STUDIES ON THE STATUS AND DISTRIBUTION OF RAPTORS IN WAYANAD DISTRICT, KERALA

FINAL REPORT SUBMITTED TO THE KERALA FOREST DEPARTMENT

By

DEEPAKUMAR NARAYANA KURUP Ph.D.

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PHOTO CREDITS

Black eagle soaring	-	*Ajayan P.A.*
Booted eagle soaring	-	*Ajayan P.A.*
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Common kestrel perching	-	*Ajayan P.A.*
Shaheen falcon perching	-	*Vinayan*
Crested Goshawk nesting	-	*Ajayan P.A.*
Crested Serpent eagle chick	-	*Ajayan P.A.*
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CHAPTER I

INTRODUCTION

Birds of prey have evoked enormous interest for human beings since earlier civilizations upto modern times by virtue of the formers' sheer beauty, hunting skills and position in the food chain. Raptors particularly fascinated primitive cultures and the sport of falconry is at least 4000 years old (Ferguson Lees and Christie, 2005). Predatory birds have figured prominently in art, ceremonies and legends of most human societies. The cultural importance of raptors has not diminished in modern times as many countries have chosen birds of prey as their national symbol.

Birds of prey commonly known as raptors include kites, hawks, buzzards, falcons, eagles, harriers and vultures and make up the order Falconiformes consisting of a total number of 293-313 species world wide (Naoroji, 2006). Some authors like Ferguson-Lees (2006) and Naoroji (2006) have excluded owls from the list of raptors. The 130 or so species of owls, which make up the order Strigiformes, are all more closely related to each other than are the raptors (Glen and Derek Lloyd, 1979). Raptors occupy a variety of habitats including forests, grasslands and wetlands while a few species depend on aquatic ecosystems for food. Raptors are known to feed on insects, crabs, fishes, frogs, snakes, birds and small mammals.

Birds of prey are declining in numbers throughout the world, due to the uncontrolled use of organochlorine pesticides and habitat destruction. Many species were brought to the verge of extinction. However, intensive efforts by Governmental and Non-governmental

agencies have saved species like the Bald eagle and Osprey in North America where these species have staged a spectacular come back and proposals are now underway to remove these birds from the ‘endangered’ status.

The Indian sub-continent harboured a rich raptor fauna according to earlier investigators like Jerdon (1870) Baker (1923), Ali and Ripley (1983), Grimmet et al (1999) etc. As elsewhere in the world, raptors in India also have been declining due to habitat destruction and indiscriminate use of DDT and other organocholorine pesticides. Recent studies have shown that vultures which were common in forests and urban countryside in India have become rare due to Diclofenac, a veterinary medicine widely used for the treatment of domestic livestock, the carcasses of which are fed by the vultures.

India’s varied biogeographical zones support an impressive diversity of 69 resident and migratory raptor species, a total of 104 forms including sub-species and races (Naoroji, 2006). Kerala used to have 38 species of raptors and 13 species of owls (Ali, 1969). During the last 20 years three species of eagles and one species of owl were additionally sighted in Kerala making the total number of birds of prey, including owls 55 in the state. Birds of prey in Kerala include a western ghat endemic, the Crested Goshawk and five disjunct species viz., the Jerdon’s baza, Black Baza, the Rufous Bellied eagle, grass owl, and the oriental Bay owl. Raptors in Kerala also include 12 species of migrants of which 11 are from the Palearctic (Ali, 1968).

Current Scenario.

Recent studies in selected areas have shown that raptors are declining in Kerala state. (Zacharias and Gaston, 1999). Elwes (1870) has found 4 species of vultures common in the cardamom hill reserve including Periyar. In his Travancore-Cochin ornithological survey, between 1935 and 1937, Salim Ali (1937) recorded 3 species of vultures in the area. I have myself witnessed the presence of congregations of White-rumped vultures and one or two Red-headed vultures near Thannikkudy and Manakkavala areas of Periyar. But in a recent study of the raptors conducted in Periyar, the Long Billed Vulture, recorded by the earlier investigators was found missing. (Srivasthava et al, 1995). Jerdon (1862) has recorded the endangered White Bellied Sea-Eagle at Ponnani and Calicut. But these birds are not found in these locations now. Jafer (2000) has reported that the White Bellied Sea Eagle is threatened with the destruction of their nesting trees on the coastal areas of North Malabar.

Objectives

In fact, very little information is available on the current status and ecology of birds of prey, which are declining in numbers in Kerala. Since these birds stands on top of the food chain, long-term conservation strategies are important for their survival. Species like the white-rumped vulture and the red-headed vulture which are critically endangered as per IUCN criteria and others like white-bellied sea-eagle, the falcons and the hawk-eagles which are included in the schedule 1 of the Wildlife (protection) Act, 1972; and the grey-headed fishing eagle, the greater

spotted eagle, bay owl and the spotted fish owl which are considered globally uncommon/threatened by the IUCN (Mace and Stuart, 1994) need special protection. For conserving these species efficient strategies supported by in-depth study are required. As a first step, a status survey of raptors in Wayanad district along with study of feeding habits and hunting success of selected species is proposed to be done.

The objectives are broadly outlined as follows:

1. A survey to find out the distribution and status of raptors of Wayanad district.
2. to study the feeding habits and hunting success of selected species.
3. record incidences of nesting of raptors.
4. outline strategies for conservation of raptors.

CHAPTER II

STUDY AREA, WAYANAD

Wayanad is a cool and verdant table land situated at the southern end of Deccan plateau and remains a strange mosaic of forests, plantations, agricultural holdings, vayals and human settlements. Wayanad, traditionally, refers to the region encompassed by the Wayanad plateau of about 3000 Sq.km area (Annayya, 2001). Wayanad is situated at the confluence of three biologically distinct and diverse regions -the main western ghats mountains, the Niligiri hills and the Deccan plateau (Nair, 1988). The plateau rises steeply from the coastal plains of Kerala and slopes gently eastwards to merge with the Deccan plateau in the east.

Wayanad district lies between the latitudes 11^0 27'and 15° 58' North and 75^0 47' and 70^0 27' East longitude and has a total area of 2131 Sq.km. It is bounded on the east by Nilgiris and Mysore districts in Tamil Nadu and Karnataka respectively, on the north by Kodagu district of Karnataka, on the south by Malappuram and on the west by Kozhikode and Kannur districts(Anonymous,2006).

The district has lofty ridges interspersed with dense forests, tangled jungles and deep valleys. It, generally, has uneven terrain with hillocks and valleys.

An area comprising 345 Sq.km at the eastern edge of the plateau is carved out to form the Wayanad wildlife sanctuary, existing as 2 discontinuous units. Tholpetty range at the north is contiguous with Nagerhole tiger reserve of Karnataka and Kurichiat, Bathery and Muthanga ranges that make up the southern unit is adjacent to Bandipur national park of

Karnataka and Mudumala tiger reserve of Tamil Nadu. Wayanad therefore is part of a larger landscape that also forms an integral part of Nilgiri biosphere reserve.

Terrain

Wayanad is an undulating landscape dotted with rounded hills which are rarely steep. The area predominantly shows western aspect though locally all possible aspects can be seen due to the rugged nature of the country. Several small streams and swamps are interspersed over this terrain. The general slope varies from 5^0 to $10^0$and the altitude varies from 600 metres to over 2000 metres. (Jayaprasad, 2002). Chembra is the tallest peak at 2145 metres. Among the other taller peaks are Banasuran mala (2061m), Elembileri mala (1839m), Brahamagiri mala (1608m), Kunnelipadi mala (1607m) and Thariode mala (1553m)

Climate

The plateau has monsoon climate which has changed considerably in the past few decades with hotter summers and lower rainfalls (Jayaprasad, 2002). The annual average rainfall is about 2000 mm. The bulk of the precipitation is received during the south-west monsoon from June to September. The north- east monsoon extends from September to December.

The maximum and minimum relative humidity in the last 10 years was 93.6% and 42.9% respectively. (Jayaprasad, 2002)

Drainage

Kabini and its tributaries constitute the main drainage network of Wayanad. Kabini, one of the 3 east flowing rivers of Kerala is an important tributary of river Cauvery.

Panamaram river takes its origin from Pookode lake. Manathavady puzha orginates from Thondarnadu peak. These two rivers confluence to form Kabini. Some of the other rivers are Kalladi river, Venniyode river, Noolpuzha river, Kannaram river, Kurichiat river etc.

Vegetation

Wayanad is a land of forests, vayals, plantations and agricultural holdings. Forests make up 75% of the area of the district.

The forests are highly fragmented over the years and it is reported that there has been massive changes in the land use pattern in the District between 1950 and 1982 (Easa et al, 1999). Correspondingly, there has been a great increase in the area under plantations and cultivations.

The main forest types are South Indian moist deciduous forests, southern dry mixed deciduous forests, tropical semi- evergreen and evergreen forests, shola-grassland forests, bamboo brakes and grassy vayals.

The common trees are *Terminalia panniculata, T. bellarica, T. tomentosa, Anogeissus latifolia, Lagerstomia microcarpa, Pterocarpus marsupium, Dalbergia latifolia, Adina cordifolia, Emblica officianalis, Schleichera oleosa, Briddelia letusa, Butea monospermia, Mangifera indica, Bishofia javanica, Toona ciliata* etc. The common shrubs are *Helicterus isora, Lantana camera, Eupatorium sp etc. Among the common climbers are Butea parviflora, Acasia intsia, Caesalpinea sp.* etc.

Fauna

Wayanad is primarily elephant country though most of the peninsular forms are well represented here. For more details of the flora and fauna see Jayaprasad (2002).

CHAPTER III

METHODS

As raptor distribution is rather sparse and not homogenous in any given habitat, line transect surveys are unsuitable. The method employed here follows Jean-Mark Thiollay (1993) wherein elevated areas which serve was vantage points for surveying soaring raptors within an identifiable radius, 2 kms, are selected carefully on the basis of geographical and habitat representation. Evergreen forests, moist deciduous forests, dry deciduous forests, grasslands, sub-tropical montane sholas, marshes and coffee estates are surveyed. Parts of Muthanga range, Bathery range and Kurichiat ranges are intensively surveyed for determination of species abundance, feeding and nesting habits. The following 10 locations were monitored for 12 months:

1. Brahmagiri
2. Begur
3. Banasuran mala
4. Padinjarethara dam
5. Puliyar mala
6. Chembra
7. Vythiri ghat
8. Ottipara
9. Panamaram marsh
10. Muthanga

The species diversity in the different locations were calculated using the Shannon-Weiner formula

Shannon Index $\Delta = \Sigma \Pi i \log \Pi i$ (Patil and Tailee, 1979).

Where Π is the proportion of the i^{th} species of the total number of birds.

Nests were located primarily through secondary sources as forest watchers and tribes as well as by intensive canopy surveys. Once located, nests were monitored on as many occasions as possible, as these provided valuable opportunity to observe raptors' feeding habits as well.

Strictly speaking, though owls are not considered as raptors, they, nevertheless, are included for the current study as they share with the raptors common anatomical features and feeding habits.

CHAPTER IV

RESULTS AND DISCUSSION

(a) Results

- A total of 30 species of raptors and 7 nocturnal birds of prey were observed during the study.
- 7 species of raptors were observed to be breeding in Wayanad District.
- The critically endangered species of **white-rumped vulture** was observed to breed regularly at three specific sites in Wayanad Wildlife Sanctuary.
- The critically endangered species of **red-headed vulture** was also observed regularly in the study area, but in smaller numbers than the former.
- Three species of owls were found breeding in Wayanad.
- The breeding of **Bonelli's eagle** appears to be its first ever record for Kerala.
- The breeding of **spot bellied eagle owl** is also apparently the first record for Kerala.
- Evidence for the breeding of the endangered **Shaheen falcon** was observed at Brahmagiri.
- There appears to be an **inter-state migration of raptors** towards Tamil Nadu and Karnataka during the monsoon season.
- Among the vulture species, the most gregarious species of **white-rumped vulture** preferred drier areas towards the east whereas the relatively solitary species of red- headed vulture preferred denser canopied forests towards the west.

