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behaviour in Corbett National Park**

by

GIRISH KUMAR AND B. S. LAMBA

**Issued by the Director
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**RECORDS
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GIRISH KUMAR

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B. S. LAMBA

*Zoological Survey of India,
Dehradun, U. P., India*



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INTRODUCTION

In the Indian subcontinent approximately 350 subspecies of birds have been observed to arrive in autumn and leave in spring. These are mainly Palaearctic forms and have to fly over the Himalayas. Our knowledge of the bird migration in the world including that of Indian subcontinent is based on careful records of arrival and departure kept by the early worker of these species in various parts of the world. With the advent of bird ringing studies it was possible to work out the destinations as well as the routes taken by the various species of migratory birds. In present times the global bird ringing studies, involve many countries, thousand of ornithologists, and million of birds. In fact more than 1,000,000 birds are ringed annually over 600,000 in the United States and Canada alone' (Dorst, 1962 : ix).

Our knowledge of the bird migration in the Indian subcontinent is based on very scanty and fragmented records of observations made by naturalists, bird watchers and ornithologists since the later half of nineteenth century. Beavan (1865) was, perhaps, the first ornithologist in India to publish notes on bird migration. He was followed by other workers like, Hume (1872), Lagge (1873), Adam (1873, 1874), Ball (1875, 1877), Fairbank (1876), Butler (1879), and Scully (1879). All these workers gave status and dates of arrival and departure of some winter visitors and altitudinal migrants.

But it was only in early 20th century that the bird migration studies appear to have really caught the imagination of the intelligentsia. Contribution on migratory birds in the Indian subcontinent were made by Whitehead (1906, 1911), Whistler (1911), Currie (1918), Ali, H. (1938), Abdulali (1947, 1965, 1970, 1971, 1973, 1976), Wolf Murray (1944), Gibson-Hill (1948), Simmons (1948), Phillips (1948, 1955), Donald (1952), Norris (1952), Alexander (1952), Neelkantan (1953, 1969), Betts (1954), Taylor (1954), Shivraj Kumar, Y. S. (1954, 1961), Krishnan (1955), Akhtar (1955), Lavkumar (1956, 1958), Dawson (1958), Sanjeeva Raj (1958, 1960, 1961), Himmatsinghji (1960, 1968), Shivraj Kumar, Y. (1961, 1962, 1969), Proud (1961), Dharmakumarsinhji (1961), Ripley (1962), George, J. (1962), Ali, S. (1962), George, P. V. (1964), Grubh, B. R. (1968), Holmes (1968), Navarro (1968), Neavoll (1968), Roberts (1969), Ali, R. (1970), Somane (1971), Saha and et al (1971), Khachar, S. (1971), Mathew (1971), Ghoropade (1973), Grubh, R. B. (1973), George, J. C. (1974), Thomson (1974), Gaston (1978), Khacher, L. (1978), Ram (1978), Kannan (1979), Majumdar (1979), Price (1979),

Khan (1980), Krishna Raju (1980), to mention a few, who wrote short notes on the occurrence of migratory birds in the Indian Subcontinent.

Bird banding as an aid to the bird migration studies was introduced in India by the Bombay Natural History Society in early forties in collaboration with erstwhile princely states. Later B. Biswas of Zoological Survey of India, World Health Organization and Smithsonian Institution of U. S. A. joined hands with Dr. Salim Ali (1962, 1964). Salim Ali and his team made efforts to study bird migration with the help of bird ringing in various parts of India. From 1959 to 1969 within ten years 1,32,368 migratory and resident birds of 25 families which includes 150 species were ringed by Bombay Natural History Society in different parts of India. Up to 1969 only 520 (0.39%) of these birds were recovered. Out of these 520 birds belonging to approximately 24 species, 451 birds were recovered from outside India e. g. Burma, East and West Pakistan, Afghanistan, U. S. S. R. and Cyprus. Only 69 birds belonging to 15 species were recovered from different parts of India (Mathew 1971 : 65). A number of birds have been recovered in India bearing the bands of the bird ringing Centres of Germany, Hungary, and U. S. S. R. These recoveries threw considerable light on the place of origin and routes taken by some other migratory species of birds that visit India annually.

In addition to intercontinental migrants there are innumerable species of Indian birds which indulge in intracontinental migration of some sort or the other. These migrants show a lot of diversity in their movement. Broadly speaking all the migratory birds can be categorised as under :

(A) *Winter migrants*

The intercontinental migrants visit the Indian subcontinent in winters. These birds have to leave their breeding grounds on account of very severe winters, when food and shelter becomes extremely scarce in their own area. They move to warmer places like our subcontinent to tide over this unfavourable period. Such migrants often cover thousands of miles during their migration. Usually they stay for about six to eight months at the feeding grounds leaving in early spring e. g. ducks, harriers, pochards, gulls, storks, plovers, wagtails etc.

(B) *Summer migrants*

These birds are usually resident and move intracontinentally to intertropical regions with the change of seasons. Such migration

does not normally involves long distances as in the case of winter visitors. Normally these summer migrants stay for about three to four months before returning or moving away e. g. cuckoos, pittas, orioles, flycatchers etc.

(C) *Passage migrants*

The winter or summer migrants during the course of their migration pass through long stretches of land or sea. Along their migratory route they stop for rest and recouperation for short periods. e. g. Ibis, geese, ducks, falcons, avocets, starlings etc.

(D) *Altitudinal migrants*

These birds normally reside and breed at different altitudinal ranges but move up and down seasonally during inclement or favourable weather conditions e. g. egrets, vultures, parakeets, woodpeckers, redstarts etc.

(E) *Local migrants*

Certain birds move locally guided by the availability of food in the various parts of their habitats e. g. cormorants, herons, egrets, kites, vultures, lapwings, plovers, pigeons, doves, parakeets, bee-eaters rollers, drongos etc. Insectivorous birds may follow the abundance of insects in an area and the frugivorous ones may move from place to place in accordance with different fruiting seasons of different plant species.

In spite of the wealth of information supplied by the foregoing workers (and many others) our knowledge of the bird migration and its various aspects remained patchy and far from complete. Most of the above mentioned workers who contributed towards our present day knowledge of winter visitors, gave only the dates of arrival and departure of various migratory species. They did not pay attention to the factors that attracted these species to their study/observation areas. Factors like prevailing climatological conditions (temperature, humidity, length of the day, etc.), availability of food, protection provided by local people or inaccessibility of the area reported on, were not taken into account. In addition, for larger areas of the country, even the information on arrival and departure dates was not gathered in detail. Himalayan foothills is one such area. With the passage of time the changing and changed land use pattern brought about a number of ecological changes in various parts of the country. These areas which were once marshy or had large stretches of standing water which

was an attraction for migratory as well as local aquatic and marsh birds were drained out for cultivation and were no longer attracted the migratory birds, and *vice versa*, some other absolutely dry areas were converted into large water reservoirs as a result of construction of hydel and irrigation dam attracting a large number of winter migrants.

The presents study area is one such area where a large lake has recently sprung up as a result of construction of a hydel dam. It has gradually started attracting more and more winter visitors. It was primarily this study was selected to study the effect of new avenues like food, shelter, protection etc., in the changing ecology offered to the migratory birds.

A somewhat similar state of affair exists as far as the intracontinental migration is concerned. The various workers already cited gave account of a single or a couple of species that they found indulging in one or other form of local migration in their study area without going into details of possible ecological factors that may be responsible for their movement. Another objective of this study was to correlate the ecological factors like climate, availability of food and shelter, or the lack of it and protection or presecution by the local human population inducing these local movements.

The various migratory birds studied in the study area are listed below :

A SYSTEMATIC LIST OF MIGRATORY BIRDS STUDIED AT CORBETT NATIONAL PARK :

(WV=Winter visitor ; SV=Summer visitor ; PM=Passage migrant ; AM=Altitudinal migrant ; LM=Local migrant)

Sl. No.	Name of species	Common name	Family	Order	Category	Page No.
1.	<i>Podiceps cristatus cristatus</i> (Linnaeus)	Great Crested Grebe	Podicipedidae	Podicipediformes	WV	19-20
2.	<i>Phalacrocorax carbo sinensis</i> (Shaw)	Large Cormorant	Phalacrocoracidae	Pelecaniformes	LM	71-72
3.	<i>Phalacrocorax niger</i> (Vieillot)	Little Cormorant	"	"	LM	72-74
4.	<i>Anhinga rufa melanogaster</i> (Pennant)	Darter or Snake-bird	"	"	LM	74-75
5.	<i>Ardea purpurea manilensis</i> Meyen	Eastern Purple Heron	Ardeidae	Ciconiiformes	LM	75-77
6.	<i>Ardeola grayii grayii</i> (Sykes)	Indian Pond Heron or Paddy-bird	"	"	LM	77-78

Sl. No.	Name of species	Common name	Family	Order	Category	Page No.
7.	<i>Bubulcus ibis coromandus</i> (Boddaert)	Cattle Egret	„	„	AM	60-62
8.	<i>Egretta alba modesta</i> (J. E. Gray)	Eastern Large Egret	„	„	LM	79
9.	<i>Egretta garzetta garzetta</i> (Linnaeus)	Little Egret	„	„	LM	80
10.	<i>Ixobrychus cinnamomeus</i> (Gmelin)	Chestnut Bittern	„	„	LM	81-82
11.	<i>Ciconia nigra</i> (Linnaeus)	Black Stork	Ciconiidae	„	WV	21-22
12.	<i>Plegadis falcinellus falcinellus</i> (Linnaeus)	Glossy Ibis	Threskiornithidae	„	PM	50
13.	<i>Anser indicus</i> (Latham)	Barheaded Goose	Anatidae	Anseriformes	PM	51
14.	<i>Tadorna ferruginea</i> (Pallas)	Ruddy Shelduck or Brahminy Duck	„	„	WV	22-23
15.	<i>Tadorna tadorna</i> (Linnaeus)	Common Shelduck	„	„	WV	23-25
16.	<i>Anas crecca crecca</i> (Linnaeus)	Common Teal	„	„	WV	25-26
17.	<i>Netta rufina</i> (Pallas)	Redcrested pochard	„	„	WV	26-28
18.	<i>Aythya marila marila</i> (Linnaeus)	Scaup Duck	„	„	PM	52
19.	<i>Elanus caeruleus vociferus</i> (Latham)	Blackwinged Kite	Accipitridae	Falconiformes	LM	82-83
20.	<i>Haliastur indus indus</i> (Boddaert)	Brahminy Kite	„	„	LM	83-84
21.	<i>Haliaeetus leucorhynchus</i> (Pallas)	Ringtailed or Pallas's Fishing Eagle	„	„	LM	84-85
22.	<i>Aegypius monachus</i> (Linnaeus)	Cinereous Vulture	„	„	AM	62-63
23.	<i>Neophron percnopterus ginginianus</i> (Latham)	Indian Scavenger Vulture	„	„	LM	86
24.	<i>Gypaetus barbatus aureus</i> (Hablizl)	Himalayan Bearded Vulture or Lammergeier	„	„	AM	63-64
25.	<i>Circus macrourus</i> (S. G. Gmelin)	Pale Harrier	„	„	WV	28-29

Sl. No.	Name of species	Common name	Family	Order	Category	Page No.
26.	<i>Falco vespertinus amurensis</i> Radde	Eastern Redlegged Falcon	Falconidae	„	PM	53
27.	<i>Falco tinnunculus</i> Linnaeus	European Kestrel	„	„	PM	54
28.	<i>Porphyrio porphyrio poliocephalus</i> (Latham)	Indian Purple Moorhen	Rallidae	Gruiformes	PM	54-55
29.	<i>Vanellus indicus indicus</i> (Boddaert)	Redwattled Lapwing	Charadriidae	Charadriiformes	LM	87-88
30.	<i>Vanellus spinosus duvaucelii</i> (Lesson)	Spurwinged Lapwing	„	„	LM	88-89
31.	<i>Charadrius dubius jerdoni</i> (Legge)	Indian Little Ringed Plover	„	„	WV	29-30
32.	<i>Tringa hypoleucos</i> Linnaeus	Common Sandpiper	„	„	WV	30-31
33.	<i>Scolopax rusticola rusticola</i> Linnaeus	Woodcock	„	„	AM	64
34.	<i>Recurvirostra avosetta</i> Linnaeus	Avocet	Recurvirostridae	„	PM	55-56
35.	<i>Esacus magnirostris recurvirostris</i> Cuvier	Great Stone Plover	Burhinidae	„	LM	89-90
36.	<i>Larus fuscus fuscus</i> Linnaeus	Lesser Blackbacked Gull	Laridae	„	WV	31-33
37.	<i>Larus ichthyaeus</i> Pallas	Great Blackheaded Gull	„	„	WV	33-34
38.	<i>Larus brunnicephalus</i> Jerdon	Brownheaded Gull	„	„	PM	56-57
39.	<i>Treron sphenura sphenura</i> (Vigors)	Wedgetailed Green Pigeon	Columbidae	Columbiformes	PM	57-58
40.	<i>Treron phoenicoptera phoenicoptera</i> (Latham)	Bengal Green Pigeon	„	„	LM	90-91
41.	<i>Streptopelia decaocto decaocto</i> (Frivaldszky)	Indian Ring Dove	„	„	LM	91-92
42.	<i>Streptopelia tranquebarica tranquebarica</i> (Hermann)	Indian Red Turtle Dove	„	„	LM	92-94

Sl. No.	Name of species	Common name	Family	Order	Category	Page No.
43.	<i>Streptopelia chinensis suratensis</i> (Gmelin)	Indian Spotted Dove	„	„	LM	94-95
44.	<i>Streptopelia senegalensis cambayensis</i> (Gmelin)	Indian Little Brwon or Senegal Dove	„	„	LM	95-96
45.	<i>Chalcophaps indica indica</i> (Linnaeus)	Indian Emerald Dove	„	„	LM	96-97
46.	<i>Psittacula eupatria nipalensis</i> (Hodgson)	Large Indian Parakeet	Psittacidae	Psittaci-formes	LM	97-98
47.	<i>Psittacula alexandri fasciata</i> (P. L. S. Muller)	Indian Redbreasted Parakeet	„	„	PM	58
48.	<i>Psittacula cyanocephala bengalensis</i> (Forster)	Northern Blossom-headed Parakeet	„	„	LM	98-99
49.	<i>Psittacula himalayana</i> (Lesson)	Himalayan Slaty-headed Parakeet	„	„	AM	64-65
50.	<i>Clamator jacobinus serratus</i> (Sparrman)	Pied Crested Cuckoo	Cuculidae	Cuculiformes	PM	58-59
51.	<i>Cuculus varius varius</i> Vahl	Common Hawk-Cuckoo or Brainfever Bird	„	„	LM	100-101
52.	<i>Cuculus micropterus micropterus</i> Gould	Indian Cuckoo	„	„	SV	39-41
53.	<i>Centropus sinensis sinensis</i> (Stephens)	Common Crow-Pheasant or Coucal	„	„	LM	101-102
54.	<i>Caprimulgus indicus hazarae</i> Whistler & Kinnear	Himalayan Jungle Nightjar	Caprimulgidae	Caprimulgi-formes	LM	102-103
55.	<i>Ceryle rudis leucomelanura</i> Reichenbach	Indian Pied Kingfisher	Alcedinidae	Coraciiformes	LM	104-105
56.	<i>Merops leschenaulti leschenaulti</i> Vieillot	Chestnutheaded Bee-eater	Meropidae	„	LM	105-106

Sl. No.	Name of species	Common name	Family	Order	Category	Page No.
57.	<i>Merops philippinus philippinus</i> Linnaeus	Bluetailed Bee-eater	Meropidae	Coraciiformes	LM	106-108
58.	<i>Merops orientalis orientalis</i> Latham	Indian Small Green Bee-eater	„	„	LM	108-109
59.	<i>Coracias benghalensis benghalensis</i> (Linnaeus)	Northern Roller or Blue Jay	Coraciidae	„	LM	109-111
60.	<i>Eurystomus orientalis cyanicollis</i> Vieillot	Himalayan Broad-billed Roller	„	„	LM	111-112
61.	<i>Anthracoceros malabaricus malabaricus</i> (Gmelin)	Indian Pied Hornbill	Bucerotidae	„	LM	112-113
62.	<i>Buceros bicornis homrai</i> Hodgson	Great Pied Hornbill	„	„	LM	113-114
63.	<i>Hypopicus hyperythrus</i> (Hartert)	Rufousbellied Woodpecker	Picidae	Piciformes	AM	65-66
64.	<i>Pitta sordida cucullata</i> Hartlaub	Hooded or Green-breasted Pitta	Pittidae	Passeriformes	SV	41-42
65.	<i>Hirundo smithii flifera</i> Stephens	Indian Wiretailed Swallow	Hirundinidae	„	SV	42-43
66.	<i>Lanius schach erythronotus</i> (Vigors)	Rufousbacked Shrike	Laniidae	„	LM	114-115
67.	<i>Oriolus oriolus kundoo</i> Sykes	Indian Golden Oriole	Oriolidae	„	SV	43-44
68.	<i>Dicrurus adsimilis albirictus</i> (Hodgson)	North Indian Black Drongo or King Crow	Dicruridae	„	LM	115-116
69.	<i>Dicrurus hottentottus hottentottus</i> (Linnaeus)	Haircrested or Spangled Drongo	„	„	LM	116-118
70.	<i>Sturnus malabaricus malabaricus</i> (Gmelin)	Greyheaded Myna	Sturnidae	„	LM	118-119
71.	<i>Sturnus pagodarum</i> (Gmelin)	Blackheaded or Brahminy Myna	„	„	SV	44-45

Sl. No.	Name of species	Common name	Family	Order	Category	Page No.
72.	<i>Sturnus vulgaris poltaratskyi</i> Finsch	Finsch's or Common Indian Starling	Sturnidae	Passeriformes	PM	59-60
73.	<i>Pycnonotus leucogenys leucogenys</i> (Gray)	Whitecheeked Bulbul	Pycnonotidae	„	LM	119-120
74.	<i>Muscicapa thalassina thalassina</i> Swainson	Verditer Flycatcher	Muscicapidae	„	SV	45-46
75.	<i>Rhipidura aureola aureola</i> Lesson	Northern White-browed Fantail Flycatcher	„	„	LM	120
76.	<i>Rhipidura albicollis canescens</i> (Koelz)	Western White-throated Faintail Flycatcher	„	„	LM	121
77.	<i>Terpsiphone paradisi leucogaster</i> (Swainson)	West Himalayan Paradise Flycatcher	„	„	SV	46-47
78.	<i>Copsychus saularis saularis</i> (Linnaeus)	Indian Magpie-Robin	„	„	LM	121-123
79.	<i>Rhyacornis fuliginosus fuliginosus</i> (Vigors)	Plumbeous Redstart	„	„	AM	66-68
80.	<i>Saxicola torquata przewalskii</i> (Pleske)	Tibetan Collared Bush Chat	„	„	WV	34-35
81.	<i>Saxicola caprata bicolor</i> Sykes	Northern Pied Bush Chat	„	„	SV	47-49
82.	<i>Chaimarrornis leucocephalus</i> (Vigors)	Whitecapped Redstart or River Chat	„	„	AM	68-69
83.	<i>Myiophonus caeruleus temminckii</i> (Vigors)	Himalayan Whistling Thrush	„	„	AM	69-70
84.	<i>Turdus ruficollis atrogularis</i> Jarocki	Blackthroated Thrush	„	„	WV	35-36
85.	<i>Parus major nipalensis</i> Hodgson	Nepal Grey Tit	Paridae	„	LM	123-124
86.	<i>Motacilla flava beema</i> (Sykes)	Blueheaded Yellow Wagtail	Motacillidae	„	WV	36-38
87.	<i>Motacilla alba dukhunensis</i> Sykes	Indian White Wagtail	„	„	WV	38-39
88.	<i>Nectarinia asiatica asiatica</i> (Latham)	Indian Purple Sunbird	Nectariniidae	„	SV	49-50
89.	<i>Melophus lathamii</i> (Gray)	Crested Bunting	Emberizidae	„	AM	70-71

THE STUDY AREA

(A) GENERAL

Observation were made for a continuous period of 31 months in the Corbett National Park from December, 1976 to June, 1979.

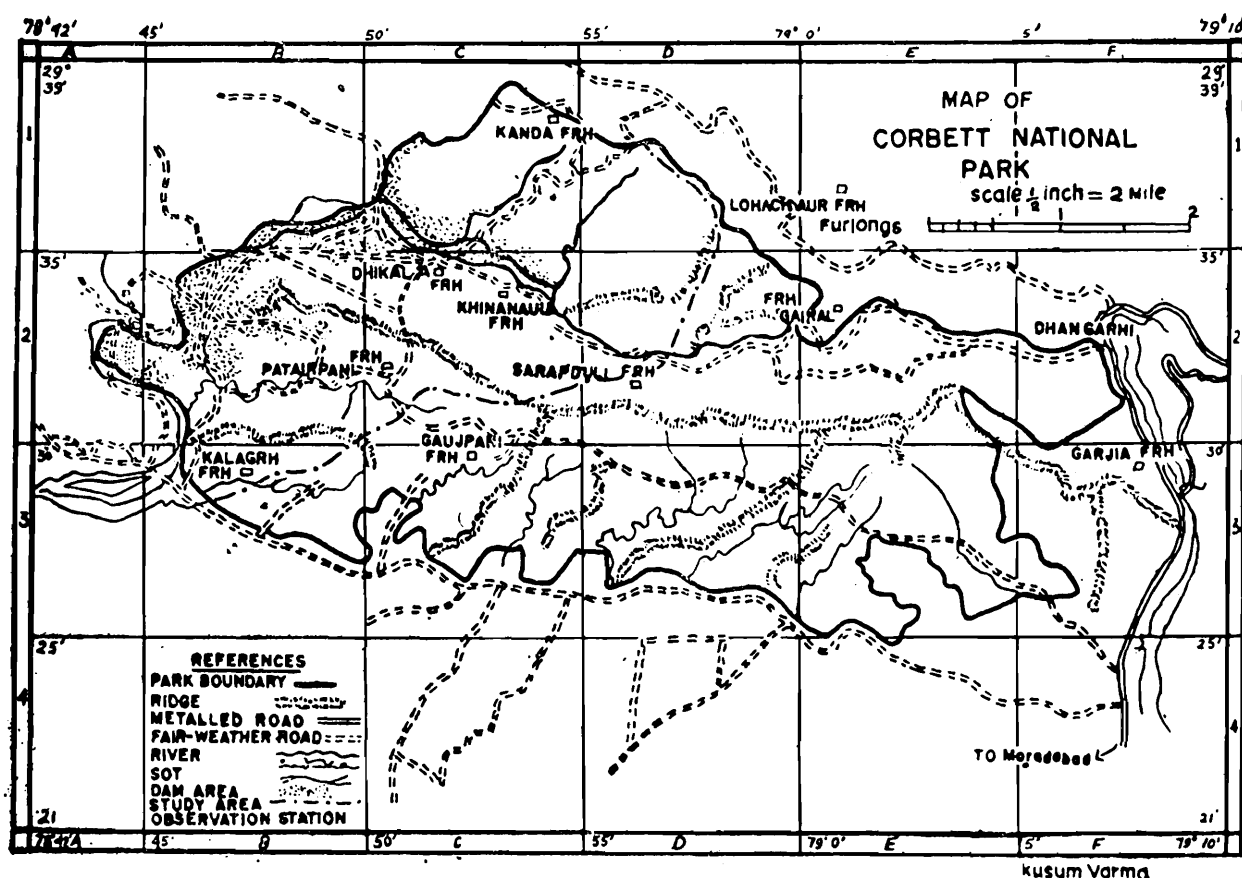
The Corbett National Park lies in two sub Himalayan districts of Uttar Pradesh, *viz.*, Pauri Garhwal and Naini Tal Districts. The Corbett National Park, the first ever National Park created in U. P. was demarcated under the 'United Provinces National Parks Act, 1937'. It comprised an area of 99.07 square miles in the foothills of the outer Himalayas in the famous Patli Dun and the hill forests to the south of it. It was named 'Haily National Park', after Sir Malcolm Haily, the then Governor of U. P. After the Indian Independence, the Park was redesignated as 'Ram Ganga National Park', after the tributary of river Ram Ganga flowing through the Park. Later to honour the memory of Jim Corbett, the celebrated naturalist, and hunter and author of 'Man-eaters' of Kumaon,' the Park was renamed 'Corbett National Park'. With the coming into being of 'Project Tiger', in the year 1973 the Park was declared as one of the nine 'Tiger Reserves' in India. In the mean while the Park had also expanded in size. Today the Corbett National Park covers an area of about 520 square kilometers between 29°13' to 29°35' N. Lat., and 78°33' to 78°46' E. Long.

(B) TOPOGRAPHY

The natural forest of the Park is confined to the Bhabar tract of Siwalik formation at an altitudes of 380-1040 metre, with varied topography of many temporary marshy depressions, ravines and plateau land. With the construction of a dam for the Ram Ganga Multipurpose Hydrel Project at Kalagarh a large fresh water lake has sprung up submerging about 10% of the Park area and almost 80% of the savannah type grassy glades in the hinterland of the Park. The river Ram Ganga enters the Park from the North east (Plate 2A) near Gairal forest rest house, runs a south westward course up to Sarapduli forest rest house, bends to flow in North west direction till it crosses Dhikala forest rest house. After passing Dhikala it again changes course to south west to emerge out of the Park at Kalagarh. The riverbed is generally narrow with high banks till about Khinanauli. In fact a little east of Khinanauli it starts widening giving rise to a number of 'Islands' where sheeshum, *Dalbergia sisso* grows in abun-

dance. West of Dhikala where the river takes a turn to Southwest the sheeshum islands are replaced by savannah grassland. When the Hydel Project Reservoir, which is partially filled up as yet (Plate 2B), fills up to capacity, its rear and will be extend upto Khinanauli forest rest house, submerging most of the savannah grassland and the sheeshum island.

PLATE - I
STUDY AREA: CORBETT NATIONAL PARK



There are a number of thickly forested ridges in the Park (Plate 3A). The largest and the longest (though not the highest) runs through the middle of the Park in an East-West direction from Sajgadi sot (temporary water drainage) to Ladpani sot. To the South of this median ridge are a number of small ridges lying in North-Southwest direction. The two larger ones of these join the median ridge at Tunirokhar sot and Chhotakoti sot. These ridges are the source of origin of a number of sots which are the secondary sources of water in the Park, primary being the Ram Ganga river. The highest ridge lies to the north of Dhikala. The highest point in the Park being Kanda forest rest house (1040 metre). The part of the Park lying south of the median ridge, is comparatively less green and bears more deciduous vegetation.

(C) THE VEGETATION

The vegetation is of three broad types, *viz.*, the forest, savannah grassland (or 'Chaud') as it is called locally, and the river-bed. The forest is composed of three different canopies : upper middle and lower. The upper canopy is mainly formed of Sal trees *Shorea robusta*, forming almost pure stands (Plate 3B), associated by other trees like *Adina cordifolia* (Haldu), *Terminalia bellica* (Bahera), *Terminalia tomentosa* (Tendu), *Garuga pinnata* (Kharpat), *Ceelrela toona* (Tun), *Lannea grandis* (Jhingan) and various species of *Ficus* e. g. *Ficus glomerata* (Gular) *Ficus religiosa* (Pipal), *Ficus roxberghii* (Timle), *Ficus retusa* (Lakeer), *Ficus aruotting* (Khabar), *Ficus bengalensis* (Bargad), *Ficus rumphii* (Pilkhan), *Ficus cunia*, *Ficus plmata* etc.

The middle canopy covers comparatively small trees like *Mallotus philippensis* (Rohini), *Cassia fissula* (Amaltas), *Cordia dichotoma* (Libhera), *Cordia myxa* (Lisora) etc.

The lower canopy is composed of smaller trees like *Murraya koenigii* (Karipatta or Jalneem), *Murraya paniculata* (Kamini), shrubs and herbs like *Glycosmis pentaphylla* (Pilu), *Clerodendrum rifortunathun*, *Callicarpa macrophylla* (Dhaia), Lantana species and developing trees etc.

The grassland holds a great variety of grasses. As many as 37 species of grass (Graminaceae) are known to occur in the Park. These are : *Andropogon halepensis* (Baru), *Anthistiria gigantea* (Ulla), *Apluda mutica*, *Apluda aristata* (Charol), *Apluda varia* (Chhari), *Arundinaria falcata* (Ringal), *Arundinella nepalensis* (Bichhla), *Arundo donax* (Nal), *Bothriochloa intermedia* (Sundhaur), *Chloris dolichostachya* (Paneri), *Chloris incompleta*, *Chrysopogon fulvus* (Bhuri), *Chrysopogon montanus* (Gorla), *Andropogon monticola*, *Chrysopogon gryllus* (Kus), *Cymbopogon martinii* (Mirchis), *Cynodon dactylon* (Dub), *Dendrocalamus strictus* (Bans), *Desmostachya bipinnata* (Kunja or Kus), *Erianthus savennal* (Basa), *Eulaliopsis binata* (Bhabar), *Heteropogon contortus* (Kumeria), *Imperata cylindrica* (Pula or siru), *Imperata arundinacea*, *Narenga porphyrocoma* (Ganeria), *Neyrandia arundinacea* (Nathura), *Oplismenus undulatifolius* (Dumbera), *Phragmites karka* (Nal), *Saccharum bengalensis* *Saccharum munja* (Munz), *Erianthus munja*, *Saccharum spontaneum* (Kans), *Setaria* sp. (Ballu), *Themeda arundinacea* (Ula), *Thysanolaena maxima* (Pelu or Ullans), *Thysunolaena agrostis* and *Vetiveria zizentioides* (Gamara or Khas). These grasses are intermingled with many small shrubs, grass like plants and creepers, prominent amongst which are : *Trichodesma indicum*, *Crotalaria medicaginea*, *Desmodium microphyllum*, *Grewia sapida*, *Vicoa indica*, *Moghania* sp., *Murraya koeingii*, *Chelanthos farinosa*, *Helictores isora*

(Marorphali), *Evolvus alsinoides*, *Oxalis cormilientata*, *Lenceas hypsipolia*, *Acacia arabica* (Babul), *Acacia catchu* (Kair), *Cannabis sativa* (Bhang), *Lantana camera* (Kuri) and *Zizyphus jujuba* (Ber) *Zizyphus xylopyrus* (Kathber). A few groves of sal trees and an occasional large tree like : *Bombax malabaricum* (Semal), *Embllica officinalis* (Awla), *Piliostigma malabaricum* (Kachnar), *Aegla marmelos* (Bel), *Eugenia jambolana* (Jamun), *Bassia latifolia* (Mahwa), *Butea monosperma* (Dhak) also exist in the 'Chaud'.

During rains grasses in 'Chaud' (Plate 4A) gain a hight of three metres by the end of rainy season. These tall grasses attract a number of resident as well as migratory bird species as they provide shelter, food (by way of seeds) and nesting sites to them. Resident birds like junglefowl, Peafowl, Black Partridge, Quails, larks etc., are attracted to this cover. Other like Weaver birds (Baya), and Yelloweyed Babbler make their nests in these tall grasses. A number of insects are also attracted to these grasses in the flowering season. These insect in turn attract birds like bulbuls, buntings, drongos, shrikes, bee-eaters, robins and chats etc. These grasses provide an ideal roosting place to a number of bird species like munias, weaver birds, buntings, larks and chats.

Bamboos occur frequently in the Park in several blocks. The only indigenous conifer in the Park is *Pinus roxburghii* (Chir), in the compartment No. 9/10, at Ghilmodya sot.

The river-bed is sandy, pebbly and narrow (Plate 4B) with high banks till about Khinanauli forest rest house. In fact a little east to Khinanauli it gives rise to a number of 'Islands' where sheeshum grows in abundance. These wooded tracts in the widened river-bed are known as 'Sheeshum islands' (Plate 5A). A number of shrubs, herbs and grasses also grows on these Islands. The most common and abundant are *Cannabis sativa* (Bhang) and Elephant grass.

With the annual creeping and receding of the lake, a curious change in the ecology of the area was observed. In the areas of river-bed, 'Chaud' and 'Sheeshum islands' which remained under water for more than four months the native vegetation was replaced by succulants (Plate 5B) like *Glinus lotoides*, *Panicum ramosum*, *Fimbristylis souorrosa*, *Solanum nigrium* etc., and the high banks created in the process, providing an ideal nesting place for hole-breeding birds.

In the sheeshum islands the smaller of the submerged trees dried and died up after the water receded. In the areas that were submerged in two or more successive years all vegetation including the trees dried up and died leaving behind the tree stumps (Plate 6A). In these dried

trees many of the local migrants like cormorants, darters, egrets etc., started roosting (Plate 17B). During daylight hours a number of birds of prey, fishing eagles, kites and many water birds like herons, egrets, storks perched on these dead trees.

(D) THE CLIMATE

There are three distinct seasons, *viz.*, the cold (November to February), the hot (March to mid-June) and the rainy season (mid-June to October).

Rainfall :

The total average annual rainfall as recorded at Sarapduli observatory of the forest department is 1653 mm (Table-1). The bulk of it is received during the summer monsoon, from mid-June to mid-September. A little rain is also received during the winter months, mostly December to February. November is the driest month.

TABLE 1. Showing monthwise total rainfall (in mm) for the year 1977-78 at Sarapduli, Corbett National Park.

Months	Year	
	1977	1978
January	36.0	7.0
February	2.0	24.8
March	nil	44.0
April	19.0	21.0
May	24.1	nil
June	14.6	227.3
July	401.5	325.9
August	374.7	606.7
September	182.4	663.8
October	27.6	32.0
November	nil	48.4
December	79.9	11.0

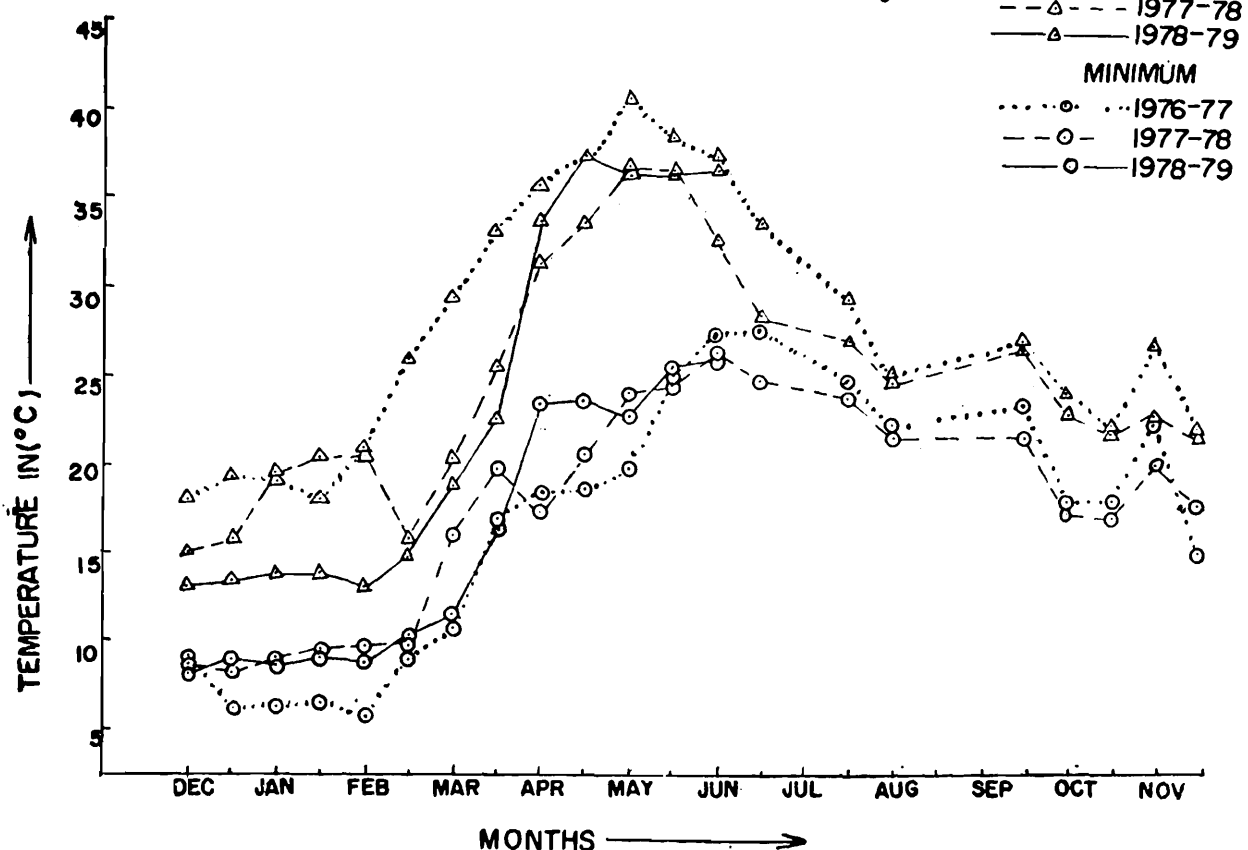
Temperature :

The fortnightly average maximum and minimum temperature were recorded on an spring operated 'Thermohydrograph' from December, 1976 to June, 1979 (Plate 7). These records revealed a highest temperature of 44°C in May 1977 and a lowest of 2.5°C in January 1977.

In the inner areas of the forest day temperature rarely exceeded 33°C in the shade during March. The month of April were fairly hot. May and June were the hottest months, but the maximum temperature in shade rarely exceeded 44°C even in severe hot weather. The fortnightly average maximum temperature was recorded 40.7°C in the first half of May, 1977 and the fortnightly average minimum temperature was recorded 5.7°C in the first half of February, 1977 (Plate 7).

PLATE-7

GRAPH SHOWING THE FORTNIGHTLY AVERAGE MINIMUM AND MAXIMUM TEMPERATURE (IN $^{\circ}\text{C}$) RECORDED AT DHIKALA CNP FROM DEC., 1976 TO **JUN**, 1979



Humidity :

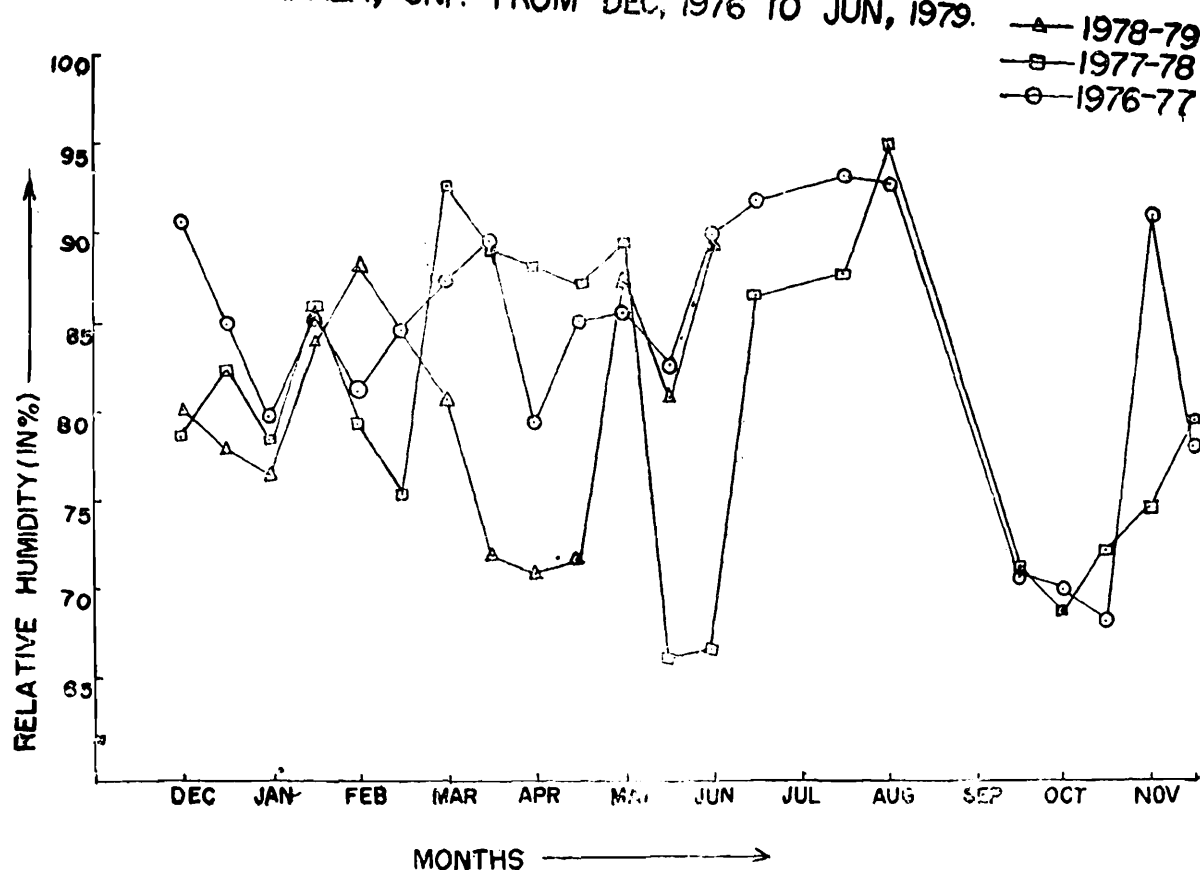
The relative humidity was low during April-June and high during monsoon months (Plate 8). But the area which have thick sal forest good canopy recorded (fortnightly average relative humidity) was 62% during second half of October, 1978. The maximum fortnightly average relative humidity was recorded 95.3% in the first half of August, 1978 (Plate 8).

Frost dew and fog :

From November to February the nights are usually very cold with much frost and dew, and in the low lying localities such as the patil

PLATE-8

GRAPH, SHOWING FORTNIGHTLY AVERAGE RELATIVE HUMIDITY (IN%) RECORDED AT 0800 HRS. AT DHIKALA, CNP. FROM DEC, 1976 TO JUN, 1979.



Dun a dense fog lingers often till after 1000 hrs. From March to the onset of the monsoon, frost and fog are absent, but dew is deposited upto April.

Winds and breeze :

A characteristic feature is coolness of the nights caused by the valley wind, locally known as 'Dadu' which blows down the valley, beginning at about 2100 hrs and dying down at about 0800 hrs. In hot months, from the middle of March till the middle of June, it is followed by a hot wind blowing up the valleys from 1000 hrs to 2200 hrs. During this period, the air becomes very dry with much dust in suspension, giving rise to a thick yellow haze, which is only interrupted by thunderstorms.

MATERIAL AND METHODS

The birds were studied in the study area in the Corbett National Park from December, 1976 to June, 1979. The methodology adopted for this study was very simple. It consisted direct audiovisual field observations. The daily observations made throughout the year were

split up monthwise and seasonwise. The enumerated species were then categorised into the residents and the migratory one on the basis of their year long or partial presence. The migrants of the following categories were listed separately :

- (a) Winter migrants
- (b) Summer migrants
- (c) Passage migrants
- (d) Altitudinal migrants
- (e) Local migrants

Observations were made daily for three days a week on foot and three days a week on elephant back. At least four days in a month a slow moving (10 km per hour) Jeep was used for observations as it provided the advantage of covering the whole area in a single trip. The main observation hours were morning commencing half an hour before sunrise continuing about two and a half hour after sunrise, and three hours in the evening, starting about two hours before sunset and terminating about an hour after sunset. Apart from this two whole days (an hour before sunrise to an hour after sunset) in a week were spent in the field.

Status and distribution of the species mentioned in the text is for the study area only. Status of the species was assigned on the basis of average number of sightings in a month in the study area. The criteria used for categorisation is as follows :

Abundant :	Observed more than 16 days in a month
Very Common :	Observed 10 to 15 days in a month
Common :	Observed 5 to 9 days in a month
Rare :	Observed 1 to 4 days in a month
Very rare :	Observed once in two months or greater intervals.

For winter migrants dates of arrival in year 1976 have not been taken into consideration although dates of first observation has been mentioned because the study was started in December, 1976. In case of other categories of migrants dates of departure in year 1979 have not been given after June as the studies were discontinued in June, 1979. Instead dates of last observations have been given,

Following abbreviations have been used in the text :

Fort.	=	Fortnightly
Avg.	=	Average
Max.	=	Maximum
Min.	=	Minimum
Temp.	=	Temperature
Humd.	=	Humidity
Rel.	=	Relative
F. B. I.	=	Fauna of British India
H. B. No.	=	Hand Book Number

In order to harmonise with the general surrounding and cause alarm to the birds while observing dull coloured clothes were worn. Enumeration was done by audiovisual means. For spotting and identification a 7×35 prismatic field binocular was used (Plate 6B). In case of very shy species like thrushes, cuckoos etc., the monitoring was done by auditory means also. The songs were recorded on a portable cassette type tape recorder and identified later in the lab. Where it was not possible to identify the birds either by sight or by sound, efforts were made to photograph the bird for identification, by, a 35 mm SLR camera (Exakta, Ashai Pentax and Nikon), using telelenses of 50 to 1000 mm focal length.

Studies on the feeding behaviour were also made by direct observations of birds while they fed. It was not possible to collect or kill the birds in the National Park, hence the question of regular gut-content analysis did not arise. However, a good number of dead birds, usually retrieved from birds of prey or found in the forest, river-bed or shore of the lake were brought to the lab and opened for the examination of the gut-contents, if any. Whenever a bird was observed feeding on emerging, assembled or swarming insects a random sample of the same was collected and got identified by the experts of the Zoological Survey of India. In case where the birds were observed feeding on flowers, fruits or seeds of a tree or a plant, the leaves, flowers and fruit of the plant/tree were collected and sent to the Botanical Survey of India for identification.

For the collection of relevant meteorological data a spring operated 'Thermohydrograph' was used. For the identification of birds and their field characters Salim Ali and Ripley, 'Hand Book of the BIRDS OF INDIA AND PAKISTAN' (Vol. 1 to 10), Stuart Baker's 'FAUNA

OF BRITISH INDIA' (Vol. 1 to 8) and Robert Fleming's 'BIRDS OF NEPAL' (1976) were made use of.

OBSERVATIONS ON MIGRATORY BIRDS AND THEIR FEEDING BEHAVIOUR

A. Winter Visitors

Order : PODICIPEDIFORMES

Family : PODICIPEDIDAE

Genus : **Podiceps** Latham

1. **Podiceps cristatus cristatus** (Linnaeus) : Great Crested Grebe.

Baker, FBI No. 2290, Vol. 6 : 477.

