band-C, all the 93 species were found during pre-monsoon, 47 during monsoon season and 91 during post-monsoon periods. In Band-A, no species were showing individuals more than 100. 7 species were having more than 50 and less than 100 individuals. In Band-B, 2 species were more frequent with above 100 individuals while 8 species were having individuals between 50 and 100. In Band-C, 3 species were more numerous with above 100 numbers. 10 species showed number of individuals between 50 and 100 (Tables 170,171,172).

2. Thootha

At Thootha, the second study site in Kunthipuzha, 100 species were identified. Of this, 86 were residents and 13 were migrants and 1 local migrant (Table: 173). 5 species were seen in Band-A alone and all were residents. No species were seen specific to Band-B or Band-C. 44 species of birds were common to the three bands. 3 were migrants, 1 local migrant and 40 residents. 18 species were common to A and B bands of which 3 were migrants and 15 residents. 26 species were common to B and C bands of which 22 were residents and 4 migrants (Tables: 183,184 and 185). 13 species of migrant birds were counted of which Band-A presented 7, Band-B, 11 and Band-C, 9. Of the total 940 birds counted 227 was from Band-A, 380 from Band-B and 333 from Band-C (Table: 174). 4 species of raptors were present and all the 4 were seen in Band-A and B whereas and 3 species in Band-C. Of the 190 birds counted, 70 were from Band-A, 62 from Band-B and 58 from Band-C (Table: 175). Insectivorous bird species counted was 32. This was present as 22 in Band-A, 30 in Band-B and 23 in Band-C. 3525 birds were counted of which 1177 were from Band-A, 1228 from Band-B and 1120 from Band-C (Table: 176).

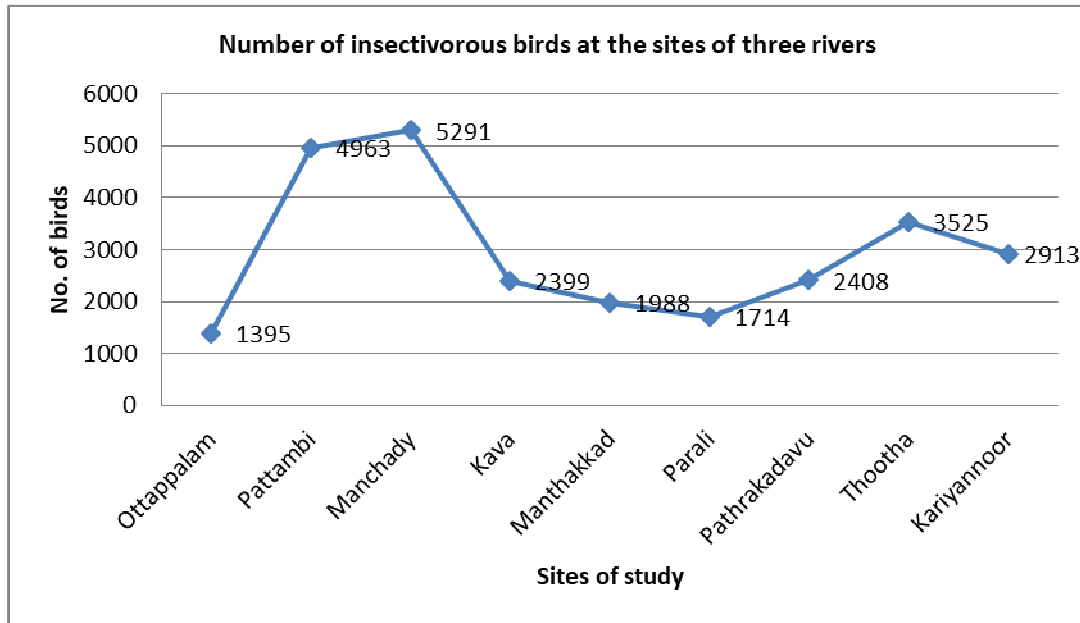


Fig. 20

Nectarivorous bird species counted were 10 of which 3 were present in Band-A, 7 in Band-B and 10 species in Band-C. In total 887 birds were counted which was distributed as 177 in Band-A, 321 in Band-B and 449 in Band-C (Table: 177). 6 species of granivorous birds were identified and all 6 were present in the three bands. 1924 total birds were counted of which 531 in Band-A, 617 in Band-B and 776 in Band-C (Table: 178). 12 species were seen feeding on aquatic fauna, of which Band-A provided habitat for all the 12, Band-B for 7 and no species seen in Band-C. 564 total birds were counted of which Band-A had 404 and Band-B, 160 (Table: 179). The number of frugivorous species observed was 11. 5 species were present in Band-A, 11 in Band-B and 10 in Band-C. 1201 total birds were counted of which 201 were from Band-A, 518 from Band-B and 482 from Band-C (Table: 180). 10 species of forest birds were identified here. Of the 10 species, Band-A had 2, Band-B and C, 9 each. 365 total birds counted were distributed as 23 in Band-A, 172 in Band-B and 170 in Band-C (Table: 181). Omnivorous bird species present were 29. Band-A presented 21 species, Band-B had 27 and Band-C, 24. Of the 6080 number of birds counted, 1784 were from Band-A, 1923 from Band-B and 2373 from Band-C (Table: 182).

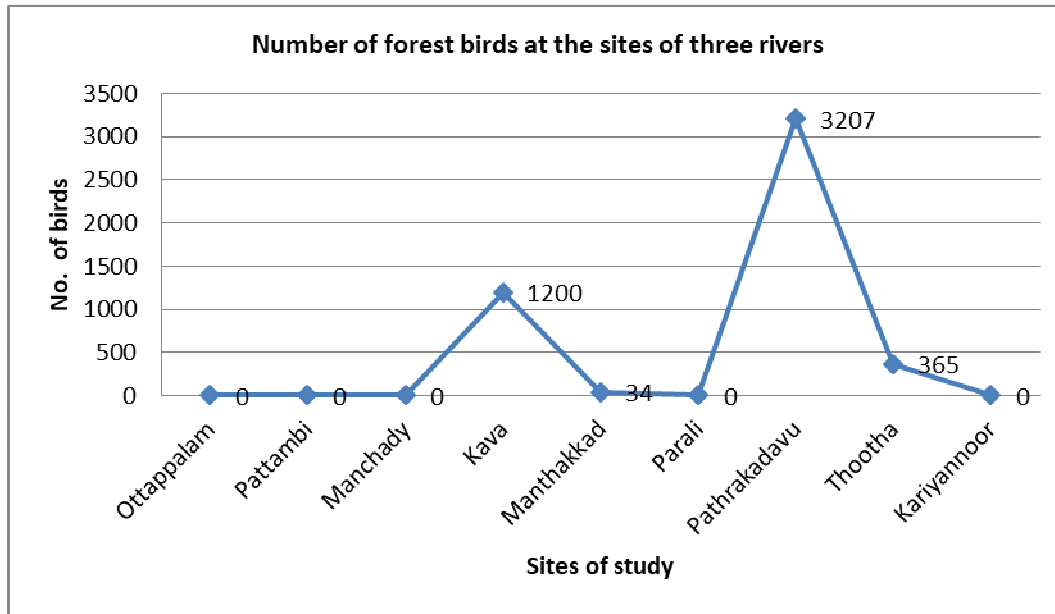


Fig. 21

Seasonal occurrence of birds

Of the total 100 species, 67 were present in Band-A. Of these 7 were migrants, 1 local migrant and 59 resident. All the 67 species were present during pre-monsoon and post-monsoon periods, whereas 45 species made their appearance during monsoon. 7 species were more numerous with a frequency of above 100. 16 species were numerous with a frequency between 50 and 100 (Table: 183). 91 species were present in Band-B of which 11 were migrants, 1 local migrant and 79 resident. All the 91 species were present during pre-monsoon period whereas 58 species made their appearance during monsoon season and 90 species during post-monsoon. 11 species were more numerous with a frequency of above 100. 16 species were having a frequency between 50 and 100 (Table: 184). In Band-C 75 species were identified. 8 were migrants and 67 residents. 74 species were present during pre-monsoon period, 42 during monsoon period and 74 during post-monsoon season. 10 species were with a frequency of more than 100 and 15 species showed a number of occurrences between 50 and 100 (Table: 185).

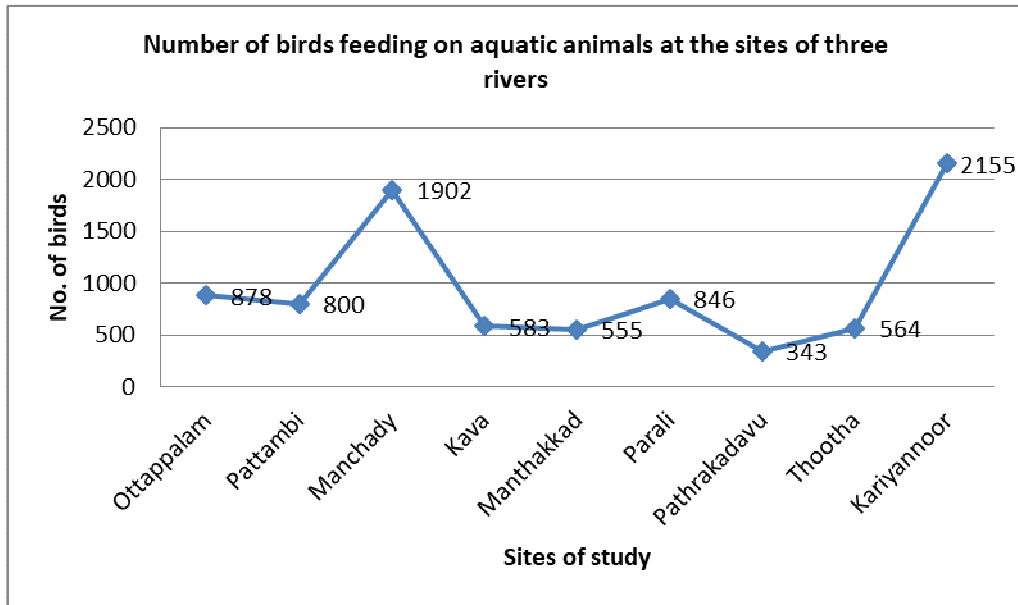


Fig. 22

3. Kariyannur

At Kariyannur, the third study site in Kunthipuzha, 106 species were observed; of this 24 were migrants, 1 local migrant and 81 residents (Table: 186). 28 species were common to A, B and C bands. Of this, 25 were residents, 2 migrants and 1 local migrant (Table: 196,197,198). 30 species were common to A and C bands; of this 26 were residents, 3 migrants and 1 local migrant (Table: 196,198). 39 species were common to B and C bands. Of this 34 were residents, 4 migrants and 1 local migrant (Table: 197,198). 49 species were common to A and B bands of which 36 were residents, 13 migrants and 1 local migrant (Table: 196,197). 10 species were present in Band-A alone, of which 4 were migrants and 6 residents (Table: 196). 3 species were present in Band-B alone and all were residents (Table: 197). 19 species were observed in Band-C alone in which 3 species were migrants and 16 residents (Table: 198). 18 species of shore birds were observed at Kariyannur, which was distributed as 17 in Band-A, 12 in Band-B and 3 in Band-C. Of the total 1386, birds counted, 728 were from Band-A, 473 from Band-B and 185 from Band-C (Table: 187). 24 species of migrants were identified of which 19 in Band-A, 13 in Band-B and 8 in Band-C. Of the total 1102 birds counted 534 were from Band-A, 401 from Band-B and 167 from Band-C (Table: 188).

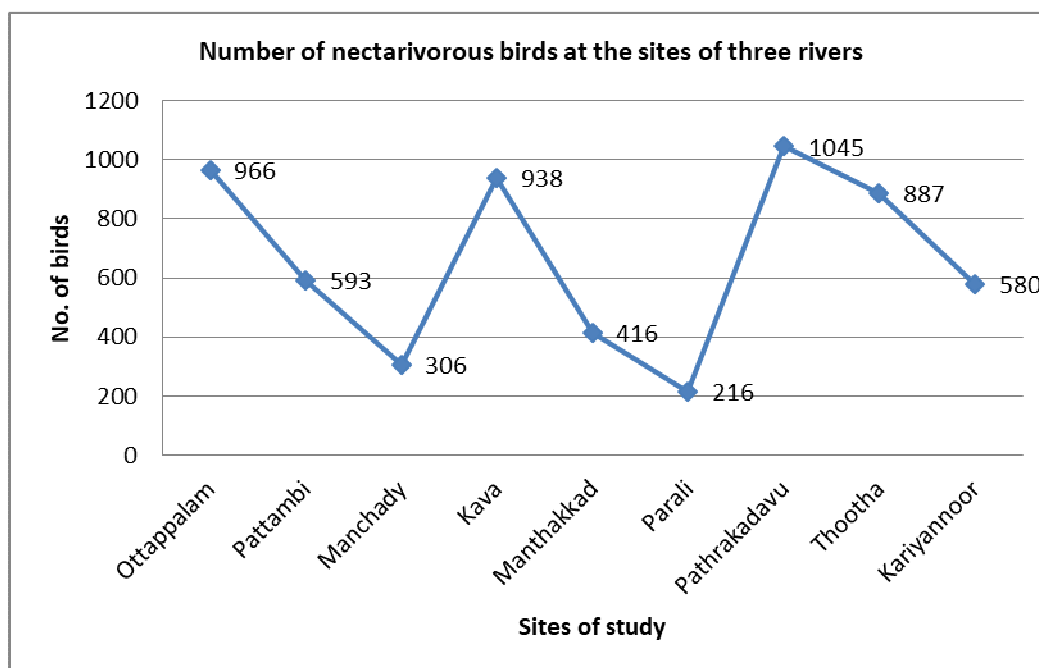


Fig. 23

5 species of raptors were found, 1 in Band-A, 5 in Band-B, and 2 in Band-C. Total of 251 birds counted, 8 from Band-A, 127 from Band-B and 116 from Band-C (Table: 189). The number of insectivorous species observed was 41. Of this, 29 species were present in Band-A, 26 in Band-B and 22 in Band-C. Of the total 2913 birds counted, the bandwise split was 1225 from Band-A, 1052 from Band-B and 636 from Band-C (Table: 190). 32 species of birds were observed as feeding on aquatic fauna. All the 32 were present in Band-A, 18 in Band-B and 5 in Band-C. Total birds counted were 2155 distributed as 1094 in Band-A, 702 in Band-B and 359 in Band-C (Table: 191). Omnivorous species observed was 26 numbers. Of this, 16 were in Band-A, 19 in Band-B and 22 in Band-C. Of the total 3293 birds counted, 1047 was counted in Band-A, 1098 in Band-B and 1148 in Band-C (Table: 192). 6 species of granivorous birds were found; 3 species in Band-A, 6 in Band-B and 5 in Band-C. Of the 1816 birds counted, 308 were from Band-A, 838 from Band-B and 670 from Band-C (Table: 193). 6 species of nectarivorous birds were observed, 1 in Band-A, 6 in Band-B and 5 in Band-C. Of the total 580 birds counted, 28 from Band-A, 334 from Band-B and 218 from Band-C (Table: 194). Frugivorous species were 9, of which 3 were in Band-A, 7 in Band-B and 6 in Band-C. Of the

total 544 birds counted, 93 were in Band-A, 256 in Band-B and 195 in Band-C (Table: 195).

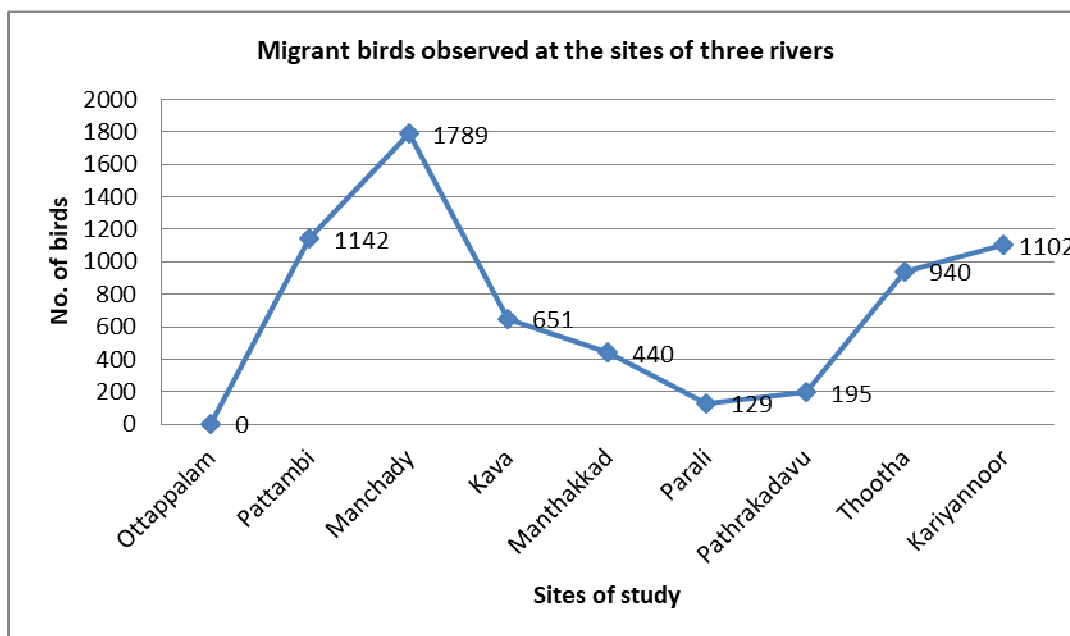


Fig. 24

Seasonal occurrence of birds

Band-A had 66 species, of which 19 were migrants, 1 local migrant and 46 residents. While 63 species were present during pre-monsoon period, only 46 were present during monsoon and all the 66 during post-monsoon period. 6 species were more numerous with a frequency of more than 100. 10 species were having a frequency between 50 and 100 (Table: 196). Band-B presented 67 species of which 13 were migrants and 54 residents. 63 species were present during pre-monsoon period, 42 species during monsoon and the full squad of 67 present in post-monsoon. 5 species marked a number of more than 100 in individual counting. 9 species were represented by a frequency of 50 to 100 (Table: 197). Band-C was habitat for 64 species. Of this, 8 were migrants, 1 local migrant and 55 were residents. All the 64 species were present during pre-monsoon and post-monsoon periods. 51 species made their appearance during monsoon period. 7 species were more numerous with an individual number more than 100. 6 species were numerous with a frequency between 50 and 100 (Table: 198).

Diversity indices

It can be presented in two components, the number of species in the community or the species richness and species evenness or equitability (Ludwig and Reynolds, 1988). As this is a combined value it is difficult to ascertain the relative importance of a species richness and evenness. A series of diversity numbers presented by Hill (1973) is very suitable to study community ecology. The following are Hill's diversity numbers;

$N_0 = S$ where S is the total number of species.

$N_1 = e^{H'}$ where H' is the Shannon's index.

$N_2 = 1/\lambda$ where λ is the Simpson's index.

Where N_0 denotes the number of all the species in the sample,

N_1 is the value of the number of the abundant species and N_2 is the value of the most abundant species. Thus to calculate Hill's diversity numbers, two indices are required, namely, Simpson's index ' λ ' and Shannon's index H' . In this study the Shannon's index of the 9 sites were computed using the formula,

Shannon's index, $H' = -\sum p_i \ln p_i$, where ' p_i ' is the proportion of individuals of species 'i'.

In a study where the sampling is accurate, the estimation of this proportion can be done as $p_i = n_i / N$, where n_i is the number of individuals of species 'i' and N is the total number of individuals in the community. Since by definition the p_i 's will be between zero and one, the natural log makes all of the terms of the summation negative, that is why the inverse of the sum is taken. The Shannon diversity index obtained in this study was the highest at Pathrakkadavu (4.5), the next at Kava (4.28). The values of the nine sites are shown below (Fig 25). It is clear that Nila river sites were the lowest in diversity index and the Kunthi river sites the highest.

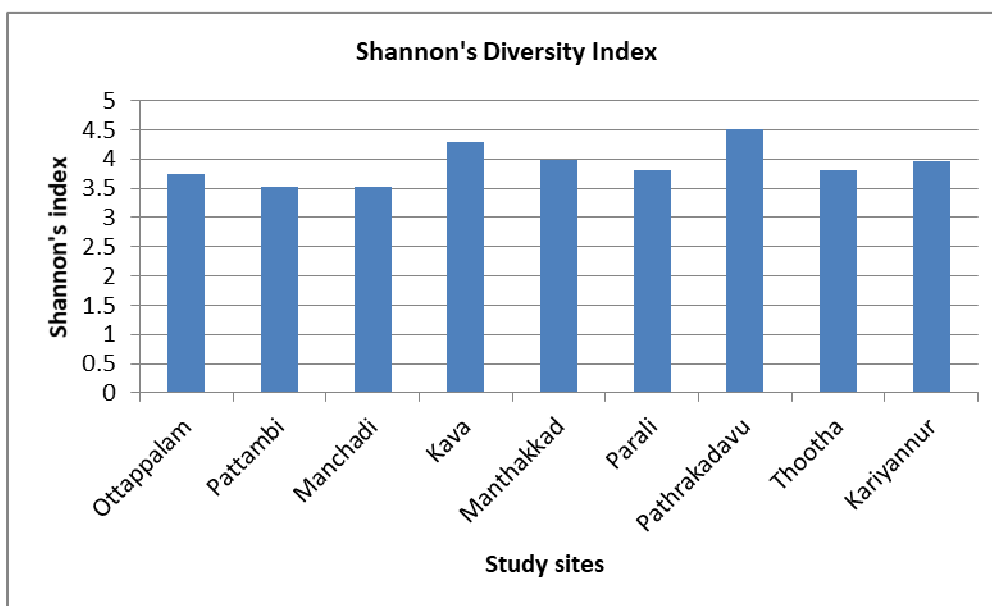


Fig. 25

Comparative analysis of Avifauna

Analyses of the three river sites showed that bird species belonging to 33 families and 208 species were present in the basins of these rivers. Bird species representing 28 families and 140 species were present at the three study sites of Nila river. Of the 140 species 98 were residents, 2 species local migrants and 40 species migrants. In the Kalpathy river basin, a total of 157 species were observed. Out of this 15 species were migrants, 2 species local migrants and 140 species residents. From the Kunthipuzha sites, 188 species were observed. Of this 150 species were residents, 37 species migrants and 1 local migrant (Table 199). The study also showed that 15 species of birds were seen only in the Nila river sites, 4 species were unique to Kalpathy basin and 7 species seen only in the Kunthipuzha sites (Table 200). Also it was observed that 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 199).

In terms of the number of birds a total of 95777 birds belonging to 208 species were counted from the 9 study sites of the three rivers. From the Nila river

sites 39422 birds were counted representing 140 species. 16 Species of birds were more abundant with more than 500 individuals. Kalpathy river basin gave a count of 24944 birds belonging to 157 species. 9 species were found more abundant with 500 and above individuals. Kunthipuzha provided habitat to 31411 birds representing 188 species. 13 species were more abundant with more than 500 individuals (Table 201).

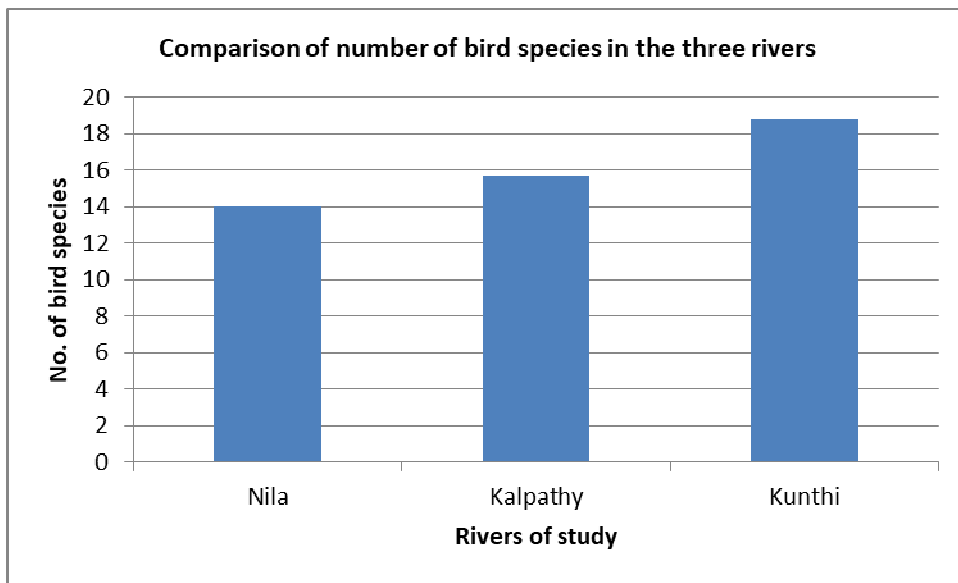


Fig 26

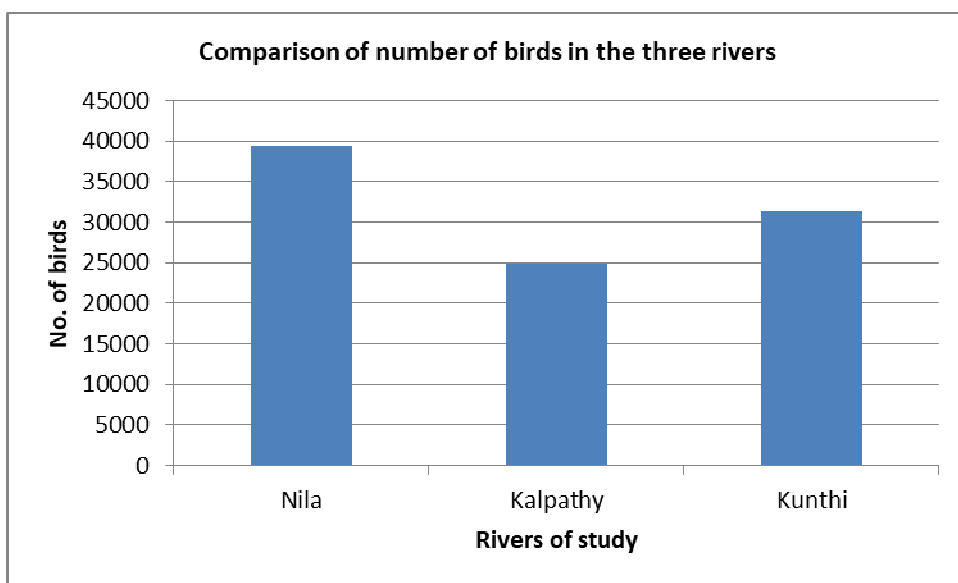


Fig 27

So in terms of species richness Kunthipuzha basin was the topmost with 188 species. Kalpathy river basin was the second highest with 157 species and Nila river with the lowest number of 140 species (Fig. 26). In terms of the number of individual birds Nila basin had the highest count with 39422 birds, Kunthipuzha with 31411 birds and Kalpathy with 24944 individuals. Though the total species in Kunthipuzha basin was highest; the composition mainly consisted of forest birds (55 species), insectivores (45 species) and omnivores (37 species) especially at Pathrakkadavu site. But the individual numbers of these birds were comparatively lesser (Tables 163, 164 and 169). Whereas Nila river basin was with the lowest species diversity, but the individual numbers were the highest (39422). This is because the numbers of migratory bird species (37), birds feeding on aquatic fauna (36) and insectivores (47), chiefly constituted the species richness especially at Manchady and Pattambi study sites; the individual numbers of these birds were relatively higher. The species like *Glareola lactea*, *Hirundo rustica*, *Ardeola grayii*, *Artamus fuscus* were in good numbers (Tables 108, 116, 117 and 121).

Seasonal fluctuations in avifauna in the three rivers

The fluctuation of avifauna over the three seasons considered (pre-monsoon, monsoon and post-monsoon) were analysed. Out of the total 140 species found along the Nila river study sites, a mean number of 63 were present during pre-monsoon, 43 during monsoon, and 64 during post-monsoon. Out of the total 39422 individual birds found along the Nila basin, 29428 birds were found during pre-monsoon, 4270 individuals during monsoon and 34654 during post-monsoon. In the Kalpathy basin, out of the total 157 species, 86 were present during pre-monsoon, 52 during monsoon and 87 species during post-monsoon. Out of the total 24944 individual birds, 20536 individuals were seen during pre-monsoon, 3368 members present during monsoon, and 22648 individuals during post-monsoon. Kunthi basin had a total of 188 species, of which 88 were present during pre-monsoon, 50 species during monsoon, and 90 species during post-monsoon. In the case of the number of birds, out of the total 31411 birds counted, 30218 birds were present during pre-monsoon, 2864 numbers during monsoon and 30788 individuals during post-

monsoon period. There was only narrow difference in the number of species during pre-monsoon and post-monsoon periods whereas during monsoon, the number was almost 1/3rd of the total number of species. The number of individual birds were also very less during monsoon period but much higher during pre and post-monsoon periods in all the three rivers. Among the three rivers, Kunthi river had highest number of species during pre and post-monsoon periods. The lowest number of species was seen along Nila river basin. Among the three rivers, Kalpathy had maximum number during monsoon period, next being Kunthi river basin (Table 90B).

Table 90 B: Comparative analysis of avifauna of the 3 rivers over seasons.

River	Total species	Total no. of birds	Pre-monsoon		Monsoon		Post-monsoon	
			Mean no. of species	No. of birds	Mean no. of species	No. of birds	Mean no. of species	No. of birds
Nila	140	39422	63	29428	43	4720	64	34654
Kalpathy	157	24944	86	20536	52	3368	87	22648
Kunthi	188	31411	88	30218	50	2864	90	30788

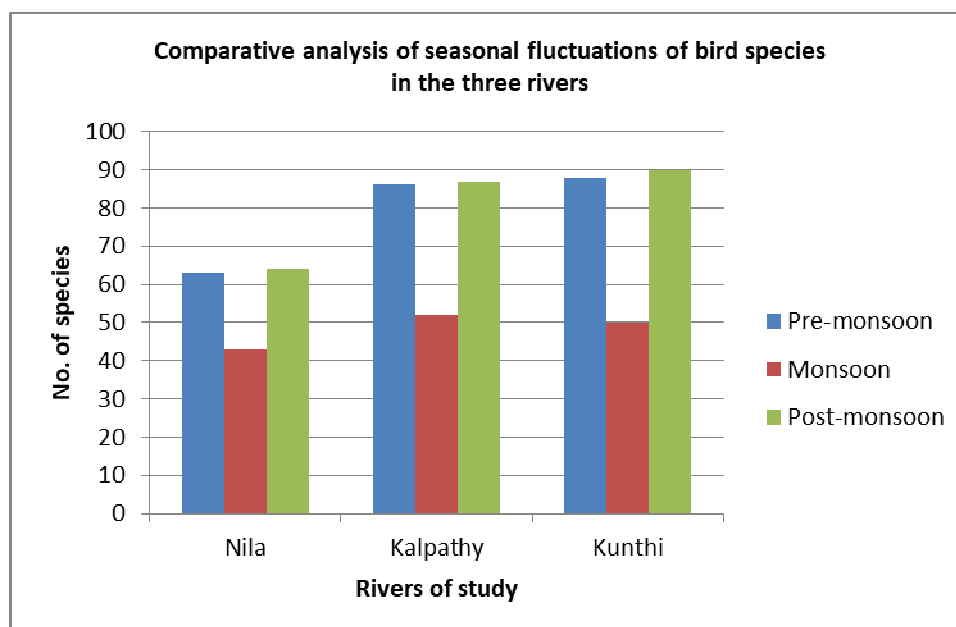


Fig 28

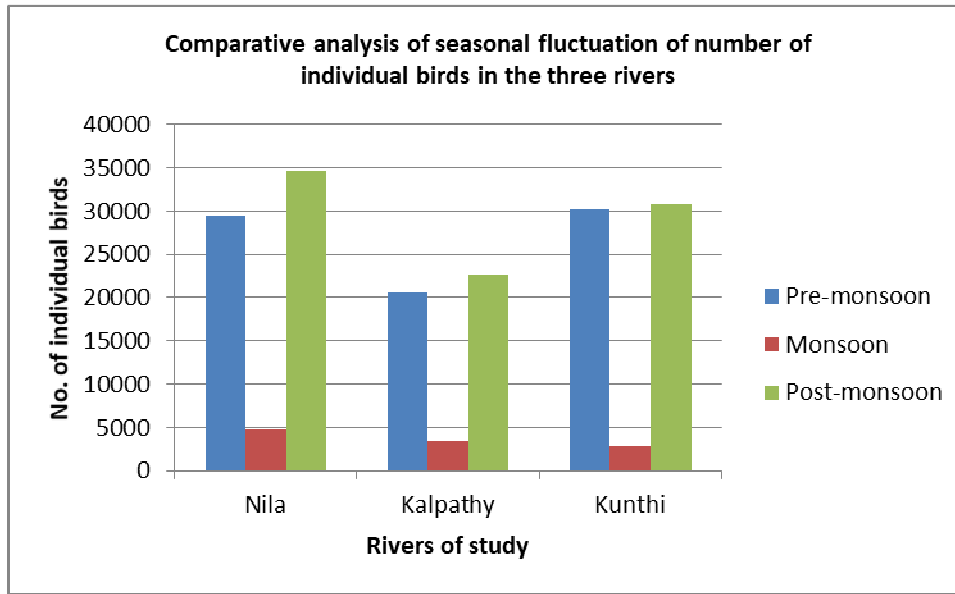


Fig 29

Correlation of avifauna with vegetation

Bird species richness, interspecific association and population density are intimately related to the vegetation type, topography, climate etc. The habitats studied are three riverine systems and it is found that the vegetation had a strong effect on the bird species composition and abundance. Among the three rivers, Kunthi river had the richest vegetation in terms of trees, shrubs and herbs. The cultivations were also very active in the three sites with maximum varieties of crops. The avifaunal analyses also confirm these results. Maximum number of bird species was seen in the Kunthi river basin. The number of birds belonging to each species was also higher here next only to the highest count in the Nila river basin. In terms of trees, shrubs and herbs, Kalpathy was the next top in vegetation cover. The avifaunal analyses also showed that Kalpathy had the second highest bird species richness. In terms of the number of individual birds, Kalpathy had the lowest number because most of the species present were non-gregarious in nature. The Nila river sites had the lowest vegetation cover in terms of trees, shrubs and herbs but good number of grass species and cultivations. The number of bird species observed was the lowest but in the number of individual birds Nila had the highest count. It was found that insectivores, grannivores and migratory species were higher in number at Nila study sites. Most of these birds are gregarious in nature. It can be noted that most of the Nila study stites had two season paddy cropping and other

vegetables farming in all the three bands. So these features accounts for the highest number of individual birds.

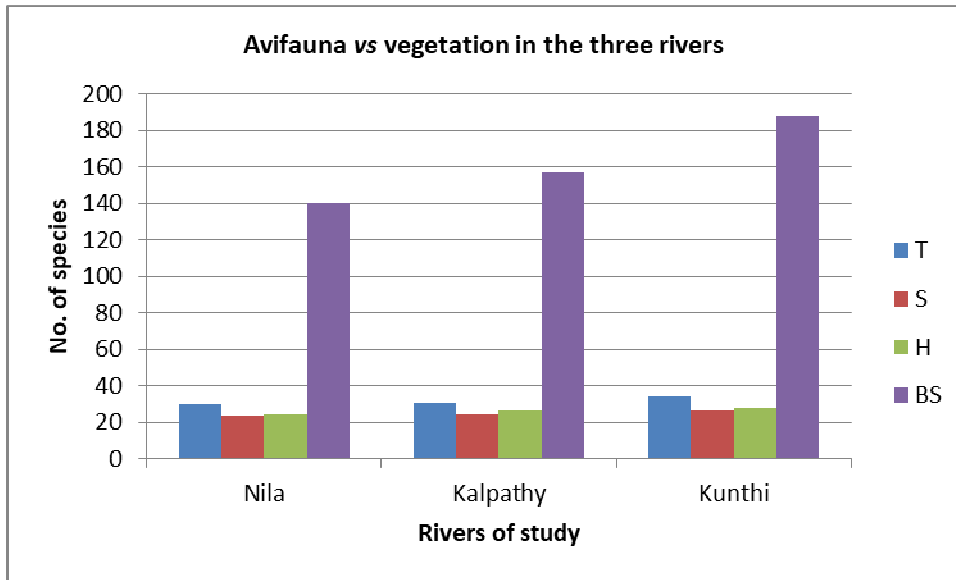


Fig 30

T=Trees, S=Shrubs, H=Herbs, BS=Bird species

The correlation coefficient with respect to avifauna and vegetation is given in figures 31, 32 and 33. The values show that the relation between vegetation and avifauna is intimate and it gives a result that the increase in vegetation positively influencing the avifauna.

Correlation of trees vs birds in the three rivers

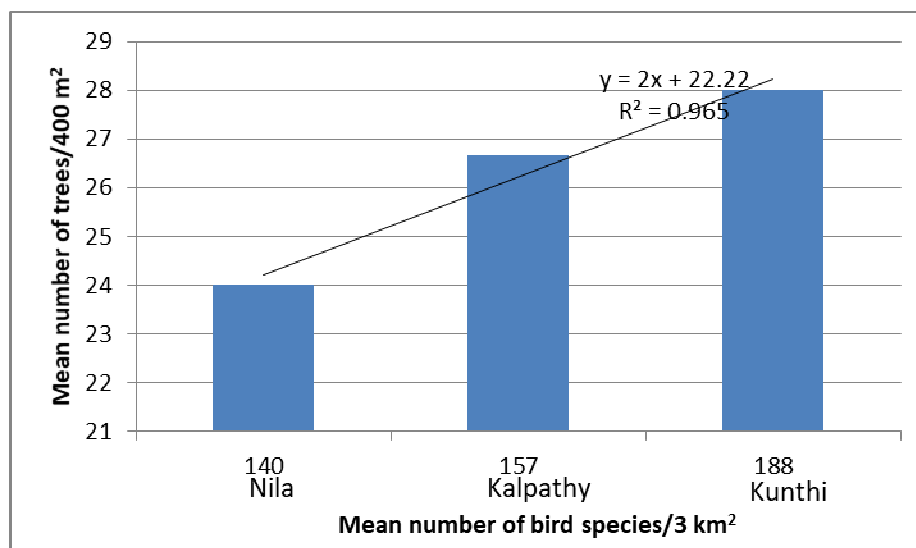


Fig 31

Correlation of shrubs vs birds in the three rivers

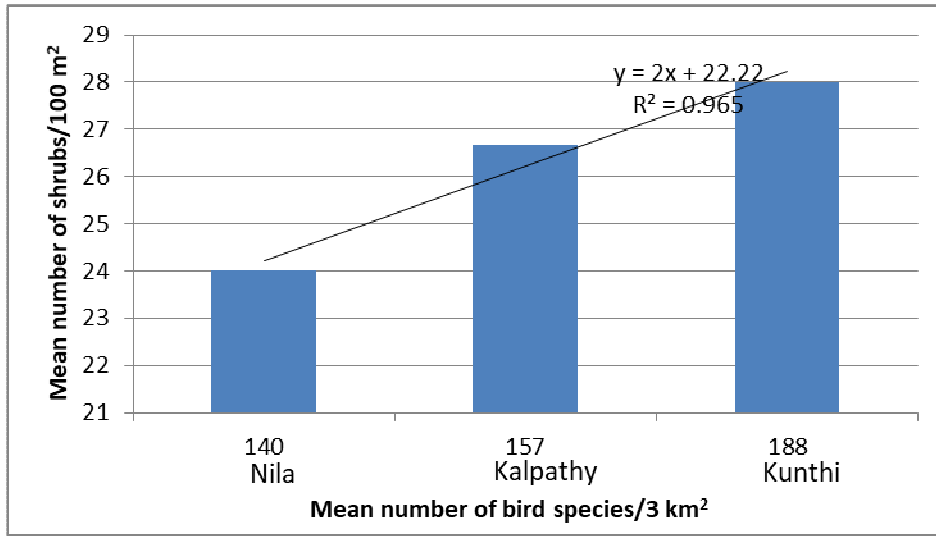


Fig 32

Correlation of herbs vs birds in the three rivers

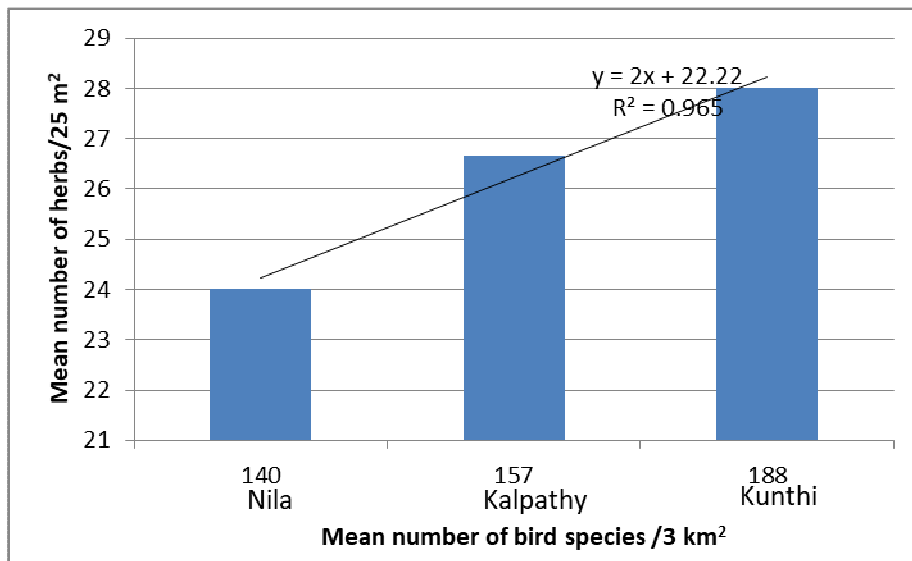


Fig 33

Avifauna and water quality

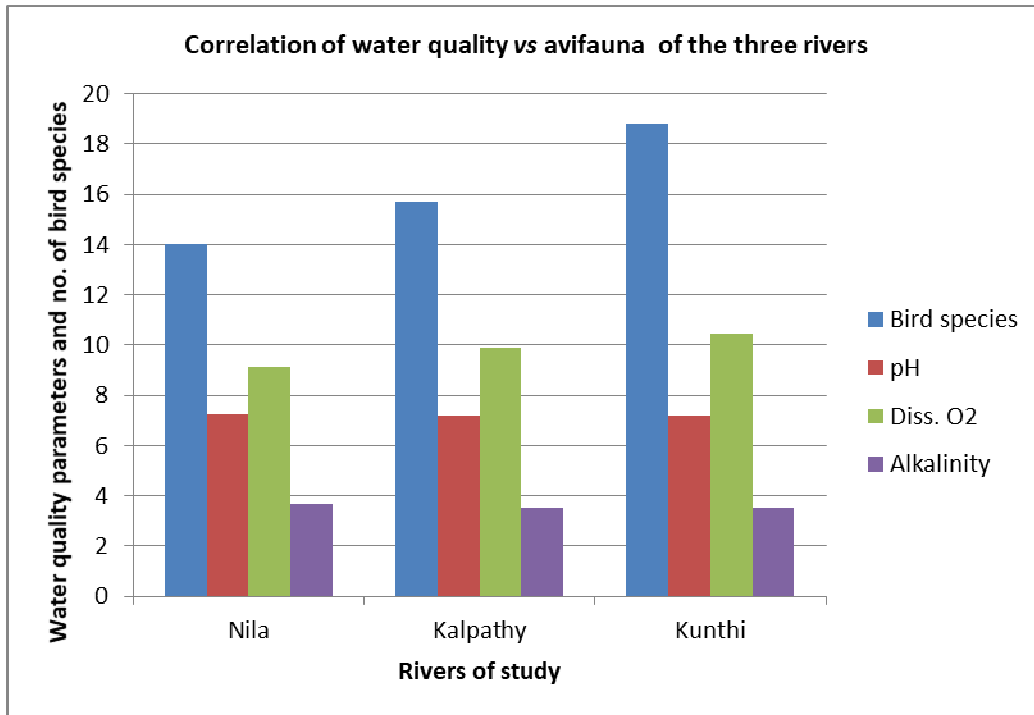


Fig 34

Bird species 1 unit = 10 species

The water quality studied based on six parameters showed that Kunthi river had the best quality of water in terms of four out of the six parameters. The avifauna in terms of species richness was also higher in Kunthi river sites next to Kalpathy river. The water quality was lowest in Nila among the three rivers and also the species richness was the lowest. Kalpathy river had the second position in terms of water quality and the bird species richness was also in the second position.

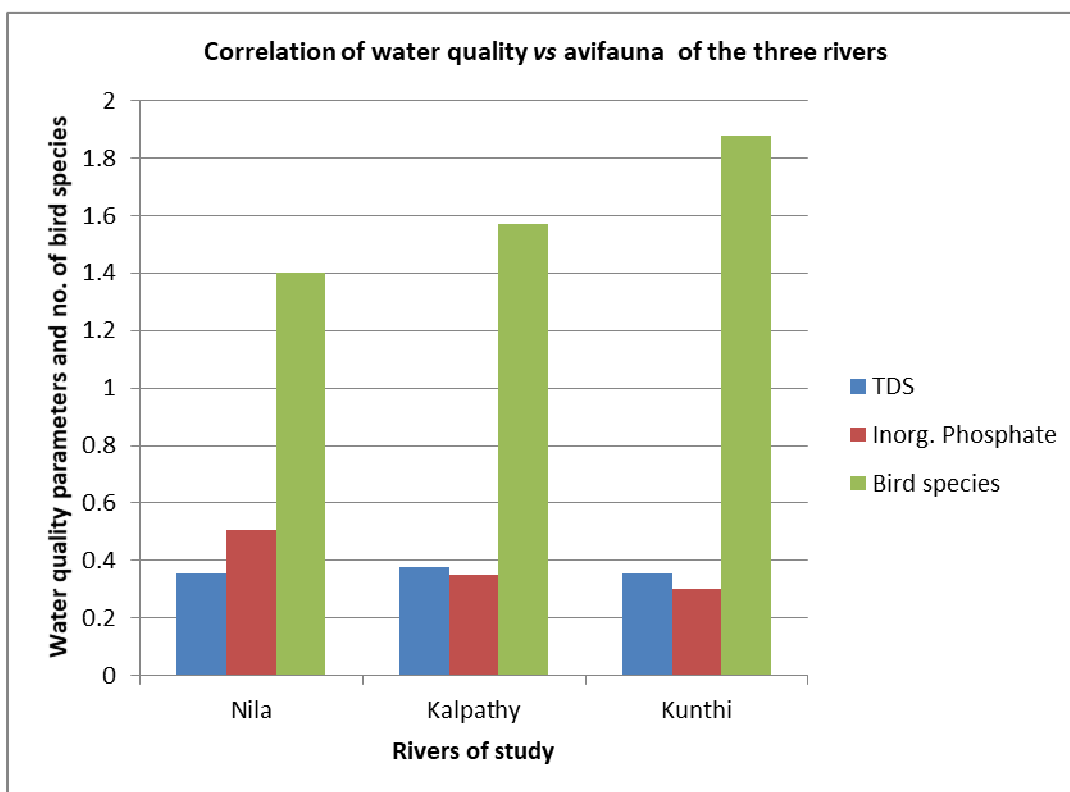


Fig 35

Bird species 1 unit = 100 species

The edaphic factors were not studied in detail as the aim and objective of this work do not include such broad aspects. Only a physical examination of the soil in terms of the nature, the texture and color were carried out. So it was not possible to ascertain the effect of edaphic conditions on avifauna. Anyhow it was observed that the texture of the soil; whether clay, granular, muddy etc had an influencing effect on the vegetation of the habitat which directly affected the avifauna of the area.

Avifauna Tables

Table: 91 List of Birds at Ottappalam - Nila river Site – I

Sl. No.	Scientific Name	Common Name	Status	Order/Family
1	<i>Phalacrocorax niger</i>	Little cormorant	R	Pelicaniformes/ Phalacrocoracidae
2	<i>Anhinga melanogaster</i>	Darter	R	
3	<i>Ardeola grayii</i>	Pond heron	R	Ciconiiformes/Ardeidae

Sl. No.	Scientific Name	Common Name	Status	Order/Family
4	<i>Egretta intermedia</i>	Median egret	R	”
5	<i>Bubulcus ibis</i>	Cattle egret	R	”
6	<i>Egretta garzetta</i>	Little egret	R	”
7	<i>Nycticorax nycticorax</i>	Night heron	R	”
8	<i>Ixobrychus cinnamomeus</i>	Chestnut bittern	R	”
9	<i>Ixoychus sinensis</i>	Yellow bittern	R	”
10	<i>Milvus migrans</i>	Common pariah kite	R	Falconiformes/Accipitridae
11	<i>Haliastur indus</i>	Brahmny kite	R	”
12	<i>Spizaetus cirrhatus</i>	Indian crested hawk	R	”
13	<i>Pandion haliaetus</i>	Osprey eagle	R	”
14	<i>Elanus caeruleus</i>	Black winged Kite	R	”
15	<i>Metopedius indicus</i>	Bramny kite	R	”
16	<i>Amaurornis Phoenicurus</i>	White breasted water hen	R	Charadriiformes/Jacaniidae
17	<i>Vanellus indicus</i>	Red wattled lap wing		
18	<i>Pluvialis dominica</i>	Golden plover	M	”
19	<i>Pluvialis squatarola</i>	Grey plover	M	”
20	<i>Charadrius dubius</i>	Little ringed plover	M	”
21	<i>Charadrius alexandrines</i>	Kentish plover	M	”
22	<i>Limosa lapponica</i>	Bartailed godwit	M	”
23	<i>Columba livia</i>	Blue rock pigeon	R	Columbiformes/Columbidae
24	<i>Streptopelia chinensis</i>	Spotted dove	R	”
25	<i>Psittacula krameri</i>	Rose ringed parakeet	R	Psittaciformes/Psittacidae
26	<i>Psittacula cyanocephala</i>	Blosson headed parakeet	R	”
27	<i>Cuculus canorus</i>	The cuckoo	R	Cuculi formes/Cuculidae
28	<i>Cuculus varius</i>	Brain fever bird	R	”
29	<i>Cuculus micropterus</i>	Indian Cuckoo	R	”
30	<i>Centropus sinensis</i>	Crow – pleasant	R	”
31	<i>Tyto alba</i>	Barn owl	R	Strigiformes/Strigidae
32	<i>Apus affinis</i>	House swift	R	Apodiformes/Apodidae

Sl. No.	Scientific Name	Common Name	Status	Order/Family
33	<i>Cypsiurus parvus</i>	Palm swift	R	”
34	<i>Alcedo atthis</i>	Small blue kingfisher	R	Coraciiformes/Alcedinidae
35	<i>Ceryle rudis</i>	Pied kingfisher	R	”
36	<i>Halcyon smyrnensis</i>	White breasted king fisher	R	”
37	<i>Merops orientalis</i>	Small green bee-eater	R	”/Meropidae
38	<i>Anthracoceros coronatus</i>	Malabar piedhornbill	R	” /Bucerotidae
39	<i>Tockus griseus griseus</i>	Malabar grey heron	R	”
40	<i>Megalaima haemaecephala</i>	Copper barbet	R	Piciformes/Capitonidae
41	<i>Megalaima zeylonica</i>	Large green barbet	R	”
42	<i>Dinopium benghalense</i>	Malabar golden backed wood pecker	R	Piciformes/Picidae
43	<i>Dinopius javanense</i>	Golden backed three toed wood pecker	M	Passeriformes/Pittidae
44	<i>Pitta brachyura</i>	Indian Pitta	M	Passeriformes/Pittidae
45	<i>Hirundo daurica</i>	Red rumped swallow	R	” / Hirundinidae
46	<i>Oriolus oriolus</i>	Golden oriole	M	” / Oriolidae
47	<i>Dicrurus adsimilis</i>	Black drongo	R	” / Dicruridae
48	<i>Dicrurus paradiseus</i>	Racket tailed drongo	R	” / Dicruridae
49	<i>Acridotheres tristis</i>	Common myna	R	” /Sturnidae
50	<i>Acridotheres fuscus</i>	Jungle myna	R	”
51	<i>Sturnus malabaricus</i>	Blyths myna	R	”
52	<i>Gracula religiosa</i>	Indian hill myna	R	”
53	<i>Dendrocitta vagabunda</i>	Tree pie	R	” /Corvidae
54	<i>Corvus splendens</i>	House crow	R	”
55	<i>Corvus macrorhynchos</i>	Indian Jungle crow	R	”
56	<i>Tephrodornis pondicerianus</i>	Common wood shrike	R	”
57	<i>Pycnonotus cafer</i>	Red vented bulbul	R	” /Irenidae

Sl. No.	Scientific Name	Common Name	Status	Order/Family
58	<i>Pycnonotus jocosus</i>	Red whiskered bulbul	R	”
59	<i>Pycnonotus luteolus</i>	White browed bulbul	R	”
60	<i>Turdoides affinis</i>	White headed babbler	R	” /Muscicapidae
61	<i>Turdoides striatus</i>	Jungle babbler	R	”
62	<i>Prinia subflava</i>	Plain wren warbler	R	”
63	<i>Prinia socialis</i>	Ashywren warbler	R	”
64	<i>Orthotomus sutorius</i>	Tailer bird	R	”
65	<i>Copsychus saularis</i>	Magprorobin	R	”
66	<i>Zoothera citrina</i>	White throated ground thrush	R	”
67	<i>Parus major</i>	Grey tit	R	” /Paridae
68	<i>Motacilla maderaspatensis</i>	Large pied wagtail	R	” /Motacillidae
69	<i>Motacilla cineria</i>	Grey Wag Tail	M	”
70	<i>Dicaeum erythrorhynchos</i>	Tickell’s flower pecker	R	” / Dicaeidae
71	<i>Nectarinia zeylonica</i>	Indian Purple rumped sunbird	R	” / Nectarinidae
72	<i>Nectarinia asiatica</i>	Purple sunbird	R	”
73	<i>Passer domesticus</i>	House sparrow	R	” /Ploceidae
74	<i>Petronia xanthocollis</i>	Yellow throated sparrow	R	”
75	<i>Ploceus philippinus</i>	Bayaweaver bird	M	”

Table 92: List of Granivorous Birds Observed at Ottappalam

LIST OF GRAMINIVOROUS BIRDS OBSERVED AT OTTAPPALAM							
SL.NO	BIRD SPECIES	BAND-A		BAND-B		BAND-C	
			No.		No.		No.
1	<i>Columba livia</i>	√	341	√	369	√	431
2	<i>Streptopelia chinensis</i>	√	25	√	25	√	36
3	<i>Petronia xanthocollis</i>	√	104	√	104	√	110

Table 93: List of Frugivorous Birds Observed at Ottappalam

SL.NO	BIRD SPECIES	BAND-A		BAND-B		BAND-C	
			No.		No.		No.
1	<i>Streptopelia chinensis</i>	√	25	√	25	√	36
2	<i>Psittacula krameri</i>	√	26	√	22	√	22
3	<i>Psittacula cyanocephala</i>	√	22	√	24	√	29
4	<i>Anthracoceros coronatus</i>	√	47	√	34	....	....
5	<i>Tockus griseus griseus</i>	√	26	√	22	....	....
6	<i>Megalaima haemacephala</i>	√	40	√	37	√	42
7	<i>Megalaima zeylanica</i>	√	45	√	40	√	36
8	<i>Dicaeum erythrorhynchos</i>	√	99	√	92	√	92

Table 94: List of Shore Birds Observed at Ottappalam

SL.NO	BIRD SPECIES	BAND-A		BAND-B		BAND-C		SEASON
			No.		No.		No.	
1	<i>Pluvialis dominica</i>	√	20	....	....	....	....	Aug-Dec
2	<i>Pluvialis sqatarola</i>	√	13	....	....	....	....	Sep-Mar
3	<i>Charadrius dubius</i>	√	70	....	....	....	....	Sep-Apr
4	<i>Charadrius alexandrines</i>	√	45	....	....	....	....	Oct-Mar
5	<i>Limosa lapponica</i>	√	80	....	....	....	....	Sep-Mar

Table : 95: List of Raptors Recorded at Ottappalam

SL.NO	BIRD SPECIES	OCCURRENCE					
		BAND-A		BAND-B		BAND-C	
			No.		No.		No.
1	<i>Milvus migrans</i>	√	29	√	43	√	58
2	<i>Haliastur indus</i>	√	24	√	26	√	41
3	<i>Spizaetus cirrhatus</i>	√	20	√	28	√	23
4	<i>Elanus caeruleus</i>	√	39	√	53		50
5	<i>Pandion haliaetus</i>	√	19	nil	-	Nil	-

Table: 96: List of Omnivorous Birds at Ottappalam

SL.N O	BIRD SPECIES	BAND-A		BAND-B		BAND-C	
			No.		No.		No.
1	<i>Metopidius indicus</i>	√	9	....	....	....	....
2	<i>Amaurornis phoenicurus</i>	√	13	....	....	....	....
3	<i>Cuculus canorus</i>	√	12	√	13	....	....
4	<i>Cuculus varius</i>	....	....	√	17	....	....

5	<i>Cuculus micropterus</i>	√	10	√	10	....	....
6	<i>Megalaima haemacephala</i>	√	40	√	37	√	42
7	<i>Megalaima zeylanica</i>	√	35	√	40	√	36
8	<i>Oriolus oriolus</i>	√	12	√	13	√	12
9	<i>Acridotheres tristis</i>	√	96	√	126	√	103
10	<i>Acridotheres fuscus</i>	√	26	√	112	√	23
11	<i>Sturnus malabaricus</i>	√	52	√	91	....	....
12	<i>Dendrocitta vagabunda</i>	√	16	√	15	√	15
13	<i>Corvus splendens</i>	√	310	√	309	√	419
14	<i>Corvus macrorhynchos</i>	√	144	√	171	√	186
15	<i>Pycnonotus cafer</i>	√	54	√	49	√	57
16	<i>Pycnonotus jocosus</i>	√	31	√	29	√	36
17	<i>Pycnonotus luteolus</i>	√	26	√	24	....	....
18	<i>Turdoides affinis</i>	√	93	√	90	√	103
19	<i>Turdoides striatus</i>	√	50	√	54	√	52
20	<i>Orthotomus sutorius</i>	√	26	....	....	√	22
21	<i>Copsychus saularis</i>	√	27	√	22	√	25
22	<i>Zoothera citrina</i>	√	8	√	12	....	....
23	<i>Parus major</i>	√	24	√	23	√	23
24	<i>Passer domesticus</i>	....	....	....	....	√	60
25	<i>Ploceus philippinus</i>	√	92	√	96	√	104

Table: 97 List of Insectivorous Birds at Ottappalam

SL.NO	BIRD SPECIES	BAND-A		BAND-B		BAND-C	
			No.		No.		No.
1	<i>Bubulcus ibis</i>	√	70	√	75	√	77
2	<i>Ixobrychus cinnamomeus</i>	√	12	....	....	....	....
3	<i>Ixobrychus sinensis</i>	√	12	....	....	....	....
4	<i>Vanellus indicus</i>	√	13	....	....	....	14
5	<i>Pluvialis dominica</i>	√	20	....	....	....	....
6	<i>Pluvialis squatarola</i>	√	13	....	....	....	....
7	<i>Charadrius dubius</i>	√	70	....	....	....	....
8	<i>Charadrius alexandrines</i>	√	45	....	....	....	....
9	<i>Streptopelia chinensis</i>	√	25	√	22	√	20
10	<i>Tyto alba</i>	√	10	....	....	....	....
11	<i>Apus affinis</i>	....	....	√	101	√	81
12	<i>Cypsiurus parvus</i>	....	....	√	36	√	37
13	<i>Merops orientalis</i>	√	36	√	42	√	44

SL.NO	BIRD SPECIES	BAND-A		BAND-B		BAND-C	
			No.		No.		No.
14	<i>Dinopium benghalense</i>	....	....	√	13	....	....
15	<i>Dinopium javanense</i>	....	....	√	13	....	....
16	<i>Pitta brachyura</i>	....	....	√	17	....	....
17	<i>Hirundo daurica</i>	....	....	√	98	....	....
18	<i>Dicrurus adsimilis</i>	√	37	√	34	√	47
19	<i>Dicrurus paradiseus</i>	√	14	....	....	√	16
20	<i>Tephrodornis pondicerianus</i>	....	....	√	49	....	....
21	<i>Prinia subflava</i>	√	28	....	....	....	....
22	<i>Prinia socialis</i>	√	30	....	....	....	....
23	<i>Copsychus saularis</i>	√	27	√	22	√	25
24	<i>Motacilla maderaspatensis</i>	....	....	....	....	√	38
25	<i>Motacilla cinerea</i>	....	....	....	....	√	16

Table 98: List of Birds Feeding on Aquatic Animals at Ottappalam

SL.NO	BIRD SPECIES	BAND-A		BAND-B		BAND-C	
			No.		No.		No.
1	<i>Phalacrocorax niger</i>	√	42	....	....	....	...
2	<i>Anhinga rufa melanogaster</i>	√	32	....	....	....	....
2.A	<i>Ardea alba</i>	√	12	....	....	....	....
3	<i>Ardeola grayii</i>	√	104	√	119	√	102
4	<i>Nycticorax nycticorax</i>	√	16	....	....	....	....
5	<i>Ixobrychus cinnamomeus</i>	√	12	....	....	....	....
6	<i>Ixobrychus sinensis</i>	√	12	....	....	....	....
7	<i>Metopidius indicus</i>	√	9	....	....	....	....
8	<i>Amaurornis phoenicurus</i>	√	13	....	....	....	....
9	<i>Limosa lapponica</i>	√	80	....	....	....	....
10	<i>Alcedo atthis</i>	√	43	√	47	√	56
11	<i>Ceryle rudis</i>	√	28	√	35	√	42
12	<i>Halcyon smyrnensis</i>	√	28	√	25	√	33

Table 99: List of Nectarivorous Birds Observed at Ottappalam

SL.NO	BIRD SPECIES	BAND-A		BAND-B		BAND-C	
			No.		No.		No.
1	<i>Oriolus oriolus</i>	√	12	√	13	√	12
2	<i>Gracula religiosa</i>	√	58	√	59	....	....
3	<i>Orthotomus sutorius</i>	√	26	....	....	√	22
4	<i>Dicaeum erythrorhynchos</i>	√	99	√	92	√	92
5	<i>Nectarinia zeylanica</i>	√	60	√	68	√	63
6	<i>Nectarinia asiatica</i>	√	36	√	46	√	31
7	<i>Petronia xanthocollis</i>	√	104	√	104	√	110

Table 100: Seasonal Occurrence of Birds; Band A – Ottappalam

Sl. No	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Pre-Monsoon	Monsoon	Post-Monsoon
1	<i>Phalacrocorax niger</i>	2	4	4	6	2	0	0	2	6	8	4	2	18	2	20
1.A	<i>Anhinga melanogaster</i>	4	4	2	6	1	1	0	0	2	4	4	4	17	1	14
2	<i>Ardea alba</i>	2	1	1	0	0	0	0	0	2	1	2	13	4	0	8
3	<i>Ardeola grayii</i>	4	4	4	8	4	8	14	12	9	11	12	14	24	34	46
4	<i>Egretta intermedia</i>	3	2	1	2	0	0	0	0	0	0	4	4	8	0	8
5	<i>Bubulcus ibis</i>	12	9	11	12	6	0	0	0	0	6	6	8	50	0	20
6	<i>Egretta garzetta</i>	4	3	4	2	1	0	0	0	0	2	3	5	14	0	10
7	<i>Nycticorax nycticorax</i>	2	1	1	2	3	2	2	0	0	0	1	2	9	4	3
8	<i>Ixobrychus cinnamomeus</i>	0	0	0	0	1	1	1	2	2	1	2	2	1	4	7
9	<i>Ixobrychus sinensis</i>	0	0	0	0	0	2	1	3	2	2	2	0	0	6	6
10	<i>Milvus migrans</i>	2	2	4	4	3	2	0	0	0	2	4	6	15	2	12
11	<i>Haliaeetus indus</i>	2	2	1	3	2	0	0	0	4	4	3	3	10	0	14
12	<i>Spizaetus cirrhatu</i>	1	2	2	2	3	0	0	0	4	3	1	2	10	0	10
13	<i>Elanus caeruleus</i>	7	3	3	3	3	0	0	0	4	5	5	6	19	0	20
13.A	<i>Pandion haliaetus</i>	2	2	1	0	0	0	0	0	3	4	3	4	5	0	14
14	<i>Metopidius indicus</i>	0	0	0	0	1	2	2	2	2	0	0	1	0	6	3
15	<i>Amauromis phoenicurus</i>	0	0	0	0	2	2	3	3	2	1	0	0	2	8	3
16	<i>Vanellus indicus</i>	0	2	2	2	1	1	0	0	0	1	2	2	7	1	5
17	<i>Pluvialis dominica</i>	0	0	0	0	0	0	0	4	6	6	4	2	0	4	16
18	<i>Pluvialis</i>	1	1	2	0	0	0	0	0	2	1	3	3	4	0	9

Sl. No	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Pre-Monsoon	Monsoon	Post-Monsoon
	<i>squatarola</i>															
19	<i>Charadrius dubius</i>	8	12	12	8	0	0	0	0	3	12	10	5	40	0	30
20	<i>Charadrius alexandrinus</i>	14	12	10	0	0	0	0	0	0	3	2	4	36	0	9
20.A	<i>Limosa lapponica</i>	10	14	8	0	0	0	0	0	6	12	14	18	30	0	50
21	<i>Columba livia</i>	42	40	36	32	30	24	16	18	28	35	38	26	180	62	99
22	<i>Streptopelia chinensis</i>	2	2	1	3	3	0	0	2	2	4	4	2	11	2	12
23	<i>Psittacula krameri</i>	2	4	2	2	1	0	0	4	2	1	4	4	11	4	11
24	<i>Psittacula cyanocephala</i>	3	3	2	1	1	0	0	1	2	2	4	3	10	1	11
25	<i>Cuculus canorus</i>	1	1	2	1	0	0	0	0	1	2	2	2	5	0	7
26	<i>Cuculus micropterus</i>	1	1	1	1	0	0	0	0	0	2	2	2	4	0	6
27	<i>Centropus sinensis</i>	2	2	2	1	1	0	1	2	4	4	4	2	8	3	14
28	<i>Tyto alba</i>	1	1	2	2	1	0	0	0	0	1	1	1	7	0	3
29	<i>Alcedo atthis</i>	2	4	4	1	1	4	4	4	5	6	4	4	12	12	19
30	<i>Ceryle rudis</i>	2	2	3	2	1	3	4	4	2	1	2	2	10	11	7
31	<i>Halcyon smyrnensis</i>	1	1	2	2	1	4	4	6	2	2	1	2	7	14	7
32	<i>Merops orientalis</i>	4	4	4	0	0	0	0	0	4	6	6	8	12	0	24
33	<i>Anthracoceros coronatus</i>	8	4	1	2	0	0	0	4	6	6	8	8	15	4	28
34	<i>Dicrurus paradiseus</i>	4	2	4	2	0	0	0	0	3	4	4	3	12	0	14
35	<i>Megalaima haemacephala</i>	6	6	4	4	2	0	0	0	0	4	8	6	22	0	18
36	<i>Megalaima zeylanica</i>	2	2	4	4	6	1	0	0	2	4	4	6	18	1	16
37	<i>Oriolus oriolus</i>	2	2	1	1	0	0	0	0	2	2	1	1	6	0	6
38	<i>Dicrurus adsimilis</i>	4	4	4	2	2	1	3	3	4	4	3	3	16	7	14
39	<i>Dicrurus paradiseus</i>	1	1	2	2	0	0	0	1	1	2	2	2	6	1	7
40	<i>Acridotheres tristis</i>	4	4	8	8	10	12	6	4	8	10	12	10	34	22	40
41	<i>Acridotheres fuscus</i>	2	2	2	3	2	0	0	1	4	4	3	3	11	1	14
42	<i>Sturnus malabaricus</i>	6	4	6	6	4	2	1	1	2	4	8	8	26	4	22
43	<i>Gracula religiosa</i>	8	8	4	6	6	2	0	1	1	4	8	10	32	4	22
44	<i>Dendrocitta vagabunda</i>	2	2	2	1	2	1	0	0	2	2	2	0	9	1	6
45	<i>Corvus splendens</i>	25	30	35	42	18	10	8	14	22	30	36	40	150	32	128
46	<i>Corvus</i>	12	15	17	12	10	4	6	4	14	18	20	22	66	14	74

Sl. No	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Pre-Monsoon	Monsoon	Post-Monsoon
	<i>macrorhynchos</i>															
47	<i>Pycnonotus cafer</i>	3	3	4	4	4	8	6	4	5	6	4	3	18	18	18
48	<i>Pycnonotus jocosus</i>	2	2	4	4	2	1	1	2	4	4	3	2	14	4	13
49	<i>Pycnonotus luteolus</i>	1	4	4	4	2	1	0	0	3	3	2	2	15	1	10
50	<i>Turdoides affinis</i>	12	14	8	8	6	4	4	6	7	6	8	10	48	14	31
51	<i>Turdoides striatus</i>	2	3	4	7	6	4	1	1	2	6	6	8	22	6	22
52	<i>Prinia subflava</i>	2	2	2	1	1	3	3	2	2	2	1	1	8	9	11
53	<i>Prinia socialis</i>	2	2	4	1	1	2	3	4	2	4	3	2	10	9	11
54	<i>Orthotomus sutorius</i>	2	2	2	3	2	2	1	2	2	3	3	2	11	5	10
55	<i>Copsychus saularis</i>	2	2	4	4	2	1	1	1	2	3	3	2	14	3	10
56	<i>Zoothera citrina</i>	1	1	0	0	0	1	1	2	2	0	1	1	2	4	2
57	<i>Parus major</i>	1	1	1	0	2	2	2	2	2	3	4	4	5	6	13
58	<i>Dicaeum erythrorhynchos</i>	11	8	14	12	12	0	0	0	0	10	14	18	57	0	42
59	<i>Nectarinia zeylonica</i>	10	12	10	6	4	0	0	0	4	4	6	4	42	0	18
60	<i>Nectarinia asiatica</i>	2	4	4	2	2	0	0	2	6	6	4	4	14	2	20
61	<i>Petronia xanthocollis</i>	6	6	8	10	12	0	0	2	14	12	18	16	42	2	60
62	<i>Ploceus philippinus</i>	4	8	8	10	4	2	2	4	6	12	14	18	34	8	50

Table 101: Seasonal Occurrence of Birds; Band B - Ottappalam

Sl.no	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Pre-Monsoon	Monsoon	Post-Monsoon
1	<i>Ardeola grayii</i>	10	12	8	4	4	8	16	12	11	8	12	14	38	36	45
2	<i>Egretta intermedia</i>	3	2	1	1	2	0	0	0	0	0	4	2	9	0	6
3	<i>Bubulcus ibis</i>	8	12	9	12	8	0	0	0	0	7	9	10	49	0	26
4	<i>Egretta garzetta</i>	4	3	4	2	1	0	0	0	0	2	2	3	14	0	7
5	<i>Milvus migrans</i>	8	4	6	6	4	2	1	1	1	4	4	2	28	4	11
6	<i>Haliastur indus</i>	4	2	3	2	2	0	0	0	4	4	2	3	13	0	13
7	<i>Spizaetus cirrhatus</i>	2	3	4	3	3	0	0	0	4	4	3	2	15	0	13
8	<i>Elanus caeruleus</i>	8	8	6	4	4	0	0	0	4	5	7	7	30	0	23