- Raptors preyed on a variety food from insects to large mammals like the Hanuman langur.
- The population of **Honey buzzard** peaks in the months of March to May, coinciding with the availability of honey.
- The **Pallid harrier**, a near threatened species by IUCN criteria is found to be a regular winter visitor. The **greater grey-headed fish eagle**, also a near threatened species was observed twice in 2009 and once in 2010.
- The **Rufous bellied-eagle**, a disjunct species, was found only once each in 2009 and 2010.
- There is population increase in respect of **Bonelli's' eagle** in May and June, coinciding with its breeding activity at Muthanga.
- The **vulture population** has registered an increase in the months of April, May and June, coinciding with increased animal mortality in the area.
- **Shaheen falcons** were observed mostly in the Brahamagiri area.
- **Crested serpent eagle, black eagle and honey buzzard** were the species ubiquitously distributed in all the habitat types.
- **Black eagles** tend to be more numerous in the shola- grassland environment whereas crested serpent eagles preferred ecotones of forest glades.
- **Bonelli's eagles** were seen confined to the drier areas of Wayanad like Muthanga and Ottippara.
- While **marsh harriers** preferred low land marshes, cultivated paddy fields, and reservoirs, **pallid harriers** preferred high altitude sub -tropical montane grassland areas.

- Primarily a species of the seaboard, the **white- bellied sea eagle** was found once at Padinjarethara Dam.
- The **Merlin, Eurasian sparrow hawk, osprey, mountain hawk eagle** were the rarest in the area, having been observed only once each during the study period.
- Otherwise one of the commonest species of the plains, the **black kite** was observed only once, at Pulpally.
- Among the migrant raptors, the earliest to arrive was the **booted eagle** which arrived in November and the last to depart was the **common buzzard** which departed on 1st June
- During monsoon, when high altitude areas experienced heavy winds and thunderstorm, **kestrels** were never found, whereas they tended to be occurring in the low-sheltered valleys during the same period.
- **Shaheen falcons**, though breeding at **Brahamgiri** with certain regularity, only 2 individuals were sighted at a time.
- While male **pallid harriers** were confined to shola-evergreen habitats, the females of the species occurred only on grasslands.
- Among the locations monitored, Panamaram marsh and Padinjarethara reservoir area registered greater species diversities.

Table 1: Monthly Abundance of the Commonly seen Raptors in Wayanad District (June 2009 to May 2010)

Species	Jerden's Baza	Brahminy Kite	Black Sholdered Kite	White Backed	Red Headed Vulture	Crested Serpent Eagle	Black Eagle	Marsh Harrier	Pallid Harrier	Crested Goshawk	Shikra	Honey Buzard	Coman Buzard	Bonnelli's Eagle	Booted Eagle	Comman Kestrel	Brown Fish Owl	Total
June			12	217	21	92	6			3	26	3		23			1	403
July										2								2
Aug																		
Sept																		
Oct																		
Nov		2	5	31		19	12	2	1	1	5	3	3	1	2	5	3	94
Dec		3	1	7		28	15	2	1	7	8	4	1		4	7		88
Jan		2	3	26	1	43	23	4	5	1	13	4	1	1	5	9	1	142
Feb		3	3	53	8	45	26	3	7	4	20	7	2	2	3	5	2	193
Mar	9	5	6	63	8	15	3	4	4	3	35	15	8	6	6	8	8	206
Apr	1	1	4	121	14	67	4			8	31	12	3	10	5	3	4	288
May		3	2	135	10	49				4	37	26	1	13		4	3	287
Total	10	19	36	653	62	358	124	14	18	33	175	74	19	56	25	41	22	1739

Table 2: Relative Abundance of different Raptor Species in the different locations and the biodiversity indices

Species → / Locations ↓	Black Baza	Brahminy Kite	Black Shouldered Kite	Indian White Backed Vulture	Red Headed Vulture	Crested Serpent Eagle	Black Eagle	Marsh Harrier	Pallid Harrier	Crested Goshawk	Shikra	Oriental Honey Buzard	Comman Buzard	Bonnelli's Eagle	Changeable Hwalk Eagle	Booted Eagle	Common Kestrel	Shaheen Falcon	others	total	proportion	Shannon Diversity Index
Brahmagiri						3	22		10	1		3	5			2	21	11		78	12.50	0.48
Begur	1	1		10		21	14			6	5	17	5		2	1	2		2	87	13.94	0.55
Banasuran Mala			4			14	12		1	2	3	6	1			5	6			54	8.65	0.63
Padinjarathara Dam		5				8	3	9		2	2	3	1						1	34	5.45	0.74
Puliyarmala			1			10	7			2		4				1				25	4.01	0.71
Chembra			3			16	22		3	5		3				8	7		1	68	10.90	0.52
Lakkidi		3	2			17	22		5	4	2	6	1							62	9.94	0.55
Panamaram		6	2			5	4	7		1	1	2				3				31	4.97	0.78
Ottyppara				12	2	15	5			3	7	5		1		2				52	8.33	0.60
Muthanga				54	4	11	12				3	10	1	5					3	103	16.51	0.40
Total	1	45	12	76	6	120	123	16	19	26	23	59	14	6	2	22	36	11	7	624	100	

Table 3: Month-wise Frequency of Different Raptor Species from all Locations and Percentage Frequency

Species	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total	Percentage Frequency
Crested serpent Eagle	22	1	8	1	3	4	16	13	13	12	7	20	120	20.6
Black Eagle	2		4	1	3	11	13	13	25	18	22	11	123	21.1
Oriental Honey Buzard	1					2	2	5	7	11	11	20	59	10.1
Shikra						2	3	3	6	4	2	3	23	3.9
Crested Goshawk	3					1	4	1	4	1	9	3	26	4.45
Comon Kestrel	2					5	7	4	5	6	3	4	36	6.17
Shaheen Falcon	3			1		2	1	2	1		1		11	1.88
White Backed Vulture	20	1			1	3	1	6		9	2	33	76	13
Red Headed Vulture										2		2	4	0.68
Marsh Harrier						2	2	4	3	5			16	2.74
Pallid Harrier						1	1	5	9	2	1		19	3.25
Common Buzard						3	2	2	1	5		1	14	2.4
Booted Eagle						1	5	5	2	5	4		22	3.77
Bonnelli's Eagle									1	1	2	2	6	1.02
Black Sholdered Kite	1				1	1		1	2	4	1		11	1.88
Brahminy Kite						2	1	2		5	1	2	13	2.22
Changeable Hawk Eagle				1	1					2			4	0.68
Total	54	2	12	4	9	40	58	66	79	91	66	101	583	100

Table 4: Occurrence of Uncommon Raptors during the Study Period

Date	Species	No.	Weather	Area
03/01/2009	Shaheen falcon	1	Clear sky	Ambuthy
16/1/2009	Shaheen falcon	2	Clear sky	Brahmagiri
16/11/2009	Shaheen falcon	1	Clear sky	Brahmagiri
21/122009	Shaheen falcon	1	Windy sunny	Brahmagiri
01/07/2010	Shaheen falcon	2	Clear sky	Brahmagiri
01/07/2010	Shaheen falcon	1	Clear sky	Brahmagiri
02/10/2010	Shaheen falcon	1	Clear sky	Brahmagiri
16/4/2010	Shaheen falcon	1	Clear sky	Brahmagiri
06/12/2010	Shaheen falcon	3	Rainy	Brahmagiri
03/01/2009	Jerdon's Baza	2	Clear sky	Vengoor
03/01/2009	Jerdon's Baza	1	Clear sky	Morarmoola
03/01/2009	Jerdon's Baza	1	Clear sky	Morarmoola
03/01/2009	Jerdon's Baza	2	Clear sky	Morarmoola
03/01/2009	Jerdon's Baza	1	Clear sky	Ayamangalam
03/01/2009	Jerdon's Baza	2	Clear sky	Pattampara Vayal
04/01/2009	Jerdon's Baza	1	Clear sky	Morarmoola
07/06/2010	Black Baza	1	Clear sky	Begur
21/2/2010	Black Baza	1	Clear sky	Chikkanji Vayal
03/01/2009	Greater Greay Headed Fish Eagle	1	Clear sky	Vengoor
03/01/2009	Greater Greay Headed Fish Eagle	2	Clear sky	Ambuthy

(Table contd..)

Date	Species	No.	Weather	Area
03/01/2010	Short Toed Snake Egle	1	Clear sky	Pattampara Vayal
30/3/2010	Greater Greay Headed Fish Eagle	1	Clear sky	Ottipara
06/01/2009	Short Toed Snake Egle	1	Clear sky	Ponkuzhi
25/4/2010	Short Toed Snake Egle	1	Clear sky	Nagappan Vayal
27/6/2010	Short Toed Snake Egle	1	Clear sky	Ottipara
07/11/2010	Short Toed Snake Egle	1	Clear sky	Ondayangadi
06/01/2009	White Eyed Buzzard	2	Clear sky	Vengoor
06/01/2009	White Eyed Buzzard	2	Clear sky	Vengoor
06/01/2009	White Eyed Buzzard	1	Clear sky	Thalkolly
06/01/2009	Rufous Bellied Eagle	1	Clear sky	80 Plantation
28/6/2010	Rufous Bellied Eagle	1	Clear sky	Anappara-Thrissilery
26/12/2009	Bezra Sparow Hawk	1	Cloudy	Banasura
30/3/2010	Bezra Sparow Hawk	1	Clear sky	Lakkidy
27/1/2010	Merlin	2	Clear sky	Muneeswaran Kunnu
23/3/2010	Changeable Hawk Eagle	1	Clear sky	Chembra
25/3/2010	Changeable Hawk Eagle	1	Clear sky	Begur
29/4/2010	Euration Sparow Hawk	1	Clear sky	Muthanga
12/12/2009	White Bellied Sea Eagle	1	Clear sky	Padinjarathara Dam
30/7/2010	Black kite	1	Cloudy	Pulpally
28/6/2010	Mountain Hawk Eagle	1	Clear sky	Muthanga
02/01/2010	Osprey	1	Clear sky	Padinjarathara Dam

Table 5: Dates of arrival of migrant raptors as observed during March 2009-August 2010

Sl. No.	Species	Scientific name	Area	Date of arrival
1	Common buzzard	*Buteo buteo*	Begur	5, November 2009
2	Booted eagle	*Hieraetus pennatus*	Brahmagiri	16, November 2009
3	Eurasian marsh harrier	*Circus aeruginosus*	Panamaram	6 December 2009
4	Pallid Harrier	*Circus macrourus*	Brahmagiri	21, December 2009
5	Merlin	*Falco columbarius*	Muneeswaran kunnu	27, January 2010
6	Eurasian sparrow hawk	*Accipiter nisus*	Muthanga	29, April 2010

Table 6: Dates of departure of migrant raptors as observed during March 2009-August 2010

Sl. No	Species	Scientific Name	Area	Date of Departure
1	Common buzzard	*Buteo buteo*	Waterfalls, Kurichiat	1, January 2009
2	Common buzzard	*Buteo buteo*	Brahamagiri	27, May 2010
3	Marsh Harrier	*Circus aeruginosus*	Padinjarathara dam	27,March 2010
4	Pallid Harrier	*Circus macrourus*	Lakkidi	30 March 2010

Fig.3: Monthly Abundance of the Commonly seen Raptors in Wayanad District (June 2009 to May 2010)