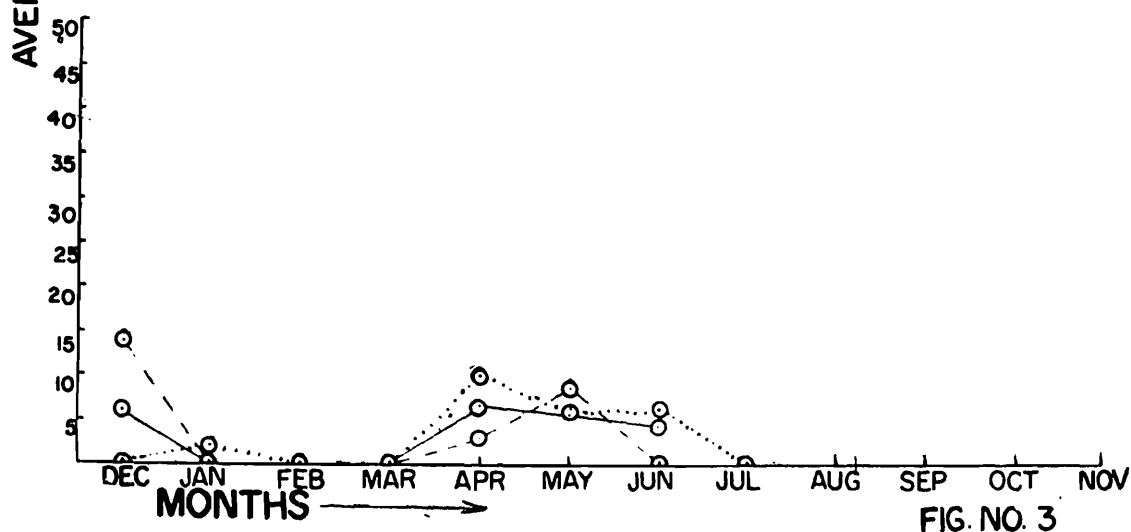
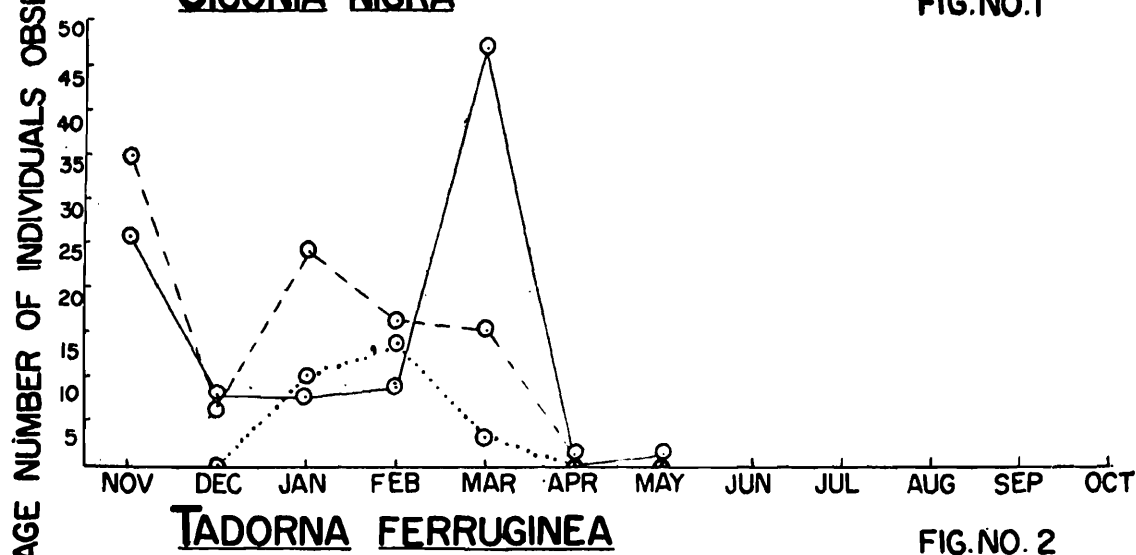
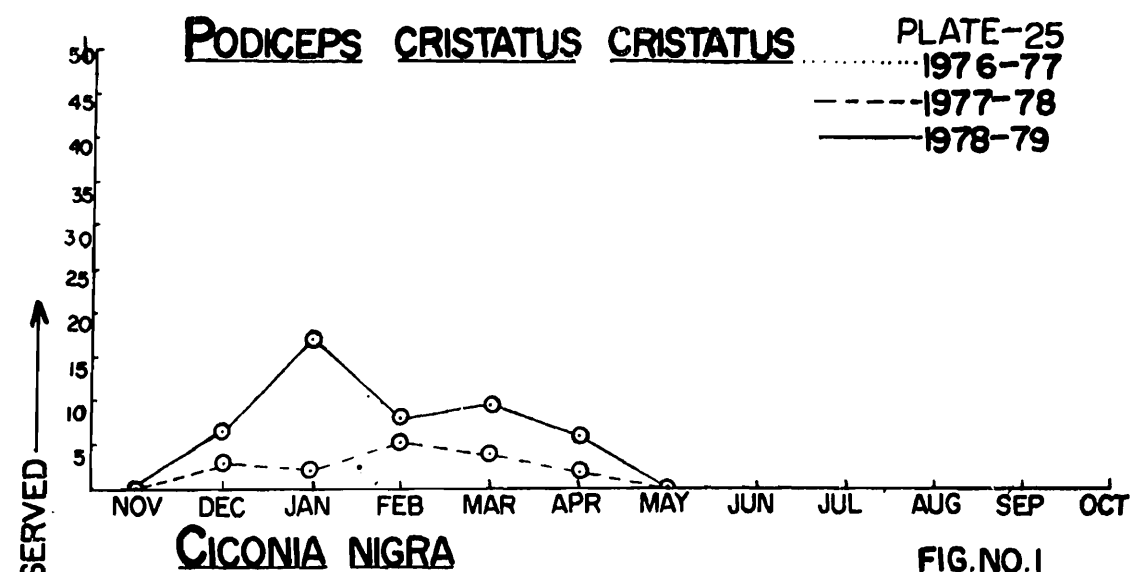
Salim Ali and Ripley, H. B. No. 3, Vol. 1 : 3.

Period of stay : This species arrived in the Park in the 2nd half of December, when the Fort. Avg. Max. Temp. ranged between 13.7 and 15.7°C and the Fort. Avg. Rel. Humd. ranged from 78 to 82.6%. The species left the Park in the 1st half of April when the Fort. Avg. Max. Temp. ranged from 31.3 to 33.6°C and Fort. Avg. Rel. Humd. ranged between 71.2 and 88.4%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 2.

TABLE 2

Observations	Year	
	1977-78	1978-79
Date of first observation	20th Dec., 1977	17th Dec., 1978
Temperature in °C Minimum	11.0	9.5
Temperature in °C Maximum	15.0	14.0
Humidity in %	74.0	80.0
Date of last observation	8th Apr., 1978	6th Apr., 1979
Temperature in °C Minimum	17.0	28.0
Temperature in °C Maximum	32.0	33.0
Humidity in %	88.2	70.5

Status and distribution : Rare. Observed swimming in the lake from Dhikala to Kalagarh often 30 to 50 metre inside along the shore-line. The maximum number of individuals observed in a single day was 17 (28th January, 1978) and minimum was one (31st January, 1978). Monthly average index varied from 2.0 to 17.0 (Plate 25 ; fig. 1).



Feeding behaviour : Feeding activity was observed up to 50 metre inside the receding shoreline of lake. Mostly observed feeding on fish, frogs and water insects in the lake. Once identifiable remains of the following three species were recovered from a dead specimen washed ashore : Fish : *Barilius bola*, *Nosmacheilus* sp. and *Kana tigrina*. On few occasion birds were observed feeding (through binocular) on *Tor* sp. and *Mestacembelus* sp. Maximum feeding activity was observed at dawn and dusk between 0800 hrs to 1100 and 1500 hrs to 1900 hrs.

Order : CICONIIFORMES
Family : CICONIIDAE
Genus : **Ciconia** Brisson

2. **Ciconia nigra** (Linnaeus) : Black Stork.

Baker, FBI No. 2209, Vol. 6 : 323.

Salim Ali and Ripley, H. B. No. 65, Vol. 1 : 102.

Period of stay : This species arrived in the Park in the 2nd half of November, when the Fort. Avg. Max. Temp. ranged from 23.1 to 26.8°C and Fort. Avg. Rel. Humd. ranged from 75 to 91.5%. The species left the Park between 2nd half of March and 1st half of May, when Fort. Avg. Max. Temp. ranged from 31.3 to 36.6°C and Fort. Avg. Rel. Humd. ranged from 87.8 to 88.9%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 3.

TABLE 3

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	19th Jan., 1977	2nd Nov., 1977	7th Nov., 1978
Temperature in °C Minimum	9.0	22.0	21.0
Temperature in °C Maximum	17.5	27.0	23.5
Humidity in%	90.0	90.0	75.0
Date of last observation	17th Mar., 1977	11th Apr., 1978	1st Mar., 1979
Temperature in °C Minimum	14.0	19.0	20.0
Temperature in °C Maximum	32.0	34.5	34.0
Humidity in%	88.8	88.2	93.0

Status and distribution : Common. Frequently observed near the lake 30 to 50 metre outside the shoreline and in or on the bank of Ram Ganga river. The maximum number of individuals observed during a single day was 47 (8th March, 1979) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 47.0 (Plate 25 ; fig. 2).

Feeding behaviour : Mostly observed feeding on the banks of Ram Ganga river and 30 to 50 metre outside along the receding shoreline of the lake on mudflats, frequently observed feeding on fishes, frogs and small birds. On a number of occasions remains retrieved from feeding

birds turned out to be that of as follows : Fish *Tor tor*, *Tor putitora*, *Barilius bola* and among Frog : *Rana tigrina* and *Rana cynophlyctis*. On one occasion one bird observed (through binocular) was feeding on *Saxicola* sp. Maximum feeding activity was observed in afternoons between 1300 hrs and 1900 hrs.

Order : ANSERIFORMES
Family : ANATIDAE
Genus : **Tadorna** Von Oken

3. **Tadorna ferruginea** (Pallas) : Ruddy Shelduck or Brahminy Duck.

Baker FBI No. 2263, Vol. 6 : 416.

Salim Ali and Ripley, H. B. No. 90, Vol. 1 : 141.

Period of stay : This species arrived in the Park between 1st half of December, 2nd half of December and 2nd half of January, when the Fort. Avg. Max. Temp. ranged from 13.4 to 17.9°C and Fort. Avg. Rel. Humd. ranged from 78.9 to 85.3%. The species left the Park from 2nd half of May to 1st half of June, when the Fort. Avg. Max. Temp. ranged between 36.4 and 37.2°C and Fort. Avg. Rel. Humd. ranged from 66.3 to 90.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 4.

TABLE 4

Observations	Years		
	1976-77	1977-78	1978-79
Date of first observation	29th Jan., 1977	15th Dec., 1977	7th Dec., 1978
Temperature in °C Minimum	2.5	6.5	6.0
Temperature in °C Maximum	16.5	12.5	11.5
Humidity in %	75.0	80.0	75.0
Date of last observation	4th Jun., 1977	24th May, 1978	5th Jun., 1979
Temperature in °C Minimum	27.0	27.5	24.0
Temperature in °C Maximum	39.0	33.0	34.0
Humidity in %	89.8	60.0	95.0

Status and distribution : Rare. Observed resting on the bank of the lake often 30 to 50 metre from the receding shoreline. The maximum number of individuals observed in a single day was 21 (28th December,

1977) and minimum of one (9th April, 1978). Curiously this species disappeared from the Park area for short stretches e. g. it was not observed in the month of February and March in 1977 and again from January to March in 1978 and 1979 (Plate 25 ; fig. 3). Monthly average index varied from 2.0 to 14.0 (Plate 25 ; fig. 3).

Feeding behaviour : Feeding activity was observed on the madflats near receding shoreline of the lake. Mostly observed feeding on vegetation present along the shoreline, on molluscs and aquatic insects etc. Plants collected from the shoreline of the lake where birds were observed feeding turned out to be follows : *Solanum nigrium*, *Glinus lotoides*, *Panicum ramosum* and *Fimbristylis squarrosa* etc. Molluscs and water insects were collected from the patches where birds were seen feeding on a number of occasions, turned out to be Mollusca : *Lymnsea* sp., *Viparus* sp., water insect : *Ptilomera laticaudata*, *Cybister tripunctatus*. On one occasion one bird was observed (through binocular) feeding on the lizard *Calotes* sp., Feeding activity reaches its zenith around dawn and dusk.

4. *Tadorna tadorna* (Linnaeus) : Common Shelduck.

Baker, FBI No. 2262, Vol. 6 : 414.

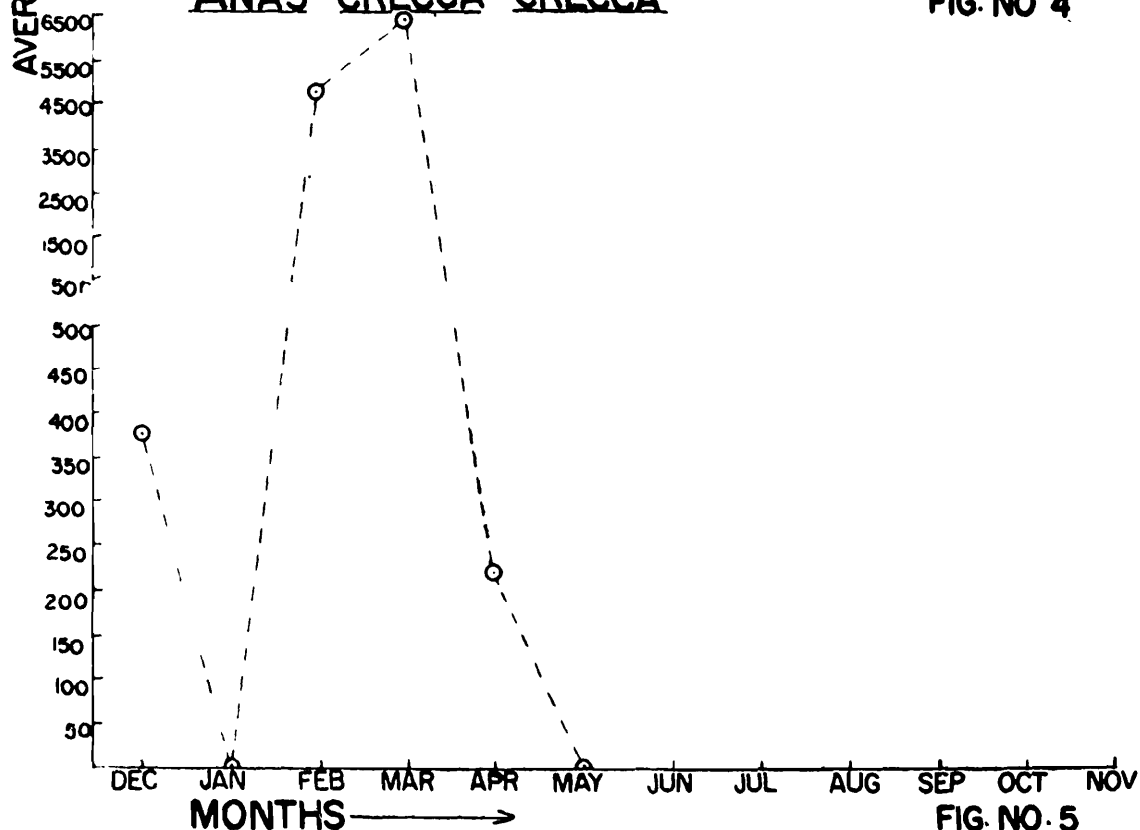
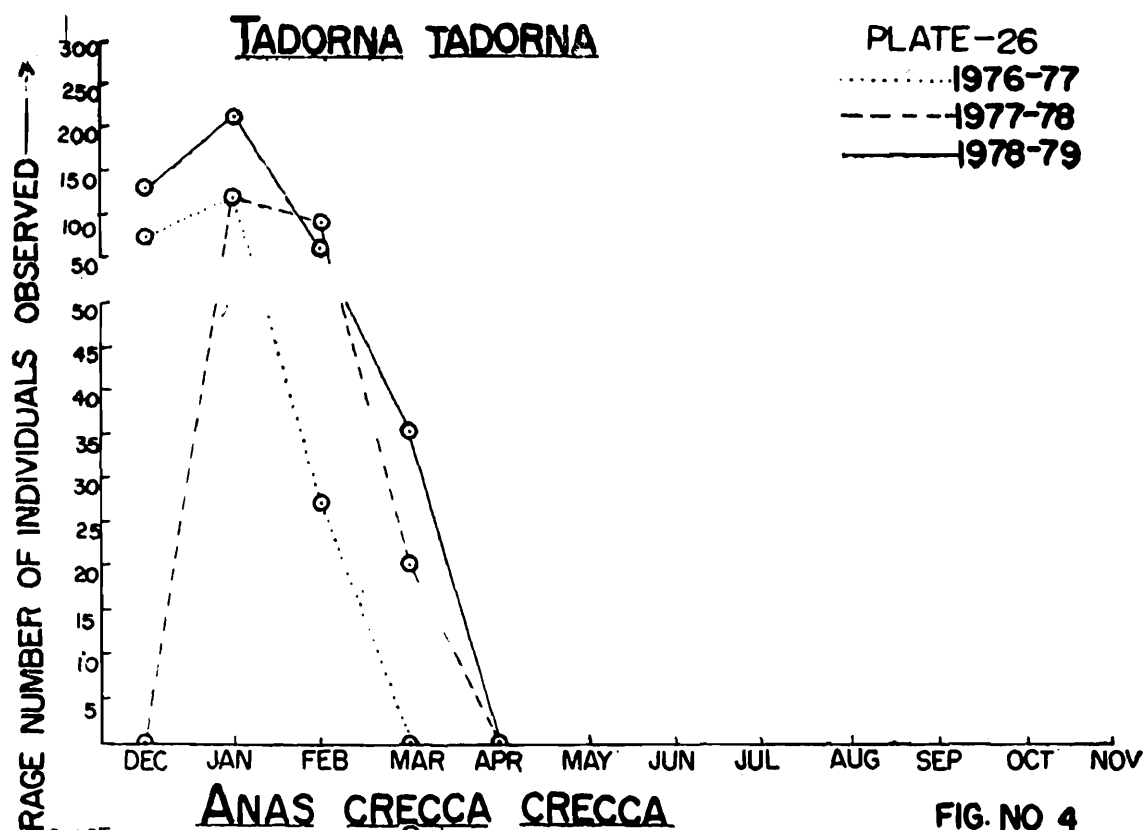
Salim Ali and Ripley, H. B. No. 91, Vol. 1 : 144.

Period of stay : This species arrived in the Park between 2nd half of December and 1st half of January, when the Fort. Avg. Max. Temp. ranged between 13.7 and 19.4°C and Fort. Avg. Rel. Humd. ranged from 78 to 85%. The species left the Park between 2nd half of February and 1st half of March, when the Fort. Avg. Max. Temp. ranged between 18.9 and 25.9°C and Fort. Avg. Rel. Humd. ranged between 80.8 and 92.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 5.

TABLE 5

Observations	Years		
	1976-77	1977-78	1978-79
Date of first observation	20th Dec., 1976	1st Jan., 1978	25th Dec., 1978
Temperature in °C Minimum	5.0	9.1	9.0
Temperature in °C Maximum	19.0	19.5	14.5
Humidity in %	90.9	80.0	82.0
Date of last observation	16th Feb., 1977	6th Mar., 1978	11th Mar., 1979
Temperature in °C Minimum	7.5	16.0	17.0
Temperature in °C Maximum	25.0	20.0	27.0
Humidity in %	72.7	93.7	70.0

Status and distribution : Rare. Observed mostly near the lake on the shoreline and swimming in deeper pools in Ram Ganga river. The maximum number of individuals observed during a single day was 250 (24th December, 1978) and minimum was four (1st January, 1978). Monthly average index varied from 20.0 to 212.5 (Plate 26 ; fig. 4).



Feeding behaviour : Normally observed feeding on the bank of Ram Ganga river in deeper pools. Observed feeding on water insects, insect larvae, small molluscs, seeds and leaves of vegetation in the

mudflats bared by the receding shoreline and riverbed. Large flocks that spent the nights on the lake dispersed in the mornings along the river and various fingers of the lake. Large numbers flew towards East in the morning and came back an hour before sunset from East and South East. Specimens of Molluscs and water insects were collected from the place where a flock of bird was observed feeding which turned out to be *Indoplanorbis* sp. and *Lymnaea* sp., *Ptilomera laticaudata*, *Laccotrephes ruber* respectively. Plants collected from the shoreline of lake where these birds were observed feeding turned out to be as : *Panicum ramosum*, *Solanum nigrium*, and *Glinus lotoides*.

Genus : *Anas* Linnaeus

5. *Anas crecca crecca* Linnaeus : Common Teal.

Baker, FBI No. 2271, Vol. 6 : 431.

Salim Ali and Ripley, H. B. No. 94, Vol. 1 : 151.

Period of stay : This species arrived in the Park in the 2nd half of December, when the Fort. Avg. Max. Temp. was recorded 15.7°C and Fort. Avg. Rel. Humd. was recorded 82.6%. The species left the Park in the 2nd half of April, when Fort. Avg. Max. Temp. was recorded 33.5°C and Fort. Avg. Rel. Humd. was recorded 87.5%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 6.

TABLE 6

Observations	Year 1977-78
Date of first observation	30th Dec., 1977
Temperature in °C Minimum	8.0
Temperature in °C Maximum	24.5
Humidity in %	80.0
Date of last observation	16th Apr., 1978
Temperature in °C Minimum	22.5
Temperature in °C Maximum	35.5
Humidity in %	90.5

Status and distribution : Rare. Observed near the lake, 30 to 50 metre along the receding shoreline in shallow water or on mudflats. The maximum number of individuals observed in a single day was 10,000 (6th March, 1978) and minimum was four (30th December, 1977). Monthly average index varied from 220.0 to 6,400 (Plate 26 ; fig. 5).

Feeding behaviour : This species was observed most of the time resting on mudflats near the shoreline during day hours, however, sometimes they were observed feeding on shoots and leaves of plants like *Glinus lotoides*, *Fimbristylis squarrosa* and *Panicum ramosum* present along the shoreline. Very active between 1500 hrs and 1800 hrs. As these birds are nocturnal feeders, probably they come to the Park from surrounding areas of the Park for protection and shelter. After dark large flocks were observed to leave the lake.

Genus : *Netta* Kaup

6. *Netta rufina* (Pallas) : Redcrested Pochard.

Baker, FBI No. 2278, Vol. 6 : 448.

Salim Ali and Ripley, H. B. No. 107, Vol. 1 : 177.

Period of stay : This species arrived in the Park in the 2nd half of October, when the Fort. Avg. Max. Temp. ranged between 21.8 and 25.9°C and Fort. Avg. Rel. Humd. ranged between 72.5 to 84.9%. The species left the Park in 1st half of March, when Fort. Avg. Max. Temp. ranged from 18.9 to 29.3°C and Fort. Avg. Rel. Humd. ranged from 80.8 to 92.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 7.

TABLE 7

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	20th Feb., 1977	22nd Oct., 1977	19th Oct., 1978
Temperature in °C Minimum	9.0	19.5	17.0
Temperature in °C Maximum	26.0	24.5	25.0
Humidity in %	82.6	65.0	70.0
Date of last observation	8th Mar., 1977	6th Mar., 1978	8th Mar., 1979
Temperature in °C Minimum	12.0	16.0	10.5
Temperature in °C Maximum	30.5	20.0	16.0
Humidity in %	88.4	93.7	80.0

Status and distribution : Rare. Occasionally observed swimming in the lake and in deeper pools of Ram Gupta river. The maximum number of individuals observed in a single day was 13 (8th February, 1978) and minimum was two (24th January, 1978). Monthly average index varied from 3.3 to 12.0 (Plate 27 ; fig. 6).

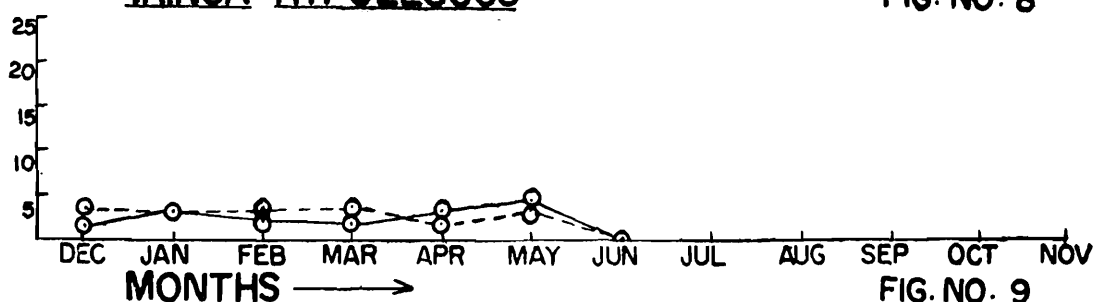
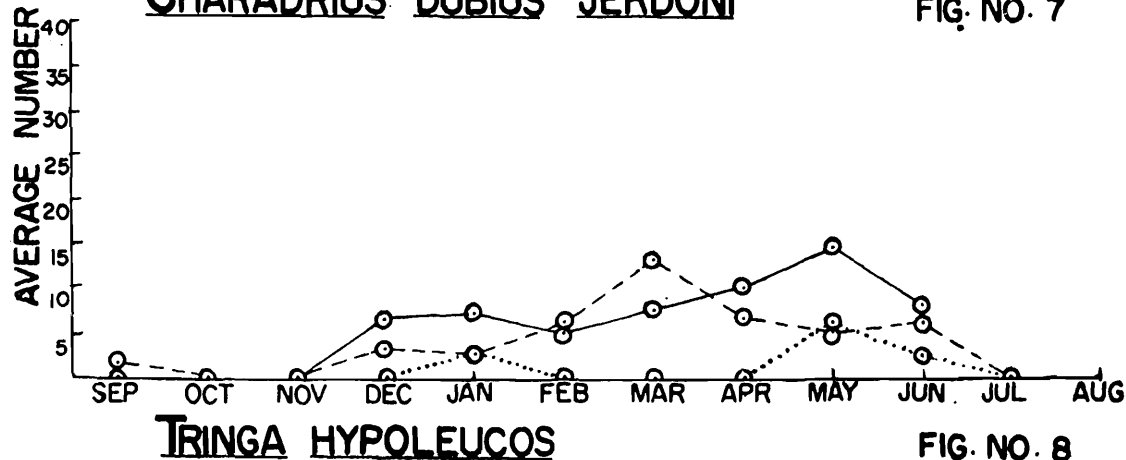
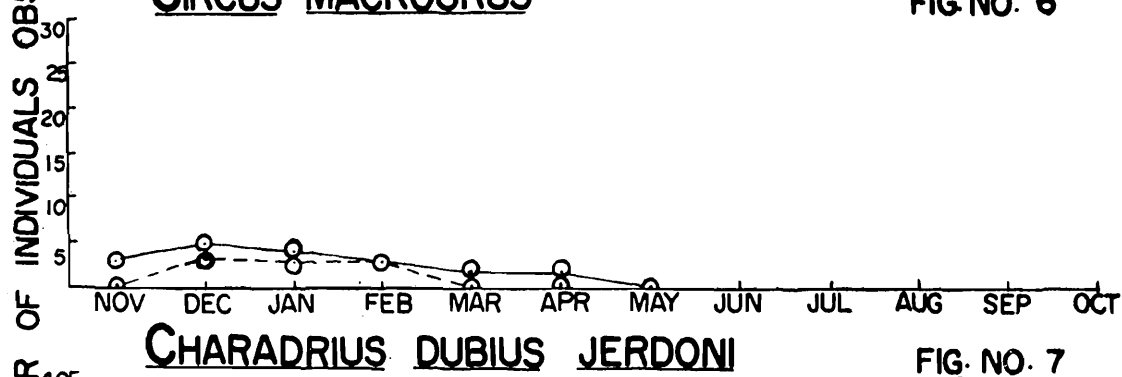
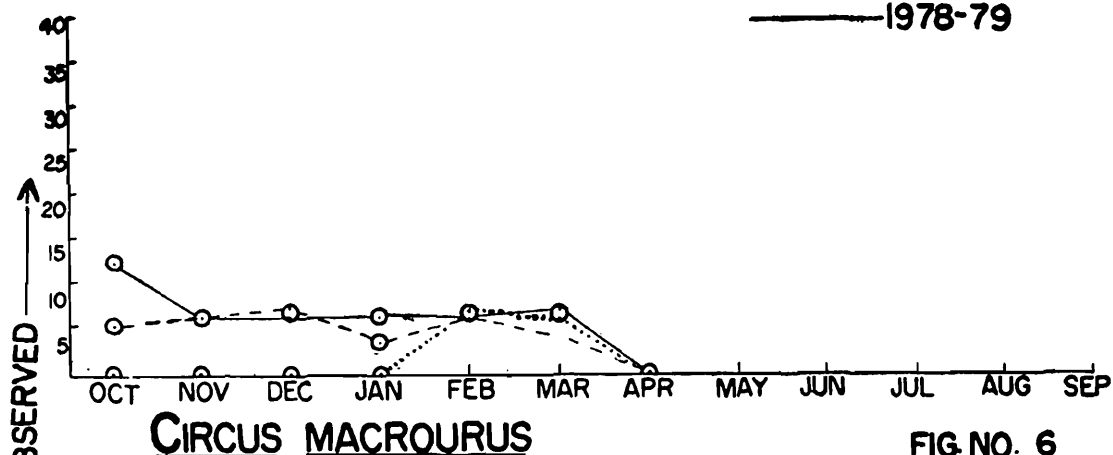
NETTA RUFINA

PLATE-27

.....1976-77

---1977-78

—1978-79



Feeding behaviour : Normally observed feeding in deeper pools and on the banks of Ram Ganga river. Mostly observed feeding on shoots, buds and leaves of water plants. Following plants species were collected from the place where birds were observed feeding : *Solanum nigrum*, *Panicum ramosum*, *Fimbristylis squarrosa* and *Glinus lotoides*. Occasionally feeds on water insects, frogs and fishes. On a few occasions when observed (through binocular) they were found feeding on frogs (*Rana* sp.) and small fish possibly (*Noemacheilus* sp.). Samples of

water insects collected from the place where these birds were observed feeding turned out to be Bugs : *Ranatra filiformis*, *Heleocoris ovatus* and *Ptilomera laticaudata*. Very active at dawn and dusk between 0800 hrs to 1100 hrs and 1600 hrs to 1830 hrs respectively.

Order : FALCONIFORMES

Family : ACCIPITRIDAE

Genus : *Circus* Lacépède

7. *Circus macrourus* (S. G. Gmelin) : Pale Harrier.

Baker, FBI No. 1790, Vol. 5 : 129.

Salim Ali and Ripley, H. B. No. 190, Vol. 1 : 319.

Period of stay : This species arrived in the Park between 2nd half of November and 1st half of December, when the Fort. Avg. Max. Temp. ranged from 15.1 to 21.6°C and Fort. Avg. Rel. Humd. ranged from 78.9 to 80%. It left the Park in 2nd half of April, when the Fort. Avg. Max. Temp. was recorded 37.2 and Fort. Avg. Rel. Humd. was recorded 71.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 8.

TABLE 8

Observations	Year	
	1977-78	1978-79
Date of first observation	1st Dec., 1977	28th Nov., 1978
Temperature in °C Minimum	13.5	19.0
Temperature in °C Maximum	17.5	22.0
Humidity in %	72.5	80.0
Date of last observation	27th Feb., 1978	17th Apr., 1979
Temperature in °C Minimum	13.0	29.0
Temperature in °C Maximum	19.5	37.0
Humidity in %	72.5	72.0

Status and distribution : Common. Frequently observed perching or soaring near the edge of dense forest and over 'Chaud'. The maximum number of individuals observed in a single day was eight (20th December, 1978) and minimum was one (1st December, 1977). Monthly average index varied from 1.0 to 4.5 (Plate 27 ; fig. 7).

Feeding behaviour : Mostly observed feeding in 'Chaud'. Normally observed feeding on frogs, lizards, rodents and small birds. On a

number of occasions remains retrieved from feeding birds turned out to be that of field Rodent : *Mus booduga*, *Rattus rattus*, Lizard : *Calotes versicolor* and Bird : *Passer domesticus*. On a few occasion birds observed (through binocular) were found feeding on Frog : *Rana* sp., Bird : *Parus* sp. and *Saxicoloides* sp., Feeding activity was observed more at dawn and dusk, between 0800 hrs and 1100 hrs, and 1500 hrs and 1830 hrs.

Order : CHARADRIIFORMES
Family : CHARADRIIDAE
Genus : **Charadrius** Linnaeus

8. **Charadrius dubius jerdoni** (Legge) : Indian Little Ringed Plover.

Baker, FBI No. 2115, Vol. 6 : 171.
Salim Ali and Ripley, H. B. No. 380, Vol. 2 : 231.

Period of stay : This species arrived in the Park between 2nd half of September and 1st half of December, when the Fort. Avg. Max. Temp. ranged from 13.4 to 27.1°C and Fort. Avg. Rel. Humd. ranged from 71.0 to 80.1%. The species left the Park generally in 2nd half of June, when the Fort. Avg. Max. Temp. ranged from 28.3 to 36.4°C and Fort. Avg. Rel. Humd. ranged from 86.6 to 92%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 9.

TABLE 9

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	17th Jan., 1977	29th Sep., 1977	14th Dec., 1978
Temperature in °C Minimum	4.5	23.5	10.5
Temperature in °C Maximum	19.5	27.0	15.0
Humidity in %	75.0	72.0	87.0
Date of last observation	18th Jun., 1977	19th Jun., 1978	6th Jun., 1979
Temperature in °C Minimum	29.0	25.2	24.0
Temperature in °C Maximum	36.0	28.5	34.0
Humidity in %	91.6	85.0	90.0

Status and distribution : Rare. Observed near the bank of lake and bed of Ram Ganga river 30 to 50 metres outside along the shoreline on mudflats. The maximum number of individuals observed in a single day was 21 (6th May, 1979) and minimum was one (3rd April, 1977). Monthly average index varied from 1.0 to 14.5 (Plate 27 ; fig. 8).

Feeding behaviour : Observed feeding on riverbanks and 30 to 50 metres outside shoreline of lake on mudflats. Mostly observed feeding on beetles, insect larvae and caterpillars. On a few occasion insects collected from the patches where the birds were feeding turned out to be beetles of following species : *Catharsius pithecius*, *Anomala ruficapilla*, *Coccinalla septempunctata* and *Cybister tripunctatus*. Some birds were observed feeding at all hours of the day but maximum feeding activity was observed at dusk from 1500 hrs. to 1900 hrs.

Genus : *Tringa* Linnaeus

9. *Tringa hypoleucos* Linnaeus : Common Sandpiper.

Baker, FBI No. 2145, Vol. 6 : 217.

Salim Ali and Ripley, H. B. No. 401, Vol. 2 : 271.

Period of stay : This species arrived in the Park in the 1st half of December, when the Fort. Avg. Max. Temp. ranged between 13.4 to 15.1°C and Fort. Avg. Rel. Humd. ranged from 78.9 to 80.1%. The species left the Park in the 1st half of May, when Fort. Avg. Max. Temp. ranged from 36.6 to 36.8°C and Fort. Avg. Rel. Humd. ranged from 87.8 to 89.9%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 10.

TABLE 10

Observations	Year	
	1977-78	1978-79
Date of first observation	3rd Dec. 1977	5th Dec., 1978
Temperature in °C Minimum	12.5	5.5
Temperature in °C Maximum	21.5	11.5
Humidity in %	75.0	77.5
Date of last observation	6th May, 1978	3rd May, 1979
Temperature in °C Minimum	24.5	22.0
Temperature in °C Maximum	36.5	37.0
Humidity in %	93.7	88.0

Status and distribution : Rare. Observed near the lake and Ram Ganga river often 30 to 50 metre outside along the receding shoreline on mudflats and on stones. The maximum number of individuals observed during a single day was six (6th March, 1978) and minimum was one (21st December, 1977). Monthly average index varied from 1.5 to 4.0 (Plate 27 ; fig. 9).

Feeding behaviour :

Birds were observed feeding on the banks of Ram Ganga river, outside the shoreline of the lake on mudflats and picking up insects under the stones. Normally observed feeding on water insects and small molluscs. Samples collected from the feeding places of the birds turned out to be as follows : Molluscs : *Lymmaea* sp., *Indoplanorbis* sp. Bug : *Heleocoris ovatus*, *Ranatra filiformis* and among Beetle : *Cathersius oithecus*, *Oxycetonia albopunctata* and *Cybister tripunctatus*. Maximum feeding activity was observed at dawn and dusk from 0800 hrs to 1100 hrs and 1500 hrs to 1900 hrs.

Family : LARIDAE

Genus : *Larus* Linnaeus

10. *Larus fuscus fuscus* Linnaeus : Lesser Blackbacked Gull.

Baker, FBI No. 2065, Vol., 6 : 107.

Salim Ali and Ripley, H. B. No. 452, Vol. 3 : 28.

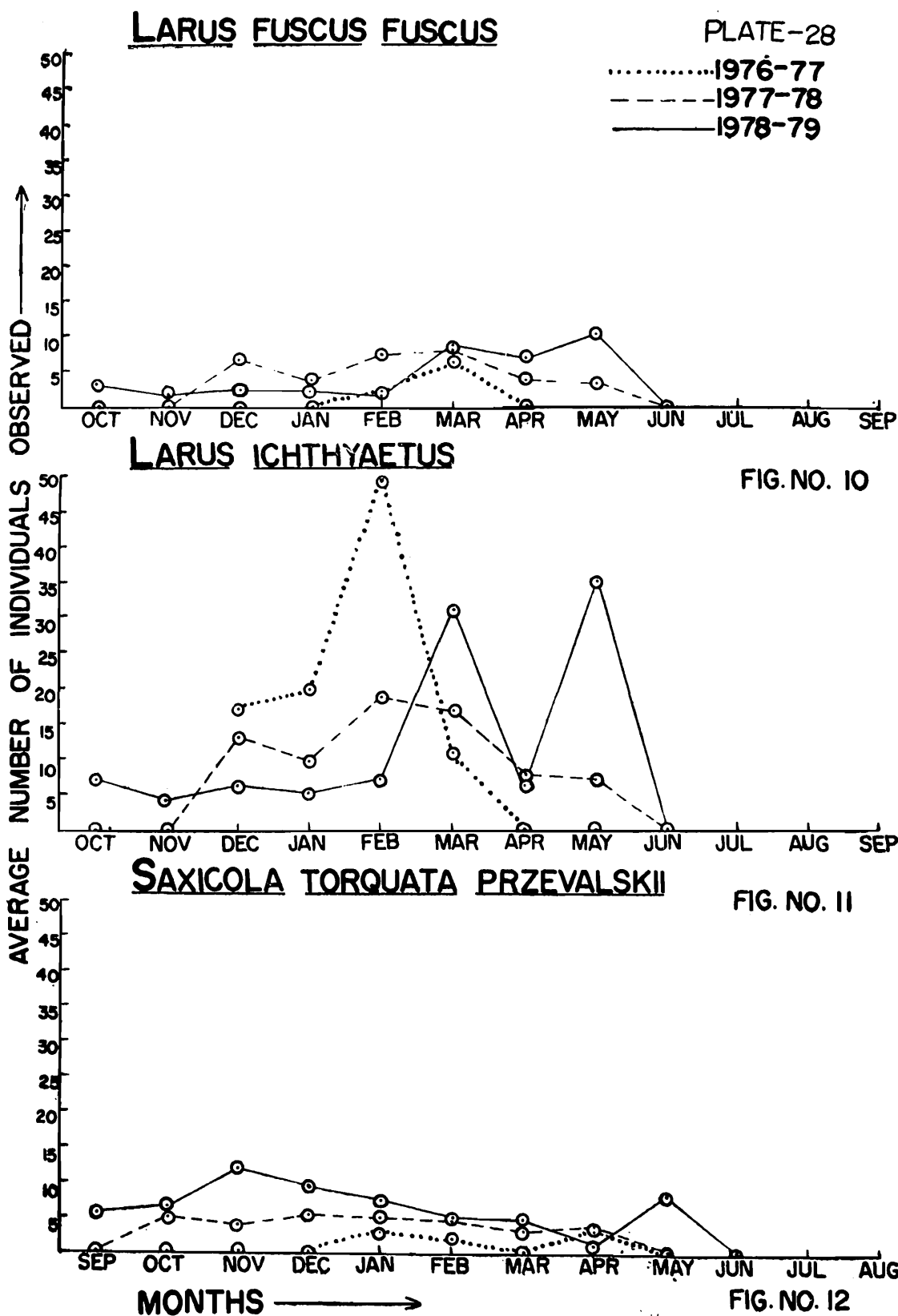
Period of stay : This species arrived in the Park between 1st half of October and 1st half of December, when the Fort. Avg. Max. Temp. ranged from 15.1 to 22.8°C and Fort. Avg. Rel. Humd. ranged from 69.0 and 78.9%. It left the Park between 1st half of March, 1st half of May, when the Fort. Avg. Max. Temp. ranged from 29.3 to 36.8°C and Fort. Avg. Rel. Humd. ranged from 87.4 to 89.9%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 11.

TABLE 11

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	3rd Feb., 1977	1st Dec., 1977	8th Oct., 1978
Temperature in °C Minimum	5.0	13.5	17.0
Temperature in °C Maximum	20.0	17.5	22.0
Humidity in %	88.8	72.5	72.0
Date of last observation	11th Mar., 1977	6th May, 1978	5th May, 1979
Temperature in °C Minimum	13.5	24.5	25.0
Temperature in °C Maximum	31.0	36.5	37.0
Humidity in %	81.3	93.7	88.5

Status and distribution : Rare. Occasionally seen flying over the lake and river or resting on the mudflats adjacent to the receding shoreline and also seen swimming 30 to 50 metres inside the receding

shoreline of the lake. While flying resting or feeding it often keeps company with the Great Blackheaded Gull *Larus ichthyæetus*. The maximum number of individuals observed during a single day was 15



(5th December, 1977) and minimum was one (21st December, 1977). Monthly average index varied from 1.5 to 10.0 (Plate 28 ; fig. 10).

Feeding behaviour : Maximum feeding activity was normally observed inside the middle of lake and Ram Ganga river. Birds were generally

observed flying over the lake and as soon as they located the fish they swooped down to pick it up with their claws from the surface of water and then moved towards the bank of river or mudflats on the shoreline outside the lake. On a few occasions carcasses retrieved from feeding birds turned out to be that of: *Barilius bola*, *Tor tor* and *Noemacheilus botia*. On one occasion a bird was observed (through binocular) carrying a fresh water eel *Mastegembelus* sp. Maximum feeding activity was observed between 1500 hrs and 1900 hrs.

11. *Larus ichthyaetus* Pallas : Great Blackheaded Gull

Baker, FBI No. 2060, Vol. 6 : 101.

Salim Ali and Ripley, H. B. No. 453, Vol. 3 : 29.

Period of stay : This species arrived in the Park between 1st half of October and 1st half of December, when the Fort. Avg. Max. Temp. ranged from 15.1 to 22.8°C and Fort. Avg. Rel. Humd. ranged between 69.0 and 85.0%. The species left the Park between 2nd half of March and 1st half of May, when the Fort. Avg. Max. Temp. ranged from 32.9 to 36.8°C and Fort. Avg. Rel. Humd. ranged between 87.8 and 89.9%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 12.

TABLE 12

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	19th Dec., 1976	4th Dec., 1977	8th Oct., 1978
Temperature in °C Minimum	5.0	12.0	17.0
Temperature in °C Maximum	18.0	17.0	22.0
Humidity in %	81.8	75.0	72.0
Date of last observation	31st Mar., 1977	6th May, 1978	10th May, 1979
Temperature in °C Minimum	32.0	24.5	21.0
Temperature in °C Maximum	33.5	36.5	34.0
Humidity in %	86.9	93.7	94.0

Status and distribution : Common. Frequently observed flying over the lake and river or resting on the mudflats adjacent to the receding shoreline and also seen swimming 30 to 50 metre inside the receding shoreline of the lake. The maximum number of individuals observed in a single day was 55 (16th February, 1977) and minimum was three (7th February, 1978). Monthly average index varied from 4.0 to 49.6 (Plate 28 ; fig. 11).

Feeding behaviour : Mostly observed feeding in the lake and Ram Ganga river. Birds were generally observed flying over the lake and as soon as they located the fish they swooped down to pick it up with their claws from the surface of water and then moved towards the bank of river mudflats on the shoreline outside to lake. Mostly feeds on fishes. On a number of occasions remains retrieved from feeding birds turned out to be that of following fishes : *Barilius bola*, *Tor tor* and *Mastacambelus armatus armatus*. Maximum feeding activity was observed between 1500 hrs to 1900 hrs.

Order : PASSERIFORMES

Family : MUSCICAPIDAE

Genus : *Saxicola* Bechstein

12. *Saxicola torquata przewalskii* (Pleske) : Tibetan Collared Bush Chat.

Baker, FBI No. 496, Vol. 2 : 30.

Salim Ali and Ripley, H. B. No. 1696, Vol. 9 : 27.

Period of stay : This species arrived in the Park in between 2nd half of September and 2nd half of October, when the Fort. Avg. Max. Temp. ranged from 22.3 to 26.6°C and Fort. Avg. Rel. Humd. ranged between 69.5 and 71.4%. It left the Park in between 1st half of April and 1st half of May, when the Fort. Avg. Max. Temp. ranged from 31.3 to 36.6°C and Fort. Avg. Rel. Humd. ranged between 85.1 and 88.4%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 13.

TABLE 13

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	31st Jan., 1977	28th Oct., 1977	27th Sep., 1978
Temperature in °C Minimum	7.5	19.5	23.0
Temperature in °C Maximum	19.5	21.5	26.0
Humidity in %	93.3	65.0	80.0
Date of last observation	8th Apr., 1977	15th Apr., 1978	6th May, 1979
Temperature in °C Minimum	22.0	22.5	25.0
Temperature in °C Maximum	32.0	36.0	37.0
Humidity in %	92.5	86.1	88.5

Status and distribution : Common. Found throughout the Park. Equally at home in tall grass, bushes and reeds along the edge of forest

and in the 'Chaud'. Also frequents, the banks of lake and Ram Ganga where it can be seen perching on dry tree stumps. The maximum number of individuals observed in a single day was 19 (30th December, 1977) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 12.0 (Plate 28 : fig. 12).

Feeding behaviour : Feeding activity was mostly observed in 'Chaud'. Frequently observed feeding on small beetles, grasshoppers, insect larvae, caterpillars and berries. On a number of occasions observed feeding on above mentioned insects. Samples were collected from the places where birds were observed feeding which were later on identified and turned out to be as follows : Beetle : *Catherius pithacius*, *Anomala ruficagilla* and *Oxycatonia albopunctata*. Grasshoppers : *Trilophidia annulata*, *Oxya hyla*, *Stenocatantops splendens* etc. On a few occasions birds were observed feeding on berries of *Zizyphus maurutiana* and *Zizyphus jujuba*. Observed feeding at all hours of the day. The maximum feeding activity was, however, seen at dawn and dusk between 0800 hrs to 1000 hrs, and 1500 hrs to 1830 hrs.

Genus : *Turdus* Linnaeus

13. *Turdus ruficollis atrogularis* Jarocki : Blackthroated Thrush.

Baker, FBI No. 578, Vol. 2 : 137.

Salim Ali and Ripley, H. B. No. 1763, Vol. 9 : 127.

Period of stay : This species arrived in the Park in the 2nd half of January, when the Fort. Avg. Max. Temp. ranged from 13.8 to 21.3°C and Fort. Avg. Rel. Humd. ranged between 83.8 and 86.1%. The species left the Park in between 2nd half of February and 2nd half of March, when the Fort. Avg. Temp. ranged from 22.6 to 25.9°C and Fort. Avg. Rel. Humd. ranged between 72.6 and 89.4%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 14.

TABLE 14

Observations	Year		
	1977	1978	1979
Date of first observation	19th Jan.	23rd Jan.	19th Jan.
Temperature in °C Minimum	9.0	9.0	10.5
Temperature in °C Maximum	17.5	21.0	14.0
Humidity in %	90.0	92.5	87.5
Date of last observation	22nd Feb.	18th Mar.	27th Mar.
Temperature in °C Minimum	8.0	14.0	15.0
Temperature in °C Maximum	26.0	21.0	20.5
Humidity in %	87.5	94.4	80.0

Status and distribution : Rare. A shy bird. Occasionally observed on the road passing through the dense forest, at the edge of forest and in 'Chaud'. The maximum number of individuals observed in a single day was 50 (17th February, 1978) and minimum was one (2nd February, 1978). Monthly average index varied from 1.0 to 22.5 (Plate 29, fig. 13).