Sl.no	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Pre-Monsoon	Monsoon	Post-Monsoon
9	<i>Columba livia</i>	30	38	43	39	28	18	15	22	28	34	39	42	178	55	141
10	<i>Streptopelia chinensis</i>	2	2	1	2	2	0	0	3	3	4	2	4	9	3	13
11	<i>Psittacula krameri</i>	2	2	2	1	3	0	0	3	3	2	1	3	10	3	9
12	<i>Psittacula cyanocephala</i>	2	4	4	2	1	0	0	1	3	3	2	2	13	1	10
13	<i>Cuculus canorus</i>	2	2	2	1	0	0	0	0	2	1	1	2	7	0	6
14	<i>Cuculus varius</i>	2	2	2	2	2	2	0	0	0	2	1	1	10	2	5
15	<i>Cuculus micropterus</i>	1	1	1	1	0	0	0	0	1	2	2	1	4	0	6
16	<i>Centropus sinensis</i>	2	2	2	2	1	1	2	2	3	2	1	2	9	5	8
17	<i>Apus affinis</i>	8	8	10	12	6	4	3	3	15	12	10	10	44	10	47
18	<i>Cypsiurus parvus</i>	6	4	4	2	2	2	1	0	0	5	6	4	18	3	15
19	<i>Alcedo atthis</i>	4	4	2	2	1	6	6	5	6	4	4	3	13	17	17
20	<i>Ceryle rudis</i>	2	2	2	3	2	3	4	4	5	2	2	2	11	11	13
21	<i>Halcyon smymensis</i>	1	1	2	1	1	4	4	5	2	2	1	1	6	13	6
22	<i>Merops orientalis</i>	4	6	6	0	0	0	0	0	4	8	8	6	16	0	26
23	<i>Anthracoceros coronatus</i>	6	3	1	2	0	0	0	2	4	4	6	6	12	2	20
24	<i>Tockus griseus griseus</i>	4	2	4	2	0	0	0	0	2	2	4	2	12	0	10
25	<i>Megalaima haemacephala</i>	8	6	3	2	2	0	0	0	0	4	6	6	21	0	16
26	<i>Megalaima zeylanica</i>	2	4	4	4	6	2	0	0	2	4	4	8	20	2	18
27	<i>Dinopium benghalense</i>	1	1	2	1	0	0	1	2	1	1	2	1	5	3	5
28	<i>Dinopium javanense</i>	2	1	2	2	0	0	1	1	1	2	1	1	7	2	4
29	<i>Pitta brachyura</i>	4	4	3	3	0	0	0	0	0	0	1	2	14	0	3
30	<i>Hirundo daurica</i>	8	8	4	2	2	0	0	10	12	16	20	18	24	10	64
31	<i>Oriolus oriolus</i>	4	2	2	0	0	0	0	0	0	2	2	1	8	0	5
32	<i>Dicurus adsimilis</i>	2	4	2	2	1	1	2	4	4	4	2	6	10	4	20
33	<i>Acridotheres tristis</i>	4	6	8	8	10	10	12	14	12	18	10	10	40	36	50
34	<i>Acridotheres fuscus</i>	2	2	4	6	6	8	8	10	14	12	18	12	20	26	56
35	<i>Sturnus malabaricus</i>	8	8	6	6	7	0	0	8	10	12	12	14	35	8	48
36	<i>Gracula religiosa</i>	8	6	6	5	4	2	0	2	2	6	8	10	29	4	26

Sl.no	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Pre-Monsoon	Monsoon	Post-Monsoon
37	<i>Dendrocitta vagabunda</i>	2	2	2	1	1	1	0	0	1	1	2	2	8	1	6
38	<i>Corvus splendens</i>	31	36	28	34	20	12	10	12	22	26	35	42	150	34	125
39	<i>Corvus macrorhynchos</i>	12	18	16	20	18	4	6	6	14	20	22	15	84	16	71
40	<i>Tephrodornis pondicerianus</i>	4	4	6	8	6	0	0	2	5	5	6	5	22	2	21
41	<i>Pycnonotus cafer</i>	4	4	2	2	2	8	6	6	4	5	3	3	14	20	15
42	<i>Pycnonotus jocosus</i>	2	2	4	4	1	1	1	2	4	3	3	2	13	4	12
43	<i>Pycnonotus luteolus</i>	1	3	3	3	2	2	0	0	3	3	2	2	12	2	10
44	<i>Turdoides affinis</i>	10	11	12	8	8	6	3	3	6	7	8	8	49	12	29
45	<i>Turdoides striatus</i>	2	4	4	6	6	6	1	1	4	6	6	8	22	8	24
46	<i>Copsychus saularis</i>	2	2	3	2	2	1	1	1	2	2	2	2	11	3	8
47	<i>Zoothera citrina</i>	1	1	0	0	0	2	2	1	2	1	1	1	2	5	5
48	<i>Parus major</i>	1	1	1	0	2	2	1	1	2	4	4	4	5	4	14
49	<i>Dicaeum erythrorhynchos</i>	12	10	12	14	10	0	0	0	0	12	14	8	58	0	34
50	<i>Nectarinia zelonica</i>	10	10	14	8	4	0	0	0	6	4	6	6	46	0	22
51	<i>Nectarinia asiatica</i>	8	8	2	4	2	0	0	2	4	6	6	4	24	2	20
52	<i>Petronia xanthocollis</i>	6	6	10	10	12	0	0	4	12	12	16	16	44	4	50
53	<i>Ploceus philippinus</i>	4	4	8	8	10	2	2	4	6	10	16	18	34	8	54

Table: 102 Seasonal Occurrence of Birds - Band C - Ottappalam

Sl.no	Bird species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Pre-Monsoon	Monsoon	Post-Monsoon
1	<i>Ardeola grayii</i>	6	6	4	4	4	8	10	12	14	12	10	12	24	30	48
2	<i>Egretta intermedia</i>	2	2	1	2	0	0	0	0	0	2	2	4	7	0	8
3	<i>Bubulcus ibis</i>	14	10	11	12	8	0	0	0	0	8	8	6	55	0	22
4	<i>Egretta garzetta</i>	3	3	2	4	1	0	0	0	0	2	4	6	13	0	12
5	<i>Milvus migrans</i>	4	6	6	8	8	4	0	0	2	8	8	4	32	4	22

Sl.no	Bird species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Pre-Monsoon	Monsoon	Post-Monsoon
6	<i>Haliastur indus</i>	4	4	6	6	3	0	0	0	6	6	4	4	23	0	18
7	<i>Spizaetus cirrhatus</i>	1	2	2	3	2	0	0	0	2	3	4	4	10	0	13
8	<i>Elanus caeruleus</i>	8	6	5	5	3	0	0	0	6	6	5	6	27	0	23
9	<i>Vanellus indicus</i>	1	2	2	2	2	1	0	0	0	2	1	1	9	1	4
10	<i>Columba livia</i>	42	60	44	48	38	18	16	18	25	28	46	48	232	52	147
11	<i>Streptopelia chinensis</i>	3	4	2	2	3	0	0	4	4	6	4	4	14	4	18
12	<i>Psittacula krameri</i>	2	2	2	2	1	0	0	2	3	2	2	3	9	2	10
13	<i>Psittacula cyanocephala</i>	2	2	4	4	4	0	0	0	4	4	3	2	16	0	13
14	<i>Centropus sinensis</i>	2	2	2	1	1	0	2	2	1	2	2	2	9	4	7
15	<i>Apus affinis</i>	6	6	8	10	4	6	1	2	2	12	10	14	34	9	38
16	<i>Cypsiurus parvus</i>	4	4	3	4	3	2	1	0	0	4	6	6	20	1	16
17	<i>Alcedo atthis</i>	4	4	4	2	4	6	6	8	6	4	4	4	18	20	18
18	<i>Ceryle rudis</i>	3	2	3	3	2	4	4	6	5	4	4	2	13	14	15
19	<i>Halcyon smymensis</i>	1	1	2	2	2	4	4	6	4	3	2	2	8	14	11
20	<i>Merops orientalis</i>	6	6	8	0	0	0	0	0	4	6	6	8	20	0	24
21	<i>Megalaima haemacephala</i>	8	8	6	4	2	0	0	0	0	4	5	5	28	0	14
22	<i>Megalaima zeylanica</i>	3	4	4	6	4	2	0	0	2	4	4	3	2	2	13
23	<i>Oriolus oriolus</i>	2	2	2	0	0	0	0	0	0	2	2	2	6	0	6
24	<i>Dicrurus adsimilis</i>	6	4	4	3	3	1	2	4	4	6	4	6	20	7	20
25	<i>Dicrurus paradiseus</i>	1	1	2	2	0	0	1	2	2	2	1	2	6	1	9
26	<i>Acridotheres tristis</i>	6	6	8	8	10	14	6	4	8	12	10	11	38	24	41
27	<i>Acridotheres fuscus</i>	2	2	1	3	2	0	0	1	3	2	4	3	10	1	12
28	<i>Dendrocitta vagabunda</i>	2	2	2	1	1	1	0	0	2	2	1	1	8	1	6
29	<i>Corvus splendens</i>	48	42	44	38	35	18	12	16	30	38	47	52	207	45	167
30	<i>Corvus macrorhynchos</i>	22	18	17	17	15	10	8	9	12	16	18	24	89	27	70
31	<i>Pycnonotus cafer</i>	4	4	4	6	4	6	8	4	5	6	4	2	22	18	17

Sl.no	Bird species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Pre-Monsoon	Monsoon	Post-Monsoon
32	<i>Pycnonotus jocosus</i>	4	4	3	4	2	1	1	2	3	5	4	3	17	4	15
33	<i>Turdoides affinis</i>	14	10	9	8	8	4	4	6	12	10	8	10	49	14	40
34	<i>Turdoides striatus</i>	2	4	4	6	6	4	1	1	2	8	8	6	22	6	24
35	<i>Orthotomus sutorius</i>	2	2	2	1	1	1	1	2	2	3	3	2	8	4	10
36	<i>Copsychus saularis</i>	2	2	4	4	2	1	0	1	1	3	3	2	14	2	9
37	<i>Parus major</i>	2	1	1	1	2	2	2	2	2	1	3	4	7	6	10
38	<i>Motacilla maderaspatensis</i>	4	4	3	2	3	1	1	2	4	6	4	4	16	4	18
39	<i>Motacilla cinerea</i>	2	2	1	1	0	0	0	0	2	3	3	2	6	0	10
40	<i>Dicaeum erythrorhynchos</i>	10	14	15	8	12	0	0	0	0	8	10	15	59	0	33
41	<i>Nectarinia zeylonica</i>	12	10	9	6	4	0	0	0	4	6	5	7	41	0	22
42	<i>Nectarinia asiatica</i>	4	4	2	2	1	0	0	1	4	3	6	4	13	1	17
43	<i>Passer domesticus</i>	8	10	0	0	0	0	0	0	6	8	12	16	18	0	42
44	<i>Petronia xanthocollis</i>	6	6	8	10	12	0	0	4	12	14	18	20	42	4	64
45	<i>Ploceus philippinus</i>	8	12	10	7	6	2	1	4	6	14	16	18	43	7	54

Table 103: List of Birds Observed at Pattambi, Nila River-Site II

Sl. No	Species	Common name	Order/family	Status
1	<i>Phalacrocorax niger</i>	Little cormorant	Pelicaniformes /Phalacrocoracidae	R
2	<i>Ardea cineria</i>	Grey heron	Ciconiiformes /Ardeidae	R
3	<i>Ardeola grayii</i>	Pond heron / paddy bird	„	R
4	<i>Ardea purpurea</i>	Purple heron	„	R
5	<i>Egretta intermedia</i>	Median egret	„	R
6	<i>Bubulcus ibis</i>	Cattle egret	„	R
7	<i>Egretta garzetta</i>	Little egret	„	R
8	<i>Anhinga rufa</i>	Darter /snake bird	„	R
9	<i>Ixobrychus</i>	Chestnut bittern	„	R

Sl. No	Species	Common name	Order/family	Status
	<i>cinnamomeus</i>			
10	<i>Ciconia episcopus</i>	White necked stork	Family/Ciconiidae	R
11	<i>Milvus migrans</i>	Common pariah kite	Falconiformes/ Accipitridae	R
12	<i>Haliastur indus</i>	Brahminy kite	„	R
13	<i>Elanus caeruleus</i>	Black winged kite	„	R
14	<i>Spizaetus cirrhatus</i>	Indian crested hawk eagle	„	R
15	<i>Accipiter badius</i>	Ceylon shikra	„	R
16	<i>Metopidius indicus</i>	Bronze winged jacana	Charadriiformes/ Jacanidae	R
17	<i>Amauornis phoenicurus</i>	White breasted waterhen	„ /Jacanidae	R
18	<i>Glareola lactea</i>	swallow plover	„ /Glareolidae	R
19	<i>Vanellus indicus</i>	Red wattled lapwing	„ /Charadriidae	R
20	<i>Vanellus malabaricus</i>	Yellow wattled lapwing	„ „	R
21	<i>Pluvialis dominica</i>	Golden plover	„ „	M
22	<i>Pluvialis squatarola</i>	Grey plover	„ „	M
23	<i>Charadrius dubius</i>	Little ringed plover	„ „	M
24	<i>Charadrius alexandrinus</i>	Kentish plover	„ „	M
25	<i>Tringa glareola</i>	Spotted sand piper	„	M
26	<i>Tringa hypoleucos</i>	Common sand piper	„	M
27	<i>Tringa totanus</i>	Common red shank	„	M
28	<i>Calidris minuta</i>	Little stint	„	M
29	<i>Calidris temmincki</i>	Temminck's stint	„	
30	<i>Gallinago gallinago</i>	Fantail snipe	„	M
31	<i>Chlidonias hybrida</i>	Indian whiskered tern	„/Laridae	M
32	<i>Sterna auticauda</i>	Black bellied tern	„	R
33	<i>Columba livia</i>	Blue rock pigeon	Columbiformes/Columbidae	R
34	<i>Treron phoenicoptera</i>	Green pigeon	„	R
35	<i>Streptopelia chinensis</i>	Spotted dove	„	R
36	<i>Psittacula krameri</i>	Rose-ringed parakeet	Psittaciformes/Psittaciformes	R
37	<i>Psittacula cyanocephala</i>	Blossom-headed parakeet	„	R
38	<i>Cuculus canorus</i>	The cuckoo	Cuculiformes/ Cuculidae	R
39	<i>Cuculus micropterus</i>	Indian cuckoo	„	R
40	<i>Centropus sinensis</i>	Crow-pheasant	„	R
41	<i>Eudynamis scolopacea</i>	Indian koel	„	R

Sl. No	Species	Common name	Order/family	Status
42	<i>Athene bramha</i>	Southern spotted owlet	Strigiformes/Strigidae	R
43	<i>Apus affins affins</i>	House swift	Apodiformes/Apodidae	R
44	<i>Cypsiurus parvus</i>	Palm swift	„	R
45	<i>Alcedo atthis</i>	Small blue king fisher	Coraciiformes/Alcedinidae	R
46	<i>Ceryle rudis</i>	Pied king fisher	„	R
47	<i>Halcyon smyrnensis</i>	White breasted king fisher	„	R
48	<i>Merops orientalis</i>	Small green bee eater	„/Meropidae	LM
49	<i>Merops philippinus</i>	Blue tailed bee eater	„	M
50	<i>Coracias benghalensis</i>	South Indian roller /blue jay	„/Coraciidae	R
51	<i>Ocyrceros birostris</i>	Common grey hornbill	„/Bucerotidae	R
52	<i>Upupa epops</i>	Ceylon hoopoe	„/Upupidae	R
53	<i>Megalaima haemacephala</i>	Copper smith barbet	Piciforms/Capitonidae	R
54	<i>Megalaima zeylanica</i>	Large green barbet	„	R
55	<i>Dinopium benghalense</i>	Malabar golden backed wood pecker	„/Picidae	R
56	<i>Pitta brachyura</i>	Indian pitta	Passeriforms/pittidae	M
57	<i>Mirafra assamica</i>	Bush lark	„/Alaudidae	R
58	<i>Galerida malabarica</i>	Malabar crested lark	„	R
59	<i>Hirundo rustica</i>	Eastern swallow	„/Hirundinidae	M
60	<i>Hirundo durica</i>	Red-rumped swallow	„	R
61	<i>Oriolus oriolus</i>	Golden oriole	„/Oriolidae	M
62	<i>Oriolus xanthornus</i>	Balck headed oriole	„	R
63	<i>Dicrurus adsimilis</i>	Balck drongo	„/Dicruridae	R
64	<i>Dicrurus paradiseus</i>	Large racket tailed drongo	„	R
65	<i>Artamus fuscus</i>	Ashy swallow shrike	„/Artamidae	R
66	<i>Acridotherus tristis</i>	Common myna	„/Sturnidae	R
67	<i>Acridotherus fuscus</i>	Jungle myna	„	R
68	<i>Dendrocitta vagabunda</i>	Tree pie	Passeriforms/Corvidae	R
69	<i>Corvus splendens</i>	House crow	„	R
70	<i>Corvus macrorhynchos</i>	Indian jungle crow	„	R
71	<i>Hemipus picatus picatus</i>	Pied flycatcher shrike	„/Compephagidae	R
72	<i>Pericrocotus cinnamomeus</i>	Malabar small minivet	„	R
73	<i>Aegithina tiphia</i>	Ceylon iora	„/Irenidae	R
74	<i>Chloropsis cochinchinensis jerdoni</i>	Jerdon's chloropsis	„	R

Sl. No	Species	Common name	Order/family	Status
75	<i>Pycnonotus cafer</i>	Redvented bulbul	„	R
76	<i>Pycnonotus jocosus</i>	Red whiskered bulbul	„	R
77	<i>Turdoides affinis</i>	white headed babbler	„/Muscicapidae	R
78	<i>Turdoides striatus</i>	Jungle babbler	„	R
79	<i>Terpsiphone paradisi</i>	Paradise flycatcher	„	M
80	<i>Muscicapa tickelliae</i>	Tickell's blue flycatcher	„	R
81	<i>Rhipidura aureola</i>	White browed fantail flycatcher	„	R
82	<i>Prinia socialis</i>	Ashy-wren warbler	„	R
83	<i>Cisticola juncidis</i>	Streaked fantail warbler	„	R
84	<i>Orthotomus sutorius</i>	Tailor bird	„	R
85	<i>Saxicoloides fulicata</i>	Indian robin	„	R
86	<i>Copsychus saularis</i>	Magpie robin	„	R
87	<i>Zoothera citrina</i>	White throated ground thrush	„	R
88	<i>Parus major</i>	Indian grey tit	„/Paridae	R
89	<i>Anthus novascelandiae</i>	Malay pipit	„/Motacillidae	R
90	<i>Motacilla maderaspatensis</i>	Large pied wagtail	„	R
91	<i>Motacilla cinerea</i>	Grey wagtail	„	R
92	<i>Motacilla alba</i>	White wagtail	„	M
93	<i>Dicaeum erythrorhynchos</i>	Tickell's flowerpecker	„/Dicaeidae	R
94	<i>Nectarinia zeylonica</i>	Indian purple rumped sunbird	„/Nectarinidae	R
95	<i>Nectarinia asiatica</i>	Purple sun bird	„	R
96	<i>Passer domesticus</i>	House sparrow	„/Ploceidae	R
97	<i>Petronia xanthocollis</i>	Yellow throated sparrow	„	M
98	<i>Ploceus philippinus</i>	Baya weaver bird	„	M
99	<i>Lonchura punctulata</i>	Spotted munia	„	R
100	<i>Lonchura striata</i>	White backed munia	„	R

Table : 104 List of Shore bird Species observed at Pattambi

Sl. No.	Bird species	Status	Bands		
			A	B	C
1	<i>Ciconia episcopus</i>	R	X	-	-
2	<i>Glareola lactea</i>	R	X	-	-
3	<i>Pluvialis dominica</i>	M	X	-	-
4	<i>Pluvialis squatarola</i>	M	X	-	-
5	<i>Charadrius dubius</i>	M	X	-	-

Sl. No.	Bird species	Status	Bands		
			A	B	C
6	<i>Charadrius alexandrinus</i>	M	X	-	-
7	<i>Tringa glareola</i>	M	X	-	-
8	<i>Tringa hypoleucos</i>	M	X	-	-
9	<i>Tringa totanus</i>	M	X	-	-
10	<i>Calidris minuta</i>	M	X	-	-
11	<i>Calidris temmincki</i>	M	X	X	-
12	<i>Gallinago gallinago</i>	M	X	X	-
13	<i>Chlidonias hybrida</i>	M	X	-	-
14	<i>Sterna auticauda</i>	M	X	-	-

Table: 105 List of Raptors recorded at Pattambi

Sl. No.	Bird Species	Band A	No.	Band B	No.	Band C	No.
1	<i>Milvus migrans</i>	X	86	X	228	X	48
2	<i>Haliastur indus</i>	X	16	X	25	-	-
3	<i>Elanus caeruleus</i>	X	11	X	37	-	-
4	<i>Spizaetus cirrhatus</i>	-	-	X	20	-	-
5	<i>Accipiter badius</i>	X	12	X	10	X	13

'X' indicates presence of birds.

Table: 106 List of Birds feeding on aquatic animals at Pattambi

Sl.No	Bird Species	Band A	No.	Band B	No.	Band C	No.
1	<i>Phalacrocorax niger</i>	X	26	-	-	-	-
2	<i>Ardea cineria</i>	X	9	X	3	-	-
3	<i>Ardeola grayii</i>	X	102	X	136	X	158
4	<i>Ardea purpurea</i>	X	10	X	9	-	-
5	<i>Anhinga rufa</i>	X	48	-	-	-	-
6	<i>Ciconia episcopus</i>	X	52	-	-	-	-
7	<i>Chlidonias hybrida</i>	X	17	-	-	-	-
8	<i>Sterna auticauda</i>	X	22	-	-	-	-
9	<i>Alcedo atthis</i>	X	29	X	72	-	-
10	<i>Ceryle rudis</i>	X	21	-	-	-	-
11	<i>Halcyon smyrnensis</i>	X	32	X	34	X	20

Table: 107 List of Omnivorous Birds at Pattambi

Sl. No.	Bird Species	Band A	No.	Band B	No.	Band C	No.
1	<i>Metopidius indicus</i>	X	16	-	-	-	-
2	<i>Amaurornis phoenicurus</i>	-	-	-	-	X	16
3	<i>Eudynamis scolopacea</i>	X	19	-	-	X	19
4	<i>Cuculus canorus</i>	X	7	-	-	X	9

Sl. No.	Bird Species	Band A	No.	Band B	No.	Band C	No.
5	<i>Cuculus micropterus</i>	-	-	-	-	X	6
6	<i>Megalaima haemacephala</i>	-	-	X	13	X	56
7	<i>Megalaima zeylanica</i>	-	-	-	-	X	19
8	<i>Galerida malabarica</i>	-	-	-	-	X	11
9	<i>Oriolus oriolus</i>	X	7	X	11	X	15
10	<i>Oriolus xanthornus</i>	X	10	X	16	X	15
11	<i>Acridotheres tristis</i>	X	165	X	176	X	132
12	<i>Acridotheres fuscus</i>	X	110	X	160	X	115
13	<i>Dendocitta vagabunda</i>	X	25	-	-	X	19
14	<i>Corvus splendens</i>	X	1788	X	610	X	399
15	<i>Corvus macrorhynchos</i>	X	528	X	436	X	318
16	<i>Pycnonotus cafer</i>	X	61	X	28	X	27
17	<i>Pycnonotus jocosus</i>	X	33	X	28	X	23
18	<i>Turdoides affinis</i>	X	166	X	142	X	76
19	<i>Turdoides striatus</i>	X	58	X	82	X	76
20	<i>Orthotomus sutorius</i>	-	-	-	-	X	11
21	<i>Copsychus saularis</i>	X	52	X	27	X	16
22	<i>Zoothera citrina</i>	-	-	-	-	X	15
23	<i>Parus major</i>	-	-	X	17	X	15
24	<i>Passer domesticus</i>	X	72	-	-	X	84
25	<i>Ploceus philippinus</i>	X	46	X	100	X	101

'X' indicates presence of species.

Table 108 List of Insectivorous Birds recorded at Pattambi

Sl. No.	Bird Species	Band A	No.	Band B	No.	Band C	No.
1	<i>Bubulcus ibis</i>	X	86	X	125	X	140
2	<i>Ixobrychus cinnamomeus</i>	X	9	-	-	-	-
3	<i>Vanellus indicus</i>	X	16	X	18	X	14
4	<i>Vanellus malabaricus</i>	-	-	X	9	-	-
5	<i>Glareola lactea</i>	X	252	-	-	-	-
6	<i>Pluvialis dominica</i>	X	12	-	-	-	-
7	<i>Pluvialis squatarola</i>	X	13	-	-	-	-
8	<i>Charadrius dubius</i>	X	73	-	-	-	-
9	<i>Charadrius alexandrines</i>	X	58	-	-	-	-
10	<i>Tringa glareola</i>	X	64	-	-	-	-
11	<i>Tringa hypoleucos</i>	X	38	-	-	-	-
12	<i>Tringa totanus</i>	X	20	-	-	-	-
13	<i>Calidris minuta</i>	X	99	-	-	-	-
14	<i>Calidris temmincki</i>	X	19	-	-	-	-
15	<i>Gallinago gallinago</i>	X	25	-	-	-	-
16	<i>Centropus sinensis</i>	X	23	X	15	X	19
17	<i>Athene brama</i>	-	-	-	-	X	7

Sl. No.	Bird Species	Band A	No.	Band B	No.	Band C	No.
18	<i>Apus affinis</i>	-	-	X	106	X	105
19	<i>Cypsiurus parvus</i>	-	-	-	-	X	33
20	<i>Merops orientalis</i>	X	24	X	111	X	29
21	<i>Merops philippinus</i>	-	-	X	30	X	44
22	<i>Coracias benghalensis</i>	-	-	X	12	X	13
23	<i>Upupa epops</i>	-	-	X	16	X	16
24	<i>Dinopium benghalense</i>	-	-	-	-	X	10
25	<i>Pitta brachyura</i>	-	-	-	-	X	13
26	<i>Hirundo rustica</i>	X	171	X	162	-	-
27	<i>Hirundo daurica</i>	X	122	X	118	-	-
28	<i>Dicrurus adsimilis</i>	X	35	X	72	X	46
29	<i>Dicrurus paradiseus</i>	X	26	X	36	X	32
30	<i>Artamus fuscus</i>	X	600	X	630	X	108
31	<i>Hemipus picatus</i>	-	-	-	-	X	20
32	<i>Pericrocotus cinnamomeus</i>	-	-	-	-	X	13
33	<i>Aegithina tiphia</i>	-	-	X	21	X	16
34	<i>Terpsiphone paradisi</i>	X	44	X	52	X	56
35	<i>Muscicapa tickelliae</i>	-	-	-	-	X	51
36	<i>Rhipidura aureola</i>	-	-	-	-	X	23
37	<i>Prinia socialis</i>	X	27	-	-	-	-
38	<i>Cisticola juncidis</i>	X	70	X	40	X	24
39	<i>Anthus novascelandiae</i>	X	70	X	40	X	24
40	<i>Saxicoloides fulicata</i>	X	17	X	16	X	14
41	<i>Motacilla maderaspatensis</i>	X	139	X	40	-	-
42	<i>Motacilla alba</i>	-	-	X	10	-	-
43	<i>Motacilla cinerea</i>	-	-	X	6	-	-

'X' indicates presence of species.

Table 109 List of Granivorous Birds recorded at Pattambi

Sl. No.	Bird Species	Band A	No.	Band B	No.	Band C	No.
1	<i>Columba livia</i>	X	276	X	394	X	296
2	<i>Streptopelia chinensis</i>	X	114	X	41	-	-
3	<i>Petronia xanthocollis</i>	X	34	X	-	-	-
4	<i>Lonchura punctulata</i>	-	-	X	44	-	-
5	<i>Lonchura striata</i>	X	-	X	36	X	-

X' indicates presence of species

Table: 110 List of Frugivorous Birds recorded at Pattambi

Sl. No.	Bird Species	Band A	No.	Band B	No.	Band C	No.
1	<i>Treron phoenicoptera</i>	X	114	-	-	-	-
2	<i>Streptopelia chinensis</i>	X	21	X	41	X	54

Sl. No.	Bird Species	Band A	No.	Band B	No.	Band C	No.
3	<i>Psittacula krameri</i>	X	16	X	20	X	19
4	<i>Psittacula cyanocephala</i>	X	19	X	15	X	19
5	<i>Ocyrceros birostris</i>	-	-	-	-	X	15
6	<i>Megalaima haemacephala</i>	-	-	-	-	X	56
7	<i>Megalaima zeylanica</i>	-	-	-	-	X	19
8	<i>Dicaeum erythrorhynchos</i>	-	-	X	98	X	91
9	<i>Eudynamis scolopaceae</i>	X	19	-	-	X	19

'X' indicates presence of species

Table: 111 List of Nectarivorous Birds recorded at Pattambi

Sl. No.	Bird Species	Band A	No.	Band B	No.	Band C	No.
1	<i>Oriolus oriolus</i>	X	7	X	11	X	15
2	<i>Chloropsis cochinchinensis</i>	-	-	X	21	-	-
3	<i>Orthotomus sutorius</i>	-	-	-	-	X	11
4	<i>Dicaeum erythrorhynchos</i>	-	-	X	98	X	91
5	<i>Nectarinia zeylonica</i>	X	83	X	62	X	95
6	<i>Nectarinia asiatica</i>	-	-	X	46	X	39
7	<i>Petronia xanthocollis</i>	X	34	-	-	-	-

'X' indicates presence of species

Table: 112 Seasonal occurrence of Birds at Pattambi - Band - A

Sl. No	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	<i>Phalacrocorax niger</i>	2	4	4	2	-	-	-	-	4	5	3	2
2	<i>Ardea cineria</i>	2	-	-	-	-	-	-	-	2	1	2	2
3	<i>Ardeola grayii</i>	8	10	6	4	6	4	8	10	12	12	16	16
4	<i>Ardea purpurea</i>	1	1	1	-	-	-	-	-	2	2	2	1
5	<i>Egretta intermedia</i>	4	2	2	2	-	-	-	-	-	-	6	4
6	<i>Bubulcus ibis</i>	10	12	12	14	-	-	-	-	-	-	20	18
7	<i>Egretta garzetta</i>	4	6	5	2	-	-	-	-	-	-	8	6
8	<i>Ixobrychus cinnamomeus</i>	-	-	-	-	-	1	1	2	2	1	2	-
9	<i>Anhinga rufa</i>	4	6	8	4	2	4	6	4	2	2	4	2
10	<i>Ciconia episcopus</i>	4	6	6	8	10	-	-	-	2	4	6	6
11	<i>Milvus migrans</i>	6	10	14	18	18	-	-1	4	4	3	2	6
12	<i>Haliastur indus</i>	1	2	1	2	3	-	-	-	2	1	3	1
13	<i>Elanus caeruleus</i>	2	2	1	1	1	-	-	-	-	1	1	2
14	<i>Accipiter badius</i>	1	1	2	2	1	-	-	-	1	1	1	2
15	<i>Metopidius indicus</i>	2	2	1	3	2	-	-	-	-	2	1	3
16	<i>Glareola lactea</i>	40	28	-	-	-	12	18	24	22	20	20	68
17	<i>Vanellus indicus</i>	1	1	-	2	2	4	-	-	1	2	1	2
18	<i>Pluvialis dominica</i>	-	-	-	-	-	-	-	2	4	4	2	-
19	<i>Pluvialis squatarola</i>	-	2	1	-	-	-	-	-	2	2	4	2
20	<i>Charadrius dubius</i>	14	10	8	8	-	-	-	-	2	23	6	2
21	<i>Charadrius alexandrinus</i>	16	20	14	-	-	-	-	-	-	-	2	6

Sl. No	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
22	<i>Tringa glareola</i>	8	4	3	1	-	-	-	-	8	10	16	14
23	<i>Tringa hypoleucos</i>	2	8	6	4	-	-	-	-	-	4	6	8
24	<i>Tringa totanus</i>	1	2	2	2	-	-	-	-	3	4	4	2
25	<i>Chlidonias hybrida</i>	1	7	5	1	-	-	-	-	-	-	1	2
26	<i>Sterna auticauda</i>	2	2	3	8	2	2	-	-	-	-	-	3
27	<i>Gallinago gallinago</i>	2	1	3	4	-	-	-	-	2	6	3	4
28	<i>Calidris minuta</i>	12	14	-	-	-	-	-	-	24	16	15	18
29	<i>Calidris temmincki</i>	1	1	1	-	-	-	-	-	-	3	4	7
30	<i>Columba livia</i>	18	10	24	30	34	16	12	14	24	28	32	34
31	<i>Treron phoenicoptera</i>	12	10	8	20	22	-	-	-	14	12	6	10
32	<i>Streptopelia chinensis</i>	2	1	1	1	3	-	1	2	2	4	3	1
33	<i>Psittacula krameri</i>	2	1	2	2	1	-	-	2	2	1	2	1
34	<i>Psittacula cyanocephala</i>	1	2	2	2	3	-	-	1	2	1	3	2
35	<i>Cuculus canorus</i>	1	1	1	1	-	-	-	1	-	-	1	1
36	<i>Centropus sinensis</i>	2	2	1	2	4	-	-	1	2	2	1	3
37	<i>Eudynamys scolopacea</i>	2	2	2	1	1	2	2	1	2	1	1	2
38	<i>Alcedo atthis</i>	2	4	2	1	2	2	2	3	4	3	2	2
39	<i>Ceryle rudis</i>	2	2	1	1	1	4	3	2	1	2	1	1
40	<i>Halcyon smymensis</i>	2	4	2	3	3	2	4	4	4	2	1	1
41	<i>Merops orientalis</i>	4	4	6	-	-	-	-	-	4	2	-	4
42	<i>Hirundo rustica</i>	20	22	18	17	-	-	-	-	16	24	26	28
43	<i>Hirundo daurica</i>	18	18	16	14	12	-	-	14	8	6	7	9
44	<i>Oriolus oriolus</i>	1	1	1	2	-	-	-	-	-	1	-	1
45	<i>Oriolus xanthornus</i>	1	-	1	2	-	1	1	-	2	1	-	1
46	<i>Dicrurus adsimilis</i>	4	2	3	1	2	4	6	1	3	2	4	1
47	<i>Dicrurus paradiseus</i>	2	3	5	2	1	1	1	2	1	2	2	4
48	<i>Artamus fuscus</i>	215	300	100	100	98	56	-	-	18	20	24	21
49	<i>Acridotheres tristis</i>	8	20	24	22	10	15	8	4	6	10	12	6
50	<i>Acridotheres fuscus</i>	4	6	4	6	8	8	12	14	16	14	10	8
51	<i>Dendrocitta vagabunda</i>	2	1	2	3	4	-	-	2	1	3	4	3
52	<i>Corvus splendens</i>	120	100	95	98	110	150	170	165	180	200	210	190
53	<i>Corvus macrorhynchos</i>	60	48	36	54	28	16	22	28	54	66	72	44
54	<i>Pycnonotus cafer</i>	6	8	4	5	2	4	6	6	7	5	2	6
55	<i>Pycnonotus jocosus</i>	4	4	1	1	2	3	4	6	3	1	2	2
56	<i>Turdoides affinis</i>	12	16	20	22	16	18	8	6	5	14	13	16
57	<i>Turdoides striatus</i>	2	4	6	6	5	4	2	2	8	6	6	7
58	<i>Terpsiphone paradise</i>	4	8	6	2	6	-	-	-	3	4	6	5
59	<i>Prinia socialis</i>	2	3	4	2	1	1	1	2	2	3	4	2
60	<i>Cisticola juncidis</i>	12	14	-	-	-	4	4	6	8	10	10	10
61	<i>Saxicoloides fulicata</i>	2	2	2	1	1	-	-	2	1	2	2	2
62	<i>Copsychus saularis</i>	4	6	8	8	4	2	2	4	6	2	4	2
63	<i>Motacilla maderaspatensis</i>	12	16	8	6	6	4	6	4	16	18	15	18
64	<i>Motacilla cineria</i>	4	2	6	4	-	-	-	-	3	6	6	4
65	<i>Nectarinia zeylonica</i>	10	6	6	12	-	-	-	8	12	14	6	9
66	<i>Passer domesticus</i>	10	16	-	-	-	-	-	-	8	10	12	16
67	<i>Petronia xanthocollis</i>	6	3	5	4	-	-	-	-	2	2	6	6
68	<i>Ploceus philippinus</i>	4	6	4	4	2	2	1	6	4	4	3	6

Table 113 Seasonal Occurrence of Birds; Band B - Pattambi

Sl.no	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	<i>Ardea cineria</i>	-	-	-	-	-	-	-	-	1	1	1	-
2	<i>Ardeola grayii</i>	4	6	6	12	14	16	12	14	10	16	12	14
3	<i>Ardea purpurea</i>	1	1	1	-	-	-	-	-	1	2	2	1
4	<i>Egretta intermedia</i>	4	3	3	2	-	-	-	-	-	-	4	4
5	<i>Bubulcus ibis</i>	12	14	18	22	12	-	-	-	8	16	11	10
6	<i>Egretta garzetta</i>	2	3	4	1	-	-	-	-	-	-	8	12
7	<i>Milvus migrans</i>	36	18	20	26	28	4	4	6	12	18	26	30
8	<i>Haliastur indus</i>	2	1	1	4	2	-	-	2	1	3	3	6
9	<i>Elanus caeruleus</i>	4	6	1	2	6	-	-	-	4	2	6	6
10	<i>Spizaetus cirrhatus</i>	2	1	2	2	4	-	-	-	4	2	1	2
11	<i>Vanellus indicus</i>	2	2	1	2	1	3	-	-	2	2	1	2
12	<i>Vanellus malabaricus</i>	-	-	2	1	2	2	-	-	-	-	-	2
13	<i>Gallinago gallinago</i>	2	2	2	1	1	-	-	-	-	2	4	2
14	<i>Accipiter badius</i>	2	1	1	1	2	-	-	-	-	1	1	1
15	<i>Columba livia</i>	20	22	40	48	60	16	18	22	26	30	38	54
16	<i>Streptopelia chinensis</i>	3	2	4	4	4	2	1	1	7	6	3	4
17	<i>Psittacula krameri</i>	2	2	4	2	1	-	-	2	2	2	1	2
18	<i>Psittacula cyanocephala</i>	1	1	2	1	2	-	-	-	3	2	2	1
19	<i>Centropus sinensis</i>	2	2	1	2	2	1	-	-	1	1	2	1
20	<i>Megalaima haemacephala</i>	2	1	1	2	1	1	-	-	-	1	2	2
21	<i>Apus affinis</i>	10	12	16	18	10	10	-	-	6	12	8	4
22	<i>Alcedo atthis</i>	2	4	6	6	4	8	10	12	12	2	4	2
23	<i>Halcyon smyrnensis</i>	2	1	1	1	1	2	6	4	6	6	2	2
24	<i>Merops orientalis</i>	12	14	10	8	10	2	2	1	10	14	16	12
25	<i>Merops philippinus</i>	6	2	2	4	-	-	-	-	4	6	4	2
26	<i>Coracias benghalensis</i>	1	1	2	2	2	1	-	-	-	1	1	1
27	<i>Upupa epops</i>	1	1	2	2	2	-	-	2	1	2	2	1
28	<i>Mirafra assaimica</i>	2	4	6	2	4	-	-	-	2	2	1	2
29	<i>Hirundo rustica</i>	10	20	12	14	12	-	-	16	18	20	22	18
30	<i>Hirunda daurica</i>	12	8	2	2	4	-	-	14	16	18	20	22
31	<i>Oriolus oriolus</i>	2	1	1	-	-	-	-	-	2	2	2	1
32	<i>Oriolus xanthornus</i>	1	1	2	1	1	2	1	1	1	2	2	1
33	<i>Dicrurus adsimilis</i>	4	6	2	2	2	8	10	12	6	6	8	6
34	<i>Dicrurus paradiseus</i>	3	2	1	2	2	4	6	6	2	2	3	3
35	<i>Artamus fuscus</i>	122	112	98	90	98	-	-	-	18	22	36	34
36	<i>Acridotheres tristis</i>	10	12	14	12	18	6	6	14	18	12	24	32
37	<i>Acridotheres fuscus</i>	6	14	8	16	14	13	12	9	16	18	22	14
38	<i>Corvus splendens</i>	80	86	60	62	64	18	22	24	26	38	62	68
39	<i>Corvus macrorhynchos</i>	44	40	46	52	58	16	18	26	32	36	28	40

Sl.no	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
40	<i>Aegithina tiphia</i>	2	2	4	4	4	-	-	-	-	2	1	2
41	<i>Chloropsis cochin sinensis</i>	3	1	2	2	1	-	-	-	2	2	4	4
42	<i>Pycnonotus cafer</i>	2	2	4	4	2	-	-	2	4	4	2	2
43	<i>Pycnonotus jocosus</i>	4	2	4	2	2	-	-	2	4	3	3	2
44	<i>Turdoides affinis</i>	14	12	16	18	10	6	6	4	12	16	18	10
45	<i>Turdoides striatus</i>	6	8	12	10	4	6	-	-	8	12	10	6
46	<i>Terpsiphone paradisi</i>	8	10	6	2	12	-	-	-	4	2	4	4
47	<i>Cisticola juncidis</i>	6	-	-	-	-	4	6	6	8	4	4	2
48	<i>Saxicoloides fulicata</i>	2	2	4	1	1	-	-	-	1	2	2	1
49	<i>Copsychus saularis</i>	2	2	6	2	4	-	-	2	2	4	2	1
50	<i>Parus major</i>	2	2	-	-	1	2	1	2	2	2	1	2
51	<i>Anthus novaeselandiae</i>	2	2	3	2	1	-	-	-	2	2	1	2
52	<i>Motacilla maderaspatensis</i>	4	4	3	2	2	2	2	3	6	4	6	2
53	<i>Motacilla cinerea</i>	2	1	1	1	-	-	-	-	2	1	1	1
54	<i>Motacilla alba</i>	1	2	1	1	-	-	-	-	-	1	2	2
55	<i>Dicaeum erythrorhynchos</i>	18	10	12	14	12	-	-	-	-	8	10	14
56	<i>Nectarinia zeylonica</i>	12	12	8	6	6	-	-	-	2	4	6	6
57	<i>Nectarinia asiatica</i>	2	2	4	6	6	-	-	2	8	8	4	4
58	<i>Passer domesticus</i>	10	12	14	6	6	-	-	-	-	8	6	6
59	<i>Ploceus philippinus</i>	18	12	12	16	14	6	4	4	2	6	4	2
60	<i>Lonchura punctulata</i>	10	8	-	-	-	-	-	2	2	6	8	8
61	<i>Lonchura striata</i>	5	12	-	-	-	-	-	4	2	4	4	2

Table:114 Seasonal Occurrence of Birds ; Band C - Pattambi

Sl. No	Bird species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	<i>Ardeola grayii</i>	4	2	4	5	7	10	14	18	22	26	24	22
2	<i>Egretta intermedia</i>	4	4	2	2	0	0	0	0	0	2	2	4
3	<i>Bubulcus ibis</i>	8	8	20	22	14	4	0	6	6	12	18	22
4	<i>Egretta garzetta</i>	2	2	1	1	0	0	0	0	0	2	1	3
5	<i>Milvus migrans</i>	8	6	6	4	6	6	2	0	2	2	2	4
6	<i>Amaurornis phoenicurus</i>	1	2	0	0	0	2	2	3	2	1	2	1
7	<i>Vanellus indicus</i>	1	1	1	0	2	2	0	0	2	1	2	2
8	<i>Accipiter badius</i>	1	1	2	1	1	0	0	2	2	1	1	1
9	<i>Columba livia</i>	22	36	38	35	40	8	4	7	18	24	28	36
10	<i>Streptopelia chinensis</i>	4	4	6	6	9	1	1	3	2	6	8	4
11	<i>Psittacula krameri</i>	2	4	3	1	1	1	0	0	0	2	2	3
12	<i>Psittacula cyanocephala</i>	2	1	3	1	2	2	1	0	2	2	1	2
13	<i>Cuculus canorus</i>	1	1	1	0	0	0	0	1	1	2	1	1
14	<i>Cuculus micropterus</i>	1	1	0	0	1	0	0	0	0	1	1	1
15	<i>Centropus sinensis</i>	2	2	1	3	1	0	2	1	2	2	2	1

Sl. No	Bird species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
16	<i>Eudynamys scolopacea</i>	2	2	1	2	1	1	1	2	1	2	2	2
17	<i>Athene brama</i>	1	1	1	1	1	0	0	0	0	1	0	1
18	<i>Apus affinis affinis</i>	8	6	6	12	4	8	2	2	12	14	15	16
19	<i>Cypsiurus parvus</i>	4	2	4	3	3	2	1	0	0	6	4	4
20	<i>Halcyon smyrnensis</i>	1	2	1	2	2	0	2	1	3	3	2	1
21	<i>Merops orientalis</i>	3	2	3	0	0	0	0	0	6	6	4	5
22	<i>Merops philippinus</i>	8	6	4	8	8	0	0	0	3	6	5	2
23	<i>Coracias benghalensis</i>	1	1	2	1	1	2	0	0	1	2	1	1
24	<i>Ocyrceros birostris</i>	2	1	1	2	1	0	0	2	1	1	2	2
25	<i>Upupa epops</i>	1	1	2	2	2	0	0	2	2	2	1	1
26	<i>Megalaima haemacephala</i>	4	4	6	8	0	0	0	0	6	8	10	10
27	<i>Megalaima zeylanica</i>	2	2	1	4	2	2	0	0	0	2	2	2
28	<i>Pitta brachyura</i>	4	2	3	2	0	0	0	0	0	0	0	2
29	<i>Dinopium benghalense</i>	1	1	1	1	0	0	1	1	1	1	1	1
30	<i>Oriolus oriolus</i>	4	2	3	0	0	0	0	0	0	2	2	2
31	<i>Oriolus xanthorus</i>	1	1	2	3	1	1	0	0	2	1	1	2
32	<i>Galerida malabarica</i>	2	1	1	2	1	0	0	0	0	1	1	2
33	<i>Dicrurus adsimilis</i>	4	4	2	2	2	4	6	6	4	6	2	4
33.A	<i>Dicrurus paradiseus</i>	2	2	3	3	1	2	4	4	2	3	4	2
34	<i>Acridotheres fuscus</i>	10	10	16	18	10	4	0	0	0	12	16	12
35	<i>Acridotheres tristis</i>	4	6	6	10	12	10	14	16	18	12	14	10
36	<i>Acridotheres fuscus</i>	2	4	2	6	8	8	12	14	16	10	15	18
37	<i>Dendrocitta vagabunda</i>	2	2	1	1	1	2	1	1	0	2	4	2
38	<i>Corvus splendens</i>	40	46	38	44	40	45	22	24	32	28	22	18
39	<i>Corvus macrorhynchos</i>	21	16	15	18	38	34	35	24	25	22	36	44
40	<i>Hemipus picatus</i>	2	4	4	2	1	1	1	0	0	2	1	2
41	<i>Pericrocotus cinnamomeus</i>	1	1	0	0	2	2	0	0	2	1	2	2
42	<i>Aegithina tiphia</i>	2	2	2	1	2	0	0	0	0	3	3	1
43	<i>Pycnonotus cafer</i>	4	4	2	3	2	1	1	2	1	2	2	3
44	<i>Pycnonotus jocosus</i>	2	2	1	1	3	1	3	0	2	2	4	2
45	<i>Turdoides affinis</i>	10	10	6	8	4	6	8	0	8	4	6	6
46	<i>Turdoides striata</i>	12	14	6	8	10	6	4	0	0	4	6	6
47	<i>Terpsiphone paradisi</i>	6	8	4	4	4	6	0	0	0	8	10	6
48	<i>Muscicapa tickelleae</i>	4	4	6	4	8	7	0	0	2	6	6	4
49	<i>Rhipidura aureola</i>	2	2	4	2	1	2	0	1	1	3	3	2
50	<i>Cisticola juncidis</i>	4	0	0	0	0	2	2	4	5	2	2	3
51	<i>Orthotomus sutorius</i>	1	1	2	1	0	0	0	2	1	1	1	1
52	<i>Saxicoloides fulicata</i>	1	1	1	2	2	0	0	2	1	1	2	1
53	<i>Copsychus saularis</i>	2	2	2	1	1	1	0	0	2	2	1	2
54	<i>Zoothera citrina</i>	1	1	0	0	2	2	1	2	2	0	2	2
55	<i>Parus major</i>	2	2	2	0	2	1	1	0	2	0	2	1
57	<i>Dicaeum erythrorhynchos</i>	1	1	2	1	1	0	0	0	2	2	1	2

Sl. No	Bird species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
58	<i>Nectarinia zeylonica</i>	8	14	12	15	12	0	0	0	6	4	12	8
59	<i>Nectarinia asiatica</i>	14	16	8	7	6	0	0	2	6	6	12	18
60	<i>Passer domesticus</i>	8	13	15	6	4	2	2	6	8	7	3	10
61	<i>Ploceus philippinus</i>	8	12	14	9	10	2	2	4	6	9	13	12

Table : 115 List of Birds observed at Manchady (Nila river Site – III)

Sl. No.	Scientific Name	Common Name	Status	Order/Family
1	<i>Phalacrocorax niger</i>	Little cormorant	R	Pelicaniformes/ Phalacrocoracidae
2	<i>Anhinga melanogaster</i>	Darter	R	Anighidae
3	<i>Tachybaptus ruficollis</i>	Little grebe	R	Policiptidae
4	<i>Ardea cinerea</i>	Grey heron	R	Ciconiiformes/Ardeidae
5	<i>Ardeola grayii</i>	Pond heron	R	”
6	<i>Ardea alba</i>	Large egret	R	” / Ardeidae
7	<i>Butorides striatus</i>	Little green heron	R	”
8	<i>Ardea purpurea</i>	Purple heron	R	”
9	<i>Egretta intermedia</i>	Smaller egret	R	”
10	<i>Egretta Garzetta</i>	Little egret	R	”
11	<i>Bubulcus ibis</i>	Cattle egret	R	”
12	<i>Anhinga rufa</i>	Darter or snakebird	R	”
13	<i>Ixobrychus cinnamomeus</i>	Chestnut bittern	R	”
14	<i>Anastomus oscitans</i>	Asian open billstork	R	”
15	<i>Ciconia episcopus</i>	White necked stork	R	Family Ciconidae
16	<i>Ciconia nigra</i>	Black stork	R	”
17	<i>Milvus migrans</i>	Common pariah kite	R	Falconiformes/Accipitridae
18	<i>Haliastur indus</i>	Brahmny kite	R	”
19	<i>Elanus caeruleus</i>	Black winged kite	R	”
20	<i>Spizaetus cirrhatus</i>	Indian crested hawk eagle	R	”
21	<i>Circus aeruginosus</i>	Marsh harrier	M	”
22	<i>Accipiter badius</i>	Ceylon shikra	R	”
23	<i>Metopidius indicus</i>	Bronze winged Jacana	R	Charadriformes/Jacanidae
24	<i>Vanellus indicus</i>	Red wattled Lapwing	R	” Charadriidae
25	<i>Glareola lactea</i>	Swallow plover	R	Family Glaredidae

Sl. No.	Scientific Name	Common Name	Status	Order/Family
26	<i>Pluvialis dominica</i>	Golden plover	M	”
27	<i>Pluvialis squatarola</i>	Grey plover	M	”
28	<i>Pluvialis fulva</i>	Pacific golden plove	M	”
29	<i>Charadrius leschenaulti</i>	Large sand plover	M	”
30	<i>Charadrius dubius</i>	Little ringed plover	M	”
31	<i>Charadrius alexandrines</i>	Kentish plover	M	”
32	<i>Charadrius mongolus</i>	Lesser sand plover	M	Charadriformes/ Charadriidae
33	<i>Tringa glareola</i>	Spotted sandpiper	M	”
34	<i>Tringa totanus</i>	Common red shark	M	”
35	<i>Tringa nebularis</i>	Green shark	M	”
36	<i>Tringa ochropus</i>	Green sandpiper	M	”
37	<i>Tringa hypoleucos</i>	Common sandpiper	M	”
38	<i>Tringa stagnatilis</i>	Marsh sandpiper	M	”
39	<i>Numenius arquata</i>	Curlew	M	”
40	<i>Calidris alba</i>	The sanderling	M	”
41	<i>Calidris temmincki</i>	Temminck’s stint	M	”
42	<i>Calidris minuta</i>	Little stint	M	”
43	<i>Calidris alpinus</i>	Dunlin	M	”
44	<i>Calidris testaceous</i>	Curlew stint	M	”
45	<i>Glareola lactea</i>	Small Indian panticole	R	”
46	<i>Gallinago gallinago</i>	Fantail snipe	M	Charadriformes/ Charadriidae
47	<i>Limosa lapponica</i>	Bartailed godwit	M	Scolopacidae
48	<i>Larus fuscus</i>	Lesser black backed gull	M	Family/Laridae
49	<i>Larus ichthyaetus</i>	Great black headed gull	M	”
50	<i>Larus brunnicephalus</i>	Brown headed gull	M	”
51	<i>Chlidonias hybrida</i>	Indian whiskered tern	M	”
52	<i>Gelochelidon nilotica</i>	Gull billed tern	M	”
53	<i>Sterna auticauda</i>	Black bellied tern	M	”
54	<i>Sterna aurantia</i>	River tern	M	”
55	<i>Columba livia</i>	Blue rock pigeon	K	Columbiformes

Sl. No.	Scientific Name	Common Name	Status	Order/Family
56	<i>Streptopelia chinensis</i>	Spotted dove	R	”
57	<i>Psittacula krameri</i>	Roseringed parakeet	R	Psittaciformes
58	<i>Psittacula cyanocephala</i>	Blossom headed parakeet	R	”
59	<i>Eudynamys scolopacea</i>	Indian Koel	R	Cuculidae
60	<i>Centropus sinensis</i>	Crow pheasant	R	”
61	<i>Athene brama</i>	Southern Spotted owlet	R	Astrigiformes
62	<i>Apus affinis</i>	House swift	R	Apodiforms
63	<i>Alcedo atthis</i>	Small blue kingfisher	R	Coraciformes/ Alcedinidae
64	<i>Ceryl rudis</i>	Pied King fisher	R	”
65	<i>Halcyon smyrnensis</i>	White breasted king fisher	R	”
66	<i>Pelargopsis capensis</i>	Brown headed stork	R	”
67	<i>Merops orientalis</i>	Small green bee-eater	M	Meropidae
68	<i>Merops philippinus</i>	Blue tailed bee-eater	M	”
69	<i>Coracias benghalensis</i>	South Indian roller	R	” /Coraciidae
70	<i>Eurystomus orientalis</i>	Broad billed roller	LM	”
71	<i>Megalaima haemacephala</i>	Coppersmith barbet	R	Piciformes/Capitonidae
72	<i>Megalaima zeylanica</i>	Large green barbet	R	”
73	<i>Dinopium benghalense</i>	Malabar golden backed wood pecker	R	” / Picidae
74	<i>Hirundo daurica</i>	Red rumped swallow	R	Passeriformes/Hirundinidae
75	<i>Hirundo rustica</i>	Eastern swallow	M	”
76	<i>Oriolus oriolus</i>	Golden oriole	M	”/Oriolidae
77	<i>Oriolus xanthornus</i>	Black headed oriole	R	”
78	<i>Dicrurus adsimilis</i>	Black drongo	R	” / Dicruridae
79	<i>Dicrurus paradiseus</i>	Racket tailed drongo	R	”
80	<i>Artamus fuscus</i>	Ashy swallow	R	” / Artamidae

Sl. No.	Scientific Name	Common Name	Status	Order/Family
		shrike		
81	<i>Acridotheres tristis</i>	Common myna	R	” /Sturnidae
82	<i>Acridotheres fuscus</i>	Jungle Myna	LM	”
83	<i>Dendrocitta vagabunda</i>	Tree pie	R	” /Corvidae
84	<i>Corvus splendens</i>	House crow	R	”
85	<i>Corvus macrorhynchos</i>	Indian Jungle crow	R	”
86	<i>Hemipus picatus</i>	Pied flycatcher shrike	R	Campephagidae
87	<i>Aegithinia tiphia</i>	Ceylon iora	R	Irenidae
88	<i>Chloropsis cochinsinensis</i>	Jerdon’s chlorsopsis	R	”
89	<i>Pycnonotus cafer</i>	Red vented bullbull	R	”
90	<i>Pycnonotus jocosus</i>	Red whiskered bullbull	R	”
91	<i>Turdoides affinis</i>	White headed babbler	R	Passeriformes/ Muscicapidae
92	<i>Turdoides striatus</i>	Jungle babbler	R	”
93	<i>Terpsiphone paradisi</i>	Paradise fly catcher	M	”
94	<i>Muscicapa tickelliae</i>	Tickell’s blue fly catcher	R	”
95	<i>Rhipidura aureola</i>	White browed fantail fly catcher	R	”
96	<i>Prinia inornata</i>	Nilgiri Plain wren-warbler	R	”
97	<i>Prinia socialis</i>	Ashy wren-warbler	R	”
98	<i>Cisticola juncidis</i>	Streaked fantail warbler	R	”
99	<i>Orthotomus sutorius</i>	Tailor bird	R	”
100	<i>Saxicoloides fulicata</i>	Indian robin	R	”
101	<i>Copsychus saularis</i>	Magpie robin	R	”
102	<i>Monticola solitarius</i>	Blue rock thrush	M	”
103	<i>Zoothera citrina</i>	White throated ground thrush	R	”
104	<i>Parus major</i>	Grey Tit	R	Paridae
105	<i>Anthus novascelandiae</i>	Malay pipit	R	Motacillidae
106	<i>Motacilla</i>	Large Pied wag tail	R	”

Sl. No.	Scientific Name	Common Name	Status	Order/Family
	<i>maderaspatensis</i>			
107	<i>Motacilla cineria</i>	Grey wag tail	M	”
108	<i>Motacilla alba</i>	White wag tail	M	”
109	<i>Dicaeum erythrorhynchos</i>	Thick billed flower pecker	R	Dicaeidae
110	<i>Nectarinia zeylonica</i>	Indian Purple rumped sunbird	R	Nectarinidae
111	<i>Nectarinia asiatica</i>	Purple sunbird	R	”
112	<i>Passer domesticus</i>	House sparrow	R	Ploceidae
113	<i>Lonchura punctulata</i>	Spotted munia	R	”
114	<i>Lonchura striata</i>	Whitebacked munia	R	”

Table : 116 List of Migrant Birds observed at Manchady

Sl. No.	Birds species	Band A		Band B		Band C		Season
		Present	No.	Present	No.	Present	No.	
1.	<i>Ciconia nigra</i>	✓	13	✓	11	-	-	Aug-Mar.
2.	<i>Cirus aeruginosus</i>	✓	13	-	-	-	-	Nov-May
3.	<i>Pluvialis dominica</i>	✓	20	-	-	-	-	Sept-Jan.
4.	<i>Pluvialis squatarola</i>	✓	12	-	-	-	-	Sept-Feb.
5.	<i>Pluvialis fulva</i>	✓	31	-	-	-	-	Aug-Feb.
6.	<i>Charadrius leschenaulti</i>	✓	42	-	-	-	-	Sept-April
7.	<i>Charadrius dubius</i>	✓	48	-	-	-	-	Sept-Apr.
8.	<i>Charadrius alexandrines</i>	✓	44	-	-	-	-	Oct-March
9.	<i>Charadrius mongolus</i>	✓	24	-	-	-	-	Sept-Apr.
10.	<i>Tringa glareola</i>	✓	74	✓	19	-	-	Sept-April
11.	<i>Tringa totanus</i>	✓	21	✓	18	-	-	Sept-April
12.	<i>Tringa nebularis</i>	✓	14	✓	13	-	-	Sept-Feb.
13.	<i>Tringa ochropus</i>	✓	22	-	-	-	-	Sept-Feb.
14.	<i>Tringa hypoleucos</i>	✓	28	-	-	-	-	Oct-April
15.	<i>Tringa stagnatilis</i>	✓	17	✓	16	-	-	Sept-Feb.
16.	<i>Numerus arquata</i>	✓	8	✓	7	-	-	Sept-Jan.
17.	<i>Calidris alba</i>	✓	16	-	-	-	-	Sept-Feb.
18.	<i>Calidris temmincki</i>	✓	29	-	-	-	-	Sept-Mar.
19.	<i>Calidris minuta</i>	✓	64	✓	35	-	-	Sept-Mar
20.	<i>Calidris alpinus</i>	✓	17	✓	14	-	-	Sept-Mar
21.	<i>Calidris testaceons</i>	✓	60	✓	45	-	-	Sept-Aprl
22.	<i>Gallinago gallinago</i>	✓	20	✓	16	✓	8	Oct-April
23.	<i>Limosa lapponica</i>	✓	16	-	-	-	-	Oct-April
24.	<i>Larus fuscus</i>	✓	16	-	-	-	-	Sept-Feb.

Sl. No.	Birds species	Band A		Band B		Band C		Season
		Present	No.	Present	No.	Present	No.	
25.	<i>Larus ichthyaetus</i>	✓	14	-	-	-	-	Dec-Mar.
26.	<i>Larus brunnicephalus</i>	✓	28	-	-	-	-	Nov-Mar.
27.	<i>Chlidonias hybrida</i>	✓	17	-	-	-	-	Nov-April
28.	<i>Gelochelidon nilotica</i>	✓	36	-	-	-	-	Sept-Mar.
29.	<i>Sterna auticauda</i>	✓	25	-	-	-	-	Dec-Jul.
30.	<i>Sterna aurantia</i>	✓	22	-	-	-	-	Nov-Mar.
31.	<i>Merops philippinus</i>	✓	32	✓	36	✓	44	Sept-Apr.
32.	<i>Hirundo rustica</i>	✓	174	✓	159	✓	168	Aug-May
33.	<i>Oriolus oriolus</i>	✓	13	-	-	-	19	Sept-Mar.
34.	<i>Terpsiphone paradisi</i>	-	-	✓	50	✓	52	Sept-May
35.	<i>Monticola solitarius</i>	-	-	-	-	✓	13	Oct-Mar.
36.	<i>Motacilla cineria</i>	✓	12	✓	15	-	-	Sept-Apr.
37.	<i>Motacilla alba</i>	✓	13	✓	17	✓	✓	Oct-Apr.

TABLE: 117 List of shore birds observed at Manchady

Sl. No.	Birds species	Band A		Band B		Band C		Season
		Present	No.	Present	No.	Present	No.	
1.	<i>Glareola lactea</i>	✓	231	✓	241	✓	49	June-Feb.
2.	<i>Pluvialis dominica</i>	✓	20	-	-	-		Sept-June
3.	<i>Pluvialis squatarola</i>	✓	12	-	-	-		Sept-Feb.
4.	<i>Pluvialis fulva</i>	✓	31	-	-	-		Aug-Feb.
5.	<i>Charadrius leschenaultii</i>	✓	42	-	-	-		Sept-Apr
6.	<i>Charadrius dubius</i>	✓	48	-	-	-		Sept-Apr.
7.	<i>Charadrius alexandrines</i>	✓	44	-	-	-		Oct-Mar
8.	<i>Charadrius mongolus</i>	✓	24	-	-	-		Sept-Apr.
9.	<i>Tringa glareola</i>	✓	74	✓	19	-	-	Sept-Apr
10.	<i>Tringa totanus</i>	✓	21	✓	18			Sept-Apr
11.	<i>Tringa nebularis</i>	✓	14	✓	13			Sept-Feb.
12.	<i>Tringa ochropus</i>	✓	22	-	-	-	-	Sept-Feb.
13.	<i>Tringa hypoleucos</i>	✓	28	-	-	-	-	Oct-April

Sl. No.	Birds species	Band A		Band B		Band C		Season
		Present	No.	Present	No.	Present	No.	
14.	<i>Tringa stagnatalis</i>	✓	17	✓	16	-	-	Sept-Feb.
15.	<i>Numenius arquata</i>	✓	8	✓	7			Sept-Jan.
16.	<i>Calidris alba</i>	✓	16	-	-	-	-	Sept-Feb
17.	<i>Calidris temmincki</i>	✓	29	-	-	-	-	Sept-Mar.
18.	<i>Calidris minuta</i>	✓	64	✓	35	-	-	Sept-Mar.
19.	<i>Calidris alpinus</i>	✓	17	✓	14	-	-	Sept-Mar.
20.	<i>Calidris testaceons</i>	✓	60	✓	45	-	-	Sept-Apr.
21.	<i>Gallinago gallinago</i>	✓	28	✓	16	✓	8	Oct-Apr
22.	<i>Limosa lapponica</i>	✓	16	-	-	-	-	Oct-Apr
23.	<i>Larus fuscus</i>	✓	10	-	-	-	-	Sept-Feb.
24.	<i>Larus brunnicephalus</i>	✓	28	-	-	-	-	Nov-Mar.
25.	<i>Chlidonias hybrida</i>	✓	17	-	-	-	-	Nov-Apr
26.	<i>Gelochelidon nilotica</i>	✓	36	-	-	-	-	Sept-Mar.
27.	<i>Sterna auticauda</i>	✓	25	-	-	-	-	Dec-Jul.
28.	<i>Sterna aurantia</i>	✓	22	-	-	-	-	Nov-Mar.
29.	<i>Larus ichthyaetus</i>	✓	14	-	-	-	-	Dec-Mar.

Table : 118 List of Birds feeding on aquatic animals at Manchady

Sl. No.	Species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Phalacrocorax niger</i>	✓	53	✓	19	-	-
2.	<i>Anhinga melanogaster</i>	✓	45	-	-	-	-
3.	<i>Tachybaptus ruficollis</i>	✓	16	✓	36	-	-
4.	<i>Ardea cineria</i>	✓	19	✓	12	-	-
5.	<i>Ardeola grayii</i>	✓	136	✓	138	✓	31
6.	<i>Ardea alba</i>	✓	14	-	-	-	-
7.	<i>Butorides striatus</i>	✓	16	✓	16	-	-
8.	<i>Ardea purpurea</i>	✓	19	✓	25	-	-
10.	<i>Ixobrychus cinnamomeus</i>	✓	12	✓	11	-	-
11.	<i>Anastomus oscitans</i>	✓	20	-	-	-	-
12.	<i>Ciconia episcopus</i>	✓	54	✓	36	-	-

Sl. No.	Species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
13.	<i>Ciconia nigra</i>	✓	13	✓	11	-	-
14.	<i>Metopidius indicus</i>	✓	18	✓	17	-	-
15.	<i>Glareola lactea</i>	✓	231	✓	241	✓	49
16.	<i>Tringa stagnatalis</i>	✓	17	✓	16	-	-
17.	<i>Larus fuscus</i>	✓	10	-	-	-	-
18.	<i>Larus ichthyaetus</i>	✓	14	-	-	-	-
19.	<i>Larus brunnicephalus</i>	✓	26	-	-	-	-
20.	<i>Chlidonias hybrida</i>	✓	17	-	-	-	-
21.	<i>Gelochelidon nilotica</i>	✓	36	-	-	-	-
22.	<i>Sterna auticauda</i>	✓	25	-	-	-	-
23.	<i>Sterna aurantia</i>	✓	22	-	-	-	-
24.	<i>Limosa lapponica</i>	✓	16	-	-	-	-
25.	<i>Tringa totanus</i>	✓	21	✓	18	-	-
26.	<i>Tringa glareola</i>	✓	74	✓	19	-	-
27.	<i>Tringa nebularis</i>	✓	14	✓	13		
28.	<i>Tringa ochropus</i>	✓	22	-	-	-	-
29.	<i>Tringa hypoleucos</i>	✓	28	-	-	-	-
30.	<i>Calidris alba</i>	✓	16	-	-	-	-
31.	<i>Calidris temmincki</i>	✓	29	-	-	-	-
32.	<i>Gallinago gallinago</i>	✓	20	✓	16	✓	8
33.	<i>Alcedo atthis</i>	✓	43	✓	26	✓	18
34.	<i>Ceryl rudis</i>	✓	27	✓	22	-	-
35.	<i>Halcyon smyrnensis</i>	✓	3	✓	26	-	-
36.	<i>Pelargopsis capensis</i>	✓	14	-	-	-	-

Table : 119 List of Raptors recorded at Manchady

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Milvus migrans</i>	✓	52	✓	45	✓	17
2.	<i>Haliastur indus</i>	✓	15	✓	16	✓	13
3.	<i>Elanus caeruleus</i>	✓	10	✓	10	✓	7
4.	<i>Spizaetus cirrhatus</i>	✓	21	✓	19	-	-
5.	<i>Cirus aeruginosus</i>	✓	13	-	-	-	-
6.	<i>Accipiter badius</i>	-	-	-	-	✓	16

Table : 120 List of Omnivorous birds at Manchady

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Metopidius indicus</i>	✓	18	✓	14	-	-
2.	<i>Pluvialis fulva</i>	✓	31	-	-	-	-
3.	<i>Numenius arquata</i>	✓	8	✓	7	-	-
4.	<i>Limosa lapponica</i>	✓	16	-	-	-	-
5.	<i>Eudynamys scolopacea</i>	-	-	-	-	✓	24
6.	<i>Megalaima haemacephala</i>	-	-	✓	15	✓	19
7.	<i>Megalaima zeylanica</i>	-	-	✓	19	✓	14
8.	<i>Oriolus oriolus</i>	✓	13	-	-	✓	19
9.	<i>Acridotheres tristis</i>	-	-	✓	168	✓	136
10.	<i>Acridotheres fuscus</i>	-	-	✓	738	✓	425
11.	<i>Dendrocitta vagabunda</i>	-	-	-	-	✓	25
12.	<i>Corvus splendens</i>	✓	1915	✓	712	✓	455
13.	<i>Corvus macrorhynchos</i>	✓	490	✓	457	✓	400
14.	<i>Pycnonotus cafer</i>	✓	37	✓	38	✓	54
15.	<i>Pycnonotus jocosus</i>	✓	31	✓	40	✓	33
16.	<i>Turdoides affinis</i>	✓	85	✓	83	✓	93
17.	<i>Turdoides striatus</i>	✓	76	✓	82	✓	55
18.	<i>Saxicoloides fulicata</i>	-	-	-	-	✓	15
19.	<i>Orthotomus sutorius</i>	-	-	-	-	✓	16
20.	<i>Copsychus saularis</i>	-	-	-	-	✓	32
21.	<i>Monticola solitarius</i>	-	-	✓	25	✓	13
22.	<i>Zoothera citrina</i>	-	-	✓	17	✓	17
23.	<i>Parus major</i>	✓	20	-	-	✓	29
24.	<i>Passer domesticus</i>	-	-	✓	52	✓	57

TABLE: 121 List of Insectivorous Birds at Manchady

Sl. No.	Birds species	Band A		Band B		Band C		Season
		Present	No.	Present	No.	Present	No.	
1.	<i>Egretta intermedia</i>	✓	29	✓	34	✓	25	Throughout
2.	<i>Egretta garzetta</i>	✓	34	✓	34	✓	26	”
3.	<i>Bubulcus ibis</i>	✓	98	✓	116	✓	61	”
4.	<i>Ixobrychus cinnamomeus</i>	✓	12	✓	13	-	-	Nat-Nov.
5.	<i>Vanellus indicus</i>	-	-	✓	22	-	-	Sept-June
6.	<i>Glareola lactea</i>	✓	231	✓	241	✓	49	June-Feb.
7.	<i>Pluvialis dominica</i>	✓	20	-	-	-	-	Sept-Jan.
8.	<i>Pluvialis squatarola</i>	✓	12	-	-	-	-	Sept-Apr.
9.	<i>Charadrius dubius</i>	✓	48	-	-	-	-	Sept-Apr.