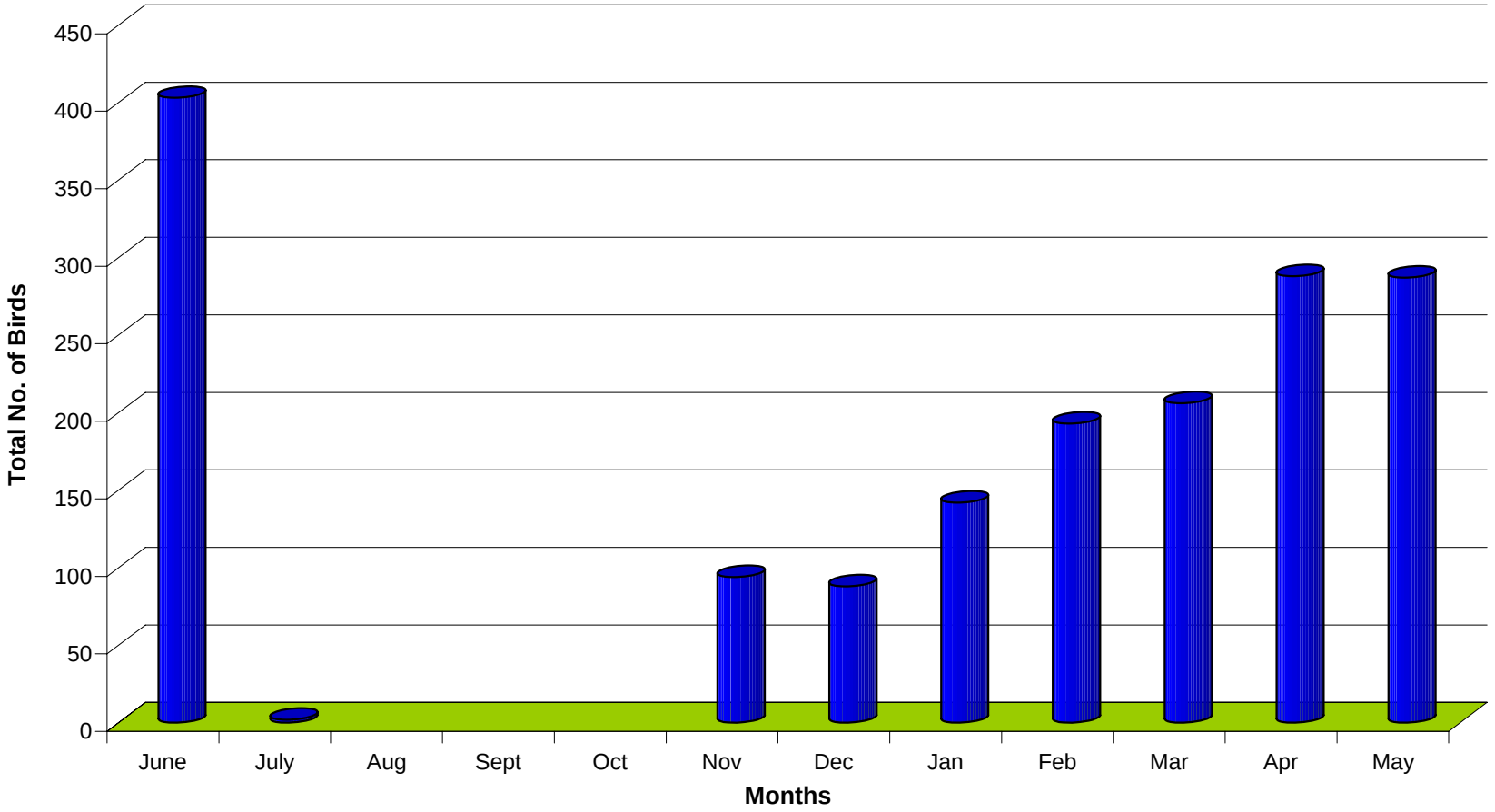


Fig.4: Percentage frequency of all raptor species from different locations (June 2009 to May 2010)

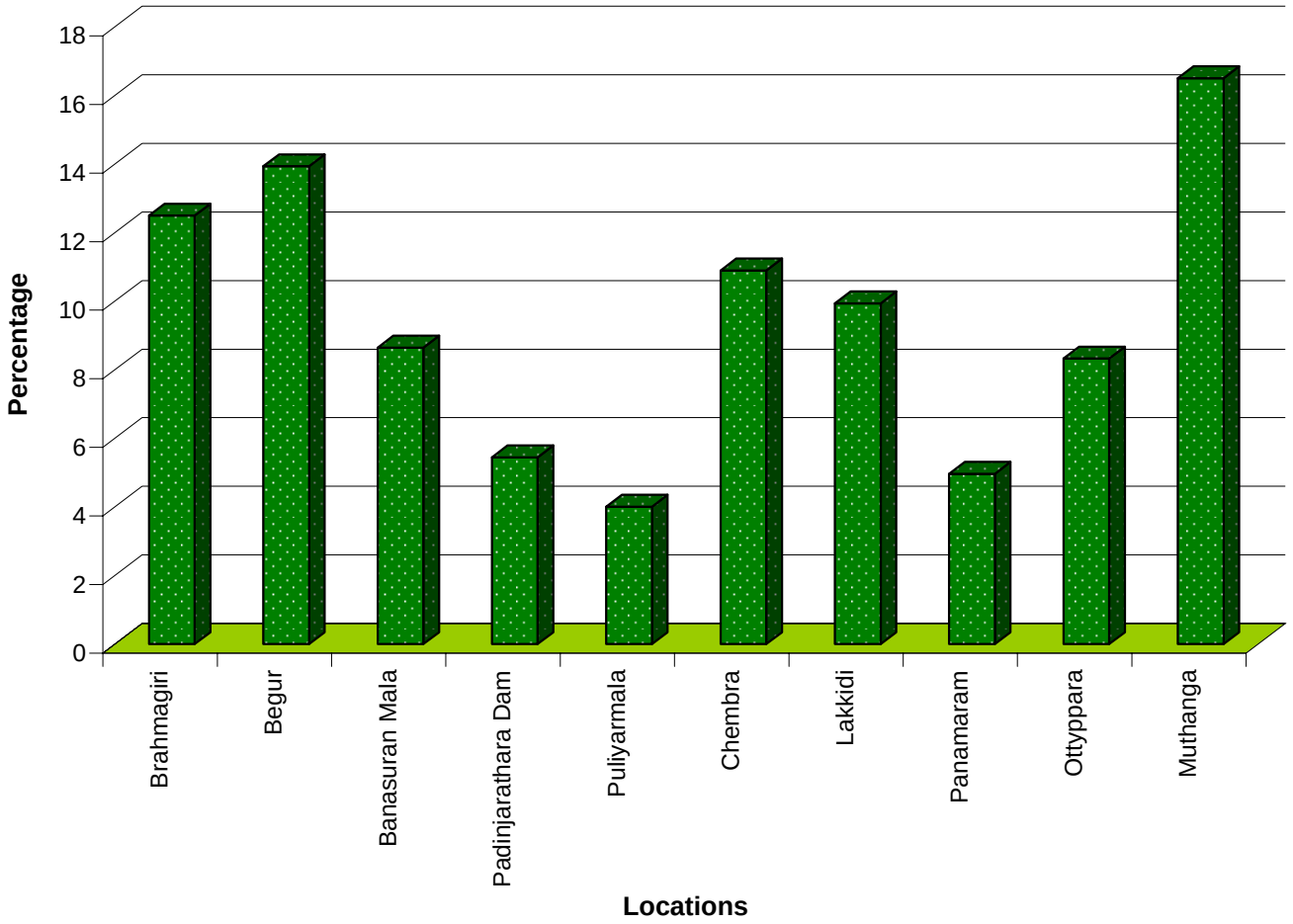
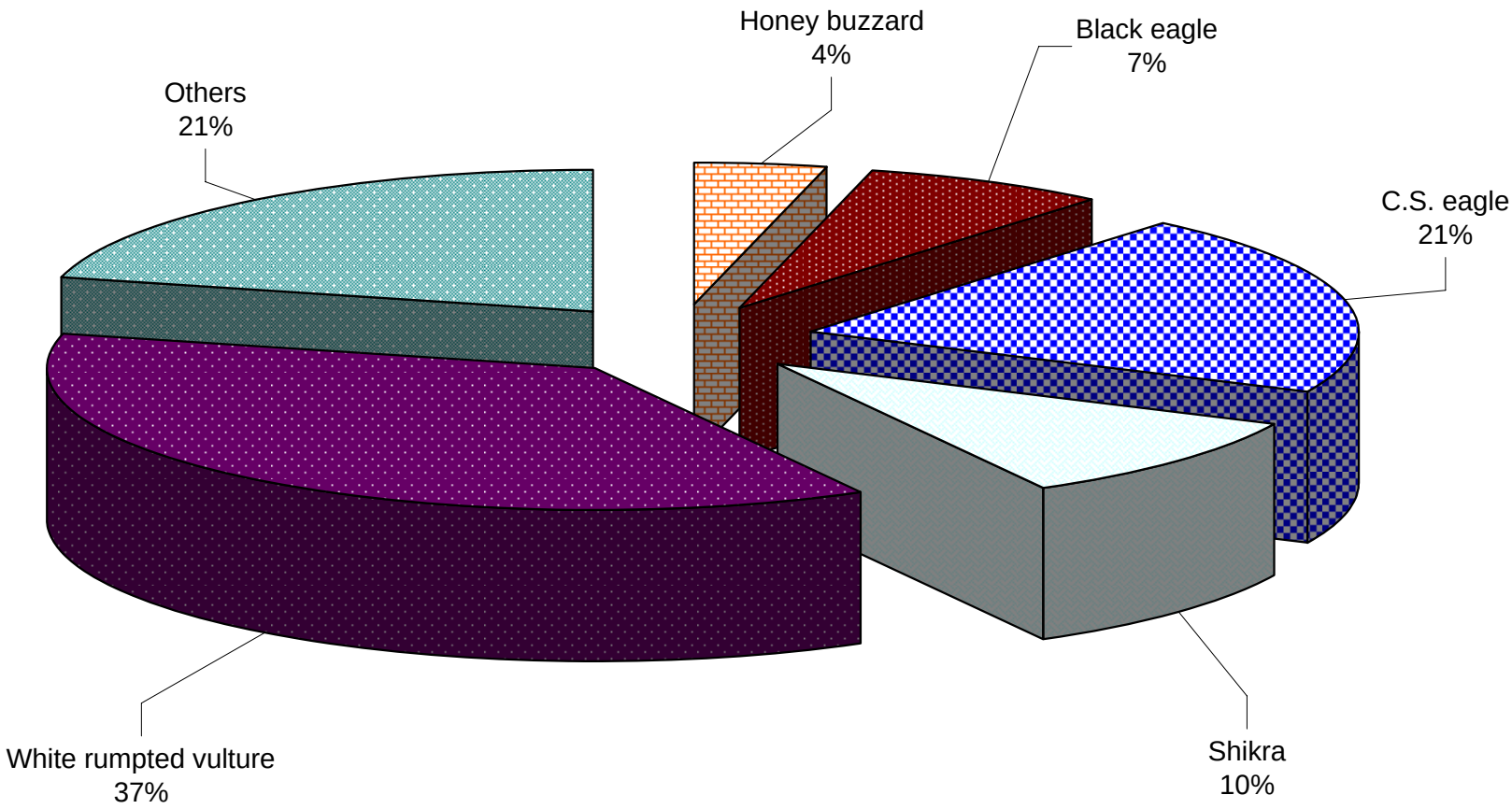


Fig.5: Relative abundance of common raptor species



(b) Discussion

Thirty raptors, both resident species and migrants have been observed in the study area during the 18 month period from March 2009 to august 2010. Additionally 7 species of nocturnal birds of prey were also observed (Table 12).

Most of the migrants come by November and December and depart by march, with a few remaining on till the end of May or beginning of June. The population of raptors in the area increased from March to May and June (Table 1). Crested serpent eagle, white-rumped vulture,shikra and the black eagle were the most abundant species in the different locations they were studied(Table 2) as well as for the entire district.