Feeding behaviour : Normally observed feeding on the roads passing through dense forest and in 'Chaud'. This species is known to feed on grasshoppers, beetles, caterpillars, whiteants, earthworms, snails, fruits and berries. But in the Park it was observed to feed on grasshoppers, caterpillars and berries. On a few occasion it was observed feeding on Grasshopper : *Trilophidia annulata* and *Stenocatantops splendens*. On two occasions it was observed feeding on (Ber) *Zizyphus mauritiana*. Occasionally it was observed feeding on flowers of (Kuri) *Lantana aculeata*. Feeding activity was maximum in early morning and late evening.

Family : MOTACILLIDAE

Genus : *Motacilla* Linnaeus

14. *Motacilla flava beema* (Sykes) : Blueheaded Yellow Wagtail.

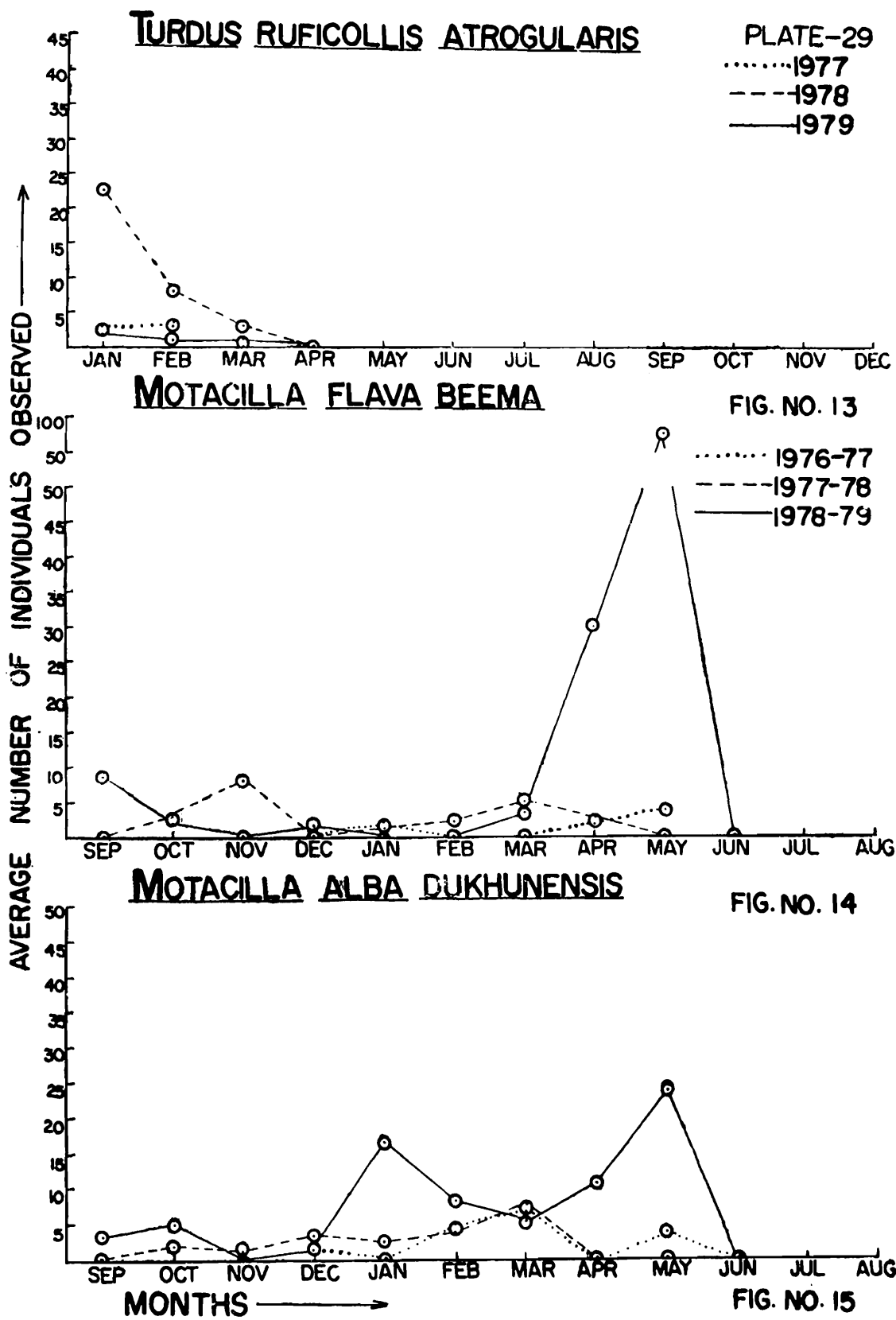
Baker, FBI No. 1175, Vol. 3 : 267.

Salim Ali and Ripley, H. B. No. 1876, Vol. 9 : 278.

Period of stay : This species arrived in the Park in between 2nd half of September and 1st half of October, when the Fort. Avg. Max. temp. ranged from 22.8 to 26.6°C and Fort. Avg. Rel. Humd. ranged between 69.0 and 71.4%. The species left the Park in between 2nd half of April and 1st half of May, when the Fort. Avg. Max. Temp. ranged from 33.5 to 40.7°C and Fort. Avg. Rel. Humd. ranged between 85.5 and 87.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 15.

TABLE 15

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	13th Jan., 1977	2nd Oct., 1977	27th Sep., 1978
Temperature in °C Minimum	5.0	19.5	23.0
Temperature in °C Maximum	20.0	25.5	26.0
Humidity in %	88.8	62.0	80.0
Date of last observation	3rd May, 1977	27th Apr., 1978	10th May, 1979
Temperature in °C Minimum	21.0	19.0	21.5
Temperature in °C Maximum	33.0	34.0	34.0
Humidity in %	90.4	89.0	94.0



Status and distribution : Common. Mostly observed on the banks of the lake and Ram Ganga river. Sometimes also observed near the edge of the forest and on forest roads. The maximum number of individuals observed in a single day was 275 (6th May, 1979) near the lake and minimum was one (25th October, 1977). Monthly average index varied from 1.5 to 74.8 (Plate 29 ; fig. 14).

Feeding behaviour : Observed feeding on the banks of Ram Ganga river, outside the lake on mudflats along the receding shoreline and

in 'Chaud'. Mostly observed feeding on bugs, beetles, insect larvae and caterpillars. On a number of occasions samples were collected from the areas where the birds were observed feeding. The insects turned out to be as follows : Bugs : *Ptilomera laticaudata*, *Laccotraphes ruber*, *Physopatta gutta* and among Beetle : *Cathersius pithecius*, *Anomela ruficapilla* and *Mylabris pustulata*. On a few occasion birds were observed feeding at all hours of the day but normally maximum feeding activity was observed at dawn and dusk between 0700 hrs to 1000 hrs and 1500 hrs to 1900 hrs.

15. **Motacilla alba dukhunensis** Sykes : Indian White Wagtail.

Baker, FBI No. 1166, Vol. 3 : 257.

Salim Ali and Ripley, H. B. No. 1885, Vol. 9 : 288.

Period of stay : This species arrived in the Park in between 2nd half of September and 1st half of October, when the Fort. Avg. Max. Temp. ranged from 23.6 to 26.6°C and Fort. Avg. Rel. Humd. ranged between 70.4 and 71.4%. It left the Park in the 1st half of May, when the fort. Avg. Max. Temp. ranged from 36.8 to 40.7°C and Fort. Avg. Rel. Humd. ranged between 85.8 and 89.9%. In year 1978, this species left the Park in 2nd half of March, when the Fort. Avg. Max. Temp. was recorded 25.3°C and Fort. Avg. Rel. Humd. was recorded 89.4%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 16.

TABLE 16

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	1st Dec., 1976	2nd Oct., 1977	27th Sep., 1978
Temperature in °C Minimum	13.0	18.5	23.0
Temperature in °C Maximum	19.0	26.0	26.0
Humidity in %	98.0	62.0	80.0
Date of last observation	3rd May, 1977	18th Mar., 1978	8th May, 1979
Temperature in °C Minimum	21.0	14.0	24.0
Temperature in °C Maximum	33.0	21.0	36.0
Humidity in %	90.4	94.4	87.5

Status and distribution : Common. Frequently observed on the banks of the lake and Ram Ganga river. Also common at the edge of forest, in 'Chaud' and on the forest roads. The maximum number of individuals observed in a single day was 67 (2nd May 1979) and minimum was one (28th October, 1977). Monthly average index varied from 1.0 to 24.4 (Plate 29 ; fig. 15).

Feeding behaviour : Feeding activity occurs mostly on the bank of Ram Ganga river, receding shoreline of lake on mudflats and in 'Chaud'. Frequently observed feeding on bugs, beetles, small molluscs grasshoppers, insect larvae and caterpillars. Samples were collected from the patches where birds were observed feeding. These turned out to be as follows : Bugs : *Heleocoris ovatus*, *Anoplocnomis phasina*. Beetle : *Cathersius pithecius*, *Mylabris pustulata*, Grasshoppers : *Trilophidia annulata*, *Gryllotapa fossor*, *Gryllus domesticus* and among Molluscs : *Lymmaea* sp. and *Viparus* sp. etc. On a few occasion birds were observed feeding at all hours of the day but normally they feed at dawn and dusk between 0700 hrs to 1000 hrs and 1500 hrs to 1900 hrs.

B. Summer visitors

Order : CUCULIFORMES

Family : CUCULIDAE

Genus : *Cuculus* Linnaeus

1. *Cuculus micropterus micropterus* Gould : Indian Cuckoo.

Baker, FBI No. 1456, Vol. 4 : 144.

Salim Ali and Ripley, H. B. No. 576, Vol. 3 : 204.

Period of stay : This species arrived in the Park in the 1st half of April, when the Fort. Avg. Max. Temp. ranged between 31.3 and 35.6°C and Fort. Avg. Rel. Humd. ranged between 71.2 and 88.4%. The species left the Park in 2nd half of June, when the Fort. Avg. Max. Temp. ranged between 27.7 and 33.6°C and Fort. Avg. Rel. Humd. ranged between 88.8 and 92%. The actual dates on which birds were first and last observed along with relevant meteorological data are given below in Table 17.

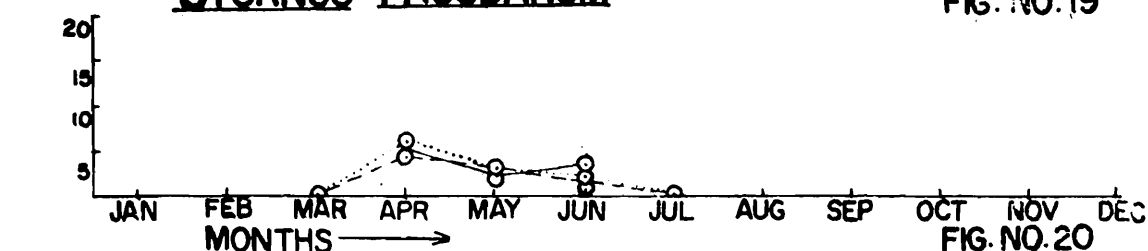
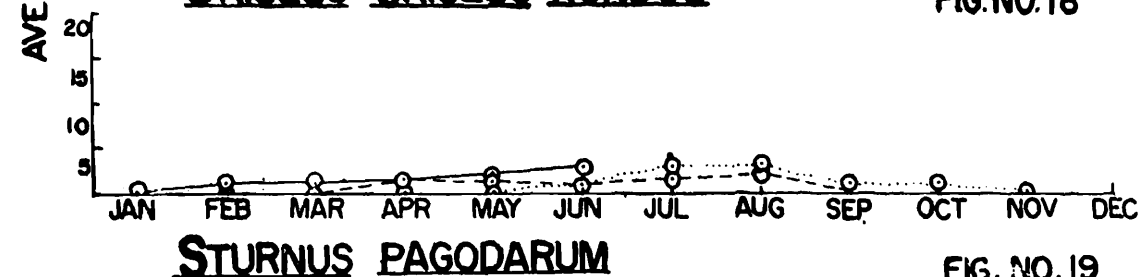
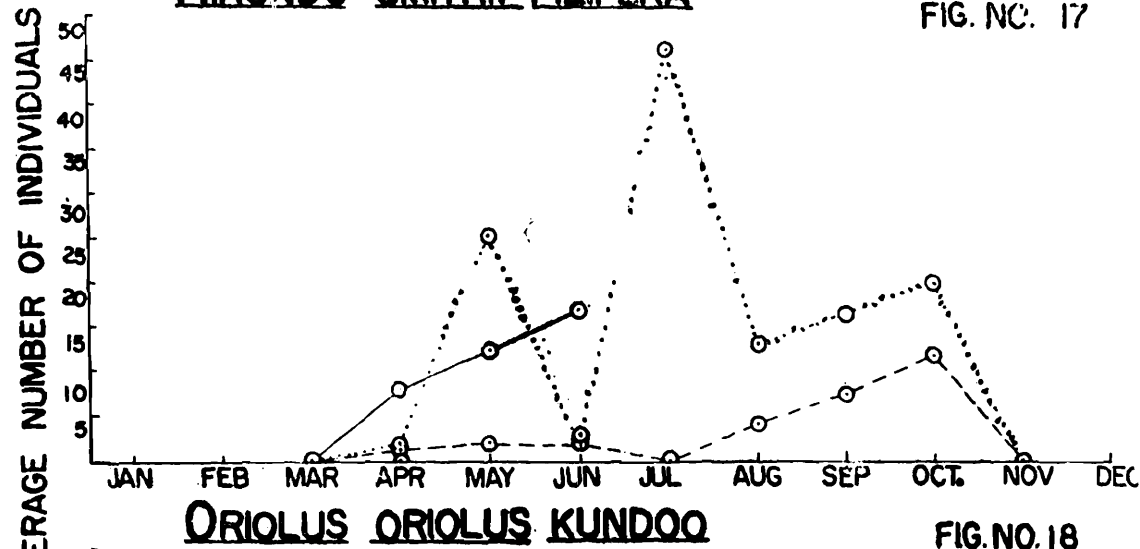
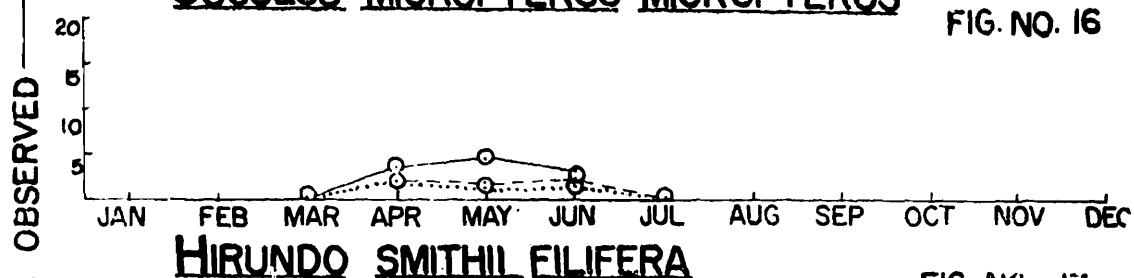
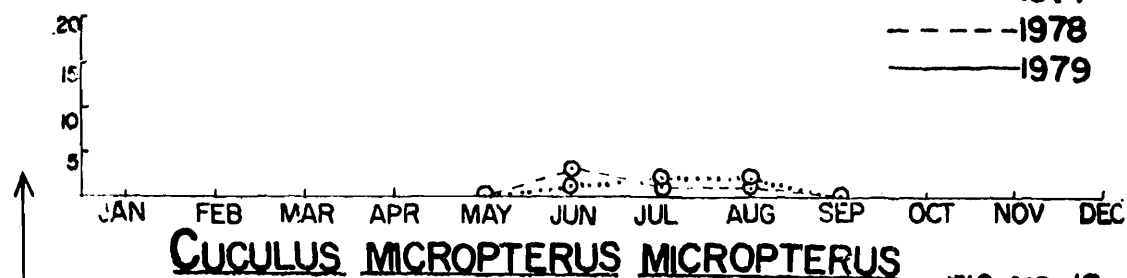
TABLE 17

Observations	Year		
	1977	1978	1979
Date of first observation	6th Apr.	18th Apr.	14th Apr.
Temperature in °C Minimum	18.0	18.0	32.0
Temperature in °C Maximum	29.0	34.0	35.5
Humidity in %	52.6	87.5	78.0
Date of last observation	16th Jun.	20th Jun.	5th Jun.
Temperature in °C Minimum	27.0	24.0	24.0
Temperature in °C Maximum	35.5	25.0	34.0
Humidity in %	92.5	90.0	95.0

CLAMATOR JACOBINUS SERRATUS

PLATE-30

.....1977
 ---1978
 —1979



Status and distribution : Common. A shy bird. More often heard than seen. Frequents the edge of dense forest where it perches on the topmost branches of tall trees. The maximum number of individuals observed in a single day was nine (2nd May, 1979) and minimum was one (17th April, 1977). Monthly average index varied from 1.1 to 4.5 (Plate 30, fig. 17).

Feeding behaviour : Occasionally observed feeding on beetles, insect larvae and caterpillars. On few occasions birds were observed feeding on insects, samples were collected from the patches where the birds were observed feeding, which, later on turned out to be as follows : Beetle : *Oxycetenia albopunctata*, *Lachnosterna* sp. and *Anomela ruficapilla*. Maximum feeding activity was observed at dawn and dusk.

Order : PASSERIFORMES

Family : PITTIDAE

Genus : **Pitta** Vieillot

2. **Pitta sordida cucullata** Hartlaub : Hooded or Greenbreasted Pitta.

Baker, FBI No. 1325, Vol. 3 : 455.

Salim Ali and Ripley, H. B. No. 869, Vol. 4 : 254.

Period of stay : This species arrived in the Park in the 1st half of May when the Fort. Avg. Max. Temp. ranged between 36.6 and 40.7°C and Fort. Avg. Rel. Humd. ranged from 85.8 to 89.9%. The species left the Park in the 1st half of August, when the Fort. Avg. Max. Temp. ranged between 24.5 and 25°C and Fort. Avg. Rel. Humd. ranged between 93.2 and 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 18.

TABLE 18

Observations	Year		
	1977	1978	1979
Date of first observation	4th May	14th May	15th May
Temperature in °C Minimum	17.0	26.0	21.5
Temperature in °C Maximum	43.0	38.0	39.0
Humidity in %	93.0	92.0	80.0
Date of last observation	5th Aug.	4th Aug.	5th Jun.
Temperature in °C Minimum	19.0	22.0	24.0
Temperature in °C Maximum	22.5	25.0	34.0
Humidity in %	94.0	97.0	95.0

Status and distribution : Rare. Occasionally observed in thick bushes or undergrowth along the forest roads, near Dhikala, Khinanauli and Paterpani area. The maximum number of individuals observed in a single day was 11 (22nd May, 1978) and minimum of one on a number of occasions. Monthly average index varied from 1.0 to 7.0 (Plate 32, fig. 27)

Feeding behaviour : Occasionally observed feeding on insect larvae, caterpillars, maggots etc. On two occasions birds were observed feeding on maggots from a dead Spotted deer. *Axis axis axis*. Feeding activity was more at dusk from 1500 hrs. to 1900 hrs.

Family : HIRUNDINIDAE
Genus : **Hirundo** Linnaeus

3. **Hirundo smithii filifera** Stephens : Indian Wiretailed Swallow.

Baker, FBI No. 1157, Vol. 3 : 245.
Salim Ali and Ripley, H. B. No. 921, Vol. 5 : 63.

Period of stay : This species arrived in the Park generally in the 2nd half of April, when the Fort. Avg. Max. Temp. ranged between 31.3 and 37.2°C and Fort. Avg. Rel. Humd. ranged between 71.8 and 88.4%. The species left the Park in the 1st half of October, when the Fort. Avg. Max. Temp. ranged between 22.8 and 23.6°C and Fort. Avg. Rel. Humd. ranged between 69.0 and 70.4%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 19.

TABLE 19

Observations	Year		
	1977	1978	1979
Date of first observation	20th Apr.	11th Apr.	21st Apr.
Temperature in °C Minimum	16.5	19.0	26.5
Temperature in °C Maximum	32.0	34.5	36.5
Humidity in %	92.5	88.2	75.0
Date of last observation	3rd Oct.	9th Oct.	5th Jun.
Temperature in °C Minimum	18.5	15.5	25.5
Temperature in °C Maximum	23.5	20.0	36.0
Humidity in %	70.0	80.0	90.0

Status and distribution : Rare. Mostly observed on telephone or electric wires and on branches of dried-up trees near the rest house, in 'Chaud' and near the lake. The maximum number of individuals observed in a single day was 81 (29th July, 1977) and minimum was one (11th May, 1977). Monthly average index varied from 1.5 to 46.3 (Plate 30, fig. 18).

Feeding behaviour : Observed feeding in 'Chaud' in the lake and Ram Ganga river. Normally observed feeding on winged insects,

beetles, water insects and termites. On a number of occasions samples were collected from the patches of grass where birds were observed feeding. Later on samples were got identified and turned out to be as follows : Beetle : *Mylabris pustulata*, *Cathersius pithecius* and *Anomala ruficapilla*. Termites : *Odontotermes feae*, *Microcerotermes beelsoni*, *Nasutitermes lambai* and *Microtermes unicolor*. Sometimes the birds were observed feeding near patches of water also. Samples collected from those spots were identified as Bugs : *Ranstra filiformis* and *Laccotraphes ruber*. They were often observed catching insect larvae from the surface of water in lake and Ram Ganga river. Very active at dawn and dusk from 0530 to 1000 hrs and 1500 to 1900 hrs.

Family : ORIOLIDAE

Genus : *Oriolus* Linnaeus

4. *Oriolus oriolus kundoo* Sykes : Indian Golden Oriole.

Baker, FBI No. 953, Vol. 3 : 6.

Salim Ali and Ripley, H. B. No. 953, Vol. 5 : 103.

Period of stay : This species arrived in the Park in between 2nd half of February and 1st half of June, when the Fort. Avg. Max. Temp. ranged from 14.8 to 37.2°C and Fort. Avg. Rel. Humd. ranged from 84.5 to 90.3%. The species left the Park in between 1st half of August and 2nd half of October, when the Fort. Avg. Max. Temp. ranged between 22.3 and 24.5°C and Fort. Avg. Rel. Humd. ranged between 68.5 and 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 20.

TABLE 20

Observations	Year		
	1977	1978	1979
Date of first observation	4th Jun.	20th Apr.	23rd Feb.
Temperature in °C Minimum	27.0	26.0	9.5
Temperature in °C Maximum	39.0	30.0	14.5
Humidity in %	89.8	84.2	85.6
Date of last observation	29th Oct.	10th Aug.	3rd Jun.
Temperature in °C Minimum	17.0	22.5	29.0
Temperature in °C Maximum	22.0	26.0	39.0
Humidity in %	72.5	93.0	85.0

Status and distribution : Rare. Normally observed and heard in tall trees at the edge of forest. Occasionally seen in lantana bushes where

it descends, possibly to feed on its berries. The maximum number of individuals observed during a single day was six (31st July, 1977) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 3.3 (Plate 30, fig. 19).

Feeding behaviour : Normally observed feeding on fruits of *Ficus*, *Lantana* and other berries. Occasionally observed feeding on insect larvae, caterpillars, termites and spiders. On a number of occasions birds were observed feeding on the fruits of *Ficus glomerata*, *Ficus bengalensis* and *Ficus plmata*, berries of *Lantana aculeata*, *Lantana camara*. On one occasion it was observed feeding on the fruit of *Zizyphus mauritiana*. On a few occasions birds were observed feeding on the flowers of *Butea monosperma*. Occasionally these birds were observed feeding on termite swarms. Samples collected from these swarms turned out to be *Heterotermes indicola* and *captotermes heimi*. On one occasion a bird was observed feeding on a spider. Feeding activity continue at all hours of the day.

Family : STURNIDAE

Genus : *Sturnus* Linnaeus

5. *Sturnus pagodarum* (Gmelin) : Blackheaded or Brahminy Myna.

Baker, FBI No. 991, Vol. 3 : 47.

Salim Ali and Ripley, H. B. No. 994, Vol. 5 : 160.

Period of stay : This species arrived in the Park in the month of April, when the Fort. Avg. Max. Temp. ranged from 31.3 to 37.2°C and Fort. Avg. Rel. Humd. ranged between 71.8 and 88.4%. It left the Park in 2nd half of June, when the Fort. Avg. Max. Temp. ranged between 28.3 and 33.6°C and Fort. Avg. Rel. Humd. ranged between 86.7 and 92.2%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 21.

TABLE 21

Observations	Year		
	1977	1978	1979
Date of first observation	15th Apr.	10th Apr.	23rd Apr.
Temperature in °C Minimum	22.0	18.0	27.0
Temperature in °C Maximum	33.0	34.0	37.5
Humidity in %	95.6	87.0	72.0
Date of last observation	19th Jun.	21st Jun.	5th Jun.
Temperature in °C Minimum	27.0	23.0	24.0
Temperature in °C Maximum	30.0	26.5	34.0
Humidity in %	95.0	95.0	95.0

Status and distribution : Rare. Occasionally observed on the roadside, trees in the forest, in the ‘Chaud’ and along the lake or river. Also seen on ground in company of Indian Myna (*Acridotheres tristis tristis*) and occasionally of Greyheaded Myna, *Sturnus malabaricus malabaricus*. The maximum number of individuals observed in a single day was 11 (21st April, 1977) and minimum was one (26th June, 1978). Monthly average index varied from 1.5 to 6.2 (Plate 30, fig. 20).

Feeding behaviour : Most of the time birds were observed feeding with *Acridotheres tristis tristis* and *Sturnus malabaricus malabaricus* in ‘Chaud’ in trees and on the bushes. Normally observed feeding on the fruits, berries, flowers, grasshoppers, caterpillars and insect larvae. On a number of occasions birds were observed feeding on the fruits of *Ficus glomerata*, *Ficus pamata*, *Lantana aculeata* and flowers of *Butea monosperma*, *Bombax malabaricum* and *Madhuca indica*. On a few occasions birds were observed feeding on grasshoppers, which were collected from the patches where birds were seen feeding. These were later identified as *Trilophidia annulata* *Pusana rugulosa* and *Stenocatantops splendens*. Maximum feeding activity was observed at dawn and dusk between 0530 hrs to 0830 hrs and 1600 hrs to 1900 hrs.

Family : MUSCICAPIDAE

Genus : **Muscicapa** Brisson

6. **Muscicapa thalassina thalassina** Swainson : Verditer Flycatcher.

Baker, FBI No. 665, Vol. 2 : 239.

Salim Ali and Ripley, H. B. No. 1445, Vol. 7 : 198.

Period of stay : This species arrived in the Park in the month of March, when the Fort. Avg. Max. Temp. ranged between 20.2 and 22.6°C and Fort. Avg. Rel. Humd. ranged between 72 and 92.8%. It left the Park in 1st half of October, when the Fort. Avg. Max. Temp. was recorded 22.8°C and Fort. Avg. Rel. Humd. was recorded 69%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 22.

TABLE 22

Observations	Year	
	1978	1979
Date of first observation	5th Mar.	16th Mar.
Temperature in °C Minimum	16.5	12.0
Temperature in °C Maximum	20.0	18.0
Humidity in %	93.7	80.0
Date of last observation	5th Oct.	12th May
Temperature in °C Minimum	18.0	23.0
Temperature in °C Maximum	23.0	37.0
Humidity in %	65.0	87.5

Status and distribution : Rare. Observed perching on the branches of tree at the edge of forest and in the 'Chaud'. Occasionally seen perching on electric wires. The maximum number of individuals observed during a single day was six (18th March, 1979) and minimum was one (5th March, 1978). Monthly average index varied from 1.0 to 3.5 (Plate 31, fig. 21).

Feeding behaviour : Observed feeding on winged insects, termites, insect larvae and caterpillars. On a few occasions birds were observed feeding on swarming termites. Samples collected from swarms turned out to be as, *Heterotermes indicola*, *Coptotermes heimi* and *Nasutitermes lambai*. On one occasion one bird was observed holding in its beak a butterfly of *Euploea* sp. Although observed feeding at all hours of the day, the maximum activity was seen at dusk between 1500 hrs and 1900 hrs.

Genus : *Terpsiphone* Gloger

7 *Terpsiphone paradisi leucogaster* (Swainson) : West Himalayan Paradise Flycatcher.

Baker, FBI No. 690, Vol. 2 : 268.

Salim Ali and Ripley, H. B. No. 1460, Vol. 7 : 216.

Period of stay : This species arrived in the Park in the 1st half of April, when the Fort. Avg. Max. Temp. ranged between 31.3 and 35.6°C and Fort. Avg. Rel. Humd. ranged between 71.2 and 88.4%. It left the Park in the 1st half of August, when the Fort. Avg. Max. Temp. ranged between 24.5 and 25°C and Fort. Avg. Rel. Humd. ranged between 93.2 and 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 23.

TABLE 23

Observations	Year		
	1977	1978	1979
Date of first observation	8th Apr.	6th Apr.	7th Apr.
Temperature in °C Minimum	18.5	15.0	28.0
Temperature in °C Maximum	35.0	30.0	33.0
Humidity in %	76.4	92.8	70.5
Date of last observation	8th Aug.	8th Aug.	5th Jun.
Temperature in °C Minimum	21.0	23.0	24.0
Temperature in °C Maximum	23.5	24.0	34.0
Humidity in %	90.0	95.0	95.0

Status and distribution : Common. Quite frequently observed flying throughout the Park, in Sal forest, in 'Chaud' and on lantana bushes moving from one branch to another. The maximum number of individuals observed during a single day was 15 (27th April, 1979) and minimum was one (24th April 1977). Monthly average index varied from 1.3 to 8.6 (Plate 31 ; fig. 22).

Feeding behaviour : Normally observed feeding on winged-form of insects, grasshoppers, bugs, beetles, butterflies, and termites. On some occasions it was observed feeding on spiders. Sometime seem to catch insect larvae from the surface of water at water holes. Samples were collected from the patches where birds were observed feeding which later on turned out to be as follows : Grasshopper : *Chrotogonus trachypterus*, *Trilophidis annulata*, *Oxya hyla* ; Beetle : *Oxycetonia elbopunctata*, *Lachnosterna* sp. ; Bug : *Ranatra filiformia*, *Serinetha augur* ; Butterfly : *Danais chrysippus*, *Euplose cora* ; Termite : *Odontotermes feae*, *Coptotermes heimi* and *Microtermes obesi* etc. Maximum feeding activity was observed at dawn and dusk but feeding activity was seen comparatively more in afternoons between 1500 hrs and 1900 hrs.

Genus : *Saxicola* Bechstein

8. *Saxicola caprata bicolor* Sykes : Northern Pied Bush Chat.

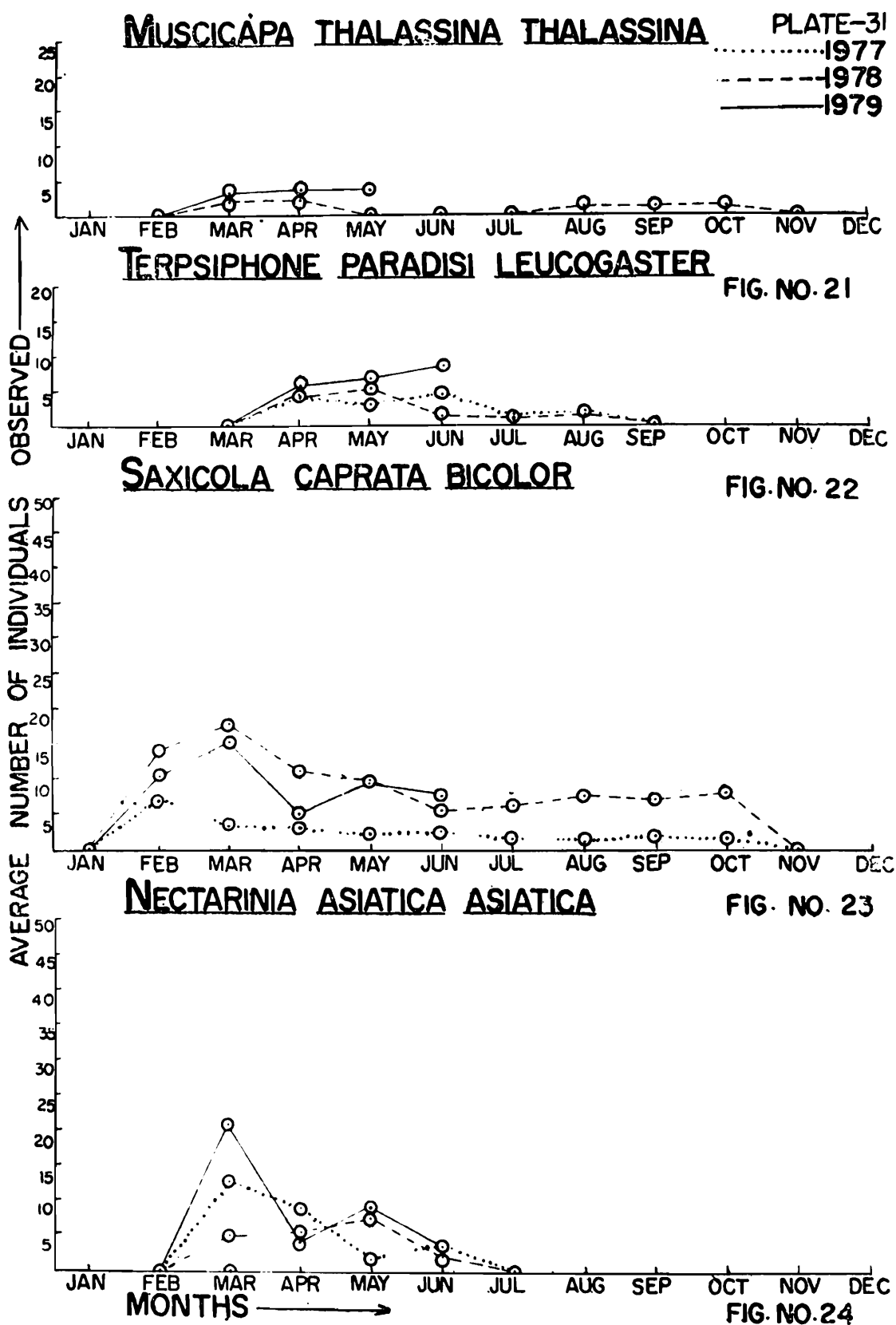
Baker, FBI No. 494, Vol. 2 : 26.

Salim Ali and Ripley, H. B. No. 1700, Vol. 9 : 32.

Period of stay : This species arrived in the Park in the 2nd half of February, when the Fort. Avg. Max. Temp. ranged between 14.8 and 25.9°C and Fort. Avg. Rel. Humd. ranged between 75.5 and 84.9%. It left the Park in the month of October, when the Fort. Avg. Max. Temp. ranged from 22.3 to 22.8°C and Fort. Avg. Rel. Humd. ranged from 68.5 to 69%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 24.

TABLE 24

Observations	Year		
	1977	1978	1979
Date of first observation	25th Feb.	23rd Feb.	16th Feb.
Temperature in °C Minimum	10.0	10.0	12.0
Temperature in °C Maximum	26.5	17.0	16.0
Humidity in %	89.0	70.0	87.5
Date of last observation	31st Oct.	3rd Oct.	5th Jun.
Temperature in °C Minimum	19.0	17.5	24.0
Temperature in °C Maximum	23.5	22.0	34.0
Humidity in %	64.0	70.0	95.0



Status and distribution : Very common. Quite frequently observed throughout the Park, in tall grass, bushes and reeds along the edge of forest and in 'Chaud'. Also frequents the banks of lake and Ram Ganga river where it can be seen perching on dry tree stumps. Also observed near water holes on the lantans bushes. The maximum number of individuals observed during a single day was 38 (7th March, 1978) and minimum was one (8th April, 1977). Monthly average index varied from 1.2 to 17.9 (Plate 31 ; fig. 23).

Feeding behaviour : Quite frequently observed feeding on beetles, grasshoppers, termites, insect larvae and caterpillars etc. Samples of insects collected from the patches of grass and river bank where birds were observed feeding turned out to be as follows : Beetle : *Catharsius pithecius*, *Coccinalla septempunctata*. Grasshopper : *Gryllotalpa fossor*, *Soathosternum prassiniferum*, *Stenocutantopa splendens* and *Trilophidia annulata*. Termite : *Odontotarmes guptai*, *Odontotarmes gurdespurensis*, *Coptotermes heimi* and *Microcarotermes beelsoni*. Observed feeding at all hours of the day but more active at dawn from 1500 hrs to 1900 hrs.

Family : NECTARINIIDAE

Genus : *Nectarinia* Illiger

9. *Nectarinia asiatica asiatica* (Latham) : Indian Purple Sunbird.

Baker, FBI No. 1278, Vol. 3 : 396.

Salim Ali and Ripley, H. B. No. 1917, Vol. 10 : 35.

Period of stay : This species arrived in the Park in the 1st half of March, when the Fort. Avg. Max. Temp. ranged from 18.9 to 29.3°C and Fort. Avg. Rel. Humd. ranged from 80.8 to 92.8%. The species left the Park generally in the 2nd half of June, when the Fort. Avg. Max. Temp. ranged from 28.3 to 33.6°C and Fort. Avg. Rel. Humd. ranged from 86.7 to 92%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 25.

TABLE 25

Observations	Year		
	1977	1978	1979
Date of first observation	15th Mar.	4th Mar.	16th Mar.
Temperature in °C Minimum	16.0	16.0	14.0
Temperature in °C Maximum	32.5	20.0	19.0
Humidity in %	83.3	93.7	85.0
Date of last observation	17th Jun.	21st Jun.	5th Jun.
Temperature in °C Minimum	28.5	23.0	24.0
Temperature in °C Maximum	34.0	26.5	34.0
Humidity in %	89.6	95.0	95.0

Status and distribution : Common. Frequently observed on flowering trees, bushes and at the edge of forest, in the compound of rest house and on top of lantana bushes. The maximum number of individuals observed in a single day was 54 (26th March, 1979) and minimum was one (30th April, 1977). Monthly average index varied from 1.8 to 20.8 (Plate 31 ; fig. 24).

Feeding behaviour : Normally observed feeding in flowering trees, on bushes near the forest roads and in 'Chaud'. Observed feeding on flowers, fruits, berries, insect larvae, bugs and caterpillars. On a number of occasions birds were observed feeding on fruits and berries of *Ficus glomerata*, *Ficus plmata*, *Lantana aculeata*, the nectar, fleshy petals of the flowers of *Butea monosperma*, and on the buds of *Ptilostigma malabaricum*, *Bombax malabaricum* and *Madhuca indica* also. On a few occasions observed feeding on insect larvae and caterpillars also. Samples of bugs were collected from the patches where birds were observed feeding which later on turned out to be of *Phypopetta gutta* and *Serinatha augur* species. Although some birds were observed feeding at all hours of the day but maximum feeding activity was observed at dawn and dusk between 0500 hrs to 1000 hrs and 1500 hrs to 1900 hrs.

C. Passage Migrants

Order : CICONIIFORMES

Family : THRESKIORNITHIDAE

Genus : *Plegadis* Kaup

1. *Plegadis falcinellus falcinellus* (Linnaeus) : Glossy Ibis.

Baker, FBI No. 2206, Vol. 6 : 318

Salim Ali and Ripley, H. B. No. 71, Vol. 1 : 114.

Period of Stay : This species was observed only twice in three years time. For the first time two birds were observed flying over the lake near Dhikala (20th December, 1976) when the maximum and minimum temperature was recorded 19 and 5°C respectively and humidity was recorded 90.9%. On the second occasion two individuals were observed near Khinanauli road on the bank of Ram Ganga river (22nd December, 1976) when the maximum and minimum temperature was recorded 21.0 and 9.0°C and humidity was recorded 84.6%. In the 2nd half of December, 1976 the Fort. Avg. Max. Temp. was recorded 19.4°C and Fort. Avg. Rel. Humd. was recorded 85%.

Status and distribution : Very rare, observed only twice in three years time near Khinanauli road on the bank of Ram Ganga river and flying over the lake.

Feeding behaviour : Known to feed on molluscs, crustaceans, worms, insects, tadpoles and small frogs. In the Park feeding behaviour could not be observed.

Order : ANSERIFORMES
Family : ANATIDAE
Genus : Anser Brisson

2. **Anser indicus** (Latham) : Barheaded Goose.

Baker, FBI No. 2258, Vol. 6 : 405.

Salim Ali and Ripley, H. B. No. 82, Vol. 1 : 131.

Period of stay : This species arrived in the Park in the 1st half of April, when the Fort. Avg. Max. Temp. ranged between 31.3 and 33.6°C and Fort. Avg. Rel. Humd. ranged between 71.2 and 88.4%. It left the Park in the 2nd half of April, when the Fort. Avg. Max. Temp. ranged between 33.5 and 37.2°C and Fort. Avg. Rel. Humd. ranged between 71.8 and 87.5%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 26.

TABLE 26

Observations	Year	
	1978	1979
Date of first observation	9th Apr.	6th Apr.
Temperature in °C Minimum	18.0	28.0
Temperature in °C Maximum	33.5	33.0
Humidity in %	88.2	70.5
Date of last observation	27th Apr	21st Apr.
Temperature in °C Minimum	19.0	26.5
Temperature in °C Maximum	34.0	36.5
Humidity in %	89.0	75.5

Status and distribution : Common. Frequently observed 30 to 50 metres outside the receding shoreline of the lake on comparatively dry mudflats. Maximum number of individuals observed during a single day was eight (20th April, 1979) and minimum was two 29th April, 1978). The average number of individuals observed was 4.0 in 1978 and 6.0 in 1979.

Feeding behaviour : Normally observed resting during day hours. On few occasions at dusk after 1700 hrs birds were observed feeding on the shoots and leaves of plants present in the mudflats and along the shoreline. These plants were collected and later identified as follows : *Panicum ramosum*, *Fimbristylis squarrosa*, *Glinus lotoides* and *Solanum nigrum*.

Genus : *Aythya* Boie3. *Aythya marila marila* (Linnaeus) : Scaup Duck.

Baker, FBI No. 2282, Vol. 6 : 456.

Salim Ali and Ripley, H. B. No. 112, Vol. 1 : 187.

Period of stay : This species arrived in the Park in the 1st half of January, when the Fort. Avg. Max. Temp. ranged from 13.8 to 19.5°C and Fort. Avg. Rel. Humd. ranged from 76.5 to 79.9%. It left the Park in 2nd half of January, when the Fort. Avg. Rel. Humd. ranged from 13.8 to 21.3°C and Fort. Avg. Rel. Humd. ranged from 83.8 to 86.1%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 27.

TABLE 27

Observations	Year		
	1977	1978	1979
Date of first observation	13th Jan.	1st Jan.	13th Jan.
Temperature in °C Minimum	5.0	9.0	11.0
Temperature in °C Maximum	20.0	19.5	16.0
Humidity in %	88.8	80.0	82.5
Date of last observation	28th Jan.	18th Jan.	26th Jan.
Temperature in °C Minimum	3.5	9.0	10.0
Temperature in °C Maximum	15.0	22.0	16.0
Humidity in %	50.0	85.7	80.0

Status and distribution : Rare. Occasionally observed swimming in the Ram Ganga river and 30 to 50 metre inside the receding shoreline of the lake. The maximum number of individuals observed in a single day was 75 (28th January, 1977 and 1st January, 1978) and minimum was two (18th January, 1979). Monthly average index was 30.6, 38.4 and 40.0 in 1977, 1978 and 1979 respectively.

Feeding behaviour : Known to feed on animal and vegetable matter. But in the Park individuals were observed feeding only on two occasions along the receding shoreline on shoots and leaves of plants present along the shoreline. Plant samples were collected from the patches where birds were observed feeding turned out to be *Panicum ramosum*, *Solanum nigrium* and *Glinus lotoides*. Feeding activity on both the occasions observed at dusk between 1700 hrs and 1830 hrs.

Order : FALCONIFORMES

Family : FALCONIDAE

Genus : **Falco** Linnaeus4. **Falco vespertinus amurensis** Radde : Eastern Redlegged Falcon.*Baker, FBI No. 1739, Vol. 5 : 58.**Salim Ali and Ripley, H. B. No. 220, Vol. 1 : 361.*

Period of stay : This species arrived in the Park in 2nd half of October, when the Fort. Avg. Max. Temp. was recorded 22.3°C and Fort. Avg. Rel. Humd. was recorded 68.5%. It left the Park in the 1st half of November when the Fort. Avg. Max. Temp. was recorded 26.8°C and Fort. Avg. Rel. Humd. was recorded 91.5%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 28.

Status and distribution : Very rare. Observed only four times in three years. The birds were observed hawking insects over the 'Chaud' or in tall trees, near machan No. 3 (as called locally) near Dhikala. Rarely the birds were observed to land on ground. The maximum number of individuals observed in a single day was 300 (1st and 2nd November, 1977) and minimum was five (29th October, 1977). Monthly average was 127.5 and 300.0 in October and November, 1977 respectively.

Feeding behaviour : Insects being hawked in the air could not be determined. Beetles and grasshoppers collected from patches of grasses near machan No. 3 where the birds landed occasionally to feed turned out to be as Beetle : *Cathasius pithecius*, *Anomala ruficapilla*, *Oxycetonia albonunctata*, *Mylabris pustulata* etc. Grasshopper : *Trilophidia annulata*, *Pusana rugulose*, *Oxya hyla*, *Stenocatantops splendens* and *Tylotropidius varicornis* etc. On two occasion few birds were observed holding insect larvae in their beak. Feeding activity was observed at dawn and dusk between 0800 hrs to 1100 hrs and 1600 hrs to 1830 hrs.

TABLE 28

Observation	Year 1977
Date of first observation	29th Oct.
Temperature in °C Minimum	17.0
Temperature in °C Maximum	22.0
Humidity in %	72.5
Date of last observation	2nd Nov.
Temperature in °C Minimum	22.5
Temperature in °C Maximum	27.0
Humidity in %	90.0

5. *Falco tinnunculus tinnunculus* Linnaeus : European Kestrel.

Baker, FBI No. 1740, Vol. 5 : 61.

Salim Ali and Ripley, H. B. No. 222, Vol. 1 : 365.

Period of stay : This species arrived in the Park between 2nd half of February and 1st half of March, when the Fort Avg. Max. Tem. ranged from 15.8 to 25.9°C and Fort. Avg. Rel Humd. ranged from 75.5 to 92.8%. The actual dates on which birds were first observed along with the relevant meteorological data and number of individuals observed are given in Table 29.

TABLE 29

Observations	Year		
	1977	1978	1979
Date of observation	21st Feb.	9th Mar.	23rd Feb.
Temperature in °C Minimum	8.0	13.0	10.0
Temperature in °C Maximum	26.0	20.0	17.0
Humidity in %	87.5	93.7	70.0
No. of individuals	1	2	5

Status and distribution : Very rare. Observed only three times in a three year period. On all the three occasion birds were observed in Dhikala 'Chaud'.

Feeding behaviour : Known to feed on insects, frogs, lizards, small rodents and occasionally on nestling or small birds. In the Park only on one occasion a bird was seen carrying a small lizard in its claws.