Sl. No.	Birds species	Band A		Band B		Band C		Season
		Present	No.	Present	No.	Present	No.	
10.	<i>Charadrius leschenaultii</i>	✓	42	-	-	-	-	Sept-Apr.
11.	<i>Charadrius alexandrines</i>	✓	44	-	-	-	-	Dec-Mar.
12.	<i>Charadrius mongolus</i>	✓	24	-	-	-	-	Sept-Apr.
13.	<i>Tringa glareola</i>	✓	74	✓	19	-	-	”
14.	<i>Tringa totanus</i>	✓	21	✓	18	✓	✓	”
15.	<i>Tringa nebularis</i>	✓	14	✓	13	-	-	Sept-Feb.
16.	<i>Tringa ochropus</i>	✓	22	-	-	-	-	”
17.	<i>Tringa hypoleucos</i>	✓	28	-	-	-	-	Oct-Apr.
18.	<i>Calidris alba</i>	✓	16	-	-	-	-	Sept-Feb.
19.	<i>Calidris temmincki</i>	✓	29	-	-	-	-	Sept-Mar.
20.	<i>Calidris minuta</i>	✓	64	✓	35	-	-	”
21.	<i>Calidris alpinus</i>	✓	17	✓	14	✓	✓	”
22.	<i>Calidris testaceus</i>	✓	60	✓	45	-	-	Sept-Apr.
23.	<i>Gallinago galligano</i>	✓	20	✓	16	✓	8	Oct-Apr.
24.	<i>Centropus sinensis</i>	-	-	✓	21	✓	15	July-Apr.
25.	<i>Athene brama</i>	-	-	-	-	✓	8	Oct-May
26.	<i>Apus affinis</i>	-	-	✓	98	✓	61	Throughout
27.	<i>Apus melba nubifuga</i>	-	-	✓	34	✓	50	”
28.	<i>Merops orientalis</i>	✓	32	✓	40	✓	48	Sept-Apr.
29.	<i>Merops philippinus</i>	✓	32	✓	36	✓	44	Sept-Apr.
30.	<i>Coracias benghalensis</i>	-	-	✓	10	✓	13	Oct-June
31.	<i>Eurystomus orientalis</i>	-	-	✓	17	✓	13	Aug-Apr
32.	<i>Dinopium benghalense</i>	-	-	-	-	✓	10	July-Apr.
33.	<i>Dicrurus adsimilis</i>	✓	84	✓	92	-	89	Throughout
34.	<i>Dicrurus paradiseus</i>	✓	30	✓	32	-	-	”
35.	<i>Artamus fuscus</i>	✓	770	✓	738	✓	425	Sept-June
36.	<i>Hemipus picatus</i>	✓	23	✓	28	✓	33	Oct-July
37.	<i>Terpsiphone paradisi</i>	-	-	✓	50	✓	52	Sept-May
38.	<i>Muscicapa tickelliae</i>	-	-	✓	49	✓	52	Sept-June
39.	<i>Rhipidura aureola</i>	-	-	✓	24	✓	33	Aug-June
40.	<i>Prinia inornata</i>	-	-	✓	33	✓	35	Throughout
41.	<i>Prinia socialis</i>	-	-	✓	31	-	-	”
42.	<i>Saxicoloides fulicata</i>	-	-	-	-	✓	15	Aug-April

Sl. No.	Birds species	Band A		Band B		Band C		Season
		Present	No.	Present	No.	Present	No.	
43.	<i>Copsychus saularis</i>	-	-	-	-	✓	32	Throughout
44.	<i>Anthus novascelandiae</i>	✓	15	✓	33	✓	16	Sept-May
45.	<i>Motacilla maderaspatensis</i>	✓	44	✓	42	-	-	Throughout
46.	<i>Motacilla cinerea</i>	✓	12	✓	15	-	-	Sept-Apr.
47.	<i>Motacilla alba</i>	✓	15	✓	17	-	-	Oct-Apr.

Table : 122 List of Granivorous birds observed at Manchady

Sl. No.	Birds species	Band A		Band B		Band C		Season
		Present	No.	Present	No.	Present	No.	
1.	<i>Columba livia</i>	✓	329	✓	369	✓	211	Throughout
2.	<i>Streptopelia chinensis</i>	✓	23	✓	33	✓	33	Aug-May
3.	<i>Lonchura punctulata</i>	✓	48	✓	52	✓	229	Sept-May
4.	<i>Lonchura striata</i>	✓	47	✓	54	✓	83	Aug-May

Table:123 List of Nectarivorous birds observed at Manchady

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Oriolous oriolous</i>	✓	13	-	-	✓	19
2.	<i>Agethenia tiphia</i>	-	-	-	-	✓	16
3.	<i>Chloropsis cochinsinensis</i>	-	-	-	-	✓	25
4.	<i>Prinia socialis</i>	-	-	✓	31	-	-
5.	<i>Orthotomus sutorius</i>	-	-	-	-	✓	16
6.	<i>Dicaeum erythrorhynchos</i>	-	-	-	-	✓	90
7.	<i>Nectarinia asiatica</i>	-	-	-	-	✓	41
8.	<i>Nectarinia zeylonica</i>	-	-	-	-	✓	55

Table: 124 List of Frugivorous birds observed at Manchady

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Streptopelia chinensis</i>	✓	13	✓	33	✓	33
2.	<i>Psittacula krameri</i>	-	-	✓	16	✓	34

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
3.	<i>Psittacula cyanocephala</i>	-	-	✓	25	✓	41
4.	<i>Megalaima haemacephala</i>	-	-	✓	15	✓	19
5.	<i>Megalaima zeylanica</i>	-	-	✓	14	✓	14
6.	<i>Dicaeum erythrorhynchos</i>	-	-	-	-	✓	90
7.	<i>Eudynamys scolopacea</i>	-	-	-	-	✓	24

Table: 125 Seasonal Occurrence of Birds – Band-A -Manchady

Sl. No.	Species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon	Total
1	<i>Phalacrocorax niger</i>	6	8	8	6	2	-	-	2	4	7	6	4	30	2	21	53
2	<i>Anhinga melanogaster</i>	6	4	4	4	3	1	-	1	4	8	6	6	21	2	32	55
3	<i>Tachybaptus ruficollis</i>	2	2	1	-	-	1	1	2	3	2	1	1	5	4	7	16
4	<i>Ardea Cineria</i>	4	2	-	-	-	-	-	-	2	3	4	4	6	-	13	19
5	<i>Ardeola grayii</i>	10	12	8	9	6	7	10	8	16	15	17	18	45	25	66	116
6	<i>Ardea alba</i>	2	2	-	-	-	-	-	-	2	3	3	2	4	-	10	14
7	<i>Butorides striatus</i>	1	1	2	2	1	-	-	-	2	1	2	2	9	-	7	16
8	<i>Ardea purpurea</i>	2	2	2	1	-	-	-	-	2	4	4	2	7	-	12	19
9	<i>Egretta intermedia</i>	4	4	3	2	-	-	-	-	-	6	6	4	13	-	16	29
10	<i>Egretta garzetta</i>	4	6	6	2	-	-	-	-	-	2	8	6	18	-	16	34
11	<i>Bubulcus ibis</i>	16	18	14	14	2	-	-	-	-	4	18	22	64	-	34	98
12	<i>Ixobrychus cinnamomeus</i>	-	-	-	-	17	2	2	2	2	1	2	-	1	6	5	12
13	<i>Anastomus oscitans</i>	2	2	2	1	1	2	2	3	2	1	1	1	8	7	5	20
14	<i>Ciconia episcopus</i>	6	6	8	10	10	-	-	-	2	3	4	5	40	-	14	54
15	<i>Ciconia nigra</i>	2	1	1	-	-	-	-	2	2	2	1	2	4	-	9	13
16	<i>Milvus migrans</i>	4	6	6	10	10	5	-	2	2	4	4	4	36	2	14	52
17	<i>Haliastur indus</i>	2	1	1	2	2	-	-	-	2	1	3	1	8	-	7	15
18	<i>Elanus caeruleus</i>	2	2	1	1	1	-	-	-	-	1	1	1	7	-	3	10
19	<i>Spizaetus cirrhatus</i>	3	3	2	1	1	-	-	-	4	3	2	2	10	-	11	21
20	<i>Circus aeruginosus</i>	2	2	1	2	2	-	-	-	-	-	2	2	9	-	4	13
21	<i>Metopedius indicus</i>	2	2	2	3	1	-	-	-	-	2	2	4	10	-	8	18

Sl. No.	Species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon	Total
22	<i>Glareola lactea</i>	28	25	-	-	-	16	20	22	26	28	30	36	53	58	120	231
23	<i>Vanellus indicus</i>	1	1	1	2	3	3	-	-	2	2	1	1	8	3	6	17
24	<i>Pluvialis dominica</i>	2	-	-	-	-	-	-	-	4	6	4	4	2	-	18	20
25	<i>Pluvialis squatarola</i>	1	2	-	-	-	-	-	-	2	2	3	2	3	-	9	12
26	<i>Pluvialis dominica fulva</i>	4	1	-	-	-	-	-	4	6	6	4	6	5	-	26	31
27	<i>Charadrius leschenaultii</i>	4	4	6	8	-	-	-	-	4	6	6	4	22	-	20	42
28	<i>Charadrius dubius</i>	8	6	4	4	-	-	-	-	4	8	8	6	22	-	25	47
29	<i>Charadrius alexandrinus</i>	10	8	10	-	-	-	-	-	-	4	6	6	28	-	16	44
30	<i>Charadrius mongolus</i>	4	2	2	2	-	-	-	-	2	4	4	4	10	-	14	24
31	<i>Tringa glareola</i>	12	12	8	4	-	-	-	-	8	8	10	12	36	-	38	74
32	<i>Tringa stagnatilis</i>	2	2	-	-	-	-	-	-	2	3	4	4	4	-	13	17
33	<i>Tringa totanus</i>	1	2	2	2	-	-	-	-	2	4	4	4	7	-	14	21
34	<i>Tringa nebularis</i>	2	1	-	-	-	-	-	-	2	2	3	4	3	-	11	14
35	<i>Tringa ochropus</i>	2	2	-	-	-	-	-	-	4	4	6	4	4	-	18	22
36	<i>Tringa hypoleucos</i>	3	4	6	4	-	-	-	-	-	4	3	4	17	-	11	28
37	<i>Numenius arquata</i>	1	-	-	-	-	-	-	-	1	2	2	2	1	-	7	8
38	<i>Calidris alba</i>	2	2	-	-	-	-	-	-	2	3	3	4	4	-	12	16
39	<i>Calidris temminckii</i>	4	4	2	-	-	-	-	-	3	4	6	6	10	-	19	29
40	<i>Calidris minuta</i>	8	8	4	-	-	-	-	-	6	10	14	16	20	-	44	44
41	<i>Calidris alpinus</i>	2	2	2	-	-	-	-	-	3	2	3	3	6	-	11	17
42	<i>Calidris testaceus</i>	6	6	8	2	-	-	-	-	10	12	8	8	22	-	38	60
43	<i>Gallinago gallinago</i>	2	2	4	2	-	-	-	-	-	2	4	4	10	-	10	20
44	<i>Limosa lapponica</i>	2	1	1	1	-	-	-	-	-	3	4	4	5	-	11	16
45	<i>Larus fuscus</i>	2	1	-	-	-	-	-	-	2	1	2	2	3	-	7	10
46	<i>Larus ichthyaetus</i>	2	2	2	-	-	-	-	-	-	-	-	2	6	-	8	14
47	<i>Larus brunnicephalus</i>	6	6	4	-	-	-	-	-	-	-	6	6	16	-	12	28

Sl. No.	Species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon	Total
	s																
48	<i>Chlidonias hybrida</i>	2	3	3	2	-	-	-	-	-	-	4	3	10	-	17	27
49	<i>Gelochelidon nilotica</i>	4	4	2	-	-	-	-	-	4	6	8	8	10	-	26	36
50	<i>Sterna auticauda</i>	2	2	3	4	6	2	7	-	-	-	-	4	17	4	4	25
51	<i>Sterna aurantia</i>	4	4	2	-	-	-	-	-	-	-	6	6	10	-	12	22
52	<i>Columba livia</i>	28	30	30	34	26	20	18	20	25	32	30	36	148	58	123	329
53	<i>Streptopelia chinensis</i>	2	2	2	1	3	-	-	1	2	4	4	2	10	1	12	23
54	<i>Alcedo atthis</i>	2	2	2	1	3	-	-	1	2	4	4	2	10	1	12	23
55	<i>Ceryl rudis</i>	2	2	2	1	1	2	4	4	2	3	2	2	8	10	9	27
56	<i>Halcyon smymensis</i>	2	2	2	2	1	3	3	2	1	1	2	2	9	8	6	23
57	<i>Pelargopsis capensis</i>	2	2	1	1	2	2	2	-	-	-	-	2	8	4	2	14
58	<i>Merops orientalis</i>	4	4	6	2	-	-	-	-	2	4	4	6	16	-	16	32
59	<i>Merops philippinus</i>	4	2	4	4	-	-	-	-	4	4	4	6	14	-	18	32
60	<i>Hirundo daurica</i>	10	8	4	4	2	-	-	12	13	15	14	16	28	12	58	98
61	<i>Hirundo rustica</i>	14	18	17	14	12	-	-	18	20	22	22	17	75	18	81	174
62	<i>Oriolus oriolus</i>	2	2	2	-	-	-	-	-	2	2	2	1	6	-	7	13
63	<i>Oriolus xanthornus</i>	1	2	2	1	1	2	2	1	2	2	2	1	7	5	8	20
64	<i>Dicrurus adsimilis</i>	8	8	4	4	2	6	6	8	12	10	8	8	26	20	38	84
65	<i>Dicrurus paradiseus</i>	2	2	2	3	1	1	3	3	4	2	3	4	10	7	13	30
66	<i>Artamus fuscus</i>	120	150	130	145	75	80	-	-	28	22	28	22	590	80	100	770
67	<i>Corvus splendens</i>	150	120	105	105	100	155	170	185	188	202	220	195	600	510	805	1915
68	<i>Corvus macrorhynchos</i>	50	48	40	54	24	18	30	32	44	48	56	62	216	80	210	506
69	<i>Hemipus picatus</i>	4	4	4	2	1	1	1	-	-	2	2	2	15	2	6	33
70	<i>Pycnonotus cafer</i>	4	4	4	3	2	1	1	3	3	4	4	4	17	5	15	37
71	<i>Pycnonotus jocosus</i>	3	2	2	3	2	2	-	4	4	2	4	3	12	6	13	31
72	<i>Turdoides affinis</i>	10	12	12	8	6	4	6	-	8	8	5	6	48	10	27	85
73	<i>Turdoides</i>	14	13	8	8	5	4	4	-	-	6	6	8	48	8	20	76

Sl. No.	Species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon	Total
	<i>striatus</i>																
74	<i>Parus major</i>	2	2	2	1	2	1	2	2	2	1	1	2	9	5	6	20
75	<i>Anthus novascelandiae</i>	2	1	6	2	2	-	-	-	2	2	1	2	8	-	7	15
76	<i>Motacilla maderaspatensis</i>	6	6	3	2	2	2	1	2	4	6	6	4	19	5	20	44
77	<i>Motacilla cinerea</i>	2	2	1	1	-	-	-	-	2	2	1	1	6	-	6	12
78	<i>Motacilla alba</i>	2	1	3	3	-	-	-	-	-	2	2	2	9	-	6	15
79	<i>Lonchura punctulata</i>	12	8	-	-	-	-	-	4	4	6	6	8	20	4	24	48
80	<i>Lonchura striata</i>	10	13	-	-	-	-	-	4	4	6	6	4	23	4	20	47

Table: 126 Seasonal Occurrence of Birds: Band – B; Manchady

Sl. No.	Species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
1	<i>Phalacrocorax niger</i>	2	6	4	2	-	-	-	-	3	6	4	2	14	-	15
2	<i>Tachybaptus ruficollis</i>	1	1	-	-	-	4	6	6	6	4	4	2	2	16	18
3	<i>Ardea cineria</i>	2	1	-	-	-	-	-	-	2	2	3	2	3	-	9
4	<i>Ardeola grayii</i>	10	12	8	4	4	8	10	12	12	18	20	20	38	30	70
5	<i>Butorides striatus</i>	2	1	-	-	2	2	1	2	1	1	2	2	5	5	6
6	<i>Ardea purpurea</i>	2	2	2	2	-	-	-	-	3	4	4	3	8	-	14
7	<i>Egretta intermedia</i>	6	6	3	2	-	-	-	-	-	5	6	6	17	-	17
8	<i>Egretta garzetta</i>	6	6	4	2	-	-	-	-	-	2	6	8	18	-	16
9	<i>Bubulcus ibis</i>	21	24	18	12	4	-	-	-	-	6	14	17	79	-	37
10	<i>Ixobrychus cinnamomeus</i>	-	-	-	-	2	2	2	1	2	1	1	-	2	5	4
11	<i>Ciconia episcopus</i>	6	6	4	4	4	-	-	-	2	2	4	4	24	-	12
12	<i>Ciconia nigra</i>	2	1	1	-	-	-	-	2	2	1	1	1	4	2	5
13	<i>Milvus migrans</i>	4	5	5	8	10	-	-	-	2	4	4	3	32	-	13
14	<i>Haliastur indus</i>	2	2	2	1	1	-	-	-	2	2	3	1	8	-	8
15	<i>Elanus</i>	1	1	1	1	1	-	-	-	-	2	2	1	5	-	5

Sl. No.	Species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
	<i>caeruleus</i>															
16	<i>Spizaetus cirrhatus</i>	2	2	2	2	1	-	-	-	3	3	2	2	9	-	10
17	<i>Metopedius indicus</i>	2	2	3	2	1	-	-	-	-	2	2	3	10	-	7
18	<i>Vanellus indicus</i>	2	2	2	3	3	3	-	-	2	2	1	2	12	3	7
19	<i>Glareola lactea</i>	30	32	-	-	-	18	20	24	23	28	32	34	62	62	117
20	<i>Tringa glareola</i>	2	2	1	2	-	-	-	-	3	2	4	3	7	-	12
21	<i>Tringa totanus</i>	1	2	2	1	-	-	-	-	2	3	3	4	6	-	12
22	<i>Tringa nebularis</i>	2	1	-	-	-	-	-	-	2	2	3	3	3	-	10
23	<i>Tringa stagnatilis</i>	2	2	-	-	-	-	-	-	1	3	4	4	4	-	12
24	<i>Numenius arquata</i>	1	-	-	-	-	-	-	-	1	1	2	2	1	-	6
25	<i>Calidris minuta</i>	6	4	4	-	-	-	-	-	4	6	6	5	14	-	21
26	<i>Calidris alpinus</i>	2	2	1	-	-	-	-	-	2	2	3	2	5	-	9
27	<i>Calidris testaceus</i>	4	4	6	3	-	-	-	-	8	9	6	5	17	-	28
28	<i>Gallinago gallinago</i>	2	2	4	1	-	-	-	-	-	2	3	2	9	-	7
29	<i>Columba livia</i>	32	30	36	38	27	24	21	20	25	34	38	44	163	65	141
30	<i>Streptopelia chinensis</i>	4	4	6	2	1	-	-	2	2	5	4	3	17	2	14
31	<i>Psittacula krameri</i>	2	2	1	1	2	-	-	2	2	2	1	1	8	2	6
32	<i>Psittacula cyanocephala</i>	1	2	2	2	4	-	-	2	2	3	3	4	11	2	12
33	<i>Centropus sinensis</i>	2	2	2	1	3	-	-	1	2	2	3	3	10	1	10
34	<i>Apus affinis</i>	8	12	16	14	12	8	-	-	6	7	9	6	62	8	28
35	<i>Apus melba nubifuga</i>	2	3	1	1	2	6	6	4	2	2	3	2	9	16	9
36	<i>Alcedo atthis</i>	1	2	1	1	1	2	4	4	2	3	3	2	6	10	10
37	<i>Ceryx rudis</i>	2	2	2	1	1	2	3	3	2	2	1	1	8	8	6
38	<i>Halcyon smymensis</i>	2	2	2	1	1	2	4	4	3	2	2	1	8	10	8
39	<i>Merops orientalis</i>	4	4	8	6	-	-	-	-	2	6	6	4	22	1	18
40	<i>Merops philippinus</i>	4	6	4	4	-	-	-	-	4	4	6	4	18	-	18
41	<i>Coracias benghalensis</i>	1	1	1	1	2	1	-	-	-	1	1	1	6	1	3
42	<i>Eurystomus</i>	2	2	2	1	-	-	-	2	2	2	2	2	7	2	8

Sl. No.	Species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
	<i>orientalis</i>															
43	<i>Megalaima haemacephala</i>	2	1	1	2	2	2	-	-	-	1	2	2	8	2	5
44	<i>Megalaima zeylanica</i>	2	2	4	2	1	1	-	-	-	2	3	3	10	1	8
45	<i>Hirundo daurica</i>	12	8	4	6	4	-	-	10	14	15	12	14	34	10	55
46	<i>Hirundo rustica</i>	14	16	13	12	12	-	-	17	15	18	22	20	67	17	75
47	<i>Dicrurus adsimilis</i>	10	12	8	6	2	6	4	10	9	9	8	8	38	20	34
48	<i>Dicrurus paradiseus</i>	4	4	3	4	1	1	3	4	4	3	2	4	16	8	13
49	<i>Artamus fuscus</i>	106	78	120	144	90	84	-	-	24	26	32	34	538	84	116
50	<i>Acridotheres tristis</i>	12	14	17	18	11	6	4	6	16	18	22	24	72	16	80
51	<i>Acridotheres fuscus</i>	6	8	8	14	16	18	11	10	17	15	12	10	52	39	54
52	<i>Corvus splendens</i>	82	84	68	74	76	18	32	34	28	32	38	46	384	84	144
53	<i>Corvus macrorhynchos</i>	60	54	52	66	48	18	38	42	34	45	29	31	280	98	139
54	<i>Hemipus picatus</i>	5	4	4	3	2	1	1	-	-	2	3	3	18	2	8
55	<i>Pycnonotus cafer</i>	3	4	3	2	2	2	1	1	4	6	6	4	14	4	20
56	<i>Pycnonotus jocosus</i>	3	3	4	2	3	2	-	3	4	6	6	4	15	5	20
57	<i>Turdoides affinis</i>	14	10	12	8	6	6	4	-	6	8	4	5	50	10	23
58	<i>Turdoides striatus</i>	15	12	10	10	6	4	4	-	-	6	6	9	53	8	21
59	<i>Terpsiphone paradisi</i>	8	8	6	2	10	-	-	-	6	5	3	2	3	4	-
60	<i>Muscicapa tickelliae</i>	4	4	4	4	8	7	-	-	2	4	6	6	24	7	18
61	<i>Rhipidura aureola</i>	2	1	2	4	2	2	-	1	2	3	3	2	11	3	10
62	<i>Prinia inumata</i>	4	4	3	3	2	2	2	1	3	3	4	2	16	5	12
63	<i>Prinia socialis</i>	2	3	4	4	2	2	1	1	2	3	3	4	15	4	12
64	<i>Zoothera citrina</i>	1	1	-	-	2	2	2	2	2	1	2	2	4	6	7
65	<i>Anthus novascelandiae</i>	1	2	2	2	2	-	-	-	4	4	8	8	9	-	24
66	<i>Motacilla maderaspatensis</i>	4	6	6	3	2	2	1	1	3	4	6	4	21	4	17
67	<i>Motacilla cinerea</i>	2	2	1	2	-	-	-	-	3	2	2	1	7	-	8

Sl. No.	Species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
68	<i>Motacilla alba</i>	2	1	3	3	-	-	-	-	-	2	3	3	9	-	8
69	<i>Passer domesticus</i>	10	12	-	-	-	-	-	6	6	4	6	8	22	-	30
70	<i>Lonchura punctulata</i>	12	12	-	-	-	-	-	4	6	6	8	6	24	-	30
71	<i>Lonchura striata</i>	10	8	-	-	-	-	-	4	8	8	6	8	18	-	26

Table : 127 Seasonal Occurrence of Birds: Band - C ; Manchady

Sl.No.	Species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
1	<i>Ardeola grayii</i>	2	4	2	2	1	3	4	3	3	2	2	3	11	10	70
2	<i>Egretta intermedia</i>	2	1	1	2	1	4	4	3	2	2	1	2	17	11	7
3	<i>Egretta garzetta</i>	2	1	2	2	1	3	3	4	3	2	2	1	8	10	8
4	<i>Bubulcus ibis</i>	4	4	6	4	3	8	8	6	4	6	6	20	23	22	18
5	<i>Milvus migrans</i>	2	2	-	2	2	-	-	-	2	2	1	1	11	-	6
6	<i>Haliastur indus</i>	1	1	1	2	2	-	-	-	1	2	2	1	7	-	6
7	<i>Elanus caeruleus</i>	1	1	1	1	-	-	-	-	-	1	1	1	4	-	3
8	<i>Accipiter badius</i>	1	1	1	2	2	-	-	2	2	2	1	2	7	2	7
9	<i>Glareola lactea</i>	4	6	-	-	-	6	4	4	6	8	5	6	10	14	25
10	<i>Gallinago gallinago</i>	1	1	2	1	-	-	-	-	-	1	1	1	5	-	3
11	<i>Columba livia</i>	12	13	15	18	16	15	15	12	20	23	24	28	74	42	95
12	<i>Streptopelia chinensis</i>	2	3	3	2	4	-	-	2	3	5	5	4	14	2	17
13	<i>Psittacula krameri</i>	4	4	5	3	2	-	-	4	4	3	3	2	18	4	12
14	<i>Psittacula cyanocephala</i>	4	4	6	6	4	-	-	3	4	4	2	4	24	3	14
15	<i>Eudynamys scolopaceae</i>	2	2	2	2	1	1	2	2	3	2	3	2	9	5	10
16	<i>Centropus sinensis</i>	2	2	1	2	-	-	1	1	2	2	1	1	7	2	6
17	<i>Athene brama</i>	1	1	1	1	1	-	-	-	-	1	1	1	5	-	3
18	<i>Apus affinis</i>	6	6	3	3	5	6	4	3	2	8	8	6	23	13	25

Sl. No.	Species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
19	<i>Apus melba nubifuga</i>	2	2	2	3	2	8	8	6	3	3	5	2	11	22	17
20	<i>Alcedo atthis</i>	1	1	2	1	1	2	2	2	2	2	1	1	6	6	6
21	<i>Merops orientalis</i>	8	8	6	4	-	-	-	-	6	5	7	4	26	-	22
22	<i>Merops philippinus</i>	4	6	6	4	-	-	-	-	6	6	8	4	20	-	24
23	<i>Coracias benghalensis</i>	2	2	1	1	1	1	-	-	-	2	2	1	7	1	5
24	<i>Eurystomus orientalis</i>	2	2	2	1	-	-	-	2	1	1	1	1	7	2	4
25	<i>Megalaima haemacephala</i>	2	2	2	2	3	2	-	-	-	2	2	2	11	2	6
26	<i>Megalaima zeylanica</i>	1	1	2	2	1	1	-	-	-	2	2	2	7	1	6
27	<i>Dinopium benghalense</i>	1	1	1	1	-	-	1	1	1	1	1	1	4	2	4
28	<i>Hirundo daurica</i>	10	7	5	4	4	-	-	11	10	12	15	12	30	11	49
29	<i>Hirundo rustica</i>	15	12	13	13	10	-	-	18	20	21	24	22	63	18	87
30	<i>Oriolus oriolus</i>	2	2	4	1	-	-	-	-	3	3	2	2	9	-	10
31	<i>Oriolus xanthomus</i>	1	1	2	1	1	2	2	2	2	1	2	1	6	6	6
32	<i>Dicrurus adsimilis</i>	10	11	8	6	4	4	6	6	8	12	8	6	39	16	34
33	<i>Artamus fuscus</i>	42	36	38	44	52	48	-	-	22	41	52	50	212	48	165
34	<i>Acridotheres tristis</i>	16	17	15	18	10	6	4	6	18	12	13	11	66	16	54
35	<i>Acridotheres fuscus</i>	6	8	6	15	18	21	14	10	18	16	15	12	53	45	61
36	<i>Dendrocitta vagabunda</i>	2	2	3	3	1	2	2	2	1	2	3	2	11	6	8
37	<i>Corvus splendens</i>	52	58	63	48	44	18	16	15	28	34	33	46	265	49	141
38	<i>Corvus macrorhynchos</i>	32	44	40	38	35	15	13	16	38	37	44	48	189	44	167
39	<i>Hemipus picatus</i>	6	4	4	4	2	1	1	-	-	3	4	4	20	2	11
40	<i>Aegithina tiphia</i>	2	2	2	1	1	-	-	-	-	2	3	3	8	-	8
41	<i>Chloropsis cochinchinensis</i>	4	3	2	2	2	-	-	-	2	2	4	4	13	-	12
42	<i>Pycnonotus cafer</i>	4	4	6	6	4	8	10	10	8	7	5	4	24	28	2

Sl. No.	Species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
43	<i>Pycnonotus jocosus</i>	2	2	4	3	3	2	2	2	3	4	4	2	14	6	13
44	<i>Turdoides affinis</i>	12	14	8	8	6	4	4	6	7	6	8	10	48	14	27
45	<i>Turdoides striatus</i>	4	4	3	6	8	6	1	1	2	6	6	8	25	8	22
46	<i>Terpsiphone paradise</i>	8	8	5	4	8	-	-	-	6	5	5	3	33	-	19
47	<i>Muscapa tickelliae</i>	6	6	4	4	6	8	-	-	4	4	6	4	26	8	18
48	<i>Rhipidura aureola</i>	2	2	2	4	4	2	-	2	2	4	4	3	14	4	15
49	<i>Prinia inornata</i>	4	4	4	4	2	2	2	1	3	3	4	2	18	5	12
50	<i>Orthotomus sutorius</i>	1	1	1	2	-	-	-	2	2	2	2	1	5	2	9
51	<i>Saxicoloides fulicata</i>	2	2	2	1	-	-	-	2	2	2	1	1	7	2	6
52	<i>Copsychus saularis</i>	3	3	4	4	2	1	1	1	3	4	4	2	16	3	13
53	<i>Monticola solitarius</i>	3	3	2	-	-	-	-	-	-	2	2	1	8	-	5
54	<i>Zoothera citrina</i>	2	1	-	-	2	2	2	2	2	2	1	1	5	6	6
55	<i>Parus major</i>	2	3	3	4	2	1	2	4	2	2	1	2	14	7	8
56	<i>Anthus novascelandiae</i>	2	2	2	2	1	-	-	-	2	2	2	1	9	-	7
57	<i>Dicaeum erythrorhynchos</i>	14	10	14	9	12	-	-	-	-	8	10	13	59	-	31
58	<i>Nectarinia zeylonica</i>	11	10	7	5	4	-	-	-	4	4	6	4	37	-	18
59	<i>Nectarinia asiatica</i>	4	6	6	4	2	-	-	2	4	5	5	3	22	2	17
60	<i>Passer domesticus</i>	12	10	-	-	-	-	-	-	4	8	11	12	22	-	35
61	<i>Lonchura punctulata</i>	42	46	44	20	4	-	-	-	6	10	24	33	156	-	73
62	<i>Lonchura striata</i>	7	14	14	11	3	-	-	2	4	5	8	15	49	2	32

Table: 128 Birds observed at Kava -Kalpathy River

SI No	Specific Name	Common Name	Status	Order /Family
1	<i>Ardeola grayii</i>	Pond heron	R	Ciconiiformes/ Ardeidae
1A	<i>Anhinga melanogaster</i>	Darter	R	„ / Ardeidae
2	<i>Egretta garzetta</i>	Little egret	R	„ / Ardeidae
2A	<i>Egretta intermedia</i>	Median egret	R	„ / Ardeidae
3	<i>Bubulcus ibis</i>	Cattle egret	R	„ /Ardeidae
4	<i>Elanus caeruleus</i>	Black winged kite	R	Falconiformes/ Accipitridae
5	<i>Haliastur indus</i>	Brahminy kite	R	Falconiformes/ Accipitridae
6	<i>Accipiter badius</i>	Shikra	R	Falconiformes/ Accipitridae
7	<i>Spilornis cheela</i>	Crested serpent eagle	R	Falconiformes/ Accipitridae
8	<i>Falco peregrinus</i>	Shaheen falcon	R	Jacanidae/ Charadriidae
8A	<i>Metopidius indicus</i>	Bronze winged jacana	R	Jacanidae/ Charadriidae
9	<i>Vanellus indicus</i>	Red wattled lapwing	R	Jacanidae/ Charadriidae
10	<i>Vanellus malabaricus</i>	Yellow wattled lapwing	R	Jacanidae/ Charadriidae
11	<i>Perdica erythrorhynchos</i>	Painted bush quail	R	Galliformes/ Phasianidae
12	<i>Galloperdix spadicea</i>	Red spurfowl	R	Galliformes/ Phasianidae
13	<i>Gallus sonneratii</i>	Grey jungle-fowl	R	Galliformes/ Phasianidae
14	<i>Treron pompadora</i>	Grey fronted green pigeon	R	Columbiformes /Columbidae
15	<i>Ducula aenea</i>	Green imperial pigeon	R	Columbiformes/ Columbidae
16	<i>Ducula badia</i>	Imperial pigeon	R	Columbiformes/ Columbidae
17	<i>Columba livia</i>	Blue rock pigeon	R	Columbiformes/ Columbidae
18	<i>Columba elphinstonii</i>	Nilgiri wood pigeon	R	Columbiformes/ Columbidae
19	<i>Streptopelia chinensis</i>	Spotted dove	R	Columbiformes /Columbidae
20	<i>Psittacula krameri</i>	Rose ringed parakeet	R	Psittaciformes/ Psittaculidae
21	<i>Psittacula cyanocephala</i>	Blossom headed parakeet	R	Psittaciformes/ Psittaculidae
22	<i>Loriculus vernalis</i>	Malabar lorikeet	R	Psittaciformes/ Psittaculidae
23	<i>Psittacula columboides</i>	Blue winged parakeet	R	Psittaciformes/ Psittaculidae
24	<i>Cuculus varius varius</i>	Common hawk cuckoo	R	Cuculiformes/ Cuculidae
25	<i>Cuculus micropterus</i>	Indian cuckoo	R	Cuculiformes/ Cuculidae
26	<i>Cuculus canorus</i>	Cuckoo	R	Cuculiformes/ Cuculidae
27	<i>Eudynamys scolopacea</i>	Indial koel	R	Cuculiformes/ Cuculidae
28	<i>Centropus sinensis</i>	Crow pheasant	R	Cuculiformes/ Cuculidae
29	<i>Tyto alba</i>	Barn owl	R	Strigiformes/ Strigidae
30	<i>Asio flammeus</i>	Short eared owl	R	Strigiformes/ Strigidae
31	<i>Bubo zeylonensis</i>	Brown fish owl	R	Strigiformes/ Strigidae
32	<i>Glaucidium radiatum</i>	Malabar jungle owlet	R	Strigiformes/ Strigidae

SI No	Specific Name	Common Name	Status	Order /Family
33	<i>Athene brama brama</i>	Southern spotted owlet	R	Strigiformes/ Strigidae
34	<i>Chaetura sylvatica</i>	White rumped spine tail swift	R	Apodiformes/Apodidae
35	<i>Cypsiurus parvus</i>	Palm swift	R	Apodiformes/Apodidae
36	<i>Hemiprocne longipennis</i>	Indian crested tree swift	R	Apodiformes/Apodidae
37	<i>Chaetura gigantea indica</i>	Brown throated spine tail swift	R	Apodiformes/Apodidae
38	<i>Harpactes fasciatus</i>	Malabar trogon	R	Trogoniformes/ Trogonidae
39	<i>Alcedo atthis</i>	Ceylon king fisher	R	Coraciiformes/ Alcedinidae
40	<i>Halcyon smyrnensis</i>	White breasted king fisher	R	Coraciiformes/ Alcedinidae
41	<i>Merops leschenaulti</i>	Chestnut-headed bee eater	R	Coraciiformes/Meropidae
42	<i>Merops orientalis</i>	Small green bee eater	R	Coraciiformes/Meropidae
43	<i>Coracias benghalensis</i>	South indian roller	R	Coraciiformes/Coraciidae
44	<i>Eurystomus orientalis</i>	Broad billed roller	R	Coraciiformes/Coraciidae
45	<i>Upupa epops ceylonensis</i>	Ceylon hoopoe	R	Coraciiformes/ upupidae
46	<i>Tockus griseus</i>	Malabar grey horn bill	R	Coraciiformes/Bucerotidae
47	<i>Buceros bicornis</i>	Great indian horn bill	R	Coraciiformes/Bucerotidae
48	<i>Anthracoceros coronatus</i>	Malabar pied horn bill	R	Coraciiformes/Bucerotidae
49	<i>Megalaima zeylanica</i>	Ceylon green barbet	R	Piciformes/Capitonidae
50	<i>Megalaima viridis</i>	Small green barbet	R	Piciformes/Capitonidae
51	<i>Dinopium benghalense</i>	Malabar golden backed woodpecker	R	Piciformes/Capitonidae
52	<i>Dinopium javanense</i>	Golden backed three - toed woodpecker	R	Piciformes/Capitonidae
53	<i>Dryocopus javensis</i>	Great black woodpecker	R	Piciformes/Capitonidae
54	<i>Hemicircus canente</i>	Heart spotted woodpecker	R	Piciformes/Capitonidae
55	<i>Pitta brachyura</i>	Indian pitta	R	Passeriformes/ Pittidae
56	<i>Galerida malabarica</i>	Malabar crested lark	R	Passeriformes/ Alaudidae
56 A	<i>Hirundo daurica</i>	Red rumped swallow	R	Passeriformes / Alaudidae
57	<i>Lanius cristatus</i>	Brown shrike	M	Passeriformes/ Laniidae
59	<i>Oriolus oriolus</i>	Indian oriole (golden oriole)	M	Passeriformes/ Oriolidae
60	<i>Oriolus xanthornus</i>	Black headed oriole	R	Passeriformes/ Oriolidae
61	<i>Dicrurus adsimilis</i>	Black drongo	R	Passeriformes/ Dicruridae
62	<i>Dicrurus aeneus</i>	White bellied drongo	R	Passeriformes/ Dicruridae

SI No	Specific Name	Common Name	Status	Order /Family
63	<i>Dicrurus paradiseus</i>	Racket -tailed drongo	R	Passeriformes/ Dicruridae
63 A	<i>Artamus fuscus</i>	Ashy swallow shrike	R	Passeriformes/ Dicruridae
64	<i>Acridotheres tristis</i>	Common myna	R	Passeriformes/Sturnidae
65	<i>Acridotheres fuscus</i>	Jungle myna	R	Passeriformes/Sturnidae
66	<i>Gracula religiosa</i>	Indian hill myna	R	Passeriformes/Sturnidae
67	<i>Dendrocitta vagabunda</i>	Tree pie	R	Passeriformes/Corvidae
68	<i>Dendrocitta leucogastra</i>	Southern tree pie	R	Passeriformes/Corvidae
69	<i>Corvus macrorhynchos</i>	Jungle crow	R	Passeriformes/Corvidae
69 A	<i>Corvus splendens</i>	House crow	R	Passeriformes/Corvidae
70	<i>Tephrodornis pondicerianus</i>	Common wood shrike	R	Passeriformes/ Campephagidae
70 A	<i>Tephrodornis virgatus</i>	Malabar wood shrike	R	Passeriformes/ Campephagidae
70 B	<i>Tephrodornis gularis</i>	Malabar wood shrike		
71	<i>Hemipus picatus</i>	Black backed pied flycatcher shrike	R	Passeriformes/ Campephagidae
72	<i>Coracina melanoptera</i>	Black headed cuckoo shrike	R	Passeriformes/ Campephagidae
73	<i>Pericrocotus cinnamomeus</i>	Malabar small minivet	R	Passeriformes/ Campephagidae
74	<i>Pericrocotus flammeus</i>	Scarlet minivet	R	Passeriformes/ Campephagidae
75	<i>Aegithina tiphia</i>	Ceylon iora	R	Passeriformes/Irenidae
76	<i>Chloropsis aurifrons</i>	Gold fronted chloropsis	R	Passeriformes/Irenidae
77	<i>Irena puella</i>	Fairy blue bird	R	Passeriformes/Irenidae
78	<i>Pycnonotus melanicterus</i>	Ruby throated yellow bulbul	R	Passeriformes/Pycnonotidae
79	<i>Pycnonotus jocosus</i>	Red-whiskered bulbul	L	Passeriformes/Pycnonotidae
80	<i>Pycnonotus cafer</i>	Red vented bulbul	R	Passeriformes/Pycnonotidae
81	<i>Hypsipetes indicus</i>	Yellow-browed bulbul	R	Passeriformes/Pycnonotidae
82	<i>Hypsipetes madagascariensis</i>	South indian black bulbul	R	Passeriformes/Pycnonotidae
83	<i>Pellorneum ruficeps</i>	Spotted babbler	R	Passeriformes/Muscicapidae
84	<i>Rhopocichla atriceps</i>	Black headed babbler	R	Passeriformes/Muscicapidae
85	<i>Turdoides subrufa</i>	Rufous babbler	L	Passeriformes/Muscicapidae
86	<i>Turdoides striata</i>	Jungle babbler	M	Passeriformes/Muscicapidae
87	<i>Turdoides affinis</i>	White headed babbler	R	Passeriformes/Muscicapidae
88	<i>Muscicapa latirostris</i>	Brown flycatcher	R	Passeriformes/Muscicapidae
89	<i>Muscicapa muttui muttui</i>	Indian brown breasted flycatcher	R	Passeriformes/Muscicapidae

SI No	Specific Name	Common Name	Status	Order /Family
90	<i>Muscicapa pallipes</i>	White bellied blue flycatcher	M	Passeriformes/Muscicapidae
91	<i>Muscicapa tickelliae</i>	Tickell's blue flycatcher	R	Passeriformes/Muscicapidae
92	<i>Muscicapa albicaudatus</i>	Nilgiri flycatcher	R	Passeriformes/Muscicapidae
93	<i>Terpsiphone paradisi</i>	Paradise flycatcher	M	Passeriformes/Muscicapidae
94	<i>Rhipidura aureola</i>	White browed fantail flycatcher	R	Passeriformes/Muscicapidae
95	<i>Prinia socialis</i>	Ashy-wren warbler	R	Passeriformes/ Sylviinae
96	<i>Phyllocopus affinis</i>	Tickell's leaf warbler	R	Passeriformes/ Sylviinae
97	<i>Monticola solitarius</i>	Blue rock thrush	R	Passeriformes/ Sylviinae
98	<i>Acrocephalus stentoreus</i>	Indian great reed warbler	M	Passeriformes/ Sylviinae
99	<i>Copsychus saularis</i>	Magpie –robin	R	Passeriformes/ Sylviinae
100	<i>Saxicola coprata</i>	Pied bush chat	R	Passeriformes/ Sylviinae
101	<i>Myophoneus horsfieldii</i>	Malabar whistling thrush	R	Passeriformes/ Sylviinae
102	<i>Zoothera citrina</i>	White throated ground thrush	R	Passeriformes/ Sylviinae
103	<i>Parus major</i>	Grey tit	R	Passeriformes/Paridae
104	<i>Parus xanthogenyes</i>	Yellow cheeked tit	R	Passeriformes/Paridae
105	<i>Anthus hodgsoni</i>	Tree pipit	M	Passeriformes/Motacillidae
106	<i>Motacilla indicus</i>	Forest wagtail	M	Passeriformes/Motacillidae
107	<i>Motacilla flava</i>	Yellow wagtail	M	Passeriformes/Motacillidae
108	<i>Motacilla caspica</i>	Grey wagtail	M	Passeriformes/Motacillidae
109	<i>Dicaeum agile</i>	Thick billed flower pecker	R	Passeriformes/ Dicaeidae
110	<i>Dicaeum erythrorhynchos</i>	Tickell's flowerpecker	R	Passeriformes/ Dicaeidae
111	<i>Nectarinia zeylonica</i>	Purple rumped sunbird	R	Passeriformes/Nectariniidae
112	<i>Nectarinia minima</i>	Small sunbird	R	Passeriformes/Nectariniidae
113	<i>Nectarinia lotenia</i>	Loten's sunbird	R	Passeriformes/Nectariniidae
114	<i>Zosterops palpebrosa</i>	Nilgiri white-eye	R	Passeriformes/Zosteropidae
115	<i>Lonchura malabarica</i>	White throated munia	R	Passeriformes/Ploceidae
116	<i>Lonchura kelaarti</i>	Rufous bellied munia	R	Passeriformes/Ploceidae
117	<i>Lonchura punctulata</i>	Spotted munia	R	Passeriformes/Ploceidae
118	<i>Carpodacus erythrinus</i>	Common rosefinch	M	Passeriformes/Ploceidae

Table : 129 List of raptors recorded at Kava

Sl no	Birds species	Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
1	<i>Elanus caeruleus</i>	X	28	X	18	X	6
2	<i>Haliastur indus</i>	X	20	X	12	-	
3	<i>Accipiter badius</i>	X	7	X	5	X	4
4	<i>Spilornis cheela</i>	X	11	X	12	-	
5	<i>Falco peregrinus</i>	X	9	X	6	-	

'X' indicates presence of species.

Table: 130 List of migrant birds at Kava - Kalpathy

Sl no	Species	Band A No.	Band B No.	Band C No.
1	<i>Pitta brachyura</i>	10	10	15
2	<i>Lanius cristatus cristatus</i>	-	6	11
3	<i>Oriolus oriolus</i>	24	-	-
4	<i>Muscicapa muttui muttui</i>	10	10	12
5	<i>Terpsiphone paradisi</i>	19	17	26
6	<i>Phyllocopus affinis</i>	3	4	5
7	<i>Monticola solitarius</i>	16	13	12
8	<i>Anthus hodgsoni</i>	6	10	10
9	<i>Motacilla indica</i>	5	7	9
10	<i>Motacilla flava</i>	13	15	18
11	<i>Motacilla capsica</i>	12	12	15
12	<i>Carpodacus erythrinus</i>	91	88	81

Table: 131 List of omnivorous birds at Kava

Sl No	Species	Band A	No.	Band B	No.	Band C	No.
		Presence		Presence		Presence	
1	<i>Galloperdix spadicea</i>	-		X	11	X	18
2	<i>Gallus sonneratii</i>	-		X	17	X	26
3	<i>Cuculus varius varius</i>	-		X	5	X	5
4	<i>Cuculus micropterus</i>	X	4	X	6	X	11
5	<i>Cuculus canorus</i>	X	8	X	14	X	14
6	<i>Eudynamys scolopacea</i>	X	16	X	20	X	28
7	<i>Megalaima zeylanica</i>	X	21	X	24	X	30
8	<i>Megalaima viridis</i>	X	28	X	34	X	29
9	<i>Dinopium benghalense</i>	X	14	X	15	X	18
10	<i>Dinopium javanense</i>	X	18	X	17	X	20

SI No	Species	Band A	No.	Band B	No.	Band C	No.
		Presence		Presence		Presence	
11	<i>Galerida malabarica</i>	X	19	X	28	X	11
12	<i>Lanius cristatus</i>	-		X	6	X	11
13	<i>Oriolus oriolus</i>	X	24	X	16	X	20
14	<i>Oriolus xanthornus</i>	X	11	X	16	X	21
15	<i>Acridotheres tristis</i>	X	39	X	32	X	25
16	<i>Acridotheres fuscus</i>	X	87	X	66	X	23
17	<i>Dendrocitta vagabunda</i>	X	20	X	17	X	14
18	<i>Dendrocitta leucogastra</i>	-		X	16	X	18
19	<i>Corvus macrohynchos</i>	X	75	X	116	X	152
20	<i>Corvus splendens</i>	X	502	X	544	X	521
21	<i>Coracina melanoptera</i>	X	13	X	17	-	
22	<i>Pycnonotus melanicterus</i>	X	8	X	11	X	12
23	<i>Pycnonotus jocosus</i>	X	45	X	49	X	39
24	<i>Pycnonotus cafer</i>	X	24	X	28	x	20
25	<i>Hypsipetes indicus</i>	X	24	X	23	X	58
26	<i>Hypsipetes madagascariensis</i>	X	9	x	18	X	20
27	<i>Turdoides subrufus</i>	X	58	X	55	X	66
28	<i>Turdoides affinis</i>	X	22	X	27	X	26
29	<i>Turdoides striatus</i>	X	92	X	85	X	83
30	<i>Copsychus saularis</i>	X	30	X	18	X	13
31	<i>Saxicola caprata</i>	X	14	X	19	X	18
32	<i>Monticola solitarius</i>	X	16	X	13	X	12
33	<i>Myophonus horsfieldii</i>	X	12	X	15	X	26
34	<i>Zoothera citrina</i>	X	13	X	16	X	19
35	<i>Parus major</i>	X	17	X	20	X	27
36	<i>Parus xanthozenys</i>	X	14	X	20	X	18

'X' indicates presence of species.

Table : 132. List of insectivorous birds at Kava

SI No	Species	Band A	No.	Band B	No.	Band C	No.
		Presence		Presence		Presence	
1	<i>Egretta intermedia</i>	X	14	X	8	-	
2	<i>Egretta garzetta</i>	X	32	X	20	-	
3	<i>Bubulcus ibis</i>	X	90	X	56	X	19
4	<i>Vanellus indicus</i>	X	10	X	10	-	
5	<i>Vanellus malabaricus</i>	X	11	X	9	-	
6	<i>Centropus sinensis</i>	X	13	X	7	X	10
7	<i>Tyto alba</i>	X	13	X	13	X	15
8	<i>Chaetura sylvatica</i>	-		X	27	X	64

SI No	Species	Band A	No.	Band B	No.	Band C	No.
		Presence		Presence		Presence	
9	<i>Cypsiurus parvus</i>	X	7	X	23	X	30
10	<i>Chaetura gigantea</i>	X	12	X	19	X	26
11	<i>Hemiprocne longipennis</i>	X	11	X	20	X	12
12	<i>Merops leschenaulti</i>	X	22	X	26	X	32
13	<i>Merops orientalis</i>	X	48	X	17	X	9
14	<i>Coracias benghalensis</i>	X	14	X	11	X	15
15	<i>Eurystomus orientalis</i>	X	17	X	16	X	31
16	<i>Upupa epops</i>	X	17	X	25	X	14
17	<i>Dryocopus javanese</i>	-		X	10	X	13
18	<i>Hemicircus canente</i>	-		X	8	X	13
19	<i>Pitta brachyura</i>	X	10	X	10	X	15
20	<i>Hirundo daurica</i>	X	12	X	16	X	16
21	<i>Dicrurus adsimilis</i>	X	47	X	73	X	26
22	<i>Dicrurus aeneus</i>	-		X	8	X	10
23	<i>Dicrurus paradiseus</i>	X	29	X	46	X	34
24	<i>Tephrodornis gularis</i>	-		X	9	X	14
25	<i>Tephrodornis pondicerianus</i>	-		X	16	X	18
26	<i>Tephrodornis virgatus</i>	-		X	12	X	14
27	<i>Hemipus picatus</i>	X	15	X	22	X	17
28	<i>Pericrocotus cinnamomeus</i>	-		X	15	X	14
29	<i>Pericrocotus flammeus</i>	X	47	X	53	X	41
30	<i>Aegithina tiphia</i>	X	11	X	14	X	13
31	<i>Chloropsis aurifrons</i>	X	10	X	12	X	16
32	<i>Rhopocichla atriceps</i>	X	11	X	29	X	27
33	<i>Muscicapa latirostris</i>	X	7	X	6	X	8
34	<i>Muscicapa muttui mutti</i>	X	10	X	10	X	12
35	<i>Muscicapa pallipes</i>	X	16	X	23	X	20
36	<i>Muscicapa tickelliae</i>	X	51	X	40	X	41
37	<i>Muscicapa albicaudata</i>	X	13	X	16	X	20
38	<i>Terpsiphone paradisi</i>	X	19	X	17	X	26
39	<i>Rhipidura aureola</i>	X	26	X	29	X	32
40	<i>Prinia socialis</i>	X	9	X	10	X	13
41	<i>Phylloscopus affinis</i>	X	3	X	4	X	5
42	<i>Acrocephalus stentoreus</i>	X	7	X	11	X	10
43	<i>Anthus hodgsoni</i>	X	8	X	10	X	10
44	<i>Motacilla indica</i>	X	5	X	7	X	9
45	<i>Motacilla flava</i>	X	13	X	15	X	18
46	<i>Motacilla caspica</i>	X	12	X	12	X	15

X' indicates presence of the species

Table : 133. List of Nectarivorous birds at Kava

SI No	Species	Band A	No.	Band B	No.	Band C	No.
		Presence		Presence		Presence	
1	<i>Oriolus oriolus</i>	X	24	X	16	X	20
2	<i>Gracula religiosa</i>	X	30	X	23	X	30
3	<i>Irena puella</i>	X	14	X	20	X	15
4	<i>Dicaeum agile</i>	X	24	X	29	X	41
5	<i>Dicaeum erythrorhynchos</i>	X	30	X	51	X	76
6	<i>Nectarinia zeylonica</i>	X	46	X	49	X	41
7	<i>Nectarinia minima</i>	X	48	X	56	X	63
8	<i>Nectarina lotenia</i>	X	24	X	36	X	37
9	<i>Zosterops palpebrosa</i>	X	24	X	32	X	39

'X' indicates presence of the species

Table : 134. List of Granivorous birds at Kava

SI No	Birds Species	Band A	No.	Band B	No.	Band C	No.
1	<i>Columba livia</i>	X	151	X	72	X	11
2	<i>Columba elphinstonii</i>	-		X	19	X	42
3	<i>Streptopelia chinensis</i>	X	21	X	40	X	53
4	<i>Lonchura malabarica</i>	X	58	X	46	X	28
5	<i>Lonchura kelaarti</i>	X	50	X	56	X	44
6	<i>Lonchura punctulata</i>	X	58	X	62	X	52

'X' indicates presence of the species

Table : 135. List of Frugivorous birds at Kava

SI No	Bird Species	Band A	No.	Band B	No.	Band C	No.
		Presence		Presence		Presence	
1	<i>Treron pompadora</i>	X	9	X	52	X	62
2	<i>Dacula aenea</i>	X	12	X	47	X	72
3	<i>Dacula badia</i>	-		-	18	X	30
4	<i>Columba elphinstonii</i>	-		-	19	X	32
5	<i>Psittacula krameri</i>	X	47	X	52	X	27
6	<i>Psittacula cyanocephala</i>	X	32	X	21	X	19
7	<i>Loriculus vernalis</i>	X	9	X	10	X	13
8	<i>Psittacula columboides</i>	X	3	X	9	X	20
9	<i>Tockus griseus</i>	X	23	X	27	X	31
10	<i>Buceros bicornis</i>	X	11	X	14	X	25

SI No	Bird Species	Band A	No.	Band B	No	Band C	No.
		Presence		Presence		Presence	
11	<i>Anthracoceros coronatus</i>	X	13	X	29	X	33
12	<i>Megalaima zeylanica</i>	X	21	X	24	X	30
13	<i>Magalaima viridis</i>	X	28	X	24	X	29
14	<i>Gracula religiosa</i>	X	30	X	23	X	30
15	<i>Carpodacus erythrinus</i>	X	91	X	88	X	81

'X' indicates presence of the species

Table : 136 List of birds feeding on aquatic animals at Kava

SI No	Bird Species	Band A	No.	Band B	No.	Band C	No.
1	<i>Ardeola grayii</i>	X	93	X	67	X	37
2	<i>Anhinga melanogaster</i>	X	144	-		-	
3	<i>Metopidius indicus</i>	X	35	-		-	
4	<i>Alcedo atthis</i>	X	45	X	56	X	27
5	<i>Halcyon smyrnensis</i>	X	26	X	19	X	16
6	<i>Bubo zeylonensis</i>	X	1	X	16	X	10

'X' indicates presence of the species

Table 137: List of forest birds at Kava

SI No	Bird Species	Band A	No.	Band B	No.	Band C	No.
1	<i>Perdicula erythrorhyncha</i>			X	41	X	48
2	<i>Galloperdix spadicea</i>			X	11	X	18
3	<i>Gallus sonneratii</i>			X	17	X	26
4	<i>Treron pompadora</i>	X	9	X	52	X	62
5	<i>Dacula aenea</i>	X	12	X	47	X	72
6	<i>Dacula badia</i>			X	18	X	30
7	<i>Columba elphinstonii</i>			X	19	X	42
8	<i>Psittacula colomboides</i>	X	3	X	9	X	20
9	<i>Cuculus canorus</i>	X	8	X	14	X	14
10	<i>Asio flammeus</i>	X	4	X	6	X	6
11	<i>Bubo zeylonensis</i>	X	5	X	8	X	10
12	<i>Glaucidium radiatum</i>					X	3
13	<i>Chaetura sylvatica</i>			X	27	X	64
14	<i>Chaetura gigantea</i>	X	12	X	19	X	26

SI No	Bird Species	Band A	No.	Band B	No.	Band C	No.
15	<i>Hemiprocne longipennis</i>	X	11	X	13	X	20
16	<i>Harpactes fasciatus</i>			X	11	X	18
17	<i>Merops leschenaultii</i>	X	22	X	26	X	32
18	<i>Eurystomus orientalis</i>	X	17	X	19	X	28
19	<i>Buceros bicornis</i>	X	11	X	14	X	25
20	<i>Anthracoceros coronatus</i>	X	13	X	29	X	33
21	<i>Megalaima viridis</i>	X	28	X	20	X	29
22	<i>Dinopium benghalense</i>	X	18	X	17	X	20
23	<i>Dryocopus Javanese</i>			X	10	X	13
24	<i>Hemicircus canente</i>			X	8	X	13
25	<i>Lanius cristatus cristatus</i>			X	6	X	11
26	<i>Dicrurus aeneus</i>	-		X	8	X	10
27	<i>Dendrocitta leucogastra</i>	-		X	16	X	18
28	<i>Pericrocotus cinnamomeus</i>	-		X	15	X	7
29	<i>Pericrocotus flammeus</i>	X	47	X	43	X	41
30	<i>Aegithina tiphia</i>	X	11	X	14	X	13
31	<i>Chloropsis aurifrons</i>	X	10	X	12	X	16
32	<i>Irena puella</i>	X	14	X	20	X	15
33	<i>Pycnonotus melanicterus</i>	X	8	X	11	X	12
34	<i>Hypsipetes indicus</i>	X	21	X	7	X	11
35	<i>Hypsipetes madagascariensis</i>	X	9	X	18	X	20
36	<i>Pellorneum ruficeps</i>	X	8	X	10	X	13
37	<i>Rhopocichla atriceps</i>	-					
38	<i>Turdoides subrufus</i>	X	19	X	29	X	27
39	<i>Muscicapa latirostris</i>	X	7	X	6	X	8
40	<i>Muscicapa muttui mutti</i>	X	10	X	10	X	12
41	<i>Muscicapa pallipes</i>	X	16	X	23	X	20
42	<i>Muscicapa albicaudata</i>	X	13	X	16	X	20
43	<i>Parus xanthogenys</i>	X	14	X	20	X	18
44	<i>Anthus hodgsoni</i>	X	8	X	10	X	10
45	<i>Motacilla indica</i>	X	5	X	7	X	9
46	<i>Nectarinia minima</i>	X	48	X	56	X	63
47	<i>Zosterops palpebrosa</i>	X	24	X	32	X	39
48	<i>Lonchura kelaarti</i>	X	50	X	56	X	44
49	<i>Carpodacus erythrurus</i>	X	91	X	88	X	81
'X' indicates presence of the species							

Table : 138 Seasonal Occurrence of birds in bands A, B and C - Kava

Sl no	Bird species	Bands	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Premonsoon	Monsoon	Post- postmonsoon	
1	<i>Anhinga melanogaster</i>	A	15	16	18	14	16	5	4	4	10	16	16	18	71	13	60	
		B																
		C																
2	<i>Ardeola grayii</i>	A	4	4	6	4	2	10	10	12	12	10	8	11	20	32	41	
		B	2	2	4	4	2	6	6	4	8	8	10	9	16	16	35	
		C	2	2	2	3	2	4	4	2	2	6	4	4	11	10	16	
3	<i>Egretta intermedia</i>	A	2	2	2	1							3	4	7		7	
		B	2	1	1								2	2	4		4	
		C																
4	<i>Egretta garzetta</i>	A	5	5	8	6	2					2	2	2	26		6	
		B	2	2	3	4	2					1	2	2	15		5	
		C																
5	<i>Bubulcus ibis</i>	A	12	10	14	16	4	4	2	2	4	4	8	10	56	8	26	
		B	8	8	6	4	4	2	4	2	2	6	6	4	30	8	18	
		C	2	2	2	1			2	1	1	3	3	2	7	3	9	
6	<i>Elanus caeruleus</i>	A	4	4	2	2	3				5	3	3	2	15		13	
		B	2	2	4	2	2				1	1	2	2	12		6	
		C	1	1								1	1	2	2		4	
7	<i>Haliastur indus</i>	A	3	3	2	1	1				3	3	2	2	10		10	
		B	2	2	1	1	2				2	2	1	1	8		4	
		C																
8	<i>Accipiter badius</i>	A	1	1	2	2								1	6		1	
		B	1	1									1	2	2		3	
		C	1	1									1	1	2		2	
9	<i>Spilornis cheela</i>	A	1	1	2	1	1				2	1	1	1	6		5	
		B	2	2	1	1					1	1	2	2	6		6	
		C																
10	<i>Falco peregrinus</i>	A	1	2	2							1	1	2	5		4	
		B	1	1	1							1	1	1	3		3	
		C																
11	<i>Vanellus indicus</i>	A		1	1	2	2	2				2	1	1	4	2	4	
		B																
		C																
12	<i>Vanellus malabaricus</i>	A	1	1	1		2	2			1	1	1	1	5	2	4	
		B	2	1	1			1	1		1	1	1		4	2	3	
		C																
13	<i>Metopidius indicus</i>	A	4			2	1	4	4	6	2	2	2	4	11	14	10	
		B																
		C																
14	<i>Perdicula erythrorhyncha</i>	A																
		B	4	4	2	1	1	1	4	6	6	3	3	6	12	11	18	
		C	6	6	4	2	2	1	2	4	4	4	6	3	8	20	7	21

Sl no	Bird species	Bands	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Premonsoon	Monsoon	Post- postmonsoon	
15	<i>Galloperdix spadicea</i>	A																
		B		1	1	1			1	2	2	1	1	1	3	3	5	
		C	2	2	2	1			1	2	2	2	2	2	7	3	8	
16	<i>Gallus sonneratti</i>	A																
		B	1	1	1	2	2	1	1	1	1	2	2	2	7	3	7	
		C	2	2	3	3	3	2	2	1	1	2	2	3	13	5	8	
17	<i>Treron pompadora</i>	A	1	1	1	2	2						1	1	7		2	
		B	4	4	6	6	8	5	2	2	1	2	6	6	28	9	15	
		C	8	10	10	8	6	2	2	1	1	2	6	8	40	5	17	
18	<i>Ducula aenea</i>	A	1	1	1	1				2	2	1	1	2	4	2	6	
		B	4	4	5	6	6	2	2	1	1	6	6	4	25	5	17	
		C	10	10	8	8	5	3	3	2	1	6	7	9	41	8	23	
19	<i>Ducula badia</i>	A																
		B	1	2	2	1			1	1	1	2	4	4	6	1	11	
		C	2	4	4	2	1	1	2	2	1	4	4	3	13	5	12	
20	<i>Columba livia</i>	A	8	10	16	22	24	4	6	6	8	4	15	18	80	16	55	
		B	4	6	6	10	10	2	2	2	6	6	10	8	36	6	30	
		C	1	2	2							2	2	2	5		6	
21	<i>Columba elphinstonii</i>	A																
		B	2	2	2	1	1	1			1	3	3	3	8	1	10	
		C	6	6	4	4	2			2	4	4	4	6	22	2	18	
22	<i>Sterptopelia chinensis</i>	A	2	2	2	2	1			2	3	3	2	2	9	2	10	
		B	4	4	4	3	3			2	5	5	6	4	18	2	20	
		C	6	6	4	2	3			3	6	8	7	8	27	3	29	
23	<i>Psittacula krameri</i>	A	4	5	5	6	6	3			2	4	6	6	26	3	18	
		B	8	6	6	5	5	2			3	5	5	7	30	2	20	
		C	4	2	2	2	2	1			3	3	4	4	12	1	14	
24	<i>Psittacula cyanocephala</i>	A	5	5	4	3	1				2	2	4	6	18		14	
		B	2	2	3	4	2				1	1	3	3	13		8	
		C	1	1	2	2	2				2	2	4	3	8		11	
25	<i>Loriculus vernalis</i>	A	1	1	2	2	1							2	7		2	
		B	1	1	2	2	2						1	1	8		2	
		C	2	2	1	2	2						2	2	9		4	
26	<i>Psittacula columboides</i>	A	1	1										1	2		1	
		B	2	2	1	1							1	2	6		3	
		C	2	3	2	1							2	2	8		12	
27	<i>Cuculus varius</i>	A	NIL															
		B			2	2	1									5		
		C			2	1	2									5		
28	<i>Cuculus micropterus</i>	A			1	1							1	1	2		2	
		B			2	1	1						1	1	4		2	
		C			2	2	1					2	2	2	5		6	
29	<i>Cuculus canorus</i>	A			1	1	1					2	2	1	3		5	
		B	1	1	2	2	2					2	2	2	8		6	
		C	2	2	2	1	1					2	2	2	8		6	

Sl no	Bird species	Bands	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Premonsoon	Monsoon	Post- postmonsoon	
30	<i>Eudynamys scolopacea</i>	A	2	2	4	2					1	1	2	2	10		6	
		B	1	3	3	2					2	2	3	4	9		11	
		C	4	4	4	2					2	4	4	4	14		14	
31	<i>Centropus sinensis</i>	A	2	2	1	1	2					1	11	2	8		5	
		B	2	2	1								1	1	5		2	
		C	NIL															
32	<i>Tyto alba</i>	A	1	1	1	2	2					1	1	2	9		4	
		B	2	2	2	2	1						2	2	9		4	
		C	2	2	2	3	2						2	2	11		4	
33	<i>Asio flammeus</i>	A	1	1	1									1	3		1	
		B	1	2	2									1	5		1	
		C	1	2	2									1	5		1	
34	<i>Bubo zeylonensis</i>	A	1	1	1	1								1	4		1	
		B	1	1	2	2							1	1	6		2	
		C	1	2	2	2							1	2	7		3	
35	<i>Glaucidium radiatum</i>	A	NIL															
		B	NIL															
		C		1	1	1									3			
36	<i>Athene brama brama</i>	A	1	1	1							1	1	1	3		3	
		B	1	1	2	2						1	2	2	6		5	
		C	1	1	2							1	1	1	4		3	
37	<i>Chaetura sylvatica</i>	A	NIL															
		B	2	4	4	3	2				4	4	2	2	15		12	
		C	8	6	6	8	4				8	8	6	10	32		32	
38	<i>Cypsiurus parvus</i>	A	2	2	1	1	2	2	11			2	2	2	8		4	
		B	3	3	3	2	2	2	1			3	2	2	13	3	7	
		C	4	4	3	3	2	1	1			4	4	4	16	2	12	
39	<i>Hemiprocne longipennis</i>	A	2	2	2							1	2	2	6		5	
		B	2	2	3							2	2	2	7		6	
		C	3	4	3							4	4	2	10		10	
40	<i>Chaetura gigantea</i>	A	1	1	2	2	1			1	1	1	1	1	7	1	4	
		B	2	2	3	2	1	1	1	1	1	1	2	2	1	10	3	6
		C	4	4	4	3	2	1	1	1	1	1	1	2	2	17	3	6
41	<i>Harpactes fasciatus</i>	A	NIL															
		B	1	1	1	1	1			1	1	1	1	1	5	1	5	
		C	2	2	2	2	1			2	2	2	1	2	9	2	7	
42	<i>Alcedo atthis</i>	A	4	4	4	6	4	2	2	2	4	4	5	4	22	6	17	
		B	6	4	6	5	3	4	4	4	6	5	6	3	24	12	20	
		C	2	2	1	1	2	2	2	2	2	2	4	4	3	8	6	13
43	<i>Halcyon smymensis</i>	A	1	1	2	2	2	4	3	3	3	2	2	1	8	10	8	
		B	1	1	2	1	1	2	2	1	1	2	2	2	6	5	7	
		C	2	1	1	1	1	1	2	2	2	2	1	2	6	3	7	
44	<i>Merops leschenaulti</i>	A	2	2	4	2	1	1	1	2	2	2	2	1	11	4	7	
		B	2	4	4	3	2	2	1	1	1	2	2	2	15	4	7	
		C	3	4	4	3	3	1	1	1	1	3	4	4	17	3	12	

Sl no	Bird species	Bands	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Premonsoon	Monsoon	Post- postmonsoon
45	<i>Merops orientalis</i>	A	6	8	8	8	4	2				2	4	6	34	2	12
		B	4	2	2	2	1	1				2	1	2	11	1	5
		C	1	1	1	2						2	1	1	5		4
46	<i>Coracias benghalensis</i>	A	1	1	1	2	2				2	2	1	2	7		7
		B	1	1	1	1	1				2	2	1	1	5		6
		C	2	2	1	1	2				2	2	2	1	8		7
47	<i>Eurystomus orientalis</i>	A	1	1	2	2	1	1	1	1	1	2	2	2	7	3	7
		B	2	2	2	2	1	1	1	2	2	2	2	2	7	4	8
		C	3	2	3	3	2	1	1	2	3	2	3	3	13	9	11
48	<i>Upupa epops</i>	A	4	2	2	1	2					2	2	2	11		6
		B	4	3	4	2	1					4	4	3	14		11
		C	2	2	2	1	1					2	2	2	8		6
49	<i>Tockus griseus</i>	A	2	2	3	5	2	1	1			2	3	2	14	2	7
		B	2	2	4	4	3	1	1			3	3	4	15	2	10
		C	3	3	4	4	3	2	1			4	4	3	17	3	11
50	<i>Buceros bicornis</i>	A	1	1	1	2	2					2	2	1	7		4
		B	2	2	1	1	2					2	2	2	8		6
		C	3	3	4	2	2					4	3	3	14		11
51	<i>Anthracoceros coronatus</i>	A	1	1	2	2	1				1	1	2	2	7		6
		B	2	4	4	4	2				2	3	4	4	16		13
		C	3	4	4	5	3				3	3	4	4	19		14
52	<i>Megalaima zeylanica</i>	A	2	3	3	2	2					3	3	3	12		9
		B	2	4	3	3	3	1				2	2	4	15	1	8
		C	3	4	4	4	3	2				3	3	4	18	2	10
53	<i>Megalaima viridis</i>	A	5	5	4	2	1	1				3	3	4	17	1	10
		B	4	4	4	1	1	1				2	2	3	14	1	9
		C	6	4	4	3	1	1				3	3	4	18	1	10
54	<i>Dinopium benghalense</i>	A	1	1	1	1	2	1	1	1	2	2	1	1	6	3	5
		B	2	2	1	1	1	1			2	2	2	1	7	1	7
		C	3	2	2	2	1	1			2	2	2	2	9	1	8
55	<i>Dinopium javanense</i>	A	2	2	2	1	1	1	1	1	2	2	2	1	8	3	7
		B		2	1	2	2	2	1	1	2	2	1	1	7	4	6
		C	2	2	2	2	1	1	1	1	2	2	2	2	9	3	8
56	<i>Dryocopus javensis</i>	A	NIL														
		B	2	1	1	1						2	2	1	5		5
		C	2	2	2	1						2	2	2	7		6
57	<i>Hemicircus canente</i>	A	NIL														
		B	2	1	1	1	1						1	1	6		2
		C	2	2	2	2	2	1						2	2	9		4
58	<i>Pitta brachyura</i>	A	2	2	1	1							2	2	6		4
		B	2	2	2	1							2	1	7		3
		C	3	2	2	2							3	3	9		6
59	<i>Galerida malabarica</i>	A	2	3	3	2	2					2	3	2	12		7
		B	4	3	4	4	2					3	4	4	17		11
		C	2	2	1	1						1	2	2	6		5