Majority of the resident raptors bred during the months from March to May, and this along with the influx of migrants contributed to the steep increase in population density during this period.

From February onwards, the general landscape of Wayanad is dry, and day temperatures soar high. Man made forest fires also do happen sporadically during this period, when ground vegetation is dry and leaf litter is thick. Heavy winds experienced during this period accentuate forest fires. Generally forest fires are greater in the drier areas of Karnataka and Tamil Nadu and this would trigger a mass movement of animals across the border into Wayanad in search of water and fodder. Population of predatory species also appeared to increase during this period. Perhaps resident raptors breed mostly during this period when food is plentiful.

Large scale influx of animals, particularly large herbivores like elephant, gaur and sambar would intensify feeding pressures of animals

operating in a small area. The rigours involved with migrating over long distances as well as heightened intra-specific and inter-specific competition for space would also result in animal mortalities. Post-mortem studies conducted in Wayanad over the past 10 years indicated a clear spurt in animal mortalities in the months of May and June. (Dr. Arun Zachariah, Pers. Commu.). The steep increase in the population of vultures during April, May and June appeared commensurate with the greater mortality of animals during this period.

There also appeared a spurt in the population of honey buzzards in the same period (Table 1) when honey combs in the area mature and availability of honey is the greatest. It must seem that there is also a local migration of honey buzzards into the area coinciding with this increased availability of honey.

During the monsoon season starting from June to July, raptors appeared to desert the area and in the months of July, August, September and October, the entire landscape, generally, is bereft of raptors. Kestrels are no longer observed over the mountains on account of the heavy lashing winds and sleet though, however, they are seen more in the sheltered valleys, where the winds are much less. South-west monsoon is not as pronounced in most parts of Tamil Nadu and Karnataka as it is in Kerala. There is, therefore reason to believe that there occurs local migration of raptors from Wayanad into the neighbouring areas or beyond to escape the rigours of the monsoon. During this period, however, certain predominantly perching raptors like crested serpent eagle and the shikra were still observed at various locations (Ajayan, pers.commu.)

because these species are not as much affected, operating inside forest canopies.

Among the raptors nesting in the area are the shikra, crested goshawk, crested serpent eagle, bonelli's eagle, black eagle, jerdon's baza and the white-rumped vulture, and among the nocturnal birds of prey are, the brown fish owl, spot bellied eagle owl and the barn owl as discussed in Chapter V.

Among the area observed, Panamaram marsh and Padinjarethara Dam environs registered greater species diversities (Table 2) perhaps on account of the ecotone effect of open glades, water bodies and marshes surrounded by vegetated zones. It is significant that all these areas were near human habitations. Among the other area areas, Puliarmala, Banasuranmala and Ottyppara have greater raptor diversities. Whereas Puliarmala is purely a large stretch of coffee plantation interspersed by tall trees, the other two areas were relatively inviolate forest tracts which are characterised by a conglomeration of different vegetation types. It was also significant that purely forest dwelling species as bonelli's eagle, black eagle, shaheen falcon, etc. preferred remote forest terrains. Also significant was the fact that the 2 critically endangered species of vultures, the white rumped vulture and the red-headed vulture, were only observed within the limits of protected area and the former bred only at pre-designated zones within the Wayanad Wildlife Sanctuary.

Habitat Preferences of Raptors

It was seen in Wayanad that raptors used all kinds of habitats that included moist deciduous and dry deciduous forests, evergreen forests and montane grasslands, paddy fields, agriculture gardens and reservoirs.

However, it was also seen that the two critically endangered species of vultures were confined to the relatively undisturbed tracts of forests within the wildlife sanctuary. Shahin falcons were always observed in the high altitude biotopes of Brahmagiri and the fact that they were found breeding in the area indicates their preference for this largely remote and inviolate high altitude shola-grassland ecosystem. While marsh harriers preferred paddy fields, marshes and reservoirs, pallid harriers preferred shola-grassland biotope. The crested serpent eagle, though also a soaring species was mostly seen perched within canopies. Similarly, shikras were also seen mostly perched on trees within the canopies. The black shouldered kite clearly preferred degraded open areas mostly overgrown with weeds.

Bonelli's eagles were seen confined to the drier areas of Wayanad like Muthanga and Ottippara of Rampur Reserve adjoining Karnataka, where there is a subtle merging of dry deciduous and moist deciduous forests.

(c) Species Accounts

Jerdon's baza ***Aviceda jerdoni***

Bazas are disjunct species having a distribution in the Western Ghats and Eastern Himalaya (Ali, 1969). Jerdon's baza is a medium sized hawk with rufous and black head and prominent long, black occipital crest (Ali,1969) has conspicuous mesial stripe; broad chestnut bands below. Flared rounded whitish wings with strong black barring on outer primaries and broad black subterminal secondary bands (Naoroji, 2006). According to Ali (1969), it is a rare resident species: a single

specimen was collected from Wayanad in 1877 and the species is confined to evergreen biotope. The nesting season is conjectured to be between February and April based on the only instance of their eggs having been collected by Stewart from venture valley, Travancore.

Jerdon's baza was observed on 5 different occasions at Muthanga range in primarily moist deciduous biotope. It was mostly found perching on tall trees singly or as a pair. Though it could not be located nesting during the study period, Vishnudas (2009) has reported a pair successfully breeding through successive years in a coffee estate near Meppadi during the months March to May.

Black baza Aviceda leuphotes

It is a smallish hawk with broad rounded wings, moderate tail, and conspicuous black crest. Wingtips extend well down to the tail. Crow like in flight, hovers at or hangs from foliage to feed. Social and crepuscular (Ali, 1969).

Adult bird is black in colour with white blotches on back. Chestnut and white patches on secondaries. Chestnut breast bands. Rufous bars on white breast and flanks.

Black baza was seen only on 4 occasions during the study. Though Salim Ali (1969) has reported the species to be confined to evergreen biotope, in Wayanad, it was seen in moist deciduous bordering on dry deciduous in Rampur reserve as well as in the moist deciduous forests in Begur and Kurichiat.

Osprey ***Pandion Haliaetus***

An exclusively fish eating bird of prey, the osprey is a regular winter visitor to several aquatic habitats of Kerala like Periyar, Parambikulam, Kadalundy etc. It is dark brown above with paler barred tail. It has a creamy head and white underparts. There is a broad dark eye band. It has long pointed angled wings. Wingtips exceed tail tip (Lees &Christie, 2005).

It was found only once in the environs of Padinjarathara reservoir and must undoubtedly occur near other water bodies like Karappuzha and Pookode in the wintering months of November to March.

Oriental Honey buzzard ***Pernis ptilorhynchus***

It is a dove headed hawk showing extreme variations in coloration. One of the commonest phases is greyish brown above, pale brown below narrowly cross-barred with white. A short blackish nuchal crest of a few elongated feathers noticeable in profile when slightly raised. Underside of wings silvery with dark markings. Tail greyish with two broad blackish cross bands (Ali 1969).

It was one of the commonest raptors encountered during the study, occurring in all the habitats. Though it is a resident raptor of India, it is described as a winter visitor to Kerala by Ali (1969). In Wayanad, they were observed to be common between February and May with populations peaking in May. It was interesting to note that in Wayanad maturing of wild honey combs also peaks during the same months. This could explain the sudden increase in the population of the species which has a preference for feeding honey. Now, there is an unpublished report

(Vishnudas-pers. commu.) that point that the species is also breeding in Wayanad, though no further details are known.

Crested serpent eagle Spilornis cheela

It is a widespread resident raptor. Has dark brown colour and broad rounded wings. Adult has broad white bands across wings and tail; hooded appearance at rest, with yellow cere and lores, and white spotting on brown underparts (Grimmet et al., 1999). It has a black and white nuchal crest, very prominent when erect; sexes alike, female larger; there is considerable individual colour variation (Ali, 1969)

In Wayanad, the crested serpent eagle turned out to be one of the most ubiquitous of raptors (Table 1). It is one of the most abundant species (Fig.5) and found in all habitant types (Table 2). Primarily a canopy species, it was mostly found perching than soaring (Appendix). Their abundance in Wayanad was greatest in the months of April and June (Table1). Of all the locations studied, the crested serpent eagle were found to be more abundant at Begur, Lakkidi and Chembra.

Their high pitched two note call is often heard from long distances and helps in locating them. The crested serpent eagle was found nesting at Edathukunnu in Wayanad (Chapter V).

The Black eagle *Ictinaetus malayensis*

It is a fairly large rapter having distinctive wing shape and long tail. Flies with wings raised in V, with primaries upturned. At rest, long wings extend to tip of tail. Adult dark brownish-black with striking

yellow cere and feet, shows white barring on upper tail-coverts; and faint greyish barring on tail and underside of remiges (Grimmet et al, 1999)

The black eagle is one of the most conspicuous raptor in our forest landscape with its large size and slow gliding flight over forest canopies. Together with the crested serpent eagle, the black eagle constituted the largest proportion among the hunting raptors seen in Wayanad (Fig. 5). Though found in almost all habitat types, they have a preference for moist forests and shola- grassland eco-system. (Table 2).

Though the black eagle is a resident species breeding in Wayanad, it could not be recorded during the current study.

Rufous bellied eagle *Hieraaetus kienerii*

It is a disjunct species having distribution in the Western Ghats and Eastern Himalaya.

It is glossy black above and white streaked with black on breast. Rich rufous chestnut streaked with black below.

Though Salim Ali (1969) mentions this species to be confined to evergreen and moist-deciduous biotope, during the present study, it was found on 2 occasions, once in 2009 at 80 plantations, Muthanga, which is a degraded area, and subsequently in 2010 at Thrissilery-Anappara area which was a coffee estate bordering a moist-deciduous tract.

Grey-headed fishing Eagle *Ichthyophaga ichithyaetus*

It is a near-threatened species under IUCN categorisation.

It has head and neck grey, underparts and tail white. Tail with broad black terminal band diagnostic in flight.

It was seen thrice during the study period, at Vengoor and Ottyppara, in Muthanga and Bathery ranges respectively, being relatively drier sonex and seen during the months of January and March.

Marsh Harrier *Circus aeruginosus*

The marsh harrier is one of the commonest winter visitors to India. There is clear sexual dimorphism in the species with the adult male coloured dark brown and rufous with silvery grey wings and tail. The female and immature rather like the pariah kite but slimmer, with rounded tails, and usually a whitish cap on the head (Ali, 1969) (see also plate2).

Though they were observed only at Padinjarathara Dam and Panamaram marsh among the locations monitored, they were observed on many other occasions skimming and gliding over rice fields. Marsh harriers seemed to arrive slightly earlier than pallid harriers. However, while marsh harriers were observed exclusively over rice field, reservoirs and marshes, pallid harriers were observed only over mountainous zones over shola- grass land habitats (Table 2)

Pallid Harrier *Circus macrourus*

Also known as the pale harrier, it is a widespread winter visitor. Pale ashy grey above and white below with black tips to its long, narrow, pointed wings especially conspicuous in flight. Tail relatively long, white with grey crossbars. Female umber brown with a buff coloured owl like ruff all round the throat (Ali, 1969). Pallid harrier is a near-threatened species by IUCN.

Though Ali (1969) mentions this species to occur in low country as well as hills, in the present study they were found confined to mountainous biotope, mostly at Brahmagiri and Lakkidi ghats (Table 2). It was also interesting to note that while male pallid harriers were only observed over shola-evergreen, the female of the species were seen confined over grasslands, the significance, if any, was never understood. Perhaps it is an adaptation to establish short-term home ranges to use spaces optimally and effectively.

Crested goshawk ***Accipiter trivirgatus***

The goshawk is a ***western ghat endemic*** raptor superficially similar to an immature shikra. It is dark brown above but with blackish crown and a short horizontal nuchal crest particularly noticeable in profile. Whitish upper tail coverts and the tail is pale brown with four broad blackish bands. Chin and throat white with two blackish moustachial and one median stripe. Breast vertically striped, abdomen transeversely barred, white and rufous brown (Ali 1969).