Order : GRUIFORMES

Family : RALLIDAE

Genus : **Porphyrio** Brisson

6. *Porphyrio porphyrio poliocephalus* (Latham) : Indian Purple Moorhen.

Baker, FBI No. 2028, Vol. 6 : 32.

Salim Ali and Ripley, H. B. No. 349, Vol. 2 : 178.

Period of stay : This species arrived in the Park in 1st half of December, when the Fort. Avg. Max. Temp. was recorded 13.4°C and Fort. Avg. Rel. Humd. was recorded 80.1%. It left the Park in the 2nd half of December when the Fort. Avg. Max. Temp. was recorded 13.7°C

and Fort. Avg. Rel. Humd. was recorded 78%. The actual dates on which birds were first and last observed along with the relevant meteorological data given in Table 30.

TABLE 30

Observations	Year
	1978
Date of first observation	7th Dec.
Temperature in °C Minimum	6.0
Temperature in °C Maximum	11.5
Humidity in%	75.0
Date of last observation	18th Dec.
Temperature in °C Minimum	9.0
Temperature in °C Maximum	13.0
Humidity in%	81.0

Status and distribution : Very rare. Occasionally observed near the lake 30 to 50 metre outside the receding shoreline in grasses. The maximum number of individuals observed in a single day was three (18th December, 1978) and minimum was one (7th and 9th December, 1978). Monthly average for December 1978 was 1.7.

Feeding behaviour : Known to feed of seeds, grasses, vegetable matter, insects and molluscs. Feeding behaviour could not be observed in the Park.

Order : CHARADRIIFORMES

Family : RECURVIROSTRIDAE

Genus : *Recurvirostra* Linnaeus

7. *Recurvirostra avosetta* Linnaeus : Avocet.

Baker, FBI No. 2131, Vol. 6 : 195.

Salim Ali and Ripley, H. B. No. 432, Vol. 2 : 332.

Period of stay : This species arrived in the Park in 1st half of April, when the Fort. Avg. Max. Temp. ranged from 31.3 to 33.6°C and Fort. Avg. Rel. Humd. ranged from 71.2 to 88.4%. It left the Park in the 2nd half of April, when the Fort. Avg. Max. Temp. ranged from 33.5 to 37.5°C and Fort. Avg. Rel. Humd. ranged between 71.8 and 87.4%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 31.

Status and distribution : Common. Frequently observed near the lake 30 to 50 metre outside the shoreline on mudflats and flying over the lake and along the Ram Ganga river. The maximum number of individuals observed in a single day was 42 (21st April, 1978) and minimum was 20 (17th April, 1979). Monthly average was 32.8 and 28.3 in year 1978 and 1979 respectively.

Feeding behaviour : Observed feeding near the lake outside the shoreline on mudflats, observed to feed on molluscs, grasshoppers, beetles and insect larvae etc. On a few occasions smaples of animals were collected from the patches where the birds were observed feeding, these turned out to be : Molluscs : *Lymmaea* sp., *Viparus* sp. Beetle : *Cybister tripunctatus*, *Gryllus domesticus* etc. Maximum feeding was observed at dawn and dusk between 0500 hrs to 0800 hrs and 1700 hrs to 1930 hrs.

TABLE 31

Observations	Year	
	1978	1979
Date of first observation	9th Apr.	6th Apr.
Temperature in °C Minimum	18.0	28.0
Temperature in °C Maximum	33.5	33.0
Humidity in %	88.2	70.5
Date of last observation	23rd Apr.	19th Apr.
Temperature in °C Minimum	20.0	25.0
Temperature in °C Maximum	31.0	35.5
Humidity in %	85.7	78.0

Family : LARIDAE

Genus : *Larus* Linnaeus

8. *Larus brunnicephalus* Jerdon : Brownheaded Gull.

Baker, FBI No. 2062, Vol. 6 : 103.

Salim Ali and Ripley, H. B. No. 454, Vol. 3 : 31.

Period of stay : This species arrived in the Park in 1st half of April, when the Fort. Avg. Max. Temp. was recorded 35.6°C and Fort. Avg. Rel. Humd. was recorded 79.7%. It left the Park in the 2nd half of May, when the Fort. Avg. Max. Temp. was recorded 38.3°C and Fort. Avg. Rel. Humd. was recorded 82.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 32.

Status and distribution : Very rare. Birds were observed only on two occasion in three years. On both occasion birds were observed in the afternoon, sitting on mudflats near the receding shoreline of the lake. Maximum number of individuals observed in a single day was 20 (3rd April, 1977) and Minimum was five (25th May, 1977). Monthly average in April, 1977 was 20.0 and in May, 1977 was 5.0.

TABLE 32

Observations	Year 1977
Date of first observation	3rd Apr.
Temperature in °C Minimum	16.0
Temperature in °C Maximum	39.0
Humidity in %	80.0
Date of last observation	25th May
Temperature in °C Minimum	27.0
Temperature in °C Maximum	41.0
Humidity in %	75.0

Feeding behaviour : Known to feed on fishes, prawns, insects, grubs, slugs, earthworms and shoots of various crops. In the Park observed feeding on one occasion on *Tor* sp. of fish. Some birds were observed feeding on shoots of vegetation present along the shoreline which were later on identified as *Glinus lotoides* and *Solanum nigrum*. Feeding activity was observed between 1500 hrs and 1900 hrs.

Order : COLUMBIFORMES

Family : COLUMBIDAE

Genus : **Treron** Vieillot

9. *Treron sphenura sphenura* (Vigors) : Kokla or Wedgetailed Green Pigeon.

Baker, FBI No. 1841, Vol. 5 : 200.

Salim Ali and Ripley, H. B. No. 494, Vol. 3 : 96.

Period of stay : This species was observed only twice in three years time. For the first time two birds were observed near Khinanauli road (17th January, 1977) when the Min. and Max. Temp. was recorded 4.5 and 19.5°C respectively and Humd. was recorded 75%. On the second occasion three birds were observed perching on a branch of dead tree near Ram Ganga river (24th January, 1977), when the Min. Max. Temp. was recorded 10.5 and 18.0°C respectively and Humd. was

recorded 95.4%. Fort. Avg. Max. Temp. in 2nd half of January, 1977 was recorded 17.9°C and Fort. Avg. Rel. Humd. was recorded as 85.3%.

Status and distribution : Very rare. Observed only twice in three years time on one occasion near Khinanauli road and on another occasion perching on the branch of dead tree near Ram Ganga river. Maximum number of birds observed in a single day was three (24th January, 1977) and minimum was two (17th January, 1977).

Feeding behaviour : Known to feed on drupes, berries, etc. In the Park feeding behaviour could not be observed.

Order : PSITTACIFORMES

Family : PSITTACIDAE

Genus : *Psittacula* Cuvier

10. *Psittacula alexandri fasciata* (P. L. S. Muller) : Indian Redbreasted Parakeet.

Baker, FBI No. 1508, Vol. 4 : 210.

Salim Ali and Ripley, H. B. No. 551, Vol. 3 : 172.

Period of stay : This species was observed only on one occasion in three years time on (4th February, 1977), when the Min. Max. Temp. was recorded as 8.5 and 18.5°C respectively and Humd. was recorded 82.6%. In the 1st half of February, 1977 when birds were observed Fort. Avg. Max. Temp. was recorded as 20.9°C and Fort. Avg. Rel. Humd. was recorded as 81.4%.

Status and distribution : Very rare. Only once (morning 4th February, 1977) in three years, eleven individuals of this species were seen perching in a *Ficus* tree in the compound of the forest rest house of Khinanauli.

Feeding behaviour : Known to feed on wild fruits, leaf, buds, fleshy petals and nectar etc. When observed at forest rest house Khinanauli the troupe was busy feeding on the buds of *Ficus cunia*.

Order : CUCULIFORMES

Family : CUCULIDAE

Genus : *Clamator* Kaup

11. *Clamator jacobinus serratus* (Sparrman) : Pied Crested Cuckoo.

Baker, FBI No. 1472, Vol. 4 : 167.

Salim Ali and Ripley, H. B. No. 570, Vol. 3 : 194.

Period of stay : This species arrived in the Park generally in the 2nd half of June, when the Fort. Avg. Max. Temp. ranged from 28.3

to 36.4°C and Fort. Avg. Rel. Humd. ranged from 86.6 to 92%. It left the Park in 1st half of August when the Fort. Avg. Max. Temp. ranged from 24.5 and 25°C and Fort. Avg. Rel. Humd. ranged from 93.2 to 95.3%. The actual dates on which birds were first and last observed along with the relevent meteorological data are given in Table 33.

Status and distribution : Rare. Occasionally observed in 'Chaud' in bushes, branches of trees at the edge of forest and sometime on ground also. Maximum number of individuals observed in a single day was three (19th June, 1978) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 3.0 (Plate 30, fig. 16).

TABLE 33

Observations	Year		
	1977	1978	1979
Date of first observation	17th Jun.	19th Jun.	3rd Jun.
Temperature in °C Minimum	28.5	25.2	29.0
Temperature in °C Maximum	34.5	28.5	39.0
Humidity in %	89.6	85.0	85.0
Date of last observation	5th Aug.	2nd Aug.	5th Jun.
Temperature in °C Minimum	19.0	21.0	24.0
Temperature in °C Maximum	22.5	23.0	34.0
Humidity in %	94.0	97.0	95.0

Feeding behaviour : Mostly observed feeding in 'Chaud' and in the bushes at the edge of forest. Observed feeding on bugs, beetles, flying termites and caterpillars. Samples collected from the patches where birds were observed feeding turned out to be as follows : Beetle : *Cathersius pithecius*, *Anomala ruficapillo*, Bug : *Anoplocnsmis phasina*, *Dalpada* sp. On a few occasions birds were observed feeding on swarming termites. Samples were collected and identified as : *Heterotermes indicola*, *Microcerotermes beelsoni* and *Microtermes obesi*. Feeding activity was observed at dawn and dusk between 0600 hrs to 0800 hrs and 1600 hrs to 1900 hrs.

Order : PASSERIFORMES

Family : STURNIDAE

Genus : *Sturnus* Linnaeus

12. *Sturnus vulgaris poltaratskyi* Finsch : Finsch's or Common Indian Starling.

Baker, FBI No. 976, Vol. 3 : 34.

Salim Ali and Ripley, H. B. No. 997, Vol. 5 : 166.

Period of stay : This species arrived in the Park in the 1st half of December, when the Fort. Avg. Max. Temp. ranged from 13.4 to

15.1°C and Fort. Avg. Rel. Humd. ranged from 78.9 to 80.1%. Again it appeared in the Park in 2nd half of February, when the Fort. Avg. Max. Temp. ranged from 14.8 to 15.8°C and Fort. Avg. Rel. Humd. ranged from 75.5 to 84.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 34.

Status and distribution : Very rare. Occasionally observed near Dhikala, Khinanauli and Paterpani on the lantana bushes and branches of tree and at the edge of the forest. The maximum number of individuals observed in a single day was 5 (23rd February, 1977) and minimum was 2 (1st December, 1977). Monthly average index varied from 2.0 to 3.5.

Feeding behaviour : Observed feeding on berries, grasshoppers and caterpillars. Occasionally observed feeding on grasshoppers. Samples were collected from the patches where birds were observed feeding. On identification these turned out to be : *Trilophidia annulata*, *Stenocatantops splendens* and *Gryllotalpa fossor*. on two occasion birds were observed feeding on the berries of *Zizyphus jujuba* and *Lantana aculeata*. Maximum feeding activity was observed in the morning hours between 0800 hrs and 1100 hrs.

TABLE 34

Observations	Year	
	1977-78	1978-79
Date of first observation	1st Dec., 1977	13th Dec., 1978
Temperature in °C Minimum	13.5	10.0
Temperature in °C Maximum	17.5	17.0
Humidity in %	72.5	82.5
Date of last observation	24th Feb., 1978	25th Feb., 1979
Temperature in °C Minimum	10.0	9.0
Temperature in °C Maximum	17.0	16.0
Humidity in %	72.5	82.0

D. Altitudinal Migrants

Order : CICONIIFORMES

Family : ARDEIDAE

Genus : **Bubulcus** Bonaparte

1. **Bubulcus ibis coromandus** (Boddaert) : Cattle Egret.

Baker, FBI No. 2226, Vol. 6 : 349.

Salim Ali and Ripley, H. B. No. 44, Vol. 1 : 66.

Period of stay : This species arrived in the Park in the 1st half of December, when the Fort. Avg. Max. Temp. ranged from 13.4 to

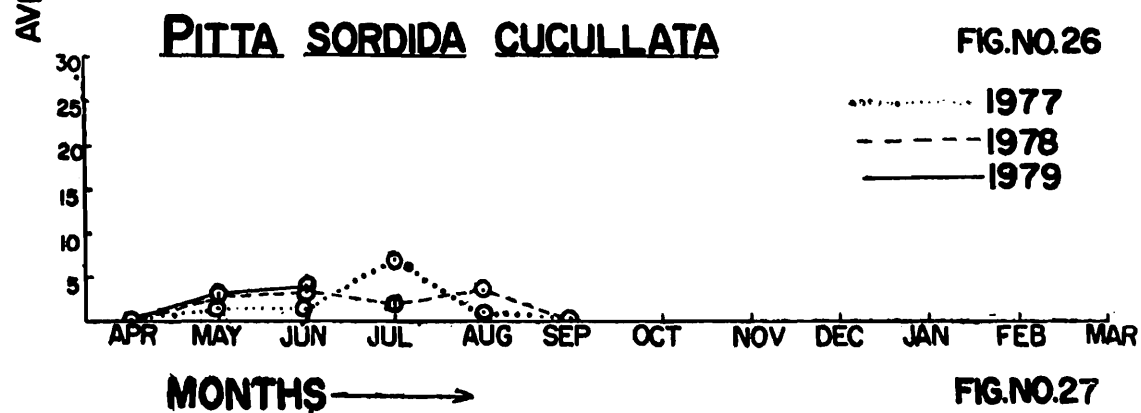
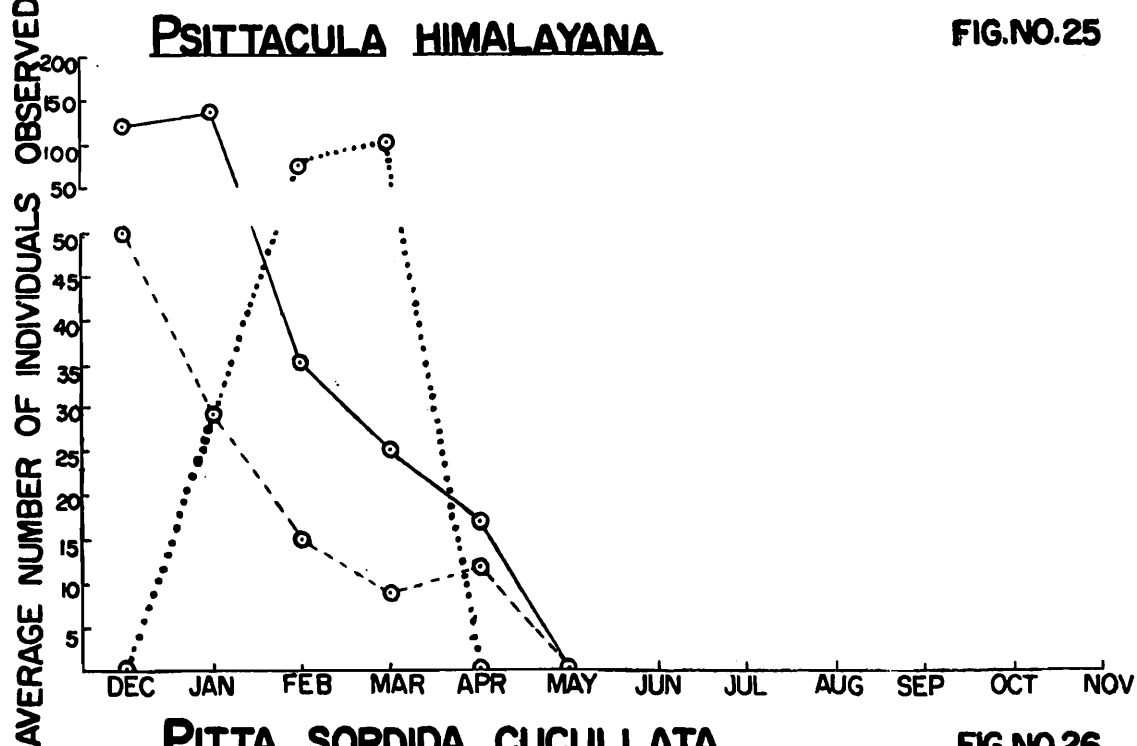
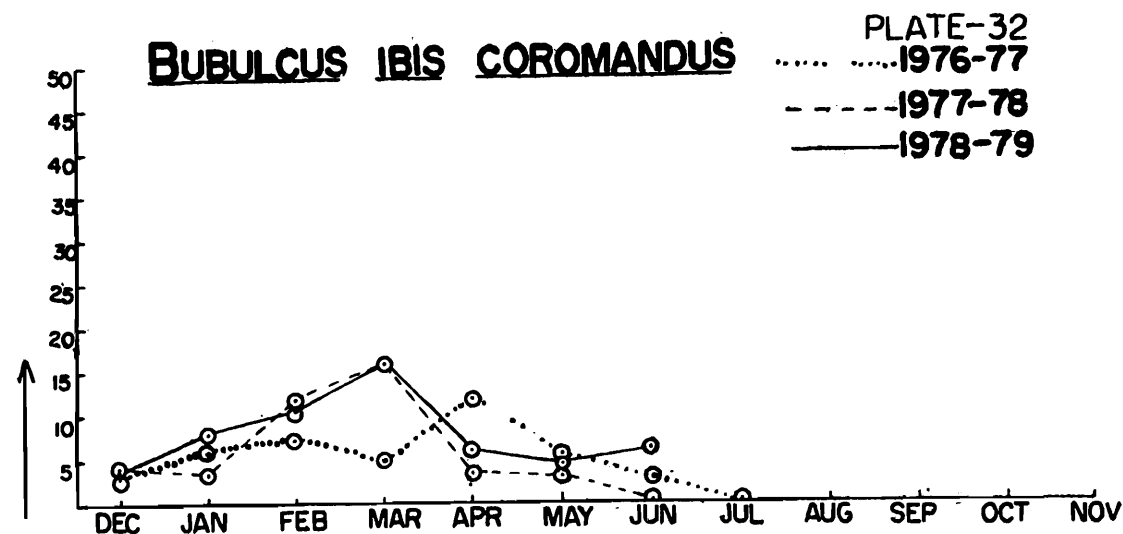
15.1°C and Fort. Avg. Rel. Humd. ranged between 78.9 and 80.1%. The species left the Park in between 2nd half of May and 2nd half of June, when the Fort. Avg. Max. Temp. ranged from 33.6 to 36.6°C and Fort. Avg. Rel. Humd. ranged between 66.3 and 92.0%. The actual dates on which birds were first and last observed along with the relevent meteorological data are given in Table 35.

TABLE 35

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	18th Dec. 1976	1st Dec. 1977	7th Dec. 1978
Temperature in °C Minimum	4.5	13.5	6.0
Temperature in °C Maximum	18.5	17.5	11.5
Humidity in%	87.5	72.5	75.0
Date of last observation	16th Jun. 1977	19th May 1978	5th Jun., 1979
Temperature in °C Minimum	27.0	22.0	24.0
Temperature in °C Maximum	35.5	41.5	34.0
Humidity in%	92.5	79.1	95.0

Status and distribution : Common. Frequently observed on the banks of Ram Ganga river and outside the receding shoreline of lake on mudflats. Flocks were observed flying over the river and lake. Sometime birds were observed standing in shallow water in the river and also perching on tree tops of dry tree stumps near the lake and river. The maximum number of individuals observed in a single day was 41 (7th March, 1978) and minimum was one on a number of occasions. Monthly average index varied from 3.0 to 16.3 (Plate 32, fig. 25).

Feeding behaviour : Most of the time observed feeding in small grass, on river banks and mudflats of receding shoreline of the lake. Frequently observed feeding on fish, frogs, lizards, beetles, grasshoppers, insect larvae and caterpillars. On a number of occasions remains retrieved from feeding birds turned out to be that of Lizard : *Calotes versicolor*, *Riopa punctata*, Frog : *Rana cynophlyctis*. These birds were also observed (through binocular) feeding on *Barilius bola* and *Naemacheilus* sp.. On a few occasions they were observed feeding on insects too. Samples of insects were collected from the patches of grass and riverbed, where these birds were seen feeding turned out to be as follows : Beetle : *Catharsius pithecius*, *Cybister tripunctatus* Grasshopper : *Trilophidia annulata*, *Pusana rugulosa* and *Stenocatantops splendens* etc. Some individuals can be seen feeding at all hours of the day although the bulk of the population indulges in feeding activity in early mornings and late afternoons.



Order : FALCONIFORMES

Family : ACCIPITRIDAE

Genus : *Aegypius* Savigny

2. *Aegypius monachus* (Linnaeus) : Cinereous Vulture.

Baker, FBI No. 1705, Vol. 5 : 7.

Salim Ali and Ripley, H. B. No. 179, Vol. 1 : 298.

Period of stay : This species was observed only twice in three years time. For the first time three birds were observed in December, 1978,

when the Fort. Avg. Max. Temp. recorded was 13.4°C and Fort. Avg. Rel. Humd. was recorded 80.1%. The second occasion when this species was observed was in March, 1979, when the Fort. Avg. Max. Temp. was recorded 22.6°C and Fort, Avg. Rel. Humd. recorded was 72%. The actual dates on which birds were observed along with the relevant meteorological data and number of individuals are given in Table 36.

TABLE 36

Observations	Year	
	1978	1979
Date of observation	6th Dec.	20th Mar.
Temperature in °C Minimum	6.0	15.0
Temperature in °C Maximum	12.0	22.0
Humidity in %	77.5	65.0
Number of individuals	3	2

Status and distribution : Very rare. Observed only twice in three years time. Once observed feeding on the Tiger's Kill (Wild Boar) on the bank of Ram Ganga river near 'Awala Sot'. On the second occasion they were seen perched on a dead tree near the bank.

Feeding behaviour : At one occasion it was observed feeding on a dead *Sus scrofa cristatus* (Wild Boar) killed by a tiger in the company of the Whitebacked vultures and king vultures.

Genus : *Gypaetus* Storr

3. *Gypaetus barbatus aureus* (Hablizl) : Himalayan Bearded Vulture or Lammergeier.

Baker, FBI No. 1716, Vol. 5 : 26.

Salim Ali and Ripley, H. B. No. 188, Vol. 1 : 314.

Period of stay : This species was observed in the Park only once in three years time. Three specimens were seen on 19th of January, 1977 perching in the branches of a dead tree. On the date of observation minimum temperature was recorded 9.0°C and maximum temperature was recorded 17.5°C. The relative humidity on 19th January was recorded 90%. In the second half of January when this species was observed Fort. Avg. Max. Temp. was recorded 17.9°C and Fort. Avg. Rel. Humd. was recorded 85.3%.

Status and distribution : Very rare. Observed only once in three years study period. Three birds were seen perched on a dead tree on Thandi Sarak near Dhikala.

Feeding behaviour : Known to feed on carrion and pieces of bone, wayside animal carcasses and refuse dumps in company with Griffons and Ravens. In the Park feeding behaviour could not be observed.

Order : CHARADRIIFORMES

Family : CHARADRIIDAE

Genus : **Scolopax** Linnaeus

4. **Scolopax rusticola rusticola** Linnaeus : Woodcock.

Baker, FBI No. 2167, Vol. 6 : 252.

Salim Ali and Ripley, H. B. No. 411, Vol. 2 : 292.

Period of stay : This species was observed only once during the three years study period, only two birds were seen moving in the vegetation on river bank, (25th December, 1977). Minimum temperature recorded on that day was 10.0°C and maximum temperature recorded was 20°C and relative humidity was 95.4%. The Fort. Avg. Max. Temp. in 1st half of December, 1977 was recorded 15.7°C and Fort. Avg. Rel. Humd. was recorded 82.6%.

Status and distribution : Very rare. Only on one occasion two birds were noticed moving in the vegetation on the river bank near the Anwla Sot.

Feeding behaviour : Known to feed on worms and grubs, occasionally on seeds and shoots of plants. In the Park feeding behaviour could not be observed.

Order : PSITTACIFORMES

Family : PSITTACIDAE

Genus : **Psittacula** Cuvier

5. **Psittacula himalayana** (Lesson) : Himalayan Slatyheaded Parakeet.

Baker, FBI No. 1504, Vol. 4 : 206.

Salim Ali and Ripley, H. B. No. 562, Vol. 3 : 183.

Period of stay : This species arrived in the Park in the 2nd half of December, when the Fort. Avg. Max. Temp. ranged from 13.7 to 15.7°C and Fort. Avg. Rel. Humd. ranged between 78.0 and 82.6%. The species left the Park in 2nd half of April when the Fort. Avg. Max. Temp. ranged from 33.5 to 37.2°C and Fort. Avg. Rel. Humd. ranged between 71.8 and 87.5%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 37.

TABLE 37

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observations	7th Feb. 1977	20th Dec. 1977	16th Dec., 1978
Temperature in °C Minimum	3.0	11.0	10.0
Temperature in °C Maximum	19.0	15.0	15.0
Humidity in %	88.8	74.0	82.0
Date of last observation	16th Apr. 1977	20th Apr. 1978	21st Apr. 1979
Temperature in °C Minimum	16.0	26.0	26.5
Temperature in °C Maximum	32.0	30.0	36.5
Humidity in %	65.2	84.2	75.5

Status and distribution : Rare. Occasionally flocks of 75 to 250 individuals were observed flying over 'Chaud' headed for forest, or perching in trees at the edge of forest near Khinanauli road and 'Thandi Sarak' near Dhikala. The maximum number of individuals observed in a single day was 250 (18th January, 1979) and minimum was one (23rd January, 1978). Monthly average index varied from 9.0 to 137.5 (Plate 32, fig. 26).

Feeding behaviour : Mostly observed feeding on seeds of *Dalbergia sisso* (Sheeshum), buds, flowers and fruits of *Piliostigma malabaricum*, *Bombax malabaricum*, *Butea monosperma*, *Ficus bengalensis*, *Ficus glomerata*, *Ficus plmata* and *Ficus religiosa*. Feeding activity was observed at all hours of the day but more active at dawn and dusk between 0800 hrs to 1100 hrs and 1500 hrs to 1800 hrs.

Order : PICIFORMES

Family : PICIDAE

Genus : **Hypopicus** Bonaparte

6. **Hypopicus hyperythrus** (Hartert) : Rufousbellied Woodpecker.

Baker, FBI No. 1359, Vol. 4 : 31.

Salim Ali and Ripley, H. B. No. 832, Vol. 4 : 211.

Period of stay : This species arrived in the Park in the month of December, when the Fort. Avg. Max. Temp. ranged from 15.1 to 19.4°C and Fort. Avg. Rel. Humd. ranged between 78.9 and 85%. The species left the Park in between 1st half of February and 1st half of March, when the Fort. Avg. Max. Temp. ranged from 20.2 to 20.9°C and Fort. Avg. Rel. Humd. ranged between 81.4 and 92.8%. In year 1978-79 species was observed once in 1st half of February when the Fort. Avg.

Max. Temp. was recorded 13.0°C and Fort. Avg. Rel. Humd. recorded was 88.4%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 38.

TABLE 38

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	27th Dec., 1976	3rd Dec., 1977	4th Feb., 1979
Temperature in °C Minimum	8.0	12.5	10.5
Temperature in °C Maximum	20.5	21.5	16.0
Humidity in %	76.9	75.0	75.0
Date of last observation	4th Feb., 1977	8th Mar., 1978	—*
Temperature in °C Minimum	8.5	16.5	—*
Temperature in °C Maximum	18.5	20.5	—*
Humidity in %	82.6	90.9	—*

—* not observed/recorded.

Status and distribution : Very rare. Occasionally observed on trees like *Dalbargia sisso* (Sheeshum) and *Shorea robusta* (Sal), on Khinanauli road and in 'Sheeshum island'. The Minimum or maximum number of individuals observed in a single day was one.

Feeding behaviour : Known to be feeding on ants, grubs, beetles and white butterflies. In the park as it is a very rare species observed feeding on insect larvae only on one occasion in the afternoon.

Order : PASSERIFORMES

Family : MUSCICAPIDAE

Genus : *Rhyacornis* Blanford

7. *Rhyacornis fuliginosus fuliginosus* (Vigors) : Plumbeous Redstart.

Baker, FBI No. 535, Vol. 2 : 81.

Salim Ali and Ripley, H. B. No. 1679. Vol. 8 : 266.

Period of stay : This species arrived in the park in the month of October, when the Fort. Avg. Max. Temp. ranged from 22.3 to 25.5°C and Fort. Avg. Rel. Humd. was ranged between 62 and 68.5%. The species left the park in between 2nd half of April, and 1st half of May, when the Fort. Avg. Max. Temp. ranged from 33.5 to 40.7°C and Fort. Avg. Rel. Humd. ranged between 85.8 and 87.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 39,

RHYACORNIS FULIGINOSUS FULIGINOSUS

PLATE-33

.....1976-77

---1977-78

—1978-79

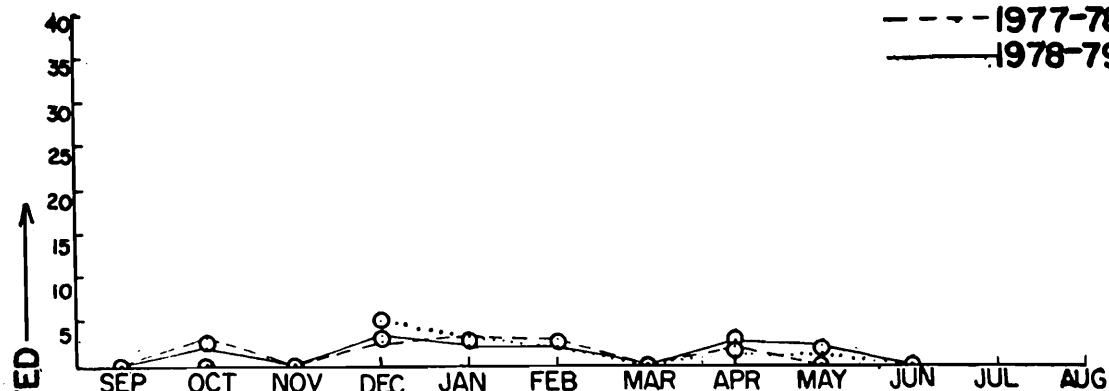
CHAIMARRORNIS LEUCOCEPHALUS

FIG. NO. 28

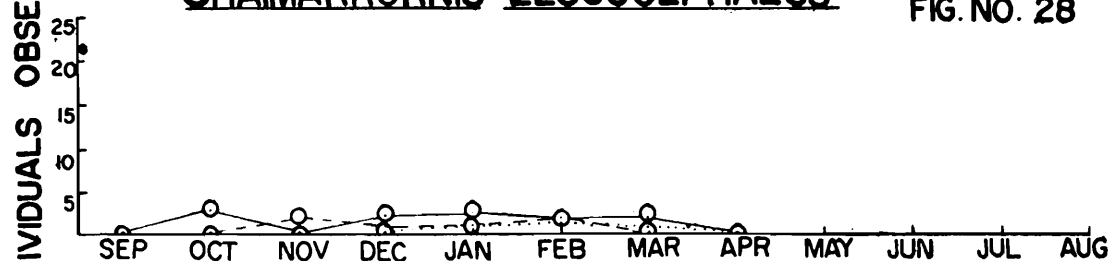
MYIOPHONUS CAERULEUS TEMMINCKII

FIG. NO. 29

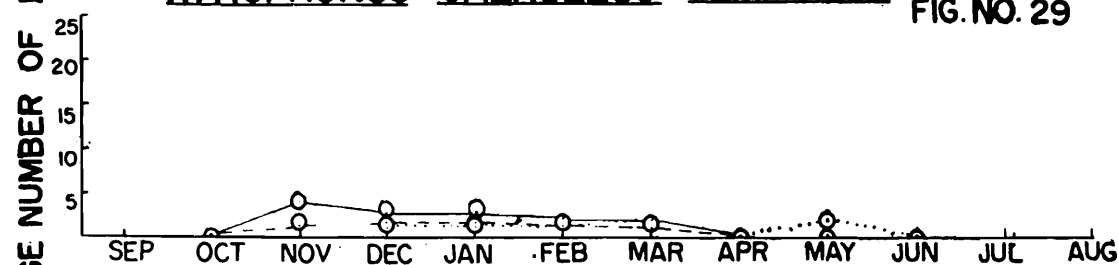
MELOPHUS LATHAMI

FIG. NO. 30

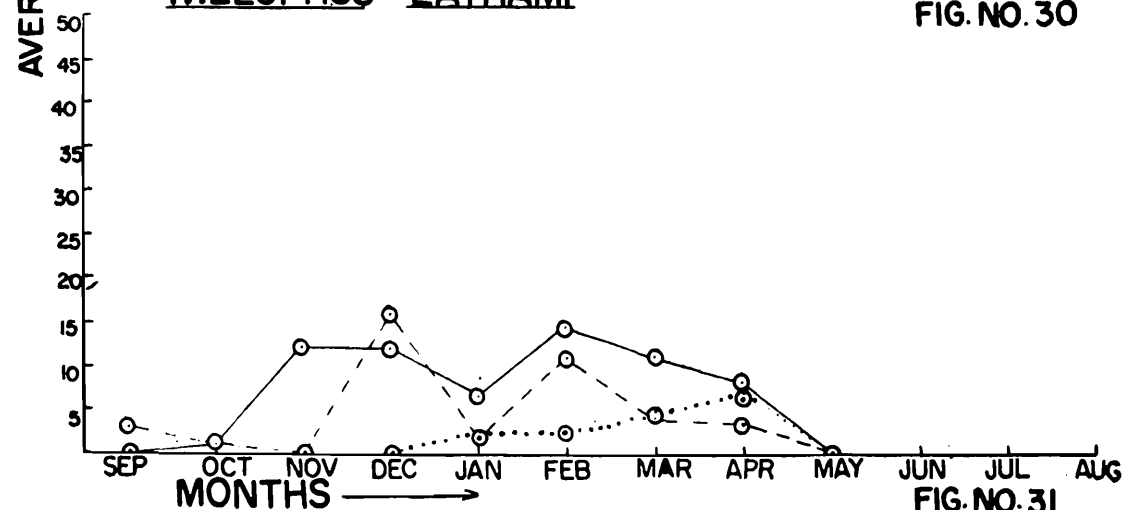


FIG. NO. 31

Status and distribution : Rare. Occasionally observed perching on bushes etc. On the bank of Ram Ganga river, or on boulders in the riverbed or the receding shoreline of lake on mudflats. The maximum number of individuals observed in a single day was six (15th January, 1978) and minimum was one (11th April, 1977). Monthly average index varied from 1.0 to 5.0 (Plate 33 : fig. 28).

TABLE 39

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	26th Dec., 1976	27th Dec., 1977	6th Oct., 1978
Temperature in °C Minimum	9.5	19.5	17.0
Temperature in °C Maximum	20.5	21.5	26.0
Humidity in%	90.0	75.0	67.0
Date of last observation	4th May., 1977	20th Apr., 1978	15th May, 1979
Temperature in °C Minimum	17.0	26.0	21.5
Temperature in °C Maximum	43.0	30.0	39.9
Humidity in%	93.0	84.2	80.0

Feeding behaviour : Mostly feeding activity was observed on the banks and riverbed of Ram Ganga river, and near receding shoreline of lake on mudflats. Observed feeding on grasshoppers, bugs, beetles and occasionally on berries. From the patches where birds were observed feeding insect samples were collected which later on turned out to be as follows : Grasshopper : *Gryllotalpa fossor* and *Gryllus domesticus*. Bug : *Heleocoris ovatus*, *Ranatra filiformis* and *ptilomera laticaudata*. Beetle : *Cybister tripunctatus* etc. On two occasions birds were observed feeding on berries of *Zizyphus mauritiana*. It was noticed that feeding activity continues well from the dusk to dark.

Genus : Chaimarrornis Hodgson

8. Chaimarrornis leucocephalus (Vigors) : Whitecapped Redstart or River Chat.

Baker, FBI No. 534, Vol. 2 : 79.

Salim Ali and Ripley, H. B. No. 1716, Vol. 9 : 57.

Period of stay : This species arrived in the park in between 1st half of October and 1st half of November, when the Fort. Avg. Mag. Temp. ranged from 22.8 to 26.8°C and Fort. Avg. Rel. Humd. ranged between 69 and 91.5%. The species left the park in between 1st half of February and 2nd half of March, when the fort. Avg. Max. Temp. ranged from 21.4 to 32°C and Fort. Avg. Rel. Humd. was ranged between 72 and 88.9%. The actual dates on which birds were first and last observed along with the meteorological data are given in Table 40.

Status and distribution : Rare. Occasionally observed perching on boulders on the bank or bed of Ram Ganga river and mudflats of the lake. The maximum number of individuals observed in a single day was four (17th January, 1979) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 3.0 (Plate 33 : fig. 29).

TABLE 40

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	29th Jan., 1977	1st Nov., 1977	6th Oct., 1978
Temperature in °C Minimum	2.5	22.0	16.5
Temperature in °C Maximum	16.5	26.5	21.5
Humidity in %	75.0	93.0	75.0
Date of last observation	24th Mar., 1977	12th Feb., 1978	18th Mar., 1979
Temperature in °C Minimum	16.0	13.0	14.0
Temperature in °C Maximum	34.0	20.0	20.5
Humidity in %	90.3	82.3	70.0

Feeding behaviour : Feeding was observed mostly on the banks of Ram Ganga river, and outside the lake on mudflats. During day hours birds were observed resting on boulders. Observed feeding on grasshoppers, bugs, insect larvae and occasionally on berries. On a number of occasions birds were observed feeding on grasshoppers and bugs. Samples of insects were collected from the patches where birds were observed feeding. These insects turned out to be as follows : Grasshopper : *Trilpphida annulata*, *Spathesternum prasiniferum*. Bug : *Laccotrepes ruber*, *Ptilomera leticaudata* etc. On one occasion birds were observed feeding on the berries of *Zizuphus mauritiana*. Maximum feeding activity was observed from 1500 to 1830 hrs.

Genus : *Myiophonus* Temminck

9. *Myiophonus caeruleus temminckii* (Vigors) : Himalayan Whistling Thrush.

Baker, FBI No. 614, Vol. 2 : 180.

Salim Ali and Ripley, H. B. No. 1729. Vol. 9 : 79.

Period of stay : This species arrived in the park in the month of November, when the Fort. Avg. Max. Temp. ranged from 21.6 to 26.8°C and Fort. Avg. Rel. Humd. ranged between 80.0 and 91.5%. The species left the park generally in the month of March, when the Fort. Avg. Max. Temp. ranged from 22.6 to 25.3°C and Fort. Avg. Rel. Humd. ranged between 72 and 89.4%. In year 1976-77 species left the park in the 1st half of May. The actual dates on which birds were first and last observed along with the relevant meteorological data are given below in Table 41.

TABLE 41

Observations	Year		
	1976-77	1977-78	1978-79
Date of First observation	13th Dec., 1976	2nd Nov., 1977	29th Nov., 1978
Temperature in °C Minimum	5.0	22.5	18.0
Temperature in °C Maximum	18.0	27.0	23.0
Humidity in %	82.4	90.0	75.0
Date of last observation	5th May, 1977	20th Mar., 1978	27th Mar., 1979
Temperature in °C Minimum	18.0	17.0	15.0
Temperature in °C Maximum	43.5	21.0	20.5
Humidity in %	88.0	91.4	80.0

Status and distribution : Common. Frequently observed throughout the park on the roads passing through the dense forest near Dhikala and Patarpani and on the banks of river Ram Ganga. The maximum number of individuals observed in a single day was five (8th and 11th December, 1978) and minimum was on a number of occasions. Monthly average index varied from 1.0 to 4.0 (Plate 33 : Fig. 30).

Feeding behaviour : Normally observed feeding on the roads passing through dense forest, 'Chaud' and on the bank of Ram Ganga river. Observed feeding on worms, molluscs, aquatic insects, larvae and caterpillars. On few occasions birds were observed feeding on molluscs and insects, samples were collected from the patches where birds observed feeding which later on turned out to be as follows : Mollusc : *Melenoides* sp. *Indoplsnorbis* sp. and *Lymmaea* sp. Bug : *Ranatra filiformia*, *Heleocoria ovatus* Beetle : *Catharsius pithecius*, *Anomala ruficapilla*, *Cybister tripunctatus*. On a few occasions birds were observed feeding on the berries of *Zyzyphus mauritiana*, *Zizyphus jujuba* and *Lantana aculeata*. On two occasions birds were observed feeding on the egg of *Caprimulgus indicus hazarae*. Feeding activity continue well from the dusk to too dark.

Family : EMBERIZIDAE

Genus : **Melophus** Swainson

10. **Melophus lathami** (Gray) : Crested Bunting.

Baker, FBI No. 1132. Vol. 3 : 221.

Salim Ali and Ripley, H. B. No. 2060, Vol. 10 : 232.

Period of stay : This species arrived in the park in between the 2nd half of September and 1st half of October, when the Fort. Avg. Max. Temp. ranged from 22.8 to 27.1°C and Fort. Avg. Rel. Humd.

ranged between 69 and 71.0%. The species left the park generally in the 2nd half of April, when the Fort. Avg. Max. Temp. ranged from 33.5 to 37.2°C and Fort. Avg. Rel. Humd. ranged between 7.18 to 7.5%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table-42.

TABLE 42

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	13th Jan., 1977	29th Sep., 1977	2nd Oct., 1978
Temperature in °C Minimum	5.0	23.5	19.5
Temperature in °C Maximum	20.0	27.0	25.5
Humidity in %	88.8	72.0	62.0
Date of last observation	2nd Apr., 1977	28th Apr., 1978	24th Apr., 1979
Temperature in °C Minimum	16.0	21.0	28.5
Temperature in °C Maximum	38.0	36.0	39.0
Humidity in %	90.0	88.0	68.0

Status and distribution : Rare. Occasionally observed in gresslands near Dhikala, Paterpani, Khinanauli and elsewhere in the park. The maximum number of individuals observed in a single day was 129 (16th December, 1977) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 14.5 (Plate 33 : fig. 31).

Feeding behaviour : Observed feeding on ground in or near the 'Chaud'. Occasionally observed feeding on seeds of grass which were collected and identified later on turned out to be of the following species. Grass growing in and recorded for Dhikala 'Chaud'. *Heteropogon contortus*, *Imperata cylindrica*, *Saccharum bengalensis*, *Saccharum munja*, *Saccharum spontaneum*, *Seteria* sp., *Thermeda arundinacea* and *Vetiveria zizanioides*. Maximum feeding activity was observed in late evenings from 1500 hrs to 1900 hrs.

E. Local Migrants

Order : PELECANIFORMES

Family : PHALACROCORACIDAE

Genus : *Phalacrocorax* Brisson

1. *Phalacrocorax carbo sinensis* (Shaw) : Large Cormorant.

Baker, FBI No. 2180, Vol. 6 : 277.

Salim Ali and Ripley, H. B. No. 26, Vol. 1 : 37.

Period of stay : This species arrived in the park in the 1st half of December, when the Fort. Avg. Max. Temp. ranged from 13.4 to

15.1°C and Fort. Avg. Rel. Humd. ranged from 78.9 to 80.1%. The species left the park in the first half of March, when the Fort. Avg. Max. Temp. ranged from 18.9 to 20.2°C and Fort. Avg. Rel. Humd. ranged from 80.8 to 92.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 43.

TABLE 43

Observations	Year	
	1977-78	1978-79
Date of first observation	4th Dec., 1977	6th Dec., 1978
Temperature in °C Minimum	12.0	6.0
Temperature in °C Maximum	17.0	12.0
Humidity in %	75.0	77.5
Date of last observation	11th Mar., 1978	14th Mar., 1979
Temperature in °C Minimum	15.5	14.0
Temperature in °C Maximum	21.0	21.0
Humidity in %	93.3	75.0

Status and distribution : Rare. Although this species is resident of the Himalayan foothills contiguous to the park but it appears to be a local migrant in the park and moves according to the water conditions and availability of food. It was usually observed near the lake and Ram Ganga river 30 to 50 metres in or outside along the shoreline. The maximum number of individuals observed during a single day was 250 (18th March, 1977) and minimum was one (31st January, 1978). Monthly average index varied from 3.0 to 158.3 (Plate 34; fig. 32).