Sl no	Bird species	Bands	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Premonsoon	Monsoon	Post- postmonsoon		
60	<i>Lanius cristatus cristatus</i>	A	NIL																
		B	1	1	1	1							1	1	4		2		
		C	2	2	2	1								2	2	7		4	
61	<i>Tephrodomis gularis</i>	A	NIL																
		B	2	2		1	1					1	1	1	5	1	3		
		C	2	2	2	2	2						2	2	10		4		
62	<i>Tephrodomis pondicerianus</i>	A	NIL																
		B	2	2	1	1	2				2	2	2	2	8		8		
		C	2	2	2	2	1				1	2	2	2	11		7		
63	<i>Oriolus oriolus</i>	A	6	6	4							2	4	6	12		12		
		B	4	4	3							1	2	2	11		5		
		C	4	4	2								1	1	2	16		4	
64	<i>Oriolus xanthomus</i>	A	1	1	1	2	1	1					2	1	1	6	1	4	
		B	1	2	2	3	2	1					2	1	2	10	1	5	
		C	2	2	3	3	2	1					2	3	3	12	1	8	
65	<i>Dicrurus adsimilis</i>	A	5	6	5	3	4	4	2	2	4	4	5	3	23	8	16		
		B	8	8	6	6	4	4	4	4	3	6	6	8	8	34	11	28	
		C	2	2	1	1	2	2	2	2	1	3	3	4	3	8	5	13	
66	<i>Dicrurus aeneus</i>	A	NIL																
		B	2	1	1	1								1	2	5		3	
		C	2	2	1	1								2	2	6		4	
67	<i>Dicrurus paradiseus</i>	A	2	2	3	2	1	2	2	2	4	3	4	2	10	6	13		
		B	5	4	4	2	2	4	6	3	3	4	4	5	17	13	16		
		C	3	3	2	2	1	4	4	3	1	3	4	4	11	11	12		
68	<i>Artamus fuscus</i>	A	18	10	14	15	12	10				16	15	15	12	69	10	58	
		B	20	22	14	10	16	12				10	12	12	10	82	12	46	
		C	8	8	4	6	7	6				4	7	7	6	33	6	24	
69	<i>Acridotheres tristis</i>	A	5	4	5	6	3					3	3	4	6	23		16	
		B	4	4	4	4	2					3	3	4	4	18		14	
		C	3	3	4	2	2					2	2	3	4	14		11	
70	<i>Acridotheres fuscus</i>	A	6	6	5	5	4	8	8	9	10	10	8	8	26	25	36		
		B	6	6	4	4	2	6	6	4	6	7	7	8	22	16	28		
		C	2	2	2	3	2				2	2	4	2	2	11	2	10	
71	<i>Gracula religiosa</i>	A	2	2	4	5	4				1	2	3	3	4	17	1	12	
		B	2	2	3	3	3					1	2	2	2	3	13	1	9
		C	3	4	4	2	2				2	2	4	4	3	15	2	13	
72	<i>Dendrocitta vagabunda</i>	A	3	3	2	1	2					3	3	2	2	10		10	
		B	2	2	1	2	2					2	2	2	2	9		8	
		C	2	2	2	1	1					2	2	1	1	8		6	
73	<i>Dendrocitta leucogastra</i>	A	NIL																
		B	1	1	1	2	2	1	1	2	2	1	1	1	7	4	5		
		C	2	2	2	2	2	1	1	1	2	2	1	2	8	3	7		
74	<i>Corvus macrorhynchos</i>	A	8	8	10	10	10					4	6	7	8	46	4	25	
		B	10	8	12	12	16	2	2	4	8	16	14	12	58	8	50		
		C	15	15	20	20	14	6	6	8	10	11	15	17	84	20	48		

Sl no	Bird species	Bands	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Premonsoon	Monsoon	Post- postmonsoon	
75	<i>Corvus splendens</i>	A	24	32	38	36	40	42	40	60	62	44	38	46	170	142	190	
		B	28	30	36	36	44	48	52	55	60	66	44	45	174	155	215	
		C	38	35	35	40	44	48	56	51	42	42	48	35	192	156	167	
76	<i>Tephrodomis pondicerianus</i>	A	2	3	3	2	1	1	1			2	3	3	11	2	8	
		B	2	2	1	1	1	1	1			2	2	1	7	2	5	
		C	NIL															
77	<i>Tephrodomis virgatus</i>	C	2	1	1	2	2	1				2	2	1	8	1	5	
		B	1	1	1	2	2	1				1	1	2	7	1	4	
		A	NIL															
78	<i>Hemipus picatus</i>	A	2	2	2	1	1	2	1	1		1	2	1	8	4	3	
		B	2	2	4	4	3	1				2	2	2	15	1	6	
		C	2	2	3	4	2	1	1			1	1	2	13	2	2	
79	<i>Coracina melanoptera</i>	A	1	2	2	3	1				1	1	2	2	9		4	
		B	2	2	4	4	1					1	1	2	2	13		4
		C	NIL															
80	<i>Pericrocotus cinnamomeus</i>	A	NIL															
		B	1	2	2	1	1	1	1		1	1	2	2	7	2	6	
		C	1	2	1		2	2	1			1	1	7	3		4	
81	<i>Pericrocotus flammeus</i>	A	5	7	4	4	2	3	3	2	2	4	5	6	22	8	17	
		B	7	6	4	4	1	4	6	3	2	5	5	6	22	13	18	
		C	4	4	3	2	2	4	4	2	2	4	6	4	15	10	16	
82	<i>Aegithina tiphia</i>	A	2	2	1	1	1					1	1	2	7		4	
		B	2	2	2	1	1					2	2	2	8		6	
		C	2	2	2	2	2					1	2	2	8		5	
83	<i>Chloropsis aurifrons</i>	A	1	1	1	2	1					1	2	1	6		4	
		B	2	2	2	1	1						2	2	8		4	
		C	2	2	2	2	2					2	2	2	10		6	
84	<i>Irena puella</i>	A	3	2	1	2	1					2	2	1	9		5	
		B	4	2	2	2	1					4	3	2	11		9	
		C		2	2	1	1					3	3	1	8		7	
85	<i>Pycnonotus melanicterus</i>	A	1	1	1	1	1						2	1	5		3	
		B	2	2	2	1	2						1	1	9		2	
		C	2	2	1	1	2						2	2	8		4	
86	<i>Pycnonotus jocosus</i>	A	4	4	4	3	2	4	4	2	2	4	6	6	17	10	18	
		B	6	6	3	2	2	4	4	3	3	5	5	6	19	11	19	
		C	4	4	2	2	2	4	3	3	2	4	5	4	14	10	15	
87	<i>Pycnonotus cafer</i>	A	3	2	4	4	2	2	1	1			2	3	15	4	5	
		B	3	3	4	4	3	2	2	1			3	3	17	5	6	
		C	2	2	3	3	2	2	1	1			2	2	12	4	4	
88	<i>Hypsipetes indicus</i>	A	2	2	2	3	2	1	1	1	3	2	2	3	11	3	10	
		B	4	4	4	5	4	3	2	2	3	5	4	4	21	7	14	
		C	6	4	6	6	5	5	4	2	3	5	6	6	27	11	20	
89	<i>Hypsipetes madagascariensis</i>	A		1	1	2	1	1					1	2	5	1	3	
		B		2	2	4	4	2					2	2	12	2	4	
		C		2	2	4	4	4					2	2	12	4	4	

Sl no	Bird species	Bands	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Premonsoon	Monsoon	Post- postmonsoon	
90	<i>Pellomeum ruficeps</i>	A	1	1	2	1						1	1	1	5		3	
		B	2	2	2	1							1	1	1	7		3
		C	3	2	2	1							1	2	2	8		5
91	<i>Pomatorhynchus schisticeps</i>	A	2	2	3	2	3						2	2	12		4	
		B	4	5	5	4	3						2	3	3	21		8
		C	4	4	4	5	2						2	4	4	19		10
92	<i>Rhopocichla atriceps</i>	A	2	1	2	2	2	3	3	2				2	9	8	2	
		B	2		3	5	5	4	6	2				2	15	12	2	
		C	2	1	2	4	4	5	5	2				2	13	12	2	
93	<i>Turdoides subrufus</i>	A	8	6	8	8	8	2				4	7	7	38	2	18	
		B	6	6	5	6	8	4					6	6	7	31	4	20
		C	8	8	8	10	6	4					6	8	8	40	4	22
94	<i>Turdoides striatus</i>	A	6	7	6	6	8	8	10	10	12	6	6	7	33	28	31	
		B	7	8	7	8	8	6	6	7	6	8	8	6	38	19	8	
		C	6	6	6	10	8	6	6	6	6	8	8	7	36	18	29	
95	<i>Turdoides affinis</i>	A	2	2	2	4	4	3	2				2	1	14	5	3	
		B	1	2	4	4	5	5	2				2	2	16	7	4	
		C	1	2	4	4	4	5	2				2	2	15	7	4	
96	<i>Muscicapa latirostris</i>	A	1	1	1							1	1	1	1	3		4
		B	1	1								1	1	1	1	2		4
		C	1	2								1	1	2	1	3		5
97	<i>Muscicapa muttui mutti</i>	A	2	2	1	1						2	1	1	6		4	
		B	2	2	1	1						2	1	1	6		4	
		C	2	2	2	1						2	2	1	7		5	
98	<i>Muscicapa pallipes</i>	A	1	1	2	2	2	1	1	2	2	2			8	4	4	
		B	2	2	2	2	2	3	3	2	3	2			10	8	5	
		C	2	2	1	2	2	1	2	3	3	2			9	6	5	
99	<i>Muscicapa tickelliae</i>	A	5	5	4	5	4	6	8			6	4	4	23	14	14	
		B	4	4	4	5	5	6	4			3	2	3	22	10	8	
		C	4	4	4	5	4	6	6			4	2	2	21	12	8	
100	<i>Muscicapa albicaudata</i>	A	1	1	2	1	2	1					2	1	2	7	1	5
		B	1	1	2	2	4	1					2	2	1	10	1	5
		C	1	2	2	3	4	2					2	2	2	12	2	6
101	<i>Terpsiphone paradisi</i>	A	2	2	2	2	1					2	3	3	2	9		10
		B	2	2	2	1	1	1				1	3	2	2	8	1	8
		C	4	4	2	2	1					3	2	3	4	13		13
102	<i>Rhipidura aureola</i>	A	2	2	4	2	2	2		2	2	3	3	2	12	4	10	
		B	2	3	4	3	2	2		2	2	3	3	3	14	4	11	
		C	3	3	4	2	2	2		3	2	3	4	4	14	5	13	
103	<i>Phylloscopus affinis</i>	A	1										1	1	1		2	
		B	1										1	1	1		3	
		C	1	1									1	1	1	2		3
104	<i>Prinia socialis</i>	A	1	1	1	2							1	1	2	5		4
		B	1	1	1	1							2	2	2	4		6
		C	2	2	2	1							2	2	2	7		6

Sl no	Bird species	Bands	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Premonsoon	Monsoon	Post- postmonsoon		
105	<i>Acrocephalus stentoreus</i>	A	1	1				1	1	1	1	1			2	3	2		
		B	1	1					2	2	2	2	1			2	6	3	
		C	1						2	2	1	2	2			1	5	4	
106	<i>Copsychus saularis</i>	A	4	4	3	2	2					4	4	4	3	15		15	
		B	2	2	2	2	2					2	2	2	2	10		8	
		C	2	1	2	1	1					2	1	1	2	7		6	
107	<i>Saxicola caprata</i>	A	NIL																
		B	2	2	2	1	1	1	1	1	2	2	1	2	2	8	44	7	
		C	2	2	2	2	1	1	1	1	1	2	2	1	1	9	3	6	
108	<i>Monticola solitarius</i>	A	2	2	1	1	1					3	2	2	2	7		9	
		B	2	2	4	1						2	1	1	2	9		4	
		C	2	2	3								1	2	2	7		5	
109	<i>Myophonus horsfieldii</i>	A	2	2	1	1	2						1	2	1	8		4	
		B	1	1	2	2	3	1					2	2	1	9	1	5	
		C	2	2	3	4	4	1					2	4	4	15		10	
110	<i>Copsychus malabaricus</i>	A	1	1	1	1	1						1	1	1	5		3	
		B	2	2	1	1	2					1	1	2	2	8		6	
		C	3	3	3	2	3	1				2	2	2	2	14	1	8	
111	<i>Zoothera citrina</i>	A	1	1	1				2	1	1	1	1	2	2	3	4	6	
		B	2	1	1				2	2	2	2	2	1	1	4	6	6	
		C	2	2	1				2	2	1	3	3	2	1	5	5	9	
112	<i>Parus major</i>	A	3	3	2		2	1	1			2	1	1	1	10	2	5	
		B	2	3	2	1	2	2	1			1	2	2	2	7	3	10	
		C	3	3	4	1	2	2	2			2	2	3	3	13	4	10	
113	<i>Parus xanthogenys</i>	A	1	1	1	1	2	2				1	1	2	2	6	2	6	
		B	3	2	2	1	2	2	2			2	1	1	2	6	4	10	
		C	1	1		1	2	2	1	3		4	3			5	6	7	
114	<i>Anthus hodgsoni</i>	A	2	1	1								1	1	2	4		4	
		B	2	1	1							1	1	2	2	4		6	
		C	2	1								2	2	1	2	3		7	
115	<i>Motacilla indica</i>	A	NIL																
		B	1	1									1	2	2	2		3	
		C	1	1	1								2	2	2	3		6	
116	<i>Motacilla flava</i>	A	2	2	2							2	1	2	2	6		7	
		B	2	2	3							2	2	2	2	7		8	
		C	3	3	2							2	3	3	2	10		8	
117	<i>Motacilla capsica</i>	A	2	2	1							1	2	2	2	5		7	
		B	1	2	1	1						1	2	2	2	5		7	
		C	1	2	2	2						2	2	2	2	7		8	
118	<i>Dicaeum agile</i>	A	4	4	3	4	5	2							2	20	2	2	
		B	4	6	6	4	4	4	2					1	2	24	2	3	
		C	5	6	5	4	4	3					4	6	4	24	3	14	
119	<i>Dicaeum erythrorhynchos</i>	A	4	4	4	6	3	1						4	4	21	1	8	
		B	6	6	4	6	7	3						6	8	8	29		22
		C	10	10	12	14	12							6	6	6	58		18

Sl no	Bird species	Bands	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Premonsoon	Monsoon	Post- postmonsoon
120	<i>Nectarinia zeylonica</i>	A	4	6	8	8	6					6	4	4	32		14
		B	6	6	7	8	7					4	6	5	34		15
		C	4	4	8	7	5					3	4	6	28		13
121	<i>Nectarinia minima</i>	A	4	7	7	6	6			2	4	4	4	4	30	2	16
		B	5	5	8	8	6			2	4	4	6	8	32	2	22
		C	8	8	7	7	4			5	6	6	5	7	34	5	24
122	<i>Nectarinia lotenia</i>	A	4	4	3	4	3					2	2	2	18		6
		B	5	6	4	7	7					2	3	2	29		7
		C	4	6	4	7	8					2	3	3	29		8
123	<i>Zosterops palpebrosa</i>	A		2	2	4	6					2	4	4	14		10
		B		2	4	6	6					4	6	4	18		14
		C		3	6	6	8					4	6	6	23		16
124	<i>Lonchura malabarica</i>	A	6	8	10	10	6					2	8	8	40		18
		B	6	8	8	8	4						6	6	34		12
		C	2	4	4	4	2					2	4	4	18		10
125	<i>Lonchura kelaarti</i>	A	6	6	8	6	4	2	2	6	6	4			30	10	10
		B	4	6	8	10	6	2	2	4	6	6			36	8	12
		C	4	4	6	6	6	2	2	4	4	4	2		26	8	10
126	<i>Lonchura punctulata</i>	A	10	10	8						4	6	10	10	28		30
		B	12	10	10						4	8	8	10	32		30
		C	10	10	6						4	6	8	8	26		26
127	<i>Carpodacus erythrinus</i>	A	12	15	12						12	12	14	14	39		52
		B	15	15	10						10	12	12	14	40		48
		C	12	15	10						12	10	10	12	37		44

Table: 139 List of Birds at Manthakkad - Kalpathy River Site – II

Sl. No.	Bird Species	Common Name	Status	Order/Family
1	<i>Phalacrocorax niger</i>	Little cormorant	R	Pelecaniformes/Phalacrocoracidae
2	<i>Anhinga melanogaster</i>	Darter	R	„ „
3	<i>Ardeola grayii</i>	Pond heron	R	Ciconiiformes/Ardeidae
4	<i>Egretta intermedia</i>	Median egret	R	„
5	<i>Egretta Garzetta</i>	Little egret	R	„
6	<i>Bubulcus ibis</i>	Cattle egret	R	„
7	<i>Milvus migrans</i>	Common pariah kite	R	Falconiformes/Accipitridae

Sl. No.	Bird Species	Common Name	Status	Order/Family
8	<i>Haliastur indus</i>	Brahmni kite	R	”
9	<i>Spizaetus cirrhatus</i>	Indian crested hawk	R	”
10	<i>Amaurornis phoenicurus</i>	White breasted water hen	R	Falconiformes/Jacaniidae
11	<i>Metopidius indicus</i>	Bronze winged jacana	R	”
12	<i>Vanellus indicus</i>	Red wattled lapwing	R	Charadriiformes/Charadriidae
13	<i>Vanellus malabaricus</i>	Yellowwattled lapwing	R	” ”
14	<i>Columba livia</i>	Blue rock pigeon	R	Columbiformes/Columbidae
15	<i>Streptopelia chinensis</i>	Spotted dove	R	”
16	<i>Psittacula krameri</i>	Rose ringed parakeet	R	Psittaciformes/Psittacidae
17	<i>Psittacula cyanocephala</i>	Blossomheaded parakeet	R	” ”
18	<i>Cuculus micropterus</i>	Indian cuckoo	R	Cuculiformes/Cuculidae
19	<i>Cuculus canorus</i>	The cuckoo	R	” ”
20	<i>Eudynamis scolopacea</i>	Indian koel	R	” ”
21	<i>Tyto alba</i>	Barn owl	R	Strigiformes/Strigidae
22	<i>Apus affinis</i>	House swift	R	Apodiformes/Apodidae
23	<i>Cypsiurus parvus</i>	Palm swift	R	”
24	<i>Alcedo atthis</i>	Ceylon kingfisher	R	Coraciformes/Alcedinidae
25	<i>Ceryl rudis</i>	Pied Kingfisher	R	”
26	<i>Halcyon smyrnensis</i>	Whitebreasted kingfisher	R	”
27	<i>Merops orientalis</i>	Small green bee-eater	R	” /Meropidae
28	<i>Merops philippinus</i>	Blue tailed bee-eater	M	”

Sl. No.	Bird Species	Common Name	Status	Order/Family
29	<i>Coracias benghalensis</i>	South Indian roller	R	Coraciformes/Coraciidae
30	<i>Upupa epops</i>	Ceylon hoopoe	R	” /Upupidae
31	<i>Anthracoceros coronatus</i>	Malabar pied hornbill	R	” /Bucerotidae
32	<i>Megalaima haemacephala</i>	Coppersmith bird	R	Piciformes/Capitonidae
33	<i>Megalaima zeylanica</i>	Large green barbet	R	”
34	<i>Bubo zeylonensis</i>	Brown fish owl	R	”
35	<i>Chaetura gigantea</i>	Brown throated spinetail swift	R	”
36	<i>Pitta brachyura</i>	Indian Pitta	M	Passeriformes/Pittidae
37	<i>Galerida malabarica</i>	Malabar crested lark	R	Passeriformes/Alaudidae
38	<i>Hirundo daurica</i>	Red rumped swallow	R	Passeriformes/Hirundinidae
39	<i>Hirundo rustica</i>	Common eastern swallow	M	”
40	<i>Tephrodornis pondicerianus</i>	Common wood shrike	R	” /Corvidae
41	<i>Tephrodornis gularis</i>	Malabar wood shrike	R	”
42	<i>Oriolus oriolus</i>	Indian oriole	M	/Oriolidae
43	<i>Oriolus xanthornus</i>	Black headed oriole	R	”
44	<i>Dicrurus adsimilis</i>	Black drongo	R	Passeriformes/Dicruridae
45	<i>Dicrurus paradiseus</i>	Racket tailed drongo	R	”
46	<i>Artamus fuscus</i>	Ashy swallow shrike	R	”
47	<i>Acridotheres tristis</i>	Common myna	R	Passeriformes/Sturnidae
48	<i>Acridotheres fuscus</i>	Jungle myna	LM	”
49	<i>Gracula religiosa</i>	Indian hill myna	R	”
50	<i>Dendrocitta vagabunda</i>	Tree pie	R	” /Corvidae

Sl. No.	Bird Species	Common Name	Status	Order/Family
51	<i>Corvus macrorhynchos</i>	Jungle crow	R	”
52	<i>Corvus splendens</i>	House crow	R	”
53	<i>Aegithina tiphia</i>	Ceylon iora	R	Passeriformes/Irenidae
54	<i>Pycnonotus jocosus</i>	Red whiskered bullbull	R	” /Pycnonotidae
55	<i>Pycnonotus cafer</i>	Red vented bullbull	R	”
56	<i>Turdoides affinis</i>	White headed babbler	R	„ / Muscicapidae
57	<i>Turdoides striatus</i>	Jungle babbler	R	„ „
58	<i>Muscicapa muttui</i>	Brown fly catcher	R	„ /Muscicapidae
59	<i>Muscicapa tickelliae</i>	Tickle’s blue fly catcher	R	”
60	<i>Terpsiphone paradisi</i>	Paradise fly catcher	M	”
61	<i>Prinia socialis</i>	Ashy wren warbler	R	Passeriformes/Sylviinae
62	<i>Phyllocopus affinis</i>	Tickle’s leaf warbler	M	”
63	<i>Saxicoloides fulicata</i>	Indian robin	R	” /Muscicapidae
64	<i>Copsychus saularis</i>	Magpie robin	R	”
65	<i>Zoothera citrina</i>	White throated ground thrush	R	”
66	<i>Parus major</i>	Grey Tit	R	”
67	<i>Anthus novascelandiae</i>	Malay paddy field pipit	R	”
68	<i>Motacilla maderaspatensis</i>	Large pied wag tail	R	”
69	<i>Dicaeum erythrorhynchos</i>	Thick billed flower pecker	R	Passeriformes/Dicaeidae
70	<i>Dicaeum agile</i>	Tickle’s flower pecker	R	”

Sl. No.	Bird Species	Common Name	Status	Order/Family
71	<i>Nectarinia zeylonica</i>	Purple rumped sunbird	R	Passeriformes/Nectarinidae
72	<i>Nectarinia minima</i>	Small sunbird	R	”
73	<i>Nectarinia asiatica</i>	Purple sunbird	R	”
74	<i>Passer domesticus</i>	House sparrow	R	” /Ploceidae
75	<i>Petronia xanthocollis</i>	Yellow throated sparrow	R	”
76	<i>Lonchura malabarica</i>	White throated munia	R	”
77	<i>Lonchura punctulata</i>	Spotted munia	R	”
78	<i>Ploceus philippinus</i>	Bayaweaver bird	R	”

Table: 140. List of Raptors at Manthakkad – Kalpathy

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Milvus migrans</i>	✓	25	✓	41	✓	21
2.	<i>Haliastur indus</i>	✓	20	✓	25	✓	14
3.	<i>Spizaetus cirrhatus</i>	✓	15	✓	19		

Table : 141. List of Migrant Birds at Manthakkad

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Merops philippinus</i>	✓	45	✓	26	✓	19
2.	<i>Pitta brachyura</i>	-	-	✓	15	✓	19
3.	<i>Hirundo rustica</i>	✓	62	✓	78	✓	68
4.	<i>Oriolus oriolus</i>	✓	16	✓	24	✓	13
5.	<i>Terpsiphone paradisi</i>	-	-	✓	19	✓	23
6.	<i>Phyllocopus affinis</i>	-	-	✓	5	✓	8

Table: 142 List of Omnivorous birds at Manthakkad – Kalpathy

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Cuculus micropterus</i>	-	-	✓	10	✓	71
2.	<i>Cuculus canorus</i>	-	-	✓	9	✓	14
3.	<i>Eudynamys scolopaceae</i>	✓	9	✓	15	✓	24
4.	<i>Megalaima zeylanica</i>	-	-	✓	21	✓	29
5.	<i>Megalaima haemacephala</i>	-	-	✓	36	✓	32
6.	<i>Galerida malabarica</i>	✓	17	✓	29	✓	39
7.	<i>Oriolus oriolus</i>	✓	16	✓	24	✓	13
8.	<i>Oriolus xanthornus</i>	✓	16	✓	30	✓	30
9.	<i>Acridotherus tristis</i>	✓	43	✓	64	✓	29
10.	<i>Acridotherus fuscus</i>	✓	71	✓	72	✓	30
11.	<i>Dendrocitta vagabunda</i>	-	-	✓	14	✓	15
12.	<i>Corvus macrorhynchos</i>	✓	52	✓	110	✓	102
13.	<i>Corvus splendens</i>	✓	102	✓	104	✓	104
14.	<i>Pycnonotus jocosus</i>	✓	30	✓	25	✓	32
15.	<i>Pycnonotus cafer</i>	✓	24	✓	26	✓	27
16.	<i>Turdoides affinis</i>	✓	21	✓	33	✓	30
17.	<i>Turdoides striatus</i>	✓	75	✓	92	✓	90
18.	<i>Copsychus saularis</i>	✓		✓		✓	
19.	<i>Saxicoloides fulicata</i>	-	-	✓	15	✓	17
20.	<i>Zoothera citrina</i>	✓	17	✓	16	✓	10
21.	<i>Parus major</i>	✓	15	✓	17	✓	21
22.	<i>Ploceus philippinus</i>	✓	42	✓	64	✓	90

Table : 143. List of Insectivorous birds at Manthakkad - Kalpathy

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Egretta intermedia</i>	✓	17	✓	16	✓	11
2.	<i>Egretta garzetta</i>	✓	31	✓	25	✓	25
3.	<i>Bubulcus ibis</i>	✓	73	✓	190	✓	179
4.	<i>Vanellus indicus</i>	✓	14	✓	19	✓	14

5.	<i>Vanellus malabaricus</i>	✓	9	✓	13	✓	10
6.	<i>Tyto alba</i>	-	-	-	-	✓	13
7.	<i>Cypsiurus parvus</i>	✓	26	✓	28	✓	36
8.	<i>Merops orientalis</i>	✓	44	✓	30	✓	17
9.	<i>Merops philippinus</i>	✓	45	✓	26	✓	19
10.	<i>Coracias benghalensis</i>	-	-	✓	13	✓	17
11.	<i>Upupa epops</i>	✓	15	✓	16	✓	26
12.	<i>Chaetura gigantea</i>	✓	12	✓	17	✓	25
13.	<i>Pitta brachyura</i>	-	-	✓	15	✓	19
14.	<i>Hirundo daurica</i>	✓	9	✓	16	✓	21
15.	<i>Hirundo rustica</i>	✓	62	✓	78	✓	68
16.	<i>Tephrodornis pondicerianus</i>	-	-	✓	16	✓	14
17.	<i>Tephrodornis gularis</i>	-	-	✓	12	✓	12
18.	<i>Dicrurus adsimilis</i>	✓	52	✓	86	✓	46
19.	<i>Dicrurus paradiseus</i>	✓	30	✓	30	✓	21
20.	<i>Aegithina tiphia</i>	-	-	✓	11	✓	13
21.	<i>Muscicapa muttui</i>	-	-	✓	9	✓	14
22.	<i>Muscicapa tickelliae</i>	-	-	✓	40	✓	43
23.	<i>Terpsiphone paradisi</i>	-	-	✓	19	✓	23
24.	<i>Prinia socialis</i>	-	-	✓	12	✓	13
25.	<i>Phyllocopus affinis</i>	-	-	✓	5	✓	8
26.	<i>Motacilla maderaspatensis</i>	✓	20	✓	29	-	-
27.	<i>Anthus novascelandiae</i>	✓	12	✓	15	✓	11

Table : 144. List of Nectarivorous Birds at Manthakkad - Kalpathy

Sl. No.	Bird species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Oriolus oriolus</i>	✓	16	✓	24	✓	13
2.	<i>Gracula religiosa</i>	-	-	✓	32	✓	19
3.	<i>Dicaeum erythrorhynchos</i>	✓	26	✓	30	-	-
4.	<i>Dicaeum agile</i>	-	-	✓	25	✓	17
5.	<i>Nectarinia zeylonica</i>	-	-	✓	44	✓	30
6.	<i>Nectarinia minima</i>	-	-	✓	41	✓	39
7.	<i>Nectarinia asiatica</i>	-	-	✓	30	✓	30

Table 145: List of Granivorous Birds at Manthakkad

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Columba livia</i>	✓	305	✓	378	✓	233
2.	<i>Streptopelia chinensis</i>	✓	42	✓	53	✓	55
3.	<i>Lonchura malabarica</i>	✓	38	✓	50	✓	36
4.	<i>Lonchura punctulata</i>	✓	46	✓	58	✓	34
5.	<i>Petronia xanthocollis</i>	✓	48	✓	71	✓	40

Table:146. List of Forest Birds at Manthakkad

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Cuculus canorus</i>	-	-	✓	9	✓	14
2.	<i>Bubo zeylonensis</i>	✓	6	✓	5	-	-
3.	<i>Chaetura gigantea</i>	✓		✓		✓	

Table : 147. List of Frugivorous Birds at Manthakkad – Kalpathy

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Psittacula krameri</i>	✓	33	✓	60	✓	86
2.	<i>Psittacula cyanocephala</i>	✓	37	✓	47	✓	62
3.	<i>Anthracoseros coronatus</i>	-	-	✓	13	✓	22
4.	<i>Megalaima zeylanica</i>	-	-	✓	21	✓	29
5.	<i>Megalaima haemacephala</i>	-	-	✓	36	✓	32
6.	<i>Gracula religiosa</i>	-	-	✓	32	✓	19

Table : 148. List of Birds Feeding on Aquatic animals-Manthakkad

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Phalacrocorax niger</i>	✓	40	-	-	-	-
2.	<i>Anhinga melanogaster</i>	✓	27	-	-	-	-
3.	<i>Ardeola grayii</i>	✓	92	✓	63	✓	29
4.	<i>Amaurornis phoenicurus</i>	✓	16	✓	10	-	-
5.	<i>Metopidius indicus</i>	✓	-	✓	-	-	-
6.	<i>Alcedo atthis</i>	✓	69	✓	42	✓	29
7.	<i>Ceryl rudis</i>	✓	42	✓	33	✓	17
8.	<i>Halcyon smyrnensis</i>	✓	30	✓	22	-	-

Table : 149. Seasonal occurrence of Birds – Manthakkad - Kalpathy

Sl. No.	Species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon	
1	<i>Phalacrocorax niger</i>	A	3	3	2	4	4	2	1	2	4	4	5	6	16	5	19	
		B	Nil															
		C	Nil															
2	<i>Anhinga melanogaster</i>	A	3	3	2	2	1	1	-	-	2	2	2	3	11	1	9	
		B	Nil															
		C	Nil															
3	<i>Ardeola grayii</i>	A	5	5	6	4	2	8	8	6	12	12	6	10	22	26	44	
		B	4	5	4	4	1	6	6	5	8	8	6	6	18	17	28	
		C	2	2	2	1	-	2	3	3	4	4	3	3	7	8	14	
4	<i>Egretta intermedia</i>	A	3	2	2	2	1	-	-	-	-	1	3	3	10	-	7	
		B	3	2	2	1	1	-	-	-	-	2	3	2	9	-	7	
		C	2	1	1	1	1	-	-	-	-	1	2	2	6	-	5	
5	<i>Egretta Garzetta</i>	A	2	4	5	8	4	-	-	-	-	2	2	4	23	-	8	
		B	2	2	4	6	4	-	-	-	-	1	2	4	18	-	7	
		C	2	4	4	3	4	-	-	-	-	2	3	3	17	-	8	
6	<i>Bubulcus ibis</i>	A	10	10	11	12	8	-	-	-	2	6	6	8	51	-	22	
		B	18	20	24	22	16	-	-	-	18	22	26	24	100	-	90	
		C	20	22	26	24	18	18	18	18	15	18	22	24	110	18	69	

Sl. No.	Species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
7	<i>Milvus migrans</i>	A	4	4	2	2	2	1	-	-	-	2	4	4	14	1	10
		B	6	4	6	4	3	3	-	-	-	3	6	6	23	3	15
		C	3	4	2	2	1	1	-	-	-	2	3	3	12	1	8
8	<i>Haliastur indus</i>	A	2	2	2	3	2	-	-	-	3	2	2	2	11	-	9
		B	3	4	4	3	2	-	-	-	2	2	3	3	16	-	10
		C	2	2	1	1	1	-	-	-	-	2	2	2	2	-	7
9	<i>Spizaetus cirrhatus</i>	A	2	2	2	1	1	-	-	-	1	2	2	2	8	-	7
		B	3	2	2	2	1	-	-	-	2	2	2	3	10	-	9
		C	Nil														
10	<i>Amaurornis phoenicurus</i>	A	-	-	-	1	2	2	2	3	3	2	1	-	3	7	6
		B	-	-	-	1	1	1	2	2	1	1	1	-	2	5	3
		C	Nil														
11	<i>Metopidius indicus</i>	A	2	2	2	2	3	3	-	-	-	2	2	2	11	3	6
		B	2	2	1	1	2	3	-	-	-	2	2	2	8	3	6
		C	Nil														
12	<i>Vanellus indicus</i>	A	2	2	1	1	2	1	-	-	-	2	2	1	8	1	5
		B	2	2	2	3	2	2	-	-	-	2	2	2	11	2	6
		C	2	1	1	2	2	2	-	-	-	1	1	2	8	2	4
13	<i>Vanellus malabaricus</i>	A	-	-	2	1	1	1	2	-	-	-	1	1	5	2	2
		B	-	-	2	2	2	2	1	-	-	-	2	2	6	3	4
		C	-	-	1	1	1	2	4	-	-	-	1	2	5	2	3
14	<i>Columba livia</i>	A	24	26	32	34	26	18	18	20	26	28	25	18	142	56	107
		B	32	38	35	30	24	25	22	28	32	34	38	40	159	75	144
		C	16	18	16	20	22	18	14	16	18	22	25	28	92	48	93
15	<i>Streptopelia chinensis</i>	A	4	5	4	5	6	2	1	1	4	3	3	4	24	4	14
		B	6	6	4	4	4	3	1	1	6	6	6	6	24	5	24
		C	3	3	6	6	6	2	2	1	8	6	6	6	24	5	26
16	<i>Psittacula krameri</i>	A	2	2	3	4	2	2	2	2	4	4	3	3	13	6	14
		B	6	5	5	6	3	3	2	2	6	6	8	8	25	7	28
		C	8	8	10	10	6	4	3	3	8	10	10	6	42	10	34
17	<i>Psittacula cyanocephala</i>	A	2	2	2	4	3	2	-	2	4	6	6	4	13	4	20
		B	5	5	3	4	3	2	-	1	4	6	6	8	20	3	24
		C	6	6	8	4	4	2	-	2	6	8	8	8	28	4	30

Sl. No.	Species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
18	<i>Cuculus micropterus</i>	A	Nil														
		B	-	2	2	1	-	-	-	-	-	1	2	2	5	-	5
		C	-	2	2	2	-	-	-	-	-	1	2	2	6	-	5
19	<i>Cuculus canorus</i>	A	Nil														
		B	1	1	1	1	2	-	-	-	-	1	1	2	5	-	4
		C	1	2	2	2	1	-	-	-	-	2	2	2	8	-	6
20	<i>Eudynamys scolopacea</i>	A	1	1	2	2	-	-		-	1	1	1	2	6	-	3
		B	2	2	2	2	-	-	-	-	1	2	2	2	8	-	7
		C	2	3	4	4	-	-	-	-	2	2	3	4	13	-	11
21	<i>Tyto alba</i>	A	Nil														
		B	Nil														
		C	2	2	1	3	1	-	-	-	-	-	2	2	9	-	4
22	<i>Apus affinis</i>	A	5	6	6	8	4	4	-	4	6	7	7	8	29	14	22
		B	4	4	6	8	8	4	-	6	6	8	7	8	30	10	29
		C	2	2	4	3	2	2	-	2	4	4	5	3	13	4	16
23	<i>Cypsiurus parvus</i>	A	4	4	2	2	2	1	1	-	-	4	2	4	14	2	10
		B	4	4	3	2	2	1	1	-	-	4	4	3	15	2	11
		C	4	5	5	3	2	2	1	-	-	4	5	5	19	3	14
24	<i>Alcedo atthis</i>	A	7	7	5	5	3	8	8	6	5	5	6	4	27	22	20
		B	6	4	4	3	3	4	4	4	2	2	4	2	20	12	10
		C	2	2	4	3	2	3	3	2	2	2	2	2	13	8	8
25	<i>Ceryl rudis</i>	A	4	2	2	3	2	4	6	6	4	2	4	2	13	16	13
		B	3	2	2	2	1	3	4	4	4	2	3	3	10	11	12
		C	2	2	1	-	-	2	2	2	2	2	1	1	5	6	6
26	<i>Halcyon smyrnensis</i>	A	2	2	2	3	2	4	4	3	2	2	2	2	11	11	8
		B	1	1	2	2	2	3	3	3	2	1	1	1	8	9	5
		C	Nil														
27	<i>Merops orientalis</i>	A	6	8	8	6	4	2	-	-	-	2	4	4	32	2	10
		B	4	4	4	3	3	2	-	-	-	2	4	4	18	2	10
		C	2	2	2	1	1	2	-	-	-	2	2	3	8	2	7
28	<i>Merops Philippinus</i>	A	5	5	4	5	-	-	-	-	6	6	8	6	19	-	26
		B	2	2	4	3	-	-	-	-	4	4	4	3	11	-	15
		C	1	1	2	2	-	-	-	-	3	4	4	2	6	-	13

Sl. No.	Species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
29	<i>Coracias benghalensis</i>	A	Nil														
		B	1	1	2	2	2	-	-	-	2	2	1	1	8	-	5
		C	2	2	2	2	1	-	-	-	2	2	2	2	9	-	8
30	<i>Upupa epops</i>	A	2	2	2	1	2	-	-	-	-	2	2	2	9	-	6
		B	3	2	2	2	1	-	-	-	-	2	2	2	10	-	6
		C	4	4	3	2	2	-	-	-	-	4	4	3	15	-	11
31	<i>Anthracoceros coronatus</i>	A	Nil														
		B	1	1	2	2	1	-	-	-	1	1	2	2	7	-	6
		C	2	2	3	3	2	-	-	-	2	2	3	3	12	-	10
32	<i>Megalaima haemacephala</i>	A	Nil														
		B	4	6	4	3	3	-	-	-	-	4	6	6	20	-	16
		C	5	4	3	3	2	-	-	-	-	4	6	5	17	-	15
33	<i>Megalaima zeylanica</i>	A	Nil														
		B	2	4	2	2	2	1	-	-	-	2	3	3	12	1	9
		C	4	4	3	2	2	2	-	-	-	4	4	4	15	2	12
34	<i>Bubo zeylonensis</i>	A	2	1	1	1	-	-	-	-	-	-	2	1	3	-	3
		B	-	1	1	1	-	-	-	-	-	-	1	1	3	-	2
		C	Nil														
35	<i>Chaetura gigantea</i>	A	1	1	1	2	1	-	-	1	1	1	1	2	6	1	5
		B	2	2	1	2	1	1	1	1	1	1	2	2	8	3	6
		C	4	3	3	2	4	1	1	1	2	2	2	2	2	4	9
36	<i>Pitta brachyura</i>	A	Nil														
		B	2	2	3	3	-	-	-	-	-	-	3	2	10	-	5
		C	3	3	4	3	-	-	-	-	-	-	3	3	13	-	6
37	<i>Galerida malabarica</i>	A	2	2	2	1	1	-	-	-	2	2	3	2	8	-	9
		B	4	4	4	2	1	-	-	-	3	3	4	4	15	-	14
		C	4	6	6	4	2	-	-	-	4	4	5	4	22	-	17
38	<i>Hirundo daurica</i>	A	1	1	1	1	-	-	-	-	-	1	2	2	4	-	5
		B	3	2	2	1	-	-	-	-	-	2	3	3	8	-	8
		C	4	4	2	2	-	-	-	-	-	2	3	4	12	-	9
39	<i>Hirundo rustica</i>	A	6	6	6	4	-	-	-	-	8	10	10	12	2	-	40
		B	6	8	8	6	-	-	-	-	10	10	14	16	28	-	50
		C	6	6	8	4	-	-	-	-	10	10	12	12	24	-	44

Sl. No.	Species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
40	<i>Tephrodornis pondicerianus</i>	A	Nil														
		B	2	2	2	2	1	1	-	-	1	2	2	1	9	1	6
		C	1	1	2	2	2	1	-	-	1	1	1	2	8	1	5
41	<i>Tephrodornis gularis</i>	A	Nil														
		B	1	1	1	2	2	2	-	-	-	1	1	1	7	2	3
		C	1	1	2	1	2	1	-	-	-	2	1	1	7	1	4
42	<i>Oriolus oriolus</i>	A	2	3	3	2	-	-	-	-	-	2	2	4	10	-	6
		B	3	2	4	4	-	-	-	-	-	3	4	4	13	-	11
		C	2	2	2	1	-	-	-	-	-	2	2	2	7	-	6
43	<i>Oriolus xanthornus</i>	A	2	2	2	1	-	-	1	1	1	2	2	2	7	2	7
		B	4	4	2	2	-	-	2	2	3	3	4	4	12	4	14
		C	4	4	2	1	-	-	2	2	3	4	4	4	11	4	15
44	<i>Dicrurus adsimilis</i>	A	6	4	4	4	2	2	4	4	5	5	6	6	20	10	22
		B	8	8	10	10	2	4	4	6	10	10	10	10	32	14	40
		C	4	4	6	4	-	2	2	6	8	8	6	6	18	10	28
45	<i>Dicrurus paradiseus</i>	A	2	2	4	2	2	1	1	2	2	4	4	4	12	4	14
		B	3	3	4	2	2	1	1	2	2	3	3	4	14	4	12
		C	2	2	1	1	1	1	1	2	2	2	3	3	7	4	10
46	<i>Artamus fuscus</i>	A	10	10	12	10	10	8	-	-	8	10	10	8	52	8	36
		B	12	14	10	10	12	10	-	-	10	10	12	10	58	10	42
		C	6	6	5	4	5	6	-	-	2	4	6	6	26	6	18
47	<i>Acridotheres tristis</i>	A	4	4	4	6	5	2	-	-	4	4	4	6	23	2	18
		B	6	6	8	6	6	4	-	-	4	4	8	8	36	4	24
		C	2	4	4	3	3	2	-	-	-	4	3	4	16	2	11
48	<i>Acridotheres fuscus</i>	A	4	4	4	4	2	6	6	7	8	8	8	10	18	19	34
		B	4	4	6	6	4	8	8	8	6	5	5	8	24	24	24
		C	2	2	2	1	2	2	4	4	2	3	3	3	9	10	11
49	<i>Gracula religiosa</i>	A	Nil														
		B	4	4	2	3	3	-	-	2	2	4	4	4	16	2	14
		C	1	1	2	2	2	-	-	2	2	3	2	2	8	2	9
50	<i>Dendrocitta vagabunda</i>	A	Nil														
		B	2	2	2	1	1	-	-	-	1	1	2	2	8	-	6
		C	1	1	1	2	2	-	-	-	2	2	2	2	7	-	8

Sl. No.	Species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
51	<i>Corvus macrorhynchos</i>	A	6	4	4	6	6	2	-	2	6	6	4	6	26	4	22
		B	10	8	10	10	12	12	2	4	8	10	14	10	50	18	42
		C	12	11	10	10	10	8	4	4	10	7	6	10	53	16	33
52	<i>Corvus splendens</i>	A	8	8	10	10	6	4	4	6	10	10	12	12	42	14	44
		B	8	7	9	10	8	5	5	4	10	12	12	16	42	14	48
		C	8	8	6	12	14	6	7	7	8	10	14	12	48	20	44
53	<i>Aegithina tiphia</i>	A	Nil														
		B	2	1	2	1	1	-	-	-	-	1	1	2	7	-	4
		C	2	2	2	1	1	-	-	-	-	1	2	2	8	-	5
54	<i>Pycnonotus jocosus</i>	A	2	2	3	2	2	4	4	1	2	2	3	3	11	9	10
		B	2	2	4	2	1	3	4	2	2	2	2	2	11	9	8
		C	1	2	2	3	2	4	4	2	2	2	4	4	10	10	12
55	<i>Pycnonotus cafer</i>	A	4	3	3	4	2	2	1	1	-	-	2	2	16	4	4
		B	3	3	4	3	3	2	2	1	-	-	2	3	16	5	5
		C	4	4	3	2	3	3	1	1	-	-	3	3	16	5	6
56	<i>Turdoides affinis</i>	A	2	2	3	4	3	2	2	-	-	-	1	2	14	4	3
		B	2	4	4	4	5	5	2	-	-	-	3	4	19	7	7
		C	3	4	4	3	4	4	2	-	-	-	2	4	18	6	6
57	<i>Turdoides striatus</i>	A	6	6	5	4	6	7	6	8	8	8	6	5	27	21	27
		B	5	6	8	8	6	8	8	10	10	8	7	8	33	26	33
		C	8	8	6	8	10	8	7	7	6	8	6	8	40	22	28
58	<i>Muscicapa muttui</i>	A	Nil														
		B	1	1	1	1	-	-	-	-	-	1	2	2	4	-	5
		C	2	2	2	2	-	-	-	-	-	2	2	2	8	-	6
59	<i>Muscicapa tickelliae</i>	A	Nil														
		B	4	3	3	4	5	6	4	-	-	3	4	4	19	10	11
		C	4	4	4	3	6	6	4	-	-	2	4	6	21	10	12
60	<i>Terpsiphone paradisi</i>	A	Nil														
		B	2	2	2	2	1	-	-	-	2	3	3	2	9	-	10
		C	4	3	1	2	1	-	-	-	2	2	4	4	11	-	12
61	<i>Prinia socialis</i>	A	Nil														
		B	2	2	1	1	-	-	-	-	-	2	2	2	6	-	6
		C	2	2	2	1	-	-	-	-	-	2	2	2	7	-	6

Sl. No.	Species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
62	<i>Phylloscopus affinis</i>	A	Nil														
		B	1	-	-	-	-	-	-	-	-	1	1	2	1	-	4
		C	2	1	-	-	-	-	-	-	-	2	1	2	3	-	5
63	<i>Saxicoloides fulicata</i>	A	Nil														
		B	2	2	2	1	-	-	-	1	1	2	2	2	7	1	7
		C	2	2	2	2	-	-	-	2	2	1	2	2	8	2	7
64	<i>Copsychus saularis</i>	A	1	1	2	2	2	1	-	-	2	2	1	1	8	1	6
		B	2	2	2	1	1	1	-	-	2	2	2	1	8	1	7
		C	1	2	2	2	2	1	-	-	2	2	2	2	9	1	8
65	<i>Zoothera citrina</i>	A	1	1	1	-	-	1	1	1	1	1	2	2	3	3	6
		B	2	2	1	-	-	1	1	2	2	2	1	2	5	4	7
		C	2	2	2	-	-	2	2	2	1	2	2	-	6	4	-
66	<i>Parus major</i>	A	1	1	2	-	1	1	1	1	2	1	2	2	5	3	7
		B	2	2	1	1	1	1	1	2	2	2	1	1	7	4	6
		C	3	2	2	2	-	1	1	2	2	2	2	2	9	4	8
67	<i>Anthus novascelandiae</i>	A	2	1	1	1	1	-	-	-	2	1	1	1	6	-	6
		B	2	2	2	2	1	-	-	-	1	2	2	2	8	-	7
		C	2	1	1	1	1	-	-	-	1	1	1	2	6	-	5
68	<i>Motacilla maderaspatensis</i>	A	2	2	1	2	2	1	1	1	2	2	2	2	9	3	8
		B	2	2	2	4	3	2	1	1	2	4	4	2	13	4	12
		C	Nil														
69	<i>Dicaeum erythrorhynchos</i>	A	4	4	4	5	2	1	-	-	-	-	4	2	19	1	6
		B	4	4	5	5	3	1	-	-	-	-	4	4	21	1	8
		C	Nil														
70	<i>Dicaeum agile</i>	A	Nil														
		B	4	4	3	4	3	1	-	-	-	-	2	4	18	1	6
		C	4	2	2	3	2	-	-	-	-	-	2	2	-	-	4
71	<i>Nectarinia zeylanica</i>	A	Nil														
		B	4	6	6	8	6	-	-	-	-	4	4	6	30	-	14
		C	4	4	5	4	3	-	-	-	-	3	3	4	20	-	10
72	<i>Nectarinia minima</i>	A	Nil														
		B	5	5	6	4	4	-	-	2	4	4	3	4	22	2	15
		C	6	6	4	4	4	-	-	1	3	3	4	4	24	1	14

Sl. No.	Species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
73	<i>Nectarinia asiatica</i>	A	Nil														
		B	2	4	4	2	2	-	-	2	4	4	3	3	14	2	14
		C	4	4	4	2	1	-	-	2	2	4	4	3	15	2	13
74	<i>Passer domesticus</i>	A	4	4	6	5	4	6	-	-	4	5	5	6	23	6	20
		B	6	4	6	6	8	6	-	-	6	8	8	6	30	6	28
		C	2	4	4	4	5	4	-	-	5	5	4	5	19	4	19
75	<i>Petronia xanthocollis</i>	A	2	4	4	6	8	-	-	4	6	6	4	4	24	4	20
		B	4	4	6	4	10	-	-	4	8	7	7	5	30	4	27
		C	2	6	4	4	6	-	-	2	4	5	4	4	22	2	16
76	<i>Lonchura malabarica</i>	A	4	4	8	8	4	-	-	-	-	2	4	4	28	-	10
		B	4	6	6	10	6	-	-	-	-	6	6	6	32	-	18
		C	2	4	4	6	4	-	-	-	-	4	6	6	20	-	16
77	<i>Lonchura punctulata</i>	A	6	8	8	-	-	-	-	-	2	6	8	8	22	-	24
		B	8	8	10	-	-	-	-	-	6	6	10	10	26	-	32
		C	4	4	6	-	-	-	-	-	2	6	6	6	14	-	20
78	<i>Ploceus philippinus</i>	A	2	4	5	8	4	-	-	-	-	2	2	4	23	-	8
		B	2	2	4	6	4	-	-	-	-	1	2	4	18	-	7
		C	2	4	4	3	4	-	-	-	-	2	3	3	17	-	8

Table: 150 List of birds at Parali - Kalpathy River Site – III

Sl. No.	Species	Common Name	Status	Order/Family
1.	<i>Tachybaptus ruficollis</i>	Little grebe	R	Podicipediformes
2.	<i>Phalacrocorax niger</i>	Little cormorant	R	Phalacrocoracidae
3.	<i>Anhinga melanogaster</i>	Darter	R	„ /Anhingidae
4.	<i>Ardea alba</i>	Large egret	R	Ciconi forms /Ardeidae
5.	<i>Ardea cineria</i>	Grey heron	R	„ „
6.	<i>Ardeola grayii</i>	Pond heron	R	„ „
7.	<i>Egretta intermedia</i>	Median egret	R	„ „
8.	<i>Egretta garzetta</i>	Little egret	R	„ „
9.	<i>Bubulcus ibis</i>	Cattle egret	R	„ „
10.	<i>Nycticorax nycticorax</i>	Night heron	R	„ „
11.	<i>Ixobrychus cinnamomeus</i>	Chest nut bittern	R	„ „

Sl. No.	Species	Common Name	Status	Order/Family
12.	<i>Ixobrychus sinensis</i>	Yellow bittern	R	„ „
13.	<i>Ixobrychus flavicollis</i>	Black bittern	R	„ „
14.	<i>Ciconia episcopus</i>	White necked stork	R	„ Ciconidae
15.	<i>Milvus migrans</i>	Common pariah kite	R	Falconiformes/Accipitridae
16.	<i>Haliastur indus</i>	Brahmni kite	R	„
17.	<i>Elanus caeruleus</i>	Black winged kite	R	„ „
18.	<i>Pandion haliaetus</i>	Osprey eagle	M	„ „
19.	<i>Amaurornis phoenicurus</i>	White breasted water hen	R	Gruiformes/Rallidae
20.	<i>Metopidius indicus</i>	Bronze winged jacana	R	Charadiri forms/Jacanidae
21.	<i>Hydrophasianus chirurgus</i>	Pheasant tailed Jacana	R	„ „
22.	<i>Glareola lactea</i>	Swallow plover	R	„ /Charadriidae
23.	<i>Vanellus indicus</i>	Red wattled lapwing	R	„ Charadriidae
24.	<i>Columba livia</i>	Blue rock pigeon	R	Columbiformes/Columbidae
25.	<i>Streptopelia chinensis</i>	Spotted dove	R	„ „
26.	<i>Psittacula krameri</i>	Rose ringed parakeet	R	Psittaciformes/Psittacidae
27.	<i>Psittacula cyanocephala</i>	Blossom headed parakeet	R	„ „
28.	<i>Cuculus canorus</i>	The cuckoo	R	„ „
29.	<i>Cuculus micropterus</i>	Indian cuckoo	R	„ „
30.	<i>Centropus sinensis</i>	Crow pheasant	R	Cuculiformes/Cuculidae
31.	<i>Tyto alba</i>	Barn owl	R	Strigiformes/Strigidae
32.	<i>Apus affinis</i>	House swift	R	Apodiformes/Apodidae
33.	<i>Cypsiurus parvus</i>	Palm swift	R	„ „
34.	<i>Alcedo atthis</i>	Small blue king fisher	R	Coraciformes/Alcedinidae
35.	<i>Ceryl rudis</i>	Pied kingfisher	R	Coraciformes/Alcedinidae
36.	<i>Halcyon smyrnensis</i>	White breasted kingfisher	R	Coraciformes/Alcedinidae
37.	<i>Merops orientalis</i>	Small green bee-eater	R	„ /Meropidae
38.	<i>Tockus griseus</i>	Malabar grey-hornbill	R	„ /Bucirotridae

Sl. No.	Species	Common Name	Status	Order/Family
39.	<i>Megalaima haemacephala</i>	Crimsonbreasted barbet	R	Piciformes/Capitonidae
40.	<i>Megalaima zeylanica</i>	Large green barbet	R	„ „
41.	<i>Dinopium benghalense</i>	Malabar golden backed wood pecker	R	„ „
42.	<i>Galerida malabarica</i>	Sykes's crested lark	R	Passeriformes/ Alaudidae
43.	<i>Pitta brachyura</i>	Indian Pitta	M	Passeriformes/ Pittidae
44.	<i>Hirundo daurica</i>	Red rumped swallow	R	Passeriformes/ Hirundinidae
45.	<i>Oriolus oriolus</i>	Golden oriole	M	„ „
46.	<i>Dicrurus adsimilis</i>	Black drongo	R	Passeriformes/ Dicruridae
47.	<i>Dicrurus paradiseus</i>	Racket tailed drongo	R	„ „
48.	<i>Acridotheres tristis</i>	Common myna	R	„ /Sturnidae
49.	<i>Acridotheres fuscus</i>	Jungle myna	R	„ „
50.	<i>Sturnus malabaricus</i>	Blyths myna	R	„ „
51.	<i>Dendrocitta vagabunda</i>	Tree pie	R	„ /Corvidae
52.	<i>Corvus splendens</i>	House crow	R	„ „
53.	<i>Corvus macrorhynchos</i>	Jungle crow	R	Passeriformes /Corvidae
54.	<i>Tephrodornis pondicerianus</i>	Common wood shrike	R	„ „
55.	<i>Aegithina tiphia</i>	Iora	R	„ /Irenidae
56.	<i>Pycnonotus cafer</i>	Red vented bullbul	R	„ /Pycnonotidae
57.	<i>Pycnonotus jocosus</i>	Red whiskered bullbul	R	„ „
58.	<i>Turdoides caudatus</i>	Common babbler	R	Passeriformes/Muscicapidae
59.	<i>Turdoides affinis</i>	White headed babbler	R	„ „
60.	<i>Turdoides striatus</i>	Jungle babbler	R	„ „
61.	<i>Terpsiphone paradisi</i>	Paradise fly catcher	R	„ „
62.	<i>Prinia socialis</i>	Ashy wren warbler	R	„ „
63.	<i>Orthotomus sutorius</i>	Tailor bird	R	„ „
64.	<i>Copsychus saularis</i>	Magpie robin	R	„ „
65.	<i>Acrocephalus stentorens</i>	Indian great reaf warbler	R	„ „
66.	<i>Saxicola caprata</i>	Pied bush chat	R	„ /Motacillidae

Sl. No.	Species	Common Name	Status	Order/Family
67	<i>Anthus novascelandiae</i>	Paddy field pipit	R	„ „
68	<i>Motacilla maderaspatensis</i>	Large pied wag tail	R	
69	<i>Motacilla cineria</i>	Grey wag tail	M	
70	<i>Dicaeum erythrorhynchos</i>	Thick billed flower pecker	R	Passeriformes/Dicaeidae
71	<i>Nectarinia zeylonica</i>	Indian Purple rumped sunbird	R	„ /Nectariniidae
72	<i>Nectarinia asiatica</i>	Purple sunbird	R	
73	<i>Passer domesticus</i>	House sparrow	R	„ /Ploceidae
74	<i>Petronia xanthocollis</i>	Yellow throated sparrow	R	„ „
75	<i>Lonchura punctulata</i>	Spotted munia	R	„ „
76	<i>Ploceus philippinus</i>	Bayaweaver bird	R	„ „

Table: 151 List of Raptors at Parali, Kalpathy River – Site III

Sl. No.	Bird Species	Band A		Band B		Band C	
			No.		No.		No.
1	<i>Milvus migrans</i>	✓	29	✓	38	✓	34
2	<i>Haliastur indus</i>	✓	20	✓	24	✓	25
3	<i>Elanus caeruleus</i>	✓	27	✓	27	✓	25
4	<i>Pandron haliaectus</i>		15	✓	11	-	-

Table : 152. List of Migrant Birds at Parali

Sl. No.	Bird Species	Band A		Band B		Band C	
			No.		No.		No.
1	<i>Pandron haliaetus</i>	✓	15	✓	11	-	-
2	<i>Pitta brachyura</i>	-	-	✓	10	✓	12
3	<i>Oriolus oriolus</i>	✓	14	✓	20	✓	11
4	<i>Motacilla cineria</i>	✓	12	✓	11	✓	13

Table : 153. List of Birds Feeding on Aquatic animals at Parali

Sl. No.	Bird Species	Band A		Band B		Band C	
			No.		No.		No.
1	<i>Tachybaptus ruficollis</i>	✓	18	✓	13	-	-
2	<i>Phalacrocorax niger</i>	✓	40	-	-	-	-
3	<i>Anhinga melanogaster</i>	✓	42	-	-	-	-
4	<i>Ardea alba</i>	✓	5	✓	10	-	-
5	<i>Ardea cineria</i>	✓	10	✓	8	-	-
6	<i>Ardeola grayii</i>	✓	85	✓	92	✓	47
7	<i>Nycticorax nycticorax</i>	✓	12	✓	13	-	-
8	<i>Ixobrychus cinnamomeus</i>	✓	10	✓	13	-	-
9	<i>Ixobrychus sinensis</i>	✓	10	✓	11	-	-
10	<i>Ixobrychus flavicollis</i>	✓	11	✓	10	-	-
11	<i>Amaurornis phoenicurus</i>	✓	18	✓	12	-	-
12	<i>Metopidius indicus</i>	✓	13	✓	17	-	-
13	<i>Alcedo atthis</i>	✓	49	✓	45	✓	29
14	<i>Ceryl rudis</i>	✓	33	✓	35	✓	22
15	<i>Halcyon smyrnensis</i>	✓	25	✓	27	✓	16

Table : 154. List of Omnivorous Birds at Parali

Sl. No.	Bird Species	Band A		Band B		Band C	
			No.		No.		No.
1	<i>Amaurornis phoenicurus</i>	✓	18	✓	12	-	-
2	<i>Metopidius indicus</i>	✓	13	✓	17	-	-
3	<i>Cuculus canorus</i>	-	-	✓	10	✓	15
4	<i>Cuculus micropterus</i>	-	-	✓	9	✓	12
5	<i>Megalaima haemacephala</i>	-	-	-	-	✓	18
6	<i>Megalaima zeylanica</i>	-	-	-	-	✓	16
7	<i>Galerida malabarica</i>	✓	13	✓	13	-	-
8	<i>Oriolus oriolus</i>	✓	14	✓	20	✓	11
9	<i>Acridotheres tristis</i>	✓	35	✓	49	✓	40
10	<i>Acridotheres fuscus</i>	✓	61	✓	72	✓	78
11	<i>Sturnus malabaricus</i>	✓	57	✓	54	✓	50

Sl. No.	Bird Species	Band A		Band B		Band C	
			No.		No.		No.
12	<i>Dendrocitta vagabunda</i>	✓	16	✓	23	✓	28
13	<i>Corvus splendens</i>	✓	222	✓	310	✓	435
14	<i>Corvus macrorhynchos</i>	✓	152	✓	151	✓	44
15	<i>Pycnonotus cafer</i>	✓	27	✓	24	✓	19
16	<i>Pycnonotus jocosus</i>	✓	49	✓	43	✓	33
17	<i>Turdoides caudatus</i>	✓	65	✓	62	✓	39
18	<i>Turdoides affinis</i>	✓	23	✓	23	✓	35
19	<i>Turdoides striatus</i>	-	-	✓	86	✓	88
20	<i>Orthotomus sutorius</i>	-	-	-	-	✓	14
21	<i>Copsychus saularis</i>	✓	17	✓	18	✓	10
22	<i>Saxicola caprata</i>	-	-	✓	17	✓	18

Table : 155. List of Insectivorous Birds at Parali – Kalpathy river

Sl. No.	Bird Species	Band A		Band B		Band C	
			No.		No.		No.
1	<i>Egretta intermedia</i>	✓	11	✓	19	✓	8
2	<i>Egretta garzetta</i>	✓	18	✓	12	✓	9
3	<i>Bubulcus ibis</i>	✓	60	✓	75	✓	40
4	<i>Ixobrychus cinnamomeus</i>	✓	10	✓	13	-	-
5	<i>Ixobrychus sinenses</i>	✓	10	✓	11	-	-
6	<i>Ixobrychus flavicollis</i>	✓	11	✓	10	-	-
7	<i>Glareola lactea</i>	✓	96	✓	83	-	-
8	<i>Vanellus indicus</i>	✓	17	✓	17	✓	14
9	<i>Centropus sinensis</i>	-	-	✓	17	✓	15
10	<i>Tyto alba</i>	-	-	✓	18	✓	14
11	<i>Apus affinis</i>	✓	71	✓	72	✓	85
12	<i>Cypsiurus parvus</i>	-	-	✓	15	✓	14
13	<i>Merops orientalis</i>	✓	46	✓	41	✓	28
14	<i>Dinopium benghalensis</i>	-	-	-	-	✓	17
15	<i>Pitta brachyura</i>	-	-	✓	10	✓	12
16	<i>Hirundo daurica</i>	-	-	✓	67	✓	57

Sl. No.	Bird Species	Band A		Band B		Band C	
			No.		No.		No.
17	<i>Dicrurus adsimilis</i>	✓	88	✓	70	✓	68
18	<i>Dicrurus paradiseus</i>	✓	28	✓	28	✓	21
19	<i>Tephrodornis pondicerianus</i>	✓	15	✓	16	✓	13
20	<i>Aegithina tiphia</i>	-	-	✓	10	✓	12
21	<i>Terpsiphone paradisi</i>	-	-	✓	16	✓	15
22	<i>Prinia socialis</i>	✓	12	✓	8	✓	12
23	<i>Copsychus saularis</i>	✓	17	✓	18	✓	10
24	<i>Acrocephalus stentoreus</i>	-	-	✓	8	✓	12
25	<i>Anthus novascelandiae</i>	✓	17	✓	24	✓	30
26	<i>Motacilla maderaspatensis</i>	✓	33	✓	20	✓	31
27	<i>Motacilla cineria</i>	✓	12	✓	11	✓	13

Table : 156. List of Nectarivorous birds at Parali

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Oriolus oriolus</i>	✓	14	✓	20	✓	11
2.	<i>Dicaeum erythrorhynchos</i>	✓	20	✓	12	✓	10
3.	<i>Nectarinia zeylonica</i>	✓	35	✓	23	✓	18
4.	<i>Nectarinia asiatica</i>	✓	14	✓	18	✓	21

Table 157. List of Granivorous Birds at Parali

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Columba livia</i>	✓	121	✓	95	✓	233
2.	<i>Streptopelia chinensis</i>	✓	21	✓	28	✓	28
3.	<i>Petronia xanthocollis</i>	✓	44	✓	46	✓	76
4.	<i>Lonchura malabarica</i>	✓	46	✓	37	✓	44

Table 158. List of Frugivorous Birds at Parali

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Psittacula krameri</i>	✓	26	✓	35	✓	34
2.	<i>Psittacula cyanocephala</i>	✓	27	✓	30	✓	37
3.	<i>Tockus griseus griseus</i>	-	-	-	-	✓	15
4.	<i>Megalaima haemacephala</i>	-	-	-	-	✓	17
5.	<i>Megalaima zeylanica</i>	-	-	-	-	✓	16

Table 159: Seasonal Occurrence Of Birds – Band Wise - Parali

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monson	Monson	Post M
1	<i>Tachybaptus ruficollis</i>	A	3	2	2	-	-	1	1	2	2	2	1	2	7	4	7
		B	2	2	1	-	-	-	1	2	2	1	1	1	5	3	5
2	<i>Phalacrocorax niger</i>	A	4	6	8	6	2	2	-	-	2	2	4	4	26	2	12
3	<i>Anhinga melanogaster</i>	A	2	6	6	4	2	1	-	1	4	4	6	6	20	2	20
4	<i>Ardea alba</i>	A	2	2	-	-	-	-	-	-	2	3	3	2	4	-	10
		B	2	1	-	-	-	-	-	-	1	2	2	2	3	-	7
5	<i>Ardea cineria</i>	A	2	2	-	-	-	-	-	-	1	1	2	2	4	-	6
		B	2	2	-	-	-	-	-	-	1	1	1	1	4	-	4
6	<i>Ardeola grayii</i>	A	8	7	4	4	4	4	8	8	10	10	12	10	23	20	42
		B	10	6	4	3	3	2	8	8	12	10	14	12	26	18	48
		C	4	4	3	2	2	2	4	4	6	6	6	4	15	10	22
7	<i>Egretta intermedia</i>	A	2	2	2	1	-	-	-	-	-	-	1	3	7	-	4
		B	2	2	1	1	-	-	-	-	-	-	1	2	6	-	3
		C	2	1	1	1	-	-	-	-	-	-	1	2	5	-	3
8	<i>Egretta garzetta</i>	A	2	3	3	2	1	-	-	-	-	2	2	3	11	-	7
		B	2	2	1	1	1	-	-	-	-	2	1	2	7	-	5
		C	2	2	1	1	-	-	-	-	-	1	1	1	6	-	3
9	<i>Bubulcus ibis</i>	A	8	10	10	6	6	-	-	-	-	4	8	8	40	-	20
		B	10	14	15	10	4	-	-	-	-	4	8	10	53	-	22

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post M
		C	4	6	6	7	3	-	-	-	-	4	4	8	26	-	14
10	<i>Nycticorax nycticorax</i>	A	2	1	1	2	1	1	-	-	-	1	1	2	7	1	4
		B	2	2	1	1	1	1	-	-	-	1	1	2	8	1	4
11	<i>Ixobrychus cinnamomeus</i>	A	-	-	-	-	1	1	1	2	2	1	1	1	1	4	5
		B	1	-	-	-	1	1	1	2	2	2	1	2	2	4	7
12	<i>Ixobrychus sinensis</i>	A	-	-	-	-	-	1	1	2	2	2	2	-	-	2	8
		B	1	-	-	-	-	1	1	2	2	2	2	-	1	2	8
13	<i>Ixobrychus flavicollis</i>	A	-	-	-	-	1	1	2	2	2	1	1	1	1	5	5
		B	-	-	-	-	1	1	2	2	1	1	1	1	4	5	4
14	<i>Ciconia episcopus</i>	A	4	4	4	6	4	5	-	-	-	3	6	4	22	5	13
		B	6	6	4	4	5	5	-	-	-	4	6	5	25	5	15
15	<i>Milvus migrans</i>	A	2	4	4	3	2	2	-	-	-	4	4	4	15	2	12
		B	4	6	6	6	4	2	-	-	-	6	6	4	26	2	16
		C	2	4	4	5	3	2	-	-	-	5	5	4	18	2	14
16	<i>Haliastur indus</i>	A	3	2	2	2	2	-	-	-	4	3	2	2	11	-	9
		B	4	3	3	2	1	-	-	-	3	3	3	2	13	-	11
		C	3	3	4	4	2	-	-	-	2	2	3	2	16	-	9
17	<i>Elanus caeruleus</i>	A	4	2	2	2	2	-	-	-	3	3	4	5	12	-	15
		B	4	4	2	2	1	-	-	-	2	4	4	4	13	-	14
		C	3	2	3	4	1	-	-	-	3	3	4	3	13	-	12
18	<i>Pandion haliaetus</i>	A	2	2	1	-	-	-	-	-	1	2	4	3	5	-	10
		B	1	2	2	2	-	-	-	-	1	1	2	2	5	-	6
19	<i>Amarauris phoenicurus</i>	A	2	2	-	-	-	2	2	3	2	3	1	1	4	7	7
		B	-	2	-	-	-	1	2	2	2	2	1	-	2	5	5
20	<i>Metopidius indicus</i>	A	1	-	-	-	2	2	2	2	1	1	1	1	3	6	4
		B	1	-	-	-	2	2	3	4	2	1	1	1	1	7	9
21	<i>Glareola lactea</i>	A	8	12	-	-	-	10	8	8	10	14	14	12	20	26	50
		B	8	10	-	-	-	10	7	6	8	10	10	14	18	23	42
22	<i>Vanellus indicus</i>	A	2	2	2	1	2	2	-	-	2	2	1	1	9	2	6
		B	2	2	1	1	2	2	-	-	2	2	2	1	8	2	7
		C	2	2	1	1	1	1	-	-	1	1	2	2	7	1	6
23	<i>Columba livia</i>	A	12	12	8	9	10	12	12	10	8	8	10	10	51	34	36
		B	16	15	15	10	10	8	10	10	9	12	15	15	16	28	51

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post M
		C	12	16	14	8	8	6	6	6	10	7	7	8	58	18	32
24	<i>Streptopelia chinensis</i>	A	2	2	2	1	2	-	-	2	2	3	2	3	9	2	10
		B	4	4	2	2	2	-	-	2	2	4	4	2	14	2	12
		C	4	4	3	2	2	-	-	2	1	4	3	3	15	2	11
25	<i>Psittacula krameri</i>	A	2	2	2	2	2	-	-	2	2	4	4	4	10	2	14
		B	4	4	4	2	2	-	-	1	2	4	6	6	16	1	18
		C	2	6	6	4	2	-	-	1	2	3	4	4	2	1	13
26	<i>Psittacula cyanocephala</i>	A	2	3	3	2	2	-	-	2	4	4	2	3	12	2	13
		B	4	4	3	2	1	-	-	2	2	4	4	4	14	2	14
		C	4	4	4	3	2	-	-	3	3	4	4	6	12	3	12
27	<i>Cuculus canorus</i>	A	N	I	L												
		B	1	1	1	1	-	-	-	-	1	2	2	1	4	-	6
		C	2	1	2	1	-	-	-	-	2	2	2	2	7	-	8
28	<i>Cuculus micropterus</i>	B	1	1	1	1	-	-	-	-	-	1	2	2	4	-	5
		C	2	2	2	1	-	-	-	-	-	1	2	2	7	-	5
29	<i>Centropus sinensis</i>	B	2	2	2	1	1	-	-	1	2	2	2	2	8	1	8
		C	1	1	2	2	1	-	-	1	1	1	2	2	7	1	7
30	<i>Tyto alba</i>	B	2	3	3	2	2	-	-	-	-	2	2	2	12	-	6
		C	1	2	2	2	2	-	-	-	-	1	2	2	9	-	5
31	<i>Apus affinis</i>	A	4	5	10	12	12	8	-	-	6	6	4	4	43	8	20
		B	6	6	4	8	8	6	-	-	8	8	7	9	32	6	32
		C	8	8	8	10	10	6	-	-	9	8	10	10	42	6	37
32	<i>Cypsiurus parvus</i>	B	2	1	11	1	2	1	1	-	-	1	2	2	8	2	5
		C	2	2	2	1	1	1	1	-	-	1	1	2	8	2	4
33	<i>Alcedo atthis</i>	A	5	5	3	2	2	4	6	6	5	4	3	4	17	16	16
		B	4	5	4	2	2	4	6	6	4	4	2	2	17	16	12
		C	2	2	1	1	1	2	4	4	2	4	4	2	7	10	12
34	<i>Ceryl rudis</i>	A	2	3	3	2	1	4	4	4	2	2	3	3	11	12	10
		B	1	3	4	2	2	3	4	5	3	4	2	2	12	12	11
		C	1	2	2	2	1	2	2	2	2	3	2	1	8	6	8
35	<i>Halcyon smyrnensis</i>	A	2	2	1	1	1	3	4	4	2	2	2	1	7	11	7
		B	2	2	2	1	1	2	3	4	2	3	3	2	8	9	10
		C	2	1	1	1	1	2	2	2	1	1	1	1	6	6	4