Though Salim Ali (1969) has described the crested gowhawk to be rather not common, it was, however, observed in the majority of the locations monitored in Wayanad (Table 2). It was also found to be regularly nesting here as described elsewhere in this report.

Shikra ***Accipiter badius***

Widespread resident. Adult paler than Besra and Eurasian sparrowhawk. Underwing pale with fine barring on reminges, and slightly darker wing tips. Male has pale blue grey upper parts, indistinct grey

gular stripe, fine brownish orange barring on underparts, unbarred white thighs, and unbarred or only lightly barred central tail feathers. Female has upper parts more brownish grey (Grimmet, 1999) .

Together with the crested serpent eagle and black eagle the Shikra is one of the commonest of raptors found during the study (Table 2). It was found maximum in moist deciduous forest, and three nesting records could be obtained during the study.

Bonelli's eagle ***Hieraetus fasciatus***

It is a medium sized resident eagle with long and broad wings, distinctly protruding head, and long square ended tail. Soars with wings flat. Adult has pale underbody and forewing, blackish band along under wing coverts, whitish patch on mantle, and pale greyish tail with broad dark terminal band.

Salim Ali (1937) had not seen this bird during his Travancore Cochin survey, but this raptor is found to be rather common in Wayanad, especially in the drier tracts. It is significant that Bonelli's were mostly observed in Ottipara of Bathery and Kakkappadom of Muthanga ranges (Appendix) and their numbers peaked during May and June. (Table 1). The eagle was found breeding in Muthanga in mid-march. It is possible that there are many other undocumented breeding locations in Muthanga that produced a post-breeding spurt in their local population.

Booted eagle ***Hieraetus pennatus***

Salim Ali (1969) describes this to be a smaller edition of Bonelli's eagle in superficial appearance. It is a winter visitor, arriving in mid-November in Wayanad (Table 1). It has long wings and long square

ended tail. Always shows white shoulder patches, pale median covert panel, pale wedge on inner primaries, white crescent on uppertail coverts, and greyish undertail with darker centre and tip (Grimmet, 1999)

Booted eagle was observed in most of the locations monitored except Padinjarathara reserver and Lakkidi ghats and the largest number was observed over the shola-grassland environs of the Chembra.

Shaheen Falcon *Falco perigrinus perigrinator*

According to Ali (1969), it is a widespread resident. It is a heavy looking falcon with broad-based and pointed wings and short broad based tail. Has dark grey upper parts with extensive black hood and less pronounced moustachial stripe. Underparts rufous with dark barring on belly and thighs.

Shaheen falcon is regularly seen at Brahmagiri and there is evidence of the species breeding there. It is a schedule I species under the Wildlife (Protection) Act, 1972.

(d) Status of the Vulture in Kerala

Only 2 vulture species, in all its probability, still exist in Kerala. Previously the Long Billed vulture *Gyps indicus* and the Egyptian Vulture *Neophron percnopterus* along with the White-Rumpted Vulture *Gyps bengalensis* and the Red-headed vulture *Sarcogyps calvus* were seen in places like Periyar Tiger Reserve, Nilambur, Parambikulam and Wayanad. The Cinereous Vulture *Aegypius monachus* was once observed near Pathanamthitta as a straggler and since then being kept at the Thiruvananthapuram zoo. Though the white-rumped vultures are still present, circumstances in Kerala that support large congregations of vultures are unavailable. Furthermore, over the past several years,

attention on every nook and corner of the forest landscape has increased owing to better deployment of staff and facilities so that wildlife deaths, wherever noticed, are immediately taken up for post-mortem and subsequently cremated. This is particularly so for large herbivores like the elephant and the gaur. In Kerala, the majority of people consume beef and therefore pre-empt the possibility of vultures having access to cattle meat. Here agriculture is practised intensely with large scale application of pesticides and fungicides. Residues of these and other heavy metals may get into the system of most species. Nevertheless, the decline of vulture species from erstwhile prime habitats like Periyar tiger reserve, Parambikulam and Nilambur warrants enough concern.

White- rumped vulture *Gyps bengalensis*.

The white- rumped vulture is apparently the only vulture species breeding in Wayanad. About 75-85 cm long, it is a heavy, dirty, blackish brown bird, with long naked neck, and head (Plate 3). In overhead flight, a broad whitish band stretching along the under side of the wings, interrupted by the contrastingly dark coloured body, is diagnostic (Plate 2). Sub-adult birds are chocolate brown without the white back or under wing bands. Sexes are alike.

White-rumped vultures are critically endangered (CR) on the IUCN Red list and listed in Appendix 2 of CITES.

Overall abundance of white- rumped vulture was greatest in May and June. March, April and May are the months when large hordes of herbivorous animals especially elephant and gaur migrate to Wayanad from the neighbouring protected areas of Tamil Nadu and Karnataka on account of acute water and fodder scarcity, often triggered by the

summer heat and frequent forest fires. Consequent to this influx of wildlife, mortality rates are also correspondingly higher in Wayanad around this time (Dr.Arun Zacharia, pers.commu.). This brings in more scavengers to this area and the increase of vulture population in May and June would indicate that vulture populations of neighbouring states also are coming in to Wayanad around this time of the year.

Among the locations monitored, Ottippara and Muthanga registered the largest number of white -rumped vultures. Rampur reserve, comprising these two areas, is relatively a dry tract with open canopies and vast vayals. This area favours vultures that fly high and wide and rely exclusively on sight for locating their prey.

Red –headed vulture *Sarcogyps calvus*

Otherwise known as the King vulture, they are often found along with white-rumped vultures, but never too numerous as the latter and found mostly solitarily or in pairs. The red-headed vulture is about 85 cm long, blackish in colour, with deep yellowish red naked head, neck and legs. The neck is flanked by 2 broad red folds of skin known as lappets. When airborne, the whitish band on the underside of the wings is prominent as are also the white patches on the upper thighs and the base of the neck. Males and females are similar, except for the eyes, which, in the male are white or yellowish, and dark in the female. Juveniles have dark eyes and more mottled dark brown plumage.

The red-headed vulture is also classified as critically endangered (CR) on the INCN red list and listed in Appendix 2 of CITES.

Red- headed vultures were also seen to increase in the months April to June. They have a smaller mean flock size of 1.5 (see Table 7)

and as they are mostly sighted near dense canopied forests, working solitarily or in a pair works better for them in securing a prey. On a couple of occasions at Kurichiat and Muthanga, a pair of red-headed vultures were seen feeding on a gaur carcasse with no other scavenger with them (Appendix).

Table 7: Species-wise frequency of vultures and Mean Flock size (June 2009 –May 2010)

Species	Frequency	June	July	August	Sep.	Oct.	Nov.	Dec	Jan.	Feb	March	April	May	Total	Mean flock size
White rumped vulture	Overall	221	-	-	-	-	33	77	22	5	6	12	1	6	7.5
	Location wise	20	1	--	-	1	3	1	6	-	9	2	3	7	
Red-headed vulture	Overall	21	-	-	-	-	-	-	1	8	8	14	1	6	1.5
	Location wise	-	-	-	-	-	-	-	-	-	2	-	2	4	

CHAPTER V

NESTING AND CARE OF THE YOUNG

Ten species of birds of prey including 3 nocturnal birds of prey have been found to be nesting in various parts of the District. All nesting incidences except two, those relating to the black eagle and Jerdon's baza were recorded within the district during the study period. The jerdon's baza was found successfully nesting in a coffee estate at Meppadi by Vishnudas (2007), an experienced birder from Wayanad.

The black eagle was found nesting on a tree at Manikkunnumala by Krishnan, a professional photographer from Thrikkaipetta (Table 8). All activities involved in breeding such as courtship, mating, nest building, egg laying, brooding over eggs, incubation, hatching, care of the young, cleaning the nest etc., however, were not studied as they were beyond the scope of this work.

Details of raptors' nesting documented during the study are described as follows.

1. Shikra, *Accipiter badius*

Three instances of shikra successfully nesting were recorded during the study period. The first one was at Ayamangalam of Muthanga range on 29 April 2009, on a vast vayal interspersed with secondary woodlands and surrounded by small hillocks densely overgrown with undergrowth and moist deciduous trees. The nest was located 22ft above ground on a *Terminalia tomentosa* tree adjacent to a waterhole dug by the forest department and nearby a perennial stream. The nest was placed on a junction between three branches and was made of twigs. The nest was of

1 ½ ft diameter, partially camouflaged by a thicket of *loranthus* growing at the junction of the branches. Inside the nest 3 chicks , almost a week old, were found. All chicks were white in colour with a tinge of gray over their back. The mother bird came first at 10-45 am to feed the chicks and came again at 3.10 pm to feed them again.

Table 8: Nesting details of Raptors and Owls (other than White-Rumped Vulture in the study area)

Sl. No.	Species	Date	Location	Host tree	Brood size
1	Shikra	29-4-2009	Ayamangalam	*Terminalia sp.*	3
2	Shikra	27-5-2009	Goundan vayal	*Syzygium sp.*	3
3	Shikra	28-3-2010	Pullumala	*Lagestomia sp.*	3
4	Bonelli's eagle	-2-2008	Muthanga	*Dalbergia sp.*	Not known
5	Bonelli's eagle	16-3-2010	Muthanga	*Eucalyptus*	1
6	Crested serpent eagle	24-4-2010	Edathukunnam	*Dalbergia sp.*	1
7	Black eagle*	-	Manikkunnumala	-	1
8	Jerdon's baza*	- -2007	Meppadi	*Hevea sp.*	3
9	Crested goshawk	29-4-2010	Anchukunnu	*Artocarpus sp.*	2
10	Crested goshawk	9-2-2009	Kaithakolly	*Eleocarpus sp.*	1
11	Crested goshawk	14-2-2009	Mananthavady	*Artocarpus sp.*	Not known
12	Brown fish owl	12-3-2009	Vengoor	*Terminalia sp.*	1
13	Spot-bellied eagle own	6-1-2010	Pukalamalam	*Dalbergia sp.*	1
14	Barn owl	12-1-2010	Mananthavady	*Unused hall of building*	4

**not seen during the present study.*

The second shikra nest was found on a njaval tree *Syzygium* at Goudanvayal near Ponkuzhi of Muthanga range on 27, May 2009. The nest was about 25 ft above ground on this medium sized tree in a degraded moist deciduous forest area adjacent to a marshy vayal and about 100 meters away from the highway. Three fledgling birds were already out of the nest and flitting about .the branches of nearby trees. Till 4 days ago, they were still in the nest, as 1 was informed by my field assistant. As falconiiform birds are severely altricial and nidicolous, they remain in their nest for a considerable period like 30-45 days, fed and looked after by the parent bird (Pettingill,1985). These were probably young birds having become partially independent of parental care, ie, brooding and feeding but still remaining dependent socially on the family group.

On our subsequent visit to the area, neither the young birds nor their parents could be located .

The third shikra nest was found on a medium sized tree, *Lagerstomia lanceolata* standing on a hillock, barely 15ft from ground and a short distance away from the Kurichiat range office at Pullumala on 28, March 2010. There were 3 chicks on the nest at the time of observation. Here, both the parents came near the vicinity of the nest but only one of the parents came near the nest to feed the chicks. It was almost a month when the chicks attained maturity before they flew off the nests.

Bonelli's Eagle ***Hieraaetus fasciatus***

Bonelli's eagle was found nesting at Muthanga on 2 different occasions. On February 2008, a bonell's eagle was found sitting on a nest in a medium sized *Dalbergia* tree, about 30 feet above ground at Patthekkar, a degraded forest area adjacent to the forest road going to Nallurvayal. It was still in the process of building the nest ,which at that time was about 3 ft in diameter. But shortly afterwards the process was aborted and the nest was abandoned by the bird probably because of the great biotic disturbance to the area. Scores of tourists passed by this area in jeeps and other vehicles leaving a trail of dust and loud noice.