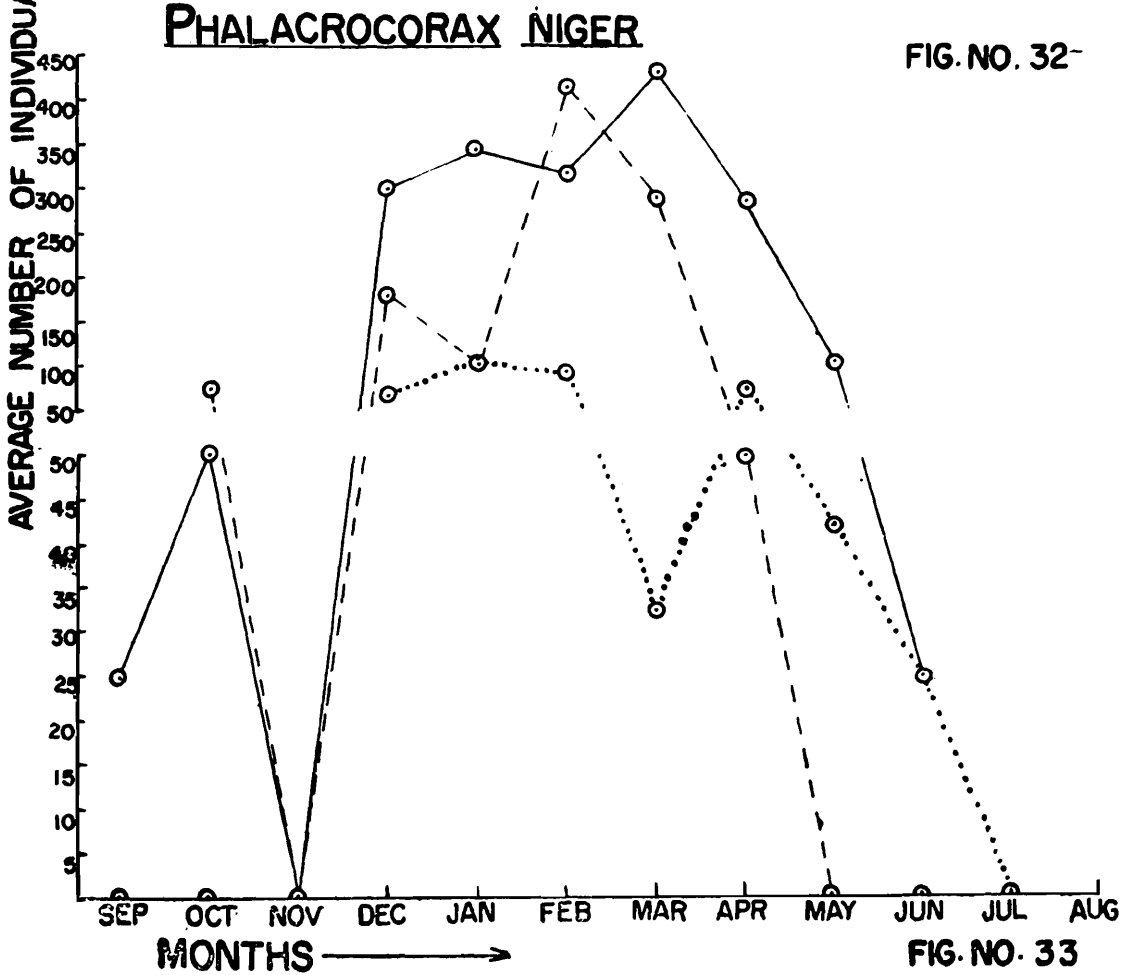
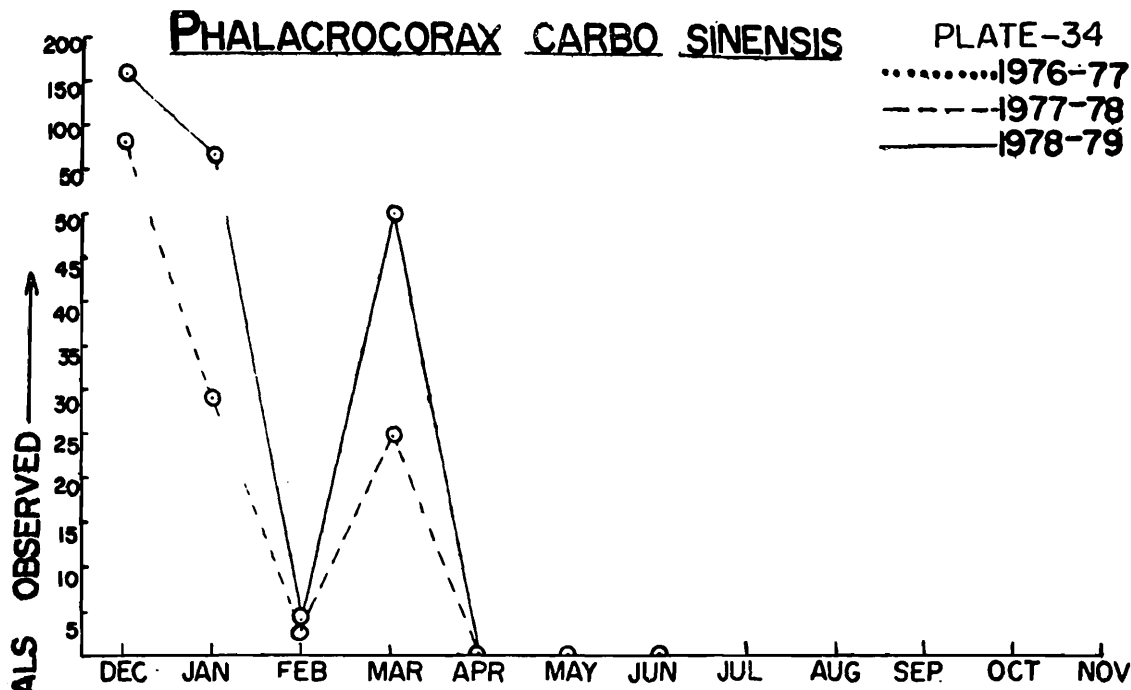
Feeding behaviour : During day hours birds were observed resting on the banks of Ram Ganga river. Feeding was observed mostly in the lake and river. On a number of occasion birds were observed (through binocular) feeding on *Barilius* sp. and *Tor* sp., maximum feeding activity was observed at dawn and dusk between 0700 hrs to 1000 hrs and 1500 hrs to 1800 hrs.

2. *Phalacrocorax niger* (Vieillot) : Little Cormorant.

Baker, FBI No. 2182, Vol. 6 : 280.

Salim Ali and Ripley, H. B. No. 28, Vol. 1 : 41.

Period of stay : This species arrived in the park in between 2nd half of September and 2nd half of October, when the Fort. Avg. Max. Temp. ranged from 22.3 to 26.6°C and Fort. Avg. Rel. Humd.



ranged from 68.5 to 71.4%. It left the park in between 2nd half of April and 2nd half of June, when the Fort. Avg. Max. Temp. ranged from 33.5 to 33.6°C and Fort. Avg. Rel. Humd. ranged from 87.5 to 92%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 44.

Status and distribution : Very common. Although this species is resident of the Himalayan foothills contiguous to the park but it

appears to be a local migrant in the park and moves according to water and food conditions. It was observed near the lake and Ram Ganga river 30 to 50 metre inside and outside along the shoreline, occasional roosts comprising of more than 800 birds were observed in partially submerged sheeshum islands, generally within 30 metres of the shoreline. The maximum number of individuals observed in a single day was 850 (7th February, 1978) and minimum was three (19th December, 1976). Monthly average index varied from 430.0 to 25.0 (Plate 34 ; fig. 33).

TABLE 44

Observations	Years		
	1976-77	1977-78	1978-79
Date of first observation	19th Dec., 1976	28th Oct., 1977	27th Sep., 1978
Temperature in °C Minimum	5.0	19.5	23.0
Temperature in °C Maximum	18.0	21.5	26.0
Humidity in %	81.8	65.0	80.0
Date of last observation	16th Jun., 1977	16th Apr., 1978	6th Jun., 1979
Temperature in °C Minimum	27.0	22.5	24.0
Temperature in °C Maximum	35.5	35.5	34.0
Humidity in %	92.5	90.5	90.0

Feeding behaviour : Mostly observed feeding in the lake and deeper pools in the Ram Ganga river. On a number of occasions birds were observed (through binocular) feeding on *Tor* sp. and *Barilius* sp. on few occasions birds were observed feeding on *Rana* sp. too. Apparently not enough food was available inside the park for such a large population as large flocks were observed leaving the lake area an hour after sunrise for an Easterly destination and returning back to their roosts an hour before sunset from westerly direction. Maximum feeding activity was observed at dawn and dusk between 0600 hrs to 0800 hrs and 1600 hrs to 1800 hrs.

Genus : *Anhinga* Brisson

3. *Anhinga rufa melanogaster* Pennant : Darter or Snake-bird.

Baker, FBI No. 2183, Vol. 6 : 282.

Salim Ali and Ripley, H. B. No. 29, Vol. 1 : 43.

Period of stay : This species was first observed in the park in the month of January, when the Fort. Avg. Max. Temp. ranged from 13.8 to 21.3°C and Fort. Avg. Rel. Humd. ranged from 76.5 to 86.1%. It was last observed in the park in 2nd half of December, when the

Fort. Avg. Max. Temp. ranged from 13.7 to 15.7°C and Fort. Avg. Rel. Humd. was ranged between 78.0 to 82.6%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 45.

TABLE 45

Observations	Year		
	1977	1978	1979
Date of first observation	3rd Jan.,	23rd Jan.,	1st Jan.,
Temperature in °C Minimum	4.0	9.0	8.0
Temperature in °C Maximum	18.0	21.0	13.5
Humidity in %	83.3	92.5	75.0
Date of last observation	31st Dec.,	27th Dec.,	5th Jun.,
Temperature in °C Minimum	9.0	8.0	24.0
Temperature in °C Maximum	18.0	12.0	34.0
Humidity in %	87.5	75.0	95.0

Status and distribution : Common. Commonly observed swimming inside the lake or resting on the branches of dry trees. While resting spread its wing, while swimming whole body remains inside water only neck comes out which gives an impression of snake. The maximum number of individuals observed in a single day was 50 (28th February, 1979) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 36.2 (Plate 35 ; fig. 34).

Feeding behaviour : Normally observed feeding on fish. During day hours birds were observed resting. On a number of occasions birds were observed (through binocular) holding *Barilius* sp. in its beak. On other occasion birds were observed feeding on small fishes but it could not be possible to identify that species from distance. Maximum feeding activity was observed between 0600 hrs to 1100 hrs and 1500 hrs to 1900 hrs.

Order : CICONIIFORMES

Family : ARDEIDAE

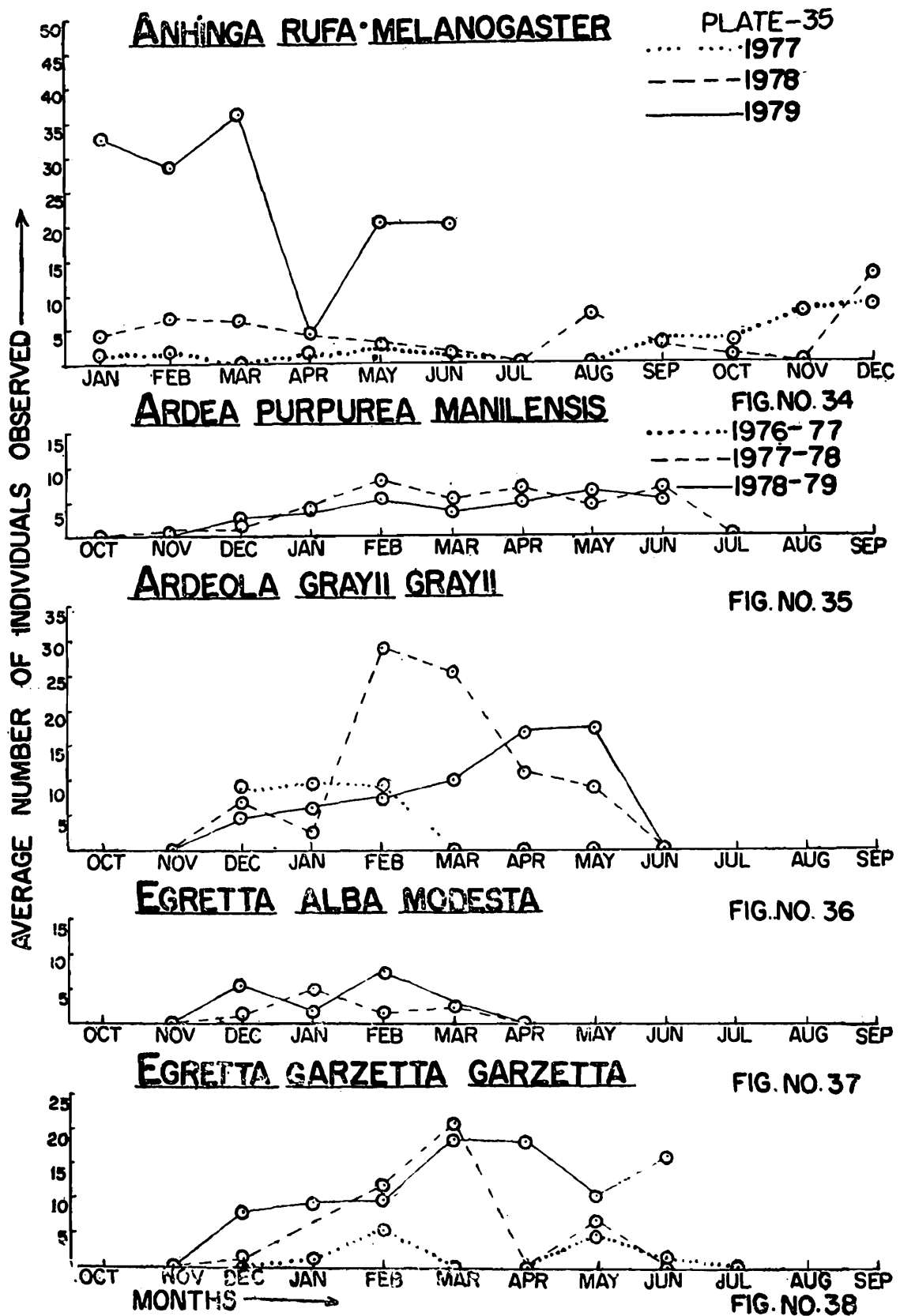
Genus : *Ardea* Linnaeus

4. *Ardea purpurea manilensis* Meyen : Eastern Purple Heron.

Baker, FBI No. 2216, Vol. 6 : 337.

Salim Ali and Ripley, H. B. No. 37, Vol. 1 : 57.

Period of stay : This species arrived in the park in between 1st half of November and 1st half of December, when the Fort. Avg. Max. Temp.



ranged from 13.4 to 26.8°C and Fort. Avg. Rel. Humd. ranged from 80.1 to 91.5%. The species left the park in 2nd half of June, when the Fort. Avg. Max. Temp. ranged from 28.3 to 36.4°C and Fort. Avg. Rel. Humd. ranged from 86.7 to 89.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 46.

TABLE 46

Observations	Year	
	1977-78	1978-79
Date of first observation	1st Nov., 1977	5th Dec., 1978
Temperature in °C Minimum	22.0	5.5
Temperature in °C Maximum	26.5	11.5
Humidity in %	93.0	77.5
Date of last observation	16th Jun., 1978	5th Jun., 1979
Temperature in °C Minimum	26.5	24.0
Temperature in °C Maximum	32.0	34.0
Humidity in %	80.0	95.0

Status and distribution : Rare. Occasionally observed near the lake 30 to 50 metres outside the receding shoreline, near reedy swamps and sometime on the top of dry trees standing near the lake. The maximum number of individuals observed in a single day was 10 (2nd February, 1978) and minimum was one (1st November, 1977). Monthly average index varied from 1.0 to 8.2 (Plate 35 ; fig. 35).

Feeding behaviour : Observed feeding near the receding shoreline of the lake near reedy swamps. Observed feeding on fish, frogs, aquatic insects, molluscs and small rodents. On few occasions birds were observed feeding on insects and molluscs. Samples were collected from the areas where birds were observed feeding. Those turned out to be as follows : Mollusc : *Lymnaea* sp. *Viparus* sp. Beetles : *Cybister tripunctatus* and Bug : *Ranatra filiformis*, *Ptilomara laticaudata* etc. On few occasions birds were observed feeding (through binocular) on Fish : *Barilius bola*, *Tor tor*, *Mastacembelus* sp. On one occasion birds were observed feeding on *Rana tigerina*. Maximum feeding activity was observed at dawn and dusk between 0600 hrs to 0800 hrs and 1600 hrs to till too dark.

Genus : *Ardeola* Boie

5. *Ardeola grayii grayii* (Sykes) : Indian Pond Heron or Paddybird.

Baker, FBI No. 2229, Vol., 6 : 354.

Salim Ali and Ripley, H. B. No. 42, Vol. 1 : 63.

Period of stay : This species arrived in the park in the 1st half of December, when the Fort. Avg. Max. Temp. ranged from 13.4 to 15.1°C and Fort. Avg. Rel. Humd. ranged from 78.9 to 80.1%. Species left the park in the 2nd half of May, when the Fort. Avg. Max. Temp. ranged from 36.3 to 36.6°C and Fort. Avg. Rel. Humd. ranged from 66.3 to 81%. In year 1977 species left the park in 2nd half of

February, when the Fort. Avg. Max. Temp. was recorded as 25.9°C and Fort. Avg. Rel. Humd. recorded was 84.9%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 47.

TABLE 47

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	22nd Dec., 1976	1st Dec., 1977	7th Dec., 1978
Temperature in °C Minimum	9.0	13.5	6.0
Temperature in °C Maximum	21.0	17.5	11.5
Humidity in%	84.6	72.5	72.0
Date of last observation	25th Feb., 1977	24th May, 1978	16th May, 1979
Temperature in °C Minimum	10.0	27.5	22.5
Temperature in °C Maximum	26.5	33.0	38.0
Humidity in%	89.0	60.0	80.0

Status and distribution : Common. Frequently observed near the lake and the Ram Ganga river, 30 to 50 metre outside along the shoreline. During day hour birds were observed resting on dry trees tops near the lake. At dusk flocks were observed flying towards the edge of forest near the Mota sal for roosting. The maximum number of individuals observed in a single day was 74 (8th February, 1978) and minimum was one (21st January, 1979). Monthly average index varied from 2.6 to 29.2 (Plate 35 ; fig. 36).

Feeding behaviour : Observed feeding near the lake outside the receding shoreline. Observed feeding on frogs, fishes, beetles, grasshoppers, crickets etc. On a number of occasions birds were observed feeding on insects. Sample were collected from the patches where these birds were observed feeding which latter on turned out to be as follows : Beetle : *Cybister tripunctatus*. Grasshopper : *Trilohidia annulata*, *Stenocetantops eplendens*, Cricket : *Gryllotlpa foesor*, *Gryllus domesticus*. On a number of occasions birds were observed feeding on fishes. Carcase retrived from feeding birds turned out to be of *Tor putitora* and *Barilius bola*. On few occasion birds were observed feeding (through binocular) on frogs *Rana* sp., Maximum feeding activity was observed at dawn and dusk between 0630 hrs to 0830 hrs and 1500 hrs to 1800 hrs, although few birds were observed feeding at all hours of the day.

Genus : **Egretta** Forster

6. **Egretta alba modesta** (J. E. Gray) : Eastern Large Egret.

Baker, FBI No. 2223, Vol. 6 : 346.

Salim Ali and Ripley, H. B. No. 46, Vol. 1 : 69.

Period of stay : This species arrived in the Park in the 2nd half of December, when the Fort. Avg. Max. Temp. ranged from 13.7 to 15.7°C and Fort. Avg. Rel. Humd. ranged from 78.0 to 82.6%. It left the Park in the 2nd half of March, when the Fort. Avg. Max. Temp. ranged from 22.6 to 25.3°C and Fort. Avg. Rel. Humd. ranged from 72 to 89.4%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 48.

Status and distribution : Rare. Occassionally observed near the water edge along the lake. Along 30 to 50 metre outside the shoreline on mudflats and perching on the branch of dry trees near the lake. Most observed in the company of Little egrets and Cattle Egrets. The maximum number of individuals observed in a single day was nine (24th and 28th February, 1979) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 7.8 (Plate 35 ; fig. 37).

Feeding behaviour : Observed feeding near the water edge along the lake and on mudflats along the shoreline. Normally birds feed on fishes, frogs and water insects. On few occasions birds were observed feeding (through binocular) on *Barilius* sp. and *Rana* sp., on a number of occasion birds were observed feeding on beetles and bugs near water. Samples were collected from the patches where birds were observed feeding turned out to be : Beetle : *Cybister tripunctatus* Bug : *Ranetra filiformis*, *Ptilomera laticaudata* etc. Maximum feeding activity was observed at dawn and dusk between 0700 hrs to 0900 hrs and 1600 hrs to 1800 hrs.

TABLE 48

Observations	Year	
	1977-78	1978-79
Date of first observation	20th Dec., 1977	16th Dec., 1978
Temperature in °C Minimum	11.0	10.0
Temperature in °C Maximum	15.0	15.0
Humidity in %	74.0	82.0
Date of last observation	27th Mar., 1978	23rd Mar., 1979
Temperature in °C Minimum	16.5	16.5
Temperature in °C Maximum	29.5	25.0
Humidity in %	88.0	91.0

7. *Egretta garzetta garzetta* (Linnaeus) : Little Egret.

Baker FBI No. 2225, Vol. 6 : 348.

Salim Ali and Ripley, H. B. No. 49, Vol. 1 : 72.

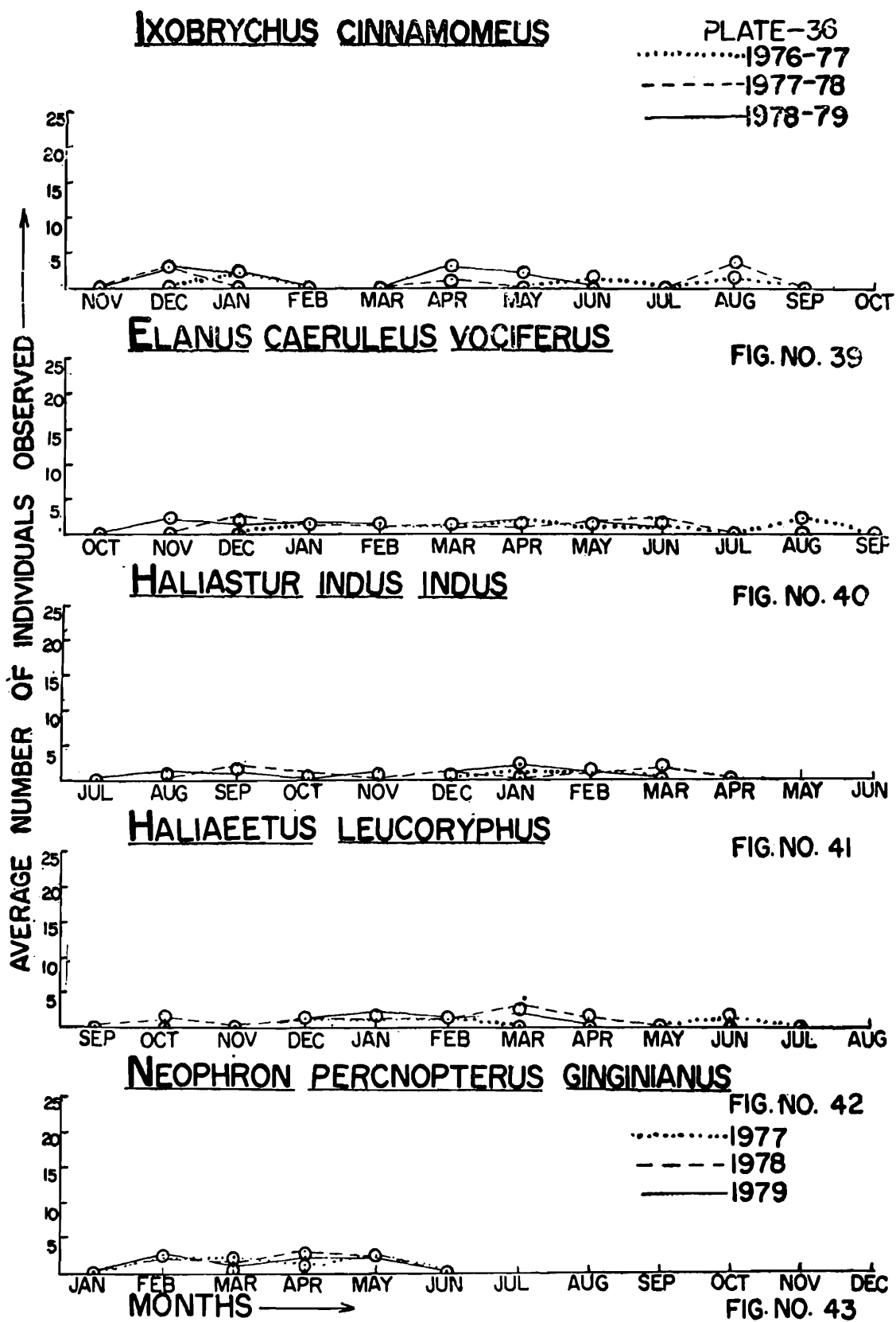
Period of stay : This species arrived in the 2nd half of December when the Fort. Avg. Max. Temp. ranged from 13.7. to 15.7°C and Fort. Avg. Rel. Humd. ranged from 78 to 82.6%. It left the Park in between 1st half of May and 2nd half of June, when the Fort. Avg. Max. Temp. ranged from 33.6 to 36.8°C and Fort. Avg. Rel. Humd. ranged from 89.8 to 92.0%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 49.

TABLE 49

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	26th Jan., 1977	24th Dec., 1977	17th Dec., 1978
Temperature in °C Minimum	5.0	8.5	9.5
Temperature in °C Maximum	17.0	13.5	14.0
Humidity in %	98.0	85.0	80.0
Date of last observation	18th Jun., 1977	6th May., 1978	5th Jun., 1979
Temperature in °C Minimum	29.0	24.5	24.0
Temperature in °C Maximum	36.0	36.5	34.0
Humidity in %	91.3	93.7	95.0

Status and distribution : Rare. Observed along the lake and Ram Ganga river often outside the shoreline on mudflats. Sometime in shallow water at the bank of river. Occasionally observed perching on dry trees near the shoreline during day hours. The maximum number of individuals observed in a single day was 32 (14th March, 1979) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 21.0 (Plate 35 ; fig. 38).

Feeding behaviour : Observed feeding in shallow water along the lake and Ram Ganga River. Also outside the shoreline on mudflats. Normally feeds on frogs, fishes and water insects. On a number of occasion birds were observed feeding on *Barilius* sp. and *Rana* sp. on several occasion birds were observed feeding on water insects. Sample collected from the place where birds were observed feeding turned out to be : Bug : *Laccotrophes ruber*, *Ptilomera laticaudata*. Beetle : *Cybister tripunctatus*. Although birds were observed feeding mostly at dawn and dusk between 0600 hrs to 0900 hrs and 1500 hrs to 1900 hrs. On few occasion birds were observed feeding during day hours also.



Genus : **Ixobrychus** Billberg

8. Ixobrychus cinnamomeus (Gmelin) : Chestnut Bittern.

Baker, FBI No. 2238, Vol. 6 : 367.

Salim Ali and Ripley, H. B. No. 56, Vol. 1 : 84.

Period of stay : This species arrived in the Park in the 1st half of December, when the Fort. Avg. Max. Temp. ranged from 13.7 to

15.1°C and Fort. Avg. Rel. Humd. ranged from 78.9 to 80.1%. Species left the Park in the 1st half of August, when the Fort. Avg. Max. Temp. ranged from 24.9 to 25°C and Fort. Avg. Rel. Humd. ranged from 93.2 to 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 50.

Status and distribution : Very rare. Observed occasionally in the vegetation along the lake and Ram Ganga river. Also outside the shoreline in reed-beds. The maximum number of individuals observed during a single day was six (10th August, 1978) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 3.5 (Plate 36 ; fig. 39).

Feeding behaviour : Known to feed on fishes, frogs, molluscs, insects etc. Feeding behaviour could not be observed as it is a very rare and shy species normally lives in long grasses and reed-beds.

TABLE 50

Observations	Years		
	1976-77	1977-78	1978-79
Date of first observation	1st Jan., 1977	1st Dec., 1977	1st Dec., 1978
Temperature in °C Minimum	8.0	13.5	5.5
Temperature in °C Maximum	18.0	17.5	12.0
Humidity in %	82.2	72.5	75.0
Date of last observation	4th Aug., 1977	10th Aug., 1978	6th May, 1979
Temperature in °C Minimum	21.5	22.5	26.5
Temperature in °C Maximum	23.0	26.0	39.0
Humidity in %	94.0	93.0	82.0

Order : FALCONIFORMES

Family : ACCIPITRIDAE

Genus : *Elanus* Savigny

9. *Elanus caeruleus vociferus* (Latham) : Blackwinged Kite.

Baker, FBI No. 1789, Vol. 5 : 125.

Salim Ali and Ripley, H. B. No. 124, Vol. 1 : 212.

Period of stay : This species arrived in the Park in between 2nd half of November and 1st half of December when the Fort. Avg. Max. Temp. ranged from 15.1 to 21.6°C and Fort. Avg. Rel. Humd.

ranged from 78.9 to 80.0%. It left the Park in between 2nd half of June and 1st half of August, when the Fort. Avg. Max. Temp. ranged from 25.0 to 28.3°C and Fort. Avg. Rel. Humd. ranged between 86.7 to 93.2%. The actual dates on which birds were first and last observed along with the relevent meteorological data are given below in Table 51.

TABLE 51

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	1st Jan., 1977	1st Dec., 1977	28th Nov., 1978
Temperature in °C Minimum	3.0	13.5	19.0
Temperature in °C Maximum	18.0	17.5	22.0
Humidity in %	82.2	72.5	80.0
Date of last observation	4th Aug., 1977	18th Jun., 1978	5th Jun., 1979
Temperature in °C Minimum	21.5	26.5	24.0
Temperature in °C Maximum	23.0	32.0	34.0
Humidity in %	91.0	80.0	95.0

Status and distribution : Rare. Generally observed perching on exposed spot like top of tall bushes, tree tops or telephone and electric wires. Occasionally observed flying over the 'Chaud'. Rarely observed on the ground. The maximum number of individuals observed in a single day was four (10th December, 1977 and 13th June, 1978) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 2.5 (Plate 36 ; fig. 40).

Feeding behaviour : Mostly observed feeding on lizards, field rats and mice. Occasionally observed feeding on grasshoppers and termites. On a number of occasions birds were observed (through binocular) carrying *Mus* sp. and *Calotes versicolor* in its claws. On one occasion dead lizard dropped by bird turned out to be *Rippa punctata*. On few occasion birds were observed feeding on grasshoppers and termites. Samples were collected from the swarm of termites which turned out to be *Microcerotermes beesoni*. Maximum feeding activity was observed in early morning and late afternoon between 0600 hrs to 0900 hrs and 1700 hrs to 1900 hrs.

Genus : **Haliastur** Selby

10. **Haliastur indus indus** (Boddaert) : Brahminy Kite.

Baker, FBI No. 1784, Vol. 5 : 118.

Salim Ali and Ripley, H. B. No. 135, Vol. 1 : 230.

Period of stay : This species arrived in the Park between 1st half of August and 2nd half of September, when the Fort. Avg. Max.

Temp. ranged from 24.5. to 27.1°C and Fort. Avg. Rel. Humd. ranged from 71.0 to 95.3%. It left the Park in between 2nd half of February and 1st half of March, when the Fort. Avg. Max. Temp. ranged from 14.8 to 25.9°C and Fort. Avg. Rel. Humd. ranged from 84.5 to 92.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 52.

TABLE 52

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	9th Jan., 1977	26th Sep., 1977	4th Aug., 1978
Temperature in °C Minimum	5.0	21.0	22.0
Temperature in °C Maximum	21.0	26.0	25.0
Humidity in %	61.1	80.0	97.0
Date of last observation	19th Feb., 1977	14th Mar., 1978	16th Feb., 1979
Temperature in °C Minimum	9.0	14.0	12.0
Temperature in °C Maximum	27.0	21.0	16.0
Humidity in %	90.0	90.9	87.5

Status and distribution : Rare. Occasionally observed flying over the lake and Ram Ganga river, or perching in the trees on branches near the lake in exposed position along the shoreline. The maximum number of individuals observed in a single day was two and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 2.0 (Plate 36 ; fig. 41).

Feeding behaviour : Normally observed feeding near the lake and Ram Ganga river. The perching birds launch themselves over the lake as soon as food a fish or frog is sighted. The pray is swooped upon and picked up in claws. The pray is carried to the bank or a near by tree partaken. Mostly observed (through binocular) carrying *Tor* sp. *Berilius* sp. *Rana* sp. and *Calotes versicolor* in their claws, or hawking winged termites. Maximum feeding activity was observed at dusk between 1500 hrs to 1800 hrs. Rarely observed feeding at dawn between 0600 hrs to 0800 hrs.

Genus : **Haliaeetus** Savigny

11. **Haliaeetus leucoryphus** (Pallas) : Ringtailed or Pallas's Fishing Eagle.

Baker, FBI No. 1779, Vol. 5 : 112.

Salim Ali and Ripley, H. B. No. 174, Vol. 1 : 289.

Period of stay : This species arrived in the Park in between 2nd half of October and 1st half of December, when the Fort. Avg. Max.

Temp. ranged from 13.4 to 22.3°C and Fort. Avg. Rel. Humd. ranged from 68.5 to 80.1%. It left the Park in between 2nd half of April and 1st half of June, when the Fort. Avg. Max. Temp. ranged from 33.5 to 37.2°C and Fort. Avg. Rel. Humd. ranged from 71.8 to 90.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 53.

TABLE 53

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	20th Dec., 1976	29th Oct., 1977	5th Dec., 1978
Temperature in °C Minimum	5.0	17.0	5.5
Temperature in °C Maximum	19.0	22.0	11.5
Humidity in %	90.9	72.5	77.5
Date of last observation	4th Jun., 1977	28th Apr., 1978	17th Apr., 1979
Temperature in °C Minimum	27.0	21.0	27.0
Temperature in °C Maximum	39.0	36.0	37.0
Humidity in %	89.8	88.0	72.0

Status and distribution : Rare. Occasionally observed flying over the lake and Ram Ganga river or perching on tree tops and boulders along the shoreline. The maximum number of individuals observed in a single day was three (16th March, 1978) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 3.0 (Plate 36 ; fig. 42).

Feeding behaviour : Mostly observed hawking fish in the lake and Ram Ganga river. The prey is swooped upon sight, picked up in claws and carried to the favourite perch nearby where it is eaten at leisure. Also observed feeding on small water birds, frogs, snakes and lizards. On a number of occasions birds were observed (through binocular) feeding on *Tor tor*, *Tor putitors*, *Barilius bola* and *Mastacembelus armatus*. On few occasion birds were observed carrying *Rana* sp. and *Calotes versicolor* in its claws. On one occasion one bird was observed carrying a snake which could not be identified. Observed feeding at all hours of the day, but maximum feeding activity was observed in late afternoon between 1400 hrs to 1900 hrs.

Genus : *Neophron* Savigny12. *Neophron percnopterus ginginianus* (Latham) : Indian Scavenger Vulture.

Baker, FBI No. 1715, Vol. 5 : 23.

Salim Ali and Ripley, H. B. No. 187, Vol. 1 : 312.

Period of stay : This species arrived in the park generally in the 1st half of February, when the Fort. Avg. Max. Temp. ranged from 13.0 to 20.9°C and Fort. Avg. Rel. Humd. ranged from 75.5 to 88.4%. The species left the park generally in the 2nd half of May, when the Fort. Avg. Max. Temp. ranged from 36.3 to 40.7°C and Fort. Avg. Rel. Humd. ranged from 66.3 to 85.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 54.

TABLE 54

Observations	Year		
	1977	1978	1979
Date of first observation	5th Feb.	17th Feb.	5th Feb.
Temperature in °C Minimum	7.0	11.0	8.0
Temperature in °C Maximum	25.0	16.0	13.5
Humidity in %	92.3	75.0	88.0
Date of last observation	11th May.	17th May.	16th May.
Temperature in °C Minimum	19.5	21.5	22.5
Temperature in °C Maximum	43.5	38.0	38.0
Humidity in %	88.3	79.1	80.0

Status and distribution : Rare. Occasionally observed flying over the 'Chaud' or perching on tree tops, termite mounds or similar exposed position at the edge of forest. Descends to ground for feeding. The maximum number of individuals observed in a single day were three and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 3.0 (Plate 36 ; fig. 43).

Feeding behaviour : Observed feeding in 'Chaud' in company with other vultures like *Gyps bengalensis*, *Gyps himalayansis* and *Sarcogyps calvus*, on the remains of the animals like *Axis axis*, *Axis percinus* and *sus scrofa cristatus*. Occasionally observed feeding on frogs and swarming termites, *Odontotermes feae*. Feeding activity was observed at all hours of the day but more active at dusk between 1600 hrs to 1900 hrs.

Order : CHARADRIIFORMES

Family : CHARADRIIDAE

Genus : *Vanellus* Brisson

13. *Vanellus indicus indicus* (Boddaert): Redwattled Lapwing.

Baker, FBI No. 2125, 2126, Vol. 6 : 187, 189.

Salim Ali and Ripley, H. B. No. 366, Vol. 2 : 212.

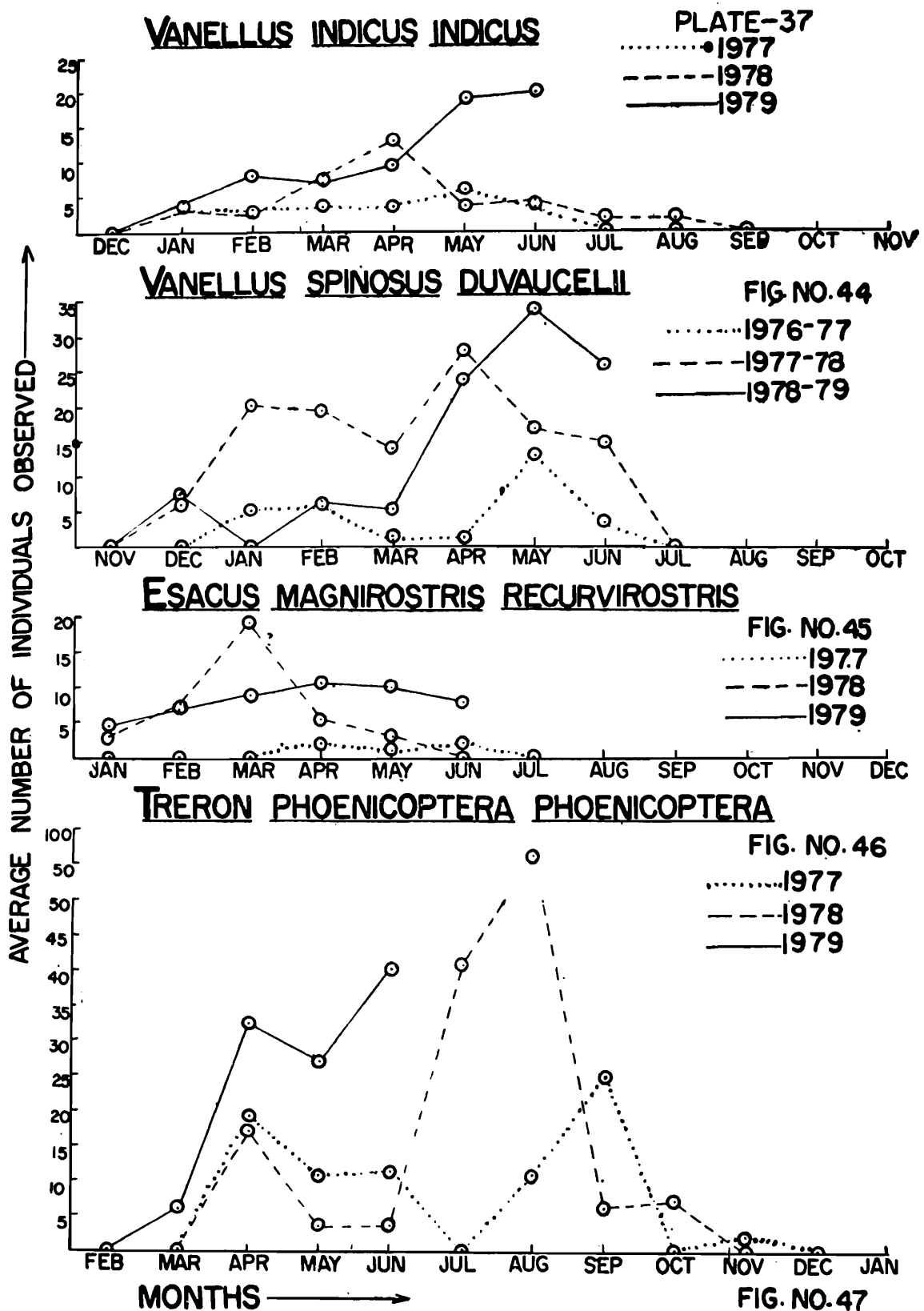
Period of stay : This species arrived in the park generally in the 1st half of January, when the Fort. Avg. Max. Temp. ranged from 13.8 to 21.3°C and Fort. Avg. Rel. Humd. ranged from 79.9 to 86.1%. It left the park in between 1st half of August and 2nd half of June, when the Fort. Avg. Max. Temp. ranged from 24.5 to 33.6°C and Fort. Avg. Rel. Humd. ranged from 92 to 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 55.

TABLE 55

Observations	Year		
	1977	1978	1979
Date of first observation	12th Jan.	20th Jan.	19th Jan.
Temperature in °C Minimum	10.0	8.0	10.5
Temperature in °C Maximum	19.0	21.0	14.9
Humidity in %	84.6	87.5	87.5
Date of last observation	18th Jun.	6th Aug.	5th Jun.
Temperature in °C Minimum	29.0	23.0	24.0
Temperature in °C Maximum	36.0	25.0	34.0
Humidity in %	91.3	90.0	95.0

Status and distribution : Very common. Frequently observed throughout the park near the lake, Ram Ganga river, 'Chaud' at the edge of forest and near water holes. The maximum number of individuals observed in a single day was 56 (16th April, 1978) and minimum was one on a number of occasions. Monthly average index varied from 2.0 to 20.0 (Plate 37 ; fig. 44).

Feeding behaviour : Feeds on beetles, caterpillars, insect larvae, molluscs and vegetable matter. On few occasions birds were observed feeding near the lake on mudflats and in grasslands. Samples of insects collected from the spot where the birds were seen feeding, turned out to be of Beetle : *Catharsius pithocius*, *Cybioter tripunctatus*. Mollusc : *Molanoides* sp. and *Viparus* sp. On a few occasion birds were observed feeding on vegetable matter like, *Glinus lotoides* and *Fimbristylis*



squarrosa along the shoreline. Maximum feeding activity was observed at dawn and dusk between 0500 hrs to 0700 hrs and 1800 hrs to 2000 hrs.

14. *Vanellus spinosus duvaucelii* (Lesson) : Spurwinged Lapwing.

Baker, FBI No. 2124, Vol. 6 : 184.

Salim Ali and Ripley, H. B. No. 369, Vol. 2 : 216.

Period of stay : This species arrived in the park in 2nd half of January, when the Fort. Avg. Max. Temp. ranged from 13.7 to 15.7°C

and Fort. Avg. Rel. Humd. ranged from 78 to 82.6%. The species left the park in 2nd half of June when the Fort. Avg. Max. Temp. ranged from 28.3 to 33.6°C and Fort. Avg. Rel. Humd. ranged from 86.6 to 92%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 56.

TABLE 56

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	24th Jan., 1977	20th Dec., 1977	21st Dec., 1978
Temperature in °C Minimum	10.5	11.0	9.0
Temperature in °C Maximum	18.0	15.0	13.5
Humidity in %	95.4	74.0	77.5
Date of last observation	17th Jun., 1977	19th Jun., 1978	5th Jun., 1979
Temperature in °C Minimum	28.5	25.2	24.0
Temperature in °C Maximum	34.0	28.5	34.0
Humidity in %	89.6	85.0	95.0

Status and distribution : Common. Frequently observed throughout the park near the lake along the shoreline on mudflats and on the banks of Ram Ganga river, streams and naullas. Occasionally in 'Chaud', at the edge of the forest and on forest roads. The maximum number of individuals observed in a single day was 100 (24th January, 1978) and minimum was one (24th March, 1977). Monthly average index varied from, 1.0 to 34.0 (Plate 37 ; fig. 45).

Feeding behaviour : Observed feeding on the shore of the lake banks of the river and mudflats. Also in shallow water and 'Chaud'. Observed feeding on molluscs, insect larvae, caterpillars and occasionally frogs. On a few occasions birds were observed feeding on insects. Samples collected from the patches where these birds were observed feeding turned out to be ; Beetle ; *Cathernius nithocius*, *Cybis-ter tripunctatus*. Bug : *Laccotraphes ruber*. Mollusc : *Melanoides* sp. etc. On two occasions birds were observed feeding on frogs near water which were identified as *Rana cynophlyctis* and *Rana tigrina*, maximum, feeding activity was observed at dawn and dusk between 0600 hrs to 0900 hrs and 1500 hrs to 1830 hrs.

Family : BURHINIDAE

Genus : *Esacus* Lesson

15. *Esacus magnirostris recurvirostris* (Cuvier) : Great Stone Plover.

Baker, FBI No. 2049, Vol. 6 : 80.

Salim Ali and Ripley, H. B. No. 437, Vol. 3 : 5.

Period of stay : This species arrived in the park in the month of January, when the Fort. Avg. Max. Temp. ranged from 13.8 to 21.3°C

and Fort. Avg. Rel. Humd. ranged from 76.5 to 86.1%. It left the park in between 1st half of May and 1st half of June, when the Fort. Avg. Max. Temp. ranged from 36.4 to 37.2°C and Fort. Avg. Rel. Humd. ranged from 89.8 to 90.3%. In the year 1977 the species arrived in the park in 1st half of April, when the Fort. Avg. Max. Temp. was recorded 35.6°C and Fort. Avg. Rel. Humd. was recorded 79.7%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 57.

TABLE 57

Observations	Year		
	1977	1978	1979
Date of first observation	8th Apr.	31st Jan.	1st Jan.
Temperature in °C Minimum	13.5	10.0	8.0
Temperature in °C Maximum	35.0	22.0	13.5
Humidity in %	76.4	85.0	75.0
Date of last observation	12th Jun.	6th May	5th Jun.
Temperature in °C Minimum	28.0	24.5	24.0
Temperature in °C Maximum	36.5	36.5	34.0
Humidity in %	94.1	93.7	95.0

Status and distribution : Rare. Occasionally observed near Ram Ganga river in pebbly and rocky beds. The maximum number of individuals observed in a single day was 19 (6th March ; 1976) and minimum was one (1st May, 1978) Monthly average index varied from 3.0 to 19.0 (Plate 37 ; fig. 46).

Feeding behaviour : Observed feeding in the riverbed. Feeds on frogs, molluscs, insect larvae, crickets. Samples collected from the patches where birds were observed feeding turned out to be : Mollusc : *Lymnaea* sp. *Indoplanerbis* sp. Cricket : *Gryllotalpa fossor*, *Gryllus domesticus*. On few occasion birds were observed feeding on frogs like *Rana cynophlyctis* and *Rana limnocharis*. Maximum feeding activity was observed at early dawn hrs between 0500 hrs to 0800 hrs and at dusk till too dark between 1700 hrs to 2000 hrs.

Order : COLUMBIFORMES

Family : COLUMBIDAE

Genus : *Treron* Vieillot

16. *Treron phoenicoptera phoenicoptera* (Latham) : Bengal Green Pigeon.

Baker, FBI No. 1826, Vol. 5 : 181.

Salim Ali and Ripley, H. B. No. 503, Vol. 3 : 106.

Period of stay : This species arrived in the park in between 2nd half of March and April, when the Fort. Avg. Max. Temp. ranged

from 22.6 to 35.6°C and Fort. Avg. Rel. Humd. ranged from 72 to 87.5%. The species left the park in between 1st half of October and 2nd half of December, when the Fort. Avg. Max. Temp. ranged from 15.7 to 22.8°C and Fort. Avg. Rel. Humd. ranged from 69 to 82.6%. The actual dates on which the birds were first and last observed along with the relevant meteorological data are given in Table 58.

TABLE 58

Observations	Year		
	1977	1978	1979
Date of first observation	6th Apr.	24th Apr.	18th Mar.
Temperature in °C Minimum	18.0	21.0	14.0
Temperature in °C Maximum	29.0	29.0	20.0
Humidity in %	52.6	90.0	70.0
Date of last observation	19th Dec.	2nd Oct.	5th Jun.
Temperature in °C Minimum	9.0	19.5	24.0
Temperature in °C Maximum	14.0	25.5	34.0
Humidity in %	85.0	62.0	95.0

Status and distribution : Rare. Observed perching on tall trees in forested areas including sheeshum island, groves in the 'Chaud' or feeding in fruit trees. The maximum number of individuals observed in single day was 237 (2nd August, 1978) and minimum was 1 (3rd May, 1977). Monthly average index varied from 2.0 to 62.8 (Plate 37 ; fig. 47).

Feeding behaviour : Observed feeding in fruit trees like *Ficus* etc. Mostly observed feeding on figs and berries of different kinds. On a number of occasions birds were feeding on berries of *Ficus bengalensis*, *Ficus glomerata*, *Ficus religiosa*, *Zyzyphus jujuba*, *Zizyphus mauritians* and *Eugenis jambolana* was observed. Occasionally observed feeding on *Lantana aculeata*. Maximum feeding activity was observed in early mornings and afternoons between 0500 hrs to 0800 hrs and 1500 hrs to 1900 hrs.

Genus : **Streptopelia** Bonaparte

17. Streptopelia decaocto decaocto (Frivaldszky) : Indian Ring Dove.

Baker, FBI No. 1879, Vol. 5 : 248.