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monson	Monson	Post M
36	<i>Merops orientalis</i>	A	6	9	8	-	-	-	-	-	4	6	6	7	23	-	23
		B	8	8	6	-	-	-	-	-	6	8	5		22	-	19
		C	4	4	6	-	-	-	-	-	4	5	5		14	-	14
37	<i>Tockus griseus</i>	C	2	2	3	2	-	-	-	-	1	1	2	2	9	-	6
38	<i>Megalaima heamacephala</i>	C	2	2	3	2	1	1	-	-	-	2	2	3	10	1	7
39	<i>Megalaima zeylanica</i>	C	2	1	3	3	2	-	-	-	-	1	2	2	11	-	5
40	<i>Dinopium benghalense</i>	C	1	1	1	2	2	1	1	1	2	2	1	2	7	3	7
41	<i>Galerida malabarica</i>	A	2	2	2	2	-	-	-	-	-	2	1	2	8	-	5
		B	2	2	1	1	2	-	-	-	-	1	2	2	8	-	5
42	<i>Pitta brachyura</i>	B	2	2	2	1	-	-	-	-	-	-	1	2	7	-	3
		C	2	2	2	2	-	-	-	-	-	-	2	2	8	-	4
43	<i>Hirundo daurica</i>	B	4	6	4	4	4	-	-	8	8	8	12	9	22	8	37
		C	4	4	5	5	5	-	-	8	6	6	8	6	23	8	26
44	<i>Oriolus oriolus</i>	A	2	2	2	-	-	-	-	-	-	2	3	3	6	-	8
		B	4	4	2	-	-	-	-	-	-	2	4	4	10	-	10
		C	2	2	2	-	-	-	-	-	-	1	2	2	6	-	5
45	<i>Dicrurus adsimilis</i>	A	8	8	6	5	5	4	6	6	8	10	12	10	32	16	40
		B	8	10	11	9	10	6	8	8	10	10	8	10	48	22	38
		C	4	5	5	6	8	6	5	5	8	6	6	4	28	16	24
46	<i>Dicrurus Paradiseus</i>	A	2	2	2	3	2	1	2	2	2	3	3	4	11	5	12
		B	4	3	3	2	1	2	-	2	2	3	4	4	13	4	11
		C	2	2	3	2	2	1	-	-	2	2	2	3	11	1	9
47	<i>Acridotheres tristis</i>	A	4	4	5	3	3	-	-	-	3	4	4	5	19	-	16
		B	8	6	5	7	5	-	-	-	4	5	5	4	31	-	18
		C	5	5	6	6	4	-	-	-	4	4	2	4	26	-	4
48	<i>Acridotheres fuscus</i>	A	4	4	6	4	2	4	4	5	6	8	8	6	20	13	28
		B	5	5	6	4	4	4	4	6	6	10	10	8	24	14	34
		C	6	5	5	3	4	4	3	8	8	10	12	10	23	15	40
49	<i>Sturnus malabaricus blythi</i>	A	4	4	2	2	1	2	4	6	6	8	8	6	28	16	13
		B	4	4	2	2	2	2	5	5	6	8	8	6	14	12	28
		C	4	4	2	2	2	2	6	6	6	8	4	4	14	14	22

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monson	Monson	Post M
50	<i>Dendrocitta vagabunda</i>	A	2	2	2	1	1	-	-	-	2	2	2	2	8	-	8
		B	3	2	2	1	1	-	-	-	3	3	4	4	9	-	14
		C	4	4	4	2	2	-	-	-	3	3	4	2	16	-	12
51	<i>Corvus splendens</i>	A	22	18	25	24	25	10	12	10	16	20	24	28	88	32	102
		B	32	26	38	36	28	30	18	16	16	24	28	38	106	64	140
		C	40	44	38	35	36	38	12	24	32	38	46	42	193	84	158
52	<i>Corvus macrorhynchos</i>	A	12	12	14	10	10	18	16	14	10	10	11	15	58	48	46
		B	8	8	10	14	12	10	12	16	16	18	15	12	52	38	61
		C	10	9	9	6	6	6	5	5	8	10	11	9	40	16	38
53	<i>Tephrodornis pondicerianus</i>	A	2	2	2	1	1	1	-	-	1	2	2	1	8	1	6
		B	1	2	2	2	1	1	2	-	-	2	2	1	8	3	5
		C	2	2	1	1	1	1	1	-	-	2	1	1	7	2	4
54	<i>Aegithina tiphia</i>	B	2	2	1	1	1	-	-	-	-	1	1	1	7	-	3
		C	1	2	2	1	1	-	-	-	-	2	2	1	7	-	5
55	<i>Pycnonotus cafer</i>	A	4	4	4	3	2	2	1	1	-	-	2	4	17	4	6
		B	4	4	2	2	2	2	2	1	-	-	2	3	14	5	5
		C	3	4	2	2	1	1	2	1	-	-	1	2	12	4	3
56	<i>Pycnonotus jocosus</i>	A	5	3	4	3	2	4	4	3	6	6	4	5	17	11	21
		B	4	4	3	2	2	4	3	3	6	4	4	4	15	10	18
		C	2	4	4	3	2	2	1	2	2	4	3	4	15	5	13
57	<i>Turdoides caudatus</i>	A	4	6	6	4	7	7	4	6	4	5	5	7	27	17	21
		B	4	6	5	7	7	7	4	6	3	3	4	6	29	17	16
		C	3	2	2	2	4	4	5	5	2	2	4	4	13	14	12
58	<i>Turdoides affinis</i>	A	2	2	4	2	4	3	2	-	-	-	2	2	14	5	4
		B	1	2	2	3	4	3	3	-	-	-	3	2	12	6	5
		C	4	4	6	4	5	3	3	-	-	-	2	4	23	6	6
59	<i>Turdoides striatus</i>	B	8	8	6	7	6	8	7	7	1	6	6	7	35	22	29
		C	4	6	8	8	7	8	10	10	8	7	6	6	33	28	27
60	<i>Terpsiphone paradisi</i>	B	1	1	2	2	2	-	-	-	1	2	3	2	8	-	8
		C	2	2	2	1	2	-	-	-	2	2	2		9	-	6
61	<i>Prinia sociali</i>	A	2	1	1	2	-	-	-	-	-	2	2	2	6	-	6
		B	1	1	1	1	-	-	-	-	-	2	1	1	4	-	4
		C	1	1	2	2	-	-	-	-	1	2	2	1	6	-	6

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post M
62	<i>Orthotomus sutorius</i>	C	2	2	1	1	1	-	-	-	2	2	2	1	7	-	7
63	<i>Copsychus saularis</i>	A	2	2	1	1	1	-	-	-	2	3	3	2	7	-	10
		B	2	2	2	2	1	-	-	-	2	2	3	2	9	-	9
		C	1	1	1	1	1	-	-	-	1	1	2	2	4	-	6
64	<i>Acrocephalus stentoreus</i>	B	1	1	1	-	-	1	1	1	1	1	-	-	3	3	2
		C	2	2	1	1	-	-	1	2	2	1	-	-	6	3	3
65	<i>Saxicola caprata</i>	B	1	1	2	2	2	1	1	1	1	2	2	1	8	3	6
		C	1	2	2	2	1	1	1	1	2	2	2	1	8	3	7
66	<i>Anthus novascelandiae</i>	A	1	2	2	1	1	1	-	-	2	2	2	3	7	1	9
		B	4	2	2	1	1	1	-	-	2	4	4	4	9	1	14
		C	4	4	4	2	1	1	-	-	1	4	4	4	15	1	14
67	<i>Motacilla maderaspatensis</i>	A	2	4	4	3	3	2	1	1	2	4	4	3	16	4	13
		B	2	2	2	1	1	2	1	1	1	3	2	2	8	4	8
		C	3	4	4	2	2	1	1	2	2	4	4	2	15	4	12
68	<i>Motacilla cineria</i>	A	2	1	1	1	-	-	-	-	2	2	2	1	5	-	7
		B	2	2	1	1	-	-	-	-	1	1	2	1	6	-	5
		C	1	2	2	2	-	-	-	-	2	2	1	1	7	-	6
69	<i>Dicaeum erythrorhynchos</i>	A	2	2	3	4	2	1	-	-	-	-	3	3	13	1	6
		B	2	2	2	1	1	1	-	-	-	-	1	2	8	1	3
		C	1	1	1	2	1	1	-	-	-	-	1	2	6	1	3
70	<i>Nectarinia zeylonica</i>	A	4	4	6	4	6	-	-	-	-	4	4	3	24	-	11
		B	2	2	4	3	3	-	-	-	-	3	4	2	14	-	9
		C	1	2	2	3	2	-	-	-	-	2	3	3	10	-	8
71	<i>Nectarinia asiatica</i>	A	1	1	2	2	1	-	-	1	2	2	1	1	6	1	7
		B	2	2	2	2	1	-	-	1	2	2	2	2	9	1	8
		C	2	2	2	1	1	-	-	2	2	3	3	3	8	2	11
72	<i>Passer domesticus</i>	A	4	6	4	5	5	6	-	-	4	6	6	8	4	6	24
		B	4	4	6	4	4	3	-	-	3	4	4	5	22	3	16
		C	4	4	3	4	5	4	-	-	5	4	4	3	20	4	16
73	<i>Petronia xanthocollis</i>	A	2	4	4	4	6	-	-	4	4	6	4	6	20	4	20
		B	4	5	5	4	4	-	-	3	3	6	8	4	22	3	21
		C	6	6	4	6	6	-	-	4	4	8	8	4	28	4	24

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post M
74	<i>Lonchura punctulata</i>	A	4	8	8	6	4	-	-	-	-	4	6	6	30	-	16
		B	2	4	6	6	4	-	-	-	-	4	5	6	22	-	15
		C	6	4	6	5	5	-	-	-	-	4	8	6	26	-	18
75	<i>Ploceus philippinus</i>	A	4	4	6	6	6	2	2	4	8	8	6	6	26	8	28
		B	2	2	4	3	4	2	-	4	6	8	6	4	15	6	24
		C	6	6	8	10	8	4	4	6	10	8	5	7	38	14	30

Table: 160 Birds observed at Pathrakkadavu – Kunthipuzha - Site – I

Sl. No.	Scientific Name	Common Name	Status	Order/Family
1.	<i>Ardeola grayii</i>	Pond heron	R	Ciconiiformes/Ardeidae
2.	<i>Egretta intermedia</i>	Median egret	R	”
3.	<i>Bubulcus ibis</i>	Cattle egret	R	”
4.	<i>Elanus caeruleus</i>	Black winged kite	R	Falconiformes/Accipitridae
5.	<i>Haliastur indus</i>	Brahminy kite	R	”
6.	<i>Accipiter badius</i>	Ceylon shikra	R	”
7.	<i>Spilornis cheela</i>	Crested serpent eagle	R	”
8.	<i>Falco peregrinus</i>	Shaheen falcon	M	”
9.	<i>Vanellus indicus</i>	Red wattled lapwing	R	Charadriiformes/Charadriidae
10.	<i>Vanellus malabaricus</i>	Yellow wattled lapwing	R	”
11.	<i>Perdica erythrorhyncha</i>	Painted bush quail	R	Galliformes/Phasianidae
12.	<i>Galloperdix spadicea</i>	Red Spurfowl	R	”
13.	<i>Gallus sonnerattii</i>	Grey jungle fowl	R	”
14.	<i>Treron pompadora</i>	Grey fronted pigeon	R	Columbiformes/Columbidae
15.	<i>Ducula aenea</i>	Green pigeon	R	”
16.	<i>Ducula badia</i>	Imperial pigeon	R	”
17.	<i>Columba livia</i>	Blue rock pigeon	R	”
18.	<i>Columba elphinstonii</i>	Nilgiri wood pigeon	R	”
19.	<i>Streptopelia chinensis</i>	Spotted dove	R	”
20.	<i>Chalcophaps indica</i>	Emerald Dove	R	”
21.	<i>Psittacula krameri</i>	Roseringed parakeet	R	Psittaciformes

Sl. No.	Scientific Name	Common Name	Status	Order/Family
22.	<i>Psittacula cyanocephala</i>	Blossom headed parakeet	R	”
23.	<i>Loriculus vernalis</i>	Malabar lorikeet	R	”
24.	<i>Psittacula columboides</i>	Blue winged parakeet	R	”
25.	<i>Cuculus varius varius</i>	Common Hawk-Cuckoo	R	”
26.	<i>Cuculus micropterus</i>	Indian Cuckoo	R	”
27.	<i>Cuculus canorus</i>	Cuckoo	R	”
28.	<i>Eudynamys scolopacea</i>	Indian koel	R	”
29.	<i>Centropus sinensis</i>	Crow- pheasant	R	”
30.	<i>Tyto alba</i>	Barn owl	R	Strigiformes/Strigidae
31.	<i>Asio flammeus</i>	Short eared owl	M	”
32.	<i>Bubo zeylonensis</i>	Brown fish owl	R	”
33.	<i>Glaucidium radiatum</i>	Malabar jungle owlet	R	”
34.	<i>Athene brama brama</i>	The spotted owlet	R	”
35.	<i>Chaetura sylvatica</i>	Whiterumped spinetail swift	R	Apodiformes/Apodidae
36.	<i>Cypsiurus parvus</i>	Palm swift	R	”
37.	<i>Hemiprocne longipennis</i>	Indian crested tree swift	R	”
38.	<i>Chaetura gigantea indica</i>	Brown throated spinetail swift	R	”
39.	<i>Harpactes fasciatus</i>	Malabar trogon	R	Trogoniformes/Trogonidae
40.	<i>Alcedo atthis</i>	Ceylon king kingfisher	R	Coraciiformes/Alcedinidae
41.	<i>Halcyon smyrnensis</i>	White breasted kingfisher	R	”
42.	<i>Merops leschenaulti</i>	Chestnut headed bee-eater	R	”Meropidae
43.	<i>Merops orientalis</i>	Small green bee-eater	R	”
44.	<i>Coracias benghalensis</i>	South Indian roller	R	Coraciiformes/Coracidae
45.	<i>Eurystomus orientalis</i>	Broad bellied roller	R	”
46.	<i>Upupa epops ceylonensis</i>	Ceylon hoopoe	R	” /Upupidae
47.	<i>Tockus griseus</i>	Malabar grey hornbill	R	” /Bucerotidae

Sl. No.	Scientific Name	Common Name	Status	Order/Family
48	<i>Buceros bicornis</i>	Great Indian horn bill	R	”
49	<i>Anthracoceros coronatus</i>	Malabar pied hornbill	R	”
50	<i>Megalaima zeylanica</i>	Ceylon green barbet	R	Piciformes-Capitonidae
51	<i>Megalaima viridis</i>	Small green barbet	R	”
52	<i>Dinopium benghalense</i>	Malabar golden backed wood-pecker	R	”
53	<i>Dinopium javanense</i>	Golden backed three-toed wood pecker	R	”
54	<i>Dryocopus javanensis</i>	Great black wood pecker	R	”
55	<i>Hemicircus canente</i>	Heart spotted wood pecker	R	”
56	<i>Pitta brachyura</i>	Indian Pitta	M	Passeriformes/Pittidae
57	<i>Galerida malabarica</i>	Malabar crested lark	R	Passeriformes/Alaudidae
58	<i>Hirundo concolor</i>	Dusky crag Martin	R	”/Hirundinidae
59	<i>Hirundo daurica</i>	Red rumped swallow	R	Passeriformes/Hirundinidae
60	<i>Hirundo tahitica</i>	Nilgiri House swallow	R	”
61	<i>Lanius cristatus</i>	Brown shrike	M	Passeriformes/Laniidae
62	<i>Oriolus oriolus</i>	Indian oriole	M	/Oriolidae
63	<i>Oriolus chinensis</i>	Black naped orile	M	”
64	<i>Oriolus xanthornus</i>	Black headed oriole	R	”
65	<i>Dicrurus adsimilis</i>	Black drongo	R	Passeriformes/Dicruridae
66	<i>Dicrurus aeneus</i>	White bellied drongo	R	”
67	<i>Dicrurus paradiseus</i>	Racket tailed drongo	R	”
68	<i>Acridotheres tristis</i>	Common myna	R	Passeriformes/Sturnidae
69	<i>Acridotheres fuscus</i>	Jungle myna	R	”
70	<i>Gracula religiosa</i>	Indian hill myna	R	”
71	<i>Dendrocitta vagabunda</i>	Tree pie	R	” /Corvidae
72	<i>Dendrocitta leucogastra</i>	Southern tree-pie	R	”

Sl. No.	Scientific Name	Common Name	Status	Order/Family
73	<i>Corvus macrorhynchos</i>	Jungle crow	R	”
74	<i>Corvus splendens</i>	House crow	R	”
75	<i>Tephrodornis pondicerianus</i>	Common wood shrike	R	”/Campephagidae
76	<i>Hemipus picatus</i>	Black backed pied flycatcher shrike	R	”
77	<i>Coracina melanoptera</i>	Black-headed cuckoo shrike	R	”
78	<i>Pericrocotus cinnamomeus</i>	Malabar small minivet	R	”
79	<i>Pericrocotus flammeus</i>	Scarlet minivet	R	”
80	<i>Aegithina tiphia</i>	Ceylon iora	R	Passeriformes/Irenidae
81	<i>Chloropsis aurifrons</i>	Gold fronted chloropsis	R	”
82	<i>Irena puella</i>	Fairy blue bird	R	”
83	<i>Pycnonotus melanicterus</i>	Ruby throated yellow bulbul	R	” /Pycnonotidae
84	<i>Pycnonotus jocosus</i>	Red whiskered bulbul	R	” /Pycnonotidae
85	<i>Pycnonotus cafer</i>	Red vented bulbul	R	”
86	<i>Hypsipetes indicus</i>	Yellow browed bulbul	R	”
87	<i>Hypsipetes medagascariensis</i>	South Indian black bulbul	R	”
88	<i>Pellorneum ruficeps</i>	Spotted babbler	R	”
89	<i>Pomatorhinus schisticeps</i>	Scimitar babbler	R	”
90	<i>Rhopocichla articeps</i>	Black headed babbler	R	”
91	<i>Turdoides subrufua</i>	Rufous babbler	R	”
92	<i>Turdoides striatus</i>	Malabar jungle babbler	R	”
93	<i>Turdoides affinis</i>	White headed babbler	R	”
94	<i>Muscicapa latirostris</i>	Brown fly catcher	LM	”
95	<i>Muscicapa muttui</i>	Indian brown breasted fly catcher	R	”
96	<i>Muscicapa pallipes</i>	White bellied blue fly catcher	R	”
97	<i>Muscicapa tickelliae</i>	Tickle’s blue fly	R	”

Sl. No.	Scientific Name	Common Name	Status	Order/Family
		catcher		
98	<i>Muscicapa albicaudata</i>	Nilgiri blue fly catcher	R	”
99	<i>Terpsiphone paradisi</i>	Paradise fly catcher	M	”
100	<i>Rhipidura aureola</i>	White browed fantail fly catcher	R	”
101	<i>Prinia socialis</i>	Ashy wren warbler	R	Passeriformes/Sylviinae
102	<i>Phyllocopus affinis</i>	Tickle’s leaf warbler	M	”
103	<i>Acrocephalus stentoreus</i>	Indian great reed-warbler	R	”
104	<i>Copsychus saularis</i>	Magpie robin	R	”
105	<i>Saxicola caprata</i>	Pied bush chat	R	”
106	<i>Monticola solitarius</i>	Blue rock-thrush	M	”
107	<i>Myiophoneus horsfieldii</i>	Malabar whistling thrush	R	”
108	<i>Zoothera citrina</i>	White throated ground thrush	R	”
109	<i>Parus major</i>	Grey Tit	R	Paridae
110	<i>Parus xanthogenys</i>	Yellow cheeked tit	R	”
111	<i>Anthus hodgsoni</i>	Tree pipit	M	” Motacillidae
112	<i>Motacilla indica</i>	Forest wagtail	M	” / Motacilladae
113	<i>Motacilla flava</i>	Yellow wagtail	M	”
114	<i>Motacilla caspica</i>	Grey wagtail	M	”
115	<i>Dicaeum agile</i>	Thick billed flower pecker	R	Passeriformes/Dicaeidae
116	<i>Dicaeum erythrorhynchos</i>	Tickell’s flower pecker	R	Passeriformes/Dicaeidae
117	<i>Nectarinia zeylonica</i>	Purple rumped sunbird	R	Passeriformes/Nectarinidae
118	<i>Nectarinia minima</i>	Small sunbird	R	”
119	<i>Nectarinia lotenia</i>	Loten’s sunbird	R	”
120	<i>Zosterops palpebrosa</i>	Nilgiri white eye	R	” /Zosteropidae
121	<i>Lonchura malabarica</i>	White throated munia	R	” /Ploceidae
122	<i>Lonchura kelaarti</i>	Rufous bellied	R	”

Sl. No.	Scientific Name	Common Name	Status	Order/Family
		munia		
123	<i>Lonchura punctulata</i>	Spotted munia	R	”
124	<i>Carpodacus erythrinus</i>	Common Rosefinch	M	”

Table: 161 List of Migrant Birds at Pathrakkadavu

Si No	Bird species	Band A		Band B		Band c		Season	
		Present	No.	Present	No.	Present	No.		
1	<i>Falco Peregrinus</i>					✓	10	Oct-Mar	
2	<i>Pitta brachyura</i>	✓	✓	14	✓	11	-	-	Nov-Apr
3	<i>Lanius cristatus</i>		✓	8	-	-	-	-	
4	<i>Oriolus oriolus</i>		✓	14	✓	19	✓	19	
5	<i>Oriolus chinensis</i>		✓	9	✓	9	-	-	
6	<i>Muscicapa muttui</i>	✓	✓	11	✓	11	✓	11	
7	<i>Terpsiphone paradisi</i>	✓		16	✓	16	✓	16	
8	<i>Phyllicopus affinis</i>	✓	✓	4	✓	4	✓	4	
9	<i>Monticola solitarius</i>	✓		13	✓	13	✓	13	
10	<i>Anthus hodgsoni</i>	✓		9	✓	10	✓	9	
11	<i>Motacilla indica</i>	✓		8	✓	✓	7	-	-
12	<i>Motacilla flava</i>	✓		13	✓		11		12
13	<i>Motacilla capsica</i>	✓		14	✓		13	✓	14
14	<i>Carpodacus erythrinus</i>	✓		85	✓		78	✓	87

Table: 162 List of Raptors recorded at Pathrakkadavu

Sl. No	Species	Occurrence					
		Band A		Band B		Band c	
		Presence	No.	Presence	No.	Presence	No.
1	<i>Elanus caeruleus</i>	-	-	-	-	✓	25
2	<i>Haliastur indus</i>	-	-	-	-	✓	21
3	<i>Accipiter badius</i>	-	-	-	-	✓	11
4	<i>Spilornis cheela</i>	-	-	-	-	✓	13
5	<i>Falco peregrinus</i>	-	-	-	-	✓	10

Table: 163 List of Omnivorous Birds at Pathrakkadavu

Sl. No.	Birds species	Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
1.	<i>Galloperdix spadicea</i>	✓	26	✓	17	-	-
2	<i>Gallus sonneratti</i>						
3.	<i>Cuculus varius</i>	✓	4	-	-	✓	4
4.	<i>Cuculus micropterus</i>	✓	4	✓	8	✓	4
5.	<i>Cuculus canorus</i>	✓	12	✓	13	✓	12
6.	<i>Eudynamys scolopacea</i>	✓	12	✓	14	✓	12
7.	<i>Megalaima zeylanica</i>	✓	14	✓	14	✓	14
8.	<i>Megalaima viridis</i>	✓	24	✓	24	✓	24
9.	<i>Dinopium benghalense</i>	✓	19	✓	17	✓	15
10.	<i>Dinopium javanense</i>	✓	19	✓	16	✓	19
11.	<i>Galerida malabarica</i>	✓	24	✓	25	✓	17
12.	<i>Lanius cristatus</i>	✓	8	-	-	-	-
13.	<i>Oriolus oriolus</i>	✓	24	✓	19	✓	19
14.	<i>Oriolus chinensis</i>	✓	9	✓	9	-	-
15.	<i>Oriolus</i>	✓	13	✓	15	✓	13

Sl. No.	Birds species	Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
	<i>xanthornus</i>						
16.	<i>Acridotheres tristis</i>	✓	21	✓	26	✓	19
17.	<i>Acridotheres fuscus</i>	✓	79	✓	83	✓	81
18.	<i>Dendrocitta vagabunda</i>	✓	14	✓	14	✓	14
19.	<i>Dendrocitta leucogastra</i>	✓	18	✓	20	-	-
20.	<i>Corvus macrorhynchos</i>	✓	36	✓	31	✓	64
21.	<i>Coracina melanoptera</i>	-	-	✓	21	-	20
22.	<i>Pycnonotus melanicterus</i>	✓	13	✓	13	-	-
23.	<i>Pycnonotus jocosus</i>	✓	31	✓	31	✓	41
24.	<i>Pycnonotus cafer</i>	✓	28	✓	28	✓	21
25.	<i>Hypsipetes indicus</i>	✓	56	✓	56	-	-
26.	<i>Hypsipetes madagascariensis</i>	✓	22	✓	22	-	-
27.	<i>Pomatorhinus schisticeps</i>	✓	31	✓	31	-	-
28.	<i>Turdoides subrufus</i>	✓	60	✓	60	✓	63
29.	<i>Turdoides affinis</i>	✓	27	✓	27	✓	27
30.	<i>Turdoides striatus</i>	✓	54	✓	54	✓	95
31.	<i>Copsychus saularis</i>	✓	16	✓	18	✓	16
32.	<i>Saxicola caprata</i>	✓	18	✓	20	-	-
33.	<i>Monticola solitarius</i>	✓	13	✓	13	✓	13
34.	<i>Myiophoneus horsfieldii</i>	✓	20	✓	14	✓	17
35.	<i>Zoothera citrina</i>	✓	19	✓	16	-	19
36.	<i>Parus major</i>	✓	17	✓	18	✓	17
37.	<i>Parus xanthegeus</i>	✓	20	✓	16	-	-

Table: 164 List of Insectivorous birds at Pathrakkadavu

Sl. No.	Species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Egretta intermedia</i>	-	-	✓	133	✓	31
2.	<i>Bubulcus ibis</i>	-	-	✓	99	✓	117
3.	<i>Vanellus indicus</i>	✓	16	✓	16	✓	13
4.	<i>Vanellus malabaricus</i>	✓	13	✓	12	✓	7
5.	<i>Centropus sinensis</i>	✓	24	✓	21	✓	24
6.	<i>Tyto alba</i>	✓	8	✓	8	✓	8
7.	<i>Chaetura sylvatica</i>	✓	78	-	-	-	-
8.	<i>Cypsiurus parvus</i>	-	-	✓	27	-	-
9.	<i>Chaetura gigantea</i>	✓	27	✓	26	✓	27
10.	<i>Hemiprocne longipennis</i>	✓	9	✓	9	✓	9
11.	<i>Merops leschenaultii</i>	✓	21	✓	21	✓	21
12.	<i>Merops orientalis</i>	✓	13	✓	8	✓	8
13.	<i>Coracias benghalensis</i>	✓	13	✓	13	✓	13
14.	<i>Eurystomus orientalis</i>	✓	20	✓	20	✓	20
15.	<i>Upupa epops</i>	✓	27	✓	19	✓	21
16.	<i>Picumnus innominatus</i>	✓	12	-	-	-	-
17.	<i>Dryocopus javensis</i>	✓	14	✓	13	-	-
18.	<i>Hemicircus canente</i>	✓	21	-	-	-	-
19.	<i>Pitta brachiyura</i>	✓	11	✓	14	-	-
20.	<i>Hirundo daurica</i>	✓	15	✓	12	✓	15
21.	<i>Hirundo concolor</i>	✓	14	✓	9	✓	14
22.	<i>Hirundo tahitica</i>	✓	18	✓	13	-	-
23.	<i>Dicrurus adsimilis</i>	✓	50	✓	41	✓	49
24.	<i>Dicrurus aeneus</i>	✓	11	-	-	-	-
25.	<i>Dicrurus paradiseus</i>	✓	34	✓	32	✓	34
26.	<i>Hemipus picatus</i>	✓	21	✓	19	✓	21
27.	<i>Pericrocotus cinnamomeus</i>	✓	13	✓	14	-	-
28.	<i>Pericrocotus flammeus</i>	✓	40	✓	39	✓	45
29.	<i>Aegithina tiphia</i>	✓	14	✓	12	✓	14
30.	<i>Chloropsis aurifrons</i>	✓	10	✓	10	✓	10
31.	<i>Rhopocichla atriceps</i>	✓	28	✓	28	-	-
32.	<i>Muscicapa latirostris</i>	✓	6	✓	6	✓	6
33.	<i>Muscicapa muttui mutti</i>	✓	11	✓	11	✓	11

Sl. No.	Species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
34.	<i>Muscicapa pallipes</i>	✓	18	✓	18	✓	15
35.	<i>Muscicapa tickelliae</i>	✓	41	✓	41	-	49
36.	<i>Muscicapa albicaudata</i>	✓	15	✓	15	-	-
37.	<i>Terpsiphone paradisi</i>	✓	16	✓	16	✓	16
38.	<i>Rhipidura aureola</i>	✓	22	✓	22	✓	24
39.	<i>Prinia socialis</i>	✓	11	✓	6	✓	11
40.	<i>Phyllocopus affinis</i>	✓	4	✓	4	✓	4
41.	<i>Acrocephalus stentoreus</i>	✓	12	✓	11	-	-
42.	<i>Anthus hodgsoni</i>	✓	9	✓	6	✓	17
43.	<i>Motacilla indica</i>	✓	8	✓	7	-	-
44.	<i>Motacilla flava</i>	✓	13	✓	11	✓	12
45.	<i>Motacilla caspica</i>	✓	14	✓	13	✓	14

Table : 165. List of Frugivorous birds observed at Pathrakkadavu

Sl. No.	Species	Band A		Band B		Band C		Season
		Present	No	Present	No	Present	No	
1.	<i>Treron pompadora</i>	✓	86	✓	68	-	-	Throughout
2.	<i>Dacula aenea</i>	✓	64	✓	64	✓	52	"
3.	<i>Dacula badia</i>	✓	27	✓	16	✓	27	"
4.	<i>Columba elphinstonii</i>	✓	22	✓	22	✓	20	Sept-June
5.	<i>Psittacula krameri</i>	✓	47	✓	45	✓	47	Throughout
6.	<i>Psittacula cyanocephala</i>	✓	26	✓	22	✓	26	Sept-May
7.	<i>Loriculus vernalis</i>	✓	6	✓	6	-	-	Dec-May
8.	<i>Psittacula columboides</i>	✓	8	-	-	✓	8	Nov-April
9.	<i>Tockus griseus</i>	✓	35	✓	33	✓	35	Throughout
10.	<i>Buceros bicornis</i>	✓	25	✓	22	✓	25	Oct-June
11.	<i>Anthracoceros coronatus</i>	✓	23	✓	22	✓	23	Oct-June
12.	<i>Megalaima zeylanica</i>	✓	14	✓	19	✓	14	Oct-June
13.	<i>Gracula religiosa</i>	✓	34	✓	37	✓	34	Aug-May
14.	<i>Carpodacus erythrinus</i>	✓	85	✓	78	✓	87	Sept-March

Table : 166. List of Nectarivorous Birds at Pathrakkadavu

Sl. No.	Birds species	Band A		Band B		Band C		Season
		Present	No.	Present	No.	Present	No.	
1.	<i>Oriolus oriolus</i>	✓	24	✓	19	✓	19	Oct-March
2.	<i>Gracula regligiosa</i>	✓	34	✓	37	✓	34	Except June/Throughout
3.	<i>Irena puella</i>	✓	13	✓	21	-	-	Oct-August
4.	<i>Dicaeum agile</i>	✓	46	✓	24	✓	24	Sept-June
5.	<i>Dicaeum erythrorhynchos</i>	✓	71	✓	78	✓	78	Oct-May
6.	<i>Nectarinia zeylonica</i>	✓	4	✓	12	✓	48	Oct-May
7.	<i>Nectarinia minima</i>	✓	59	✓	65	✓	59	July-May
8.	<i>Nectarinia lotenia</i>	✓	34	✓	38	✓	38	Oct-May
9.	<i>Zosterpes palpebrosa</i>	✓	34	✓	32	✓	33	Oct-May

Table: 167 List of Granivorous Birds observed at Pathrakkadavu

Sl. No.	Birds species	Band A		Band B		Band C		Season
		Present	No.	Present	No.	Present	No.	
1.	<i>Columba livia</i>	-	-	✓	66	✓	174	Throughout
2.	<i>Streptopelia chinensis</i>	✓	31	✓	39	✓	31	Aug-May
3.	<i>Chalcophaps indica</i>	✓	12	✓	16	✓	12	Nov-May
4.	<i>Lonchura malabarica</i>	✓	32	✓	38	✓	32	Nov-May
5.	<i>Lonchura Kelaarti</i>	✓	46	✓	51	✓	50	Throughout
6.	<i>Lonchura punctulata</i>	✓	44	✓	52	✓	12	Sept-March
7.	<i>Perdicula erythrorhyncha</i>	✓	39	✓	29	-	-	

Table 168. List of Birds feeding on aquatic animals at Pathrakkadavu

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Ardeola grayii</i>	-	48	-	-	✓	110
2.	<i>Alcedo atthis</i>	✓	48	✓	19	✓	48
3.	<i>Halcyon smyrnensis</i>	✓	27	✓	164	✓	27
4.	<i>Bubo zeylonensis</i>	✓	5	✓	5	✓	5

Table: 169 List of Forest Birds at Pathrakkadavu

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Perdicula erythrorhyncha</i>	✓	39	✓	29	-	-
2.	<i>Galloperdix spadicea</i>	✓	26	✓	17	-	-
3.	<i>Gallus sonneratti</i>	✓	27	✓	31	-	-
4.	<i>Treron pompadora</i>	✓	86	✓	68	-	-
5.	<i>Dacula aenea</i>	✓	64	✓	64	✓	52
6.	<i>Dacula badia</i>	✓	27	✓	16	✓	27
7.	<i>Columba elphinstonii</i>	✓	22	✓	22	✓	22
8.	<i>Chalcophaps indica</i>	✓	12	✓	16	✓	12
9.	<i>Psittacula columboides</i>	✓	8	-	-	✓	8
10.	<i>Cuculus canorus</i>	✓	12	✓	13	✓	12
11.	<i>Asio flammeus</i>	✓	5	✓	5	-	-
12.	<i>Bubo zeylonensis</i>	✓	5	✓	6	✓	5
13.	<i>Glaucidium radiatum</i>	✓	7	-	-	✓	2
14.	<i>Chaetura sylvatica</i>	✓	80	-	-	-	-
15.	<i>Chaetura gigantea</i>	✓	27	✓	26	✓	27
16.	<i>Hemiprocne longipennis</i>	✓	9	✓	9	✓	9
17.	<i>Harpactes fasciatus</i>	✓	14	-	-	✓	14
18.	<i>Merops leschenaulti</i>	✓	21	✓	21	✓	21
19.	<i>Eurystomus orientalis</i>	✓	20	✓	20	✓	20
20.	<i>Buceros bicornis</i>	✓	25	✓	22	✓	25
21.	<i>Anthracoceros coronatus</i>	✓	23	✓	22	✓	23
22.	<i>Megalaima viridis</i>	✓	24	✓	24	✓	28
23.	<i>Picumnus innominatus</i>	✓	12	-	-	-	-

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
24.	<i>Dinopium javanense</i>	✓	19	✓	16	-	19
25.	<i>Dryocopus javensis</i>	✓	14	✓	-	-	-
26.	<i>Hemicircus canente</i>	✓	21	-	-	-	-
27.	<i>Hirundo concolor</i>	✓	14	✓	9	✓	14
28.	<i>Hirundo tahitica</i>	✓	18	✓	13	-	-
29.	<i>Lanius cristatus cristatus</i>	✓	8	-	-	-	-
30.	<i>Oriolus chinensis</i>	✓	9	✓	9	-	-
31.	<i>Dicrurus aeneus</i>	✓	11	-	-	-	-
32.	<i>Dendrocitta leucogastra</i>	✓	18	✓	16	-	-
33.	<i>Pericrocotus cinnamomeus</i>	✓	13	✓	14	-	-
34.	<i>Pericrocotus flammeus</i>	✓	40	✓	49	✓	45
35.	<i>Aegithina tiphia</i>	✓	14	✓	12	✓	14
36.	<i>Chloropsis aurifrons</i>	✓	10	✓	10	✓	10
37.	<i>Irena puella</i>	✓	13	✓	21	-	-
38.	<i>Pycnonotus melanicterus</i>	✓	13	✓	1	-	-
39.	<i>Hypsipetes indicus</i>	✓	56	✓	51	-	-
40.	<i>Hypsipetes medagascariensis</i>	✓	22	✓	22	-	-
41.	<i>Pellorneum ruficeps</i>	✓	13	✓	10	-	-
42.	<i>Pomatorhinus schisticeps</i>	✓	31	✓	30	-	-
43.	<i>Rhopocichla atriceps</i>	✓	28	✓	28	-	-
44.	<i>Turdoides subrufus</i>	✓	60	✓	60	✓	63
45.	<i>Muscicapa latirostris</i>	✓	6	✓	6	✓	6
46.	<i>Muscicapa muttui mutti</i>	✓	11	✓	11	✓	11
47.	<i>Muscicapa pallipes</i>	✓	18	✓	20	✓	15
48.	<i>Muscicapa albicaudata</i>	✓	15	✓	15	-	-
49.	<i>Parus xanthogenys</i>	✓	20	✓	16	-	-
50.	<i>Anthus hodgsoni</i>	✓	9	✓	10	✓	9
51.	<i>Motacilla indica</i>	✓	8	✓	7	-	-
52.	<i>Nectarinia minima</i>	✓	59	✓	15	✓	54
53.	<i>Zosterops palpebrosa</i>	✓	34	✓	32	✓	33
54.	<i>Lonchura Kelaarti</i>	✓	46	✓	51	✓	50
55.	<i>Carpodacus erythrinus</i>	✓	85	✓	78	✓	87

Table: 170 Seasonal Occurrence of Birds - Band A-Pathrakkadavu

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Mansoon
1	<i>Ardeola grayii</i>		6	5	5	4	2	1	1	2	4	4	8	6	22	4	22
2.	<i>Perdicula erythrorhyncha</i>		4	6	1	-	1	1	4	6	4	2	2	8	12	15	12
3	<i>Galloperdix spadicea</i>		2	2	3	4	1	-	-	2	4	4	2	2	12	2	12
4	<i>Gallus sonneratti</i>		2	2	4	4	3	2	2	1	1	2	2	2	15	5	7
5	<i>Treron pompadora</i>		10	12	12	8	7	2	2	1	2	4	12	14	49	5	32
6	<i>Dacula aenea</i>		3	5	6	8	6	2	1	1	6	4	8	10	28	4	32
7	<i>Dacula badia</i>		2	4	2	1	1	1	2	1	1	4	4	4	10	4	13
8	<i>Cloumba elphinstonii</i>		2	2	2	2	1	1	-	-	1	4	4	4	9	1	12
9	<i>Streptopelia chinensis</i>		4	4	2	2	1	-	-	4	3	1	4	6	13	4	14
10	<i>Chalcophaps inidica</i>		2	2	2	2	1	-	-	-	-	-	1	2	9	-	3
11	<i>Psittacula krameri</i>		6	4	6	5	3	2	-	1	4	4	6	6	24	3	20
12	<i>Psittacula cyanocephala</i>		3	4	4	3	2	-	-	-	2	2	3	3	16	-	10
13	<i>Loriculus vernalis</i>		1	1	1	1	1	-	-	-	-	-	-	1	5	-	1
14	<i>Psittacula columboides</i>		2	2	2	1	-	-	-	-	-	-	-	1	7	-	1
15	<i>Cuculus varius varius</i>		-	-	-	2	2	-	-	-	-	-	-	-	4	-	-
16	<i>Cuculus micropterus micropterus</i>		-	-	2	2	1	-	-	-	-	-	1	1	3	-	1
17	<i>Cuculus canorus</i>		1	1	2	2	1	-	-	-	-	2	2	1	7	-	5
18	<i>Eudynamys scolopaceae</i>		2	2	2	1	-	-	-	-	1	1	1	2	7	-	5
19	<i>Centropus sinensis</i>		4	4	2	2	1	-	-	-	1	2	4	2	15	-	9
20	<i>Tyto alba Stertens</i>		1	1	2	1	1	-	-	-	-	-	1	1	6	-	2
21	<i>Asio flammeus</i>		1	1	1	-	-	-	-	-	-	-	-	1	3	-	1
22	<i>Bubo zeylonensis</i>		1	1	1	-	-	-	-	-	-	-	-	1	4	-	1
23	<i>Glaucidium radiatum</i>		-	-	1	1	-	-	-	-	-	-	-	-	2	-	-
23A	<i>Athena brama brama</i>		1	1	1	1	-	-	-	-	1	1	-	1	4	-	3
24	<i>Chaetura sylvatica</i>		8	8	1	12	4	-	-	-	8	12	12	10	3	-	42
25	<i>Hemiprocne longipennis</i>		2	2	2	-	-	-	-	-	-	-	1	2	6	-	3

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Mansoon
26	<i>Chaetura gigantea indica</i>		2	4	4	4	2	1	1	1	2	2	2	2	16	3	8
27	<i>Harpactes faciatus</i>		1	2	2	2	2	-	-	1	1	1	1	1	9	1	4
28	<i>Alcedo atthis</i>		4	4	4	2	1	4	6	4	5	6	4	4	15	14	19
29	<i>Halcyon smyrnensis</i>		1	1	1	2	2	4	4	4	3	2	2	1	7	12	8
30	<i>Merops leschenaulti</i>		2	2	4	2	2	1	1	1	2	2	1	1	12	3	6
31	<i>Merops orientalis</i>		1	2	2	1	1	-	-	-	-	2	2	2	6	1	6
32	<i>Coracias benghalensis</i>		1	1	1	1	1	2	-	-	2	2	1	1	5	2	6
33	<i>Eurystomus orientalis</i>		2	2	2	2	2	1	1	1	1	2	2	2	1	3	7
33a	<i>Upupa epops</i>		3	3	4	4	2	-	-	-	1	3	3	4	16	-	11
34	<i>Tockus griseus</i>		4	4	4	6	2	1	1	1	2	2	4	4	20	3	12
35	<i>Buceros bicornis</i>		3	3	4	4	2	1	-	-	-	2	3	3	16	1	8
36	<i>Anthracoceros coronatus</i>		2	4	4	4	2	1	-	-	-	2	2	2	16	1	6
37	<i>Megalaima zeylanica</i>		2	2	1	2	2	1	-	-	-	2	2	2	7	1	6
38	<i>Megalaima viridis</i>		4	4	4	2	1	1	-	-	-	2	2	4	15	1	8
39	<i>Picumnus innominatus</i>		2	2	2	2	1	-	-	-	1	1	1	2	9	-	3
40	<i>Dinopium benghalense</i>		1	2	2	2	2	-	2	2	1	1	2	2	9	4	6
41	<i>Dinopium javanense</i>		2	2	2	2	2	1	1	1	1	2	1	2	10	3	6
42	<i>Dryocopus javensis</i>		2	3	3	2	1	-	-	-	-	1	1	1	11	-	3
43	<i>Hemicircus canente</i>		2	2	2	2	1	-	-	-	-	-	2	1	9	-	12
43a	<i>Pitta brachyura</i>		2	2	2	1	-	-	-	-	-	-	2	2	7	-	4
44	<i>Galerida malabarica</i>		4	3	4	5	2	-	-	-	-	2	2	2	18	-	6
45	<i>Hirundo concolor</i>		1	2	2	1	-	-	-	-	-	-	1	1	6	-	8
46	<i>Hirundo daurica</i>		3	2	3	2	1	-	-	-	-	-	2	2		-	4
47	<i>Hirundo tahitica</i>		1	1	4	4	4	1	-	-	-	-	2	1	14	1	3
48	<i>Lanius cristatus</i>		1	1	2	2	-	-	-	-	-	-	1	1	6	-	2
49	<i>Oriolus oriolus</i>		4	4	6	-	-	-	-	-	-	2	4	4	14	-	10
50	<i>Oriolus chinensis</i>		1	2	2	-	-	-	-	-	-	1	1	2	5	-	4
51	<i>Oriolus xanthornus</i>		1	1	2	3	1	1	-	-	-	2	1	1	8	1	4
52	<i>Dicrurus adsimilis</i>		5	6	4	7	4	4	1	4	4	5	2	4	26	13	11
53	<i>Dicrurus aeneus</i>		2	2	2	2	-	-	-	-	-	-	1	2	8	-	3
54	<i>Dicrurus</i>		3	3	2	2	2	1	4	4	4	2	3	4	12	9	13

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Mansoon
	<i>paradiseus</i>																
55	<i>Acridotheres tristis</i>		4	4	2	2	3	-	-	-	-	2	2	4	13	-	8
56	<i>Acridotheres fuscus</i>		3	2	2	4	6	8	4	4	10	12	14	10	17	16	46
57	<i>Gracula religiosa</i>		4	4	4	6	2	-	-	2	2	2	4	4	20	2	12
58	<i>Dendrocitta vagabunda</i>		1	1	2	1	2	-	-	-	1	2	2	2	7	-	7
59	<i>Dendrocitta leucogastra</i>		2	2	2	1	1	1	1	2	1	1	2	2	8	4	6
60	<i>Corvus macrorhynchos</i>		6	6	4	4	2	-	-	1	1	2	4	6	22	1	13
61	<i>Hemipus picatus</i>		2	2	4	4	2	1	1	-	-	1	2	2	14	2	5
62a	<i>Pericrocotus cinnamomeus</i>		1	2	-	-	2	2	-	-	1	1	2	2	5	2	6
63	<i>Pericrocotus flammeus</i>		4	4	2	2	2	4	4	3	2	4	5	4	14	11	15
64	<i>Aegithina tiphia</i>		2	2	2	1	1	-	-	-	-	2	2	2	8	-	6
65	<i>Chloropsis aurifrons</i>		2	2	2	2	1	-	-	-	-	-	1	1	9	-	1
66	<i>Irena puella</i>		-	1	2	2	1	-	-	-	-	3	3	2	5	-	8
67	<i>Pycnonotus melanicterus</i>		4	2	2	2	2	-	-	-	-	-	1	2	10	-	3
68	<i>Pycnonotus jocosus</i>		3	3	1	1	4	2	2	-	4	4	3	4	12	4	15
69	<i>Pycnonotus cafer</i>		2	2	4	4	2	2	2	1	-	-	2	3	16	7	5
70	<i>Hypsipetes indicus</i>		6	4	6	6	6	4	2	2	3	5	6	6	28	8	20
71	<i>Hypsipetes madagascariensis</i>		-	2	2	6	4	4	-	-	-	-	2	2	14	4	4
72	<i>Pellorneum ruficeps</i>		2	2	2	2	-	-	-	-	-	1	2	2	8	-	5
73	<i>Pomatorhinus schisticeps</i>		4	4	6	5	2	-	-	-	-	2	4	4	21	-	10
74	<i>Rhopocichla articeps</i>		2	-	-	5	5	4	6	2	-	-	-	2	14	12	2
75	<i>Turdoides subrufus</i>		8	6	7	6	8	4	-	-	-	6	7	7	36	4	20
76	<i>Turdoides striatus</i>		7	8	7	10	9	7	7	7	6	8	8	7	4	21	29
77	<i>Turdoides affinis</i>		1	2	4	4	6	6	2	-	-	-	2	2	15	8	4
78	<i>Muscicapa latirostris</i>		1	1	-	-	-	-	-	-	1	1	1	1	2	-	4
79	<i>Muscicapa muttui</i>		2	2	1	1	-	-	-	-	-	2	2	1	6	-	5
80	<i>Muscicapa pallipes</i>		1	1	2	2	2	2	2	2	2	2	-	-	8	6	4
81	<i>Muscicapa tickelliae</i>		2	4	4	5	4	6	6	-	-	4	4	2	19	12	10
82	<i>Muscicapa</i>		1	1	2	2	4	1	-	-	-	-	2	2	1	1	4

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Mansoon
	<i>albicaudata</i>																
83	<i>Terpsiphone paradisi</i>		2	2	2	1	1	-	-	-	3	2	2	1	8	-	8
84	<i>Rhipidura aureola</i>		2	2	4	2	1	2	-	1	1	3	2	2	11	3	8
85	<i>Phyllsocolopus affinis</i>		1	-	-	-	-	-	-	-	-	1	1	1	1	-	3
85a	<i>Prinia socialis</i>		1	2	2	2	-	-	-	-	-	2	1	1	7	-	4
86	<i>Acrocephalus stentoreus</i>		1	-	-	-	-	1	2	2	2	2	-	-	1	5	6
87	<i>Saxicoloides saularis</i>		2	2	2	1	1	-	-	-	3	2	2	1	8	-	8
88	<i>Saxicola caprata</i>		1	2	2	2	2	1	1	1	2	2	1	1	9	3	6
89	<i>Monticola solitarius</i>		2	2	4	-	-	-	-	-	-	-	2	3	8	-	5
90	<i>Myiophoneus horsfieldii</i>		1	4	4	4	4	1	-	-	-	2	2	2	13	1	6
91	<i>Zoothera citrina</i>		2	2	1	-	-	2	2	1	3	3	2	1	5	5	9
92	<i>Parus major</i>		3	3	3	-	2	1	1	-	2	-	1	1	11	2	4
93	<i>Parus xanthogenys</i>		-	1	-	1	2	2	4	4	4	2	-	-	4	10	6
94	<i>Anthus hodgsoni</i>		2	1	-	-	-	-	-	-	1	1	2	2	3	-	6
95	<i>Motacilla indica</i>		1	1	-	-	-	-	-	-	-	-	2	2	2	-	6
96	<i>Motacilla flava</i>		2	2	-	-	-	-	-	-	1	3	3	2	4	-	9
97	<i>Motacilla capsica</i>		1	2	2	1	-	-	-	-	2	2	2	2	6	-	8
98	<i>Dicaeum agile</i>		4	4	3	3	4	2	-	-	6	8	8	4	18	2	26
99	<i>Dicaeum erythrorhynchos</i>		8	10	11	14	12	-	-	-	-	4	6	6	55	-	16
100	<i>Nectarinia zeylonica</i>		4	4	10	8	4	-	-	-	-	2	4	5	30	-	11
101	<i>Nectarinia minima</i>		4	5	8	8	6	-	2	3	3	6	7	7	31	5	23
102	<i>Nectarinia lotenia</i>		4	6	5	6	8	-	-	-	-	2	2	1	29	-	5
103	<i>Zosterpes palpebrosa</i>		-	2	6	6	8	-	-	-	-	2	5	5	22	-	12
104	<i>Lonchura malabarica</i>		4	6	4	4	2	-	-	-	-	-	6	6	20	-	1
105	<i>Lonchura kelaarti</i>		4	4	8	6	6	2	2	6	4	4	-	-	28	10	8
106	<i>Lonchura punctulata</i>		10	10	4	-	-	-	-	-	2	4	6	8	24	-	20
107	<i>Carpodacus erythrinus</i>		14	15	12	-	-	-	-	-	8	10	12	14	41	-	44

Table: 171 Seasonal Occurrence of Birds - Band B- Pathrakkadvu (Kunthipuzha)

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Mansoon
1	<i>Bubulcus ibis</i>		8	8	10	6	4	12	14	14	18	15	12	12	36	40	57
2	<i>Vanellus indicus</i>		8	9	13	12	15	6	-	4	8	8	5	10	57	10	32
3	<i>Vanellus malabaricus</i>		-	-	2	2	2	1	-	-	-	-	2	3	8	2	6
4	<i>Perdica erythrorhyncha</i>		4	4	1	-	1	1	2	4	4	2	2	4	10	7	12
5	<i>Galloperdix spadicea</i>		1	1	2	3	1	-	-	2	2	2	2	1	8	2	7
6	<i>Gallus sonneratti</i>		4	2	4	4	3	2	2	1	1	2	2	4	17	5	9
7	<i>Trenon pompadora</i>		8	10	8	8	5	2	2	1	2	2	6	10	39	5	24
8	<i>Dacula aenea</i>		3	5	6	8	6	2	1	1	6	8	8	10	28	4	32
9	<i>Dacula badia</i>		2	2	1	1	-	-	2	1	1	2	3	3	6	2	8
10	<i>Cloumba livia</i>		8	6	5	5	4	2	2	2	6	6	10	10	28	6	32
11	<i>Cloumba elphinstonii</i>		2	2	2	2	1	1	-	-	1	4	4	4	9	1	12
12	<i>Streptopelia chinensis</i>		4	4	4	4	2	-	-	4	3	2	6	6	18	4	17
13	<i>Chalcophaps inidica</i>		2	2	3	3	2	-	-	-	-	1	1	2	12	-	4
14	<i>Psittacula krameri</i>		4	4	3	5	3	1	-	1	4	6	8	6	19	2	24
15	<i>Psittacula cyanocephala</i>		2	4	4	2	2	-	-	-	2	2	2	2	14	-	8
16	<i>Loriculus vernalis</i>		1	1	1	-	-	-	-	-	1	-	1	1	4	-	2
17	<i>Cuculus micropterus micropterus</i>		1	2	1	1	-	-	-	-	-	1	1	1	5	-	3
18	<i>Cuculus canorus</i>		1	1	2	2	1	-	-	-	-	2	2	2	7	-	6
19	<i>Eudynamys sclopacea</i>		2	2	2	1	-	-	-	-	1	2	2	2	7	-	7
20	<i>Centropus sinensis</i>		4	4	2	2	1	-	-	-	2	2	2	2	13	-	8
21	<i>Tyto alba stertens</i>		1	1	2	1	1	-	-	-	-	-	1	1	6	-	2
22	<i>Asio flammeus</i>		1	1	1	-	-	-	-	-	-	-	-	1	3	-	1
23	<i>Bubo zeylonensis</i>		1	1	1	1	-	-	-	-	-	-	-	1	4	-	1
24	<i>Cypsiurus parvus</i>		2	2	3	3	2	2	1	-	-	4	4	4	12	3	12
25	<i>Hemiprocne longipennis</i>		2	2	2	-	-	-	-	-	-	-	1	2	6	-	3
26	<i>Chaetura gigantea indica</i>		2	4	4	4	2	1	1	1	1	1	1	2	16	3	7

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Mansoon
27	<i>Alcedo atthis</i>		2	2	2	2	1	1	1	1	2	2	1	2	9	3	7
28	<i>Halcyon smyrnensis</i>		1	1	1	2	1	1	1	1	2	2	2	1	6	3	7
29	<i>Merops leschenaulti</i>		2	2	4	2	2	1	1	1	2	2	1	1	12	3	6
29a	<i>Merops orientalis</i>		1	1	1	1	1	-	-	-	-	1	1	1	5	-	3
30	<i>Coracias benghalensis</i>		1	1	1	1	1	2	-	-	2	2	1	1	5	2	6
31	<i>Eurystomus orientalis</i>		2	2	2	2	2	1	1	1	1	2	2	2	10	3	7
32	<i>Upupa epops</i>		4	4	2	2	2	-	-	-	-	1	2	2	14	-	5
33	<i>Tockus griseus</i>		4	4	4	6	2	1	1	0	1	2	4	4	20	2	11
34	<i>Buceros bicornis</i>		3	3	4	4	2	-	-	-	-	1		3	16	1	6
35	<i>Anthracoceros coronatus</i>		2	4	4	4	2	1	-	-	-	2	2	2	16	-	6
36	<i>Megalaima zeylanica</i>		2	2	2	3	2	1	-	-	-	2	2	3	11	1	7
37	<i>Megalaima viridis</i>		4	4	4	2	1	1	-	-	-	2	2	4	15	1	8
38	<i>Dinopium benghalense</i>		1	-	-	2	2	-	2	-	1	1	2	2	8	3	6
39	<i>Dinopium javanense</i>		-	-	1	2	2	1	1	1	2	2	2	5	10	3	8
40	<i>Dryocopus javanense</i>		2	2	2	2	-	-	-	-	-	2	2	1	8	-	35
41	<i>Pitta brachyura</i>		3	3	2	2	-	-	-	-	-	-	2	2	10	-	4
42	<i>Galerida malabarica</i>		4	2	24	4	2	-	-	-	1	2	3	3	16	-	9
43	<i>Hirundo concolor</i>		1	2	2	1	-	-	-	-	-	1	1	1	6	-	3
44	<i>Hirundo daurica</i>		2	2	2	2	1	-	-	-	-	1	2	2	9	-	3
45	<i>Hirundo tahitika</i>		1	1	2	2	2	1	-	-	-	-	2	2	8	1	4
46	<i>Oriolus oriolus</i>		4	4	4	-	-	-	-	-	-	2	2	3	12	-	7
47	<i>Oriolus chinensis</i>		1	2	2	-	-	-	-	-	-	1	1	2	5	-	4
48	<i>Oriolus xanthornus</i>		1	2	2	3	2	1	-	-	-	1	1	2	10	1	4
49	<i>Dicrurus adsimilis</i>		4	4	4	6	4	4	1	2	2	5	3	4	22	2	12
50	<i>Dicrurus Paradiseus</i>		3	4	4	3	2	1	2	2	2	2	3	4	16	5	11
51	<i>Acridotheres tristis</i>		4	4	4	4	2	-	-	-	2	2	2	6	14	-	12
52	<i>Acridotheres fuscus</i>		3	2	2	2	4	6	6	4	10	14	14	12	13	16	54

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Mansoon
53	<i>Gracula religiosa</i>		2	2	6	6	4	-	-	1	2	4	4	6	20		16
54	<i>Dendrocitta vagabunda</i>		1	1	2	1	2	-	-	-	1	2	2	2	7	-	7
55	<i>Dendrocitta leucogastra</i>		2	2	2	1	1	1	1	2	1	1	1	1	8	4	4
56	<i>Corvus macrorhynchos</i>		3	4	4	4	3	-	-	1	2	2	4	4	8	1	12
56a	<i>Hemipus picatus</i>		2	2	2	4	3	1	-	-	1	2	2		13		5
57	<i>Tephrodornis pondicerianus</i>		3	3	2	2	1	1	1	-	-	2	2	2	11	2	6
58	<i>Coracina melanoptera</i>		2	2	4	4	1	-	-	-	2	2	2	2	13	-	8
59	<i>Pericrocotus cinnamomeus</i>		1	2	2	-	-	1	2	-	-	1	2	2	5	3	6
60	<i>Pericrocotus flammeus</i>		6	6	2	2	1	4	6	3	2	6	5	6	17	13	19
61	<i>Aegithina tiphia</i>		2	2	1	1	1	-	-	-	-	1	2	2	7	-	5
62	<i>Chloropsis aurifrons</i>		2	2	2	2	1	-	-	-	-	-	1	1	9	-	1
63	<i>Irena puella</i>		4	2	2	2	1	-	-	-	-	4	3	3	11	-	10
64	<i>Pycnonotus melanicterus</i>		4	2	2	2	2	-	-	-	-	-	1	2	10	-	3
65	<i>Pycnonotus jocosus</i>		3	3	1	1	4	2	2	-	4	4	3	4	12	4	15
66	<i>Pycnonotus cafer</i>		2	2	4	4	2	2	2	1	-	-	2	3	16	7	5
67	<i>Hypsipetes indicus</i>		4	4	4	6	6	4	2	2	3	5	5	4	24	8	19
68	<i>Hypsipetes madagascariensis</i>		-	2	2	6	4	4	-	-	-	-	2	2	14	4	4
69	<i>Pellorneum ruficeps</i>		2	2	2	1	-	-	-	-	-	1	1	1	7	-	3
70	<i>Pomatorhinus schisticeps</i>		4	4	6	5	2	-	-	-	-	2	4	3	21	-	9
71	<i>Rhopocichla aiticeps</i>		2	-	2	5	5	4	6	2	-	-	-	2	14	12	2
72	<i>Turdoides subrufus</i>		8	6	7	6	8	4	-	-	-	6	7	7	36	4	20
73	<i>Turdoides striatus</i>		7	8	7	10	9	7	7	7	6	8	8	7	4	21	29
74	<i>Turdoides affinis</i>		1	2	4	4	6	6	2	-	-	-	2	2	15	8	4
75	<i>Muscicapa latirostris</i>		1	1	-	-	-	-	-	-	1	1	1	1	2	-	4
76	<i>Muscicapa muttui</i>		2	2	1	1	-	-	-	-	-	2	2	1	6	-	5
77	<i>Muscicapa pallipes</i>		1	2	2	2	2	2	2	3	1	3	-	-	9	7	4

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Mansoon
78	<i>Muscicapa tickelliae</i>		2	4	4	5	4	6	6	-	-	4	4	2	19	12	10
79	<i>Muscicapa albicaudata</i>		1	1	2	2	4	1	-	-	-	-	2	2	10	1	4
80	<i>Terpsiphone paradisi</i>		2	2	2	1	1	-	-	-	3	2	2	1	8	-	8
81	<i>Rhipidura aureola</i>		2	2	4	2	1	2	-	1	1	3	2	2	11	3	8
82	<i>Phyllocopus affinis</i>		1	-	-	-	-	-	-	-	-	1	1	1	1	-	3
83	<i>Prinia socialis</i>		1	1	1	1	-	-	-	-	-	2	2	2	4	-	6
84	<i>Acrocephalus stentorius</i>		1	1	-	-	-	1	2	2	1	1	-	-	2	5	4
85	<i>Saxicoloides saularis</i>		2	2	2	2	1	-	-	-	3	3	2	1	9	-	9
86	<i>Saxicola caprata</i>		2	2	2	2	2	1	1	2	2	2	1	1	10	4	6
87	<i>Monticola solitarius</i>		2	2	4	-	-	-	-	-	-	1	2	2	8	-	5
88	<i>Myiophonus horsfieldii</i>		1	1	2	2	2	1	-	-	-	2	2	1	8	1	5
89	<i>Zosterops citrina</i>		2	2	1	-	-	2	2	1	2	2	2	1	5	5	6
90	<i>Parus major</i>		3	2	2	1	2	2	2	-	2	-	1	1	1	4	4
91	<i>Parus xanthogenys</i>		-	2	1	1	2	2	3	3	2	2	-	-	6	8	2
92	<i>Anthus hodgsoni</i>		2	1	1	-	-	-	-	-	1	1	2	2	4	-	6
93	<i>Motacilla indica</i>		1	1	-	-	-	-	-	-	-	2	2	1	2	-	5
94	<i>Motacilla flava</i>		2	1	1	-	-	-	-	-	1	2	2	2	4	-	7
95	<i>Motacilla capsica</i>		1	2	2	2	-	-	-	-	1	1	2	2	7	-	6
96	<i>Dicaeum agile</i>		4	4	4	4	4	2	-	-	-	-	1	1	20	2	2
97	<i>Dicaeum erythrorhynchos</i>		10	10	12	12	12	-	-	-	-	4	8	8	58	-	20
98	<i>Nectarinia zeylonica</i>		6	6	10	9	7	-	-	-	-	3	6	5	38	-	14
99	<i>Nectarinia minima</i>		5	5	8	8	8	-	2	4	3	6	8	8	34	6	25
100	<i>Nectarinia lotenia</i>		5	6	4	8	8	-	-	-	-	2	3	2	31	-	7
101	<i>Zosterops palpebrosa</i>		-	2	4	6	6	-	-	-	-	4	5	5	18	-	14
102	<i>Lonchura malabarica</i>		4	4	8	8	4	-	-	-	-	-	6	4	28	-	10
103	<i>Lonchura kelaarti</i>		4	6	8	8	6	1	2	6	6	4	-	-	32	9	10
104	<i>Lonchura punctulata</i>		10	12	6	-	-	-	-	-	2	6	8	8	28	-	24
105	<i>Carpodacus erythrinus</i>		14	12	10	-	-	-	-	-	6	12	12	12	36	-	42

Table: 172 Seasonal Occurrence of Birds- Band C– Pathrakkadvu

Sl. No.	Bird species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Mansoon
1	<i>Ardeola grayii</i>	4	6	4	4	3	8	8	10	14	16	15	18	21	26	23
2	<i>Egretta intermedia</i>	6	6	6	2	2	-	-	-	-	1	4	4	22	-	9
3	<i>Bubulcus ibis</i>	8	11	16	18	10	4	-	4	7	9	12	18	63	8	46
4	<i>Elanus caeruleus</i>	4	4	1	1	3	-	-	-	2	2	4	4	3	-	12
5	<i>Haliastur indus</i>	1	1	1	2	2	-	-	2	2	3	3	4	7	2	12
6	<i>Accipiter badius</i>	2	2	1	1	1	-	-	-	-	1	1	2	7	-	4
7	<i>Spilornis cheela</i>	2	2	2	1	1	-	-	-	1	1	1	2	8	-	5
8	<i>Falco perigrinus</i>	1	2	2	-	-	-	-	-	-	1	2	2	5	-	5
9	<i>Vanellus indicus</i>	1	1	1	-	2	2	-	-	1	2	2	1	5	2	6
10	<i>Vanellus malabaricus</i>	-	-	2	1	1	1	-	-	-	-	-	2	4	1	2
11	<i>Dacula aenea</i>	3	5	6	4	6	2	1	1	4	6	6	8	24	4	24
12	<i>Columba livia</i>	15	17	20	22	12	8	6	6	12	16	16	22	86	20	68
13	<i>Dacula badia</i>	2	4	2	1	1	1	2	1	1	4	4	4	10	4	13
14	<i>Columba elphinstonii</i>	2	2	1	1	1	1	-	-	2	3	4	4	6	1	13
15	<i>Streptopelia chinensis</i>	4	4	2	2	1	-	-	4	3	1	4	6	13	4	14
16	<i>Chalcophaps inidica</i>	2	2	2	2	1	-	-	-	-	-	1	2	9	-	3
17	<i>Psittacula krameri</i>	6	4	6	5	3	2	-	1	4	4	6	6	24	3	20
18	<i>Psittacula cyanocephala</i>	3	4	4	3	2	-	-	-	2	2	3	3	16	-	10
19	<i>Psittacula columboides</i>	2	2	2	1	-	-	-	-	-	-	-	1	7	-	1
20	<i>Cuculus varius varius</i>	-	-	-	2	2	-	-	-	-	-	-	-	4	-	-
21	<i>Cuculus micropterus</i>	-	-	2	2	1	-	-	-	-	-	1	1	3	-	1
22	<i>Cuculus canorus</i>	1	1	2	2	1	-	-	-	-	2	2	1	7	-	5
23	<i>Eudynamys sclopacea</i>	2	2	2	1	-	-	-	-	1	1	1	2	7	-	5
24	<i>Centropus sinensis</i>	4	4	2	2	1	-	-	-	1	2	4	2	15	-	9
25	<i>Tyto alba</i>	1	1	2	1	1	-	-	-	-	-	1	1	6	-	2
26	<i>Asio flammeus</i>	1	1	1	-	-	-	-	-	-	-	-	1	3	-	1
27	<i>Bubo zeylonensis</i>	1	1	1	-	-	-	-	-	-	-	-	1	4	-	1
28	<i>Glaucidium radiatum</i>	-	-	1	1	-	-	-	-	-	-	-	-	2	-	-
29	<i>Hemiprocne longipennis</i>	2	2	2	-	-	-	-	-	-	-	1	2	6	-	3

Sl. No.	Bird species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Mansoon
30	<i>Chaetura gigantea indica</i>	2	4	4	4	2	1	1	1	2	2	2	2	16	3	8
31	<i>Harpactes faciatus</i>	1	2	2	2	2	-	-	1	1	1	1	1	9	1	4
32	<i>Alcedo atthis</i>	4	4	4	2	1	4	6	4	5	6	4	4	15	14	19
33	<i>Halcyon smyrnensis</i>	1	1	1	2	2	4	4	4	3	2	2	1	7	12	8
33	<i>Merops leschenaulti</i>	2	2	4	2	2	1	1	1	2	2	1	1	12	3	6
33a	<i>Merops orientalis</i>	1	1	1	1	-	-	-	1	-	1	1	1	4	1	3
34	<i>Coracias benghalensis</i>	1	1	1	1	1	2	-	-	2	2	1	1	5	2	6
35	<i>Eurystomus orientalis</i>	2	2	2	2	2	1	1	1	1	2	2	2	10	3	7
36	<i>Upupa epops</i>	4	4	2	1	1	1	-	-	-	2	2	4	12	1	8
37	<i>Tockus griseus</i>	4	4	4	6	2	1	1	1	2	2	4	4	20	3	12
38	<i>Buceros bicornis</i>	3	3	4	4	2	1	-	-	-	2	3	3	16	1	8
39	<i>Anthracoceros coronatus</i>	2	4	4	4	2	1	-	-	-	2	2	2	16	1	6
40	<i>Megalaima zeylanica</i>	2	2	1	2	2	1	-	-	-	2	2	2	7	1	6
41	<i>Megalaima viridis</i>	4	4	4	2	1	1	-	-	-	4	4	4	15	1	12
42	<i>Dinopium benghalense</i>	1	1	1	2	2	-	2	2	1	1	-	-	7	4	6
43	<i>Dinopium javanense</i>	2	2	2	2	2	1	1	1	1	2	1	2	10	3	6
44	<i>Galerida malabarica</i>	2	3	2	3	2	-	-	-	-	1	1	3	12	-	5
45	<i>Hirundo concolor</i>	1	2	2	1	-	-	-	-	-	-	1	1	6	-	8
46	<i>Hirundo daurica</i>	3	2	3	2	1	-	-	-	-	-	2	2	11	-	4
47	<i>Oriolus oriolus</i>	2	3	6	-	-	-	-	-	-	2	3	3	11	-	8
48	<i>Oriolus xanthornus</i>	1	1	2	3	1	1	-	-	-	2	1	1	8	1	4
49	<i>Dicrurus adsimilis</i>	8	6	4	8	4	4	1	6	6	5	4	4	3	11	16
50	<i>Dicrurus Paradiseus</i>	3	3	2	2	2	1	4	4	4	2	3	4	12	9	13
51	<i>Acridotherus tristis</i>	4	4	4	4	3	-	-	-	-	3	3	4	17	-	10
52	<i>Acridotherus fuscus</i>	3	3	3	4	4	6	4	4	11	12	18	1	17	14	50
53	<i>Gracula religiosa</i>	4	4	4	6	2	7	-	2	2	2	4	4	20	2	12
54	<i>Dendrocitta vagabunda</i>	1	1	2	1	2	-	-	-	1	2	2	2	7	-	7
55	<i>Corvus</i>	8	8	12	14	4	-	-	2	2	6	6	6	42	2	20