The second nest was found a year later on 16,March 2010 at Thakarappadi Vayal, in Muthanga range. This time, the chick had already hatched and the mother bird spent time in an out of the nest. The nest was made of long twigs on the fork of an eucalyptus tree, some 35 feet above ground and was about 3 ½ ft in diameter (see plate 4). The young chick , covered with a whitish down, occasionally propped up it's head. Only one of the parents, the mother, cared for the young. It was seen feeding the chick at frequent intervals. As soon as it had regurgitated some food into the month of the chick it would be gone in about 5 minutes time, to return again after an interval of 15-20 minutes. The hunting success of the raptor must be prolific, it seemed. The mother did spend some time arranging the leaves and perhaps also cleaning the nest before flying away. As the chick advanced in growth, the mother's feeding was reduced to 10 times or less during the daytime. The exact time the bird took to attain maturity and flew off the nest could not be observed.

Crested serpent eagle *Spilornis cheela*

A single nest of a crested serpent eagle was discovered on the branch of a *Dalbergia latifolia* tree at Edathukunnu in Mananthavady taluk on 24, April 2010. The nest was located on the fork of the tree, about 35 ft above ground, and was somewhat a large structure made of twigs and lined with leaves. Though Ali (1969) mentions this species to be breeding between December and March, here it was found nesting in the month of April. On closer observation, it was seen that twigs of *Eucalyptus* as well as dry roots secured from ploughed fields were used in the making of the nest. Over the top, fresh green leaves of *Eucalyptus* and *Cinnamomum* were placed as a lining, As *Eucalyptus* and *Cinnamomum* leaves have a high oil content, and emit pungent odour, it needs to be investigated whether the leaves are provided for any therapeutic purpose.

A single chick about a week old was found. Visiting the nest a month later, the mother bird was found feeding the now almost grown up chick with a snake.

Black eagle *Ictinaetus malayensis*

Though no direct observation of nesting could be made, the species was found nesting in a lofty tree at Manikunnumala by *Krishnan*, professional photographer based at Thrikkaipetta. He found a single chick in the nest (Ajayan, Pers commu).

The possibility of black eagles breeding elsewhere, for instance, Ambukuthimala could not be ruled out as this investigator witnessed the courting behaviour of two eagles in the vicinity of Ambukuthimala and saw them subsequently heading towards a cleft in the mountain on 29,

December 2008. Black eagles are among the most prolifically seen raptor in the district (Table) and would most likely be breeding plentifully on tall trees of the evergreen canopies. Locating them during the study period turned out to be a futile task.

Jerdon's baza ***Aviceda jerdoni***

Though Jerdon's baza was observed on 10 different occasions, particularly in Muthanga and elsewhere, it could not be seen breeding. However, *Vishnudas (*2008) had observed a pair breeding on a rubber tree adjacent to a tea estate at Meppadi in 2007 and again in 2008. The incubation period extended for about 30 – 40 days. Though the clutch size in 2008 was three ,only 2 chicks attained maturity.

Crested goshawk ***Accipiter trivirgatus***

The goshawk nest was found on an *Artocarpus* tree, about 30ft above the ground in a coffee estate at Anchukunnu, Mananthavady taluk. It's nest was small, about a feet and half in diameter and made of twigs and sticks and lined with a few leaves. At the time of observation 2 chicks, a few days old, were in the nest. Only one of the parents cared for the young (see plate 4).

Another nest was located on a semi-evergreen forest patch at Kaithakkolly on 9-2-2009. The nest was built about 45 ft above ground on an *Eleocarpus* tree. While the female was brooding over the clutch, the male bird was always in the vicinity. No further details of the nesting could be known.

In 2009, a single nest of the bird was found in an agricultural garden on an *Artocarpus* tree, about 40 ft from ground. The mother bird was seen brooding on the nest for 36 days. The nest was lined with the leaves of *Loranthus*, *Dalbergia* and *Albizzia*. Only a single egg was found. Though the mother bird brooded over the egg for 36 days, it did not hatch and ultimately the nest was abandoned.

Residents of the area have observed goshawks to nest in the same area regularly over several years.

Brown fish owl *Ketupa zeylonensis*

A brown fish owl was observed successfully breeding in the area. At Pattampara vayal, an open marsh surrounded on one side by degraded moist deciduous forests and on the other side by bamboo brakes and moist deciduous forests and flanked on the western side by *Noolpuzha* river, a hole nest was located on a dead tree concealed by bamboos. Inside the nest hole was an almost fully grown brown fish owl chick (see plate 4). The parent birds were always in the vicinity perched up on nearby tall trees. They were so observant that when we were watching over the nest, parent birds did not come anywhere near. However, the distal portion of a fresh water eel was seen lying over outside from the brink of the nest, obviously presented to the young chick by its parents. The presence of 2 grown up birds in the vicinity indicated that both parents partook in the feeding of the young one. After about a month of observation the nest was found empty, indicating that the young chick had flown off.

Another brown fish owl was observed in a large hole of an old dead tree jutting out of the water in *Noolpuzha* river surrounded by water. It could not, however, be ascertained whether the bird was breeding or simply holed up inside.

Spot bellied eagle owl ***Bubo nipalensis***

A spot bellied eagle owl was found nesting inside a large hole in a *Dalbergia latifolia* tree, approximately 25ft above ground. The tree was at *Pukalamalam* near the Kurichiat tribal colony. The whole area was subjected to heavy disturbance by fire wood collectors and cattle graziers. On examination of the hole, a single egg was found. The bird was found brooding over the egg on 7 January 2010 and subsequently on 7 other occasions (see plate 4). The bird was last seen on 29 January 2010. On the subsequent visit it was found that the egg had withered over and the bird was not found anywhere else. The heavy biotic disturbances in the area could have prompted the large owl to move out from the nest.

Barn owl ***Tyto alba***

In the year 2010, in a disused hall in the Mary Matha College of Mananthavady a barn owl nested on the bare floor using merely straw and grass and produced a clutch of 4 eggs. The college authorities destroyed the eggs.

White – rumped vulture ***Gyps bengalensis***

There are only three established locations inWayanad where the white – rumped vultures have been observed to nest year after year. They

are *Doddadi* in Tholpetty range, *Kazhukankolly* of Kurichiat range and *Kaithalam* in Bathery range , well within the protected area limits.

The nest of the white – rumped vulture is a structure made of twigs and sticks mostly placed over the horizontal fork of a branch. It is about 2 ft in diameter and often set high, between 45ft to 60 ft above ground. At Kuzhukankolly, an attempt was made to monitor the nests. While most of the egg laying happened in November, hatching of the egg was in mid – December. It took nearly 45 days before the chick was able to fly about. A single nest was monitored for 21 days stretching over a 55 days period, when on an average, 3 ½ hours were spent near a nest. One day it could be noted that the female that brooded over the egg was fed by the male bird. At other times, the male bird was seen perched on a branch at a distance away. It appeared to be exceedingly sensitive to human approach and tended to fly away when a man was nearby. But the female bird was at times seen feeding the chick despite human presence in the area. There was no regularity in feeding and the feeding intervals were far and wide. The chick, even when fully grown and able to fly about, still chose to keep inside the nest while resting.

A majority of the nests were made about 35 to 40ft above ground on *Stereospermum suaveolens, Adina cordifolia* and *Anogeissus latifolia* trees (Table 9). In addition to live nests, several other nests, perhaps used in the previous years, were found concentrated at one location at *Kaithalam.* There is a possibility that certain nests were used repeatedly year after year if the brood was successful. While it was seen that there is a significant increase in the member of brood from 2009-2010 to 2010-

2011 at *Kaithalam* and *Kazhukankolly,* it was seen to come down from two to one at *Doddadi* from 2009-2010 to 2010-2011.

Table 9: Nesting details of white- rumped vulture for the two seasons 2009-2010 and 2010-2011

Location	Year	No. of nests	Host tree	Height above ground
Kazhukankolly (Kurichiat range)	2009-2010	3	*Stereospermum sp* *Dalbersia latifolia* *Anogeissus latifolia*	30ft 45ft 30ft
	2010-11	7	*Terminalia tomentosa* *Adina cordifolia* *Stereospermum suaveolens* *Dalbergia latifolia* *Dalbergia latifolia* *Anogeissus latifolia* *Tectona grandis*	40ft 35ft 30ft 45ft 44ft 30ft 25ft
Kaithalam (Bathery range)	2009-10	2	*Adina cordifolia* *Stereospermum sp.*	30ft 35ft
	2010-11	3	*Terminalia tomentosa* *Stereospermum sp.* *Adina cordifolia*	40ft 35ft 30ft
Doddadi (Tholpetty range)	2009-10	2	*Stereospermum sp.* *Adina cordifolia*	45ft
	2010-11	1	*Stereospermum sp.*	45ft

CHAPTER VI

FOOD AND FEEDING HABITS OF RAPTORS

As the very term ‘raptor’ indicates, the bird’s modus operandi is to seize and carry away its prey using the sharp and powerful talons and tear open the flesh using its sharp beaks. Different raptor species, however, employ diverse strategies to hunt. While several species prefer to spend more time perching on tree branches and sometimes glide through forest canopies, others soar in the skies effortlessly riding the thermals. Like all the predators they are capable of dispatching prey well in excess of their own body weight (Naoroji, 2006).

Though several of the species exhibit specialization in their hunting techniques, most are opportunistic and when soaring, scours the surface for possible prey species. Prey ranged from tiny grasshoppers and insects to medium sized mammals like giant squirrel and hanuman langur.

Studying the feeding habits of raptors is exceedingly difficult as they are far ranging birds with a predilection for opportunistic hunting. However, small raptors like shikra could be observed near their nests to look out and hunt small prey in greater frequencies to be able to satiate their hungry chicks. Secondary information from reliable sources were useful in ascertaining the range and variety of the prey species involved.

Most of **shikra’s** feeding was obtained in the vicinity of its nest. As it had to bring back suitable grub to feed the three rapacious chicks in as short a time, the mother shikra pounced on a variety of animals such as flying lizard, grasshopper, frog, teak defoliater larvae etc. At other times, shikras were seen to hunt red-whiskered bulbul, spotted dove and even domestic chicken. Shikras often killed on the ground pinning the victims

using their talons and immediately despatching off smaller animals right there on the occasion.

Two **black bazas** were observed near the border road making sorties in the air to catch insects and other grub just as flycatchers and drongos do. The **Jerdon's baza** was once observed feeding on a giant squirrel while perched on a tree branch.

Honey buzzards have been known to feed on large honey combs in the area. Twice it was observed to sneak its head into the bee-hive inside a tree hole to feed on the honey there. The raptor positioned momentarily in front of the nest hole by the heavy flapping of its wings, consumed the honey inside, and immediately went back to a nearby perch.

The **goshawk** that nested near Anchukunnu was seen feeding on garden lizard, domestic chicken as well as rats. About the time it was nesting at Anchukunnu, which was in the neighbourhood of human habitation, so many chicken corpses devoid of their heads were seen strewn around , as informed by Ajayan. Perhaps they have a selective preference for bird heads!

At Brahmagiri once, Sujin observed a **Shaheen falcon** stooping on a fruit bat and hitting it with its talons, the bat somehow fell off its feet, only to be retrieved back in mid-air by the intrepid raptor! On another occasion at the same location, a swift, most likely an edible nest swiftlet, was also caught by the shaheen falcon, as observed by Sujin.

Quite befitting its name, the **crested serpent eagle** was many times observed by a score of people, including forest watchers, flying with a snake dangling down its claws. While caring for its young in the nest,

another crested serpent eagle was observed feeding the chick with a snake! Chandran, my field assistant saw a crested serpent eagle perched on the branch of a tree and eating a freshly killed giant squirrel.