Salim Ali and Ripley, H. B. No. 534, Vol. 3 : 147.

Period of stay : This species arrived in the Park in the month of January, when the Fort. Avg. Max. Temp. ranged from 19 to 22.8°C and Fort. Avg. Rel. Humd. ranged from 69 to 79.9%. The species left

the Park in the 1st half of October, when the Fort. Avg. Max. Temp. ranged from 23.6 to 25.5°C and Fort. Avg. Rel. Humd. ranged between 62 and 70.4%. In the year 1979 the species arrived in the Park in the 2nd half of March, when the Fort. Avg. Max. Temp. was recorded 22.6°C and Fort. Avg. Rel. Humd. was recorded 72%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 59.

TABLE 59

Observations	Year		
	1977	1978	1979
Date of first observation	4th Jan.	30th Jan.	17th Mar.
Temperature in °C Minimum	6.0	11.5	14.0
Temperature in °C Maximum	18.0	23.0	20.0
Humidity in %	83.3	85.0	70.0
Date of last observation	1st Oct.	2nd Oct.	5th Jun.
Temperature in °C Minimum	20.0	19.5	24.0
Temperature in °C Maximum	25.0	25.5	34.0
Humidity in %	65.0	62.0	95.0

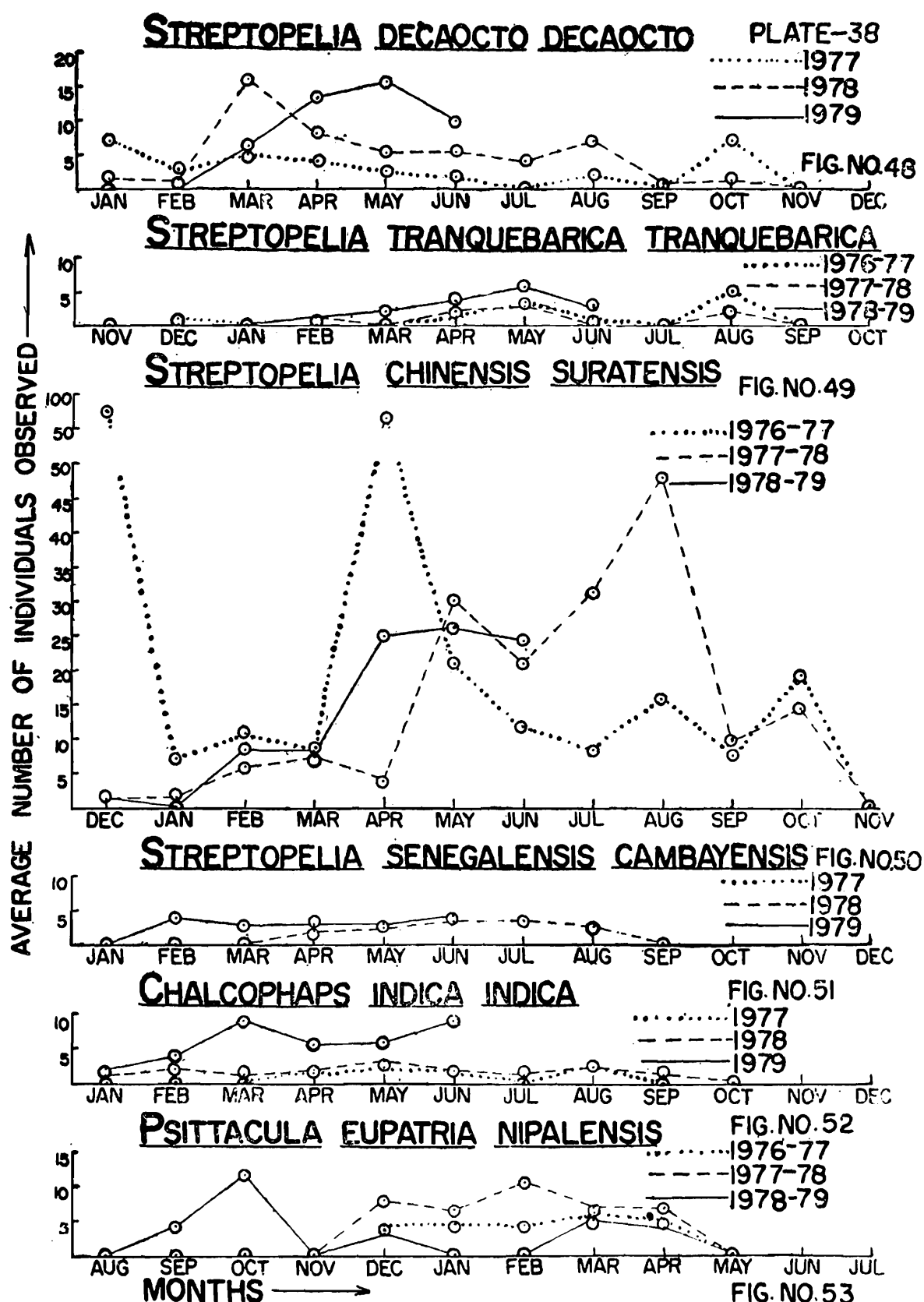
Status and distribution : Common. Equally at home in scrub, forest and 'Chaud'. Prefers perching on foliated branches. Feeds on ground. The maximum number of individuals observed in a single day was 51 (6th March, 1978) and minimum was one (4th January, 1977). Monthly average index varied from 1.0 to 16.0 (Plate 38 ; fig. 48).

Feeding behaviour : Observed feeding mostly on ground. Feeds on grains and seeds including grass seeds. Grass collected from the patches where these birds were observed feeding were later on identified as *Apluda mutica*, *Arundinaria falcata*, *Arundo denex*, *Chloris dolichestachya*, *Cynodon dactylon* and *Dendrocalamus strictus*. Maximum feeding activity was observed at dawn and dusk between 0600 hrs to 1100 hrs and 1500 hrs to 1900 hrs.

18. ***Streptopelia tranquebarica tranquebarica* (Hermann) : Indian Red Turtle-Dove.**

Baker, FBI No. 1881, Vol. 5 : 250.
Salim Ali and Ripley, H. B. No. 535, Vol. 3 : 149.

Period of stay : This species arrived in the Park in the 1st half of February, when the Fort. Avg. Max. Temp. ranged from 13 to 21.4°C and Fort. Avg. Rel. Humd. ranged between 79.6 and 88.4%. The



species left the Park in the 1st half of August, when the Fort. Avg. Max. Temp, ranged from 24.5 to 25°C and Fort. Avg. Rel. Humd. ranged between 93.2 and 95.3%. In the year 1976 the species arrived in the Park in the first half of December, when the Fort. Avg. Max. Temp. was recorded 18.2°C and Fort. Avg. Rel. Humd. was recorded 90.7%. The actual dates on which the birds were first and last observed along with the relevant meteorological data are given in Table 60.

TABLE 60

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	15th Dec., 1976	4th Feb., 1978	14th Feb., 1979
Temperature in °C Minimum	4.5	9.5	11.5
Temperature in °C Maximum	19.0	22.5	15.0
Humidity in %	88.2	73.3	85.0
Date of last observation	6th Aug., 1977	9th Aug., 1978	4th Jun., 1979
Temperature in °C Minimum	19.5	22.0	25.5
Temperature in °C Maximum	22.0	25.0	36.0
Humidity in %	96.8	96.0	90.0

Status and distribution : Rare. Occasionally observed feeding on forest roads, in the 'Chaud'. Perches in the branches of trees at the edge of forest and on dry trees along the shoreline near the lake. The maximum number of individuals observed in a single day was 12 (2nd May, 1979) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 5.7 (Plate 38 ; Fig. 49).

Feeding behaviour : Mostly observed feeding on ground. On few occasions birds were observed feeding on grass seeds. Grass collected from the patches where these birds were observed feeding later on turned out to be as *Apluda mutica*, *Arundinella nepalensis*, *Chloria dolichestachya*, *Cynodon dactylon*, *Dendrocalamus strictus*. Mostly observed feeding at dawn and dusk between 0500 hrs to 0900 hrs and 1500 hrs to 1900 hrs.

19. *Streptopelia chinensis suratensis* (Gmelin) : Indian Spotted Dove.

Baker, FBI No. 1873, Vol. 5 : 242.

Salim Ali and Ripley, H. B. No. 537, Vol. 3 : 152.

Period of stay : This species arrived in the Park generally in the 1st half of December, when the Fort. Avg. Max. Temp. ranged from 13.3 to 19.4°C and Fort. Avg. Rel. Humd. ranged between 78.9 and 85%. It left the Park in the month of October, when the Fort. Avg. Max. Temp. ranged from 22.3 to 22.8°C and Fort. Avg. Rel. Humd. ranged between 68.5 and 69%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 61.

Status and distribution : Very common. Very frequently observed throughout the Park in Forests, scrub, Sheeshum islands, grasslands

and even in the riverbed seen feeding on ground, on forest road, forest floor and grasslands. The maximum number of individuals observed in a single day was 250 (13th April, 1977) and minimum was one (25th February, 1977). Monthly average index varied from 1.0 to 75.0 (Plate 38 ; fig. 50).

TABLE 61

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	27th Dec., 1976	10th Dec., 1977	1st Dec., 1978
Temperature in °C Minimum	8.0	7.5	5.5
Temperature in °C Maximum	20.5	13.5	12.0
Humidity in %	76.9	80.0	75.0
Date of last observation	30th Oct., 1977	7th Oct., 1978	3rd Jun., 1979
Temperature in °C Minimum	17.5	16.0	29.0
Temperature in °C Maximum	22.0	25.0	39.0
Humidity in %	72.5	60.0	85.0

Feeding behaviour : Feeding activity was mostly observed on ground. Normally observed feeding on roads passing through grassland and forest. On a number of occasions birds were observed feeding on grass seeds. Grass collected from the patches where birds were observed feeding identified later on turned out to be, *Apluda mutica*, *Arundinaria falcata*, *Arundine/la bengalensis*, *Arundo denax*, *Chloris dolichistachva*, *Cynodon dactylon* and *Dendrocalamus strictus*. Although some birds were observed feeding throughout the day, but maximum activity was observed at dawn and dusk between 0500 hrs to 1100 hrs and 1500 hrs to 1900 hrs.

20. ***Streptopelia senegalensis cambayensis* (Gmelin) : Indian Little Brown or Senegal Dove.**

Baker, FBI No. 1877, Vol. 5 : 246.

Salim Ali and Ripley, H. B. No. 541, Vol. 3 : 155.

Period of stay : This species arrived in the Park in between 1st half of February and 2nd half of April, when the Fort. Avg. Max. Temp. ranged from 13 to 33.5°C and Fort. Avg. Rel. Humd. ranged between 87.5 and 88.4%. It left the Park in 1st half of August, when the Fort. Avg. Max. Temp. was recorded 24.5°C and Fort. Avg. Rel. Humd. was recorded 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 62.

Status and distribution : Rare. Occasionally observed perched on branches of trees along forest roads, near the rest house, in grassland and near the lake, often in company of other doves. Descends to ground for feeding. The maximum number of individuals observed in a single day was seven (16th February and 17th May, 1979) and minimum was one (24th April, 1978). Monthly average index varied from 2.0 to 4.0 (Plate 38 ; fig. 51).

TABLE 62

Observations	Year	
	1978	1979
Date of first observation	10th Apr.	11th Feb.
Temperature in °C Minimum	26.0	9.0
Temperature in °C Maximum	30.0	13.0
Humidity in %	84.2	85.0
Date of last observation	9th Aug.	5th Jun.
Temperature in °C Minimum	22.0	24.0
Temperature in °C Maximum	25.0	34.0
Humidity in %	96.0	95.0

Feeding behaviour : Mostly observed picking up grains and seeds from the ground. On a number of occasions birds were observed feeding on grass seeds, samples collected from the patches where birds were observed feeding turned out to be as *Arundinella bengalensis*, *Chloris dolichestachya*, *Cynodon dactylon*, *Dendrocalamus strictus*. On few occasions birds were observed feeding near human habitation on rice, and wheat, observed feeding throughout the day maximum feeding activity was observed between 0800 hrs to 1100 hrs and 1500 hrs to 1900 hrs.

Genus ; **Chalcophaps** Gould

21. **Chalcophaps indica indica** (Linnaeus) : Indian Emerald Dove.

Baker, FBI No. 1852, Vol. 5 : 215.

Salim Ali and Ripley, H. B. No. 542, Vol. 3 : 157.

Period of stay : This species arrived in the Park in 2nd half of January, when the Fort. Avg. Max. Temp. ranged from 13.8 to 21.3°C and Fort. Avg. Rel. Humd. ranged between 83.8 and 86.1%. It left the Park in between 1st half of August and 2nd half of September, when the Fort. Avg. Max. Temp. ranged from 25.0 to 26.6°C and Fort. Avg. Rel. Humd. ranged between 71.4 and 93.2%. In the year 1977, species arrived in 1st half of April, when the Fort. Avg. Max. Temp. was

recorded 35.6°C and Fort. Avg. Rel. Humd. was recorded 79.7%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 63.

TABLE 63

Observations	Year		
	1977	1978	1979
Date of first observation	13th Apr.	31st Jan.	19th Jan.
Temperature in °C Minimum	15.0	10.0	10.5
Temperature in °C Maximum	40.0	22.0	14.0
Humidity in %	82.3	85.0	87.5
Date of last observation	1st Aug.	27th Sep.	3rd Jun.
Temperature in °C Minimum	21.0	23.0	29.0
Temperature in °C Maximum	28.5	26.0	39.0
Humidity in %	90.0	80.0	85.0

Status and distribution : Rare. Occasionally observed in dense patches of forest where one gets a glimpse of the bird as it flies across an open space. While sitting on foliated branches; it merges completely with the background and is hard to detect. Alights on ground for feeding when it is more clearly seen. The maximum number of individuals observed in a single day was nine (27th March, 1979) and minimum was one (13th April, 1977). Monthly average index varied from 1.0 to 9.0 (Plate 38 ; fig. 52).

Feeding behaviour : Known to feed on grains, seeds, fallen berries of lantana and termites. In the Park feeding behaviour could not be observed.

Order : PSITTACIFORMES

Family : PSITTACIDAE

Genus : *Psittacula* Cuvier

22. *Psittacula eupatria nipalensis* (Hodgson) : Large Indian Parakeet.

Baker, FBI No. 1497, 1498, Vol. 4 : 199, 200.

Salim Ali and Ripley, H. B. No. 545, Vol. 3 : 164.

Period of stay : This species arrived in the Park generally in the month of December, when the Fort. Avg. Max. Temp. ranged from 15.1 to 19.4°C and Fort. Avg. Rel. Humd. ranged between 78.9 and 85%. The species left the Park in the 2nd half of April, when the Fort. Avg. Max. temp. ranged from 33.5 to 37.2°C and Fort. Avg.

Rel. Humd. ranged between 71.8 and 87.5%. In the year 1978-79 the species arrived in 2nd half of September, when the Fort. Avg. Max. Temp. was recorded 26.3°C and Fort. Avg. Rel. Humd. was recorded 70.6%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 64.

TABLE 64

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	18th Dec., 1976	3rd Dec., 1977	26th Sep., 1978
Temperature in °C Minimum	4.5	12.5	23.0
Temperature in °C Maximum	18.5	21.5	26.0
Humidity in %	87.5	75.0	80.0
Date of last observation	16th Apr., 1977	18th Apr., 1978	19th Apr., 1979
Temperature in °C Minimum	16.0	19.0	25.0
Temperature in °C Maximum	32.0	32.5	35.5
Humidity in %	65.2	90.5	78.0

Status and distribution : Rare. Occasionally observed on the branches of fruiting trees, flocks were observed crossing over the grassland which flying from one forest patch to another. The maximum number of individuals observed in a single day was 20 (1st February, 1978) and minimum was one (11th December, 1977). Monthly average index varied from 3.0 to 11.5 (Plate 38 ; fig. 53).

Feeding behaviour : Observed feeding on fruits, figs, berries seeds, and nectar of flowers etc. On a number of occasions fruits of the trees on which the birds were observed to feed were collected for identification turned out to be : Fruits and Berries : *Ficus bengalensis*, *Ficus glomerata*, *Zizyphus jujuba*, *Eugenia jambolana* etc. Seed : *Dalbargia sisso*, *Anthistrie gigantes*. On a few occasions birds were observed feeding on nectar of *Butea monosperma*. Few birds were observed feeding at all hours of the day, but maximum feeding activity was observed at dawn and dusk between 0600 hrs to 1100 hrs and 1500 hrs to 1900 hrs.

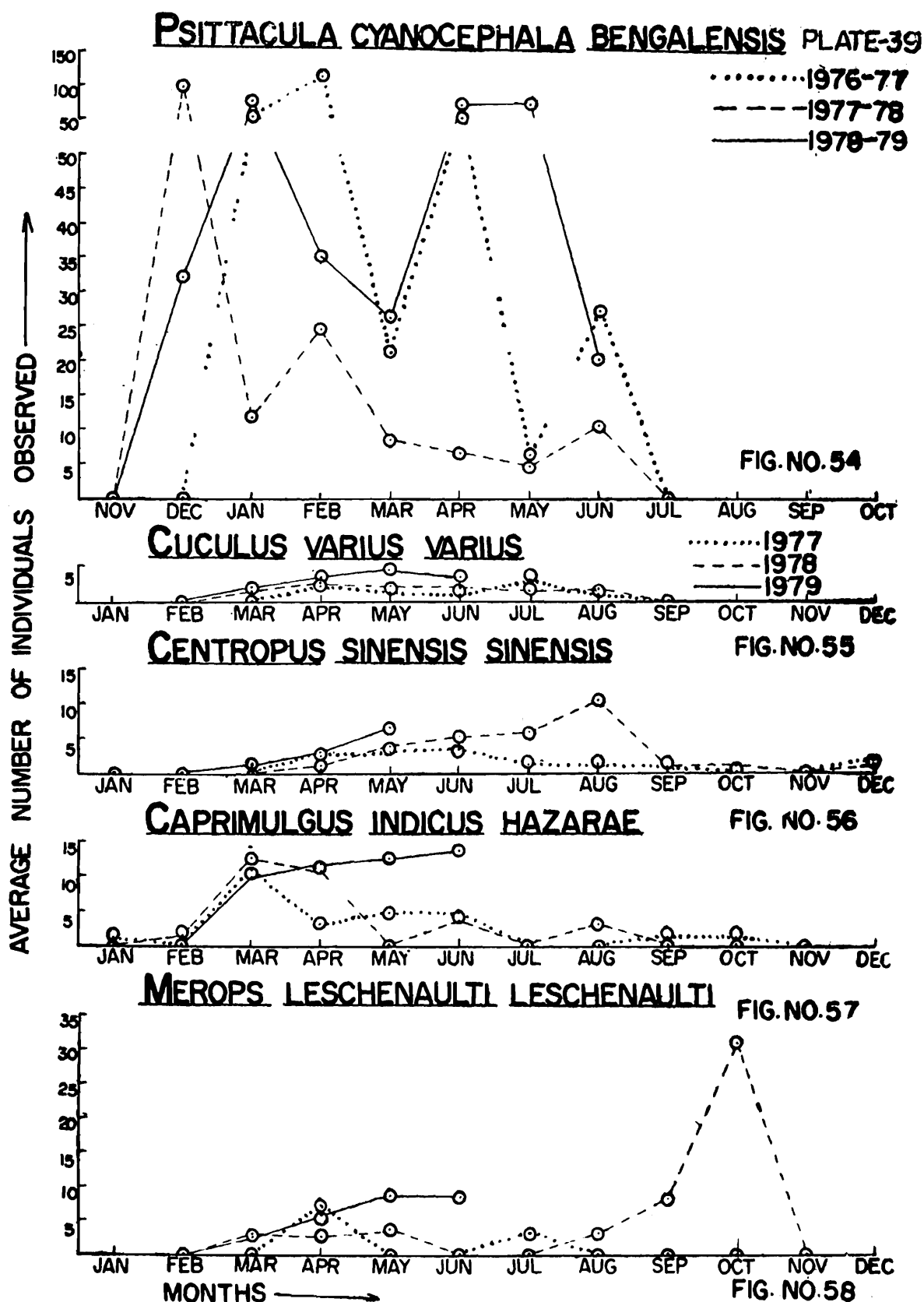
23. *Psittacula cyanocephala bengalensis* (Forster) : Northern Blossomheaded Parakeet.

Baker, FBI No. 1503, Vol. 4 : 206.

Salim Ali and Ripley, H. B. No. 557, Vol. 3 : 178.

Period of stay : This species arrived in the Park in the 1st half of December, when the Fort. Avg. Max. Temp. ranged from 13.4 to

15.1°C and Fort. Avg. Rel. Humd. ranged between 78.9 and 80.1%. It left the Park in the month of June, when the Fort. Avg. Max. Temp. ranged from 28.3 to 37.2°C and Fort. Avg. Rel. Humd. ranged between 86.7 and 90.3%. The actual dates on which birds were first



and last observed along with the relevant meteorological data are given in Table 65.

TABLE 65

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	17th Jan., 1977	9th Dec., 1977	15th Dec., 1978
Temperature in °C Minimum	4.5	7.5	10.0
Temperature in °C Maximum	19.5	13.0	14.5
Humidity in %	75.0	80.0	78.0
Date of last observation	3rd Jun., 1977	21st Jun., 1978	1st Jun., 1979
Temperature in °C Minimum	28.5	23.0	25.5
Temperature in °C Maximum	37.5	26.5	36.0
Humidity in %	76.6	95.0	91.0

Status and distribution : Common. Frequently observed in forested areas of Park including the Sheeshum island and grooves in the grass-land. Occasionally seen perching on the top of bushes in fruit. The maximum number of individuals observed in a single day was 300 (17th February, 1977) and minimum was one (12th February, 1977). Monthly average index varied from 4.5 to 111.4 (Plate 39 ; fig. 54).

Feeding behaviour : Observed feeding on fruit trees in the forest and bushes in Chaud'. Feeds on fruits, buds, fleshy petals, nectar of flower and seeds. On a number of occasions birds were observed feeding on fruits of *Ficus bengalensis*, *Ficus glomerata*, berries of *Zizyphus jujuba* and *Lantana aculeata*. Birds were observed feeding on fleshy petals of *Butea monosperma*, buds of *Bombex malabaricum*, *Piliostigma malabaricum*. On few occasions birds were observed feeding on seeds of *Dalbargia sisso*, *Anthistria gigantea* etc. Maximum feeding activity was observed at dawn and dusk between 0500 hrs to 1000 hrs and 1500 hrs to 1900 hrs.

Order : CUCULIFORMES

Family : CUCULIDAE

Genus : *Cuculus* Linnaeus

24. *Cuculus varius varius* Vahl : Common Hawk-Cuckoo or Brainfever Bird.

Baker, FBI No. 1458, Vol. 4 : 148.

Salim Ali and Ripley, H. B. No. 573, Vol. 3 : 200.

Period of stay : This species arrived in the Park generally in 1st half of March, when the Fort. Avg. Max. Temp. ranged from 18.9 to 20.2°C and Fort. Avg. Rel. Humd. ranged between 80.8 and 92.8%.

The species left the Park in the 1st half of August, when the Fort. Avg. Max. Temp. ranged from 24.5 to 25°C and Fort. Avg. Rel. Humd. ranged between 93.2 and 95.3%. In the year 1977 species arrived in the Park in 1st half of April, when the Fort. Avg. Max. Temp. was recorded 35.6°C and Fort. Avg. Rel. Humd. was recorded 79.7%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 66.

TABLE 66

Observations	Year		
	1977	1978	1979
Date of first observation	6th Apr.	5th Mar.	14th Mar.
Temperature in °C Minimum	18.0	16.5	14.0
Temperature in °C Maximum	29.0	20.0	21.0
Humidity in%	52.6	93.7	75.0
Date of last observation	8th Aug.	10th Aug.	5th Jun.
Temperature in °C Minimum	24.0	22.5	24.0
Temperature in °C Maximum	27.5	26.0	34.0
Humidity in%	90.0	93.0	95.0

Status and distribution : Very common but equally shy. More frequently heard than observed, throughout the forested areas of the Park. The maximum number of individuals heard or observed in a single day was nine (2nd May, 1979) and minimum was one (26th April, 1977). Monthly average index varied from 1.0 to 4.5 (Plate 39 ; fig. 55).

Feeding behaviour : Known to feed on caterpillars, cutworms, grasshoppers, beetles, bugs and winged termites. Wild figs and occasionally lizards. In the Park feeding behaviour could not be observed on account of the shyness of the bird.

Genus : **Centropus** Illiger

25. **Centropus sinensis sinensis** (Stephens) : Common
Crow-Pheasant or Coucal.

Baker, FBI No. 1490, Vol. 4 : 189.
Salim Ali and Ripley, H. B. No. 600, Vol. 3 : 240.

Period of stay : This species arrived in the Park generally in between 2nd half of March and 2nd half of April, when the Fort. Avg. Max. Temp. ranged from 22.6 to 36.5°C and Fort. Avg. Rel. Humd. ranged between 72 and 87.5%. It left the Park in 2nd half of December, when the Fort. Avg. Max. Temp. ranged from 13.7 to 15.7°C. and Fort. Avg.

Rel. Humd. ranged between 78 and 82.6%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 67.

Status and distribution : Rare. Normally observed in tall grasses in 'Chaud' and near riverbed. The maximum number of individuals observed in a single day was 17 (2nd and 4th August, 1978) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 10.6 (Plate 39 ; fig. 56).

TABLE 67

Observations	Year		
	1977	1978	1979
Date of first observation	20th Apr.	20th Apr.	28th Mar.
Temperature in °C Minimum	16.5	26.0	14.5
Temperature in °C Maximum	32.0	30.0	21.5
Humidity in %	92.5	84.2	75.0
Date of last observation	31st Dec.	29th Dec.	5th Jun.
Temperature in °C Minimum	9.0	8.5	24.0
Temperature in °C Maximum	18.0	13.0	34.0
Humidity in %	87.5	77.5	95.0

Feeding behaviour : Observed feeding in 'Chaud'. Feeds on lizards, rats, frogs, grasshoppers, eggs of bird etc. On a number of occasions birds were observed feeding on *Calotes versicolor*, *Riops punctata* and *Rana cynophlyctis*. On few occasions birds were observed feeding on grasshoppers. Samples were collected from the patches where these birds were observed feeding. They were later identified as : *Trilophidia annulata*, *Stanocatentops splendens*. On one occasion one bird was observed feeding on eggs of Lapwing *Vanellus* sp. near the river bank. Maximum feeding activity was observed between 0600 hrs to 1000 hrs and 1500 hrs to 1900 hrs.

Order : CAPRIMULGIFORMES

Family : CAPRIMULGIDAE

Genus : **Caprimulgus** Linnaeus

26. Caprimulgus indicus hazarae Whistler & Kinnear : Himalayan Jungle Nightjar.

Baker, FBI No. 1626, Vol. 4 : 367.

Salim Ali and Ripley, H. B. No. 670, Vol. 4 : 8.

Period of stay : This species arrived in the Park in between 1st half of January and 1st half of March, when the Fort. Avg. Max. Temp.

ranged from 15.8 to 19.0 °C and Fort. Avg. Rel. Humd. ranged between 75.5 and 80.8%. The species left the park in between 1st half of August and 1st half of October, when the Fort. Avg. Max. Temp. ranged from 23.6 to 24.5°C and Fort. Avg. Rel. Humd. ranged between 70.4 to 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 68.

Status and distribution : Common. Commonly seen and heard at night. Bright red reflection of the eyes gives away its presence, in the middle of forest roads and road in the 'Chaud' keeps on sitting in the beam of the headlights of the vehicle or the search light till about too trampled. Also seen perching on electric or telephone wires, poles or posts wheresoever available. The maximum number of individuals in a single day was observed 45 (18th March, 1978) and minimum was one (12th January, 1977). Monthly average index varied from 1.0 to 12.7 (Plate 39 ; fig. 57).

TABLE 68

Observations	Year		
	1977	1978	1979
Date of first observation	12th Jan.,	19th Feb.,	8th Mar.,
Temperature in °C Minimum	10.0	8.0	10.5
Temperature in °C Maximum	19.0	12.5	16.8
Humidity in %	84.6	82.0	80.0
Date of last observation	2nd Oct.,	6th Aug.,	5th Jun.
Temperature in °C Minimum	18.5	23.0	24.0
Temperature in °C Maximum	26.0	25.0	34.0
Humidity in %	62.0	90.0	95.0

Feeding behaviour : Observed feeding in 'Chaud'. On few occasions birds were observed feeding on moths, beetles and termites. Samples were collected from the patches where birds were observed feeding. The insects turned out to be : Beetle ; *Catharsius pithecius*, *Anomale ruficapilla*. Termites : *Heterotermes indicola*, *Odontotermes ourdespuransis*. On few occasions they were observed feeding on caterpillars. Maximum feeding activity was observed at dusk after 18.00 hrs to till to dark.

Order : CORACIIFORMES

Family : ALCEDINIDAE

Genus : *Ceryle* Boie27. *Ceryle rudis leucomelanura* Reichenbach : Indian Pied Kingfisher.*Baker, FBI No. 1531, Vol. 4 : 246.**Salim Ali and Ripley, H. B. No. 719, Vol. 4 : 71.*

Period of stay : This species arrived in the Park between 1st half of October and 2nd half of November, when the Fort. Avg. Max. Temp. ranged from 22.0 to 22.8°C and Fort. Avg. Rel. Humd. ranged between 69 and 78%. The species left the Park in between 2nd half of June and 2nd half of July, when the Fort. Avg. Max. Temp. ranged from 28.3 to 29.2°C and Fort. Avg. Rel. Humd. ranged between 86.7 and 93.6%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 69.

TABLE 69

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	20th Dec., 1976	20th Nov., 1977	6th Oct., 1978
Temperature in °C Minimum	5.0	15.0	16.5
Temperature in °C Maximum	19.0	22.0	21.5
Humidity in %	90.9	78.0	75.0
Date of last observation	31st Jul., 1977	21st Jun., 1978	5th Jun., 1979
Temperature in °C Minimum	26.0	23.0	24.0
Temperature in °C Maximum	30.5	26.5	34.0
Humidity in %	92.0	95.0	95.0

Status and distribution : Common. Observed near the lake and Ram Ganga river, nallah and streams. Observed perching in small trees and bushes growing along or near the banks and also on boulders in riverbed. The maximum number of individuals observed in a single day was five (2nd January, 1977) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 3.5.

Feeding behaviour : Observed feeding in the lake and Ram Ganga river on fishes and water insects. While fishing the bird hovers almost stationary in the air over a shoal of fish in water. A sudden headlong dive and a quick stab seals the fate of the prey. The prey is too big to swallow in mid air is taken to a favourite perch nearby where it is

consumed at leisure. On a number of occasions birds were observed feeding (through binocular) on *Berilius bels* and *Nosmachsilus* sp. On few occasion birds were also observed feeding on water insects. Samples of water insects were collected from the patches where birds were observed feeding. These turned out to be Bug : *Laccotrophes ruber*, *Ranatra filiformis*, *Ptilomera laticaudata*. Beetles : *Gybister tripunctatus*. Feeding activity was observed at all hours of the day.

Family : MEROPIDAE

Genus : *Merops* Linnaeus

28. *Merops leschenaulti leschenaulti* Vieillot : Chestnutheaded Bee-eater.

Baker, FBI No. 1528, Vol. 4 : 240.

Salim Ali and Ripley, H. B. No. 744, Vol. 4 : 99.

Period of stay : This species generally arrived in between 2nd half of March and 1st half of April, when the Fort. Avg. Max. Temp. ranged from 22.6 to 35.6°C and Fort. Avg. Rel. Humd. ranged between 72 and 89.4%. It left the park in between 2nd half of July and 1st half of October, when the Fort. Avg. Max. Temp. ranged from 22.8 to 29.2°C and Fort. Avg. Rel. Humd. ranged between 69 and 93.6%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 70.

TABLE 70

Observations	Year		
	1977	1978	1979
Date of first observation	6th Apr.,	16th Mar.	18th Mar.,
Temperature in °C Minimum	18.0	14.5	14.0
Temperature in °C Maximum	29.0	21.0	20.5
Humidity in %	52.6	93.7	70.0
Date of last observation	29th Jul.,	4th Oct.,	3rd Jun.,
Temperature in °C Minimum	25.0	17.0	29.0
Temperature in °C Maximum	30.0	21.0	39.0
Humidity in %	92.7	75.0	85.0

Status and distribution : Rare. Occasionally observed perching on branches of trees, or electric or telephone wires along the forest roads in sheeshum island, in 'Chaud' and at the edge of forest. The maximum number of individuals observed in a single day was 50 (4th October, 1978) and minimum one (25th May, 1978) Monthly average index varied from 2.5 to 30.5 (Plate 39 ; fig. 58).

Feeding behaviour : Observed feeding on beetles, bugs, termites butterflies and bees. Hawk, insects or winged insects. Also hunts insect larvae and caterpillars from the branches of trees and bushes. On a number of occasions samples of insects were collected from the patches where these birds were observed feeding. These turned out to be : Bug, *Dalpada* sp., *Physopsts gutte*. Beetle : *Catharsius pithecius*, *Catharsius molessus*, *Anomale ruficapilla*, Termite : *Microtermes obesi*, *Odontotermes fess*, *Microcorotermes beelsoni*. On two occasion birds were observed holding *Euplea* sp. in its beak. Maximum feeding activity was observed at dusk between 1500 hrs to 1930 hrs. In morning feeding activity was observed comperatively less.

29. *Merops philippinus philippinus* Linnaeus : Bluetailed Bee-eater.

Baker, FBI No. 1526, Vol. 4 : 237.
Salim Ali and Ripley, H. B. No. 748, Vol. 4 : 106.

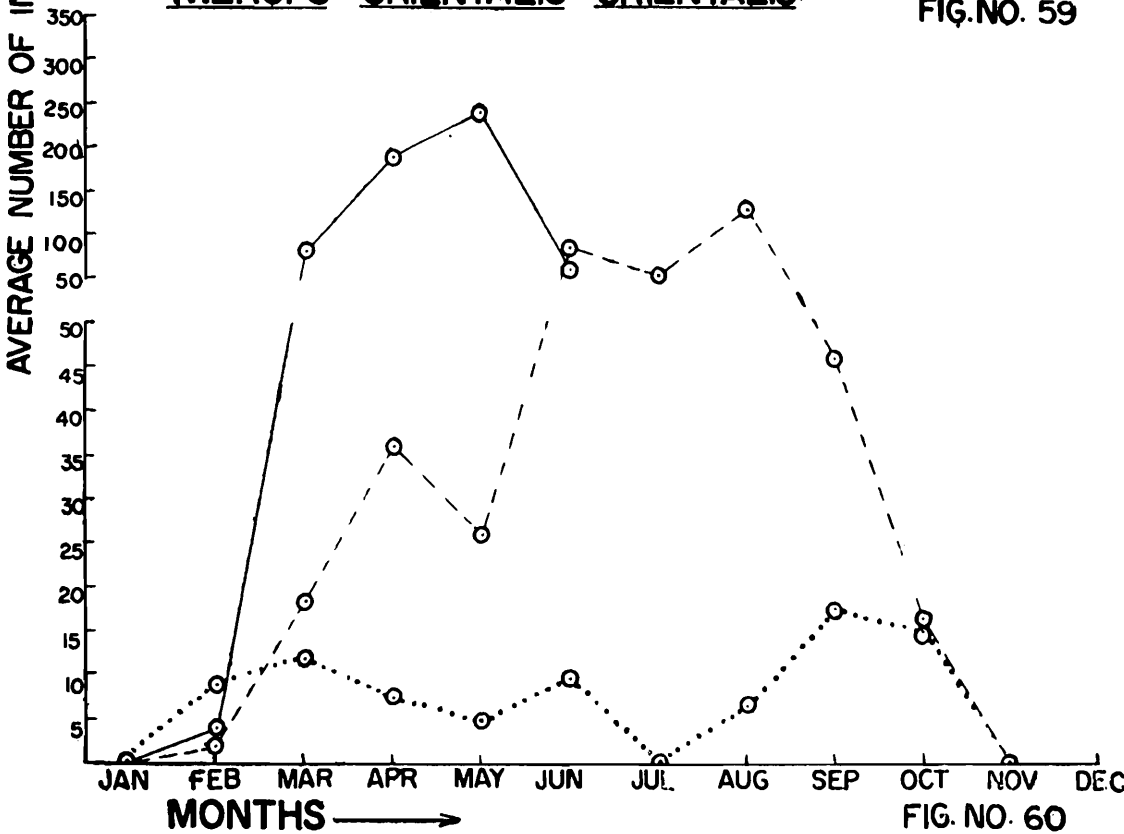
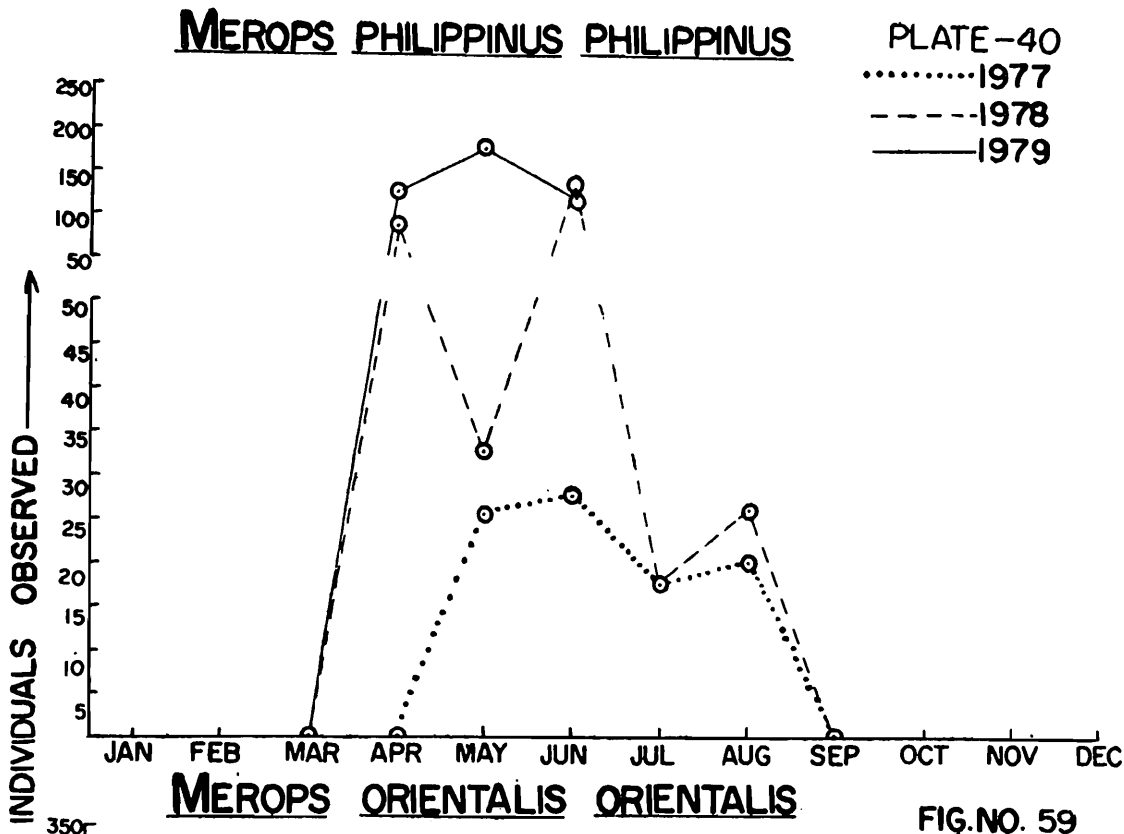
Period of stay : This species arrived in the Park between April and Ist half of May, when the Fort. Avg. Max. Temp. ranged from 31.8 to 40.7°C and Fort. Avg. Rel. Humd. ranged between 71.8 and 88.4%. The species left the park in the 1st half of August, when the Fort. Avg. Max. Temp. ranged from 24.5 to 25°C and Fort. Avg. Rel. Humd. ranged between 93.2 and 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 71.

TABLE 71

Observations	Year		
	1977	1978	1979
Date of first observation	1st May	11th Apr.	17th Apr.
Temperature in °C Minimum	21.0	19.0	29.0
Temperature in °C Maximum	35.0	34.5	37.0
Humidity in %	86.6	88.2	72.0
Date of last observation	8th Aug.	9th Aug,	5th Jun.
Temperature in °C Minimum	24.0	22.0	24.0
Temperature in °C Maximum	27.5	22.0	34.0
Humidity in %	94.1	96.0	95.0

Status and distribution : Common. Very frequently observed throughout the park, frequents exposed perches in grasslands, on forest-roads, in trees, sheeshum islands and the laks and riverside. The maximum number of individuals observed in a single day was 449 (2nd May 1979) and minimum was one (21 st June, 1978). Monthly average index varied from 17.5 to 174.6 (Plate 40 ; fig. 59).

Feeding behaviour : Hawk insects on the wing. On a number of occasions samples of insects were collected from the patches where the birds were observed feeding. These turned out to be *Vespa orientalis*
Beetle : *Cathersius pithecius*, *Anemala ruficapilla*. Bug. *Dalpada* sp.



Quite frequently observed feeding on bees but it was not possible to collect them for identification. On few occasions observed feeding on *Euploea* sp. On a couple of occasions birds were observed feeding on

swarming termites which were collected and identified as *Microcerotermes beelsoni*, *Coptotermes heimi* and *Microtermes unicolor*. A few birds were observed feeding on insect larvae and caterpillars also. Maximum feeding activity was observed between 1500 hrs to 1900 hrs at dusk. In morning hours feeding activity was observed comparatively less.

30. *Merops orientalis orientalis* Latham : Indian Small Green Bee-eater.

Baker, FBI No. 1523, Vol. 4 : 234.

Salim Ali and Ripley, H. B. No. 750, Vol. 4 : 109.

Period of stay : This species arrived in the park in 2nd half of February, when the Fort. Avg. Max. Temp. ranged from 14.8 to 25.9°C and Fort. Avg. Rel. Humd. ranged between 75.5 and 84.9%. The species left the park in the 1st half of October when the Fort. Avg. Max. Temp. ranged from 22.8 to 23.6°C and Fort. Avg. Rel. Humd. ranged between 69 to 70.4%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 72.

TABLE 72

Observations	Year		
	1977	1978	1979
Date of first observation	25th Feb.,	27th Feb.,	21st Feb.,
Temperature in °C Minimum	10.0	13.0	11.5
Temperature in °C Maximum	26.5	19.5	14.0
Humidity in %	89.0	72.5	86.0
Date of last observation	2nd Oct.,	7th Oct.,	5th Jun.,
Temperature in °C Minimum	18.5	16.0	24.0
Temperature in °C Maximum	26.0	25.0	34.0
Humidity in %	62.0	60.0	95.0

Status and distribution : Very common. Frequently observed throughout the park perching in exposed position or hawking insects on wings. Equally common in grasslands lake and riverside, forest roads and clearings, on electric wires and in sheeshum islands. The maximum number of individuals observed in a single day was 621 (1st May, 1979) and minimum was two (6th October, 1978). Monthly average index varied from 2.0 to 243.2 (Plate 40 ; fig. 60).

Feeding behaviour : Mostly observed feeding on ants, wasps, bees, butterflies, beetles, termites, insect larvae and caterpillars. Normally takes insects on the wing but is not averse to pick up an insect, larvae

or caterpillar from ground. Insect sample collected from the patches where birds were observee feeding turned out to be : Wasp : *Vespa orientalis*. Beetle : *Oxycetonis albopunctata*, *Anomala ruficapilla*, *Catharsius pithocius* Butterfly : *Ypthima* sp. *Euploea core*, Termite : *Coptotermes heimi*, *Microtermes obesi* etc. Maximum feeding activity was observed at dawn and dusk between 0600 hrs to 1000 hrs and 1500 hrs to 1900 hrs. Feeding activity was more at dusk in comparison to dawn.

Family : CORACIIDAE

Genus : *Coracias* Linnaeus

31. *Coracias benghalensis benghalensis* (Linnaeus) : Northern Roller or Blue Jay.

Baker, FBI No. 1517, Vol. 4 : 224.

Salim Ali and Ripley, H. B. No. 755, Vol. 4 : 116.

Period of stay : This species arrived in the park in between 2nd half of February and 1st half of March, when the Fort. Avg. Max. Temp. ranged from 14.8 to 29.3°C and Fort. Avg. Rel. Humd. ranged between 75.5 and 87.4%. The species left the park in the 1st half of August, when the Fort. Avg. Max. Temp. ranged from 24.5 to 25°C and Fort. Avg. Rel. Humd. ranged between 93.2 and 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 73.

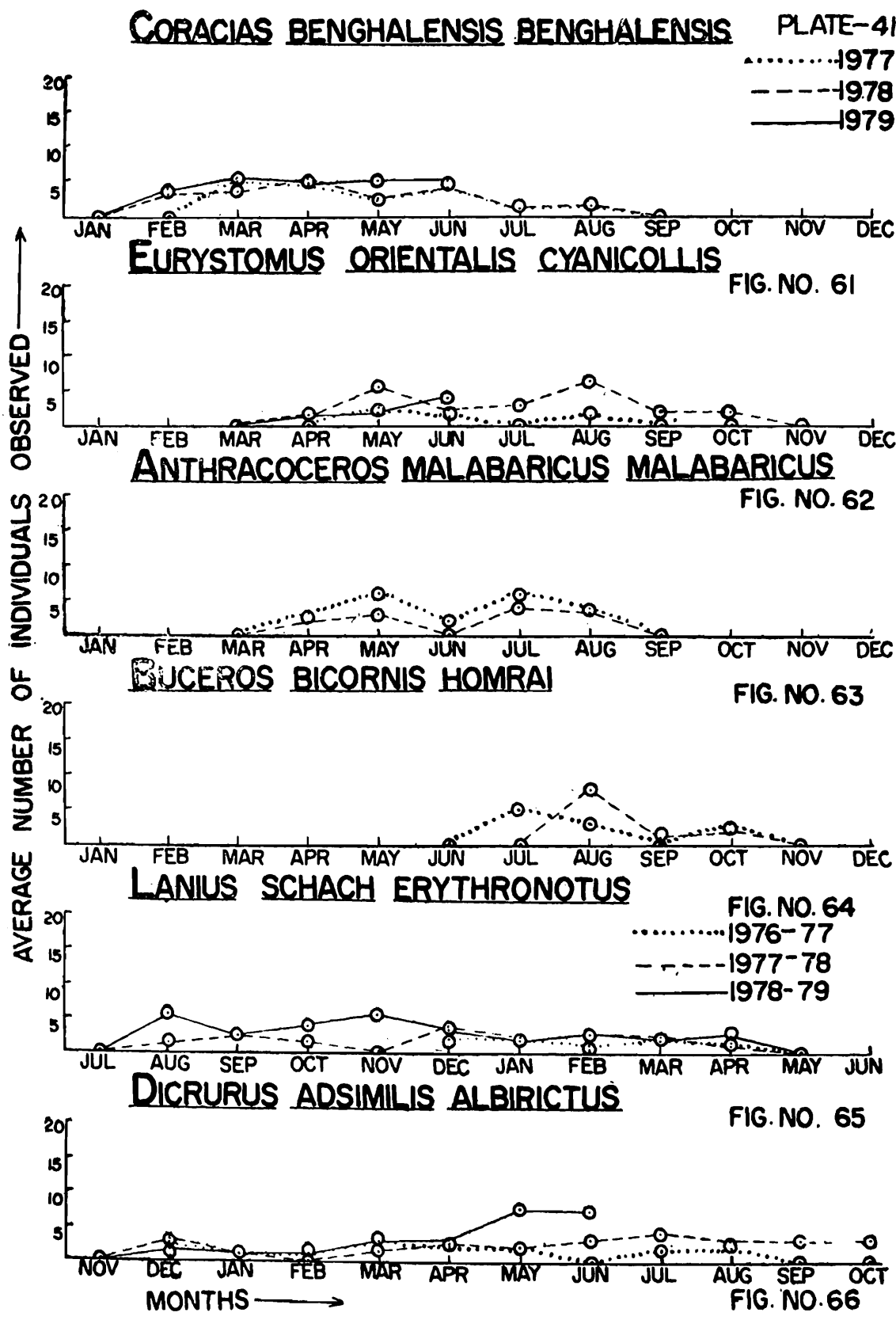
TABLE 73

Observations	Year		
	1977	1978	1979
Date of first observation	15th Mar.,	28rd Feb.,	20th Feb.,
Temperature in °C Minimum	16.0	10.0	12.5
Temperature in °C Maximum	32.5	17.0	15.0
Humidity in %	83.5	70.0	87.5
Date of last observation	8th Aug.,	8th Aug.,	3rd Jun.,
Temperature in °C Minimum	24.0	23.0	29.0
Temperature in °C Maximum	27.5	24.0	39.0
Humidity in %	94.5	95.0	85.0

Status and distribution : Very common. Quite frequently observed throughout the park perching on posts, poles, roadside, trees, electric wires and similar exposed positions from where it watches for the movement of its prey. The maximum number of individuals observed in a single day was 13 (23rd March, 1979) and minimum was one on a

number of occasions. Monthly average index varied from 1.0 to 5.5 (Plate 41 ; fig. 61).