Sl. No.	Bird species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Mansoon
	<i>macrorhynchus</i>															
56	<i>Hemipus picactus</i>	2	2	4	4	2	1	1	-	-	1	2	2	14	2	5
57	<i>Tephrodornis pondiserianus</i>	2	2	3	3	1	1	1	-	-	2	2	2	11	2	6
58	<i>Coracina melanoptera</i>	2	3	4	4	2	-	-	-	-	1	2	2	15	-	5
59	<i>Pericrocotus flammeus</i>	4	4	4	3	2	4	4	2	2	6	5	5	17	10	18
60	<i>Aegithina tiphia</i>	2	2	2	1	1	-	-	-	-	2	2	2	8	-	6
61	<i>Chloropsis aurifrons</i>	2	2	2	2	1	-	-	-	-	-	1	1	9	-	1
62	<i>Pycnonotus jocosus</i>	6	6	2	2	4	2	1	-	5	5	4	4	20	3	18
63	<i>Pycnonotus cafer</i>	4	4	4	4	2	2	2	1	-	-	2	4	18	7	5
64	<i>Turdoides subrufus</i>	8	6	8	8	8	4	-	-	-	4	7	8	38	4	21
65	<i>Turdoides striatus</i>	8	8	6	12	9	7	8	7	6	8	8	8	48	22	30
66	<i>Turdoides affinis</i>	1	2	4	4	I.	6	6	2	-	-	2	2	15	8	4
67	<i>Muscicapa latirostris</i>	1	1	-	-	-	-	-	-	1	1	1	1	2	-	4
68	<i>Muscicapa muttui</i>	2	2	1	1	-	-	-	-	-	2	2	1	6	-	5
69	<i>Muscicapa pallipes</i>	1	2	2	2	2	1	1	2	1	1	-	-	9	4	2
70	<i>Muscicapa tickelliae</i>	4	4	4	5	4	6	8	-	-	6	6	2	21	14	14
71	<i>Terpsiphone paradisi</i>	2	2	2	1	1	-	-	-	3	2	2	1	8	-	8
72	<i>Rhipidura aureola</i>	2	2	4	2	1	2	-	2	2	3	2	2	11	4	9
73	<i>Phyllocopus affinis</i>	1	-	-	-	-	-	-	-	II.	1	1	1	1	-	3
74	<i>Prinia socialis</i>	1	1	1	2	-	-	-	-	-	2	2	1	6	-	5
75	<i>Saxicoloides saularis</i>	2	2	2	1	1	-	-	-	3	2	2	1	8	-	8
76	<i>Monticola solitarius</i>	2	2	2	-	-	-	-	-	-	1	2	3	7	-	6
77	<i>Myiophoneus horsfieldii</i>	1	2	2	2	4	-	-	-	-	2	2	2	11	-	6
78	<i>Zoothera citrina</i>	2	2	1	-	-	2	2	1	3	3	2	1	5	5	9
79	<i>Parus major</i>	3	3	3	-	2	1	1	-	2	-	1	1	11	2	4
80	<i>Anthus hodgsoni</i>	2	1	-	-	-	-	-	-	1	1	2	2	3	-	6
81	<i>Motacilla flava</i>	2	2	1	-	-	-	-	-	1	2	2	2	5	-	7
82	<i>Motacilla capsica</i>	1	2	2	1	-	-	-	-	2	2	2	2	6	-	8
83	<i>Dicaeum agile</i>	4	4	4	6	4	2	-	-	-	-	-	2	22	-	2
84	<i>Dicaeum</i>	10	12	10	12	12	-	-	-	2	4	8	8	56	-	22

Sl. No.	Bird species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Mansoon
	<i>erythrorhynchos</i>															
85	<i>Nectarinia zeylonica</i>	4	6	10	8	6	-	-	-	-	4	4	5	34	-	14
86	<i>Nectarinia minima</i>	4	6	8	8	4	-	2	3	4	6	7	7	30	5	24
87	<i>Nectarinia lotenia</i>	4	6	5	6	8	-	-	-	-	4	2	2	30	-	8
88	<i>Zosterops palpebrosa</i>	-	2	4	8	8	-	-	-	-	-2	5	4	22	-	11
89	<i>Lonchura malabarica</i>	4	6	4	4	2	-	-	-	-	-	6	6	20	-	12
90	<i>Lonchura kelaarti</i>	6	6	8	6	4	2	2	6	6	4	-	-	30	10	10
91	<i>Lonchura punctulata</i>	10	10	8	-	-	-	-	-	2	6	8	8	28	-	24
92	<i>Carpodacus erythrinus</i>	14	15	12	-	-	-	-	-	10	10	12	14	41	-	46

Table: 173 Birds observed at Thootha – Kunthi River- Site – II

Sl. No.	Bird Species	Common Name	Status	Order/Family
1.	<i>Phalacrocorax niger</i>	Little cormorant	R	Phalacrocoracidae
2.	<i>Anhinga melanogaster</i>	Darter	R	„
3.	<i>Ardeola grayii</i>	Pond heron	R	Ciconiiformes/ Ardeidae
4.	<i>Ardea alba</i>	Large egret	R	„ „
5.	<i>Ardea cineria</i>	Grey egret	R	„ „
6.	<i>Egretta intermedia</i>	Median egret	R	„ „
7.	<i>Egretta garzetta</i>	Little egret	R	„ „
8.	<i>Ixobrychus cinnamomeus</i>	Yellow bittern	R	„ „
9.	<i>Anhinga rufa</i>	Dunlin	R	„ „
10	<i>Bubulcus ibis</i>	Cattle egret	R	„
11.	<i>Milvus migrans</i>	Common pariah kite	R	Falconiformes/ Accipitridae
12	<i>Haliastur indus</i>	Brahmni kite	R	„ „
13	<i>Spizaetus cirrhatus</i>	Indain crested hawk		„ „
14	<i>Accipiter badius</i>	Ceylon shikra	R	„ „
15.	<i>Amaurornis phoenicurus</i>	White breasted water hen	R	„ „
16.	<i>Metopidius indicus</i>	Bronze winged jacana	R	„ „
17.	<i>Vanellus indicus</i>	Red wattled lapwing	R	Charadriiformes/Charadriidae

Sl. No.	Bird Species	Common Name	Status	Order/Family
18.	<i>Vanellus malabaricus</i>	Yellow wattled lapwing	R	„
19	<i>Columba livia</i>	Blue rock pigeon	R	Columbiformes/ Columbidae
20	<i>Streptopelia chinensis</i>	Spotted dove	R	„ „
21	<i>Chalcophaps indica</i>	Emerald dove	R	„ „
22	<i>Psittacula krameri</i>	Rose ringed parakeet	R	Psittaciformes/ Psittacidae
23	<i>Psittacula cyanocephala</i>	Blossom headed parakeet	R	„ „
24	<i>Loriculus vernalis</i>	Malabar lorikeet	R	„ „
25	<i>Cuculus varius</i>	Common hawk cuckoo	R	Cuculiformes/Cuculidae
26	<i>Cuculus micropterus</i>	The Indian cuckoo	R	„ „
27	<i>Cuculus canorus</i>	The cuckoo	R	„
28	<i>Eudynamis scolopacea</i>	Indian koel	R	„
29	<i>Tyto alba</i>	Barn owl	R	Strigiformes/Strigidae
30	<i>Apus affinis</i>	House swift	R	Apodiformes/Apodidae
31	<i>Cypsiurus parvus</i>	Palm swift	R	„
32	<i>Alcedo atthis</i>	Ceylon kingfisher	R	Coraciiformes/ Alcedinidae
33	<i>Ceryl rudis</i>	Pied kingfisher	R	Coraciiformes/ Alcedinidae
34	<i>Halcyon smyrnensis</i>	White breasted kingfisher	R	Coraciiformes/ Alcedinidae
35	<i>Merops orientalis</i>	Small green bee-eater	R	„ /Meropidae
36	<i>Merops philippinus</i>	Blue tailed bee-eater	R	„ „
37	<i>Coracias benghalensis</i>	South Indian roller	R	Coraciiformes/Coraciidae
38	<i>Upupa epops</i>	Ceylon hoopoe	R	„ / Upupidae
39	<i>Tockus griseus griseus</i>	Malabar grey-hornbill	R	„ /Bucerotidae
40	<i>Anthracoceros coronatus</i>	Malabar piedhornbill	R	„ / Bucerotidae
41	<i>Ocyrceros birostris</i>	Malabar piedhornbill	R	„ „
42	<i>Megalaima</i>	Copper smith bird	R	Piciformes/

Sl. No.	Bird Species	Common Name	Status	Order/Family
	<i>haemacephala</i>			Capitonidae
43	<i>Megalaima zeylanica</i>	Large green barbet	R	„ „
44	<i>Dinopium benghalensis</i>	Malabar golden backed woodpecker	R	„ „
45.	<i>Pitta brachyura</i>	Indian Pitta	R	Passeriformes/ Pittidae
46	<i>Galerida malabarica</i>	Malabar crested lark	R	Passeriformes/ Alaudidae
47	<i>Hirundo daurica</i>	Red rumped swallow	R	Passeriformes/ Hirundinidae
48	<i>Hirundo rustica</i>	Common eastern swallow	R	„ „
49	<i>Oriolus oriolus</i>	Black headed oriole	R	„ / Oriolidae
50	<i>Oriolus xanthornus</i>	Indian oriole	R	„ „
51	<i>Dicrurus adsimilis</i>	Balck drongo	R	Passeriformes/ Dicruridae
52	<i>Dicrurus paradiseus</i>	Racket tailed drongo	R	„ „
53	<i>Artamus fuscus</i>	Ashy swallow shrike	R	„ „
54	<i>Acridotheres tristis</i>	Common myna	R	„ /Sturnidae
55	<i>Acridotheres fuscus</i>	Jungle myna	R	„ „
56	<i>Sternus malabaricus blyth</i>	Blyths myna	R	„ „
57	<i>Gracula religiosa</i>	Indian hill myna	R	„ „
58	<i>Dendrocitta vagabunda</i>	Tree pie	R	„ /Corvidae
59	<i>Corvus macrorhynchos</i>	Jungle crow	R	Passeriformes /Corvidae
60	<i>Corvus splendens</i>	House crow	R	„ „
61	<i>Tephrodornis pondicerianus</i>	Common wood shrike	R	„ „
62	<i>Pericrocotus cinnamomeus</i>	Malabar small minivet	R	„ / Campephagidae
63	<i>Aegithina tiphia</i>	Ceylon iora	R	„ /Irenidae
64	<i>Chloropsis aurifrons</i>	Gold fronted chloropsis	R	„ „
65	<i>Pycnonotus jocosus</i>	Red whiskered bulbul	R	„ /Pycnonotidae
66	<i>Pycnonotus cafer</i>	Red vented bulbul	R	„ /Pycnonotidae

Sl. No.	Bird Species	Common Name	Status	Order/Family
67	<i>Turdoides affinis</i>	White headed babbler	R	„/Muscicapidae
68	<i>Turdoides striatus</i>	Jungle babbler	R	„ „
69	<i>Muscicapa muttui</i>	Brown fly catcher	R	„ /Muscicapidae
70	<i>Muscicapa tickelliae</i>	Tickle’s blue fly catcher	R	„ „
71	<i>Terpsiphone paradise</i>	Paradise fly catcher	R	„ „
72	<i>Rhipidura aureola</i>	White browed fantail fly catcher	R	„ „
73	<i>Prinia socialis</i>	Ashy wren warbler	R	„ „
74	<i>Phyllocopus affinis</i>	Tickle’s blue fly catcher	M	„ „
75	<i>Phyllocopus trochiloides</i>	Greenish leaf warbler	M	„ „
76	<i>Acrocephalus stentoreus</i>	Indian great red warbler	R	„ „
77	<i>Cisticola juncidis</i>	Streaked warbler	R	„
78	<i>Orthotomus sutorius</i>	Tailor bird	R	„ / Musciapidae
79	<i>Saxicoloides fulicata</i>	Indian robin	R	„ „
80	<i>Copsychus saularis</i>	Magpie robin	R	„ „
81	<i>Monticola solitarius</i>	Blue rock thrush	M	„ „
82	<i>Myiophoneus horsfieldi</i>	Malabar whistling thrush	R	„ „
83	<i>Zoothere citrina</i>	White throated ground thrush	R	„ /Motacillidae
84	<i>Parus major</i>	Grey tit	R	„ „
85.	<i>Anthus hodgsoni</i>	Tree pipit	M	„ „
86	<i>Anthus novascelandiae</i>	Malay paddy field pipit	R	„ „
87.	<i>Motacilla maderaspatensis</i>	Large pied wag tail	R	„ „
88	<i>Motacilla cineria</i>	Grey wag tail	M	„ „
89	<i>Motacilla capsica</i>	White wag tail	M	„ „
90	<i>Dicaeum erythrorhynchos</i>	Thick billed flower pecker	R	Passeriformes/ Dicaeidae
91	<i>Dicaeum agile</i>	Tickle’s flower pecker	R	„ „
92	<i>Nectarinia zeylonica</i>	Purple rumped sunbird	R	” Nectarinidae
93	<i>Nectarinia minima</i>	Small sunbird	R	„ „
94	<i>Nectarinia lotenia</i>	Loten’s sun bird	R	„ „

Sl. No.	Bird Species	Common Name	Status	Order/Family
95	<i>Nectarinia asiatica</i>	Purple sun bird	R	„ „
96	<i>Passer domesticus</i>	House sparrow	R	„ /Ploceidae
97	<i>Petronia xanthocollis</i>	Yellow throated sparrow	R	„ „
98	<i>Lonchura malabarica</i>	White throated sparrow	R	„ „
99	<i>Lonchura punctulata</i>	Spotted munia	R	„ „
100	<i>Ploceus philippinus</i>	Bayaweaver bird	R	„ „

Table: 174 List of Migrant Birds at Thootha

Sl. No	Bird species	Band A		Band B		Band c	
		P	No.	P	No.	P	No.
1	<i>Merops philippinus</i>	✓	46	✓	39	✓	38
2	<i>Pitta brachyura</i>	-	-	✓	17	✓	16
3	<i>Hirundo rustica</i>	✓	129	✓	116	✓	110
4	<i>Oriolus oriolus</i>	✓	11	✓	12	✓	22
5	<i>Sternus malabaricus blyth</i>	✓	53	✓	76	✓	70
6	<i>Muscicapa muttui</i>	-	-	✓	11	✓	-
7	<i>Terpsiphone paradisi</i>	-	-	✓	23	✓	27
8	<i>Phylloscopus affinis</i>	-	-	✓	7	✓	28
9	<i>Phylloscopus trochiloides</i>	-	-	✓	36	✓	32
10	<i>Monticola solitaries</i>	✓	14	✓	18	-	-
11	<i>Anthus hodgsoni</i>	✓	-	-	-	✓	10
12	<i>Motacilla cineria</i>	✓	11	✓	12	-	-
13	<i>Motacilla capsica</i>	✓	13	✓	13	-	-

Table : 175 List of Raptors recorded at Thootha

Sl. No	Bird species	Occurrence					
		Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
1	<i>Milvus migrans</i>	✓	17	✓	20	✓	27
2	<i>Haliastur indus</i>	✓	21	✓	17	✓	20
3	<i>Spizaetus cirrhatus</i>	✓	17	✓	13	-	-
4	<i>Accipiter badius</i>	✓	15	✓	12	✓	11

Table : 176 List of Insectivorous Birds observed at Thootha

Sl. No	Bird species	Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
1	<i>Egretta intermedia</i>	✓	23	✓	31	-	-
2	<i>Egretta garzetta</i>	✓	18	✓	16	-	-
3	<i>Ixobrychus cinnamomeus</i>	✓	16	✓	18	-	-
4	<i>Bubulcus ibis</i>	✓	72	✓	44	✓	116
5	<i>Vanellus indicus</i>	✓	15	✓	21	✓	27
6	<i>Vanellus malabaricus</i>	✓	15	✓	16	✓	20
7	<i>Tyto alba</i>	-	-	✓	10	✓	12
8	<i>Apus affinis</i>	✓	85	✓	65	✓	62
9	<i>Cypsiurus parvus</i>	✓	31	✓	30	✓	62
10	<i>Merops orientalis</i>	✓	46	✓	43	✓	56
11	<i>Merops phillippinus</i>	✓	40	✓	39	✓	38
12	<i>Dinopium benghalense</i>	-	-	✓	13	✓	17
13	<i>Pitta brachyura</i>	-	-	✓	17	✓	16
14	<i>Hirundo daurica</i>	✓	17	✓	13	✓	13
15	<i>Hirundo rustica</i>	✓	129	✓	116	✓	110
16	<i>Dicrurus adsimilis</i>	✓	48	✓	67	✓	94
17	<i>Dicrurus paradiseus</i>	✓	33	✓	35	✓	30
18	<i>Dicrurus aeneus</i>	✓	13	✓	11	✓	10
18A	<i>Tephrodornis pondicerianus</i>	-	-	✓	19	✓	17
19	<i>Artamus fuscus</i>	✓	459	✓	364	✓	351
19A	<i>Pericrocotus cinnamomeus</i>	-	-	✓	11	✓	14
20	<i>Terpsiphone paradisi</i>	-	-	✓	23	✓	27
21	<i>Rhipidura aureola</i>	-	-	-	-	✓	27
22	<i>Prinia socialis</i>	-	-	✓	13	✓	14
22A	<i>Cisticola juncidis</i>	✓	27	✓	36	-	-
23	<i>Phylloscopus affinis</i>	-	-	✓	7	✓	8
24	<i>Acrocephalus stentorius</i>	✓	14	✓	22	-	-
25	<i>Anthus hodgsoni</i>	-	-	-	-	✓	10
26	<i>Anthus novascelandiae</i>	✓	15	✓	21	-	-
27	<i>Motacilla maderaspatensis</i>	✓	34	✓	30	-	-
28	<i>Motacilla cineria</i>	✓	11	✓	12	-	-
29	<i>Motacilla capsica</i>	✓	13	✓	15	-	-

Table : 177 List of Nectarivorous Birds at Thootha

Sl. No	Bird species	Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
1	<i>Oriolus oriolus</i>	✓	11	✓	12	✓	22
2	<i>Oriolus xanthornus</i>	✓	14	✓	12	✓	18
3	<i>Gracula religiosa</i>	-	-	✓	40	✓	44
4	<i>Orthotomus sutorius</i>	-	-	-	-	✓	35
5	<i>Dicaeum erythrorhynchos</i>	-	-	✓	103	✓	77
6	<i>Dicaeum agile</i>	-	-	-	-	✓	48
7	<i>Nectarinia zeylonica</i>	-	-	-	-	✓	52
8	<i>Nectarinia lotenia</i>	-	-	✓	36	✓	38
9	<i>Nectarinia asiatica</i>	-	-	✓	34	✓	26
10	<i>Petronia xanthocollis</i>	✓	92	✓	84	✓	89

Table: 178 List of Granivorous Birds observed at Thootha

Sl.No	Bird species	Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
1	<i>Columba livia</i>	✓	280	✓	364	✓	496
2	<i>Streptopelia chinensis</i>	✓	57	✓	58	✓	65
3	<i>Chalcophaps indica</i>	✓	10	✓	12	✓	11
4	<i>Lonchura malabarica</i>	✓	42	✓	48	✓	56
5	<i>Lonchura punctulata</i>	✓	50	✓	51	✓	59
6	<i>Petronia xanthocollis</i>	✓	92	✓	84	✓	89

Table: 179 List of birds feeding on aquatic animals at Thootha

Sl. No	Bird species	Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
1	<i>Phalacrocorax niger</i>	✓	50	-	-	-	-
2	<i>Anhinga melanogaster</i>	✓	26	-	-	-	-
3	<i>Ardeola grayii</i>	✓	102	✓	165	-	-
4	<i>Ardea alba</i>	✓	14	✓	13	-	-
5	<i>Ardea cineria</i>	✓	5	✓	7	-	-
6	<i>Anhinga rufa</i>	✓	31	-	-	-	-

Sl. No	Bird species	Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
7	<i>Amaurornis phoenicurus</i>	✓	16	-	-	-	-
8	<i>Metopidius indicus</i>	✓	16	-	-	-	-
9	<i>Ixobrychus cinnamomeus</i>	✓	16	✓	18	-	-
10	<i>Alcedo atthis</i>	✓	59	✓	66	-	-
11	<i>Ceryle rudis</i>	✓	39	✓	33	-	-
12	<i>Halcyon smyrnensis</i>	✓	30	✓	23	-	-

Table: 180 List of Frugivorous birds recorded at Thootha

Sl.No	Bird species	Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
1	<i>Streptopelia chinensis</i>	✓	57	✓	58	✓	65
2	<i>Psittacula Krameri</i>	✓	89	✓	102	✓	106
3	<i>Psittacula cyanocephala</i>	✓	50	✓	56	✓	52
4	<i>Loriculus vernalis</i>	✓	5	✓	5	-	-
5	<i>Tockus griseus griseus</i>	-	-	✓	39	-	25
6	<i>Anthracoceros coronatus</i>	-	-	✓	27	✓	22
7	<i>Ocyers birostris</i>	-	-	✓	18	✓	15
8	<i>Megalaima haemacephala</i>	-	-	✓	38	✓	44
9	<i>Megalaima zeylanica</i>	-	-	✓	32	✓	32
10	<i>Gracula religiosa</i>	-	-	✓	40	✓	44
11	<i>Dicaeum erythrorhynchos</i>	-	-	✓	103	✓	77

Table : 181 List of Forest birds at Thootha

Sl. No	Bird species	Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
1	<i>Chalcophaps indica</i>	✓	10	✓	12	✓	11
2	<i>Cuculus canorus</i>	-	-	✓	13	✓	14
3	<i>Anthracoceros coronatus</i>	-	-	✓	27	✓	22
4	<i>Dicrurus admisimilis</i>	✓	13	✓	11	✓	10
5	<i>Pericrocotus cinnamomeus</i>	-	-	✓	11	✓	14
6	<i>Aegithina tiphia</i>	-	-	✓	22	✓	22

Sl. No	Bird species	Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
7	<i>Chloropsis aurifrons</i>	-	-	✓	12	✓	14
8	<i>Muscicapa muttui</i>	-	-	✓	11	-	-
9	<i>Anthus hodgsoni</i>	-	-	-	-	✓	10
10	<i>Nectarinia minima</i>	-	-	✓	53	✓	52

Table: 182 List of Omnivorous Birds at Thootha

Sl. No	Bird species	Band A		Band B		Band C	
		Presence	No.	Presence	No.	Presence	No.
1	<i>Amaurornis phoenicurus</i>	✓	16	-	-	-	-
2	<i>Metopidius indicus</i>	✓	16	-	-	-	-
3	<i>Cuculus varius</i>	-	-	✓	6	✓	5
4	<i>Cuculus micropterus</i>	-	-	✓	12	✓	17
5	<i>Cuculus canorus</i>	-	-	✓	13	✓	14
6	<i>Eudynamis scolopaceae</i>	-	-	✓	18	✓	24
7	<i>Megalaima haemacephala</i>	-	-	✓	38	✓	44
8	<i>Megalaima zeylanica</i>	-	-	✓	32	✓	32
9	<i>Dinopium benghalense</i>	-	-	✓	17	✓	17
10	<i>Galerida malabarica</i>	✓	24	✓	27	✓	32
11	<i>Oriolus oriolus</i>	✓	11	✓	12	✓	22
12	<i>Oriolus xanthornus</i>	✓	13	✓	12	✓	18
13	<i>Acridotheres tristis</i>	✓	170	✓	172	✓	157
14	<i>Acridotheres fuscus</i>	✓	105	✓	70	✓	355
15	<i>Dendrocitta vagabunda</i>	✓	17	✓	32	✓	32
16	<i>Corvus macrorhynchos</i>	✓	354	✓	324	✓	476
17	<i>Corvus splendens</i>	✓	456	✓	601	✓	624
18	<i>Pycnonotus cafer</i>	✓	62	✓	29	✓	34
19	<i>Pycnonotus jocosus</i>	✓	30	✓	32	✓	39
20	<i>Turdoides affinis</i>	✓	134	✓	36	✓	48
21	<i>Turdoides striatus</i>	✓	55	✓	99	✓	102
22	<i>Orthotomus sutorius</i>	-	-	✓	36	✓	35
23	<i>Copsychus saularis</i>	✓	46	✓	45	✓	46
24	<i>Monticola solitarius</i>	✓	14	✓	15	-	-
25	<i>Myiophoneus horsfieldi</i>	✓	21	✓	21	-	-
26	<i>Zoothera citrina</i>	✓	18	✓	30	-	-
27	<i>Parus major</i>	✓	22	✓	31	✓	30
28	<i>Passer domesticus</i>	✓	86	✓	80	✓	93
29	<i>Ploceus philippinus</i>	✓	84	✓	80	✓	82

Table: 183 Seasonal Occurrence of Birds – Band A Thootha (Kunthipuzha)

Sl. No.	Bird species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Mon0soon	Post Monsoon
1	<i>Phalacrocorax niger</i>	4	5	5	8	4	2	-	2	5	4	5	6	20	4	26
2.	<i>Anhinga melanogaster</i>	3	3	2	3	1	1	-	-	2	4	4	3	12	1	13
3	<i>Ardeola grayii</i>	6	6	4	3	1	1	-	-	2	4	4	3	12	1	13
4	<i>Ardea alba</i>	2	2	2	-	-	-	-	-	1	2	2	3	6	-	8
5	<i>Ardea cineria</i>	1	-	-	-	-	-	-	-	1	1	1	1	1	-	4
6	<i>Egretta intermedia</i>	4	4	3	2	1	-	-	-	-	-	4	5	14	-	9
7	<i>Egretta garzetta</i>	3	2	2	1	-	-	-	-	-	-	4	6	8	-	10
8	<i>Ixobrychus cinnamomeus</i>	-	-	-	-	1	1	2	2	3	3	2	2	1	5	10
9	<i>Anhinga rufa</i>	4	4	5	4	1	1	-	-	2	3	3	4	18	1	12
10	<i>Bubulcus ibis</i>	10	12	10	11	9	-	-	-	-	8	8	10	52	-	20
11	<i>Milvus migrans</i>	2	2	1	1	2	1	-	-	-	2	4	2	8	1	8
12	<i>Haliastur indus</i>	2	2	1	3	3	-	-	3	3	2	2	11	-	10	7
13	<i>Spizaetus cirrhatus</i>	2	1	1	2	2	-	-	-	3	2	2	2	8	-	9
14	<i>Accipiter badius</i>	1	1	2	2	2	-	-	-	2	2	1	2	8	-	7
15	<i>Amauromis phoenicurus</i>	-	-	-	-	3	3	2	3	2	2	1	-	5	8	3
16	<i>Metopidius indicus</i>	2	2	2	1	3	2	-	-	-	2	2	2	8	2	6
17	<i>Vanellus indicus</i>	1	3	3	2	1	1	-	-	-	2	2	3	10	1	7
18	<i>Vanellus malabaricus</i>	-	-	2	2	3	3	2	-	-	-	1	2	7	5	3
19	<i>Columba livia</i>	26	30	20	18	16	15	18	20	24	28	32	35	110	53	117
20	<i>Streptopelia chinensis</i>	6	8	8	6	6	2	1	1	5	6	4	4	34	4	19
21	<i>Chalcophaps indica</i>	2	2	1	1	1	-	-	-	-	-	1	2	7	-	3
22	<i>Psittacula krameri</i>	6	8	10	10	10	2	1	6	8	8	10	10	44	9	36
23	<i>Psittacula cyanocephala</i>	4	6	7	7	8	-	-	1	2	4	6	5	32	1	17
24	<i>Loriculus vernalis</i>	1	1	1	1	-	-	-	-	-	-	-	1	4	-	1
25	<i>Apus affinis</i>	8	8	10	11	10	8	-	-	7	7	8	8	47	8	30
26	<i>Cypsiurus parvus</i>	4	4	4	3	2	1	1	-	-	4	5	3	17	2	12
27	<i>Alcedo atthis</i>	6	6	4	5	2	6	8	5	5	4	4	4	23	19	17
28	<i>Ceryle rudis</i>	3	2	2	3	2	2	6	6	4	2	4	3	12	14	13
29	<i>Halcyon smyrnensis</i>	2	2	2	1	1	4	6	6	2	2	1	1	8	16	6

Sl. No.	Bird species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Mon0soon	Post Monsoon
30	<i>Merops orientalis</i>	8	8	6	-	-	-	-	-	4	8	6	6	22	-	24
31	<i>Merops philippinus</i>	6	4	4	4	-	-	-	-	6	6	6	4	18	-	22
32	<i>Upupa epops</i>	1	1	2	2	2	-	-	2	2	2	1	1	8	2	6
33	<i>Galerida malabarica</i>	3	3	4	5	1	-	-	-	-	2	3	3	16	-	8
34	<i>Hirundo daurica</i>	3	3	3	2	2	-	-	-	-	-	2	2	13	-	4
35	<i>Hirundo rustica</i>	12	14	18	15	-	-	-	-	14	20	18	18	59	-	70
36	<i>Oriolus oriolus</i>	2	2	2	2	-	-	-	-	-	1	1	1	8	-	3
37	<i>Oriolus xanthornus</i>	1	1	1	1	-	1	1	-	2	2	2	1	4	2	7
38	<i>Dicrurus adsimilis</i>	6	4	4	3	2	2	4	4	6	6	4	3	19	10	19
39	<i>Dicrurus paradiseus</i>	3	3	4	4	2	2	1	2	2	3	3	4	16	5	12
40	<i>Dicrurus aeneus</i>	2	2	3	2	-	-	-	-	-	-	2	2	9	-	4
41	<i>Artamus fuscus</i>	52	60	62	70	65	50	-	-	22	20	28	30	309	50	100
42	<i>Acridotheres tristis</i>	18	12	16	17	15	10	12	8	6	16	18	22	78	30	62
43	<i>Acridotheres fuscus</i>	8	8	6	6	4	10	10	9	12	12	10	10	32	29	24
44	<i>Sternus malabaricus</i>	8	6	6	4	4	2	1	1	2	4	8	7	28	4	21
45	<i>Dendrocitta vagabunda</i>	2	2	2	2	1	-	-	2	2	1	1	2	9	2	6
46	<i>Corvus macrorhynchos</i>	32	36	40	44	30	10	12	12	18	38	42	46	152	52	150
47	<i>Corvus splendens</i>	52	40	48	60	62	30	18	22	32	38	60	64	222	70	194
48	<i>Pycnonotus jocosus</i>	2	2	4	41	2	1	1	2	3	3	4	2	14	4	12
49	<i>Pycnonotus cafer</i>	4	4	3	4	6	6	4	8	8	7	5	3	21	18	23
50	<i>Turdoides affinis</i>	16	20	22	12	8	4	4	6	6	10	12	14	78	14	42
51	<i>Turdoides striatus</i>	3	3	4	6	7	6	1	1	2	6	8	8	23	8	29
52	<i>Acrocephalus stentoreus</i>	2	1	-	-	-	1	2	2	2	2	1	1	3	5	6
53	<i>Saxicoloides fulicata</i>	2	4	4	2	2	-	-	2	2	2	4	4	14	12	12
54	<i>Copsychus saularis</i>	4	6	6	6	4	2	2	4	6	2	2	2	26	8	12
55	<i>Monticola solitarius</i>	2	4	4	-	-	-	-	-	-	-	2	2	10	-	4
56	<i>Myophonus</i>	2	2	2	4	4	1	-	-	-	2	2	2	14	1	6

Sl. No.	Bird species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
	<i>horsfieldi</i>															
57	<i>Zoothera citrina</i>	2	2	1	-	-	2	2	1	2	2	2	2	5	5	8
58	<i>Parus major</i>	4	4	4	-	2	2	1	-	2	-	2	1	14	3	5
59	<i>Anthus novascelandiae</i>	2	2	2	1	1	-	-	-	2	2	1	2	8	-	7
60	<i>Motacilla maderaspatensis</i>	4	4	2	2	2	2	2	3	4	4	2	3	14	7	13
61	<i>Motacilla cineria</i>	2	2	1	1	-	-	-	-	2	1	1	1	6	-	5
62	<i>Motacilla capsica</i>	2	2	2	1	-	-	-	-	1	1	2	2	7	-	6
63	<i>Passer domesticus</i>	12	12	14	10	8	6	-	-	4	6	6	8	48	14	24
64	<i>Petronia xanthocollis</i>	8	7	7	8	10	-	-	4	12	12	12	12	40	4	48
65	<i>Lonchura malabarica</i>	4	6	4	4	2	-	-	-	4	6	6	6	20	-	22
66	<i>Lonchura punctulata</i>	12	10	6	-	-	-	-	-	2	6	6	8	28	-	22
67	<i>Ploceus philippinus</i>	6	6	9	9	6	2	2	4	6	10	12	12	36	8	40

Table: 184 Seasonal Occurrence of Birds - Band B- Thootha

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post M
1	<i>Ardeola grayii</i>		8	7	8	4	2	12	12	10	18	18	20	16	29	34	72
2.	<i>Ardea alba</i>		1	2	2	-	-	-	-	-	1	2	2	3	5	-	8
3	<i>Ardea cineria</i>		1	-	-	-	-	-	-	-	1	2	2	1	1	-	6
4	<i>Egretta intermedia</i>		6	6	5	32	-	-	-	-	-	-	3	6	22	-	9
5	<i>Egretta garzetta</i>		3	3	3	2	-	-	-	-	-	-	2	3	11	-	5
6	<i>Ixobrychus cinnamomeus</i>		-	-	-	-	1	1	2	2	4	4	2	2	1	5	12
7	<i>Bubulcus ibis</i>		16	18	18	10	6	-	-	-	-	8	8	10	68	-	26
8	<i>Milvus migrans</i>		2	2	2	2	1	1	-	-	-	3	3	4	9	1	10
9	<i>Haliastur indus</i>		2	2	1	2	2	-	-	-	2	2	2	2	9	-	8
10	<i>Spizaetus cirrhatus</i>		2	1	1	1	1	-	-	-	1	2	2	2	6	-	7
11	<i>Accipiter badius</i>		1	1	1	2	2	-	-	-	2	1	1	1	7	-	5
12	<i>Vanellus indicus</i>		-	3	2	2	2	2	2	-	-	2	3	2	10	4	7
13	<i>Vanellus malabaricus</i>		-	-	2	3	3	3	1	-	-	-	2	2	8	4	4
14	<i>Columba livia</i>		40	44	52	56	28	20	18	18	24	36	38	44	210	56	98
15	<i>Streptopelia</i>		8	8	10	6	4	2	1	1	4	7	4	3	36	4	18

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post M
	<i>chinensis</i>																
16	<i>Chalcophaps indica</i>		2	2	2	1	1	-	-	-	-	-	2	2	8	-	4
17	<i>Psittacula krameri</i>		8	8	12	12	12	2	2	4	8	8	14	14	52	8	42
18	<i>Psittacula cyanocephala</i>		3	5	5	6	6	-	-	1	4	4	6	8	25	1	30
19	<i>Loriculus vernalis</i>		1	1	1	1	-	-	-	-	-	-	-	1	4	-	1
20	<i>Cuculus varius</i>		-	-	2	2	2	-	-	--	-	-	-	-	6	-	-
21	<i>Cuculus micropterus</i>		-	-	3	3	2	-	-	-	-	-	2	2	8	-	4
22	<i>Cuculus canorus</i>		1	1	2	2	2	-	-	-	-	1	2	2	8	-	5
23	<i>Eudynamys scolopacea</i>		3	3	2	2	-	-	-	-	1	2	2	3	10	-	8
24	<i>Tyto alba</i>		2	2	2	1	1	-	-	-	-	-	1	1	8	-	2
25	<i>Apus affinis</i>		6	6	8	12	10	4	-	-	6	6	7	8	42	4	19
26	<i>Cypsiurus parvus</i>		3	4	4	3	3	2	1	-	-	4	6	2	17	3	10
27	<i>Alcedo atthis</i>		8	6	6	4	3	6	8	6	5	4	4	6	27	20	19
28	<i>Ceryx rudis</i>		2	2	2	3	2	1	4	4	4	3	4	2	11	9	13
29	<i>Halcyon smyrnensis</i>		2	2	1	1	1	3	4	4	2	1	1	1	7	11	5
30	<i>Merops orientalis</i>		7	5	5	-	-	-	-	-	4	8	8	6	17	-	26
31	<i>Merops philippinus</i>		6	5	5	4	-	-	-	-	6	5	5	3	20	-	19
32	<i>Coracias benghalensis</i>		1	1	1	1	1	1	-	-	2	2	1	2	5	1	7
33	<i>Upupa epops</i>		2	2	4	4	2	-	-	-	2	3	3	2	14	-	10
34	<i>Tockus griseus</i>		4	6	6	6	2	1	1	2	2	2	3	4	24	4	11
35	<i>Anthracoceros coronatus</i>		3	4	4	4	2	2	-	-	-	2	3	3	17	2	8
36	<i>Ocyrceros birostris</i>		2	2	3	3	2	-	-	-	-	2	2	2	12	-	6
37	<i>Megalaima haemacephala</i>		6	5	5	4	2	-	-	-	-	4	6	6	22	-	16
38	<i>Megalaima zeylanica</i>		2	2	4	6	4	2	-	-	2	4	4	4	18	2	12
39	<i>Dinopium benghalense</i>		2	2	2	2	1	-	-	1	1	2	2	2	9	1	7
40	<i>Pitta brachyura</i>		3	3	3	3	-	-	-	-	-	-	3	2	12	-	5
41	<i>Galerida malabarica</i>		4	4	4	3	2	-	-	-	2	2	3	3	17	-	10
42	<i>Hirundo daurica</i>		2	2	1	1	1	-	-	-	-	2	2	2	7	-	6

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post M
43	<i>Hirundo rustica</i>		10	10	12	16	-	-	-	-	16	18	18	16	48	-	68
44	<i>Oriolus oriolus</i>		2	2	2	1	-	-	-	-	-	2	1	2	7	-	5
45	<i>Oriolus xanthornus</i>		2	2	1	1	-	-	1	1	1	2	2	2	6	1	5
46	<i>Dicrurus adsimilis</i>		10	8	9		3	2	2	3	4	6	6	8	36	7	24
47	<i>Dicrurus Paradiseus</i>		3	3	3	4	3	2	1	2	2	4	4	4	16	5	14
48	<i>Dicrurus aeneus</i>		2	2	2	1	-	-	-	-	-	-	2	2	7	-	4
49	<i>Artamus fuscus</i>		34	40	48	62	65	30	-	-	32	25	28	3	219	30	115
50	<i>Acridotheres tristis</i>		12	15	17	17	18	15	10	12	8	8	18	22	79	37	56
51	<i>Acridotheres fuscus</i>		14	10	8	6	6	4	2	2	2	4	4	8	44	8	18
52	<i>Sternus malabaricus</i>		10	8	8	6	4	4	2	2	4	4	10	12	36	10	30
53	<i>Gracula religiosa</i>		4	6	6	5	3	-	-	3	2	2	4	5	24	3	13
54	<i>Dendrocitta vagabunda</i>		4	4	4	6	2	-	-	-	2	2	2	6	20	-	12
55	<i>Corvus macrorhynchos</i>		36	34	40	48	12	10	16	18	22	24	26	38	170	44	110
56	<i>Corvus splendens</i>		58	60	64	62	56	30	38	45	44	38	52	54	300	113	185
57	<i>Tephrodornis pondicerianus</i>		3	3	2	2	2	1	-	-	2	2	2	2	12	1	6
58	<i>Pericrocotus cinnamomeus</i>		2	2	2	-	-	1	2	-	-	1	1	2	6	3	2
59	<i>Aegithina tiphia</i>		2	4	4	2	2	-	-	-	-	2	2	4	14	-	8
60	<i>Chloropsis aurifrons</i>		2	2	2	1	1	1	-	-	-	-	1	2	8	1	3
61	<i>Pycnonotus jocosus</i>		4	4	4	2	1	2	1	-	2	4	4	4	15	3	14
62	<i>Pycnonotus cafer</i>		2	2	4	4	3	3	3	2	-	-	2	4	15	8	6
63	<i>Turdoides affinis</i>		2	4	4	4	6	8	2	-	-	-	2	4	20	14	6
64	<i>Turdoides striatus</i>		8	8	10	10	8	7	7	6	8	8	9	10	44	20	35
65	<i>Muscicapa muttui</i>		2	2	2	1	-	-	-	-	-	2	1	1	7	-	4
66	<i>Muscicapa tickelliae</i>		4	4	6	5	4	6	6	-	-	6	6	4	23	12	16
67	<i>Terpsiphone paradisi</i>		3	3	4	2	2	-	-	-	3	2	2	2	14	-	9
68	<i>Prinia socialis</i>		2	2	2	1	-	-	-	-	-	2	2	2	7	-	6
69	<i>Phylloscopus</i>		2	-	-	-	-	-	-	-	-	2	2	1	2	-	5

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post M
	<i>affinis</i>																
70	<i>Phylloscopus trochiloides</i>		4	4	2	-	-	-	-	-	-	8	6	6	10	-	26
71	<i>Acrocephalus stentorius</i>		2	2	-	-	-	2	2	2	3	3	4	2	4	6	12
72	<i>Orthotomus sutorius</i>		4	4	4	3	2	2	1	2	4	5	5	3	17	5	14
73	<i>Cisticola juncidis</i>		6	6	4	2	2	-	-	-	-	4	6	6	20	-	16
74	<i>Copsychus saularis</i>		4	4	5	5	4	2	2	3	6	4	2	4	22	7	16
75	<i>Monticola solitarius</i>		2	4	4	-	-	-	-	-	-	-	4	4	10	-	8
76	<i>Myiophonus horsfieldii</i>		2	2	4	4	2	1	-	-	-	2	2	2	14	1	6
77	<i>Zoothera citrina</i>		3	3	4	-	-	2	2	2	4	4	4	2	10	6	14
78	<i>Parus major</i>		6	5	5	-	3	2	2	1	2	2	2	1	19	15	7
79	<i>Anthus novascelandiae</i>		2	3	3	2	1	-	-	-	2	2	3	3	11	-	10
80	<i>Motacilla maderaspatensis</i>		4	5	5	2	2	2	1	1	1	3	4	4	18	4	12
81	<i>Motacilla cineria</i>		2	2	2	1	-	-	-	-	2	1	1	1	7	-	5
82	<i>Motacilla capsica</i>		3	3	3	1	-	-	-	-	1	1	2	2	9	-	6
83	<i>Dicaeum erythrorhynchos</i>		14	15	10	10	12	-	-	-	-	10	14	18	61	-	42
84	<i>Nectarinia minima</i>		4	4	6	6	6	-	2	2	4	5	7	7	26	4	23
85	<i>Nectarinia lotenia</i>		6	6	5	4	6	-	-	-	-	3	4	2	27	-	9
86	<i>Nectarinia asiatica</i>		4	4	4	2	2	-	-	2	5	5	3	3	16	2	16
87	<i>Passer domesticus</i>		10	10	12	10	8	8	-	-	4	5	5	8	50	8	22
88	<i>Pertronia xanthocollis</i>		7	7	6	8	10	-	-	4	10	10	12	10	38	4	42
89	<i>Lonchura malabarica</i>		4	8	8	6	2	-	-	-	4	4	6	6	28	-	22
90	<i>Lonchura punctulata</i>		10	9	10	-	-	--	-	-	2	6	6	8	29	-	22
91	<i>Ploceus philippinus</i>		8	9	9	8	6	2	2	4	6	8	8	10	40	8	32

Table: 185 Seasonal Occurrence of Birds – Band C– Thootha

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monson	Monson	Post M
1	<i>Bubulcus ibis</i>		22	20	18	10	4	-	-	-	-	12	12	18	74	-	42
2.	<i>Milvus migrans</i>		4	3	3	2	2	1	-	-	-	4	4	4	14	1	12
3.	<i>Haliastur indus</i>		3	2	2	2	1	-	-	-	3	3	2	2	10	-	10
4.	<i>Accipiter badius</i>		2	2	2	1	2	-	-	-	2	2	2	1	9	-	2
5.	<i>Vanellus indicus</i>		2	4	4	2	2	2	1	-	-	2	4	4	14	3	10
6.	<i>Vanellus malabaricus</i>		-	-	2	4	4	4	2	-	-	-	2	2	10	6	4
7.	<i>Columba livia</i>		36	48	44	52	56	30	20	18	46	42	54	50	236	68	192
8.	<i>Streptopelia chinensis</i>		10	10	8	6	4	2	2	1	6	6	4	6	38	5	22
9.	<i>Cholophaps indica</i>		2	2	1	1	1	-	-	-	-	-	2	2	7	-	4
10	<i>Psittacula krameri</i>		12	12	10	12	14	8	2	2	8	6	12	12	60	8	38
11.	<i>Psittacula cyanocephala</i>		4	4	6	5	5	-	-	2	4	8	8	6	24	2	26
12.	<i>Cuculus varius</i>		-	-	2	2	1	-	-	-	-	-	-	-	5	-	-
13.	<i>Cuculus micropterus</i>		-	-	4	4	2	-	-	-	-	-	4	3	10	-	7
14.	<i>Cuculus canorus</i>		2	2	1	2	2	-	-	-	-	1	2	2	9	-	5
15.	<i>Eudynamys scolopacea</i>		4	4	3	3	-	-	-	-	2	2	3	3	14	-	10
16.	<i>Tyto alba</i>		2	2	2	2	1	-	-	-	-	-	2	1	9	-	3
17.	<i>Apus affinis</i>		6	6	8	10	8	4	-	-	4	4	5	7	38	4	20
18.	<i>Cypsiurus parvus</i>		2	3	3	2	3	2	1	-	-	4	4	2	13	3	10
19.	<i>Merops orientalis</i>		10	10	8	-	-	-	-	-	6	8	8	6	28	-	28
20	<i>Merops philippinus</i>		6	4	4	4	-	-	-	-	5	5	4	6	18	-	20
21.	<i>Upupa epops</i>		3	3	4	4	2	-	-	-	3	3	2	2	16	-	10
22.	<i>Tockus griseus</i>		4	4	4	4	2	2	1	2	2	3	3	4	18	5	12
23.	<i>Arthracoceros coronatus</i>		2	3	3	4	2	1	-	-	-	2	3	2	14	1	7
24.	<i>Ocyrceros birostris</i>		2	1	3	3	1	-	-	-	-	2	2	1	10	-	5
25.	<i>Megalaima haemacephala</i>		6	6	8	4	4	-	-	-	-	6	6	4	28	-	16
26.	<i>Megalaima zeylanica</i>		2	2	4	4	4	2	-	-	4	4	4	2	16	2	14
27.	<i>Dinopium benghalense</i>		2	2	2	1	1	-	-	2	2	1	2	2	8	2	7
28.	<i>Pitta brachyura</i>		3	3	2	2	-	-	-	-	-	-	3	3	10	-	6
29.	<i>Galerida Malabarica</i>		5	5	5	4	2	-	-	-	3	3	2	3	21	-	11
30.	<i>Hirundo daurica</i>		2	2	2	1	1	-	-	-	-	2	2	1	8	-	5
31.	<i>Hirundo rustica</i>		12	11	11	10	14	-	-	-	-	16	18	18	58	-	52
32.	<i>Oriolus oriolus</i>		4	4	4	2	-	-	-	-	-	2	2	4	14	-	8

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monson	Monson	Post M
33.	<i>Oriolus xanthornus</i>		3	2	2	2	-	-	1	1	1	2	2	2	-	2	7
34.	<i>Dicrurus adsimilis</i>		12	12	10	9	3	2	2	4	6	8	14	12	46	8	40
35.	<i>Dicrurus paradiseus</i>		3	2	2	3	2	2	1	2	2	3	4	4	12	5	13
36.	<i>Dicrurus aeneus</i>		2	2	2	1	-	-	-	-	-	-	2	1	7	-	3
37.	<i>Artamus fuscus</i>		22	30	36	43	46	30	-	-	24	38	42	40	177	30	144
38.	<i>Acridotheres tristis</i>		14	15	15	13	16	10	10	12	11	10	14	18	73	32	53
39.	<i>Acridotheres fuscus</i>		30	26	34	46	52	55	-	-	32	26	24	30	188	55	112
40.	<i>Sternus malabaricus</i>		8	8	6	6	4	2	2	2	6	6	10	10	32	6	32
41.	<i>Gracula religiosa</i>		5	5	8	6	3	-	-	3	2	2	4	6	27	3	14
42.	<i>Dendrocitta vagabunda</i>		3	3	4	6	4	-	-	-	2	2	4	4	20	-	12
43.	<i>Corvus macrorhynchos</i>		48	55	66	42	46	18	12	14	32	30	45	68	257	44	175
44.	<i>Corvus splendens</i>		42	62	68	72	54	32	28	26	44	52	58	74	298	98	228
45.	<i>Tephrodornis pondicerinaus</i>		3	2	2	2	1	1	-	-	1	1	2	2	10	1	6
46.	<i>Pericrocotus cinnamomeus</i>		2	2	1	-	-	1	2	1	-	2	1	2	5	4	5
47.	<i>Aegithina tiphia</i>		3	3	4	2	2	-	-	-	-	2	3	3	14	-	8
48.	<i>Chloropsis aurifrons</i>		2	2	2	2	2	1	-	-	-	-	1	2	10	1	3
49.	<i>Pycnonotus jocosus</i>		6	6	4	2	1	2	2	-	2	4	4	6	19	4	16
50.	<i>Pycnonotus cafer</i>		3	4	4	6	4	3	2	2	-	-	2	4	21	7	6
51.	<i>Turdoides affinis</i>		4	6	6	6	5	8	4	-	-	-	4	5	27	12	9
52.	<i>Turdoides striatus</i>		10	10	9	9	8	6	6	4	8	10	12	10	46	16	40
53.	<i>Muscicapa muttui</i>		2	4	4	2	-	-	-	-	-	3	3	2	12	-	8
54.	<i>Muscicapa tickelliae</i>		6	6	4	5	5	7	7	-	-	8	8	6	26	14	22
55.	<i>Terpsiphone paradisi</i>		3	2	3	3	2	-	-	-	3	4	4	3	13	-	14
56.	<i>Rhipidura aureola</i>		2	3	3	4	2	2	-	1	2	3	2	3	14	3	10
57.	<i>Prinia socialis</i>		2	2	2	3	-	-	-	-	-	2	2	1	9	-	5
58.	<i>Phylloscopus affinis</i>		2	1	-	-	-	-	-	-	-	2	2	1	3	-	5
59.	<i>Phylloscopus trochiloides</i>		4	4	4	-	-	-	-	-	6	6	4	4	12	-	20
60.	<i>Orthotomus sutorius</i>		4	3	3	3	2	2	1	2	4	5	3	3	15	5	15
61.	<i>Saxicoloides fulicata</i>		4	4	4	3	2	-	-	3	3	4	4	2	17	3	13
62.	<i>Copsychus saularis</i>		4	5	5	4	3	2	2	2	4	5	6	4	21	6	19
63.	<i>Parus major</i>		4	4	5	-	2	3	2	-	4	2	2	2	15	5	10
64.	<i>Anthus hodgsoni</i>		2	2	-	-	-	-	-	-	1	1	2	2	4	-	6
65.	<i>Dicaeum</i>		10	10	12	11	12	-	-	-	-	8	8	6	55	-	22

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post M
	<i>erythrorhynchos</i>																
66	<i>Dicaeum agile</i>		5	5	3	3	4	2	-	-	6	8	8	4	20	2	26
67	<i>Nectarinia zeylonica</i>		6	6	12	10	4	-	-	-	-	3	6	5	38	-	14
68	<i>Nectarinia minima</i>		4	6	6	8	4	-	1	3	3	5	7	6	28	4	21
69	<i>Nectarinia lotenia</i>		6	6	5	5	8	-	-	-	-	3	3	2	30	-	8
70	<i>Nectarinia asiatica</i>		3	4	4	3	2	-	-	3	5	5	4	3	16	3	17
71	<i>Passer domesticus</i>		12	10	8	14	11	5	-	2	2	10	14	10	55	2	36
72	<i>Petronia xanthocollis</i>		7	7	9	6	10	-	-	4	8	12	12	14	39	4	46
73	<i>Lonchura malabarica</i>		6	6	8	8	4	-	-	-	4	4	8	8	32	-	24
74	<i>Lonchura punctulata</i>		12	8	11	-	-	-	-	-	4	8	8	8	31	-	28
75	<i>Ploceus philippinus</i>		10	10	8	8	4	2	2	3	7	8	8	12	40	7	35

Table: 186 List of Birds at Kariyannur -Kunthipuzha Site – III

Sl. No.	Scientific Name	Common Name	Status	Order/Family
1.	<i>Phalacrocorax niger</i>	Little cormorant	R	Pelecaniformes/ Phalacrocoracidae
2.	<i>Anhinga melanogaster</i>	Darter	R	
3.	<i>Ardea alba</i>	Large egret	R	Ciconiiformes/ Ardeidae
4.	<i>Ardea cineria</i>	Grey heron	R	
5.	<i>Ardeola grayii</i>	Pond heron	R	”
6.	<i>Butorides striatus</i>	Little green heron	R	”
7.	<i>Ardea purpurea</i>	Purple heron	R	”
8.	<i>Bubulcus ibis</i>	Cattle egret	R	”
9.	<i>Egretta intermedia</i>	Median egret	R	”
10.	<i>Egretta garzetta</i>	Little egret	R	”
11.	<i>Nycticorax nycticorax</i>	Night heron	R	”
12.	<i>Ixobrychus sinensis</i>	Yellow bittern	R	”
13.	<i>Ciconia episcopus</i>	White necked stork	R	”
14.	<i>Ixobrychus flavicollis</i>	Black bittern	R	”
15.	<i>Anastomus oscitans</i>	Asian open billed stork	R	”
16.	<i>Ciconia nigra</i>	Black stork	R	”
17.	<i>Milvus migrans</i>	Common pariah kite	R	Falconiformes/Accipitidae

Sl. No.	Scientific Name	Common Name	Status	Order/Family
18.	<i>Haliastur indus</i>	Brahmny kite	R	”
19.	<i>Spizaetus cirrhatus</i>	Indian crested hawk	R	”
20.	<i>Elanus caeruleus</i>	Black winged kite	R	”
21.	<i>Accipiter badius</i>	Ceylon shikra	R	”
22.	<i>Metopidius indicus</i>	Bronze winged Jacana	R	Charadriiformes/Jacanidae
23.	<i>Amaurornis phoenicurus</i>	White breasted water hen	R	„ Rallidae
24.	<i>Glareola lactea</i>	Swallow plover	R	„ Glareolidae
25.	<i>Vanellus indicus</i>	Red wattled Lapwing	R	„ Charadriinae
26.	<i>Pluvialis dominica</i>	Golden plover	M	”
27.	<i>Pluvialis squatarola</i>	Grey plover	M	”
28.	<i>Charadrius dubius</i>	Little ringed plover	M	”
29.	<i>Charadrius leschenaulti</i>	Large sand plover	M	”
30.	<i>Charadrius alexandrines</i>	Kentish plover	M	”
31.	<i>Limosa lapponica</i>	Bartailed godwit	M	”
32.	<i>Tringa glareola</i>	Spotted sandpiper	M	”
33.	<i>Tringa hypoleucos</i>	Common sandpiper	M	”
34.	<i>Tringa nebularis</i>	Green shank	M	”
35.	<i>Tringa ochropus</i>	Green sandpiper	M	”
36.	<i>Calidris minuta</i>	Little stint	M	”
37.	<i>Calidris temmincki</i>	Temminck’s stint	M	”
38.	<i>Calidris alpinus</i>	Dunlin	M	”
39.	<i>Gallinago gallinago</i>	Fantail snipe	M	„
40.	<i>Chlidonias hybrida</i>	Indian whiskered tern	M	”/Laridae
41.	<i>Gelochelidon nilotica</i>	Gull billed tern	M	”
42.	<i>Sterna auticauda</i>	Black bellied tern	M	”
43.	<i>Sterna aurantia</i>	Rivertern	M	”
44.	<i>Columba livia</i>	Blue rock pigeon	R	Columbiformes/ Columbidae
45.	<i>Treron phoenicoptera</i>	Green pigeon	R	”

Sl. No.	Scientific Name	Common Name	Status	Order/Family
46.	<i>Streptopelia chinensis</i>	Spotted dove	R	”
47.	<i>Psittacula Krameri</i>	Rose ringed parakeet	R	Psittaciformes/Psittacidae
48.	<i>Psittacula cyanocephala</i>	Blossom headed parakeet	R	”
49.	<i>Cuculus canorus</i>	The cuckoo	R	Cuculiformes/Cuculidae
50.	<i>Cuculus micropterus</i>	Indian cuckoo	R	”
51.	<i>Centropus sinensis</i>	Crow pheasant	R	”
52.	<i>Eudynamys scolopacea</i>	Indian Koel	R	”
53.	<i>Apus affinis affinis</i>	House swift	R	Apodiforms/Apodidae
54.	<i>Cypsiurus parvus</i>	Palm swift	R	”
55.	<i>Alcedo atthis</i>	Small blue kingfisher	R	Alcedinidae
56.	<i>Ceryl rudis</i>	Pied King fisher	R	”
57.	<i>Halcyon smyrnensis</i>	White breasted king fisher	R	”
58.	<i>Merops orientalis</i>	Small green bee-eater	M	Meropidae
59.	<i>Merops Phillippinus</i>	Blue tailed bee-eater	M	”
60.	<i>Coracias benghalensis</i>	South Indian roller	R	” /Coraciidae
61.	<i>Anthracoceros coronatus</i>	Malabar piedhornbill	R	” /Bucerotidae
62.	<i>Ocyeros birostris</i>	Common grey hornbill	R	”
63.	<i>Upupa epops</i>	Ceylon hoopoe	R	” / Upupidae
64.	<i>Megalaima haemacephala</i>	Coppersmith bird	R	Piciformes/Capitonidae
65.	<i>Megalaima zeylanica</i>	Large green barbet	R	”
66.	<i>Dinopium benghalense</i>	Malabar goldenbacked wood pecker	R	” / Picidae
67.	<i>Pitta brachyura</i>	Indian Pitta	M	Passeriformes/Pittidae
68.	<i>Galerida malabarica</i>	Malabar crested lark	R	Passeriformes//Alaudidae
69.	<i>Mirafra assamica</i>	Bush lark	R	”

Sl. No.	Scientific Name	Common Name	Status	Order/Family
70.	<i>Oriolus oriolus</i>	Golden oriole	M	” / Oriolidae
71.	<i>Dicrurus adsimilis</i>	Black drongo	R	” / Dicruridae
72.	<i>Dicrurus paradiseus</i>	Racket tailed drongo	R	Passeriformes/Dicruridae
73.	<i>Artamus fuscus</i>	Ashy swallow shrike	R	” / Artamidae
74.	<i>Acridotheres tristis</i>	Common myna	R	” /Sturnidae
75.	<i>Gracula religiosa</i>	Indian hill myna	R	”
76.	<i>Dendrocitta vagabunda</i>	Tree pie	R	” /Corvidae
77.	<i>Corvus splendens</i>	House crow	R	”
78.	<i>Corvus macrorhynchos</i>	Indian Jungle crow	R	”
79.	<i>Hemipus picatus</i>	Pied flycatcher shrike	R	”
80.	<i>Pericrocotus cinnamomeus</i>	Malabar small minivet	R	”
81.	<i>Pycnonotus cafer</i>	Red vented bulbul	R	” /Irenidae
82.	<i>Pycnonotus jocosus</i>	Red whiskered bulbul	R	”
83.	<i>Turdoides affinis</i>	White headed babbler	R	” /Muscicapidae
84.	<i>Turdoides striatus</i>	Jungle babbler	R	”
85.	<i>Terpsiphone paradisi</i>	Paradise fly catcher	M	”
86.	<i>Prinia inornata</i>	Plain wren-warbler	R	”
87.	<i>Prinia socialis</i>	Ashy wren-warbler	R	”
88.	<i>Orthotomus sutorius</i>	Tailor bird	R	”
89.	<i>Saxicoloides fulicata</i>	Indian robin	R	”
90.	<i>Copsychus saularis</i>	Magpie robin	R	”
91.	<i>Zoothera citrina</i>	White throated ground thrush	R	”
92.	<i>Parus major</i>	Indian grey Tit	R	Paridae
93.	<i>Anthus novascelandiae</i>	Malay pipit	R	Motacillidae
94.	<i>Motacilla maderaspatensis</i>	Large pied wag tail	R	”
95.	<i>Motacilla cineria</i>	Grey wag tail	M	”

Sl. No.	Scientific Name	Common Name	Status	Order/Family
96.	<i>Motacilla alba</i>	White wag tail	M	
97.	<i>Dicaeum erythrorhynchos</i>	Thick billed flower pecker	R	Passeriformes/Dicaeidae
98.	<i>Nectarinia zeylanica</i>	Indian Purple rumped sunbird	R	Passeriformes/Nectarinidae
99.	<i>Nectarinia asiatica</i>	Purple sunbird	R	”
100.	<i>Passer domesticus</i>	House sparrow	R	” /Ploceidae
101.	<i>Petronia xanthocollis</i>	Yellow throated sparrow	R	”
102.	<i>Ploceus philippinus</i>	Bayaweaver bird	LM	”
103.	<i>Lonchura punctulata</i>	Spotted munia	R	”
104.	<i>Lonchura striata</i>	White backed munia	R	”
105.	<i>Lonchura malacca</i>	Black headed munia	R	”

Table 187 List of Shore birds at Kariyannur – Kunthipuzha

Sl. No.	Birds species	Band A		Band B		Band C		Season
		Present	No.	Present	No.	Present	No.	
1.	<i>Glareola lactea</i>	✓	256	✓	131	✓	114	June-Mar
2.	<i>Pluvialis dominica</i>	✓	12	✓	14	-	-	Aug-Nov
3.	<i>Pluvialis squatarola</i>	✓	10	✓	9	-	-	Sept-Mar
4.	<i>Charadrius dubius</i>	✓	66	✓	64	✓	35	Sept-May
5.	<i>Charadrius leschenaultii</i>	✓	37	✓	34	-	-	Sept-Apr
6.	<i>Charadrius alexandrinus</i>	✓	45	✓	42	-	-	Oct-Mar
7.	<i>Limosa lapponca</i>	✓	19	✓	13	-	-	Oct-Apr
8.	<i>Tringa glareola</i>	✓	64	✓	51	✓	36	Sept-Apr
9.	<i>Tringa hypoleucos</i>	✓	30	✓	28	-	-	Oct-Apr
10.	<i>Tringa nebularis</i>	✓	5	-	-	-	-	Oct-Feb.
11.	<i>Tringa ochropus</i>	✓	10	-	-	-	-	Sept-Feb.
12.	<i>Calidris minuta</i>	✓	76	✓	64	-	-	Sept-Mar
13.	<i>Calidris temmincki</i>	✓	25	-	-	-	-	Sept-May
14.	<i>Calidris alpinus</i>	✓	22	✓	-	-	-	
15.	<i>Gallinago gallinago</i>	✓	15	✓	14	-	-	Oct-Apr
16.	<i>Chlidonias hybrida</i>	✓	13	✓	9	-	-	Nov-Apr
17.	<i>Sterna auticauda</i>	✓	11	-	-	-	-	Dec-May
18.	<i>Gelochelidon nilotica</i>	✓	34	-	-	-	-	Sept-Apr

Table: 188 List of Migrant birds observed at Kariyannur - Kunthipuzha

Sl. No.	Birds species	Band A		Band B		Band C		Season
		Present	No.	Present	No.	Present	No.	
1.	<i>Pluvialis dominica</i>	✓	12	✓	14	-	-	Aug-Nov.
2.	<i>Pluvialis squatarola</i>	✓	10	✓	9	-	-	Sept-Mar
3.	<i>Charadrius dubius</i>	✓	66	✓	64	✓	35	Sept-May
4.	<i>Charadrius leschenaultii</i>	✓	37	✓	34	-	-	Sept-April
5.	<i>Charadrius alexandrinus</i>	✓	45	✓	42	-	-	Oct-March
6.	<i>Limosa lapponica</i>	✓	19	✓	13	-	-	Oct-Aprl
7.	<i>Tringa glareola</i>	✓	64	✓	51	✓	36	Sept-Apr
8.	<i>Tringa hypoleucos</i>	✓	30	✓	28	-	-	Oct-Apr
9.	<i>Tringa nebularis</i>	✓	5	-	-	-	-	Oct-Feb.
10.	<i>Tringa ochropus</i>	✓	10	-	-	-	-	Sep-Feb.
11.	<i>Calidris minuta</i>	✓	76	✓	64	-	-	Sep-May
12.	<i>Calidris temmincki</i>	✓	25	-	-	-	-	Sep-May
13.	<i>Calidris alpinus</i>	✓	22	✓	21	-	-	Oct-Apr
14.	<i>Gallinago gallinago</i>	✓	15	✓	14	-	-	Oct-Apr
15.	<i>Chlidonias hybrida</i>	✓	13	✓	9	-	-	Nov-Apr
16.	<i>Gelochelidon nilotica</i>	✓	34	-	-	-	-	Sept-Apr
17.	<i>Sterna auticauda</i>	✓	11	-	-	-	-	Dec-May
18.	<i>Sterna aurantia</i>	✓	16	-	-	-	-	”
19.	<i>Merops philippinus</i>	✓	24	✓	27	✓	19	Sep-Apr
20.	<i>Pitta brachyura</i>	-	-	-	-	✓	14	Nov.-Apr
21.	<i>Oriolus oriolus</i>	-	-	✓	11	✓	10	Sep-Mar
22.	<i>Terpsiphone paradisi</i>	-	-	-	-	✓	30	Oct-Jun
23.	<i>Motacilla cineria</i>	-	-	-	-	✓	12	Sep-Apr
24.	<i>Motacilla alba</i>	-	-	-	-	✓	11	Oct-Apr

Table : 189 List of Raptors recorded at Kariyannur

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Milvus migrans</i>	-	-	✓	37	✓	41
2.	<i>Haliastur indus</i>	-	-	✓	29	✓	22
3.	<i>Spizaetus cirrhatus</i>	-	-	✓	21	✓	17
4.	<i>Elanus caeruleus</i>	-	-	✓	34	✓	36
5.	<i>Accipiter badius</i>	✓	8	✓	6	-	-

Table : 190 List of Insectivorous birds at Kariyannur

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Egretta intermedia</i>	✓	16	✓	11	✓	13
2.	<i>Bubulcus ibis</i>	✓	66	✓	60	✓	84
3.	<i>Egretta garzetta</i>	✓	29	✓	20	✓	19
4.	<i>Ixobrychus sinensis</i>	✓	11	✓	8	-	-
5.	<i>Vanellus indicus</i>	✓	10	✓	8	-	-
6.	<i>Glareola lactea</i>	✓	256	✓	221	✓	114
7.	<i>Pluvialis dominica</i>	✓	12	✓	14	-	-
8.	<i>Pluvialis squatarola</i>	✓	10	✓	9	-	-
9.	<i>Charadrius dubius</i>	✓	66	✓	64	✓	35
10.	<i>Charadrius leschenaulti</i>	✓	37	✓	34	-	-
11.	<i>Charadrius alexandrines</i>	✓	45	✓	42	-	-
12.	<i>Tringa glareola</i>	✓	66	✓	51	✓	36
13.	<i>Tringa hypoleucos</i>	✓	30	✓	28	-	-
14.	<i>Tringa nebularis</i>	✓	5	-	-	-	-
15.	<i>Tringa ochropus</i>	✓	10	✓	21	-	-
16.	<i>Calidris alpinus</i>	✓	22	✓	-	-	-
17.	<i>Calidris minuta</i>	✓	76	✓	64	-	-
18.	<i>Calidris temmincki</i>	✓	25	-	-	-	-
19.	<i>Gallinago gallinago</i>	✓	15	✓	14	-	-
20.	<i>Centropus sinensis</i>	✓	16	✓	17	✓	21
21.	<i>Apus affinis affinis</i>	-	-	-	-	-	-
22.	<i>Cypsiurus parvus</i>	-	-	-	-	-	-
23.	<i>Merops orientalis</i>	✓	21	✓	18	✓	34
24.	<i>Merops phillippinus</i>	✓	24	✓	27	✓	19
25.	<i>Coracias benghalensis</i>	✓	12	✓	10	-	-
26.	<i>Upupa epops</i>	-	-	-	-	✓	16
27.	<i>Dinopium benghalensis</i>	-	-	-	-	✓	8
28.	<i>Pitta brachyura</i>	-	-	-	-	✓	14
29.	<i>Dicrurus adsimilis</i>	✓	31	✓	30	✓	38
30.	<i>Dicrurus paradiseus</i>	✓	14	✓	12	✓	14
31.	<i>Artamus fuscus</i>	✓	238	✓	217	✓	12
32.	<i>Pericrocotus cinnamomeus</i>	-	-	-	-	-	-
33.	<i>Terpsiphone paradisi</i>	-	-	-	-	✓	30

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
34.	<i>Prinia inurnata</i>	-	-	-	-	✓	23
35.	<i>Prinia socialis</i>	-	-	-	-	✓	30
36.	<i>Saxicoloides fulicata</i>	✓	15	✓	15	-	-
37.	<i>Copsychus saularis</i>	✓	33	✓	26	-	-
38.	<i>Anthus novascelandiae</i>	-	-	-	-	✓	19
39.	<i>Motacilla maderaspatensis</i>	-	-	-	-	✓	34
40.	<i>Motacilla cineria</i>	-	-	-	-	✓	12
41.	<i>Motacilla alba</i>	-	-	-	-	✓	11

Table: 191 List of birds feeding on aquatic animals at Kariyannur

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Phalacrocorax niger</i>	✓	40	-	-	-	-
2.	<i>Anhinga melanogaster</i>	✓	54	-	-	-	-
3.	<i>Ardea alba</i>	✓	10	✓	5	-	-
4.	<i>Ardea cineria</i>	✓	18	✓	22	-	-
5.	<i>Ardeola grayii</i>	✓	92	✓	84	✓	100
6.	<i>Ardea purpurea</i>	✓	7	-	-	-	-
7.	<i>Butorides striatus</i>	✓	13	-	-	-	-
8.	<i>Ciconia episcopus</i>	✓	72	✓	52	-	-
9.	<i>Ciconia nigra</i>	✓	14	✓	14	-	-
10.	<i>Anastomus oscitans</i>	✓	24	-	-	-	-
11.	<i>Nycticorax nycticorax</i>	✓	15	-	-	-	-
12.	<i>Ixobrychus sinensis</i>	✓	11	✓	8	-	-
13.	<i>Ixobrychus flavicollis</i>	✓	14	✓	11	-	-
14.	<i>Metopidius indicus</i>	✓	5	-	-	-	9
15.	<i>Amaurornis phoenicurus</i>	✓	11	-	-	-	11
16.	<i>Glareola lactea</i>	✓	256	✓	221	-	114
17.	<i>Limosa lapponica</i>	✓	19	✓	13	-	-
18.	<i>Tringa glareola</i>	✓	66	✓	51	✓	36
19.	<i>Tringa hypoleucos</i>	✓	30	✓	28	-	-
20.	<i>Tringa nebularis</i>	✓	5	-	-	-	-
21.	<i>Tringa ochropus</i>	✓	10	-	-	-	-
22.	<i>Calidris minuta</i>	✓	76	✓	64	-	-

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
23.	<i>Calidris temmincki</i>	✓	25	-	-	-	-
24.	<i>Calidris alpinus</i>	✓	22	✓	21	-	-
25.	<i>Gallinago gallinago</i>	✓	15	✓	14	-	-
26.	<i>Chlidonias hybrida</i>	✓	13	✓	9	-	-
27.	<i>Gelochelidon nilotica</i>	✓	34	-	-	-	-
28.	<i>Sterna auticauda</i>	✓	10	-	-	-	-
29.	<i>Sterna aurantia</i>	✓	26	-	-	-	-
30.	<i>Alcedo atthis</i>	✓	32	-	28	✓	25
31.	<i>Ceryl rudis</i>	✓	23	✓	28	✓	35
32.	<i>Halcyon smyrnensis</i>	✓	32	✓	29	✓	30

Table: 192 List of Omnivorous Birds at Kariyannur- Kunthipuzha

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Metopidius indicus</i>	✓	5	-	-	✓	9
2.	<i>Amaurornis phoenicurus</i>	✓	11	-	-	✓	11
3.	<i>Eudynamis scolopaceae</i>	✓	18	✓	13	-	-
4.	<i>Cuculus canorus</i>	-	-	-	-	✓	9
5.	<i>Cuculus micropterus</i>	-	-	-	-	✓	7
6.	<i>Megalaima haemacephala</i>	-	-	✓	40	✓	26
7.	<i>Megalaima zeylanica</i>	-	-	✓	39	-	-
8.	<i>Galerida malabarica</i>	-	-	-	-	✓	11
9.	<i>Mirafra assamica</i>	-	-	-	-	✓	21
10.	<i>Oriolus oriolus</i>	-	-	✓	11	✓	10
11.	<i>Acridotheres tristis</i>	-	96	✓	71	✓	88
12.	<i>Acridotheres fuscus</i>	✓	33	✓	28	✓	22
13.	<i>Dendrocitta vagabunda</i>	✓	17	✓	14	✓	15
14.	<i>Corvus splendens</i>	✓	235	✓	236	✓	300
15.	<i>Corvus macrorhynchos</i>	✓	230	✓	240	✓	242
16.	<i>Pycnonotus cafer</i>	✓	45	✓	41	✓	30
17.	<i>Pycnonotus jocosus</i>	✓	33	✓	27	✓	20
18.	<i>Turdoides affinis</i>	✓	99	✓	89	✓	99
19.	<i>Turdoides striatus</i>	✓	47	✓	44	✓	62
20.	<i>Saxicoloides fulicata</i>	✓	15	✓	15	-	-
21.	<i>Orthotomus sutorius</i>	-	-	✓	14	✓	32
22.	<i>Copsychus saularis</i>	✓	33	✓	26	-	-