The **black eagle** could easily be one of the largest eagles in the area and once it was seen at Kurichiat, by Dr. Arun Zachariah, flying with the young one of a hanuman langur in its claws! On another occasion, chandran had seen a black eagle feeding on a giant squirrel.

Vultures are opportunistic feeders and fly over great distances, often riding the thermals high up in the sky, constantly scouring the ground for any animal carcasses. Old world vultures find carcasses exclusively by sight (Kurup 2010). Of the two species of vultures, the **white- rumped vultures** are gregarious and have been observed to flock around a carcasse in large numbers. They mostly fed on dead chital, sambar and gaur, as observed during the study. While feeding they squeal and squeak and emit cacophonous sounds in a feeding frenzy. Often one or two individuals of the **red- headed vulture** also might join in the feeding. Once finished and gorged up as they are, they tend to remain still around the remains of the carcasse with their wings spread wide. When disturbed by humans or other animals they run for a short take off with heavy flapping wingbeats and soon alight on a branch nearby. At Muthanga, a frequent haunt for the white- rumped vulture is Kakkappadam vayal, where dead animals either killed by feral dogs or hit by motor vehicles would be deposited after conducting due post-mortem by the Forest Department.

In Wayanad district, white-rumped vultures were more frequently seen near the drier areas towards the east, whereas the red- headed

vultures have a predilection to move towards west. This appears to go well commensurate with their specialized adaptations and behavioural traits. While white-rumped vultures are gregarious with greater flock sizes it suits them to soar over large open expanses. The forests towards the east are more of stunted moist deciduous or dry deciduous forests interspersed with vayals and degraded plantations. Spotting the cadaver of an animal in such a habitat would be easier for them than while in a closed forest as in parts of Kurichiat. The red-headed vultures, on the other hand, move about mostly in one's or two's with a mean flock size of 1.5 (Table 7). They are often sighted in the closer canopied forests and on many an occasion, red- headed vultures have been observed to negotiate carcasses of gaur solely in the company of crows with not any other vulture species around.

Table 10: showing incidences of predation by raptors during the study period.

Sl.No	Species	Prey species	Location	Observer
1	Shikra	Flying lizard	Pullumala	Chandran
2	Shikra	Grasshopper, frog	Ayamangalam	DKNK
3	Shikra	Teak defoliator larvae	Ayamangalam	DKNK
4	Shikra	Red whiskered bulbul	80 plantation	Chandran
5	Shikra	Domestic chicken	Anchukunnu	Ajayan
6	Shikra	Spotted dove	Panavally	DKNK
7	Crested serpent eagle	Snake	Edathukunnu	Anoop
8	Crested serpent eagle	Giant squired	Vengoor	Chandran
9	Black eagle	Hanuman langur	Kurichiat	Dr. Arun Zachariah
10	Black eagle	Giant squirrel	Chethalayam	Chandran
11	Crested goshawk	Blue rock pigeon	Mananthavady	Ajayan
12	Crested goshawk	Garden lizard	Valliyoorkkavu	Ajayan
13	Crested goshawk	Domestic chicken	Anchukunnu	Ajayan
14	Crested goshawk	Rat	Anchukunnu	Ajayan
15	Honey buzzard	Honey comb	Pukalamalam	Chandran
16	Black baza	Insects	Border road	DKNK
17	Jerdon’s baza	Giant squirrel	Doddappalam	Chandran
18	Barn owl	Rat, bandicoot rat	Manathavady	Ajayan
19	Brown fish owl	Fish (eel)	Muthanga	DKNK
20	Shaheen falcon	Fruit bat	Brahmagiri	Sujin
21	Shaheen falcon	Swift	Brahmagiri	Sujin
22	White- rumped vulture	Spotted deer, sambar, Gaur	Muthanga	DKNK
23	White- rumped vulture	Gaur	Mudumala road	DKNK
24	Red -headed vulture	Gaur	Ponkuzhi	DKNK

DKNK-Deepakumar Narayanakurup

No direct sighting of **brown fish owl** feeding could be observed though the distal end of an eel was found dangling out of the nest hole where the young one was holed up. Obviously the mother bird would have caught that from the nearby stream to feed the chick. Most of the times the brown fish owl were observed, they were in the vicinity of a water body like a stream.

Among the other owls, barn owls have been found to be among the most prolific in feeding. When it was found nesting on a disused hall in the city, it could often be spied pouncing and catching rats in succession to feed the large brood it was raising.

CHAPTER VII

TRADE INVOLVED IN RAPTORS AND OWLS

Illegal trade in wildlife has for years been a multi-million dollar industry worldwide. Among birds, raptors have always evinced a special interest. Falcons of different species were the most prized, and used in falconry as practised in several countries particularly in the middle east and Europe. Of late, owls have also become much sought after ostensibly for their alleged importance as talisman.

For the past few years trafficking in owls and raptors has become a big scourge in Kerala particularly Wayanad as well. The number of cases booked relating to such offences during the past couple of years are given in Table 1 where unspecified owls and raptors were the seized birds. Barn owls formed the majority in the cases involved, obviously because they are relatively easily acquirable. Barn owls breed mostly in unused spaces of buildings in the inhabited neighbourhoods. They are usually caught while they raised a brood, along with their nestlings. Other large owls are harder to get as they are extremely rare and found mostly in forest areas.

If could be seen that 21 birds were seized in 7 cases under the Wildlife (Protection) Act where the total accused were 44 persons. The above offences are only the tip of the iceberg while a vast majority of such incidents go undetected.

Barn owls are prolific breeders and often produce a brood of 5 to 6 chicks. Barn owls were observed bringing in rats and mice in such large numbers at small intervals to satiate the hungry chicks. Obviously the economic importance of the species is enormous considering the control it exerts on the bourgeoning rodent population.

Trafficking in such animals would clearly make a dent in the natural biological control on rodents inimical to agriculture. Other unspecified raptors could be extremely rare birds, either threatened, or listed in the high priority schedules of Wildlife (Protection) Act. There are clear indications that these offences are related to a supply –demand based activity practised by a wider network of organized wildlife trade.

Table 11: Cases Relating to raptors and Owls booked during 2009 and 2010 in Wayanad

Forest Division	Sl. No.	O.R.No.	Species Involved	No. of Species	Area of seizure	No. of Accused
South Wayanad , Kalpetta	1 2 3	34/09 5/09 26/08	Barn owl Barn owl Barn owl	7 1 6	Meppadi Meppadi Meppadi	6 3 3
North Wayanad, Manathavady	4 5	2/09 8/09	Unspecified owl Barn owl	2 1	Begur Moozhithod	7 22
Wildlife Division, S.Bathery	6 7	10/09 11/09	Unspecified eagle Owls	2 2	S.Bathery S.Bathery	2 1

CHAPTER VIII

SUMMARY AND RECOMMENDATIONS

With 30 species of raptors including a few breeding in the area, Wayanad has a significant diversity of raptors in addition to the presence of a few nocturnal birds of prey. Located at the southern end of Deccan plateau, with a connection to the eastern ghats, Wayanad is part of an unique bio-geographical territory encompassing a number of wildlife protected areas. That the white-rumped vulture, a critically endangered species, is regularly observed here and also found breeding successively every year in pre-designated locations points to the importance of Wayanad as an important raptor area. The red-headed vulture, also a red listed species by the CITES, though not breeding here, is found regularly in most habitat types.

The Grey- Headed Fishing Eagle and the Pallid Harrier, near threatened species by IUCN criteria are also found regularly in Wayanad.

Wayanad also supports such important raptor genera of *Aviceda* (jerdons baza and black baza) and species such as white- bellied sea eagle, shaheen falcon, osprey and hawks belonging to the family *Accipitridae*, all listed under schedule 1 of the Wildlife (protection) Act, 1972.

Wayanad being a mosaic of different habitat types provides a staging ground for a variety for raptors, both resident and migratory. The migrant raptors start arriving by November and depart by March and April.

February and March are the months that experience periodic summer drought and occasional forest fires, particularly in the neighbouring protected areas of Karnataka and Tamil Nadu abutting Wayanad. This triggers a mass local exodus of herbivorous animals in search of fodder and water which brings them into Wayanad. Consequently, population of

predators also do increase during this period. A distinct trend of increase in the raptor population is observed around this period. The rigours involved in migration and increased feeding pressure will naturally have a toll on wild life, and animal deaths also do increase around this time. This would explain the steep increase of vulture species from April to June.

Majority of the breeding raptors also appeared to choose this time of the year to nest and bring up their offspring when food is plentiful. The Bonelli's eagle, the shikra, the crested goshawk, the crested serpent eagle etc. bred during these months.

High altitude shola-grassland habitats such as Brahamagiri, Banasuranmala, Chembra and Lakkidi Ghats appeared to support a good population of resident raptors particularly Shaheen falcon, black eagle, crested serpent eagle and migrant forms such as pallid harrier and booted eagle. Panamaram marsh and Padinjarethara reservoir registered high species diversity and raptor abundance seemingly on account of the ecotone effect of divergent ecosystems coming together. There appeared an overall increase in the incidence of breeding with respect to white-rumped vultures from 2009 to 2010.

There appears to exist organized trade involving birds of prey, particularly owls, in Wayanad as evidenced by a number of related offences registered during the last few years.

The Brown fish owl, the spot bellied eagle owl and the barn owl were observed to breed in Wayanad.

Recommendations

Pesticide Policy

With the kind of growth happening in the agricultural sector in Wayanad, consumption of fungicides and pesticides also has reached alarming proportions. There is large scale use of organochlorine pestcides such as Dieldrin, Malathion, Furadon etc. especially for the cultivation of crops such as banana, ginger and cardamom. Land crabs have already long since disappeared from the cultivated fields. It is primarily the diurnal and nocturnal birds of prey that keep a check on small mammals such as hare, rats and other rodents. A secondary consumer such as the raptor preying on a species that has consumed agricultural produce laced with pesticide residues are either doomed to die or become scarce due to decreased breeding success. Numerous studies have implicated heptachlor and dieldrin in the deaths of a variety of raptors, and controlled feeding studies have shown that many organochlorines and PCBs are toxic to raptors (Naoroji, 2006). Seepage of fertilizers and pesticides into water bodies endangers water dependant species such as osprey, grey-headed fishing eagle, white-bellied sea eagle etc. Raptors' eggs are known to become highly porous and brittle on account of bio- accumulation of pesticide residues. The Government has to have a clear policy on the use of pesticides so that pesticide use could be controlled and monitored. Safe agricultural practices are to be encouraged and popularized.

Contiguity of inviolate forest tracts.

Though raptors are observed in all kinds of habitats, many species clearly preferred inviolate forest tracts for their free ranging and breeding. Breeding raptors appeared to have considerable site fidelity so that the majority keep coming to the same location to breed year after year if breeding success is ensured. The critically endangered white- rumped vultures have been seen to breed only at three specific remote locations free from biotic disturbance of any kind.

Conservation of montane grasslands.

High altitude shola-grassland areas such as Banasuranmala, Chembra and Brahamagiri showed considerable raptor diversity and abundance. Many of these areas also experience periodic summer fires. This clearly would bring about a reduction in the biomass and take severe toll on the food chain of life. Old trees that serve as raptor perches or provide a platform for nests would perish thereby affecting all forms of wildlife especially raptors. Therefore, fire management around such areas has to be strengthened.

Control on Tourism

At Muthanga, a nesting Bonelli's eagle on a rose wood tree adjoining a forest path was observed suddenly deserted. Only the uncontrolled tourism along the path would have caused this. Tourism in many areas especially Muthanga is not properly controlled or managed and the fall out of the same would have far reaching consequences on wildlife.

Models of responsible tourism practised elsewhere may be replicated in Wayanad as well.

Hunting and trade.