Feeding behaviour : As soon as the movement of a prey catches its eye the bird launches itself after it and more often then not returns to the same perch. Observed feeding on beetles, crickets, termites, butter-



flies, insect larvae and caterpillars. Samples collected from the patches where these birds were observed feeding turned out to be : Beetle :

Cathersius pithocius, *Anomala ruficapilla*, *Oxycatonis albopunctata*. Cricket : *Gryllotalpa fossor*, *Gryllus domesticus*, Termite : *Coptotermes heimi*, *Microtermes unicolor*, *Odontotermes guptai* Butterfly : *Euploea core* and *Yothima* sp. Although few birds were observed feeding at all hours of the day, but maximum feeding activity was observed at dawn and dusk between 0500 hrs to 0900 hrs and 1500 hrs to 1900 hrs.

Genus : **Eurystomus** Vieillot

32. **Eurystomus orientalis cyanicollis** Vieillot : Himalayan Broad-billed Roller.

Baker, FBI No. 1520, Vol. 4 : 228

Salim Ali and Ripley, H. B. No. 758, Vol. 4 : 120.

Period of stay : This species arrived in the park in between 2nd half of April and 1st half of May, when the Fort. Avg. Max. Temp. ranged from 35.5 to 40.7°C and Fort. Avg. Rel. Humd. ranged between 71.8 and 87.5%. It left the park in between 1st half of August and 1st half of October, when the Fort. Avg. Max. Temp. ranged from 22.8 to 25.0°C and Fort. Avg. Rel. Humd. ranged between 69.0 to 93.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 74.

TABLE 74

Observations	Year		
	1977	1978	1979
Date of first observation	4th May,	26th Apr.	26th Apr.
Temperature in °C Minimum	17.0	18.0	29.0
Temperature in °C Maximum	43.0	31.0	35.5
Humidity in%	93.0	83.7	72.5
Date of last observation	8th Aug.,	2nd Oct.,	5th Jun.,
Temperature in °C Minimum	24.0	19.5	24.0
Temperature in °C Maximum	27.5	25.5	34.0
Humidity in%	90.0	62.0	95.0

Status and distribution : Rare. Occasionally observed perching on electric wires and poles in 'Chaud' and at the edge of dense forest. The maximum number of individuals observed in a single day was 11 (4th and 5th August, 1978) and minimum was one on a number of occasions. Monthly average index varied from 1.3 to 6.6 (Plate 41 ; fig. 62).

Feeding behaviour : Usually catches insects in air. Observed feeding on circkets, beetles and termites. On few occasions, insect samples were collected from the patches where these birds were observed feeding. The insects turned out to be : Cricket : *Gryllus domesticus*, *Gryllotalpa fossor*. Beetle : *Catharsius molassus*, *Anomala ruficapilla*. Termite : *Coptotermes heimi*, *Microtermes obesi*, *Odontotermes gurdespurensis*. On few occasions birds were observed feeding on insect larvae and caterpillars also. On one occasion a bird was observed attacking *Calotes* sp. Maximum feeding activity was observed at dawn and dusk between 0600 hrs to 1000 hrs and 1600 hrs to till too dark.

Family : BUCEROTIDAE

Genus : *Anthracoceros* Reichenbach

33. *Anthracoceros malabaricus malabaricus* (Gmelin) : Indian Pied Hornbill.

Baker, FBI No. 1565, Vol. 4 : 288.

Salim Ali and Ripley, H. B. No. 774, Vol. 4 : 140.

Period of stay : This species arrived in the Park in the 1st half of April, when the Fort. Avg. Max. Temp. ranged from 31.3 to 35.6°C and Fort. Avg. Rel. Humd. ranged between 79.7 and 88.4%. It left the Park in the 1st half of August, when the Fort. Avg. Max. Temp. ranged from 24.5 to 25°C and Fort. Avg. Rel. Humd. ranged between 93.2 and 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 75.

TABLE 75

Observations	Year	
	1977	1978
Date of First observation	3rd Apr.	1st Apr.
Temperature in °C Minimum	16.0	14.5
Temperature in °C Maximum	39.0	28.0
Humidity in %	80.0	80.0
Date of last observation	8th Aug.	5th Aug.
Temperature in °C Minimum	24.0	22.0
Temperature in °C Maximum	7.5	27.0
Humidity in %	90.0	96.0

Status and distribution : Rare. Observed in dense forest on trees in fruit. Most of the time this species was observed in Khinanauli forest

and Fulai forest. The maximum number of individuals observed in a single day was six (2nd May, 1977) and minimum was two on a number of occasions. Monthly average index varied 2.0 to 6.0 (Plate 41 ; fig. 63).

Feeding behaviour : Known to feed on wild figs, drupe, berries, fish, young birds, lizards and snakes but in the Park it was observed feeding on wild figs of *Ficus bengalensis*, *Ficus glomerata* and *Eugenia jambolana*. On one occasion observed carrying *Calotes* sp. in its beak. Maximum feeding activity was observed between 0600 to 1100 hrs in the morning.

Genus : **Buceros** Linnaeus

34. **Buceros bicornis homrai** Hodgson : Great Pied Hornbill.

Baker, FBI No. 1563, Vol. 4 : 284.

Salim Ali and Ripley, H. B. No. 776, Vol. 4 : 143.

Period of stay : This species arrived in the Park in between 2nd half of July and 1st half of August, when the Fort. Avg. Max. Temp. ranged from 24.5 to 29.1°C and Fort. Avg. Rel. Humd. ranged between 93.6 and 95.3%. It left the Park in the 1st half of October, when the Fort. Avg. Max. Temp. ranged from 22.8 to 23.6°C and Fort. Avg. Rel. Humd. ranged between 69 to 70.4%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 76.

TABLE 76

Observations	Year	
	1977	1978
Date of first observation	30th Jul.	1st Aug.
Temperature in °C Minimum	23.0	20.0
Temperature in °C Maximum	27.0	22.5
Humidity in %	96.0	96.0
Date of last observation	1st Oct.	2nd Oct.
Temperature in °C Minimum	20.0	19.5
Temperature in °C Maximum	25.0	25.5
Humidity in %	65.0	62.0

Status and distribution : Rare. Observed in the sal forest near Dhikala, Fulai and Paterpani. The maximum number of individuals observed in a single day was eight (1st August, 1978) and minimum was two (2nd October, 1978). Monthly average index varied from 1.0 to 8.0 (Plate 41 ; fig. 64).

Feeding behaviour : Known to feed on wild figs, drupes, lizards, snakes, rats and nestling birds. In the Park observed feeding on wild figs of *Ficus bengalensis* *Ficus glomerata* and fruits of *Eugania jambolana*. Feeding activity was observed maximum in the morning between 0600 hrs to 1100 hrs.

Order : PASSERIFORMES

Family : LANIIDAE

Genus : *Lanius* Linnaeus

35. *Lanius sehach arythronotus* (Vigors) : Rufousbacked Shrike.

Baker, FBI No. 714, Vol. 2 : 295.

Salim Ali and Ripley, H. B. No. 946, Vol. 5 : 93.

Period of stay : This species arrived in the Park in the 1st half of August, when the Fort. Avg. Max. Temp. ranged from 24.5 to 25°C and Fort. Avg. Rel. Humd. ranged between 93.2 and 95.3%. The species left the Park in between April and 2nd half of May, when the Fort. Avg. Max. Temp. ranged from 31.3 to 36.5°C and Fort. Avg. Rel. Humd. ranged between 91 and 88.4%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 77.

TABLE 77

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	20th Dec., 1976	3rd Aug., 1977	2nd Aug., 1978
Temperature in °C Minimum	5.0	23.0	21.0
Temperature in °C Maximum	19.0	25.5	23.0
Humidity in %	90.9	94.3	97.0
Date of last observation	29th Apr. 1977	11th Apr. 1978	16th May., 1979
Temperature in °C Minimum	23.0	19.0	22.5
Temperature in °C Maximum	35.0	34.5	38.0
Humidity in %	80.8	88.2	80.0

Status and distribution : Very common. Frequently observed throughout the Park in 'Chaud', near the river and lake, and in scrub or grassland at the edge of the forest. The maximum number of individuals observed in a single day was 10 (29th November, 1979) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 5.6 (Plate 41 ; fig. 65).

Feeding behaviour : Observed feeding on crickets, grasshoppers, winged termites, beetles, insect larvae, caterpillars, butterflies, lizards and field mice. On a number of occasions birds were observed feeding on winged insects. Samples collected from the places where these birds were seen feeding later on turned out to be as follows : Cricket ; *Gryllotalpa fossor*, *Gryllus domesticus*. Grasshopper ; *Trilophidia annulata*, *Stenocatantops splendens*. Beetle : *Catharsius pithecius*, Butterfly : *Euploea core*. Termite : *Heterotermes indicola*, *Coptotermes heimi*. On a few occasions birds were observed feeding on *Calotes versicolor* and *Riopa punctata*. On one occasion one bird was observed (through binocular) attacking on *Mus*. sp. Observed feeding at all hours of the day. Maximum feeding activity was observed in morning and evening between 0600 hrs to 1000 hrs and 1600 hrs to 1900 hrs.

Family : DICRURIDAE

Genus : **Dicrurus** Vieillot

36. *Dicrurus adsimilis albirictus* (Hodgson) : North Indian Black Drongo or King Crow.

Baker, FBI No. 767, Vol. 2 : 357.

Salim Ali and Ripley, H. B. No. 962, Vol. 5 : 114.

Period of stay : This species arrived in the Park in 1st half of December, when the Fort. Avg. Max. Temp. ranged from 13.4 to 15.1°C and Fort. Avg. Rel. Humd. ranged between 78.9 and 80.1%. The species left the Park in between 1st half of August and 1st half of October, when the Fort. Avg. Max. Temp. ranged from 24.5 to 25°C and Fort. Avg. Rel. Humd. ranged between 93.2 and 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 78.

TABLE 78

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	18th Dec., 1976	13th Dec., 1977	7th Dec., 1978
Temperature in °C Minimum	4.5	7.0	6.0
Temperature in °C Maximum	18.5	13.5	15.0
Humidity in %	87.5	82.0	75.0
Date of last observation	8th Aug., 1977	4th Oct., 1978	5th Jun., 1979
Temperature in °C Minimum	24.0	22.0	24.0
Temperature in °C Maximum	27.5	25.0	34.0
Humidity in %	90.0	97.0	95.0

Status and distribution : Common. Frequently observed singly, in pairs or small parties throughout the Park in grassland, forest, lake and riverside. The maximum number of individuals observed in a single day was 23 (9th May, 1979) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 7.5 (Plate 41 ; fig. 66).

Feeding behaviour : Observed feeding on insect larvae, caterpillars, lizards, small birds and occasionally fleshy parts and nectar of flowers. On a few occasions birds were observed feeding on *Calotes versicolor* and *Riopa punctata*. Sometime birds were observed feeding on fleshy petals of *Butea monosperma* and nectar of *Bombax malabaricum*. On one occasion a bird was observed attacking the Grey Tit (*Parus major*). Maximum feeding activity was observed between 0600 hrs to 1000 hrs and 1600 hrs to 1900 hrs.

37. **Dicrurus hottentottus hottentottus** (Linnaeus) : Hairceded or Spangled Drongo.

Baker, FBI No. 782, Vol. 2 : 370.

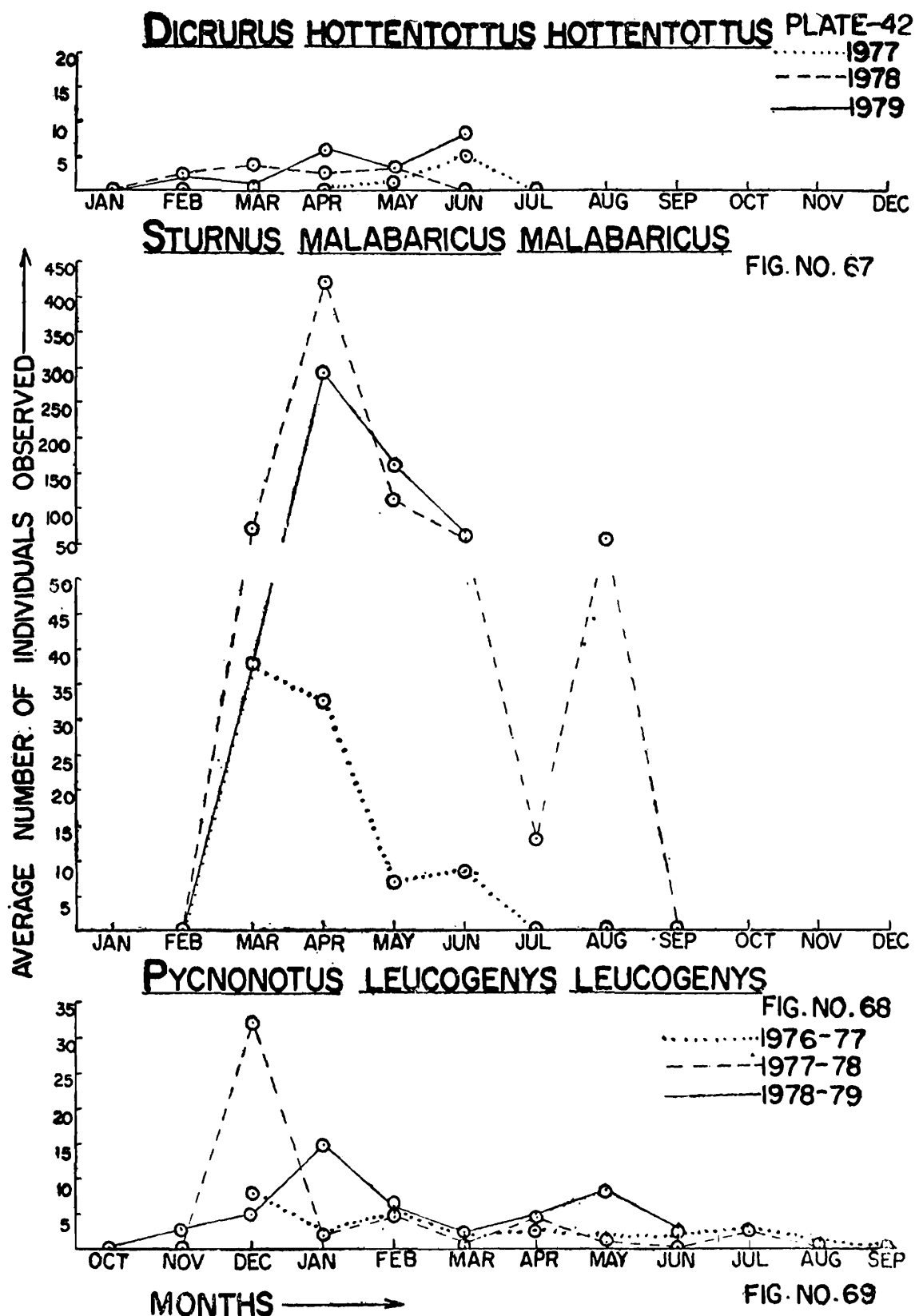
Salim Ali and Ripley, H. B. No. 973, Vol. 5 : 131.

Period of stay : This species arrived in the Park in the 2nd half of February, when the Fort. Avg. Max. Temp. ranged from 13.8 to 21.3°C and Fort. Avg. Rel. Humd. ranged between 83.8 and 86.1%. It left the Park in between 1st half of May and 2nd half of June, when the Fort. Avg. Mex. Temp. ranged from 33.6 to 36.8°C and Fort. Avg. Rel. Humd. ranged between 89.8 and 92%. In the year 1977 species arrived in the Park in the 1st half of May, when the Fort. Avg. Max. Temp. was recorded 40.7°C and Fort. Avg. Rel. Humd. was recorded 85.8%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 79.

TABLE 79

Observations	Year		
	1977	1978	1979
Date of first observation	1st May	24th Feb.,	20th Feb.
Temperature in °C Minimum	21.0	9.0	10.5
Temperature °C Maximum	35.0	23.0	14.0
Humidity in%	86.6	88.8	87.5
Date of last observation	17th Jun.	15th May	5th Jun.
Temperature in °C Minimum	28.5	23.0	24.0
Temperature in °C Maximum	34.0	38.0	34.0
Humidity in%	89.6	87.5	95.0

Status and distribution : Rare. Occasionally observed near waterhole of Bichhu Bhuji and at the edge of sal forest near Thandi Sarak. The maximum number of individuals observed in a single day was 14 (27th April, 1979) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 8.0 (Plate 42 ; fig. 67).



Feeding behaviour : Mostly observed feeding on insects and flower nectar. On a number of occasions birds were observed feeding on

flower nectar of *Bombax malabaricum*. Observed feeding at all hours of the day but maximum feeding activity was observed between 1600 hrs to 1900 hrs.

Family : STURNIDAE

Genus : *Sturnus* Linnaeus

38. *Sturnus malabaricus malabaricus* (Gmelin) : Greyheaded Myna.

Baker, FBI No. 982, Vol. 3 : 39.

Salim Ali and Ripley, H. B. No. 987, Vol. 5 : 152.

Period of stay : This species arrived in the Park in the 2nd half of March, when the Fort. Avg. Max. Temp. ranged from 22.6 to 32.9°C and Fort. Avg. Rel. Humd. ranged between 72 and 89.4%. It left the Park in between 2nd half of June and 1st half of August, when the Fort. Avg. Max. Temp. ranged from 24.5 to 33.6°C and Fort. Avg. Rel. Humd. ranged between 92 and 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 80.

TABLE 80

Observations	Year		
	1977	1978	1979
Date of first observation	16th Mar.	18th Mar.	18th Mar.
Temperature in °C Minimum	15.0	14.0	14.0
Temperature in °C Maximum	34.0	21.0	20.5
Humidity in %	90.3	94.4	70.0
Date of last observation	17th Jun.,	6th Aug.,	5th Jun.,
Temperature in °C Minimum	28.5	33.0	24.0
Temperature in °C Maximum	34.0	25.0	34.0
Humidity in %	89.6	90.0	95.0

Status and distribution : Common. Observed throughout the Park. Frequents the branches of flowering trees and bushes in flower. Occasionally on ground along with common Myna and Brahminy Myna. A single roost of more than 2300 birds was observed near 'Mota Sal' in 'Nibu Bhui'. The maximum number of individuals observed in a single day was 2350 (1st May, 1979) and minimum was two (21st May, 1978). Large flocks were observed flying from East to West at dusk. Monthly average index varied from 6.9 to 423.5 (Plate 42 ; fig. 68).

Feeding behaviour : Observed feeding on fruits, berries, flower nectar, insects, insect larvae and caterpillars. On a number of

occasions birds were observed feeding on fruits and berries of *Zizyphus jujuba*, *Lantana aculeata*, *Ficus religiosa*, *Ficus glomerata*, *Bombex malabaricum* and fleshy petals of *Butea monosperma*. Few birds were observed feeding at all hours of the day but maximum feeding activity was observed between 1600 hrs and 1900 hrs.

Family : PYCNONOTIDAE

Genus : *Pycnonotus* Boie

39. *Pycnonotus leucogenys leucogenys* (Gray) : Whitecheeked Bulbul.

Baker, FBI No. 405, Vol. 1 : 389.

Salim Ali and Ripley, H. B. No. 1125, Vol. 6 : 83.

Period of stay : This species arrived in the Park between 2nd half of November and 1st half of December, when the Fort. Avg. Max. Temp. ranged from 15.1 to 21.6°C and Fort. Avg. Rel. Humd. ranged between 78.9 and 90.7%. It left the Park between 2nd half of July and 1st half of August, when Fort. Avg. Max. Temp. ranged from 25 to 27.1°C and Fort. Avg. Rel. Humd. ranged between 88 to 93.2%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 81.

TABLE 81

Observations	Year		
	1976-77	1977-78	1978-79
Date of first observation	15th Dec., 1976	11th Dec., 1977	29th Nov., 1978
Temperature in °C Minimum	4.5	10.0	18.0
Temperature in °C Maximum	19.0	15.5	23.0
Humidity in %	88.2	75.0	75.0
Date of last observation	3rd Aug., 1977	27th Jul., 1978	5th Jun., 1979
Temperature in °C Minimum	23.0	24.0	24.0
Temperature in °C Maximum	25.5	27.0	34.0
Humidity in %	94.3	90.0	95.0

Status and distribution : Rare. Occasionally observed in smaller trees, in bushes or scrub, in 'Chaud', and forest clearings. Also seen perched on electric wires and branches of trees at the edge of mixed forest on Khinanauli road appears to be a favourite site. The maximum number of individuals observed in a single day was 45 (22nd December, 1977) and minimum was one on a number of occasions. Monthly average index varied from 1.3 to 32.3 (Plate 42 ; fig. 69).

Feeding behaviour : Normally observed feeding on fruits, berries, nectar, seeds, insects larvae and caterpillars. On a number of occasions

birds were observed feeding on berries of *Lantana aculeata*, *Zizyphus jujuba*, *Melia* sp. and fleshy petals of *Butea monosperma*. Feeding activity was normally observed in early morning and late evening between 0600 hrs to 0900 hrs and 1600 hrs to 1900 hrs.

Family : MUSCICAPIDAE
Genus : *Rhipidura* Vigors & Horsfield

40. *Rhipidura aureola aureola* Lesson : Northern Whitebrowed Fantail Flycatcher.

Baker, FBI No. 700, (part), Vol. 2 : 277.
Salim Ali and Ripley, H. B. No. 1451, Vol. 7 : 207.

Period of stay : This species arrived in the Park between 1st half of February and 1st half of March, when the Fort. Avg. Max. Temp. ranged from 18.9 to 21.4°C and Fort. Avg. Rel. Humd. ranged between 79.6 and 81.4%. The species left the Park in between 1st half of August and 1st half of October, when then Fort. Avg. Max. Temp. ranged from 22.8 to 25°C and Fort. Avg. Rel. Humd. ranged between 69 and 93.2%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 82.

Status and distribution : Rare. Occasionally observed on forest road to Khinanauli and near forest rest house, also seen on Thandi Sarak near Dhikala on the top of lantana bushes. The maximum number of individuals observed in a single day was 10 (29th March, 1978) and minimum was one a number of occasions. Monthly average index varied from 1.0 to 5.8 (Plate 43 ; fig. 70).

Feeding behaviour : Known to feed on Insects of the orders diptera and hemiptera. In the Park it was observed feeding on insect larvae and caterpillars on a few occasions, in afternoon between 1600 hrs and 1800 hrs.

TABLE 82

Observations	Year		
	1977	1978	1979
Date of first observation	10th Feb.	3rd Feb.	8th Mar.
Temperature in °C Minimum	6.0	6.5	10.5
Temperature in °C Maximum	21.0	22.5	16.0
Humidity in %	84.3	83.8	80.0
Date of last observation	1st Aug.	4th Oct.	5th Jun.
Temperature in °C Minimum	21.0	17.0	24.0
Temperature in °C Maximum	23.5	21.0	34.0
Humidity in %	90.0	75.0	95.0

41. *Rhipidura albicollis canescens* (Koelz) : Western Whitethroated Faintail Flycatcher.

Baker, FBI No. 703 (part), Vol. 2 : 279.

Salim Ali and Ripley, H. B. No. 1454, Vol. 7 : 211.

Period of stay : This species arrived in the Park between 2nd half of January and 2nd half of February, when the Fort. Avg. Max. Temp. ranged from 13.8 to 15.8°C and Fort. Avg. Rel. Humd. ranged between 75.5 and 83.8%. It left the Park in the 1st half of October, when the Fort. Avg. Max. Temp. was recorded 22.8°C and Fort. Avg. Rel. Humd. was recorded as 69%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 83.

TABLE 83

Observations	Year	
	1978	1979
Date of first observation	23rd Feb.	28th Jan.
Temperature in °C Minimum	10.0	10.0
Temperature in °C Maximum	17.0	15.5
Humidity in %	70.0	78.0
Date of last observation	2nd Oct.	5th Jun.
Temperature in °C Minimum	19.5	24.0
Temperature in °C Maximum	25.5	34.0
Humidity in %	62.0	95.0

Status and distribution : Common. Mostly observed in shady bushes and trees along forest roads and even in the compound of forest rest houses. It flits at the edge of forest on Thandi Sarak and around in the branches catching insects and on the top of bushes. The maximum number of individuals observed in a single day was 10 (2nd May, 1979) and minimum was one (17th April, 1978). Monthly average index varied from 1.0 to 7.0 (Plate 43 ; fig. 71).

Feeding behaviour : On a few occasions observed feeding on insects larvae and caterpillars in the afternoons between 1600 hrs to 1800 hrs.

Genus : **Copsychus** Wagler

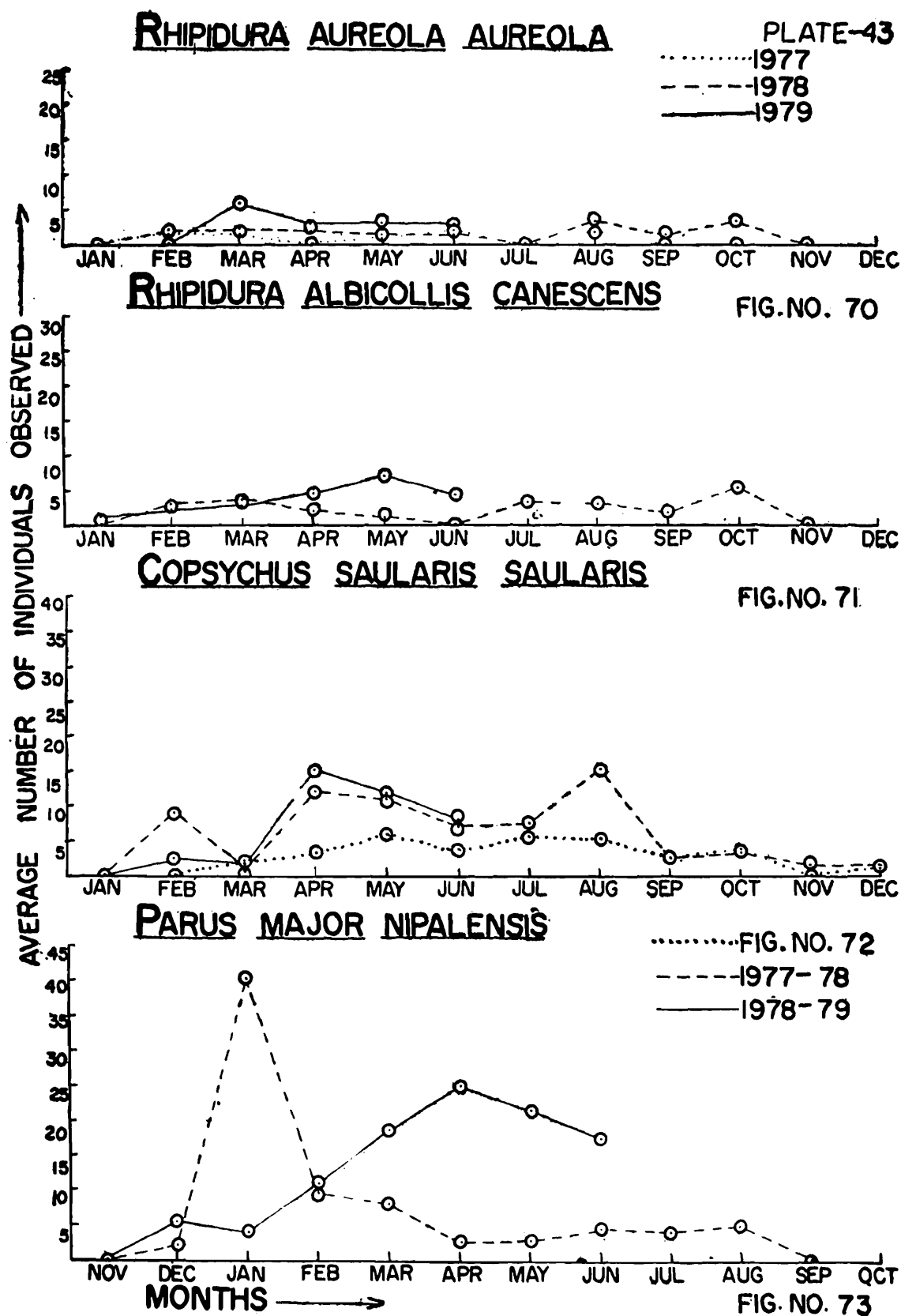
42. *Copsychus saularis saularis* (Linnaeus) : Indian Magpie-Robin.

Baker, FBI No. 558 (part), Vol. 2 : 113.

Salim Ali and Ripley, H. B. No. 1661, Vol. 8 : 239.

Period of stay : This species arrived in the Park between 2nd half of February and 2nd half of March, when the Fort. Avg. Max. Temp.

ranged from 14.8 to 32.9°C and Fort. Avg. Rel. Humd. ranged between 75.5 and 88.9%. It left the Park in 2nd half of December when the Fort. Avg. Max. Temp. ranged from 13.7 to 15.7°C and Fort. Avg. Rel. Humd. ranged between 78 and 82.6%. The actual dates on which birds



were first and last observed along with the relevant meteorological data are given in Table 84.

TABLE 84

Observations	Year		
	1977	1978	1979
Date of first observation	25th Mar.	26th Feb.	16th Feb.
Temperature in °C Minimum	17.0	13.0	12.0
Temperature in °C Maximum	35.5	19.5	16.0
Humidity in %	93.3	72.5	87.5
Date of last observation	25th Dec.	31st Dec.	5th Jun.
Temperature in °C Minimum	8.0	8.0	24.0
Temperature in °C Maximum	14.0	13.5	34.0
Humidity in %	83.0	80.0	95.0

Status and distribution : Common. Frequently observed throughout the Park. Equally at home in grassland, 'Chaud' forest clearings, in the forest and on the bushes and trees along the lake and road. The maximum number of individuals observed in a single day was 46 (2nd August, 1978) and minimum was one on a number of occasions. Monthly average index varied from 1.0 to 15.2 (Plate 43 ; fig. 72).

Feeding behaviour : Observed feeding on butterflies, grasshoppers, termites, insect larvae, caterpillars, flower nectar and small lizard. On a number of occasions birds were observed feeding on winged insects. Samples collected from the place of feeding were later identified as : Butterfly : *Euploea core*, *Yothima* sp. Grasshopper : *Trilophidia annulata*, *Stenocatantops splendens*. Termite : *Microtermes obesi*, *Coptotermes heimi*, *Microcerotermes besoni*. On one occasion a bird was observed attacking a *Calotes versicolor*. On a few occasions birds were observed feeding on fleshy petals of *Butea monosperma*. Feeding activity was observed at all hours of the day, but maximum feeding activity was observed in afternoons between 1600 hrs and 1900 hrs.

Family : PARIDAE

Genus : **Parus** Linnaeus

43. **Parus major nipalensis** Hodgson : Nepal Grey Tit.

Baker, FBI Nos. 51, 54 & 55 (part), Vol. 1 : 74.77.

Salim Ali and Ripley, H. B. No. 1793, Vol. 9 : 168.

Period of stay : This species arrived in the Park in December, when the Fort. Avg. Max. Temp. ranged from 13.4 to 15.7°C and Fort. Avg. Rel. Humd. ranged between 80.1 and 82.6%. It left the Park in 1st half of August, when the Fort. Avg. Max. Temp. was recorded 24.5°C

and Fort. Avg. Rel. Humd. was recorded 95.3%. The actual dates on which birds were first and last observed along with the relevant meteorological data are given in Table 85.

TABLE 85

Observations	Year	
	1977-78	1978-79
Date of first observation	16th Dec., 1977	18th Dec., 1978
Temperature in °C Minimum	7.0	10.0
Temperature in °C Maximum	16.0	17.0
Humidity in %	84.0	82.5
Date of last observation	10th Aug., 1978	4th Jun., 1979
Temperature in °C Minimum	22.5	25.5
Temperature in °C Maximum	26.0	36.0
Humidity in %	93.0	90.0

Status and distribution : Rare. Occasionally observed on the branches of tree in sal forest, on the top of bushes on thandi sarak, Khinanauli road and 'Chaud'. The maximum number of individuals observed in a single day was 75 (31st January, 1978) and minimum was one on a number of occasions. Monthly average index varied from 2.3 to 40.3 (Plate 42 ; fig. 73).

Feeding behaviour : Observed feeding on caterpillars, insects larvae, flowers, buds and berries. On a number of occasions birds were observed feeding on berries of *Ziglyphus jujuba*, *Lantana camara*, buds of *Bombex malabricum*, *Phliostigma malabaricum* and fleshy petals of *Butea monosperma*. Maximum feeding activity was observed in early morning and late evenings between 0600 hrs to 1000 hrs and 1600 hrs to 1900 hrs.

DISCUSSION

A. Winter Visitors

A large majority of birds that breed in palaeartic region beyond the Himalayas in central and Northern Asia and Central and Northern Europe finds the winters of their breeding grounds hard to survive in. The winters are very severe there with temperature falling many degrees below zero. There are strong blizzards and snow storms. The food and shelter become very scarce. In order to survive the birds are forced to move towards comparatively warmer equatorial regions where food and shelter are available easily in relatively moderate winter.

In addition to these species there are many others whose palaearctic breeding range just encroaches our boundaries in the Himalayas on West Pakistan-Afghanistan border and also into Gilgit, Ladakh, Garhwal, Nepal, Sikkim, Bhutan and North Eastern Himalayan regions. Many of these species too move down to the warmer parts of the country in Northern, Central and Southern India during harsh winters in the Himalayas and thus behave somewhat like extralimital migrants. The word winter visitor has been used for this category of birds in this text.

The winter migration of birds is very well known phenomenon since the dawn of civilization and has been discussed in detail elsewhere. Despite the advances made in the field of science and technology, our present day knowledge of the mechanism of migration is far from complete. The current theory of migratory birds can be summed up as follows :—

1. The migratory birds take their cue for migration from the climatological factors, *viz.*, length of day (or sunshine hours), temperature, humidity etc. which evidently triggers off internal (physiological and hormonal) changes.

2. They generally collect into and move in large flocks often flying at great height (6000 to 8800 m) and speed 80-800 kmph covering long distances (upto 18000 km) sometime in single non-stop (4500 km's) hops (Ali, S. 1972).

3. They find their direction from the position of the sun stars and constellations and often visit a favourite area during a certain time period, year after year as long as the food and protection last (Ali, S. 1972).

It has been a general belief that most of these winter migrants enter India through two migratory routes, one each in Western and eastern Himalayas, avoiding the higher central ranges.

The availability of food and shelter can safely be singled out as the most important factor which attracts all migratory birds including the winter visitors. Unfortunately the earlier workers in Indian subcontinent did not leave any records of the ecology of the areas from where they recorded the bird migration data like dates of arrival and departure etc. Neither they dwelt upon the protection provided by the local people nor upon the climatological conditions prevailing at the time of arrival and departure ; thus neglecting a very important aspect of bird migration i.e. the factors that attracted the winter migrants. In India there have been large scale ecological changes over the past 50 years or so that have had a direct bearing on bird

migration. Large rivers have been left with meagre flow. Marshes have disappeared from many areas. Large multipurpose dams have come up in hitherto dry areas converting them into large water reservoirs. In the Himalayan terrai region close to which the present study area situated the ecology has also changed considerably. The formerly marshy areas which provided food and shelter to a large number of migratory birds have now been converted into lush green agricultural farms irrigated with tube wells and canals and have thus become unattractive to migratory birds. A number of multipurpose dams have sprung up in formerly dry areas converting them into large water reservoirs which now attract a large variety of winter visitors.

The area of present study is one such area where a large lake has recently sprung up as a result of construction of a Multipurpose Hydel Project Dam at Kalagarh. It has gradually started attracting more and more winter visitors in recent years, though it had completed sometimes in 1972. In the year 1976-1977 only a few migrants like *Ciconia nigra*, *Tadorna ferruginea*, *Tadorna tadorna*, *Netta rufina*, *Charadrius dubius jerdoni*, *Larus fuscus fuscus*, *Larus ichthyaetus*, *Saxicola torquata przewalskii*, *Turdus ruficollis atrogularis*, *Motacilla flava beema* and *Motacilla alba dukhunensis* could be observed. In year 1977-78 many other species like *Podiceps cristatus cristatus*, *Anas crecca crecca*, *Circus macrourus* and *Tringa hypoleucos* arrived for the first time in the study area. *Tadorna tadorna* is known as a casual and uncommon winter visitor in India. It has been recorded only in Sind, Pakistan and Punjab in small numbers (Ali and Ripley, 1978 : 144) and never beyond. But it appears to be a regular winter visitor to the Park. Flocks of more than two hundred were regularly observed in the Park from December to March. Their number was found to increase every year (Plate 26 : fig. 4). These species have presumably extended their range on account of the unfavourable ecological conditions now prevailing in their former range.

Other species like *Larus fuscus fuscus* and *Larus ichthyaetus* are reported for the first time from the area. According to (Ali and Repley, 1969 : 28-9) distributional range of both of these species in western India is upto Delhi in North. Both these species have been observed in the study area which is approximately 300 km away (N. E.) from its known range. Not only their number increased each year but also their period of stay prolonged (Plate 28 : fig. 10, 11). It is quite evident that these two species of winter visitors as well as other fish eating birds, were attracted to the Park by the large freshly formed lake which sustained large quantities of fish. The area being a National Park provided the necessary protection. Many other

winter visitors like *Podiceps cristatus cristatus*, *Ciconia nigra*, *Tadorna ferruginea*, *Netta rufina*, *Circus macrourus*, *Charadrius dubius jardonii*, *Tringa hypoleucos*, *Saxicola torquata przewalskii*, *Motacilla flava beema* and *Motacilla alba dukhunensis* are also attracted to the study area for similar reasons i. e. availability of food and protection afforded by the National Park. On account of annual rise and fall in the water level, large areas of the shoreline are turned in mudflats teeming with water insects, insect larvae, molluscs and sundry animal and plant life which is consumed as food by these birds. The population of individual species appeared to increase every year. Larger numbers were recorded for each species in year 1978-79, in comparison to years 1976-77. This was perhaps due to the fact that the reservoir being new was yet in the process of becoming popular. More and more species arrived every year. Species like *Circus macrourus* which was not observed in years 1976-77 made its first appearance in year 1977-78 (Plate 27 : fig. 7).

It was extremely interesting to note that some species of winter visitors come to the Park more for protection than for food. For example, *Anas crecca crecca* visited the Park for the first time in 1977-78. This species is a nocturnal feeder. It feeds on vegetation along the shoreline or in shallow water. Apparently the Park did not supply enough food for such a large population, as flocks were observed at dusk leaving the Park area and again returning back at dawn. It is presumed that these birds come in the Park primarily for protection and shelter during the day and for feeding they moved out at night to the surrounding areas in small flocks. In the month of March a sudden increase was observed in the population of this species in the Park (Plate 26 : fig. 5). The birds were presumably, congregating in large number from the surrounding areas before starting their return migration, to their breeding ground (Plate 10A, B).

In addition to the water birds mentioned above a large number of raptors are also attracted to the Park on account of large populations of rodents, small birds, reptiles, fishes, frogs and the snakes. Most common ones were *Circus macrourus* and *Falco vespertinus amurensis*. The most interesting migratory raptor was the Redlegged Falcon *Falco vespertinus amurensis*. This falcon is known to spend the winters in penninsular India. It was known to enter Indian penninsula through both the traditional winter migratory routes of western and eastern Himalayas avoiding the high central and North western Himalayan ranges as it was never recorded from the middle stretch of Himalayas. A flock of 300 birds was observed in the first week of November at Dhikala 'Chaud' in 1977. This observation belies the earlier belief

that winter visitors avoid crossing the Northern and North western high Himalayan range. On the basis of this observation we are of the belief that the high ranges of the Northern and North western Himalayas are no bar to the winter visitors.

On the basis of three years observations, it was found that the climatic factors like temperature and humidity played a major role in arrival and departure of winter visitors. In species like *Podiceps cristatus cristatus*, *Ciconia nigra*, *Tadorna ferruginea* and *Tringa hypoleucos* temperature and humidity played a major role in the arrival and departure of the species. For example it was noticed that :—

1. *Podiceps cristatus cristatus* arrived when Fort. Avg. Max. Temp. ranged from 13.7 to 15.7°C and Fort. Avg. Rel. Humd. ranged from 78% and 82.6%. It left the Park when Fort. Avg. Max. Temp. ranged between 31.3 and 33.6°C and Fort. Avg. Rel. Humd. fell to 71.2% in the month of April.

2. *Ciconia nigra* arrived when Fort. Avg. Max. Temp. ranged between 23.1 and 26.8°C and Fort. Avg. Rel. Humd. fell to 75% in the month of November. It left the Park when Fort. Avg. Max. Temp. ranged from 31.3 to 32.9°C and Fort. Avg. Rel. Humd. ranged between 88.4 and 88.9%.

3. *Tadorna ferruginea* arrived in the Park when Fort. Avg. Max. Temp. ranged from 13.4 to 17.9°C and Fort. Avg. Rel. Humd. ranged 78.9 to 81.1%. It left the Park when Fort. Avg. Max. Temp. ranged from 36.4 to 37.2°C and Fort. Rel. Humd. ranged from 89.8 to 90.3%.

4. *Tringa hypoleucos* arrived in the Park when Fort. Avg. Max. Temp. ranged from 13.4 to 15.1°C and Fort. Avg. Rel. Humd. from 78.9 to 80.1%. It left the Park when Fort. Avg. Max. Temp. ranged between 36.6 and 36.8°C and Fort. Avg. Rel. Humd. ranged between 87.8 and 89.9%. In the case of *Circus macrourus*, *Motacilla flava beema* and *Motacilla alba dukhunensis* it was humidity alone that played an important role in the arrival and departure of the species. It was noticed that :—

1. *Circus macrourus* arrived when Fort. Avg. Rel. Humd. ranged from 78.9 to 80%. It left the park when humidity fell from 75.5% to 71.8%. Although there was a difference of 48 days in dates of departure in two year (Table 8).

2. *Motacilla flava beema* arrived in the Park when Fort. Avg. Rel. Humd. ranged from 69 to 71.4% and left the Park when Fort. Avg. Rel. Humd. ranged between 85.5 and 87.8%.

Motacilla alba dukhunensis arrived in the Park when Fort. Avg. Rel. Humd. ranged from 70.4. to 71.4% and it left the Park when Fort. Avg. Rel Humd. ranged between 85.8 and 89.9%.

The assumption that the climatic factors like temperature and humidity do play a definite role in the dates of arrival and departure of the winter visitors is further supported by the following observations.

1. *Ciconia nigra* left the Park on 17th March in the year 1977 and on 1st May in 1979. Although, according to the calendar, It left 45 days later in 1979, but the Fort. Avg. Max. Temp. was recorded 32.9 in year 1977 and 36.6°C in the year 1979 at the time of departure and humidity was recorded 88.9 in the year 1977 and 87.8% in 1979.

2. *Tadorna tadorna* left the Park on 16th February in the year 1977 and 17th March in 1979. Though, according to the calendar, it left 23 days later in 1979 but the range of temperature and humidity was very close in both the years. In 1977 at the time of departure Fort. Avg. Rel. Humd. was recorded 84.9 and in 1979 it was 80.8%.

3. *Circus macrourus*, this species left the Park 48 days earlier in the year 1978 as compared to 1979. In the year 1978 it left the Park on 27th February when Fort. Avg. Max. Temp. was 15.8°C and Fort. Avg. Rel. Humd. was 75.5%. In the year 1979 it left on 17th April when Fort. Avg. Max. Temp. was recorded 37.1°C and Fort. Avg. Rel. Humd. was 71.7%. Although there was a great difference in the range of temperature (15.8 and 37.1°C) but humidity was almost the same i.e. 71.8 and 75.5% respectively in both the years.

4. *Larus fuscus fuscus* left the Park on 11th March in the year 1977 and on 6th May in 1978. Although, according to calendar, it left 55 days later in 1978 but Fort. Avg. Rel. Humd. at the time of departing was recorded 89.9 and 87.4% in 1977 and 1978 respectively.

5. *Larus ichthyaetus* left the Park on 31st March in 1977 and on 10th May in 1979. Although it left 40 days later in 1979 but Fort. Avg. Max. Temp. ranged closely on the departure time in both the years. Fort. Avg. Max. Temp. ranged between 32.9°C and 36.6°C and Fort. Avg. Rel. Humd. 88.9 and 87.8% in the year 1977 and 1979 respectively.

6. *Motacilla alba dukhunensis* left the park on 18th March in 1978 and on 8th May in 1979 i.e. about 51 days later in 1979. At the time of departure Fort. Avg. Max. Temp. was recorded 25.3 and 36.8°C in 1978 and 1979 respectively and Fort. Avg. Rel. Humd. was recorded 89.4 and 89.9% in 1978 and 1979 respectively. Although there is a

great variation in temperature but humidity in both year was almost same.

On the basis of foregoing observations it can be concluded that availability of food, shelter and protection from hunters and poachers are the mandatory factors that attract the migratory winter visitors to Corbett National Park. The dates of arrival and departure are influenced by the climatic factors like temperature and relative humidity etc.

B. Summer Visitors

Birds which move in intertropical regions with the change in season are called summer visitors. These birds come to these areas mostly for breeding purpose, after which they leave the area. But occasionally they may come to an area only for food and shelter. This type of migration does not involve movement over tremendous distances as in the case of winter visitors. Most of the time it is limited to about a thousand kilometres or so. These migrants stay generally for 3 to 4 months before returning or moving away and generally appear to adhere to a set calendar.

Observation were made on nine species of summer migrants which belong to two orders, seven families and nine genera.