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
23.	<i>Zoothera citrina</i>	-	-	✓	11	✓	16
24.	<i>Parus major</i>	-	-	-	-	✓	20
25.	<i>Passer domesticus</i>	✓	58	✓	45	✓	62
26.	<i>Ploceus philippinus</i>	✓	72	✓	44	✓	36

Table: 193 List of Granivorous birds at Kariyannur - Kunthipuzha

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Columba livia</i>	✓	260	✓	277	✓	305
2.	<i>Streptopelia chinensis</i>	✓	20	✓	23	✓	17
3.	<i>Petronia xanthocollis</i>	✓	28	✓	120	-	-
4.	<i>Lonchura punctulata</i>	-	-	✓	268	✓	238
5.	<i>Lonchura striata</i>	-	-	✓	108	✓	77
6.	<i>Lonchura malacca</i>	-	-	✓	42	✓	33

Table: 194 List of Nectarivorous birds observed at Kariyannur - Kunthipuzha

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Oriolus oriolus</i>	-	-	✓	11	✓	10
2.	<i>Orthotomus sutorius</i>	-	-	✓	14	✓	32
3.	<i>Dicaeum erythrorhynchos</i>	-	-	✓	86	✓	93
4.	<i>Nectarinia zeylonica</i>	-	-	✓	69	✓	54
5.	<i>Nectarinia asiatica</i>	-	-	✓	34	✓	29
6.	<i>Petronia xanthocollis</i>	✓	28	✓	120	-	-

Table: 195 List of Frugivorous birds recorded at Kariyannur - Kunthipuzha

Sl. No.	Birds species	Band A		Band B		Band C	
		Present	No.	Present	No.	Present	No.
1.	<i>Treron phoenicoptera</i>	✓	55	✓	41	✓	28
2.	<i>Streptopelia chinensis</i>	✓	20	✓	33	✓	17
3.	<i>Psittacula krameri</i>	-	-	-	-	✓	16
4.	<i>Psittacula cyanocephala</i>	-	-	-	-	✓	15
5.	<i>Megalaima haemacephala</i>	-	-	✓	41	✓	26
6.	<i>Megalaima zeylanica</i>	-	-	✓	39	-	-
7.	<i>Dicaeum erythrorhynchos</i>	-	-	✓	86	✓	93
8.	<i>Eudynamis scolopaceae</i>	✓	18	✓	13	-	-
9.	<i>Anthracoceros coronatus</i>	-	-	✓	13	-	-

Table : 196 Seasonal Occurrence of Birds – Band A - Kariyannur

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
1	<i>Phalacrocorax niger</i>		2	3	4	4	1	-	-	2	6	8	8	2	14	8	18
2	<i>Anhinga melanogaster</i>		8	8	6	4	4	2	-	-	4	8	6	6	30	2	12
3	<i>Ardea alba</i>		2	2	-	-	-	-	-	-	1	1	2	2	4	1	5
4	<i>Ardeola grayii</i>		6	6	4	4	2	6	8	10	12	12	14	10	22	36	36
5	<i>Ardea cineria</i>		4	3	-	-	-	-	-	-	2	2	3	4	7	-	11
6	<i>Ardea purpurea</i>		1	-	-	1	-	-	-	-	2	1	1	1	2	2	3
7	<i>Butorides striatus</i>		1	2	2	2	2	-	-	-	2	1	2	2	9	-	6
8	<i>Bubulcus ibis</i>		10	10	12	14	2	-	-	-	-	4	8	6	48	-	18
9	<i>Egretta intermedia</i>		3	2	2	1	-	-	-	-	-	-	2	6	8	-	8
10	<i>Egretta garzetta</i>		3	5	6	4	1	-	-	-	-	2	2	6	19	-	10
11	<i>Ciconia nigra</i>		2	2	1	1	-	-	-	2	2	2	2	6	-	-	8
12	<i>Nycticorax nycticorax</i>		2	-	2	2	4	2	1	-	-	-	1	1	10	3	2
13	<i>Anastomus oscitanus</i>		2	2	3	2	2	3	3	2	1	2	1	1	11	9	2
14	<i>Ixobrychus sinensis</i>		-	-	-	-	-	2	2	3	2	1	1	-	-	9	2
15	<i>Ciconia episcopus</i>		8	8	8	10	6	8	-	-	-	4	10	10	40	8	24
16	<i>Ixobrychus flavicollis</i>		-	-	-	-	1	1	2	3	2	2	2	1	1	8	5
17	<i>Accipiter badius</i>		1	1	1	1	1	-	-	2	1	1	1	-	1	4	1
18	<i>Metopidius indicus</i>		-	-	-	-	1	1	1	1	-	-	-	-	5	4	1
19	<i>Amaurornis phoenicurus</i>		-	-	-	-	1	2	2	2	3	1	-	-	1	9	1
20	<i>Glareola lactea</i>		30	32	4	-	-	10	14	32	30	32	24	48	66	86	104
21	<i>Vanellus indicus</i>		-	1	1	2	1	2	-	-	-	1	1	1	5	2	3
22	<i>Pluvialis dominica</i>		-	-	-	-	-	-	-	3	4	4	1	-	-	7	5
23	<i>Pluvialis squatarola</i>		-	1	1	-	-	-	-	-	1	2	3	2	2	1	7
24	<i>Charadrius dubius</i>		10	8	12	6	-	-	-	-	2	14	10	4	36	2	28
25	<i>Charadrius leschenaultii</i>		4	6	8	5	-	-	-	-	2	6	4	2	23	2	12
26	<i>Charadrius</i>		12	16	10	-	-	-	-	-	-	2	1	4	38	-	7

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
	<i>alexandrines</i>																
27	<i>Limosa lapponica</i>		2	2	2	1	-	-	-	-	-	4	2	4	7	-	12
28	<i>Tringa glareola</i>		10	6	4	2	-	-	-	-	6	8	14	16	22	6	38
29	<i>Tringa hypoleucos</i>		2	4	8	4	-	-	-	-	-	2	4	6	8	-	12
30	<i>Tringa nebularis</i>		1	1	-	-	-	-	-	-	-	1	1	1	2	-	3
31	<i>Tringa ochropus</i>		2	1	-	-	-	-	-	-	2	2	1	2	3	-	7
32	<i>Calidris minuta</i>		10	8	6	-	-	-	-	-	4	12	16	20	24	-	52
33	<i>Calidris temmincki</i>		4	2	2	-	-	-	-	-	2	3	6	6	8	-	17
34	<i>Calidris alpinus</i>		2	2	3	2	-	-	-	-	3	4	4	4	7	-	15
35	<i>Gallinago gallinago</i>		2	2	3	1	-	-	-	-	-	2	3	2	8	-	7
36	<i>Chlidonias hybrida</i>		1	3	4	1	-	-	-	-	-	-	2	2	9	-	4
37	<i>Gelochelidon nilotica</i>		3	3	2	-	-	-	-	-	4	6	8	8	8	-	4
38	<i>Sterna auticauda</i>		1	1	2	3	2	-	-	-	-	-	-	2	8	-	2
39	<i>Sterna aurantia</i>		6	6	4	-	-	-	-	-	-	-	4	6	16	2	10
40	<i>Columba livia</i>		20	14	18	22	16	14	18	22	24	26	32	34	90	78	92
41	<i>Treron phoenicoptera</i>		8	6	7	5	4	-	-	-	2	6	8	9	30	2	23
42	<i>Streptopelia chinensis</i>		2	1	1	2	4	-	-	2	1	3	2	2	10	3	7
43	<i>Centropus sinensis</i>		2	1	1	2	2	-	-	1	1	2	2	2	8	2	6
44	<i>Eudynamis scolopaceae</i>		2	2	1	1	1	2	2	1	2	2	1	1	7	7	4
45	<i>Alcedo atthis</i>		2	3	1	7	1	3	4	4	6	2	2	3	8	17	7
46	<i>Ceryl rudis</i>		2	2	1	1	1	2	4	2	3	1	2	2	7	11	5
47	<i>Halcyon smyrnensis</i>		1	1	2	2	1	3	3	2	2	2	1	2	7	10	5
48	<i>Merops orientalis</i>		2	2	4	-	-	-	-	-	4	4	2	3	8	4	9
49	<i>Merops phillippinus</i>		4	2	2	4	-	-	-	-	2	4	3	3	12	2	10
50	<i>Coracias benghalensis</i>		1	1	2	1	1	1	-	-	-	1	2	2	6	1	5
51	<i>Dicrurus adsimilis</i>		6	2	3	1	1	1	4	3	5	2	1	3	13	14	4
52	<i>Dicrurus paradiseus</i>		1	1	2	1	-	-	1	1	2	1	2	2	5	4	5

Sl. No.	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
53	<i>Artamus fuscus</i>		22	15	30	34	36	12	-	-	14	25	26	24	137	26	75
54	<i>Acridotheres tristis</i>		4	4	6	6	8	10	12	14	12	8	7	5	28	48	20
55	<i>Acridotheres fuscus</i>		2	6	4	5	2	-	-	2	3	3	4	2	17	4	12
56	<i>Dendrocitta vagabunda</i>		2	2	1	1	1	-	-	2	3	2	1	2	7	2	8
57	<i>Corvus splendens</i>		12	14	10	16	18	20	22	24	20	26	25	28	70	86	7
58	<i>Corvus macrorhynchos</i>		8	10	14	18	18	12	16	22	26	20	22	18	68	76	
59	<i>Pycnonotus cafer</i>		3	2	2	4	4	6	4	4	5	3	2	6	15	14	16
60	<i>Pycnonotus jocosus</i>		2	4	4	1	1	2	1	3	3	4	6	2	12	6	15
61	<i>Turdoides affinis</i>		10	12	8	9	5	8	4	4	6	12	10	14	41	16	42
62	<i>Turdoides striatus</i>		2	2	4	6	5	4	2	1	2	6	5	8	19	9	19
63	<i>Saxicoloides fulicata</i>		2	2	1	1	-	-	-	2	2	2	1	2	6	2	7
64	<i>Copsychus saularis</i>		2	2	2	4	4	2	2	2	3	2	4	4	14	6	13
65	<i>Passer domesticus</i>		8	12	-	-	-	-	-	-	6	10	8	14	20	-	38
66	<i>Petronia xanthocollis</i>		5	2	5	3	-	-	-	-	2	2	5	4	15	-	13
67	<i>Ploceus philippinus</i>		6	6	10	8	12	1	2	2	3	5	8	10	42	5	26

Table: 197 Seasonal Occurrence of Birds – Band B - Kariyannur

S No	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
1	<i>Ardea alba</i>		1	1	-	-	-	-	-	-	-	1	1	1	2	-	3
2	<i>Ardeola grayii</i>		6	4	2	2	4	8	6	8	10	10	12	12	14	36	34
3	<i>Ardea cineria</i>		8	10	12	12	2	-	-	-	-	2	8	6	42	3	16
4	<i>Bubulcus ibis</i>		6	4	1	-	-	-	-	-	2	2	2	4	5	-	6
5	<i>Egretta intermedia</i>		3	1	1	-	-	-	-	-	-	-	2	4	5	-	6
6	<i>Egretta garzetta</i>		2	4	3	2	1	-	-	-	-	2	2	4	11	1	8
7	<i>Ixobrychus sinensis</i>		-	-	-	-	-	1	2	2	2	1	1	-	-	7	1
8	<i>Ciconia nigra</i>		2	2	1	-	-	-	-	2	2	2	1	2	5	2	7

S No	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
9	<i>Ixobrychus flavicollis</i>		-	-	-	-	-	1	1	2	2	2	2	1	-	6	5
10	<i>Ciconia episcopus</i>		8	8	6	4	4	-	-	-	2	4	8	8	30	-	22
11	<i>Milvus migrans</i>		2	4	4	2	3	-	-	-	2	6	8	4	15	2	20
12	<i>Haliastur indus</i>		4	2	2	1	2	-	-	-	4	6	5	3	9	2	18
13	<i>Spizaetus cirrhatus</i>		1	1	2	2	3	-	-	-	5	3	2	2	6	8	7
14	<i>Elanus caeruleus</i>		5	4	2	2	3	-	-	-	3	4	6	5	13	6	15
15	<i>Accipiter badius</i>		1	1	1	1	1	-	-	-	-	-	1	-	5	-	15
16	<i>Glareola lactea</i>		25	30	6	-	-	8	15	32	30	28	22	28	6	82	78
17	<i>Vanellus indicus</i>		-	-	1	2	2	1	-	-	-	-	1	1	5	1	2
18	<i>Pluvialis dominica</i>	-180	-	-	-	-	-	-	-	2	4	6	1	1	-	6	8
19	<i>Pluvialis squatarola</i>		-	-	1	1	-	-	-	-	-	2	2	3	2	-	7
20	<i>Charadrius dubius</i>		12	6	10	5	3	-	-	-	2	12	8	6	33	5	26
21	<i>Charadrius leschenaultia</i>		2	6	6	4	-	-	-	-	1	5	6	4	18	-	16
22	<i>Charadrius alexandrines</i>		12	14	8	-	-	-	-	-	-	2	2	6	34	-	8
23	<i>Limosa lapponica</i>		2	2	2	-	-	-	-	-	-	2	3	2	6	-	7
24	<i>Tringa glareola</i>		8	6	4	1	-	-	-	-	6	6	10	10	19	-	32
25	<i>Tringa hypoleucos</i>		6	4	6	2	-	-	-	-	-	2	4	4	18	-	10
26	<i>Calidris minuta</i>		8	4	4	2	2	-	-	-	4	10	14	16	20	-	44
27	<i>Calidris alpinus</i>		2	2	2	1	-	-	-	-	2	4	4	4	7	-	14
28	<i>Gallinago gallinago</i>		2	2	2	1	-	-	-	-	-	2	4	2	6	-	8
29	<i>Chlidonias hybrida</i>		1	2	1	1	-	-	-	-	-	-	2	2	5	-	4
30	<i>Columba livia</i>		24	16	18	26	20	16	20	21	22	28	30	36	104	57	116
31	<i>Treron phoenicoptera</i>		8	6	5	4	2	-	-	-	-	6	6	4	23	2	16
32	<i>Streptopelia chinensis</i>		2	1	1	2	6	-	-	1	1	2	4	3	7	6	10
33	<i>Centropus sinensis</i>		3	2	2	2	2	-	-	2	1	1	2	1	11	3	3
34	<i>Eudynamys scolopacea</i>		1	1	2	1	-	-	2	1	1	2	2	1	5	3	5
35	<i>Alcedo atthis</i>		2	2	1	1	1	4	4	3	5	2	1	2	7	16	5
36	<i>Ceryx rudis</i>		2	2	2	2	1	3	4	3	3	1	3	2	9	13	6

S No	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
37	<i>Halcyon smyrnensis</i>		1	1	2	2	2	4	4	2	2	3	2	2	10	12	7
38	<i>Merops orientalis</i>		1	1	2	-	-	-	-	-	4	3	4	3	4	-	14
39	<i>Merops philippinus</i>		5	3	4	2	-	-	-	-	2	3	4	4	14	-	13
40	<i>Coracias benghalensis</i>		1	1	1	2	2	-	-	-	-	1	1	1	7	-	3
41	<i>Anthracoceros coronatus</i>		1	1	1	2	2	-	-	-	1	1	2	2	7	-	6
42	<i>Ocyrceros birostris</i>		2	2	2	1	2	-	-	-	2	2	1	1	9	-	6
43	<i>Megalaima haemacephala</i>		4	6	6	5	3	-	-	-	-	4	6	6	24	-	16
44	<i>Megalaima zeylanica</i>		3	3	4	6	4	2	-	-	2	5	4	6	20	2	17
45	<i>Oriolus oriolus</i>		2	2	1	-	-	-	-	-	2	2	1	1	5	-	6
46	<i>Dicrurus adsimilis</i>		4	2	2	1	1	1	3	3	4	4	2	3	10	7	13
47	<i>Dicrurus paradiseus</i>		1	1	2	2	-	-	-	1	1	2	1	1	6	1	5
48	<i>Artamus fuscus</i>		18	22	20	32	32	16	-	-	15	18	26	20	122	16	79
49	<i>Acridotheres tristis</i>		4	2	6	5	8	8	7	5	8	8	6	4	25	20	26
50	<i>Acridotheres fuscus</i>		2	2	3	3	2	-	-	2	4	4	4	2	12	2	14
51	<i>Dendrocitta vagabunda</i>		1	1	1	2	1	-	-	2	2	1	1	2	6	2	6
52	<i>Corvus splendens</i>		20	20	26	18	16	8	8	40	15	19	24	22	-	-	-
53	<i>Corvus macrorhynchos</i>		10	14	12	18	16	14	16	20	22	24	28	26	70	50	12
54	<i>Pycnonotus cafer</i>		2	2	3	4	6	3	4	4	5	2	2	6	15	11	15
55	<i>Pycnonotus jocosus</i>		2	3	1	2	1	2	1	3	3	3	2	4	9	6	12
56	<i>Turdoides affinis</i>		1	8	12	6	5	6	4	2	6	8	10	12	41	12	36
57	<i>Turdoides striatus</i>		2	2	4	4	5	4	2	1	2	6	4	8	17	7	20
58	<i>Orthotomus sutorina</i>		1	1	1	2	-	-	-	2	2	1	2	2	5	2	7
59	<i>Saxicoloides fulicata</i>		2	1	2	2	-	-	-	2	2	1	1	2	7	2	6
60	<i>Copsychus saularis</i>		2	2	4	4	2	1	1	1	3	2	2	2	14	3	9
61	<i>Passer domesticus</i>		6	8	-	-	-	-	-	-	8	8	8	6	15	-	30

S No	Bird species	Band	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
62	<i>Zoothera citrina</i>		1	1	-	-	1	1	1	2	2	-	1	1	3	4	4
63	<i>Dicaeum erythrorhynchos</i>		10	12	14	10	16	-	-	-	-	6	6	12	62	-	24
64	<i>Nectarinia zeylonica</i>		8	8	6	10	-	-	-	4	10	12	6	5	32	4	33
65	<i>Nectarinia asiatica</i>		4	4	6	2	2	-	-	1	3	5	2	5	18	1	15
66	<i>Petronia xanthocollis</i>		6	8	8	12	6	-	-	2	14	18	20	26	40	2	78
67	<i>Ploceus philippinus</i>		6	10	12	8	4	2	2	3	6	14	12	15	40	7	47
68	<i>Lonchura punctulata</i>		62	40	40	8	4	-	-	2	6	8	42	56	154	2	112
69	<i>Lonchura striata</i>		18	16	20	12	2	-	-	2	4	8	10	16	68	2	38
70	<i>Lonchura malacca</i>		2	2	4	4	4	-	-	2	3	5	8	8	16	2	24

Table:198 Seasonal Occurrence of Birds – Band – C - Kariyannur – Kunthipuzha

S. No	Bird species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
1	<i>Ardeola grayii</i>	8	5	3	4	3	7	8	10	14	14	12	12	23	25	52
2	<i>Bubulcus ibis</i>	12	16	18	12	4	-	-	-	-	4	10	8	62	-	22
3	<i>Egretta intermedia</i>	2	2	2	1	-	-	-	-	-	-	2	4	7	-	6
4	<i>Egretta Garzetta</i>	2	2	3	3	1	-	-	-	-	2	2	4	11	-	8
5	<i>Milvus migrans</i>	4	6	6	5	2	-	-	-	2	6	6	4	23	-	18
6	<i>Haliastur indus</i>	1	1	2	3	2	-	-	2	2	2	3	4	9	4	9
7	<i>Spizaetus cirrhatus</i>	2	2	1	1	1	3	-	-	2	2	1	2	7	5	5
8	<i>Elanus caeruleus</i>	4	6	2	2	4	-	-	-	4	3	5	6	18	4	14
9	<i>Metopidius indicus</i>	-	-	-	-	1	1	2	2	1	2	-	-	1	6	2
10	<i>Amaurornis phoenicurus</i>	-	-	-	-	1	2	2	2	3	1	-	-	1	9	1
11	<i>Glareola lactea</i>	10	12	2	-	-	8	6	12	16	12	18	18	24	42	48
12	<i>Charadrius dubius</i>	4	4	6	5	1	-	-	-	1	6	4	4	20	1	14
13	<i>Tringa glareola</i>	6	4	2	2	-	-	-	-	4	6	4	8	14	4	18
14	<i>Columba livia</i>	18	20	32	30	42	15	18	12	20	26	28	44	142	65	98

S. No	Bird species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
15	<i>Treron phoenicoptera</i>	4	2	4	6	2	-	-	-	-	4	4	2	18	-	10
16	<i>Streptopelia chinensis</i>	1	1	2	1	4	-	-	1	1	1	2	4	9	2	6
17	<i>Psittacula krameri</i>	3	2	1	2	2	-	-	1	1	1	2	1	10	2	4
18	<i>Psittacula cyanocephala</i>	2	2	2	1	2	-	-	-	2	2	2	1	9	2	6
19	<i>Cuculus canorus</i>	1	1	1	-	-	-	-	1	1	2	1	1	3	2	4
20	<i>Cuculus micropterus</i>	1	1	1	-	1	-	-	-	-	1	1	1	4	-	3
21	<i>Centropus sinensis</i>	2	2	1	2	1	-	2	3	3	1	2	2	8	8	5
22	<i>Alcedo atthis</i>	2	2	1	1	1	4	4	3	2	2	1	2	7	13	5
23	<i>Ceryl rudis</i>	2	2	2	2	1	4	4	6	6	3	2	1	9	20	6
24	<i>Halcyon smyrnensis</i>	1	-	2	2	2	4	4	3	2	2	4	4	7	13	10
25	<i>Merops orientalis</i>	4	6	4	-	-	-	-	-	4	6	6	4	14	4	16
26	<i>Merops phillippinus</i>	2	2	3	2	-	-	-	-	2	2	4	2	9	2	8
27	<i>Upupa epops</i>	1	1	2	2	1	-	-	2	1	2	2	2	7	3	6
28	<i>Megalaima haemacephala</i>	4	4	3	3	2	-	-	-	-	2	4	4	16	-	10
29	<i>Dinopium benghalense</i>	1	1	1	1	-	-	1	-	-	1	1	1	4	1	3
30	<i>Pitta brachyura</i>	4	2	2	2	-	-	-	-	-	-	2	2	10	-	4
31	<i>Galerida malabarica</i>	2	1	1	2	1	-	-	-	-	1	1	2	7	-	4
32	<i>Mirafra assamica</i>	2	2	4	4	2	1	-	-	2	1	2	1	14	3	4
33	<i>Oriolus oriolus</i>	2	2	1	-	-	-	-	-	1	1	2	1	5	1	4
34	<i>Dicrurus adsimilis</i>	4	4	4	2	1	1	2	4	6	4	2	4	15	13	10
35	<i>Dicrurus paradiseus</i>	1	1	2	1	-	-	-	1	1	2	1	1	5	2	4
36	<i>Acridotheres tristis</i>	8	6	4	6	6	8	10	10	12	8	6	4	30	40	18
37	<i>Acridotheres fuscus</i>	2	2	1	2	-	-	2	2	4	2	4	1	7	8	7
38	<i>Dendrocitta vagabunda</i>	2	2	1	1	1	-	-	2	2	1	2	1	7	4	4
39	<i>Corvus splendens</i>	24	28	40	44	46	12	8	10	16	18	24	30	182	46	72
40	<i>Corvus macrorhynchos</i>	12	10	16	18	18	12	15	22	25	30	38	26	74	74	94

S. No	Bird species	J	F	M	A	M	J	J	A	S	O	N	D	Pre Monsoon	Monsoon	Post Monsoon
41	<i>Hemipus picatus</i>	2	3	3	2	1	1	-	-	-	1	2	2	11	1	5
42	<i>Pericrocotus cinnamomeus</i>	1	1	-	-	2	2	-	-	2	1	1	2	4	4	4
43	<i>Pycnonotus cafer</i>	6	6	3	2	1	2	1	1	1	2	2	3	18	5	7
44	<i>Pycnonotus jocosus</i>	3	2	2	1	1	2	1	-	2	2	2	2	9	5	6
45	<i>Turdoides affinis</i>	6	8	7	6	4	6	6	2	10	12	18	14	31	24	44
46	<i>Turdoides striatus</i>	4	2	2	6	6	4	-	-	8	12	10	8	20	12	30
47	<i>Terpsiphone paradisi</i>	4	2	4	4	2	4	-	-	-	4	4	2	16	4	10
48	<i>Prinia inurnata</i>	2	2	1	1	1	4	4	2	2	2	1	1	7	12	4
49	<i>Prinia socialis</i>	2	2	4	2	1	2	2	4	2	4	3	2	11	10	9
50	<i>Orthotomus sutorius</i>	2	2	4	4	2	2	1	2	2	4	4	3	14	7	11
51	<i>Zoothera citrina</i>	1	2	-	-	2	2	1	2	1	2	1	2	5	6	5
52	<i>Parus major</i>	2	1	-	-	1	1	1	2	2	3	3	4	4	6	10
53	<i>Anthus novascelandiae</i>	2	2	4	2	2	-	-	-	2	2	1	2	12	2	5
54	<i>Motacilla maderaspatensis</i>	4	4	2	2	2	1	1	2	4	6	4	2	14	8	12
55	<i>Motacilla cineria</i>	2	1	1	1	-	-	-	-	2	2	2	1	5	2	5
56	<i>Motacilla alba</i>	1	2	1	1	-	-	-	-	-	2	2	2	5	-	6
57	<i>Dicaeum erythrorhynchos</i>	12	10	14	8	13	-	-	-	-	8	12	16	57	-	36
58	<i>Nectarinia zeylonica</i>	10	12	8	4	4	-	-	-	4	4	5	3	38	4	12
59	<i>Nectarinia asiatica</i>	2	4	4	2	1	-	-	2	4	5	3	2	13	6	10
60	<i>Passer domesticus</i>	6	10	-	-	-	-	-	-	4	12	14	16	16	4	42
61	<i>Ploceus philippinus</i>	2	4	2	3	1	-	-	-	2	8	8	6	12	-	24
62	<i>Lonchura punctulata</i>	40	46	42	12	2	-	-	-	4	10	38	44	142	-	96
63	<i>Lonchura striata</i>	8	12	14	10	2	-	-	1	2	6	8	14	46	1	30
64	<i>Lonchura malacca</i>	2	2	1	2	1	-	-	2	2	6	7	8	8	2	23

Table: 199 Comparison of Avifauna of Nila, Kalpathypuzha and Kunthipuzha.

	Scientific Name	Common Name	Status	Location
1	<i>Accipiter badius</i>	Shikra	R	N, K, Ku
2	<i>Acridotheres fuscus</i>	Jungle myna	R	N, K, Ku
3	<i>Acridotheres tristis</i>	Common myna	R	N, K, Ku
4	<i>Acrocephalus stentoreus</i>	Indian great reed warbler	M	K, Ku
5	<i>Aegithina tiphia</i>	Ceylon iora	R	N, K, Ku
6	<i>Alcedo atthis</i>	Small blue kingfisher	R	N, K, Ku
7	<i>Amaurornis phoenicurus</i>	White-breasted waterhen	R	N, K, Ku
8	<i>Anastomus oscitans</i>	Asian open billed stork	R	N, Ku
9	<i>Anhinga melanogaster</i>	Darter	R	N, K, Ku
10	<i>Anhinga rufa</i>	Darter	R	N, Ku
	<i>Anthracoceros coronatus</i>	Malabar pied hornbill	R	N, K, Ku
12	<i>Anthus hodgsoni</i>	Tree pipit	M	K, Ku
13	<i>Anthus novaeseelandiae</i>	Indian pipit	R	N, K, Ku
14	<i>Apus affinis</i>	House swift	R	N, K, Ku
15	<i>Ardea alba</i>	Large egret	R	N, K, Ku
16	<i>Ardea cinerea</i>	Grey heron	R	N, K, Ku
17	<i>Ardea purpurea</i>	Purple heron	R	N, Ku
18	<i>Ardeola grayii</i>	Pond heron	R	N, K, Ku
19	<i>Artamus fuscus</i>	Ashy swallow shrike	R	N, K, Ku
20	<i>Asio flammeus</i>	Short-eared owl	M	K, Ku
21	<i>Athene brama</i>	Southern Spotted owlet	R	N, K, Ku
22	<i>Bubo zeylonensis</i>	Brown fish owl	R	K, Ku
23	<i>Bubulcus ibis</i>	Cattle egret	R	N, K, Ku
24	<i>Buceros bicornis</i>	Great Indian horn bill	R	K, Ku
25	<i>Butorides striatus</i>	Little green heron	R	N, Ku
26	<i>Calidris alba</i>	Sanderling	M	N, K, Ku
27	<i>Calidris alpinus</i>	Dunlin	M	N, K, Ku

	Scientific Name	Common Name	Status	Location
28	<i>Calidris minuta</i>	Little stint	M	N, Ku
29	<i>Calidris temminckii</i>	Temminck's stint	M	N, Ku
30	<i>Calidris testaceous</i>	Curlew stint	M	N
31	<i>Carpodacus erythrurus</i>	Common rosefinch	M	K, Ku
32	<i>Centropus sinensis</i>	Crow pheasant	R	N, K, Ku
33	<i>Ceryl rudis</i>	Pied Kingfisher	R	N, K, Ku
34	<i>Chaetura gigantea</i>	Brown-throated spinetail swift	R	K, Ku
35	<i>Chaetura sylvatica</i>	White-rumped spinetail swift	R	K, Ku
36	<i>Chalcophaps indica</i>	Emerald Dove	R	Ku
37	<i>Charadrius alexandrinus</i>	Kentish plover	M	N, Ku
38	<i>Charadrius dubius</i>	Little ringed plover	M	N, Ku
39	<i>Charadrius leschenaulti</i>	Large sand plover	M	N, Ku
40	<i>Charadrius mongolus</i>	Pamirs lesser sand plover	M	N
41	<i>Chlidonias hybrida</i>	Indian whiskered tern	M	N, Ku
42	<i>Chloropsis aurifrons</i>	Gold fronted chloropsis	R	K, Ku
43	<i>Chloropsis cochinchinensis jerdoni</i>	Jerdon's chloropsis	R	N
44	<i>Ciconia episcopus</i>	White-necked stork	R	N, K, Ku
45	<i>Ciconia nigra</i>	Black stork	R	N, Ku
46	<i>Circus aeruginosus</i>	Marsh harrier	M	N
47	<i>Cisticola juncidis</i>	Streaked fantail warbler	R	N, Ku
48	<i>Columba elphinstonii</i>	Nilgiri wood pigeon	R	K, Ku
49	<i>Columba livia</i>	Blue rock pigeon	K	N, K, Ku
50	<i>Copsychus saularis</i>	Magpie robin	R	N, K, Ku
51	<i>Coracias benghalensis</i>	South Indian roller	R	N, K, Ku
52	<i>Coracina melanoptera</i>	Black-headed cuckoo shrike	R	K, Ku
53	<i>Corvus macrorhynchos</i>	Indian jungle crow	R	N, K, Ku
54	<i>Corvus splendens</i>	House crow	R	N, K, Ku
55	<i>Cuculus canorus</i>	Cuckoo	R	N, K, Ku
56	<i>Cuculus micropterus</i>	Indian cuckoo	R	N, K, Ku
57	<i>Cuculus varius</i>	Common hawk cuckoo	R	N, K, Ku
58	<i>Cypsiurus parvus</i>	Palm swift	R	N, K, Ku

	Scientific Name	Common Name	Status	Location
59	<i>Dendrocitta leucogastra</i>	Southern tree pie	R	K, Ku
60	<i>Dendrocitta vagabunda</i>	Tree pie	R	N, K, Ku
61	<i>Dicaeum agile</i>	Thick-billed flowerpecker	R	K, Ku
62	<i>Dicaeum erythrorhynchos</i>	Tickell's flowerpecker	R	N, K, Ku
63	<i>Dicrurus adsimilis</i>	Black drongo	R	N, K, Ku
64	<i>Dicrurus aeneus</i>	White-bellied drongo	R	K, Ku
65	<i>Dicrurus paradiseus</i>	Racket-tailed drongo	R	N, K, Ku
66	<i>Dinopium benghalensis</i>	Malabar golden-backed woodpecker	R	N, K, Ku
67	<i>Dinopium javanense</i>	Golden-backed three woodpecker	M	N, K, Ku
68	<i>Dryocopus javensis</i>	Great black woodpecker	R	K, Ku
69	<i>Ducula aenea</i>	Green imperial pigeon	R	K, Ku
70	<i>Ducula badia</i>	Imperial pigeon	R	K, Ku
71	<i>Egretta garzetta</i>	Little egret	R	N, K, Ku
72	<i>Egretta intermedia</i>	Median egret	R	N, K, Ku
73	<i>Elanus caeruleus</i>	Black winged Kite	R	N, K, Ku
74	<i>Eudynamis scolopaceae</i>	Indian koel	R	N, K, Ku
75	<i>Eurystomus orientalis</i>	Broad-billed roller	LM	N, K, Ku
76	<i>Falco peregrinus</i>	Shaheen falcon	M	K, Ku
77	<i>Galerida malabarica</i>	Malabar crested lark	R	N, K, Ku
78	<i>Gallinago gallinago</i>	Fantail snipe	M	N, Ku
79	<i>Galloperdix spadicea</i>	Red spur fowl	R	K, Ku
80	<i>Gallus sonnerattii</i>	Grey jungle fowl	R	K, Ku
81	<i>Gelochelidon nilotica</i>	Gull-billed tern	M	N, Ku
82	<i>Glareola lactea</i>	Small Indian pranticole	R	N, K, Ku
83	<i>Glaucidium radiatum</i>	Malabar jungle owlet	R	K, Ku
84	<i>Gracula religiosa</i>	Indian hill myna	R	N, K, Ku
85	<i>Halcyon smyrnensis</i>	White-breasted kingfisher	R	N, K, Ku
86	<i>Haliastur Indus</i>	Brahminy kite	R	N, K, Ku

	Scientific Name	Common Name	Status	Location
87	<i>Harpactes fasciatus</i>	Malabar trogon	R	K, Ku
88	<i>Hemicircus canente</i>	Heart spotted woodpecker	R	K, Ku
89	<i>Hemiprocne longipennis</i>	Indian crested free swift	R	K, Ku
90	<i>Hemipus picatus</i>	Black-backed pied flycatcher shrike	R	N, K, Ku
91	<i>Hirundo concolor</i>	Dusky crag martin	R	Ku
92	<i>Hirundo daurica</i>	Red-rumped swallow	R	N, K, Ku
93	<i>Hirundo rustica</i>	Common eastern swallow	R	N, K, Ku
94	<i>Hirundo tahitica</i>	Nilgiri House swallow	R	Ku
95	<i>Hydrophasianus chirurgus</i>	Pheasant-tailed Jacana	R	K
96	<i>Hypsipetes indicus</i>	Yellow-browed bulbul	R	K, Ku
97	<i>Hypsipetes madagascariensis</i>	South Indian black bulbul	R	K, Ku
98	<i>Irena puella</i>	Fairy blue bird	R	K, Ku
99	<i>Ixobrychus cinnamomeus</i>	Yellow bittern	R	N, K, Ku
100	<i>Ixobrychus flavicollis</i>	Black bittern	R	K, Ku
101	<i>Ixobrychus sinensis</i>	Yellow bittern	R	N, K, Ku
102	<i>Lanius cristatus</i>	Brown shrike	M	K, Ku
103	<i>Larus brunnicephalus</i>	Brown-headed gull	M	N
104	<i>Larus fuscus</i>	Lesser black-backed gull	M	N
105	<i>Larus ichthyaetus</i>	Great black-headed gull	M	N
106	<i>Limosa lapponica</i>	Bar-tailed godwit	M	N, Ku
107	<i>Lonchura kelaarti</i>	Rufous bellied munia	R	K, Ku
108	<i>Lonchura malabarica</i>	White throated munia	R	K, Ku
109	<i>Lonchura Malacca</i>	Black-headed munia	R	Ku
110	<i>Lonchura punctulata</i>	Spotted munia	R	N, K, Ku
111	<i>Lonchura striata</i>	White backed munia	R	N, Ku
112	<i>Loriculus vernalis</i>	Malabar lorikeet	R	K, Ku
113	<i>Megalaima haemacephala</i>	Coppersmith barbet	R	N, K, Ku
114	<i>Megalaima viridis</i>	Small green barbet	R	K, Ku
115	<i>Megalaima zeylanica</i>	Large green barbet	R	N, K, Ku
116	<i>Merops leschenaultii</i>	Chestnut-headed bee-eater	R	K, Ku
117	<i>Merops orientalis</i>	Small green bee-eater	LM	N, K, Ku
118	<i>Merops phillippinus</i>	Blue-tailed bee-eater	R	N, K, Ku
119	<i>Metopidius indicus</i>	Bronze-winged Jacana	R	N, K, Ku

	Scientific Name	Common Name	Status	Location
120	<i>Milvus migrans</i>	Common pariah kite	R	N, K, Ku
121	<i>Mirafra assamica</i>	Bush lark	R	N, Ku
122	<i>Monticola solitarius</i>	Blue rock thrush	M	N, K, Ku
123	<i>Motacilla alba</i>	White wagtail	M	N, Ku
124	<i>Motacilla capsica</i>	White wag tail	M	K, Ku
125	<i>Motacilla cinerea</i>	Grey wagtail	R	N, K, Ku
126	<i>Motacilla flava</i>	Yellow wagtail	M	K, Ku
127	<i>Motacilla indica</i>	Forest wagtail	M	K, Ku
128	<i>Motacilla maderaspatensis</i>	Large pied wagtail	R	N, K, Ku
129	<i>Muscicapa albicaudata</i>	Nilgiri flycatcher	R	K, Ku
130	<i>Muscicapa latirostris</i>	Brown flycatcher	R	K, Ku
131	<i>Muscicapa mutti</i>	Brown flycatcher	R	K, Ku
132	<i>Muscicapa pallipes</i>	White-bellied blue flycatcher	M	K, Ku
133	<i>Muscicapa tickelliae</i>	Tickell's blue flycatcher	R	N, K, Ku
134	<i>Myiophoneus horsfieldii</i>	Malabar whistling thrush	R	K, Ku
135	<i>Nectarinia asiatica</i>	Purple sunbird	R	N, K, Ku
136	<i>Nectarinia lotenia</i>	Loten's sunbird	R	K, Ku
137	<i>Nectarinia minima</i>	Small sunbird	R	K, Ku
138	<i>Nectarinia zeylonica</i>	Indian Purple rumped sunbird	R	N, K, Ku
139	<i>Numenius arquata</i>	Curlew	M	N
140	<i>Nycticorax nycticorax</i>	Night heron	R	N, K, Ku
141	<i>Ocyrceros birostris</i>	Common grey hornbill	R	N, Ku
142	<i>Oriolus chinensis</i>	Black naped oriole	M	Ku
143	<i>Oriolus oriolus</i>	Golden oriole	M	N, K, Ku
144	<i>Oriolus xanthornus</i>	Black-headed oriole	R	N, K, Ku
145	<i>Orthotomus sutorius</i>	Tailorbird	R	N, K, Ku
146	<i>Pandion haliaetus</i>	Osprey eagle	R	N, K
147	<i>Parus major</i>	Grey tit	R	N, K, Ku
148	<i>Parus xanthogenys</i>	Yellow cheeked tit	R	K, Ku
149	<i>Passer domesticus</i>	House sparrow	R	N, K, Ku
150	<i>Pelargopsis capensis</i>	Brown-headed stork	R	N

	Scientific Name	Common Name	Status	Location
151	<i>Pellorneum ruficeps</i>	Spotted babbler	R	K, Ku
152	<i>Perdica erythrorhyncha</i>	Painted bush quail	R	K, Ku
153	<i>Pericrocotus cinnamomeus</i>	Malabar small minivet	R	N, K, Ku
154	<i>Pericrocotus flammeus</i>	Scarlet minivet (Orange)	R	K, Ku
155	<i>Petronia xanthocollis</i>	Yellow-throated sparrow	M	N, K, Ku
156	<i>Phalacrocorax niger</i>	Little cormorant	R	N, K, Ku
157	<i>Phylloscopus affinis</i>	Tickell's leaf warbler	R	K, Ku
158	<i>Phylloscopus trochiloides</i>	Greenish leaf warbler	M	Ku
159	<i>Pitta brachyura</i>	Indian pitta	M	N, K, Ku
160	<i>Ploceus philippinus</i>	Baya weaver bird	R	N, K, Ku
161	<i>Pluvialis dominica</i>	Golden plover	M	N, Ku
162	<i>Pluvialis fulva</i>	Pacific golden plover	M	N
163	<i>Pluvialis squatarola</i>	Grey plover	M	N, Ku
164	<i>Pomato-rhinus schisticeps</i>	Scimitar babbler	R	Ku
165	<i>Prinia inornata</i>	Nilgiri Plain wren-warbler	R	N, Ku
166	<i>Prinia socialis</i>	Ashy wren-warbler	R	N, K, Ku
167	<i>Prinia subflava</i>	Plain wren warbler	R	N
168	<i>Psittacula columboides</i>	Blue-winged parakeet	R	K, Ku
169	<i>Psittacula cyanocephala</i>	Blossom headed parakeet	R	N, K, Ku
170	<i>Psittacula krameri</i>	Rose-ringed parakeet	R	N, K, Ku
171	<i>Pycnonotus cafer</i>	Red-vented bulbul	R	N, K, Ku
172	<i>Pycnonotus jocosus</i>	Red-whiskered bulbul	R	N, K, Ku
173	<i>Pycnonotus luteolus</i>	White-browed bulbul	R	N
174	<i>Pycnonotus melanicterus</i>	Ruby-throated yellow bulbul	R	K, Ku
175	<i>Rhipidura aureola</i>	White-browed fantail flycatcher	R	N, K, Ku
176	<i>Rhopocichla atriceps</i>	Black-headed babbler	R	K, Ku
177	<i>Saxicola caprata</i>	Pied bush chat	R	K, Ku
178	<i>Saxicoloides fulicata</i>	Indian robin	R	N, K, Ku
179	<i>Spilornis cheela</i>	Crested serpent eagle	R	K, Ku
180	<i>Spizaetus cirrhatus</i>	Indian crested hawk-eagle	R	N, K, Ku
181	<i>Sterna aurantia</i>	River tern	M	N, Ku

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

R=Resident, M=Migrant, LM=Local migrant, N=Nila basin, K=Kalpathypuzha basin, Ku=Kunthipuzha basin

Table: 200 Unique Birds of Nila, Kalpathy and Kunthi Rivers

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

Table: 201 Comparison of the number of birds at the three river sites.

Species	OTP	PTB	MAC	KAV	MAD	PAR	PKV	THA	KYR	Total
<i>Accipiter badius</i>	0	35	16	16	0	0	11	38	26	142
<i>Acridotheres fuscus</i>	151	387	304	176	173	211	243	510	83	2238
<i>Acridotheres tristis</i>	325	455	304	96	136	114	74	500	255	2259
<i>Acrocephalus stentoreus</i>	0	0	0	28	0	20	23	36	0	107
<i>Aegithina tiphia</i>	0	37	16	38	24	22	40	44	0	221
<i>Alcedo atthis</i>	146	101	67	128	140	123	115	125	85	1030
<i>Amaurornis phoenicurus</i>	13	16	0	0	26	30	0	16	22	123
<i>Anastomus oscitans</i>	0	0	20	0	0	0	0	0	22	42
<i>Anhinga melanogaster</i>	32	0	55	144	21	42	0	26	44	364
<i>Anhinga rufa</i>	0	48	0	0	0	0	0	31	0	79
<i>Anthracoceros coronatus</i>	81	0	0	75	35	0	68	49	13	321
<i>Anthus novaeseelandiae</i>	0	17	64	0	38	71	0	36	19	245
<i>Apus affinis</i>	182	211	159	0	167	226	0	212	0	1157

Species	OTP	PTB	MAC	KAV	MAD	PAR	PKV	THA	KYR	Total
<i>Apus melba nubifuga</i>	0	0	84	0	0	0	0	0	0	84
<i>Ardea alba</i>	12	0	14	0	0	24	0	27	15	92
<i>Ardea cinerea</i>	0	12	31	0	0	18	0	12	79	152
<i>Ardea purpurea</i>	0	19	41	0	0	0	0	0	7	67
<i>Ardeola grayii</i>	325	406	365	197	184	224	118	161	278	2258
<i>Artamus fuscus</i>	0	166 2	1933	340	256	0	0	1174	455	5820
<i>Asio flammeus</i>	0	0	0	16	0	0	12	0	0	28
<i>Athene brama</i>	0	7	8	24	0	0	7	0	0	46
<i>Bubo zeylonensis</i>	0	0	0	23	11	0	15	0	0	49
<i>Bubulcus ibis</i>	222	349	277	165	442	175	250	282	161	2323
<i>Buceros bicornis</i>	0	0	0	50	0	0	73	0	0	123
<i>Butorides striata</i>	0	0	32	0	0	0	0	0	15	47
<i>Calidris alba</i>	0	0	16	0	0	0	0	0	0	16
<i>Calidris alpinus</i>	0	0	31	0	0	0	0	0	43	74
<i>Calidris minuta</i>	0	99	99	0	0	0	0	0	140	338
<i>Calidris temmincki</i>	0	17	29	0	0	0	0	0	25	71
<i>Calidris testacea</i>	0	0	105	0	0	0	0	0	0	105
<i>Carpodacus erythrinus</i>	0	0	0	260	0	0	250	0	0	510
<i>Centropus sinensis</i>	67	54	36	20	0	32	69	0	54	332
<i>Ceryx rudis</i>	105	22	49	0	92	90	0	72	86	516
<i>Chaetura gigantea</i>	0	0	0	57	44	0	80	0	0	181
<i>Chaetura sylvatica</i>	0	0	0	91	0	0	45	0	0	136
<i>Chalcophaps indica</i>	0	0	0	0	0	0	40	33	0	73
<i>Charadrius alexandrinus</i>	45	58	44	0	0	0	0	0	87	234
<i>Charadrius dubius</i>	70	73	47	0	0	0	0	0	165	355
<i>Charadrius leschenaultii</i>	0	0	42	0	0	0	0	0	71	113
<i>Charadrius mongolus</i>	0	0	24	0	0	0	0	0	0	24
<i>Chlidonias hybrida</i>	0	17	27	0	0	0	0	0	22	66
<i>Chloropsis aurifrons</i>	0	0	0	38	0	0	30	26	0	94
<i>Chloropsis cochinchinensis</i>	0	21	25	0	0	0	0	0	0	46
<i>Ciconia episcopus</i>	0	52	90	0	0	85	0	0	124	351
<i>Ciconia nigra</i>	0	0	24	0	0	0	0	0	22	46
<i>Circus aeruginosus</i>	0	0	13	0	0	0	0	0	0	13

Species	OTP	PTB	MAC	KAV	MAD	PAR	PKV	THA	KYR	Total
<i>Cisticola juncidis</i>	0	142	0	0	0	0	0	36	0	178
<i>Columba elphinstonii</i>	0	0	0	61	0	0	64	0	0	125
<i>Columba livia</i>	1146	954	909	234	611	324	240	1140	842	6400
<i>Copsychus malabaricus</i>	0	0	0	45	0	0	0	0	0	45
<i>Copsychus saularis</i>	74	95	32	61	49	45	0	137	59	552
<i>Coracias benghalensis</i>	0	25	23	40	30	0	39	13	22	192
<i>Coracina melanoptera</i>	0	0	0	30	0	0	41	0	0	71
<i>Corvus macrorhynchos</i>	511	1140	1423	343	264	397	121	1154	518	5871
<i>Corvus splendens</i>	1038	2767	2982	1561	316	967	0	1708	463	11802
<i>Cuculus canorus</i>	25	16	0	36	23	25	37	27	9	198
<i>Cuculus micropterus</i>	20	6	0	21	21	21	0	29	7	125
<i>Cuculus varius</i>	17	0	0	10	0	0	0	11	0	38
<i>Cypsiurus parvus</i>	73	33	0	65	90	29	27	87	0	404
<i>Dacula aenea</i>	0	0	0	0	0	0	180	0	0	180
<i>Dacula badia</i>	0	0	0	0	0	0	70	0	0	70
<i>Dendrocitta leucogastra</i>	0	0	0	34	0	0	34	0	0	68
<i>Dendrocitta vagabunda</i>	46	44	25	51	29	67	42	81	46	431
<i>Dicaeum agile</i>	0	0	0	94	29	0	94	48	0	265
<i>Dicaeum erythrorhynchos</i>	283	111	90	157	56	42	227	180	179	1325
<i>Dicrurus adsimilis</i>	118	151	265	146	194	264	116	209	99	1562
<i>Dicrurus aeneus</i>	0	0	0	18	0	0	11	34	0	63
<i>Dicrurus paradiseus</i>	30	94	67	109	81	77	100	98	37	693
<i>Dinopium benghalense</i>	13	10	10	47	0	17	53	34	8	192
<i>Dinopium javanense</i>	13	0	0	23	0	0	76	0	0	112
<i>Ducula aenea</i>	0	0	0	131	0	0	0	0	0	131
<i>Ducula badia</i>	0	0	0	48	0	0	0	0	0	48
<i>Egretta garzetta</i>	70	73	94	52	81	39	0	34	68	511
<i>Egretta intermedia</i>	46	60	98	22	44	28	31	54	40	423
<i>Elanus caeruleus</i>	142	48	27	52	0	79	15	0	70	433
<i>Eudynamys scolopacea</i>	0	38	24	64	48	0	38	42	31	285
<i>Eurystomus orientalis</i>	0	0	30	69	0	0	51	0	0	150
<i>Falco peregrinus</i>	0	0	0	15	0	0	10	0	0	25
<i>Galerida malabarica</i>	0	11	0	58	85	26	66	83	11	340

Species	OTP	PTB	MAC	KAV	MAD	PAR	PKV	THA	KYR	Total
<i>Gallinago gallinago</i>	0	41	44	0	0	0	0	0	29	114
<i>Galloperdix spadicea</i>	0	0	0	29	0	0	43	0	0	72
<i>Gallus sonneratii</i>	0	0	0	43	0	0	58	0	0	101
<i>Gelochelidon nilotica</i>	0	0	36	0	0	0	0	0	12	48
<i>Glareola lactea</i>	0	252	521	0	0	179	0	0	536	1488
<i>Glaucidium radiatum</i>	0	0	0	3	0	0	4	0	0	7
<i>Gracula religiosa</i>	117	0	0	83	51	0	104	84	0	439
<i>Halcyon smyrnensis</i>	86	86	49	60	52	68	70	53	81	605
<i>Haliastur indus</i>	91	41	44	32	55	69	21	54	22	429
<i>Harpactes fasciatus</i>	0	0	0	29	0	0	28	0	0	57
<i>Hemicircus canente</i>	0	0	0	21	0	0	21	0	0	42
<i>Hemiprocne longipennis</i>	0	0	0	44	0	0	27	0	0	71
<i>Hemipus picatus</i>	0	20	84	54	0	0	60	0	17	235
<i>Hirundo concolor</i>	0	0	0	0	0	0	37	0	0	37
<i>Hirundo daurica</i>	98	240	287	0	46	124	31	43	0	869
<i>Hirundo rustica</i>	0	333	501	0	188	0	0	355	0	1377
<i>Hirundo tahitica</i>	0	0	0	0	0	0	31	0	0	31
<i>Hypsipetes indicus</i>	0	0	0	124	0	0	107	0	0	231
<i>Hypsipetes madagascariensis</i>	0	0	0	47	0	0	44	0	0	91
<i>Irena puella</i>	0	0	0	49	0	0	34	0	0	83
<i>Ixobrychus cinnamomeus</i>	12	9	23	0	0	23	0	34	0	101
<i>Ixobrychus flavicollis</i>	0	0	0	0	0	24	0	0	25	49
<i>Ixobrychus sinensis</i>	12	0	0	0	0	21	0	0	19	52
<i>Lanius cristatus cristatus</i>	0	0	0	17	0	0	8	0	0	25
<i>Larus brunnicephalus</i>	0	0	28	0	0	0	0	0	0	28
<i>Larus fuscus</i>	0	0	10	0	0	0	0	0	0	10
<i>Larus ichthyaetus</i>	0	0	14	0	0	0	0	0	0	14
<i>Limosa lapponica</i>	80	0	16	0	0	0	0	0	32	128
<i>Lonchura kelaarti</i>	0	0	0	150	0	0	147	0	0	297
<i>Lonchura malabarica</i>	0	0	0	132	124	0	91	148	0	495
<i>Lonchura malacca</i>	0	0	0	0	0	0	0	0	75	75
<i>Lonchura punctulata</i>	0	44	331	172	138	127	148	160	506	1626
<i>Lonchura striata</i>	0	33	130	0	0	0	0	0	185	348

Species	OTP	PTB	MAC	KAV	MAD	PAR	PKV	THA	KYR	Total
<i>Loriculus vernalis</i>	0	0	0	32	0	0	12	10	0	54
<i>Megalaima haemacephala</i>	119	69	34	0	68	18	0	82	66	456
<i>Megalaima viridis</i>	0	0	0	81	0	0	76	0	0	157
<i>Megalaima zeylanica</i>	92	19	33	75	51	16	47	64	39	436
<i>Merops leschenaulti</i>	0	0	0	80	0	0	63	0	0	143
<i>Merops orientalis</i>	122	164	121	74	91	115	29	145	73	934
<i>Merops philippinus</i>	0	80	112	0	45	0	0	117	70	424
<i>Metopidius indicus</i>	9	16	35	35	37	30	0	16	19	197
<i>Milvus migrans</i>	130	360	114	0	87	107	0	64	78	940
<i>Mirafra assamica</i>	0	25	0	0	0	0	0	0	21	46
<i>Monticola solitaries</i>	0	0	13	41	0	0	39	32	0	125
<i>Motacilla alba</i>	0	10	32	0	0	0	0	0	11	53
<i>Motacilla caspica</i>	0	0	0	39	0	0	41	28	0	108
<i>Motacilla cinerea</i>	16	45	27	0	0	36	0	23	12	159
<i>Motacilla flava</i>	0	0	0	46	0	0	36	0	0	82
<i>Motacilla indica</i>	0	0	0	14	0	0	15	0	0	29
<i>Motacilla maderaspatensis</i>	38	171	86	0	49	84	0	68	34	530
<i>Muscicapa albicaudata</i>	0	0	0	49	0	0	21	0	0	70
<i>Muscicapa latirostris</i>	0	0	0	21	0	0	18	0	0	39
<i>Muscicapa muttui</i>	0	0	0	0	23	0	33	31	0	87
<i>Muscicapa muttui muttui</i>	0	0	0	32	0	0	0	0	0	32
<i>Muscicapa pallipes</i>	0	0	0	59	0	0	53	0	0	112
<i>Muscicapa tickelliae</i>	0	51	101	132	83	0	131	113	0	611
<i>Myiophoneus horsfieldii</i>	0	0	0	52	0	0	51	42	0	145
<i>Nectarinia asiatica</i>	113	141	41	0	60	53	0	70	63	541
<i>Nectarinia lotenia</i>	0	0	0	97	0	0	110	74	0	281
<i>Nectarinia minima</i>	0	0	0	167	78	0	183	106	0	534
<i>Nectarinia zeylonica</i>	191	236	55	136	74	76	141	52	123	1084
<i>Numenius arquata</i>	0	0	15	0	0	0	0	0	0	15
<i>Nycticorax nycticorax</i>	16	0	0	0	0	25	0	0	15	56
<i>Ocyrceros birostris</i>	0	15	0	0	0	0	0	33	0	48
<i>Ocyrceros coronatus</i>	0	0	0	0	0	0	0	0	15	15
<i>Oriolus chinensis</i>	0	0	0	0	0	0	18	0	0	18

Species	OTP	PTB	MAC	KAV	MAD	PAR	PKV	THA	KYR	Total
<i>Oriolus oriolus</i>	37	33	32	60	53	45	62	45	21	388
<i>Oriolus xanthornus</i>	0	44	38	48	60	0	41	34	0	265
<i>Orthotomus sutorius</i>	48	11	16	0	0	14	0	71	46	206
<i>Pandion haliaetus</i>	19	0	0	0	0	26	0	0	0	45
<i>Parus major</i>	70	32	49	64	53	0	43	93	20	424
<i>Parus xanthogenys</i>	0	0	0	52	0	0	36	0	0	88
<i>Passer domesticus</i>	60	224	109	0	155	115	0	259	165	1087
<i>Pelargopsis capensis</i>	0	0	14	0	0	0	0	0	0	14
<i>Pellorneum ruficeps</i>	0	0	0	31	0	0	23	0	0	54
<i>Perdicula erythrorhyncha</i>	0	0	0	89	0	0	68	0	0	157
<i>Pericrocotus cinnamomeus</i>	0	13	0	22	0	0	27	25	12	99
<i>Pericrocotus flammeus</i>	0	0	0	141	0	0	134	0	0	275
<i>Petronia xanthocollis</i>	312	34	0	0	149	146	0	265	148	1054
<i>Phalacrocorax niger</i>	40	26	82	0	40	40	0	50	40	318
<i>Phylloscopus affinis</i>	0	0	0	12	13	0	12	15	0	52
<i>Phylloscopus trochiloides</i>	0	0	0	0	0	0	0	68	0	68
<i>Picumus innominatus</i>	0	0	0	0	0	0	12	0	0	12
<i>Pitta brachyura</i>	0	0	0	35	0	0	0	0	0	35
<i>Ploceus philippinus</i>	292	247	0	0	81	189	0	246	203	1258
<i>Pluvialis dominica</i>	20	12	20	0	0	0	0	0	26	78
<i>Pluvialis dominica fulva</i>	0	0	31	0	0	0	0	0	0	31
<i>Pluvialis squatarola</i>	13	13	12	0	0	0	0	0	19	57
<i>Pomatorhinus schisticeps</i>	0	0	0	74	0	0	61	0	0	135
<i>Prinia inornata</i>	0	0	68	0	0	0	0	0	23	91
<i>Prinia socialis</i>	30	27	31	32	25	32	32	27	30	266
<i>Prinia subflava</i>	28	0	0	0	0	0	0	0	0	28
<i>Psittacula columboides</i>	0	0	0	32	0	0	16	0	0	48
<i>Psittacula cyanocephala</i>	75	53	66	72	146	84	74	158	17	745
<i>Psittacula krameri</i>	69	56	50	126	179	77	139	297	16	1009
<i>Pycnonotus cafer</i>	160	116	129	72	77	70	86	125	116	951
<i>Pycnonotus jocosus</i>	96	84	104	133	90	125	103	101	80	916
<i>Pycnonotus luteolus</i>	50	0	0	0	0	0	0	0	0	50

Species	OTP	PTB	MAC	KAV	MAD	PAR	PKV	THA	KYR	Total
<i>Pycnonotus melanicterus</i>	0	0	0	31	0	0	26	0	0	57
<i>Rhipidura aureola</i>	0	23	57	87	0	0	68	27	0	262
<i>Rhopocichla articeps</i>	0	0	0	75	0	0	56	0	0	131
<i>Saxicola caprata</i>	0	0	0	77	0	35	38	0	0	150
<i>Saxicoloides fulicata</i>	0	47	15	0	32	0	0	71	30	195
<i>Saxicoloides saularis</i>	0	0	0	0	0	0	50	0	0	50
<i>Spilornis cheela</i>	0	0	0	23	0	0	13	0	0	36
<i>Spizaetus caeruleus</i>	71	20	40	0	34	0	0	30	38	233
<i>Sterna acuticauda</i>	0	20	25	0	0	0	0	0	10	55
<i>Sterna aurantia</i>	0	0	22	0	0	0	0	0	28	50
<i>Sturnus malabaricus</i>	143	0	0	0	0	0	0	199	0	342
<i>Streptopelia chinensis</i>	86	118	89	120	150	77	101	180	60	981
<i>Tachybaptus ruficollis</i>	0	0	52	0	0	31	0	0	0	83
<i>Tephrodornis gularis</i>	0	0	0	23	24	0	0	0	0	47
<i>Tephrodornis pondicerianus</i>	45	0	0	35	30	44	38	36	0	228
<i>Tephrodornis virgatus</i>	0	0	0	26	0	0	0	0	0	26
<i>Terpsiphone paradisi</i>	0	152	59	62	42	31	48	50	30	474
<i>Tockus griseus</i>	22	0	0	81	0	15	103	74	0	295
<i>Treron phoenicoptera</i>	0	114	0	0	0	0	0	0	124	238
<i>Treron pompadora</i>	0	0	0	123	0	0	154	0	0	277
<i>Tringa glareola</i>	0	64	93	0	0	0	0	0	153	310
<i>Tringa hypoleucos</i>	0	38	28	0	0	0	0	0	48	114
<i>Tringa nebularis</i>	0	0	27	0	0	0	0	0	5	32
<i>Tringa ochropus</i>	0	0	22	0	0	0	0	0	10	32
<i>Tringa stagnatilis</i>	0	0	33	0	0	0	0	0	0	33
<i>Tringa totanus</i>	0	20	39	0	0	0	0	0	0	59
<i>Turdoides affinis</i>	286	384	230	75	84	81	81	222	287	1730
<i>Turdoides caudatus</i>	0	0	0	0	0	166	0	0	0	166
<i>Turdoides striatus</i>	156	216	213	240	257	174	208	261	153	1878
<i>Turdoides subrufus</i>	0	0	0	179	0	0	183	0	0	362
<i>Tyto alba</i>	10	0	0	41	13	32	24	22	0	142
<i>Upupa epops</i>	0	32	0	586	57	0	67	66	16	294

Species	OTP	PTB	MAC	KAV	MAD	PAR	PKV	THA	KYR	Total
<i>Vanellus indicus</i>	27	48	39	10	47	48	112	66	18	415
<i>Vanellus malabaricus</i>	0	9	0	20	32	0	23	51	0	135
<i>Zoothera citrina</i>	20	15	34	48	38	0	54	48	27	284
<i>Zosterops palpebrosa</i>	0	0	0	95	0	0	99	0	0	194
	Nila Basin Total: 39422			Kalpathy Basin Total: 24944			Kunthi Basin Total: 31411			

OTP=Ottappalam, PTB=Pattambi, MAC=Manchady, KAV=Kava, MAD=Manthakkad, PAR=Parali, PKV= Pathrakkadavu, THA=Thootha, KYR=Kariyannoor

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CHAPTER VII

DISCUSSION

Studies on freshwater systems all over the globe have attained much importance during the past century. As a result the freshwater biodiversity, for various threats those systems face, has become a prime concern in recent years. In that context, in the present study, an attempt was made to generate and collate information on the ecology of the Nila river along with its two tributaries the Kalpathypuzha and Kunthipuzha. Emphasis was given to study the avifauna of these three river courses and their comparison.

It is evident that birds prefer specific habitats. This habitat preference is dependent on various resource requirements in the form of availability of food, nesting sites, nesting methods and such like. These specific necessities form primary factors for the habitat preference of avifauna (Karr et al, 1992). Thus, natural freshwater habitats such as riverine systems are found to be richer in species diversity than artificial habitats.

1) Factors determining bird distribution in the Nila river basin.

A) Climate and seasonality:

All the study sites along the Nila river course and the two tributaries experienced a humid climate with hot summer from March to May, rainy season from June to October and cold climate from November to February. The study sites received more than 200 cm of annual rainfall. The highest annual rainfall was recorded at Pathrakkadavu (281.48 cm), and the lowest at Parali (170 cm). The highest mean temperature experienced was 36.8⁰C at two stations (Kava and Manthakkad), while the lowest mean temperature recorded was 19.6⁰C at Thootha. So the climate was suitable for good vegetation and cultivation all along the river basins which provided ample habitat for avian species. Naturally, the changes in the

climates in different months have its implications on the habitats as well as avian species present.

The single most important factor that affected the birds along the three riverine systems was the southwest monsoon. The surging waters of the river during the monsoon gradually inundate the entire river beds and hence the aquatic feeders and shorebirds cannot get the required resources. Besides the agrarian practice along these river basins are mainly dependent on the rainy season. During this period the crops are in the half-grown stage and so that majority of insectivores, nectarivores, frugivores and granivores also find it difficult to strive on. Consequently, this is the time when many of the resident species like herons and egrets make local movements elsewhere to breed and nest. Studies conducted by Menon et al (2015) on the species diversity and functional assemblages of bird fauna along the riverine habitats of Tiruchirappalli, India gives supporting evidence to the findings of the present study. Hembahadur et al (2016) also reached into the same conclusions in their studies on seasonal changes in bird species and feeding guilds along elevational gradients of the central Himalayas, Nepal.

A diverse population of birds belonging to 17 families and 140 species was observed in the 3 study areas along the Nila river course. Of this, 98 species were residents, 40 species migrants and 2 species local migrants. At Ottappalam 74 species were present. During the pre-monsoon period (January to May), 62 species were found whereas only 36 species were present during the monsoon period (June to September) and the number of species present during the post-monsoon period (October to December) was 65 taking together the three bands (A, B and C) that were delineated parallel to the river course for sampling.

At Pattambi, 100 species were observed. Of this, 78 species were residents, 19 species migrants and 3 species local migrants. Out of this, 65 species were present during pre-monsoon, 58 species during the monsoon period and 67 species during the post-monsoon period. At Manchady a total of 114 species were recorded of which 37 were migrants and 75 species residents. 80 species were present during pre-monsoon and post-monsoon periods. Only 45 species showed their presence

during monsoon season. Here some species were present in higher numbers, like *Corvus splendens* (1915 no's), *Artamus fascus* (770) and *Corvus macrorhynchos* (506). The numbers of migrant species were also higher in this site (37). The site is nearer to Ponnani seashore and Chamravattom, where a large number of migrant birds flock annually.

At Kava 127 species were identified. Here only 13 species were migrants, 3 species local migrants and 112 species residents. During pre-monsoon and post-monsoon season, 123 species were present and 69 species were seen during monsoon season. At Manthakkad, 78 species were identified. Of this only 41 were present during the monsoon period whereas all 78 species were seen during pre-monsoon and post-monsoon periods. The numbers of omnivorous and insectivorous species were higher (22 and 27) here, whereas granivorous and frugivorous species were few (5 and 6). Parali site had 76 species of birds of which only 4 are migrants and the rest residents. All the 76 species were present during pre-monsoon and post-monsoon whereas 55 species made their presence during monsoon.

At Pathrakkadavu in total 124 species were identified. Of this, 14 were migrants, 4 local migrants and 106 species residents. 112 species were present during pre-monsoon, 110 species during post-monsoon and 58 species during monsoon. The numbers of forest bird species, omnivorous and insectivorous species were much higher (55, 37 and 45 respectively). At Thootha the total number of species was 100 of which 86 residents, 13 migrants and 1 local migrant and higher numbers of omnivorous and frugivorous species (29 and 11 respectively). The numbers of forest bird species were 10 here. 91 species were present during pre-monsoon, 90 species during post-monsoon and only 58 species during the monsoon period. At Kariyannoor, a total of 106 species were seen. Of this, 81 were residents, 24 migrants and 1 local migrant. 64 species were counted during pre-monsoon, 67 during post-monsoon and 51 during monsoon periods. 18 species of shorebirds identified was a higher number. 41 species of insectivorous and 26 species of omnivorous are also relatively higher in presence.

It can be seen that in all the 9 study sites, seasonal variation is apparent. During pre-monsoon and post-monsoon periods, the highest number of species were present whereas during monsoon season almost half or less of the total number of species were present. The number of species it appears is getting affected by the seasons thorough its impacts on foraging grounds, prey-species availability, etc apart from the likely direct impact of seasons on the ecological / biological seasonality on the avian species itself.

B) Habitat availability

1. The proximity of water: - It was observed that water availability and proximity of water bodies is a major factor influencing the abundance of avifauna. In this study, it can be seen that the number of shorebirds, aquatic birds, birds feeding on aquatic organisms and migrant species were showing higher variation in numbers depending on proximity to water bodies. The number of migrant bird species was the highest at Manchady (37), Kariyannur (24) and Pattambi (19). These sites are relatively closer to the seashore at Ponnani. Most of the migratory species were feeders on aquatic animals and preferably seashore dwellers and that is why they were seen in higher numbers in these sites.

Ottapalam, Kava, Manthakkad, Parali, Pathrakkadavu and Thootha sites are far away from the seashore and the number of migratory species was lesser in number. Most of the migratory species present at these sites were also not shorebirds or aquatic feeders. Some are omnivorous and others insectivorous and frugivorous. The number of aquatic feeders was higher at Manchady, Pattambi, Kariyannur and Ottappalam. Here the presence of a vast sand bed and shallow mudflats are the prime reason for the higher number of aquatic feeders. Undisturbed sand beds and shallow water bodies attract many numbers of aquatic feeders as they give suitable feeding ground and resting and breeding sites nearby to these species. Mudflats are a good attraction for many aquatic insectivores.

2. Forests: - The proximity to forest vegetation has a profound influence on the richness of the avian species. Kava and Pathrakkadavu are adjacent to Western ghat forests. Manthakkad and Thootha are also closer to these sites. The numbers of

forest bird species were highest at Pathrakkadavu and then Kava (55 and 49 respectively), Thootha and Manthakkad (10 and 3 respectively). At the same time Manchady, Pattambi, Ottappalam, Kariyannur and Parali, which are relatively away from forest cover showed no presence of forest birds. The forest vegetation with its rich diversity provides appropriate niches to a variety of insects (including caterpillars, termites, ants, etc), reptiles and mammals. Different avian species are finding their favorite food items in this habitat and use that as nesting and breeding sites. The insectivores, frugivores, nectarivores and omnivores are present in higher numbers in these sites. Though these groups of birds are present in considerable numbers at other study sites, the food preference of each group is different in the respective habitats. For example, insectivorous species of Pathrakkadavu and Kava are different from those of Manchady or Pattambi sites. This finding conformed to the findings of Daniel et al (1999)'s study on the impact of forest type and management strategy on avian densities in the Mississippi alluvial valley, USA. Berg (1997)'s study on diversity and abundance of birds in relation to forest fragmentation, habitat quality and heterogeneity also supports the findings of this study. A similar finding was reported by Gil-Tena et al (2007) in their research on the effects of forest composition and structure on bird species richness in a Mediterranean context: Implication for forest ecosystem management.

3. Agriculture: - Avian diversity and richness are intimately related to agrarian habitats. The study showed that most of the study sites are having active agricultural practice. The different stages of crops reared provided varied types of food to birds. Some of them directly depend on the agricultural crops feeding on the different parts of plants such as the tender leaf, flowers, nectar, tender grains, seeds or nuts and mature crops. Besides multiple varieties of insects, caterpillars, and eggs are available in the agrarian system on which different bird species feed. This exemplifies an excellent example of a food chain in the animal world. Studies by Hiron et al (2015) on the relationship of bird diversity to crop and non-crop heterogeneity in agricultural landscapes support the findings of the present study. A similar finding was published by Elsen et al (2017) based on studies on the importance of agricultural lands for Himalayan birds in winter. A study conducted

by Hulme (2007), on the density and diversity of birds on farmland in West Africa, made similar observations.

The cultivation pattern in the study area showed Paddy to be the major crop at all stations. 12 species of vegetables, 4 species of plantain were also grown at various sites. The plantations / long term crops were coconut, areca nut and rubber. Tapioca and banana were also cultivated at different sites. At Pattambi, Parali and Kariyannur paddy cultivation was practiced in all three bands (A, B and C) identified for sampling in the present study. At Ottappalam, Manchady, Pathrakkadavu and Manthakkad, paddy was cultivated in the first 2 bands only, whereas at Thootha and Kava cultivation was seen only in one band. At Kava and Kariyannur only one season cropping was practiced (from September to December). In all the other sites paddy was reared in two seasons (From May to August and from September to December). The summer cropping of Paddy from February to May (Puncha cultivation) was not seen at any of the sites. The numbers of insectivores, granivores, omnivores, nectarivores, etc are also confirming the relationship with the food availability and other habitat features available in the agrarian practices at these sites.

C) Soil characteristics:-

The nature of the soil in the study areas was largely riverine alluvium, lateritic, granular, blocky, sandy granular (mostly at Pattambi), loose clay (mostly at Manchady), blackish muddy (mostly at Manthakkad), loam, Clay loam (mostly at Parali), blackish granular, prismatic (mostly at Pathrakkadavu), etc. In most of the study sites, A-band had loose, sandy and muddy soil suitable for paddy and other such crops. The soil nature of B and bands of most study sites were enhancing good vegetations of trees, plantations, herbs and shrubs.