It has been observed that, of late, Wayanad also has become a hub for trafficking in wildlife especially owls and raptors as evidenced by the spurt of offences booked by the Forest Deparment in recent times. Obviously this scourge, unless dealt with severely, can lead to local extermination of several species like the barn owl. The Forest department has to work closely with the Wildlife Crime Control Bureau to bust the racket.

Research and Monitoring

Raptors are predators occupying the top rung of the food chain and are therefore indicator species on the state of health of the environment. Just as scavenging species such as the vulture congregates where there is a dead animal or black kites and Brahminy kites abound in areas where there is left over of fish or meat, raptors flourish where there is enough prey available. Base level data on the raptors and their habitats is still inadequate. The exercise to study them in Wayanad during an 18 month period was only akin to touching the tip of the iceberg. Long term research and monitoring of raptors and their habitats, their feeding ecology, nesting, care of the young, migration patterns, raptor mortality and limiting factors is to be attempted for meeting our conservation objectives.

Conservation education

There is still inadequate awareness on the part of the general public on the importance of conservation, on the need to conserve our plants and animals. Raptors and owls are also integral part of our natural landscape, and being top predators, occupy higher rungs of the food chain and keep a check on the population of rodents and other animals that are inimical to agriculture. Similarly, vultures as scavengers perform an important function of keeping our environment clean of rotting corpses , thereby ridding us of pests and pestilence. Awareness programs highlighting these issues among students and the public as well as among fringe area people must be conduced as a periodical, regular programme around protected areas and other eco-sensitive areas.

Conservation Strategy for vultures

Immediate measures must be taken up for careful conservation of these species in not only the existing habitats like Wayanad wildlife sanctuary but also for replenishing stock in erstwhile habitats like Periyar and Parambikulam. In addition to policy level changes in the wildlife management strategies as practised in Kerala today, a multi-pronged approach at addressing the issue through awareness, legislation, research and monitoring should be attempted.

Action Plan and Scheme for Conservation of Raptors

1. ***New policies to be promulgated***

   At present, during instances of mortality of large herbivores like elephant and gaur, as soon as detected, the carcasses are subjected to

post-mortem and subsequently exhumed. This exercise clearly reduces the availability of food for scavenging species like the vulture. The wildlife authorities have to stipulate policies to facilitate providing such dead carcasses at the disposal of scavenging species like vulture, jackal etc. As soon as a mortality is detected, immediate post-mortem and histo-pathological examination for the detection of disease antigens might be conducted so that confirmed natural deaths of large animals will provide a large food source available to vulture. In this respect, similar practices followed elsewhere, for example at Bandipur, may be emulated here as well.

2. Examination of vulture Carcasses

Vulture mortalities in their present ranges like Wayanad may be bestowed immediate special attention and carcasses may be collected and immediately sent to the Vulture Conservation and Breeding Centre (VCBC) at Pinjore, Haryana for toxicological examination of the tissue and entrails. This might throw further light on other causes related to vulture mortality.

3. Diclofenae monitoring

Diclofenac, one of the established causes for the decline of vulture populations is presently banned by the Animal Husbandry Department and another drug Meloxicam substituted in its place. Diclofenac is an anti-inflamatory drug still being prescribed for human use. Since instances of diclofenac misuse have been reported from Karnataka and Tamil Nadu, a random monitoring of diclofenac at druggists may be done to avert possible misuse. There is a vulture conservation and breeding centre run by the Haryana Forest Department and the

Bombay Natural History Society at Pinjore, Haryana. The possibility of securing a few breeding pairs of the white rumped vulture *Gyps bengalensis* for restocking the wild at Periyar tiger reserve may be considered.

4. Survey

A State wide survey may be done to ascertain the status of different species of vulture. Aerial counts, Roost counts, nest counts etc may be done.

5. Research

A vulture research station may be established in Wayanad for long-term study and monitoring of the only remaining population of the critically endangered species of white-rumped vulture in the state. The station should be equipped with vehicles, GPS, spotting scope, binoculars, camera etc and could address issues like night roost, nest building, pairing, incubation, hatchlings, care of young, feeding habits, feeding success, prey availability, home range, intra-specific and inter-specific relationships, congregation behaviour, threat factors etc.

Proposed Scheme for the Conservation of Vultures and other Raptors in Wayanad

A scheme for conservation of vultures and other raptors in Wayanad Wildlife sanctuary can be drawn out incorporating the above mentioned points. As a first step, a three year scheme can be prepared with focus on research and monitoring. A ***Raptor Research and Monitoring Cell*** may be attached to the Veterinary Research Laboratory already functioning at Sulthan Bathery. A consultancy with the required

expertise may be appointed to carry out the work in association with the Senior Veterinary Officer.

Financial Forecast for Vulture Conservation Scheme (Rs. in Lakhs)

Activity	1st Year	2nd Year	3rd Year	Total
Wage of consultants Prl. investigator Co. Investigator Field assistants	3.5	3.5	3.5	10.5
Acquiring equipments Camera, spotting scope, binoculars, GPS, etc.	2.5	-	-	2.5
Maintenance of a vehicle	8	3	3	14
Awareness programmes	1	1	1	3
Office expenditure	1	1	1	3
Contingencies	1	0.5	0.5	2
Total	17	9	9	35

Awareness Programs for Raptor Conservation

A state wide awareness programme on vulture conservation may be launched coinciding preferably with the wildlife week celebrations. As Dr. Salim Ali has rightly described the vultures, in his book of 'Indian Birds', as "God's own incinerators that cannot be replaced by even the most sophisticated ones which man may invent", we have every reason to protect these winged marvels that save our earth from rotting animal matter thus freeing us from pestilence and diseases. Though they might look ungainly in sitting posture, vultures are among the most graceful in flight, riding the thermals effortlessly, and looking spectacular while circling the skies. Children must be educated on the need to keep their environment clean, devoid of accumulated wastes. Modern waste management technologies must be adopted and instituted by urban/village authorities and care must be taken that our water sources like ponds, rivers and backwaters are not polluted. Safe agricultural practices may be

encouraged with less dependence on pesticides, fungicides and organic manure. Toxicological examination of dead cattle and carcasses of wildlife may be done to ascertain the presence of residues of heavy metals and other poisonous substances.

Vultures play very important role in safeguarding our environment and are probably a classical example of nature's best natural resource recycling machinery. They have cultural, environmental and aesthetic values. If they were to suddenly decline from their erstwhile habitats, there must surely be something seriously wrong with the environment that we share with them. It is therefore up to us humans to address the issue more seriously as it is one of the biggest challenges facing the conservation community in modern times.

Awareness Programs being Conducted in Wayanad

Conservation education in the form of nature camps are regularly conducted in four areas in Wayanad, Muthanga, Bathery, Tholpetty and Kurichiat within the Wayanad Wildlife Division, targeting a wide section of the public such as students, members of non-governmental organizations, tribes and other fringe area people. Among subjects such as conservation of tropical forests and biodiversity, water and soil conservation, wildlife management and similar issues, conservation of raptors also is invariably discussed as Wayanad is the only area in Kerala which still has a sizeable population of vultures including the white-rumped vulture that actually breeds here. Apart from issues such as the wide spread use of *Diclofenac* that led to mass mortality of vultures elsewhere, other issues such as excessive use of organochlorine pesticides that contributes to bio-accumulation of toxic materials in raptors' bodies

leading to their decreased breeding success and increased mortality are also discussed. During field trips conducted as part of nature camps, participants are usually taken along for bird watching where raptors are specially highlighted for their role in the food chain and also as an indicator species.

Specific programs on vulture conservation were conducted in Wayanad by *Ferns*, a non-governmental organization, in association with the Kerala Forest Department where talks and PowerPoint presentations on the various issues on vulture conservation were done.

Localities that require special management interest

As it is clearly established that the white-rumped vulture breeds only at pre-designated locations such as Doddadi in Tholpetty, Kazhukankolly in Kurichiat and Kaithalam in Bathery ranges, these areas need special attention. Though well within the wildlife sanctuary, the latter two areas occasionally witness the intrusion of tribes from the nearby settlements for grazing and for collection of firewood and other forest produce. Though Doddadi is relatively safer, all these areas stand the risk of occasional forest fires in summer. Vultures, wherever they were observed perched up, appeared extremely vary of human presence. When these areas are taken up for surveillance, extreme care must be taken not to disturb the habitat.

Panamaram marsh and Padinjarethara reservoir, that have shown greater raptor diversities are heavily disturbed areas. At Panamaram, agriculture is practised rather intensely with heavy fertilizer-pesticide input. Possibility of pesticide residues getting into the bodies of the

raptors is high and therefore these areas also need careful and continuous surveillance and attention.

High altitude shola-grassland areas such as Brahmagiri, Banasuranmala, Chembra and Lakkidi support good populations of resident raptors like the shahin falcon, black eagle, crested serpent eagle and migrant species like the pallid harrier and booted eagle. The single bigges threat to these areas is forest fires in summer. Since a few of the raptors like shahin falcon and black eagle use these areas for breeding purposes, conservation and monitoring of these areas also appear relevant.

Pathekkar and Thakarappadi vayal of Muthanga range have witnessed regular, periodic breeding activity of Bonelli's eagle. Unfortunately, these areas are heavily disturbed and instances of this species deserting their nest have been witnessed. Nesting has been seen to be largely sight-specific and whenever instances of nesting are detected in the future, these areas may be judiciously guarded from the fall out from tourism and such other biotic disturbances.

Table 12: SYSTEMATIC LIST OF AND STATUS OF RAPTORS AND NOCTURNAL BIRDS OF PREY SEEN IN WAYANAD DURING THE STUDY PERIOD

Sl No	Common name	Scientific name	Status
1	Osprey	*Pandion haliaetus*	M
2	Jerdon's baza	*Aviceda jerdoni*	R
3	Black baza	*Aviceda leuphotes*	R
4	Black shouldered kite	*Elanus caeruleus*	R
5	Black kite	*Milvus migrans*	R
6	Brahminy kite	*Haliaestur Indus*	R
7	White bellied sea eagle	*Haliaetus leucogaster*	R
8	Grey- headed fishing eagle	*Ichthyophaga ichthyaetus*	R
9	White- rumped vulture	*Gyps bengalensis*	R
10	Red -headed vulture	*Sarcogyps calvus*	R
11	Short- toed snake eagle	*Circaetus gallicus*	R
12	Crested serpent eagle	*Spilornis cheela*	R
13	Black eagle	*Ictinaetus malayensis*	R
14	Eurasian marsh harrier	*Circus aeruginosus*	M
15	Pallid harrier	*Circus macrourus*	M
16	Crested goshawk	*Accipiter trivirgatus*	R
17	Shikra	*Accipiter badius*	R
18	Besra	*Accipiter virgatus*	R
19	Eurasian sparrow hawk	*Accipiter nisus*	M
20	Oriental honey buzzard	*Pernis ptilorhyncus*	R
21	White – eyed buzzard	*Butastur teesa*	R
22	Common buzzard	*Buteo buteo*	M
23	Bonelli's eagle	*Hieraaetus fasciatus*	R
24	Booted eagle	*Hieraeetus pennatus*	M
25	Rufous bellied eagle	*Hieraeetus kienerii*	R
26	Changeable hawk- eagle	*Spizaetus cirrhatus*	R
27	Mountain hawk- eagle	*Spizatus nipalensis*	R
28	Common kestrel	*Falco tinnunculus*	R
29	Merlin	*Falco columbarius*	M
30	Shaheen falcon	*Falco periginus peregrinator*	R
31	Barn owl	*Tyto alba*	R
32	Oriental scops owl	*Otus sunia*	R
33	Collared scops owl	*Otus bakkamoena*	R
34	Spot bellied eagle owl	*Bubo nipalensis*	R
35	Brown fish owl	*Ketupa ceylonensis*	R
36	Jungle owlet	*Glaucidium radiatum*	R
37	Brown hawk owl	*Ninox scu*	R

Status M = Migrant; R = Resident

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Fig. 1: Map showing Wayanad District