2) Threats to avifauna in the study area:-

The Nila river basin is subject to heavy pressure and consequent destruction of habitat much similar to riverine systems all over the world, which threatens biodiversity especially the avifauna. The sand mining along the Nila and Kunthi

river course and banks are a serious threat to habitat and birds. Nila river banks from Ottappalam to Chamravattom have a vast stretch of sand bed which provides a treasure for sand excavators, both legal as well as illegal. The river bed is exposed in many areas as a result of large scale illegal mining and has paved the way for the growth of wild grass. Massive sand removal results in the breaking of the food web and nutrient cycle within the ecosystem. Several fish species, insects, copepods, crustaceans use the sand bed and shallow bottom as their habitat which forms the food for many birds. The conversion of paddy fields for various purposes (both industrial and inhabitation) poses a serious threat to the riverine agroecosystem which ultimately affects several bird species. The rampant deforestation is another serious threat to the rivers and the avifauna.

The excessive sand mining have severely altered the habitat of many shore birds, migratory species and those feeding on aquatic organisms resulting in the decline of their population. The mudflats and inter tidal areas of Manchady, Kariyannur and Pattambi, where good concentrations of polychaete worms, shrimps and clams occur, are favorite feeding grounds of these groups of birds. In the succeeding periods of my observation it was found that the populations of *Pluvialis squatarola*, *Tringa totanus*, *Pluvialis dominica*, *Tringa hypoleucos*, *Tringa nebularia*, *Tringa ochropus*, *Tringa glareola*, *Calidris alba*, *Calidris minuta*, *Calidris Temmincki*, *Calidris alpina*, *Calidris testaceous*, *Charadrius mongolus*, *Larus fuscus*, and *Larus brunnicephalus* were notably reduced. Breeding and nesting of some species like *Charadrius dubius* (Little ringed plover) is on the sand banks and thus the vulnerability of this species to the threats is high.

Sand layers along the course of these rivers have high holding capacity of large quantity of water in their interspaces. Removal of large quantities of sand leads to the reduction of this capacity thus reducing the water holding capacity and ground water recharge capacity of the rivers. The reduction in percolation of water through the river bed and its subsequent recharge of the ground water affects irrigation and drinking water availability. The adverse impacts on agriculture lead to the decline in

the diversity and density of flora and fauna on which depend several avian species as well as other organisms.

Conversion of paddy fields is rampant along the course of the rivers especially Nila and Kunthipuzha. The rice fields are legally and illegally changed for human habitation, industrial purposes, clay mining and brick furnaces. Good numbers of birds both residents and migratory are dependent on riparian vegetation especially rice paddies. Manchady, Pattambi, Ottappalam, Parali and Thootha areas are witnessing large scale conversions. *Pluvialis dominica*, *Charadrius dubius*, *Tringa nebularia*, *Tringa ochropus*, *Tringa glareola*, *Tringa hypoleucos*, *Calidris minuta*, *Calidris temmincki*, *Calidris alpina* etc are solely depending on paddy fields for feeding. Some of them are insectivorous, and others feed on the different stages of the paddy plants and other plant species there. The land use conversions have drastically affected the population of these birds especially at Manchady, Pattambi and Ottappalam.

Pollution from agricultural sources such as chemical fertilizers, pesticides, weedicides and nutrients are also posing alarming threats to the rivers. It is observed that large scale unauthorized cultivations within the river channels particularly of vegetables during summer season also aggravate the situation.

The catchment areas of Nila river basin and its tributaries are subjected to heavy disturbance of the riparian vegetation. The mountain slopes in the the river catchment are degraded and thus unable to let out the percolated rain water during summer. Indiscriminate deforestation in the catchment areas like Walayar, Dhoni, Siruvani, Kalladikkode, Wadakkanchery, Malampuzha, Nelliampathy, Thiruvazhamku nnu etc have an increasing effect on the water flow to these three rivers. The deforestation effects are also visible in the decline of the biodiversity of the forests of these regions. Birds like Nilgiri wood pigeon (*Columba elphinstonii*), Bluewinged Parakeet (*Psittacula columboides*), Malabar Grey Hornbill (*Tockus griseus*), Southern Tree Pie (*Dendrocitta leucogastra*) etc are severely threatened.

The Nila river basin has 11 dams (6 in Kerala and 5 in Tamilnadu) in addition to lot of weirs and check dams. The contributions by the dams in

deteriorating the rivers by reducing the quantity and quality of water are much more than the claimed benefits attributed. It is a matter of concern that many dams are not well managed that, even illegal cultivation in large areas within the reservoirs are undergoing. This results in heavy siltation to the rivers adding to the same effect caused by indiscriminate deforestation in the catchment areas. More and more check dams are constructed along the course of Nila and Thootha rivers. At Parali, Lakkidi, Kondayoor, Karakkad, Shoranur, Thootha, Kattuppara and Pulamanthole check dams already are constructed and new proposals are under consideration at various points. Besides, two major regulator- cum -bridges at Velliyankallu and Chamravattom are also in operation adding major ecological problems. These dams affect the ecology of the rivers in the long run in many ways hampering the free flow of water, changing the habitat for many species of fishes , fish migration etc. These adversaries will have an effect on the avifauna and other animal groups. Anyhow more studies are needed to assess the pros and cons of the effect of check dams.

It is evident that human interference on Nila and its tributaries are at its peak. The illegal and unscientific human interventions in the environs of these riverine systems have resulted in unrecoverable loss to the biodiversity and ecosystem. Important areas of this river are under unbearable stress from anthropogenic activities. There should be a concerted effort from the part of the public as well as the government to save this magnificent river system from further deterioration and peril.

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CHAPTER VIII

SUMMARY AND CONCLUSION

This study was an attempt to amass information on the ecology of the riverine systems of Nila river, Kalpathi and Kunthipuzha focusing on avifauna. Nila river is the second longest river of Kerala, and Kalpathy and Kunthi rivers are its two main tributaries. The study was aimed to generate information along the following.

1. The habitat quality of environs of the rivers up to a radial distance of 1500m from the river beds at selected sites.
2. Comparison of the water and habitat quality of the different sites of the three rivers representing different types of habitats.
3. Estimation of the avifauna and the vegetation, their seasonality and comparison at the three sites along each river course..
4. Community ecology of the bird species, their relationship with the vegetation and other biotic and abiotic factors.

The study sites were selected along the banks of the three rivers. Three study sites were selected along Nila river. The first site is at Ottappalam behind the railway station, the second site at Pattambi, downstream of the bridge on the south side of Pattambi town and railway station, and the third site is at Manchady 2 km west of Kuttippuram town and railway station. Similarly three sites were selected along the Kalpathy river. The first site along Kalpathy river is at Kava, situated north of Malampuzha reservoir in the valley of Dhoni mountains. The second site is at Manthakkad, 10 km down Malampuzha reservoir and 6 km away from Olavakkode. The third study site is at Parali, 15 km west of Palakkad town and close to the Palakkad- Pattambi state highway. The study sites along Kunthi river are Pathrakkadavu, Thootha and Kariyannur. The first site at Pathrakkadavu is 10km

east of Mannarkkad close to the west side of Silent Valley National Park. The second site is Thootha about 25 km down the Pathrakkadavu site on the side of Cherpulassery - Perinthalmanna highway. The third site is Kariyannur, 2 km west of Pallippuram railway station. Kunthi river joins Nila river at this site.

The study sites along Nila river are thickly populated and good agricultural areas. Here Manchady is close to seashore at Ponnani. Of the sites along Kalpathy river, Kava, proximal to Dhoni forests, has little cultivable land. Manthakkad and Parali are having moderate agricultural practice. Kunthi river sites vary much in climate and topography from the other sites. Pathrakkadavu is a part of Silent Valley National Park and have low number of people around. Thootha is a midland with good agricultural practice. Kariyannur is the confluence point of the river with Nila and also with better cultivation areas.

The Methodology used in this study was direct observation. The vegetation and avifauna were thoroughly studied dividing each site into three bands A, B and C, each of 500m width and 2 km length; band-A starts from mid of riverbed, followed by band-B and then band-C. Thus, the sampling area in each site is 1500m wide from the river bed and 2 km in length.

The vegetation was studied as trees, shrubs, herbs, grasses and cultivations. For trees three quadrates of 20m x 20m were selected in each band and the species and number of trees were counted. For shrubs also 3 quadrates of 10m x 10m were marked and the species and numbers counted. For herbs the quadrate size was 5m x 5m in each band and the species and number of plants counted. For grasses 2m x 2m quadrate and the species were identified. The phenological stages (flowering, fruiting, fresh leaf, mature leaf and leaf shedding) of the trees, shrubs and herbs were recorded in four seasons.

The avifauna was observed using Line transect method, during the morning hours (6.30 am to 9 am) once in every month for two years. The birds were identified for their species, activity, feeding habits, resting habits, and their associations. The total check list of birds in each sites, and the type, whether resident, migrant or local migrant were noted. Different groups such as omnivores,

insectivores, nectarivores, granivores, frugivores, shore birds, raptors, forest birds etc were also recorded.

The water quality assessment was done using 6 parameters adopting standard analytical methods. The aquatic temperature analysis of the Nila river sites showed that Ottappalam has the highest mean temperature (29.7⁰C). The maximum aquatic temperature was 33.2⁰C at Manchady during the month of May. The minimum temperature among the three sites was recorded at Pattambi (27.8⁰C) during July. Among the Kalpathy river sites, Kava recorded the highest temperature (33.8⁰C) during April. The minimum temperature was at Manthakkad (27.4⁰C) during December. Among the Kunthi river sites Pathrakkadavu recorded the lowest reading (26.8⁰C) in February. The highest temperature recorded was at Thootha (33.6⁰c) during May. Among the three rivers Nila had the highest mean temperature and the lowest mean temperature was in the Kunthi river. It was seen that during monsoon and post monsoon periods up to February the temperature was below 30⁰C. During summer months the temperature was above 31⁰C.

The pH in all the 9 study sites was almost neutral or above 7. The highest pH was seen during September in all the sites, the top reading of 7.60 seen at Pattambi and Parali. The lowest pH was recorded at Pathrakkadavu and Kava (7.08) in December, January and February. Among the three rivers, the highest mean pH was in Nila river (7.23) and the lowest mean pH in Kunthi and Kalpathy rivers (7.21).

The total dissolved solvent estimation gave the result that Parali had the highest value (0.388 gm/l). The lowest was at Pathrakkadavu (0.340gm/l). The TDS content was high in all sites during June to October period and the highest value was recorded during September. Heavy rain in June and the succeeding months bring dissolved solids to river leading to hike in TDS. During March and summer months the volume of water was lowest and flow was minimum and subsequently the TDS was also low. Among the three rivers Kunthi river had the minimum amount of TDS and Kalpathy had the highest.

The mean dissolved oxygen content was maximum (9.66 mg/l) at Ottappalam and Manchady had the lowest value (8.15mg/l) in Nila river sites. The highest value (12.2 mg/l) was found at Ottappalam in July. Among Kalpathy river sites, Kava had the highest mean value (10.18 mg/l) and Parali had the lowest value (9.60 mg/l). Among Kunthi river stations Pathrakkadavu showed the highest mean value (10.47 mg/l). Kariyannur showed the lowest (10.39mg/l). The amount of dissolved oxygen was below 9mg/l in all the sites from December to April which increased steadily from May to November and was highest during July, August and September months. Among the three rivers, Kunthi river had the highest value in all the 9 stations. The lower values were at Nila river sites.

Alkalinity was highest at Manchady site among all the Nila river sites (45.13 ppm). Among Kalpathy river sites Parali had the highest alkalinity (45.16 ppm) and Kava had the minimum value. Among the three rivers Kunthi river had the lowest value and Nila river had the highest value. In all the study sites the highest value was recorded during September and October months and lowest during January.

Inorganic Phosphate content was high at Nila river stations, the highest at Pattambi (0.57mg/l), and the lowest (0.45ug/l) at Manchady. Among Kalpathy river sites Parali had the highest value (0.3 ug/l) and Kava the lowest (0.30ug/l). In Kunthi river sites Pathrakkadavu showed the least content (0.21 ug//) and Kariyannur (0.36) the highest content. Among the three rivers Nila had the highest amount and Kunthi river had the lowest amount. The highest values were seen during the months of September, October, November, and March and the lowest was recorded during the months of June, July and August.

At Ottappalam, plant species in band A was lesser than in bands B and C. Band A had more of trees commonly seen along river banks or marshy areas, whereas band B and C had more cultivated fruit bearing trees. Cultivations are seen more in band B and C. In band A, common vegetables were cultivated. With respect to phenology in season I (March to May) highest numbers of trees and shrubs were in flowering and fruiting, while more of herbs were in flowering and fruiting during season IV (January to March).

Pattambi also is highly populated but is more vegetated than Ottappalam. Here band-C had more number of tree species. Shrubs were higher in band-B and herbs more in band-C. Higher numbers of trees were in fruiting and flowering stages during season I and III at Pattambi. Highest numbers of shrubs in flowering were during season II and season III. Most of the herbs were in flowers and fruits during season I. Cultivations are more in band B, next in band C. Paddy and 17 species of different vegetables were grown in all the three bands.

At Manchady, band-C had the highest number of trees followed by band-B. Band-A is used for Acacia plantation and natural trees are less in number. More trees were in fruiting and flowering stages during season 1 and season 2. Shrubs and herbs were also more in bands B and C. Cultivation of vegetables are less and only 4 vegetable species and paddy grown in B and C bands. Of the study sites along Nila river, Pattambi had the highest number of trees, shrubs, herbs and cultivations.

Kalpathy river sites are richer in vegetation. Kava had 35 species of trees, the highest of the three sites. Kava and Parali are equal in number of shrubs (26). In the case of herbs Manthakkad was the highest in number (29). Cultivation was higher at Manthakkad (12 species) than Parali and Kava (11 species.) At Kava highest number of trees, shrubs and herbs were in flowers and fruits during season I and IV. At Manthakkad also more numbers of trees were in flowers during season I and IV. Higher number of shrubs and herbs were in flowers during season II (11 and 17). Trees in fruits were more during season I and II, while shrubs in fruits were more during season II and herbs in season I.

Kunthi river sites showed more variations in topography and vegetation than the sites on other rivers. Pathrakkadavu is a forest dominated site close to the western side of Silent Valley forests. 37 species of trees were identified here, the highest number being in band-A, close to the forest. Majority of the species were forest trees. Thootha and Kariyannur had 32 species each. Shrubs were more at Kariyannur (28 species), than Thootha and Pathrakkadavu (25 species each). Herbs were also higher at Pathrakkadavu (31). At Pathrakkadavu, more of trees were in flowering and fruiting in season III and IV. At Thootha and Kariyanoor more

number of trees was in flowers and fruits in season I and IV. More shrubs were in flowering during season I, II and IV at Pathrakkadavu, Thootha and Kariyannur. Cultivation was limited to band-C at Pathrakkadavu and partially in band-B while band-A was almost forested. 14 species of crops, including Tapioca and Banana, were cultivated at Thootha. Plantations of rubber, arecanut and coconut were dominant in band-C. Kariyannur is a highly cultivated area with paddy and banana as main crops.

Among the 9 study sites, Pathrakkadavu was the highest in number of tree species (37) and the second was Kava with 35 species. Both sites are adjacent to forests. Regarding shrub species Pattambi and Kariyannur were the highest in number (28), next being Kava (26). Herb species were highest at Pathrakkadavu with 31 species. Among the three rivers Kunthi had the richest vegetation cover in terms of the number of species of trees, shrubs and herbs. In terms of the number of grass species Nila river had the highest mean number (25) next being Kalpathy. Cultivation was highest along the Nila river sites, the second highest being at Kunthi river sites.

Bird community, species composition, interspecific association, and species abundance are strongly related to the vegetation type, topography, nature of microhabitats, proximity to water bodies and such other factors. Of the 9 study sites Kariyannur and Manchady are close to the Sea at Ponnani. Of the total 75 species of birds present in the study area at Ottappalam, 8 species were migrants. Among this, 5 species were shore birds and preferring Band-A, the band that covers the riverbank. These species were not present in Band – B or Band – C, both the bands being away from the rivers. Migrant birds were not seen during Monsoon. Their presence was recorded towards the end of September and they stayed there up to May i.e. the pre-monsoon and post monsoon seasons. 12 species of birds feeding on aquatic animals were seen at Ottappalam. All these were present in Band – A showing the affinity for water bodies. The numbers of individual birds also showed how the habitat influences the species composition. From Band-A 419 birds were counted whereas only 226 and 233 were recorded from bands B and C respectively.

3 Species of granivorous birds were present in the three bands. These 3 species were present in all the 3 seasons. One or other of trees, shrubs, herbs, grasses and cultivations were in fruiting stages in all the seasons. Of the 8 species of frugivorous birds, all were present in band-A and band-B, where as 6 were present in band-C. The prominent fruit bearing trees *Syzygium cumni*, *Mangifera indica*, *Psidium guajava*, *Anacardium occidentale*, *Anona reticulata* etc were flowering and fruiting during Pre-monsoon. These phenological stages had a strong influence on the presence of specific species of birds. 3 species of migrant birds, *Pitta brachyura* (in band-B only), *Oriolus oriolus* (A, B and C bands) and *Motacilla cineraria* (Band- C only) those are not shore birds were seen in all seasons.

All the 5 species of raptors recorded were present during pre-monsoon and post monsoon periods, and they were absent during monsoon. 25 species of omnivorous birds recorded were also spread through the 3 bands (band-A 23, band-B 21 and band-C 17) almost uniformly. In bird abundance also not much differences were seen (band-A 1206, band-B 1353 and band-C 1318). The vegetation in the three bands gives ample food and nesting facilities for this group of birds. Some species were present during all the seasons while majority were present only pre-monsoon and monsoon seasons.

The presence of insectivorous birds, in species and individual numbers were also almost in a uniform pattern here Very few species were present during monsoon. Most of them were well represented in all the three bands during pre-monsoon and post-monsoon seasons (Band-A 462, band-B 518 and band-C 415). 10 species were present in all the three seasons. These were specialized feeders on insects and caterpillars of river banks and others aquatic species. Nectarivorous species were also seen almost uniformly distributed in three bands. Here in band-C, though had 6 species out of 7, the number of birds counted was only 189, because of the high human settlement and less vegetations. Band-A presented a number of 395 and band-B 382 birds indicating that they are directly related to the flowering stages of plants. 16 species of birds were seen in band-A alone of which 5 species were migrants and 11 species residents. Of this 5 species were shore birds and 10 were

feeding on aquatic fauna. Thus the river and riverbed covering band-A provide the suitable niche to these birds. 6 species were present in band-B alone, 1 was omnivore and 5 were insectivores. 2 species were seen in band-C alone. These were insectivores.

At Pattambi the avifauna counted was 100 species. The numbers of omnivorous, insectivorous, granivorous and frugivorous birds present during pre-monsoon and post-monsoon periods were higher than monsoon. The higher number of insectivorous species (43) during post-monsoon is a good indicator of food availability. Number of migratory birds was also higher than Ottappalam (19). Here 16 species were found in band-A, majority of them arriving after monsoon and staying until the end of pre-monsoon. Of this 19 species, 12 were shore birds feeding on insects and fishes. Pattambi site is nearer to sea-shore at Ponnani, may be a reason for the higher number of migrants. Raptors were common at these sites. The species, *Milvus migrans* was the most common among the five species with the highest number of 228 in band-B, where more human settlement is present. Omnivorous birds were represented by 25 species with a total count of 6594. Of this, the highest number of 3163 was in band-A, where vegetative and non-vegetative food availability was more.

The nectarivorous species present was 7. Of this *Oriolus oriolus* was the only migrant species. This was absent during monsoon in band-A, but present throughout the seasons in band-B and C. In bands B and C the nectar availability was higher throughout the seasons as some species of plants were flowering and fruiting during monsoon also (12 species of trees, 16 species of shrubs and 11 species of herbs were in flowering and fruiting stages in monsoon).

Manchady site is the nearest one to seashore at Ponnani among the 9 study sites. The 114 species of birds observed here contained the highest number of migrant species (37). Of this 34 species were present in band-A. Out of the 37 species only 3 were present during monsoon and that also at the last leg of August. B-band had 15 species of migrants and C-band 6. The proximity to river and a vast sand bank is the attraction for migrants. Numbers of shore birds were also the

highest at Manchady (29). Of this, 28 were migrants and only one species *Glareola lactea* (Small Indian pratincole) was resident. The proximity to Ponnani sea shore and the sand bank is the reason for the high number. The species *Charadrius dubius* (Little ringed plover) was another notable species as its occurrence is very rare in other parts of Kerala.

36 species of birds feeding on aquatic fauna was found here. In this group 17 were migrants. 6 species of raptors were present represented by 254 individuals. 5 species were seen in band-A and 4 each in B and C bands. The habitat preference was seen dependant on the human settlement and the nature of river bank. 24 Omnivorous species present here was represented by 7139 individuals (2740 in band-A, 2468 in band-B and 1931 in band-C). 5 species were migrants and 19 were residents. 18 species were present during all the three seasons. The species present on all seasons were predominantly feeders on plant parts as well as insects and caterpillars of cultivations. Insectivorous species were in high number here (47). The vast river bank, the acacia plantation in band-A and the common trees, shrubs, herbs and the paddy cultivation mostly in bands B and C, are the major factors for the higher number of insectivores here. Here also 18 species of this group were migrants. Of the 47 species, 32 were present during pre-monsoon and post monsoon only whereas 15 species were seen in all seasons. Paddy cultivation and other vegetables grown in band-B during monsoon periods give an appropriate niche to the species present during monsoon. 4 Species of granivorous birds found at Manchady were common species present in all bands almost uniformly in all the three seasons. One or the other plants and cultivations were in the fruiting stage on all the three seasons including grasses.

Frugivorous birds were represented by 7 species. Only one is present in band-A, because fruit bearing trees were few in this band with only 10 species, most of which were not attractive to birds. All the 7 species were present in band-C with a good number of individuals (255). Common fruit bearing trees like *Syzygium cumini*, *Mangifera indica*, *Embllica officianalis*, *Artocarpus integrifolia*, *Anacardium occidentale* etc. were common here. 6 species of birds were present on all the three

seasons. One species the *Dicaeum erythrorhynchos* (Tickell's flowerpecker) was absent during monsoon.

The study sites at Kalpathy river showed high abundance and diversity in species. At Kava, where the habitat is forest dominated 125 species were recorded of which 13 were migrants and 3 were local migrants. The migrant species consisted of 5 insectivores, 4 omnivores, 1 frugivore and 1 nectarivore. Of this, all 13 were present in band B and C, whereas 11 species were seen in band A. 36 species of omnivores were present here which are distributed almost uniformly in the three bands. The number of insectivorous species of Kava was 45, which is a high number. 9 species of nectarivorous birds were identified here of which this one species *Oriolus oriolus* is migratory. All the 9 were present in the 3 bands. Granivorous birds were represented by 6 species. 15 species of frugivorous birds present at Kava were almost uniformly found in the three bands. The closeness to forest is an important factor for the high number of forest birds (49 species). Climate also plays an important role in the occurrence of birds. During pre-monsoon and post-monsoon, 112 species were present in band-A, whereas during monsoon only 69 species were present. In band-B, 123 species were present during pre monsoon and post monsoon, where as only 66 were present during monsoon. In band-C, 111 were present during pre monsoon and 109 during post monsoon. Only 55 species were present during monsoon.

At Manthakkad the number of bird species was 75, which is a moderate number. The migrant species were only 6. It can be seen that most of the migrant birds were seashore birds or those showing affinity towards rivers with vast sand beds. Here the habitat is of a different type with more vegetation and rocky substratum. The number of omnivores was 22 and all the 22 were present in band-B and C, while only 16 species were in band-A. Insectivorous species were 27 of which 26 species were present in bands B and C and 16 in band-A. Nectarivorous species were 7 in number, of which all 7 were present in band-B and 6 species in band-C. Band-A had only 2 species. 5 species of granivorous birds were present, all of them appearing in all the three bands. Frugivorous birds were also showing the

same pattern of distribution, A band with 2 species, B and C bands with 6 species each. The number of forest bird species was only 3. The number of bird species feeding on aquatic animals was 8, all of which were present in band-A. Band-B had 6 and only 3 in band-C. Occurrence of birds was the highest in all the 3 bands during pre-monsoon and post-monsoon. During monsoon almost half of the total species were present in all the 3 bands.

Parali site had 76 species of birds, of which only 4 species were migrants and 72 species residents. The migrant birds were not seen in river beds or feeding on aquatic animals. The number of forest bird species was only one (*Cuculus canorus*). Number of bird species feeding on aquatic animals was 15 and all of them were present in band -A, 13 in band-B and only 4 in band-C. River proximity determines the species presence here. The number of omnivorous species was 22, of which high numbers were seen in bands B and C. Number of insectivorous species were high (27) of which more species were present in bands B and C. B and C bands had more vegetation, crops and cultivations. The majority of birds were feeding on insects and so their presence was higher in these bands. Nectarivorous and granivorous birds were represented by 4 species each, present in all the 3 bands. Number of frugivorous species was also less (5), of which only 2 were present in bands A and B, while all were seen in band-C. Fruiting trees were higher in band-C which is the reason for the higher number of frugivores there. The total species count in each band was, band- A, 59, band -B 69 and band-C 60. During pre-monsoon 58 species were present in band -A, 67 in band -B and 60 in band-C. During monsoon 44 species were present in band - A, 52 in band- B and 38 in band-C. During post monsoon 58 species were present in band -A, 67 in band-B and 60 in band-C.

At Pathrakakdavu 124 species of birds were recorded of which 14 were migrants, 4 local migrants and 106 residents. Highest number of species was seen in band-A (112) of which 13 were migrants. Band-B had 108 species and band-C, 92 species 14 species of migrants were seen of which 13 in band-A, 12 in band-B and 10 in Band-C. All these migrants were omnivores, insectivores or nectarivores. 45 species of insectivores were seen here which is fairly higher number and distributed

as 44 species in band –A, 42 in band-B and 32 in band- C. Majority of these birds were feeders on plant insects and caterpillars. The numbers of frugivorous birds were also high (14), of which 14 were in band –A, 13 in band –B and 8 in band-C. Band –A had higher number of fruit bearing forest trees. 9 Species of nectarivorous species were present which was distributed as 9 each in band –A and band – B and 8 in band-C. The flowering trees were also higher in this site and thus this group of birds had better nectar availability. The number of granivorous species was 7 and almost equally distributed in 3 bands. 37 species of omnivores were present here, of which 36 were present in band A, 35 in band –B and 26 in band-C.

55 Species of forest birds were present at Pathrakkadavu, which is a good number. The closeness to Silent Valley forests and the plantations of Teak and Cashew are the major factors for the presence high number of forest birds. The occurrence of birds here showed that in band-A 112 species were present during pre-monsoon, 108 in band-B, and 93 in band C. During monsoon 58 species were seen in band –A, 59 in band-B and 47 in band- C. Post-monsoon figures showed that, band-A harbored 110 species, band –B 108 and band –C 91.

At Thootha 100 species were identified of which 13 were migrant species, 92 residents and one local migrant. The migrant species were distributed as 7 in band-A, 11 in band-B and 9 in band- C. Of this 7 species were insectivores, 2 nectarivores and 4 omnivores. The 4 species of raptors were seen in all the three bands. 32 species of insectivores were distributed as 22 in band –A, 32 in band –B and 23 in band-C. The site was with good agricultural activity, so the number of insectivores was almost equally seen in all bands. Nectarivorous species were 10, of which only 3 were present in band –A, 7 in band-B and all 10 in band-C. More plantations and cultivations were in bands B and C, thus the nectar availability was also higher in these bands. All the 6 species of granivorous birds were present in all the three bands. 12 species of birds were feeding on aquatic fauna of which all 12 were present in band –A, 7 in band -.B and none in band-C. None of these birds were migrants and majority of them were common species. 11 species of frugivorous birds were indentified; 5 species in band-A, 11 in band B and 10 in band-C.

Presence of the higher number of birds in band –B and C was probably because of the varied number of plantations in these bands. The number of forest bird species was 10, of which, band-A had only 2, whereas bands B and C had 9 each. The thick vegetation including plantations of rubber, teak and cashew, was a main factor for the presence of these birds. 29 species of omnivorous birds were almost equally present in all the three bands, the highest number being in band –C. The seasonality of the occurrence of birds showed that all the 67 species present in band-A were seen during pre-monsoon and post-monsoon seasons. But only 45 were present during monsoon. In band-B, 91 species were present during pre-monsoon, 90 during post monsoon and 58 during monsoon. Out of the 75 species present in band-C 74 were present during pre-monsoon and post-monsoon and 42 during monsoon.

At Kariyannur, 106 species were recorded; of this 24 were migrants, 1 local migrant and 81 resident. The migrant species, higher here, were distributed as 19 in band-A, 13 in band –B and 8 in band-C. Of this, 18 species were shore birds or feeding on aquatic fauna and only 6 species were insectivores or nectarivores. The number of raptor species was 5 and were seen 1 in band A, 5 in band – B and 2 in band-C. 41 species of insectivores were seen of which 29 was in band-A, 26 in band–B and 22 in band- C. Band-B was rich in cultivations, the main crop being paddy and vegetables. Band-C was with good vegetation of natural trees, shrubs and herbs. 32 species of birds feeding on aquatic fauna were present in band-A, 18 in band-B and 5 in band-C. As the Kunthi river joins with Nila at this site, a vast aquatic habitat and river bank is available here. 26 species of omnivorous birds were present here. 16 species showed up in band –A, 19 in band-B and 22 in band-C. The number of granivorous species was 6 of which 3 were in band-A, 6 in band-B and 5 in band-C. Nectarivorous species were 6; 1, 6 and 5 in bands A, B and C respectively. 9 species of frugivorous birds seen were distributed as 3 in band –A, 7 in band –B and 6 in band- C.

The seasonality of occurrence showed that, of the 66 species present in band-A, 63 were present during pre-monsoon, 46 during monsoon and 66 during post – monsoon season. In band-B, the total species present was 67, of which 63 were seen

during pre-monsoon, 42 during monsoon and all 67 present during post monsoon. In band –C, of the total 64 species present, all were present during pre and post monsoon periods and 54 were present in monsoon season.

To conclude, the vegetation, cultivations, topography, human interference, water quality, climate, and proximity to sea were found important factors in determining species presence, abundance, and species diversity of birds in the study areas. In my study it is proved that areas where rich vegetation, whether natural or cultivation had a major role in determining the type of bird species. Pathrakkadavu and Kava are very close to forests and the total number of species was high at these sites. The number of forest birds, insectivores and omnivores were also in high numbers. The number of shore birds and birds feeding on aquatic fauna were less or totally absent in these sites. At Manchady, Kariyannur and Pattambi, forest birds were absent. The numbers of shore birds, migrants, birds feeding on aquatic fauna were very high in these sites. Manchady is near to Ponnani seashore, and Kariyannur and Pattambi are the next proximal sites to sea. Here the type of insectivores and omnivores were also different as majority of them are feeding on insects and caterpillars of the river beds. The numbers of species present during pre-monsoon, monsoon and post-monsoon seasons were also showing variations. In all the sites during monsoon the number of species and individuals were low. During post-monsoon the number of migrant birds was high as the migratory season begins from September and lasts up to May. The number of frugivores, omnivores, insectivores and raptors were also high in post monsoon and pre-monsoon as majority of trees, shrubs and herbs had their flowering and fruiting season coinciding with these periods. At the sites where human habitation is high the number of omnivores, raptors and insectivores were found to be in high numbers. Water quality also had a determining influence on the vegetation and faunal characteristics of the sites. The most pure quality of water based on the 6 parameters considered was found at Pathrakkadavu and Kava and the richness of vegetation and avifauna were highest at these sites. The water quality was best in Kunthi River because it is originating from Silent Valley forests and there are no industries or towns in its catchment. The quality of water was lowest in Nila river as the quantity of sulphate, alkalinity and

pH was high and the oxygen content were low, which are indications of the deterioration of the quality of water. Here the sewages from Pattambi, Ottappalam and Shoranur towns, wastes from hospitals etc were the major factors causing impurity. Anyhow the other two the rivers are not seriously polluted and the habitat quality is not at thresholds.

Finally, from the information generated from present study, and from the personal experience of the investigator acquired especially during the fieldworks, the following recommendations are made to improve and sustain the avian biodiversity in the study area.

1. Encroachment of river banks should be strictly prevented.
2. The coastal regulatory zone law should be enforced strictly so that illegal constructions along the sides of the river course are minimized.
3. Conversion of paddy fields for other purposes such as to build residences, industries etc are to be strictly prohibited
4. The paddy cultivation should be encouraged with incentives and authorities should ascertain that no paddy fields are left barren for long. The paddy fields along the Nila and Kunthi rivers are an asylum for many shore birds, majority of which are migrants. They are depending on different food items such as insects, caterpillars and eggs available at different stages of paddy cultivation.
5. The sides of the rivers are recurrently subjected to erosion during the monsoon. This should be prevented by planting appropriate trees and bamboos. That would also provide suitable habitat for several avian species.
6. The growth of the giant grass species all along the river beds is causing a serious problem. Many areas along Nila river and Kunthi river are now being dominated by this grass leading to formation of small islands (“thuruth”) in the centre of the rivers at many places. That results in diversion of the river

course curtailing the natural flow of water. Appropriate measures should be taken to prevent the menace.

7. Urgent steps should be taken to stop the sewage disposal to rivers from hospitals, markets, industries and households, especially at Parali, Ottappalam, Pattambi and Mannarkkad.
8. Several check dams are constructed along the course of Nila and Thootha rivers. The pros and cons of such constructions should be studied in detail and appropriate measures to be implemented. Sand mining is another serious threat to the sustenance of rivers and the riverine ecosystems and that has to be done under proper scientific planning.

Ishak M. P. “Studies on the Comparative Ecology of the Riverine Systems of Kalpathi, Kunthipuzha and Nila Rivers with Emphasis on Avifauna.” Thesis. PG & Research Department of Zoology Farook College, Feroke, University of Calicut, 2019.

REFERENCES

- Abraham, J.C, 1962. A survey of hydrobiology and fisheries of Cooum River. Madras J. Fish; 1:50-59
- Ali Salim and H. Whistler, 1935-1937. The ornithology of Travancore and Cochin. J. Bomb. Nat. Hist. Soc. 8 Parts-39
- Ali Salim, M.A, 1949. Indian Hill Birds. Oxford University Press.
- Ali Salim, M.A, 1962. The BNHS/WHO bird migration study project J. Bombay Nat. Hist. Soc. 59: 100-130
- Ali Salim, M.A, 1968. The books of Indian Birds. Bombay Natural History Society, Bombay
- Ali Salim, M.A, 1969. Birds of Kerala, 2nd Edn. Oxford University Press.
- Ali Salim, M and S.D, Ripley, 1949. Hand book of the bird of India and Pakistan. 1-10 volume. Oxford University Press, Bombay
- Ali Salim, M.A and S.D, Ripley, 1983. Hand Book of the birds of India and Pakistan, Oxford University Press,
- Ali Salim, M.A and S.D, Ripley, 1987. Compact Hand book of the birds of India and Pakistan, 2nd Edn. Oxford University Press,
- Allann, J.D and A.S, Flecker, 1993. Biodiversity conservation in running waters Bioscience, 43(1) :32-43
- Arnold, E.G, Joseph, J.C, David, J and Mary, A.H. F, 1980. Standard methods for the examination of water and Waste Water. A.P.H.A.(HW Washington, DC 2005)
- Assu Gil- Tena, Santiago Saura and Lluís Brotons, 2007. Effects of forest composition and structure on bird species richness in a Mediterranean

- context: Implications for forest ecosystem management. *Forest Ecology and Management*, 242(2): 470-476
- Azeez, P.A, 2000. The impact of monsoonal wetlands on ground water chemistry. *Pollution research* 19(2):245-255, January 2000.
- Balakrishnan, K.P and C.S, Shynamma, 1975. A comparison of the diel variations in the hydrographical conditions between, monsoon, post-monsoon and pre-monsoon periods near the mouth of the Cochin back water, a tropical estuary. *Sym. Est. Biol. Cochin (Abs)*
- Baldi, A, 1999. Microclimate and vegetation edge effects in a reed bed. *Bio diversity and conservation* 8(12):1697-1706- December.1999.
- Baldi, A and Tibur Kisbenselek, 1998. Factors influencing the occurrence of great white egret, *Ekologica Bratislava* 17(4) Pages 384-390. January -1998.
- Baldi, A, 2004. Area requirements of passerine birds in the reed archipelago of lake Velence, Hungary. *Acta Zoologica Academiae Scientiarum Hungaricae* 50(1): 1-8.Jan-2004.
- Barbour, M.G, Burk, J.H and Pitts, W.d, 1987. *Terrestrial plant ecology*, Chapter 9: method of sampling the plant community. Menlo Park, Benjamin/Cummings publishing company: 1987.
- Bellanthudawa, B.K.A, Subanky, S, Nawalage,N.M.S.K, and Panagodan,P.A.B.G, 2019. Composition and diversity variation of avifauna along different vegetative habitat types in human modified area, University of Kelaniya, Srilanka. *Int. J. Zoology*, 2019((2):1-16. July-2019.
- Berg, A, 1997. Diversity and abundance of birds in relation to forest fragmentation, habitat quality and heterogeneity. *Bird study*, 44:3, 355-366
- Beverton, R.J.H, 1992. Fish resources: Threats and Protection. *Neth. J. Zool*; 42:139-175
- Bhadran, G, 1997. Heavy metal pollution in Ashtamudi estuarine system. Ph.D.Thesis, University of Kerala.

- Brown, S.L, 1981. A comparison of the structure, primary productivity and transpiration of cypress ecosystem in Florida. *Ecology Monogram*, 51: 403-427
- Bristow, R.C, 1938. History of mud banks. Cochin Government press, Ernamkulam. Vol- 1 and 2.
- Butcher, R.W, 1932. Notes on new and little known algae from the beds of rivers. *New Phytologist* 31:289-309.
- Butcher, R.W, 1933. Studies on the Ecology of rivers, I, on the distribution of macrophytic vegetation in the rivers of Britain. *J.Ecol*, 21: 58-91
- Butcher, R.W, 1940. Studies on the ecology of rivers. III Observations on the growth and distribution of the sessile algae in the river Hull, Yorkshire. *J. Ecol*; 28:210-223
- Carloss, M. Herrera, 1998. Long term dynamics of Mediterranean frugivorous birds and fleshy fruits. 1998, *J. Ecological Monographs*. Vol-68 pages 511-538
- Christopher, J. Norment, Alex Hal and Paul Hendricks, 1977-78. Observations on the annual chronology for birds in the Warden's Grove area, Thelon River. *Canadian Field- Naturalist* 99. 471-483
- Colin, N, H.P, Jarvie, S.M, Howrath, P.G, Whitehead, T, Richard Williams, Margaret Neil, Martin Harrow and H.Wickhams , 2000C. Water quality of a tributary of river Kennet. *Sci. Total Environ* .Spl. Issue (477-495).
- Colin, N, J .W.Richard, Margaret, N, C, Lal, Bhardwaj, H, Whickham, M, Harrow and L,K.Hill, 2000. The water quality of the river Thames at a rural site down stream of Oxford. *Sci Total Environ*; Special Issue (459-775) : 251 – 252.
- C P C B, 2016. National water quality monitoring programme (NWMP), Annual report, 2016. ENVIS centre.
- C W R D M, 1991. Preparation of an integrated water Resource management plan for Bharathapuzha basin. A status report .CWRDM, Kozhikode, Kerala

- Daniel, J, R. Randy Wilson, Jackie L.Henne-Kerr and Robert B.Hamilton, 1999. Impact of forest type and management strategy on avian densities in the Mississippi Alluvial valley, USA. *Forest Ecology and management* 123 (2-3): 261-276
- David, G. Krementz and Lakin A.Powell, 2000. Breeding season demography and movements of Eastern Towhees at the Savannah river South Carolina. *The Wilson J. of ornithology*. 112(2) 243-245 (2000)
- Davis, H.S, 1938. Instructions for conducting stream and lake surveys. *Fishery Circular U.S; Bureau Fisheries*, 26
- Donald, C. Franklin and R.A. Noske, 1999. Birds and Nectar in a monsoonal woodland; Correlations at three spatio – temporal scales. *Emu*, 1999(1), 15-28
- Dunning, B.J, Brent, J.D, Bryan, D.W, Jianguo Liu and David.G.Krementz,2000. Stuying wildlife at local and landscape scales: Bachmann’s sparrow at the Savannah river site. *Studies in avian biology.No.21:75-80*. 2000.
- Eberhardt, L.L, 1978. Appraising variability in population studies. *The . J. of Wild Life Management*. 1978 JSTOR
- Eberhardt, L.L, 1978. Transect methods for population studies. *The .J. of Wild Life Management-1978 JSTOR*
- Eberhardt, L.L and J.M, Thomas, 1991. Designing environmental field studies. *Eco logical monographs*, 1991;61(1): 53-73
- Ehrlich, P.R and Wilson, E.O, 1991. Biodiversity studies: Science and Policy. *Science*, 253: 758-762
- Elbaz Poulichet, F.C. Guieu, J.M.Martin and A.J, Thomas, 1991. Reassessment of the river input of trace metals into the Mediterranean Sea. *Agris. fao. org.*
- Elbaz Poulichet, F.C, Guieu, J.M. Martin and A.J. Thomas, 1991. Atmospheric versus river inputs of metals to the Gulf of Lions: Total concentrations partitioning and fluxes. *Marine Pollution Bulletin -1991-Elsevier*.

- Emeln, J.T, 1974. An urban bird community in Tucson, Arizona: Derivation, structure, regulation. *The condor* 1974. JSTOR.
- Emlen, J.T, 1971. A variable Circular-plot method for estimating bird numbers- *The condor*, 1980 – academic.oup.com
- Evans, P.R, 1972. A hydrobiological study of the polluted River Lieve (Ghent, Belgium),. *Hydrobiologia*. 1972.
- Franklin.C.Donald and Richard .A. Noske, 1999. Birds and Nectar in monsoonal woodland: Correlations at there spatio-temporal scales. *Emu* 99(1): 15-28, March-1999.
- Franklin.C. Donald and Richard.A.Noske, 2000. Nectar sources used by birds in monsoonal North-western Australia: A regional survey. *Australian .J.of Botany* 48(4): 461-474, January 2000.
- Feare, C J and J High, 1977. Migrant shore birds in the Seychelles. *Ibis*.119: 323-337
- Feare, C.J, 1979. Ecology of bird Island Seychelles. *Atoll Research Bulletin* 226: 1-29
- Fogden, M.P.L, 1992. The seasonality and population dynamics of equatorial forest birds EST Sarawak. *Ibis* vol-114,No.3, 307 – 342
- Gambrell, R.P and W.H, Patrick, Jr., 1978. Chemical and microbiological properties of anaerobic soils and sediments in plant life in anaerobic environment, D.D, Hook and R.M.M, Crawford, eds., Ann. Arbor Sci. Pub. Inc.,Ann. Arbor, Mich., pp.375-423
- Ganapathy, S.V, 1955. Hydro biological investigations of the Stanley reservoir and of the river Cauvery at Mettur dam. *Met. Kem*; 6(2):1 -8
- Gaston, A.J, Mathew, D.N and Zacharias, V.J, 1979. Regional variation in the breeding seasons of Babblers in India. *The Ibis*, 12: 512 – 516
- Gaston, A.J, 1973. Methods for estimating bird populations *J. Bombay Nat. Hist. Soc* 72(2): 271 -283

- Gopalan, P.P and Sreekumaran Nair,S.R, 1975. Ecological studies on the floating weed *Salvinia auriculatia* in Cochin back waters and adjacent areas. Bull .Dept. Mar, Sci. Univ; Cochin 7(2): 367- 375
- Gore, P.S, Ravindran, O and Unnithan, R.V, 1979. Pollution in the Cochin back water with reference to indicator bacteria. Indian. J. Mar. Sci; 8: 43-46
- Goss-custard, J.D, 1970. Effect of tide cycles on habitat selection and habitat partitioning by migrating shore birds. 233 – 270. Int. J. Burger and BL. Olla (eds).
- Goss-custard, J.D, 1970. The responses of Redshank to spatial variations in the density of their prey. J.of Animal Ecology,Vol.39,No.1,Feb.1970.PP 91-113
- Hanowski, J. A. M, D. P,Christian and M .C, Nelson, 1999. Response of breeding birds to shearing and burning in wetland brush ecosystems. Wetlands, Vol.19,No.3, Sept.1999.Pp, 584-593.
- Happanen, A, 1965. Bird fauna of Finnish forests in relation to forest success. Ann. Zool. 1965.
- Haridas, P, M, Madhupratap and R.S.S, Rao, 1973. Salinity, temperature, oxygen and Zooplankton biomass of the back water from Cochin to Alleppey. India J. Mar. Science 2 (2), 94- 103
- Herman, H.S and Doughlas, J, 1973. Ecological succession of breeding bird populations in North western Arkansas. The Auk Vol.90, 62-77
- Hem Bahadur Katwal, Khadga Basnet, Bhaiya Khanal, Shiva Devkota, Sanjeev Kumar, Jyothi Prasad Gajurel, Christoph Sheidegger and Michael P.Nobis, 2016. Seasonal changes in bird species and feeding guilds along elevational gradientsoftheCentral Himalayas, Nepal-Effects of season. <https://doi.org/10.1371/E July-1-2016> Journal
- Hill, M.O, 1993 b. Diversity and evenness: A unifying notation and its consequences. Ecology 61:225-238

- Hoffman, T.W, 1983. Palaeartic migrants that enter the sub continent through the principal routes. The Ceylon Bird club, Sri Lanka.
- Hughes, R.M and Noss, R.M, 1992. Biological diversity and Biological integrity. Current concerns for Lakes and streams. Fisheries, 17: 11-19.
- Ian.G, Warkentin and J, Michael Reed, 1999. Effects of habitat type and degradation on avian species richness in Great Basin riparian habitats Great Basin Naturalist Vol. 59 (3)
- Irrigation Department, Government of Kerala, Thrissur circle. Field study circle , Thrissur, Annual data, 2005 and 2006
- Iscandri, N.B, 1990. Biological observations on fresh water systems adjacent to the coast of Sierra Leone. Hydro biologia, 1990. Springer.
- Jain, S.K and Rao, R. R, 1977. A hand book of field and herbarium methods. Today and Tomorrow, New Delhi, 1977.
- Jha, M, 1992. Hydrobiological studies in Suraj Kund and Chandrama Kund hot springs of Rajgir, Bihar. Int. Rev. Gesamt. Hydrobiol; 77(3): 453 – 443
- Joshi C.B. 1998. Seasonal variations in certain water quality parameters of some hill streams in Western Himalayas. II National symposium on Fish and Their Enviroment, 21 -23 November, 1988, Dept. of Aqu. Bio and Fish; University of Kerala, Trivandrum.
- Karr, J.R and Roth R.R, 1971. Vegetation structure and avian diversity in several new world areas. American Naturalist 105: 423-435
- Karr, J.R, 1977. Ecological correlates of rarity in a tropical bird community. The Auk -1997
- Karr, J.R, Toth, L.A and D.R, Dudley, 1985. Fish communities of mid western rivers: A history of degradation. Bio science, 35 : 90-95
- Klopatek, J.M, 1978. Nutrient dynamics of freshwater riverine marshes and the role of emergent macrophytes in freshwater wetlands: Ecological processes and

- management potential, R.E Good, D.F Whigham and R.L, Simpson, eds., Academic press, New York, pp.195-216
- Knapp, R.Ed, 1984. Sampling methods and taxon analysis in vegetation science. Hand book of vegetation science 1, Part 4, Hague:Junk, 1984
- Kottelat, M.T and Whitten, A.J, 1996. Fresh water bio-diversity in Asia with special reference to fish. World Bank Technical paper. No. 343, The world Bank, Washington D.C, 59 PP.
- Krementz, D.G and Powell, A.Larkin, 2000. Breeding season demography and movements of eastern towhees at the Savannah River site, South Carolina. The Wilson J.of Ornithology, 112(2): 243-248, June-2000
- Kurup, B.M, 1989. Coastal wetlands and habitats of population of avifauna, Proceedings of National Conference of Coastal Zone Management, Cochin.
- Leghari, S.M, Leghari, M.K, Kushw, M.Y and Jahangir, T.M , 2000. Limnological study of Tattapani hot spring and river Punch at Tattapani Village, Punch district, Azad Kashmir; Scientific Khyber, 13 (1): 73-85
- Leidy, R.A and Moyle, P.B, 1997. Conservation status of the world's fish faunas : An overview. In conservation Biology for the coming Decade. Chapman and Hall, New York. PP 187-227
- Ludwig, J.A and Reynolds, J.F, 1998. Statistical Ecology: A primer in method and computing. Jhon Wiley and Sons, May-1998. 337 pages.
- Mac Arthur and Mac Arthur, 1961. On bird species diversity Ecology, 42(3): 594 - 598
- Mac Arthur and Mac Arthur, 1960. On the relation between habitat selection and species diversity. American Naturalist. 100 : 319 -332
- Maloney, R.F, Keedwell, J, Wells, N.J, Rebergen, A.L and Nillson, R.J, 1999. Effect of willow removal on habitat use by five birds of braided rivers, Mackenzie Basin, New Zealand. New Zealand J. of Ecology Vol.23 (1)PP 53-60.

- Manjula Menon, Prashanthi Devi, Nandagopalan, V and Rangaswamy Mohanraj, 2015. Species diversity and functional assemblages of bird fauna along the riverine habitats of Tiruchirappalli, India. Environmental management of river basin ecosystems. Springer International Publishing, Switzerland, 2015.
- Marlter, G, 1973. Limnology of the Congo and Amazon rivers in Tropical Forest Ecosystems in Africa and South America; A comparative review. Washington, Smithsonian Institution Press. 223-228
- Mark Hulme, 2007. The density and diversity of birds on farm land in West Africa. Ostrich- Journal of African Ornithology, 78(2). June-2007.
- Mathew Hiron, Ake Berg, Sonke Eggers and Asa Berggren, 2015. The relationship of bird diversity to crop and non-crop heterogeneity in agricultural landscapes. Land scape Ecology, 30 (10), May-2015.
- Mathew, W, Fidelibus and T.F, Robert Mac Aller, 1993. Methods for plant sampling .Desert management notes, Californiua department of transportation, district, 11, San Diego. Oct. 1993.
- Minshall, G.W, Robinson, C.T and Lawrence, D.E., 1997. Post fire responses of lotic ecosystems in Yellow Stone National Park, USA. Can. J. Fish Aquat. Sci, J. Can. Sci. Halieut. Aquat; 54 (11). 2509-2525
- Mitsch, W.J, C.L, Dorge and J.R, Wiemhoff, 1979. Ecosystem dynamics and a phosphorous budget of an alluvial cypress swamp in southern Illinois, Ecology, 60: 1116- 1124.
- Moyle, P.B and J.E, Williams, 1990. Biodiversity loss in the temperate zone. Decline of fish fauna of California Conservation Biology, 4 : 275 – 284
- Muttowski, R.A, 1929. The ecology of trout streams in Yellow Stone National Park. Roosevelt Wild Life Annals; 2:155-240
- Nair N.B, and Abdul Aziz, D.M. 1987. Hydrobiology of the Ashtamudi estuary- a tropical back water system in Kerala. Proceedings of the National Seminar on Estuarine Management, 4-5 June 1987, Trivandrum, PP 268- 280.

- NBFGR, 2000. Annual Report, 1999-2000. National Bureau of Fish Genetic Resources, Lucknow. ICAR.
- Neelakantan, K.K, Sashikumar, C and Venugopalan, R, 1993. A Book of Kerala Birds part I. World Wide Fund for Nature India, Trivandrum .146 P
- Neelakntan, K.K, 1958. 'Keralathilae Pakshikal: Kerala Sahithya Academy, Thrissur. 529.P
- Nikhil Raj and Azeez, P.A, 2009. Spatio – temporal variation in surface water chemistry of a Tropical River, the river Bharathapuzha, India Current Science vol. 96 245-251.
- Nikhil Raj and Azeez, P.A, 2011. Temperature Rise in Bharathapuzha River Basin, S. India Current Science. 2011 Vol.101
- Nikhil Raj and Azeez, P.A, 2010. Consolidated check list of Birds in the Pallikarani Wet Lands, Chennai, India. J. of Threatened taxa (2010), 1114-1118
- Norment, C.J, Hall.A and Hendricks, P, 1999. Important bird and mammal records in the Thelon river valley, North-west territories: Range expansions and possible causes. The Canadian Field Naturalist, 113 :375-385.
- Odum, E.P, 1983. Fundamentals of Ecology W.B. Saunders Company Landon. 574p
- Ogbeibu, A.E. and Victor, R, 1995. Hydrobiological studies of water bodies in the OKomu Forest Reserve (Sanctuary) in Southern Nigeria. Trop. Freshwat. Biol; 4:83-100.
- Parish Duncun, 1985. Migratory waders in East Asia. Report to Australian National and Wild Life service.
- Paul, R.Elson, Ramnarayan, K, Ramesh, K, and David.S.Wilcove, 2017. The importance of agricultural lands for Himalayan birds in winter. Doi: 10-1111/cobi.12812
- Petts, G.E, 1996. Water Allocation to Protect River Ecosystems.Proceedings of an International Work Shop on Remedial Strategies in Regulated Rivers, Lycksele, Sweden, 25-28 September 1995, 12 (4-5): 353-365

- Qasim, S.Z. and C.K. Gopinathan, 1969. Tidal cycle and environmental features of Cochin back waters (a tropical estuary). *Proc. Indian Acad. Sci*, 69 B): 336-348.
- Robinson, R.A and W.J, Sutherland, 1999. The Winter Distribution of Seed Eating Birds; Habitat structure, Seed Density and Seasonal Depletion. *Ecography*. Vol.22, No.4 (Aug-1999)
- Rai, H, 1974. Limnological studies on the River Yamuna at Delhi, India. *Achi. Fur Hydrobiologia*, 73:492- 517
- Raj, P.P.N and P.A, Azeez, 2017. Environmental Change Analysis of a River Basin in Western Ghats, India. Paper back July-2017. ISBN – 13
- Rajni Gupta, 2006. Plant taxonomy: Past, present and future ,ISBN , TERI press, New Delhi.
- Ramakrishnan, P, 1983. Environmental studies on the Birds of Malabar Forests. Ph. D. Thesis, University of Calicut.
- Ramsar convention, 1996. Wet lands, Biodiversity and the Ramsar convention <http://www.ramsar.org>.
- Recher, H.F, 1969. Bird Species Diversity and Habitat Diversity in Australia and North America. *The American Naturalist*. 103: 75-80
- Ricker, W.E, 1934. An Ecological classification of certain Ontario streams. University of Toronto. *Studies Biology series*, 37:1-114.
- Rolecek, J, Hajek, M, Lvoncik, S and Tichy, L, 2007. Sampling design in large-scale vegetation studies: Do not sacrifice ecological thinking to statistical purism. *Folia Geobotanica* 42, article no.199.
- Roth, R.R, 1977. The comparison of four bird communities in South Texas British grass lands. *The Condor*. 79 : 417-425
- Roth, R.R, 1976. Spatial heterogeneity and bird species diversity. *Ecology*. 57:773-782

- Rupprecht, R, 1988. A long term chemical observation of fifteen mountain streams in Central Europe. Congress in New Zealand 1987 proceedings, 23(3): 1313-1319
- Sabo, M.J, Bryan, C.F, Kelso, W.E and Rutherford, D.A, 1999. Hydrobiology and aquatic habitat Characteristics of a reverine swamp: Influence of flow on water temperature and chemistry. Regulated Rivers Research and Management, 15(6): 505-523
- Sankara Narayanan, V.N and S.Z. Qasim, 1969. Nutrients of the Cochin back waters in relation to environmental characteristics. Mar. Biol; 2:236-247
- Sarala Devi, Venugopak, K.P, Remani, K.N, Dominic Zacharias and Unnithan, R.V , 1983. Nutrients in some estuaries of Kerala. Mahasagar, 16(2): 161-174
- Sasidharan, N, 2004. Biodiversity documentation for Kerala, Part 6- Flowering plants. Kerala Forest Research Institute, Peechi, Kerala.
- Sasidharan, N, 2006. Illustrated manual on tree flora of Kerala. Geography, 2006.
- Sasidharan, N, 2006. KFRI Research report no.282. ISBN, No. 09708103, KFRI, July-2006.
- Sawyer, C.N and Mc Carty, P.L, 1978. Chemistry for environmental engineering (3rd edition) New York: Mc Graw Hill Book Co.
- Sawidis ,T, 1997. Chemical Pollution Monitoring in Fresh water systems from Macedonia, Greece, A comparative study. Toxic. Environ. Chem. 63 (1-4)
- Sayyad, N and A, Dhamani, 2017. The Diversity and status of Avifauna from Prahinta River sub basin in Sironcha Tahsil, Maharashtra, India. Int. J. Zoo. Studies 2017, Vol. 2 page 43-51
- Scot, D.A, 1982. Managing Wetlands and their Birds. International Water fowl Research Bureau, Slimbridge, Glos, England.
- Sharma, O.P, 2011. Plant taxonomy 2E. Tata Mc Graw-Hill Education, 2011, Taxonomy.

- Shell Ford, V.E, 1911. Ecological Succession: Stream fishes and the Method of Physiographic Analysis. Biological Bulletin of the Marine Biology Laboratory Woods Hole, 21:9-35
- Shukla, S.C, Tripathi, B.D and Deepakumari, V, 1988. Physicochemical and Biological Characteristics of River Varuna in Relation to Pollution at Varanasi. II National symposium on Fish and their Environment. Dept. Aqu. Bio. And Fish, University of Kerala. 112-113 PP
- Sihanova, N.S and Rahimov, I.I, 2018. A study on the avifauna of the Lake systems in the delta of the Syr Darya river (Lake Cartma), Russia. 2016. DOI:10.29042/2018, 2259 -2264
- Simpson, E.H, 1949. Measurement of diversity. Nature, 163:688.
- Sinha, A and Adhikari, B.S, 2018. Bird diversity along riverine areas in the Bhagirathi valley, Uttarkhand, India. Biodiversity data journal 7. April 2019.
- Sing, H.R. and Dobriyal, A.K, 1981. Potomology of the stream “chakagadeara” in relation to the productivity of cold water minor carps in Garhwal, Himalaya. Proc. Nat. Sci. Acad. India B47 (5): 652-655
- Smith, J.N.M and MacMohan, 1981. Bird communities along a montane sere: Community structure and energetics. The Auk, Vol.98, PP.8-28
- Sivarajan, V.V, 1984 and 1991. Introduction to the principles of plant taxonomy. 2nd edition, Oxford and IBH pub. Co. 1984.
- Stewart, R.E. and Kantrud, H.A, 1972. Population estimates of breeding birds in North Dakota. The Auk Vol. 89. 766-788
- Stewart, R.E. and Kantrud, H.A. 1974. Breeding water fowl populations in the Prairie pothole region of North Dakota. The condor Vol. 76, No.1, 70-79.
- Sykes, J. M and A.D, Horril, 1997. Vegetation monitoring in Indian Tiger Reserves: A report to the WWF, Institute of Terrestrial Ecology Cambridge.
- Thanusanth, S, Sakthivel, K, Harris, J.M, Vinobaba, M and Vinobaba, P, 2018. Avifaunal diversity and composition of Vellakkattukulam, Batticaloa, Sri

- Lanka, Best: Int. national J.of arts, humanities and medicine andl sciences, Vol.6, Issue 7 , July-2018.
- Thomas, G, 1995. Comparative studies on the ecobiology of mangrove communities along the back water systems of Kerala. Ph D Thesis, Unversity of Kerala
- Tripathi, B.D, Suresh shukla, Rajanikant, C, Deepakumari.V and V.S, Pandey, 1988. Physico - chemical and bacteriological characteristics of River Ganga from Mirazapur to Ballia. II Nat. Symp. On Fish and their Environment 21-23 Nov. 1988. Dept of Aqu .Bio. and Fish Uniersity of Kerala . Trivandrum 103 PP.
- Trivedi, R.K and P.K, Goel, 1984. Chemical and Biological methods for water pollution studies. Environmental Publiucations, 1984-Water-215pp.`
- Twedt, D.J and Charles, R. Loesch, 1999. Forest area and distribution in the Mississippi alluvial valley: implications for breeding bird conservation. J. of Biogeography, 26(6):1215-1224, November 1999.
- Unnithan, R.V, Vijayan.M and Remani, K.N, 1975. Organic Pollution in Cochin Back waters. Indian. J. Mar. Sci 4(1): 39-42
- Utpal Sing Roy and S.K, Mukopadhyay, 2008. A study on avifaunal diversity from three different regions of North Bengal, India. Open cons. J.1 (2): 12 -129 January .2013.
- Verma, S.R, Sharma, P, Tyagi, A, Rani, S, Gupta, A.K and Dalela, R.C, 1984. Pollution and Saprobic Status of Eastern Kalinadi. Limnologica, 15: 69 – 133
- Vidyasagaran, K and Madhusoodhanan, V.K, 2014. Distribution and plant diversity of mangroves in the west coast of Kerala, India. J.of Biodiversity and Environmental sciences (JBES), Vol. 4, No.5, p.38-45, 2014.
- Warkentin, I.G, J. Michael Reed and Susie. M, Dunham, 2004. Off spring size as an index of habitat degradation. Ornithological Science .2004

- Weller, M.W, and Spatcher, C.S, 1985. Role of habitat in the distribution and abundance of marsh birds. Special Rep. No. 43. Iowa State University, Iowa 31
- Weller, M.W, 1981. Fresh water marshes. University of Minnesota Press, Minneapolis, Minn, 146 P
- Wellershaus, S, 1972. On the hydrography of the Cochin Back water: A south Indian Estuary. *J. Mar. Biol. Ass. India* 14: 487 – 495
- Wilber, D.H, Tighe, R.E and O'Neil, L.J, 1996. Associations between changes in agriculture and hydrology in the Cache river basin Arkansas, USA. *Wetlands*, 16 (3): 366-378
- William, H.O, De Smet, Frans and M.J.C, Evens, 1972. A hydrological study of the polluted river Lieve, Ghent, Belgium. *Hydrobiologia*, 39(1) : 91- 154.
- William, L, 1887. Malabar Manual Vol I and II Asian Educational Services, New Delhi and Madras.
- Williams, D.D and M.R, Smith, 1996. Colonization dynamics of river benthos in response to local changes in bed characteristics. *Fresh Water Biology*; 39(2) : 237-248
- Willson, M.F. 1974. Avian Community Organization and habitat structure. *Ecology* 55: 1017- 1029.
- Zeeshan, M, Azeez, P.A and Baltrenaite, 2017. Soil characteristics in the flood plains of Munawar Tawi in Rajouri, Western Himalayas, India. *Environmental systems research*. 6, Article number: 22(2017).

APPENDIX I

A: Measurement of pH:-

The measurement was done using pH indicator paper. A piece of indicator paper was dipped into the water sample collected from the sites. The colour developed in the paper was compared with the range of colours on the standard scale provided. The values corresponding to the range of colours marked on the pH scale was recorded.

B: Estimation of Total Dissolved Solvents (TDS):-

An evaporating dish was cleaned with distilled water and dried for 1 hour at 104⁰c in hot air oven. Then it was cooled in a desiccator. The dish was weighed and the value recorded. 100ml of the collected sample was filtered and transferred to the dish. This sample was evaporated without boiling in a hot air oven at 104⁰c for 16 hrs. Then it was cooled in a desiccator. Weighed the dish after the sample water is evaporated to dryness. The value was recorded. The difference between the two weights of the dish was recorded as the amount of TDS in mg. Multiplied the value by 10 to get the quantity in one litre.

C: Estimation of Dissolved Oxygen:-

Materials required:

BOD bottle, Conical Flask, Pipette, Burette etc

Reagents required:-

1. **Manganous sulphate solution:** This is prepared by dissolving 36.4 gms of $MnSO_4 \cdot H_2O$ in 100 ml of distilled water. Filtered the solution. This solution is known as winkler A solution.
2. **Alkaline iodide solution:** This is prepared by dissolving 15 gms of KI and 50 gm of NaOH in distilled water and made up to 100ml. This is known as winkler B solution.
3. **Conc. H_2SO_4 :** H_2SO_4 with specific gravity 1.83 to 1.84.
4. **Sodium thio Sulphate ($Na_2 S_2O_3 \cdot 5H_2O$) 0.1N solution :-**

Dissolved 24.83 gm $Na_2 S_2O_3 \cdot 5H_2O$ in 1L distilled water. Added 5 ml of chloroform (or 0.4 gm NaOH) to prevent deterioration. Stored in a dark bottle.

5. **Starch solution:-** 1gm of soluble starch is made fluid paste and boiled in 100ml of distilled water. Cooled and the supernatant is used.

Procedure:-

The water was collected carefully without entrapping air bubbles in a 250ml sample bottle. The temperature of the sample was noted. Added 1ml of Winkler A and Winkler B solutions to the sample using separate pipettes and the tip of the pipettes touching the bottom of the sample. The bottle was shaken well to enhance the formation of the precipitate. Then the bottle was kept undisturbed to settle the precipitate. The bottle was taken to the laboratory and added 1 ml of conc. H₂SO₄ along the sides of the bottle shaken well. 100ml of the sample is then pipetted out into a clean conical flask. Titrated against 0.0125N sodium thio sulphate solution, till the brown colour of the sample became pale yellow. Added 5 drops of the starch solution mixed well. The titration is continued quickly until the first disappearance of the blue colour. The titration was repeated to get concordant values. The burette readings were recorded.

Calculation:-

Amount of dissolved O₂ = $\frac{V_1 V_2}{V_2} \times 8 \times 1000$, where V₁ is volume of the titrant in ml, V₂ is volume of treated water sample, N₁ is the normality of the titrant and 8 is the eq. wt of Oxygen.

D. Estimation of alkalinity:-

Materials required:- conical flask, Pipette, burette etc

Reagents:-

1. **Standard Na₂CO₃ solution (O.O₂N):-** weighed out 0.53 gm AR-Na₂CO₃ into a standard conical flask. Dissolved in 100ml distilled water and made up to the mark.
2. N/50 Hcl:- Diluted 10 ml of Hcl to 1000ml(0.1N.) Pipetted out 20 ml of this solution and made up to 100ml(0.02)
3. Phenolphthalein and Methyl orange as indicators.

Procedure: -

1. **Standardising Hcl:-** Pipetted out 20ml 0.02N Na₂CO₃ into a standard conical flask. Added a drop of methyl orange indicator and titrated with 0.02N Hcl. The end point is the change of the golden yellow color to pale orange red

Calculation:-

$$\begin{aligned}
 \text{Strength of HCl} &= \frac{N \cdot \text{Na}_2\text{a}_3 \times V \text{ Na}_2 \text{ CO}_3}{V \text{ HCl}} \\
 &= \frac{0.02 \times 20}{V \text{ HCl}} \\
 &= N \text{ HCl}
 \end{aligned}$$

2. Determination of alkalinity:-

Pipetted out 100ml of the water sample into a conical flask. Added 2 drops of phenolphthalein indicator and titrated with N/50 till the pink color is just disappeared. Noted the burette reading. Taken another 100ml of the sample in a conical flask and added 2-3 drops of methyl orange. Continued the titration till an orange yellow color appeared. Noted the volume (V_2)

Calculation:-

$$\begin{aligned}
 \text{Volume of the HCl used in phenolphthalein end point} &= V_1 \text{ ml} \\
 \text{Phenolphthalein alkalinity in terms of Ca}_2\text{CO}_3 \text{ equivalent} &= 10V_1 \text{ PPM} \\
 &= V_1 \times N \text{ HCl} \times 50 \times 10 \\
 \text{Methyl orange alkalinity} &= V_2 \times N \text{ HCl} \times 50 \times 10 \\
 &= 10 V_2 \text{ PPM}
 \end{aligned}$$

E: Estimation of Inorganic phosphate:-

Materials: - Conical flasks, Pipette, Spectrophotometer etc

Reagents:-

- 4.5 Molar H₂SO₄:-** Added 125 ml conc H₂SO₄ to 3375 ml of distilled water

Mixed Reagent:-

- Dissolved 6.25 gm of Ammonium molybdate in 62.5ml of distilled water.

(b) Dissolved 0.25gm potassium antimonyl tartarate in 10 ml of distilled water.

Added Ammonium molybdate solution to 175ml of 4.5 molar H_2SO_4 stirring continuously. Then added potassium antimonyl tartarate solution and mixed well.

(c) Acidified ascorbic acid: - Dissolved 5gm ascorbic acid in 25ml of 4.5 molar H_2SO_4 , this reagent was prepared fresh. To the mixed reagent added acidified ascorbic acid. This was allowed to stand for few minutes until turbidity disappeared.

3 Standard potassium dihydrogen sulphate solution:-

It is prepared by dissolving 68 mg of anhydrous potassium dihydrogen phosphate in 50ml of distilled water. 1ml of this solution contains 1 millimole phosphate phosphorous. Diluted this solution to 250ml to be used as working standard solution. Thus one ml of this solution contains 0.2 millimole phosphate .

4 Phenolphthalein indicator:-

Procedure: - Taken a series of conical flasks. To these added 1, 2, 3&4 mls of the working standard phosphate solution. Each flask was made up to 10ml with distilled water: Added one drop of a phenolphthalein reagent to each flask. A red color appeared. At this point added a few drops of 4.5 molar H_2SO_4 . Then added 0.5 ml of the mixed reagent and mixed well. A blue color developed in each flask. The absorbance of the blue color was measured at 620nm against the blank reagent in the spectrophotometer. The absorbance was recorded as a calibration curve based on the readings.

Sample Analysis:-

The water sample was taken in a conical flask. The same procedure described above was done with the sample. The absorbance was measured. A

standard test was also done with a solution containing 0.008 millimoles of phosphate phosphorus per ml.

Concentration of sample = Absorbance of sample / (Absorbance of standard X Concentration of the Standard).

Ishak M. P. “Studies on the Comparative Ecology of the Riverine Systems of Kalpathi, Kunthipuzha and Nila Rivers with Emphasis on Avifauna.” Thesis. PG & Research Department of Zoology Farook College, Feroke, University of Calicut, 2019.

pH was high and the oxygen content were low, which are indications of the deterioration of the quality of water. Here the sewages from Pattambi, Ottappalam and Shoranur towns, wastes from hospitals etc were the major factors causing impurity. Anyhow the other two the rivers are not seriously polluted and the habitat quality is not at thresholds.

Finally, from the information generated from present study, and from the personal experience of the investigator acquired especially during the fieldworks, the following recommendations are made to improve and sustain the avian biodiversity in the study area.

1. Encroachment of river banks should be strictly prevented.
2. The coastal regulatory zone law should be enforced strictly so that illegal constructions along the sides of the river course are minimized.
3. Conversion of paddy fields for other purposes such as to build residences, industries etc are to be strictly prohibited
4. The paddy cultivation should be encouraged with incentives and authorities should ascertain that no paddy fields are left barren for long. The paddy fields along the Nila and Kunthi rivers are an asylum for many shore birds, majority of which are migrants. They are depending on different food items such as insects, caterpillars and eggs available at different stages of paddy cultivation.
5. The sides of the rivers are recurrently subjected to erosion during the monsoon. This should be prevented by planting appropriate trees and bamboos. That would also provide suitable habitat for several avian species.
6. The growth of the giant grass species all along the river beds is causing a serious problem. Many areas along Nila river and Kunthi river are now being dominated by this grass leading to formation of small islands (“thuruth”) in the centre of the rivers at many places. That results in diversion of the river

course curtailing the natural flow of water. Appropriate measures should be taken to prevent the menace.

7. Urgent steps should be taken to stop the sewage disposal to rivers from hospitals, markets, industries and households, especially at Parali, Ottappalam, Pattambi and Mannarkkad.
8. Several check dams are constructed along the course of Nila and Thootha rivers. The pros and cons of such constructions should be studied in detail and appropriate measures to be implemented. Sand mining is another serious threat to the sustenance of rivers and the riverine ecosystems and that has to be done under proper scientific planning.