It was observed during three years' observation period that species like *Cuculus micropterus micropterus*, *Pitta sordida cucullata*, *Hirundo smithii filifera*, *Sturnus pagodarum*, *Terpsiphone paradisi leucogaster*, *Saxicola caprata bicolor* and *Nectarinia asiatica asiatica* kept a rather rigid time-table of their arrival and departure dates. *Terpsiphone paradisi leucogaster* was observed to arrive on 8th, 6th and 7th April in 1977, 1978 and 1979 respectively and it left the Park on 8th August in the years 1977 and 1978. Climatic factors like temperature and humidity were again found to play a major role in this type of migration. For example it was noticed that :—

1. *Cuculus micropterus micropterus* arrived in the Park when the Fort. Avg. Max. Temp. ranged from 31.3 to 35.6°C and Fort. Avg. Rel. Humd. ranged between 71.2 and 88.4%. It left the park when Fort. Avg. Max. Temp. ranged from 27.7 to 36.4°C and Fort. Avg. Rel. Humd. ranged between 88.8 and 92%.

2. *Pitta sordida cucullata* arrived in the Park when the Fort. Avg. Max. Temp. ranged between 36.6 and 40.7°C and Fort. Avg. Rel. Humd. ranged between 85.8 and 89.9%. It left the Park when Fort. Avg. Max. Temp. ranged between 24.5 and 25°C and Fort. Avg. Rel. Humd. ranged between 93.2 and 95.3%.

3. *Hirundo smithii filifera* arrived in the Park when the Fort. Avg. Max. Temp. ranged between 31.3 and 37.2°C and Fort. Avg. Rel. Humd. ranged between 71.8 and 88.4%. It left the Park when the Fort. Avg. Max. Temp. ranged between 22.8 and 23.6°C and Fort. Avg. Rel. Humd. ranged between 69 and 70.4%.

There is another category of summer visitors which comes to the Park for breeding. *Saxicola caprata bicolor* is one such visitor. It arrives in the Park in September and leaves in May thus staying in the Park for about nine months. Its population was observed to increase considerably in 1978 and 1979. This increase could possibly be attributed to a compulsive concentration of the breeding population. In 1978 the lake was filled to capacity as a result of which 80% of savannah type grassland went under water. This greatly reduced the nesting area of this species. As a result the total population was compelled to concentrate in a such smaller remaining area. Apparently the remaining area had the carrying capacity to maintain this increase as the population remained at the same level next year also (Plate 31 ; fig. 23).

Availability of food at the nestling time is obviously the main attraction in the Park to such species. Species like, *Hirundo smithii filifera*, *Muscicapa thalassina thalassina*, *Terpsiphone paradisi leucogaster* and *Saxicola caprata bicolor* mainly feed on winged insects and feed their young mostly with insect larvae, caterpillars etc.. Of these there is an abundance every where in the Park i. e. in savannah, lake side, riverside and forests.

In the forested areas enough food is also available for frugivorous and nector-eating species like *Sturnus pagodarum* and *Nectarinia asiatica asiatica*. *Sturnus pagodarum* mainly feeds on fruits and berries of *Ficus glomerata*, *Ficus plmata*, *Lantana aculeata*, fleshy petals of *Butea monosperma* and the buds of *Piliostigma malabaricum* ; while *Nectarinia asiatica* feeds on the nector of the flowers of *Bombax malabaricum* and *Madhuca indica*. Their stay in the Park coincides with the flowering and fruiting season of these trees.

Therefore, it can safely be concluded that the availability of food and shelter are the mandatory factors which attract the migratory summer visitors. Temperature and humidity play an important role in the arrival and departure of these migratory summer visitors.

C. Passage Migrants

On their way up and down the migratory birds make short stoppages or halts on way, ranging from an over night stay to a few weeks for

rest and recouperation. In these areas of temporary halt or rest these birds are known as passage migrants. These birds are normally observed twice in a year during their journeys to and from the breeding areas. But sometimes when they take a different route for the return journey they may be seen only once.

A total of 12 species belonging to nine orders, ten families and eleven genera of this category were observed in the Park. Some of them were far away from their known migration ranges. For example *Falco vespertinus amurensis*, is known to cross the Himalayas through traditional western and eastern gaps (migratory routes) in the mountain ranges. It has never been reported from northern India especially North west Himalayas. A large flock of about 300 birds of the species was observed in the study area in the year 1977 from 29th October to 2nd November.

A number of species, viz., *Plegadis falcinellus falcinellus*, *Anser indicus*, *Aythya marila marila*, *Falco vespertinus emurensis*, *Falco tinnunculus tinnunculus*, *Porphyrio porphyrio poliocephalus*, *Recurvirostra avosetta*, *Larus brunnicephalus*, *Treron sphenura sphenura*, *Psittacula alexandri fasciata* and *Clamator jacobinus serratus* were observed once a year. Presumably these species took another route or escaped observations. But *Sturnus vulgaris poltaratskyi* was observed passing twice a year from the study area.

Certain others like *Anser indicus*, *Porphyrio porphyrio poliocephalus* and *Recurvirostra avosetta* made their first appearance in the Park in 1978. Possibly it was because of the abundance of food and plenty of shelter offered by the large reservoir which filled to its capacity in 1977. Certain species which are attracted to streams and rivers (for reasons of food) disappeared from the Park as the lake filled up in 1977, reducing the length of flowing river. Some species of known winter visitors behaved as passage migrants leaving the Park after a very short stay. For example *Plegadis falcinellus falcinellus* and *Aythya marila marila* which are regular winter visitors to the Indian subcontinent stayed in the Park only for 4 to 20 days. Possibly their type of food is not available yet in the Park area in good and sufficient quantities.

Climatic conditions appear to have no effect on the appearance or disappearance of these species, as their period of stay is too short for any substantial climatic changes to take place.

It can, therefore, be concluded that food and shelter available in the Park are mandatory factors that attract this class of migrants also. Due to an enhanced food supply as a result of the creation of fresh water lake and the shelter and protection from poachers and hunters,

a number of long distance migrants have started staying in the Park for short periods on their way to and back from their breeding grounds.

D. Altitudinal Migrants

Altitudinal migrants are mostly resident of high altitudes in the Himalayas. In winter these birds are forced to descend to lower elevations due to unfavourable weather conditions on account of extreme cold and descending snowline. In spring when snow melts they move back to higher hills for breeding. Normally they stay at lower altitude for 2 to 3 months. The birds which are resident of lower elevations and plains of northern and central India may also migrate to higher altitudes on account of hostile weather conditions and scarcity of food in summer.

A total of 10 species of such altitudinal migrants were observed in the study area belonging to five orders, seven families and 10 genera. Some of these species, viz., *Bubulcus ibis coromandus*, *Psittacula himalayana*, *Rhyacornis fuliginosus fuliginosus*, *Chaimarrornis leucocephalus*, *Myiophonus caeruleus temminckii* and *Melophus lathamii* are well known for the diversity in their known status and distribution. Other like *Aegypius monachus*, *Gypaetus barbatus aureus*, *Scolopax rusticola rusticola* and *Hypopicus hyperythrus* were recorded in the area for the first time far away from their known distributional range.

1. *Aegypius monachus* : This species is resident in high mountains between 1800 and 3600 metres altitude. Rare and spars winter visitor in northern India (Ali and Ripley, 1978: 299). But it was observed twice in the study area on 6th December, 1978 and 20th March, 1979 at an altitude of 385 metre.

2, *Gypaetus barbatus aureus* : This species normally remains between 1200 and 4000 metre elevation (Ali and Ripley, 1978: 314). It was observed in the study area only once (19th January, 1977) in Dhikala 'Chaud' which is situated at an altitude of 335 metre.

3. *Hypopicus hyperythrus* : This species is resident in Himalayas between 800 and 4100 metre (Ali and Ripley, 1970: 211). But it was observed in the study area for all the three years period (Table 38) at an altitude of 385 metre. This is the first record of this species at this altitude (Lamba and Garg, 1977).

4. *Rhyacornis fuliginosus fuliginosus* : This species occurs between 1200 and 4400 metre in its distributional ranges. It descends down upto 900 metre in Kulu Valley, 1500 metre in Kathmandu Valley but

never reported below 600 metre (Ali and Ripley, 1973 : 266). In the study area this species appear to be a regular altitudinal migrant coming down to an altitude of 385 metre.

As the movements of these species depend on local weather conditions they are not so regular in their arrival and departure. Some of them like *Bubulcus ibis coromandus*, *Psittacula himalayana*, *Chaimarrornis leucocephalus* and *Myiophonus caeruleus temminckii*, however, exhibited a certain regularity in their arrival and departure times with a variation of 15 to 30 days according to calendar. One of them, viz., *Melophus lathamii* showed a variation of four to six days only year after year (Table 42).

Factors like easy availability of food, protection and shelter appeared to play an important role in attracting these altitudinal migrants to the Park. Temperature and humidity appear to influence the arrival and departure of these altitudinal migrants also. It was noticed that :—

1. *Psittacula himalayana* : Arrived when the Fort. Avg. Max. Temp. ranged between 13.7 and 15.7°C and Fort. Avg. Rel. Humd. ranged between 78 and 82.6%. It left the Park when the Fort. Avg. Max. Temp. ranged from 33.5 to 37.2°C and Fort. Avg. Rel. Humd. ranged between 71.8 and 85.1%.

2. *Rhyacornis fuliginosus fuliginosus* : Arrived when the Fort. Avg. Max. Temp. ranged between 22.3 and 25.5°C and Fort. Avg. Rel. Humd. ranged from 62 to 68.5%. It left the Park when Fort. Avg. Max. Temp. ranged between 33.5 and 40.7°C and Fort. Avg. Rel. Humd. ranged from 85.8 to 87.8%.

3. *Melophus lathamii* : Arrived in the Park when the Fort. Avg. Max. Temp. ranged from 22.8 to 27.1°C and Fort. Avg. Rel. Humd. ranged from 69 to 71%. It left the Park when the Fort. Avg. Max. Temp. ranged from 33.5 to 37.2°C and Fort. Avg. Rel. Humd. ranged from 71.8 to 87.5%.

The assumption that the climatic factor do play a definite role in the arrival and departure of altitudinal migrants is further supported by the following observations :—

1. *Bubulcus ibis coromandus* : Left the Park on 19th May in 1978 and on 16th June in 1977. Although according to calendar it left 28 days earlier in 1978 but the Fort. Avg. Max. Temp. was 33.6 and 36.6°C in 1977 and 1978 respectively. There was a great variation in the range of Fort. Avg. Rel. Humd. which was 66.3 and 92% in 1977 and 1978 respectively.

2. *Hypopicus hyperythrus* : Left the Park on 4th February in 1977 and on 8th March, in 1978. In 1977 it left the study area 32 days earlier, but Fort. Avg. Max. Temp. was almost same, 20.9°C in 1977 and 20.2°C in 1978. Fort. Avg. Rel. Humd. was recorded 82.4 and 92.8% in 1977 and 1978 respectively.

3. *Rhyacornis fuliginosus fuliginosus* : Left the Park on 20th April in 1978 and 15th May in 1979. According to calendar it left the Park 25 days later in 1979 but Fort. Avg. Max. Temp, was recorded 33.5 and 36.6°C in 1978 and 1979 respectively and Fort. Avg. Rel. Humd. was recorded 87.5 and 87.8 respectively.

Hence it can be concluded that temperature and humidity do play an important role in the arrival and departure of altitudinal migrants in the Park.

E. Local Migrants

These are the birds which move locally according to the availability of food in the various parts of their habitat. Insectivorous birds follow the abundance of insect populations. Frugivorous birds move from one place to another in accordance with the fruiting seasons of different plant species. Water birds move from one locality to another according to the availability of water in the reservoir.

A total of 43 species of local migrants belonging to 10 orders, 19 families and 33 genera were observed during the period of study. The major cause for the movements of these birds was found to be the easy availability of food. Species like :—*Phalacrocorax carbo sinensis*, *Phalacrocorax niger*, *Anhinga rufa melanogaster*, *Ardea purpurea manilensis*, *Ardeola grayii grayii*, *Egretta alba modesta*, *Egretta garzetta garzetta*, *Haliastur indus indus*, *Haliaeetus leucoryphus* and *Ceryle rudis leucomelanura* are mainly fish eating birds. Some of them feed on water insects, frogs and molluscs also. Obviously they are attracted to the abundance of food supply offered by the freshly created reservoir in the Park. The population of these species was noticed to fluctuate considerably in various parts of the Park during the various times of the year, depending upon the condition of the reservoir. *Phalacrocorax carbo sinensis* can be cited as a typical example. A large population breeds in the partially submerged and dead sheeshum trees in the lake during rains. As the shoreline recedes after the rains the population also moves alongwith the receding shoreline often covering a distance of 8-10 km. Populations of waders like *Vanellus indicus indicus* and *Vanellus spinosus duvaucelii* (Plate 37 ; fig. 44, 45) which feed along the shoreline, also increase gradually from January to

June. The shoreline starts receding in January and continues to do so till the onset of rains in June. These birds are attracted to abundance of food provided by the receding shoreline. More and more birds discover this easy supply of food and their population swells gradually.

Species like *Elanus caeruleus vociferus*, *Centropus sinensis sinensis*, *Caprimulgus indicus hazarae*, *Coracias benghalensis benghalensis*, and *Lanius schach erythronotus* normally feeds on insects, small rodents, lizards, snakes, and small birds. An appreciable increase was noticed in the population of *Centropus sinensis sinensis* and *Caprimulgus indicus hazarae* (Plate 39 ; fig. 56, 57) at Dhikala 'Chaud' in the year 1978 and 1979. This increase could be attributed to the considerable shrinkage of savannah area on account of large scale inundation. As the population of insects, lizards, rodents, and snakes etc. concentrated in remaining grassland, the population of these predator species too concentrated in the area. Birds like, *Merops leschenaulti leschenaulti* (Plate 39 ; fig. 38), *Merops philippinus philippinus*, *Merops orientalis orientalis* (Plate 40 ; Fig. 59, 60), *Euryatomus orientalis cyanicollis* (Plate 41 ; fig. 62), *Rhipidura aureola aureola*, *Rhipidura albicollis canescens* (Plate 43 fig. 70, 71) and *Copsychus saularis saularis* (Plate 43 ; fig. 72) which feed mainly on insects (bugs, beetles, termites, bees, grasshoppers, butterflies and crickets), insect larvae and caterpillars were observed to increase in numbers during rains when there was abundance of insect life.

A sudden increase was observed in the population of *Merops philippinus philippinus* and *Merops orientalis orientalis* from March to June. After which there was a decrease in their population. Again there was a sudden increase in August (Plate 40, fig. 59, 60). These sudden changes were, probably, because of the swarming season of Honey-bees and termites on which these species feeds.

Frugivorous species like *Treron phoenicoptera phoenicoptera* (Plate 37 ; fig. 47). *Psittacula eupatria nipalensis* (Plate 38 ; fig. 53), *Psittacula cyanocephala bengalensis* (Plate 39 ; fig. 54). *Anthraceros malabaricus malabaricus* (Plate 41 ; fig. 63) and *Buceros bicornis homrai* (Plate 41 ; fig. 64), which mainly feed on figs of *Ficus* sp., berries of *Zizyphus* sp. and fruits of *Eugenia jambolana* swelled in numbers according to the fruiting seasons of the different plant species mentioned above. For example, the population of *Treron phoenicoptera phoenicoptera* (Plate 37 ; fig. 47) registered an appreciable increase in the months of April through September in accordance with the main fruiting season of the various *Ficus* species in the Park.

Grains and seed eaters like *Streptopelia decaocto decaocto*, *Streptopelia tranquebarica tranquebarica*, *Streptopelia chinensis suratensis*, *Streptopelia senegalensis cambayensis* and *Chalcophaps indica indica* (Plate 38 ; fig. 48 to 52) showed a population increase from February to May and August to October when grasses seed in the area.

Species like *Dicrurus absimilis albirictus* (Plate 41 ; fig. 66), *Dicrurus hottentottus hottentottus*, *Pycnonotus leucogenys leucogenys* (Plate 42 ; fig. 67, 69) and *Parus major nipalensis* (Plate 43 ; fig. 73) which feeds mainly on nectar, buds and fleshy petals of flowers of *Zizyphus jujuba*, *Bombex malabaricum*, *Piliostigma malabriculum*, *Lantana aculeata* and *Butea monosperma* were observed in maximum numbers from December to February and again from April to June which is the main flowering season of these plant species in the Park.

Although the shelter and protection remain constant in the foregoing periods of time from April to June and December to February but there is a vast difference in temp. humidity, rainfall, etc. and yet the two population peaks fall in these seasons. Hence it would not be entirely illogical to assume that food, more than shelter and protection, is the main attraction for the local migrants. Climatological factors like temperature and humidity do not appear to play any significant role in their movements.

SUMMARY

1. To fill in the gaps in our existing knowledge of the various aspects of bird migration in the North-western Subhimalayan region this problem was taken up for the study.

2. Previous work on the subject has been traced right from 1865 to date. It consists mainly of arrival and departure dates of various winter visitors and occasional records of birds ringed in India by Bombay Natural History Society and Zoological Survey of India.

3. This study was carried out for the period of 31 months (December, 1976 to June, 1979) at Corbett National Park, Uttar Pradesh. The Park covers an area of about 520 square kilometers between 29°13' to 29°35' N. Latitude and 78°33' to 78°46' E. Longitude.

4. The natural forest of the Park is confined to the Bhabar tract of Siwalik formation at an altitude of 380-1040 metre, with varied topography of many temporary marshy depressions, ravines and plateau land.

5. Recently, with the construction of a dam for the Ram Ganga Multipurpose Hydel Project at Kalagarh a large fresh water lake has sprung up submerging about 10% of the Park area and almost 80% of the savannah type grassy glades in the hinterland of the Park.

6. There are three distinct seasons, *viz.*, the cold (November to February), the hot (March to mid-June) and the rainy season (mid-June to October).

7. The total average annual rainfall as recorded at Sarapduli observatory was 1653 mm.

8. The fortnightly average maximum temperature was recorded 40.7°C in the first half of May, 1977 and the fortnightly average minimum temperature was recorded 5.7°C in the first half of February, 1977.

9. The maximum fortnightly relative humidity was recorded 95.3% in the first half of August, 1978 and it hardly ever comes down below 62% during second half of October, 1978.

10. From November to February the nights were reported to be very cold with frost and dew and a dense fog lingered often till after 1000 hrs.

11. The migrants were observed with naked eyes and/or with the aid of 7×35 prismatic field binocular often from behind a cover like a hide, bushes or stout trees or a closed vehicle.

12. All migratory birds, *viz.*, winter migrants, summer migrants, altitudinal migrants and local migrants were studied.

13. A total of 89 species of various types of migrants belonging to 14 orders and 35 families were observed. Out of these 89 species, 15 were winter visitors, 9 were summer visitors, 12 were passage migrants, 10 were altitudinal migrants and 43 were local migrants.

14. Migrants of each category has been arranged and presented in accordance with their systematic (Taxonomic) position.

15. Dates of arrival and departure (period of stay) and distribution of each migratory species was studied which along with relevant meteorological data have been presented in the text.

16. Status of each migratory species was determined on the basis of average number of sightings in a month in the study area. The following terms have been adopted for the purpose : Abundant, Very common, Common, Rare and Very rare.

17. A record of the maximum and minimum number of individuals observed in a single day and the monthly average indices for each migratory species was kept.

18. Feeding behaviour of each migratory species was also studied. Wherever possible the availability of food and its role in the migration was investigated and has been discussed in the text.

19. *Winter visitors*

15 species of winter visitors (Migrants) belonging to seven orders, eight families and 12 genera were recorded. The observations revealed that :

- (i) Availability of food, shelter and protection from hunters and poachers are mandatory factors which attract the migratory winter visitors to the Park.
- (ii) The climatic factors like temperature and humidity appear to play a major role in the arrival and departure of these migrants.

20. *Summer visitors*

Nine species of summer visitors belonging to two orders, seven families and nine genera were recorded. Observations on summer visitors showed that :

- (i) Availability of food at nestling time was the main attraction in the study area for these migrants e. g. the period of stay of frugivorous summer migrants coincided with fruiting season of the trees on the fruits of which these birds feed.
- (ii) Climatic factors play an important role in this type of migration. The temperature appeared to play more important role than humidity in case of summer visitors.

21. *Passage migrants*

A total of 12 species belonging to nine orders, 10 families and 11 genera were recorded as passage migrants. Observations made on the passage migrants revealed that :

- (i) Climatic conditions appeared to have no effect on the appearance or disappearance of this type of migratory birds, as their period of stay is too short for any substantial climatic change to take place.
- (ii) Food and shelter available in the Park appeared to be the mandatory factors of attraction for this class of migrants also.
- (iii) These birds were normally observed once in a year during their journey to or from the breeding areas. But sometimes may be seen twice a year i. e. during both of their onward and return journey.

22. *Altitudinal migrants*

Ten species of altitudinal migrants were observed in the study area belonging to five orders, seven families and ten genera. Analysis of the observations made on altitudinal migrants showed that :

- (i) Factors like easy availability of food, protection and shelter appeared to play an important role in attracting these migratory species to the Park.
- (ii) Temperature and humidity appear to determine the arrival and departure dates of those altitudinal migrants in the Park.
- (iii) Four altitudinal migrants, viz., *Aegypius monachus*, *Gypaetus barbatus aureus*, *Scolopax rusticola rusticola* and *Hypopicus hyperythrus* are reported for the first time in the area far away from their known distributional range.

23. *Local migrants*

A total of 43 species of local migrants, belonging to ten orders, 19 families and 33 genera were recorded. Observations on these local migrants revealed that :

- (i) Availability of food is more important than shelter and protection for these migrants.
- (ii) The climatological factors like temperature and humidity do not appear to play any significant role in case of these local migrants.
- (iii) These are the birds which move locally according to the availability of food i. e. insectivorous birds follow the abundance of insect population, frugivorous birds move from one place to another in accordance with different fruiting seasons of different plant species and the water birds move from one locality to another according to the availability or shrinkage of water in the reservoir.

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REFERENCES

- ABDULALI, H. 1947. The movement of the Rosy Pastor in India [*Pastor roseus* (L.)]. *J. Bombay nat. Hist. Soc.*, **46** : 704-8.
- ABDULALI, H. 1965. On the occurrence of Finsch's Starling (*Sturnus vulgaris poltaratskyi* Finsch) near Bombay. *J. Bombay nat. Hist. Soc.*, **62** : 161.
- ABDULALI, H. 1970. An addition to the list of Indian birds—the migratory Jungle Nightjar, *Caprimulgus indicus jotaka* Temm. & Schl. *J. Bombay nat. Hist. Soc.*, **67** : 331-2.
- ABDULALI, H. & HUSSAIN, S. A. 1971. A second record of the migratory Jungle Nightjar (*Caprimulgus indicus jotaka* Temm. & Schl.) in Indian limits. *J. Bombay nat. Hist. Soc.*, **68** : 451-2.
- ABDULALI, H. & HUSSAIN, S. A. 1973. On the occurrence of Golden-backed throated Woodpecker [*Dinopium shorii* (Vigors)] South of the Himalayan range. *J. Bombay nat. Hist. Soc.*, **70** (1) : 200.
- ABDULALI, H. 1976. The occurrence of Russian-ringed Large Cormorants [*Phalacrocorax carbo sinensis* (Shaw)] in India. *J. Bombay nat. Hist. Soc.*, **73** (1) : 212.
- ADAM, R. M. 1873. Notes on the birds of the Sambhur Lake and its vicinity. *Stray Feathers*, **1** : 361-404.
- ADAM, R. M. 1874. Additional note on the birds of the Sambhur Lake and its vicinity. *Stray Feathers*, **2** : 337-41.
- AKHTAR, S. A. 1955. Bird migration and fowling in Afghanistan. *J. Bombay nat. Hist. Soc.*, **53** : 49-53.
- Alexander, H. G. 1952. Rednecked Phalarope near Delhi. *J. Bombay nat. Hist. Soc.*, **51** : 507-8.
- ALI, H. 1938. Some birds observed in Kutch and Kathiawar. *J. Bombay nat. Hist. Soc.*, **40** : 122.

- ALI, R. 1970. Occurrence of least frigate bird (*Fregata ariel iredalei* Mathews) in Bombay. *J. Bombay nat. Hist. Soc.*, **67** : 569-70.
- ALI, S. 1962. The Bombay Natural History Society/World Health Organization Bird Migration Study Project. *J. Bombay nat. Hist. Soc.*, **59** : 100-30.
- ALI, S. 1962. Migratory Wagtails in Kerala. *J. Bombay nat. Hist. Soc.*, **59** : 294-6.
- ALI, S. 1964. The BNHS/WHO Bird Migration Study Project 4 Activities from 13-9-1963 to 23-3-1964. *J. Bombay nat. Hist. Soc.*, **61** : 99-107.
- ALI, S. 1972. The Book of Indian Birds. *Bombay nat. Hist. Soc.*, pp. i+li+1-162 (9th Ed. Revised).
- ALI, S. AND RIPLEY, S. D. 1978. Handbook of the birds of India and Pakistan. *Bombay nat. Hist. Soc.*, **1** : i-1viii+1-382.
- ALI, S. AND RIPLEY, S. D. 1969. Handbook of the birds of India and Pakistan. *Bombay nat. Hist. Soc.*, **2** : i-xvi+1-345.
- ALI, S. AND RIPLEY, S. D. 1969. Handbook of the birds of India and Pakistan. *Bombay nat. Hist. Soc.*, **3** : i-xvi+1-325.
- ALI, S. AND RIPLEY, S. D. 1970. Handbook of birds of India and Pakistan. *Bombay nat. Hist. Soc.*, **4** : i-xiii+1-265.
- ALI, S. AND RIPLEY, S. D. 1972. Handbook of birds of India and Pakistan. *Bombay nat. Hist. Soc.*, **5** : i-xiii+1-276.
- ALI, S. AND RIPLEY, S. D. 1971. Handbook of birds of India and Pakistan. *Bombay nat. Hist. Soc.*, **6** : i-xiii+1-245.
- ALI, S. AND RIPLEY, S. D. 1972. Handbook of birds of India and Pakistan. *Bombay nat. Hist. Soc.*, **7** : i-xiii+1-236.
- ALI, S. AND RIPLEY, S. D. 1973. Handbook of birds of India and Pakistan. *Bombay nat. Hist. Soc.*, **8** : i-xiv+1-277.
- ALI, S. AND RIPLEY, S. D. 1973. Handbook of birds of India and Pakistan. *Bombay nat. Hist. Soc.*, **9** : i-xvi+1-306.
- ALI, S. AND RIPLEY, S. D. 1973. Handbook of birds of India and Pakistan. *Bombay nat. Hist. Soc.*, **10** : i-xx+1-334.
- BAKER, E. C. S. 1922. The Fauna of British India including Ceylon and Burma : Bird. Taylor & Francis London, **I** : i-xxii+1-479.
- BAKER, E. C. S. 1924. The Fauna of British India including Ceylon and Burma : Birds. Taylor & Francis London, **II** : i-xxiii+1-561.
- BAKER, E. C. S. 1926. The Fauna of British India including Ceylon and Burma : Birds. Taylor & Francis London, **III** : i-xx+1-489.

- BAKER, E. C. S. 1927. The Fauna of British India including Ceylon and Burma : Birds. Taylor & Francis London, IV : i-xxiv+1-471.
- BAKER, E. C. S. 1928. The Fauna of British India including Ceylon Burma : Birds. Taylor & Francis London, V : i-xviii+1-469.
- BAKER, E. C. S. 1929. The Fauna of British India including Ceylon and Burma : Birds. Taylor & Francis London, VI : i-xxxv+1-499.
- BAKER, E. C. S. 1930. The fauna of British India including Ceylon and Burma : Birds. Taylor & Francis London, VII : i-viii+1-484.
- BAKER, E. C. S. 1930. The Fauna of British India including Ceylon and Burma : Birds. Taylor & Francis London, VIII : i-iv+485-801.
- BALL, V. 1875. Notes on some birds observed in the Suliman Hills, West of Dera Ghazi Khan, *Stray Feathers*, 3 : 204-9.
- BALL, V. 1877. Notes on birds observed in the region between the Mahanadi and Godavari rivers. *Stray Feathers*, 5 : 410-20.
- BEAVAN, R. C. 1865. Indian ornithological Notes, Chiefly on the migration of species. *Proc. Zool. Soc.*, 8 : 690-695.
- BETTS, F. N. 1954. Occurrence of the Blacknecked Crane (*Grus nigricollis*) in Indian Limits. *J. Bombay nat. Hist. Soc.*, 52 : 605-6.
- BUTLER, E. A. 1879. Further additions to the Sindh avifauna. *Stray Feathers.*, 8 : 386-9.
- CURRIE, A. J. 1918. Occurrence of the Indian Red Breasted Flycatcher (*Siphia hyperythra*) in the Deccan, *J. Bombay nat. Hist. Soc.*, 26 : 667.
- DAWSON, E. W. 1958. Wilson's Storm Petrel, *Oceanites oceanicus* (Kuhl), at Colombo. *J. Bombay nat. Hist. Soc.*, 55 : 562-4.
- DHARMAKUMARSINHJI, R. S. 1961. Occurrence of the Shelduck [*Tadorna tadorna* (Linn.)] in Bhavnagar, Gujarat State. *J. Bombay nat. Hist. Soc.*, 58 (1) : 275-76.
- DONALD, C. H. 1952. Bird migration across the Himalayas. *J. Bombay nat. Hist. Soc.*, 51 : 269-71.
- DORST, J. 1962. The migrations of Birds. *Publ. by Houghton Mifflin Company London.* pp. i-xi+1-476.
- FAIRBANK, S. B. 1876. List of birds collected in the vicinity of Khandala and near Ahmednagar in the Deccan. *Stray Feathers*, 4 : 250-68.
- FLEMING, SR., R. L., FLEMING, JR., R. L. AND BANGDEL, L. S. 1979. (Sec. Ed.) Birds of Nepal, Publ. pp. Banks, Avalok Publishers, Kathmandu, Nepal. pp. 1-358.

- GASTON, A. J. 1978. The seasonal occurrence of Birds on the New Delhi ridge. *J. Bombay nat. Hist. Soc.*, **75** (1) : 115-28.
- GEORGE, J. 1962. Orange-flanked Bush Robin [*Erithacus cyanurus* (Pallas)] in Dehra Dun. *J. Bombay nat. Hist. Soc.*, **59** : 290.
- GEORGE, J. C. 1974. Physiological adaptations in the Rosy Pastor Wintering in India. *J. Bombay nat. Hist. Soc.*, **71** (3) : 394-404.
- GEORGE, P. V. 1964. Notes on migrant Birds of North Bihar. *J. Bombay nat. Hist. Soc.*, **61** : 370-84.
- GHORPADE, K. D. 1973. Occurrence of the Starling. *Sturnus vulgaris* Linnaeus near Bangalore. *J. Bombay nat. Hist. Soc.*, **70** (3) : 556-7.
- GIBSON-HILL, C. A. 1948. The Storm Petrels occurring in the Northern Indian Ocean, and adjacent seas. *J. Bombay nat. Hist. Soc.*, **47** : 443-9.
- GRUBH, B. R. 1968. Grey-headed Lapwing *Vanellus cinereus* (Blyth) : New record for Rajasthan. *J. Bombay nat. Hist. Soc.*, **65** : 484.
- GRUBH, R. B. 1973. On the occurrence of *Gyps fulvus* and *Aegypius monachus* in the Gir Forest, *J. Bombay nat. Hist. Soc.* **70**(1) : 198-9.
- HIMMATSINGHJI, M. K. 1960. The Eastern Calandra Lark (*Melanocorypha bimaculata*) in Kutch. *J. Bombay nat. Hist. Soc.*, **57** : 408.
- HIMMATSINGHJI, M. K. 1968. Some interesting migrants in Kutch. *J. Bombay nat. Hist. Soc.*, **65** : 225.
- HIMMATSINGHJI, M. K. 1968. The Brown flycatcher *Muscicapa latirostris* Raffles in Kutch. *J. Bombay nat. Hist. Soc.*, **65** : 778-9.
- HOLMES, J. R. S. 1968. New wintering locality of the Spotted Bush Warbler *Bradypterus thoracicus* (Blyth). *J. Bombay nat. Hist. Soc.*, **65** : 779-80.
- HUME, A. O. 1872. Contributions to the ornithology of India. Sindh. 2 parts. *Stray Feathers*, **1**.
- KANNAN, P. AND BERTRAND, G. 1979. Occurrence of Chestnut-headed Bee-eater (*Merops leschenaulti*) in Bombay. *J. Bombay nat. Hist. Soc.*, **76**(1) : 157.
- KHACHER, L. 1978. Bird migration across the Himalayas. *J. Bombay nat. Hist. Soc.*, **75**(1) : 212-13.
- KHACHER, S. 1971. Occurrence of the Bar-headed Goose, *Anser indicus* in Jasdan (Gujarat). *J. Bombay nat. Hist. Soc.*, **68** : 242.

- KHAN, M. A. R. 1980. Wintering habits of the Blue Chat *Erithacus brunneus* (Hodgson) in the Nilgiris, Southern India. *J. Bombay nat. Hist. Soc.*, **75** (Suppl.) : 1153-76.
- KRISHNA RAJU, K. S. R. 1980. Ecological notes on some migrant waders in India. *J. Bombay nat. Hist. Soc.*, **75** (Suppl.) : 1080-9.
- KRISHNAN, M. 1955. The Rosy Pastor in the Bellary Area. *J. Bombay nat. Hist. Soc.*, **53** : 128-9.
- LAMBA, B. S. AND GARG, G. K. 1977. Altitudinal migration of Rufous-bellied woodpecker *Hypopicus hyperythrus* (Vigors) *Newsl. Zool. Surv. India*, **3** (5) : 297-8.
- LAVKUMAR, K. S. 1956. The occurrence of Pinkbreasted Parakeet (*Psittacula alexandri*) in Dehra Dun. *J. Bombay nat. Hist. Soc.*, **54** : 185.
- LAVKUMAR, K. S. 1958. The Eastern Swift *Micropus apus* in Saurashtra. *J. Bombay nat. Hist. Soc.*, **55** : 352-3.
- LEGGE, W. V. 1873. Additions to the avifauna of Ceylon, *Stray Feathers*, **1** : 487-92.
- MAJUMDAR, N. 1979. New records of birds from Orissa. *J. Bombay nat. Hist. Soc.*, **76** (1) : 161-2.
- MATHEW, D. N. 1971. A review of recovery data obtained by the Bombay Natural History Society's Bird Migration Study Project. *J. Bombay nat. Hist. Soc.*, **68** : 65-85.
- NAVARRO BR. A. 1968. Southward extension of the range of the Slenderbilled Gull (*Larus genei* Breme). *J. Bombay nat. Hist. Soc.*, **65** : 218.
- NEAVOLL, G. F. 1968. Occurrence of the Reef Heron [*Egretta gularis* (Bosc.)] in Hyderabad district. *J. Bombay nat. Hist. Soc.*, **65** : 215-6.
- NEELAKANTAN, K. K. 1953. Occurrence of Pheasant-tailed Jacana (*Hydrophasianus chirurgus*) in Madras State. *J. Bombay nat. Hist. Soc.*, **51** : 741-2.
- NEELAKANTAN, K. K. 1969. Occurrence of the Terek Sandpiper, *Tringa terek* (Latham) in Kerala. *J. Bombay nat. Hist. Soc.*, **66** : 623.
- NORRIS, C. E. 1952. Oceanic and other birds seen on two recent trips between Colombo and Aden in 1951. *J. Bombay nat. Hist. Soc.*, **50** (3) : 671-74.
- PANT, P. C. 1976. Plants of Corbett National Park Uttar Pradesh. *J. Bombay nat. Hist. Soc.*, **73** (2) : 287-295+1 map.

- PHILLIPS, W. W. A. 1948. The Rosy Pastor [*Pastor roseus* (Linn.)] in Ceylon. *J. Bombay nat. Hist. Soc.*, **47** : 739-40.
- PHILLIPS, W. W. A. 1948. Occurrence of the Indian Cliff-Swallow (*Hirundo fluviicola*) in Ceylon. *J. Bombay nat. Hist. Soc.*, **47** : 740.
- PHILLIPS, W. W. A. 1955. Wilson's Petrel [*Oceanites oceanicus* (Kuhl)] in Indo-Ceylon Waters, with special reference to the 1954 Southward migration. *J. Bombay nat. Hist. Soc.*, **53** : 132-3.
- PRICE, T. D. 1979. The seasonality and occurrence of birds in the eastern Ghats of Andhra Pradesh. *J. Bombay nat. Hist. Soc.*, **76** (3) : 379-422.
- PROUD, D. 1961. Notes on bird migration during a voyage from England to India in September 1960. *J. Bombay nat. Hist. Soc.*, **58** : 517-23.
- RAM, L. 1978. Bird Migration in Surahal Lake, Ballia, U. P. *Cheetal J. Wildl. Pres. Soc., India* **20** (1) : 23-24.
- RIPLEY, S. DILLON, 1962. The Leeser Whitethroat (*Sylvia curruca blythi* Ticehurst & Whistler) in Nepal, a new record. *J. Bombay nat. Hist. Soc.*, **59** : 290.
- ROBERTS, T. J. 1969. A note on *Ciconia nigra* (Linnaeus) in West Pakistan. *J. Bombay nat. Hist. Soc.*, **66** : 616-19.
- SANJEEVA RAJ, P. J. 1958. Occurrence of the common flamingo (*Phoenicopterus ruber* Linne.). At Nandyal Andhra State. *J. Bombay nat. Hist. Soc.*, **55** : 171-2.
- SANJEEVA, RAJ, P. J. 1960. The Forest Wagtail *Motacilla indica* (Gmelin) in Madras, Chingleput district. *J. Bombay nat. Hist. Soc.*, **57** : 220-1.
- SANJEEVA RAJ, P. J. 1961. Further notes on the wintering of the Forest Wagtail, *Motacilla indica* (Gmelin) in India. *J. Bombay nat. Hist. Soc.*, **59** : 269.
- SAHA, S. S. AND *et. al.* 1971. Notes on some interesting birds from the Salt Lakes, near Calcutta, *J. Bombay nat. Hist. Soc.*, **68** : 455-7.
- SCULLY, J. 1879. A contribution to the ornithology of Nepal. *Stray Feathers*, **8** : 204-368.
- SHIVRAJKUMAR, Y. S. 1954. The occurrence of the Crested Bunting (*Melophus lathami*) in Saurashtra, *J. Bombay nat. Hist. Soc.*, **82** : 598.
- SHIVRAJKUMAR, Y. S. 1961. The Moustached Sedge Warbler [*Luscinola melanopogon* (Temminck)] and the Yellow Bittern [*Ixobrychus sinensis* (Gmelin)] : Additions to the birds of Kutch. *J. Bombay nat. Hist. Soc.*, **58** : 513,

- SHIVRAJKUMAR, Y. 1961. Recoveries of Ringed migratory and residential birds at Hingolghadh Jasdan. *J. Bombay nat. Hist. Soc.*, **58** : 807.
- SHIVRAJKUMAR, Y. 1962. Occurrence of the Whitecapped Bunting [*Emberiza stewarti* (Blyth)] in Gujarat. *J. Bombay nat. Hist. Soc.*, **59** : 956-7.
- SHIVRAJKUMAR, Y. 1969. Blackcrowned Finch-Lark, *Eremopterix nigriceps affinis* (Blyth) in Gujarat. *J. Bombay nat. Hist. Soc.*, **66** : 625.
- SIMMONS, R. M. 1948. The Movements of the Rosy Pastor in India. *J. Bombay nat. Hist. Soc.*, **47** : 547.
- SIMMONS, R. M. 1948. On the occurrence of the Blackheaded Cuckoo-Shrike (*Lalage sykesii*) at Ahmedabad, Abu Road and Ajmer. *J. Bombay nat. Hist. Soc.*, **47** : 734-6.
- SOMANE, S. S. 1971. Recovery of a Spotbill Duck (*Anas poecilorhyncha*) in U. S. S. R. *J. Bombay nat. Hist. Soc.*, **68** : 244-6.
- TAYLOR, J. N. 1954. Occurrence of Bronzecapped or Falcated Teal (*Eunetta falcata*) near Calcutta. *J. Bombay nat. Hist. Soc.*, **52** : 607.
- THOMSON, A. L. 1974. The migration of the Gannet into the Mediterranean. *J. Bombay nat. Hist. Soc.*, **71** (3) : 548-53.
- WHISTLER, H. 1911. Some winter visitors to Rawal Pindi. *J. Bombay nat. Hist. Soc.*, **21** : 261-2.
- WHITEHEAD, C. H. 1906. Notes on the occurrence of certain birds in the plains of N. W. India. *J. Bombay nat. Hist. Soc.*, **17** : 243-4.
- WHITEHEAD, C. H. 1911. Notes on Birds of Sehore, Central India, with special reference to migration. *J. Bombay nat. Hist. Soc.*, **21** : 153-70.
- WOLFE MURRAY, M. E. 1944. Some notes on the movement of birds in the Lovedale neighbourhood-Nilgiris. *J. Bombay nat. Hist. Soc.*, **45** : 90-1.

PLATES

PLATE—3



A : There are thickly forested ridges in the Park.

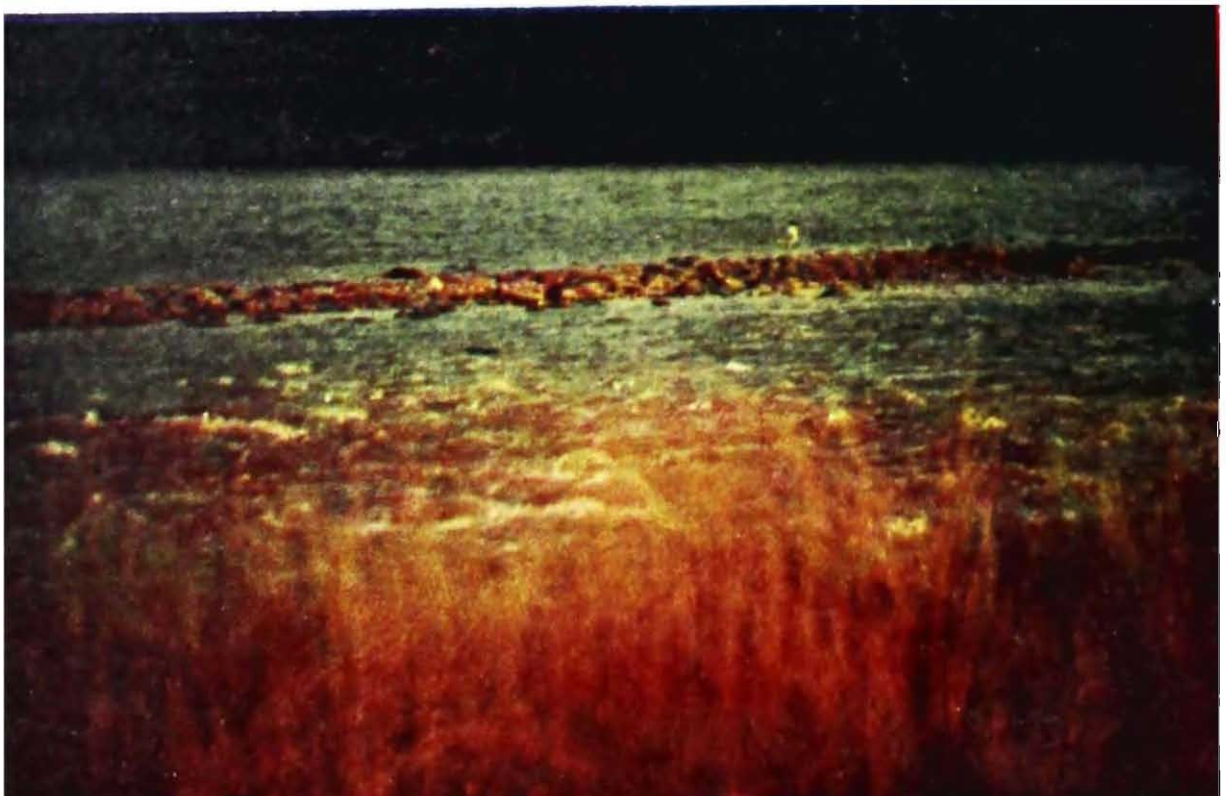


B : Dominant tree species in the Park is *Shorea robusta* (Sal) forming almost Pure stands.

PLATE—4



A : Savannah grassland 'Chaud' 80% of this habitat type is going to be submerged by 1980.



B : The riverbed is sandy, pebbly and narrow.

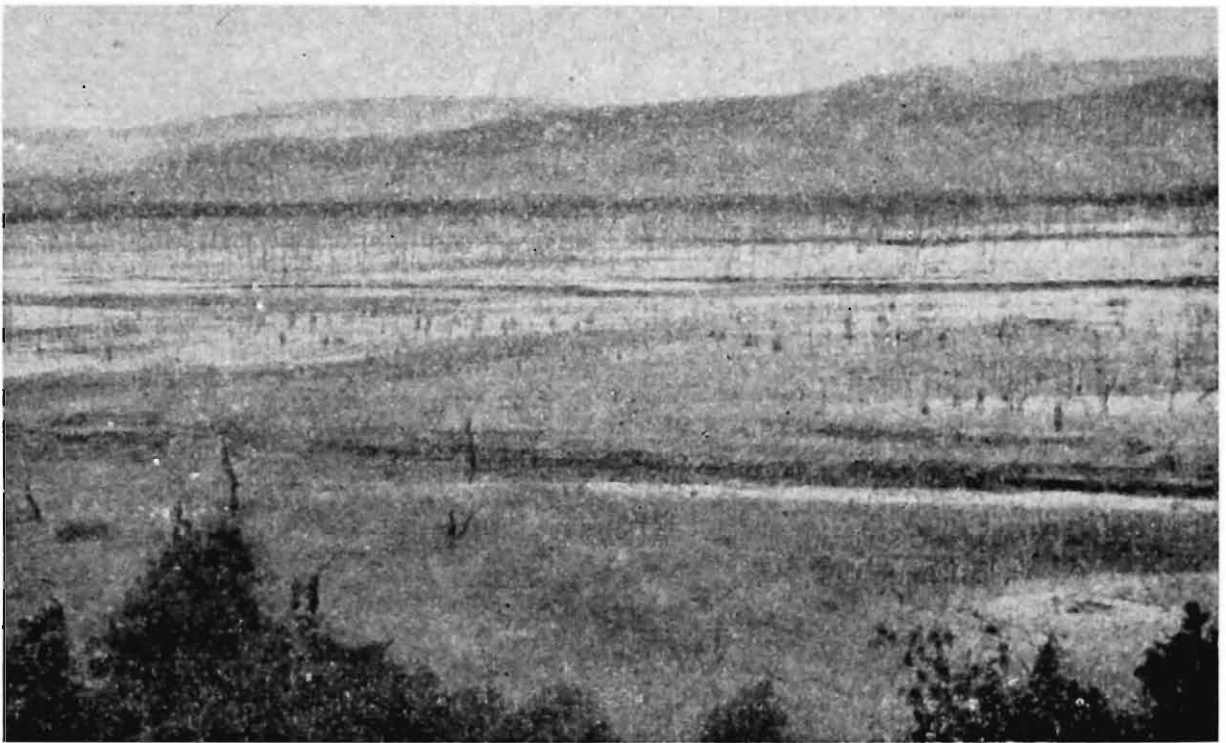
PLATE—5



A : The wooded tracks in the widened riverbed are known as 'Sheeshum Island'.



B : The area that remained under water for more than four months the native vegetation of such area being replaced by succulents.



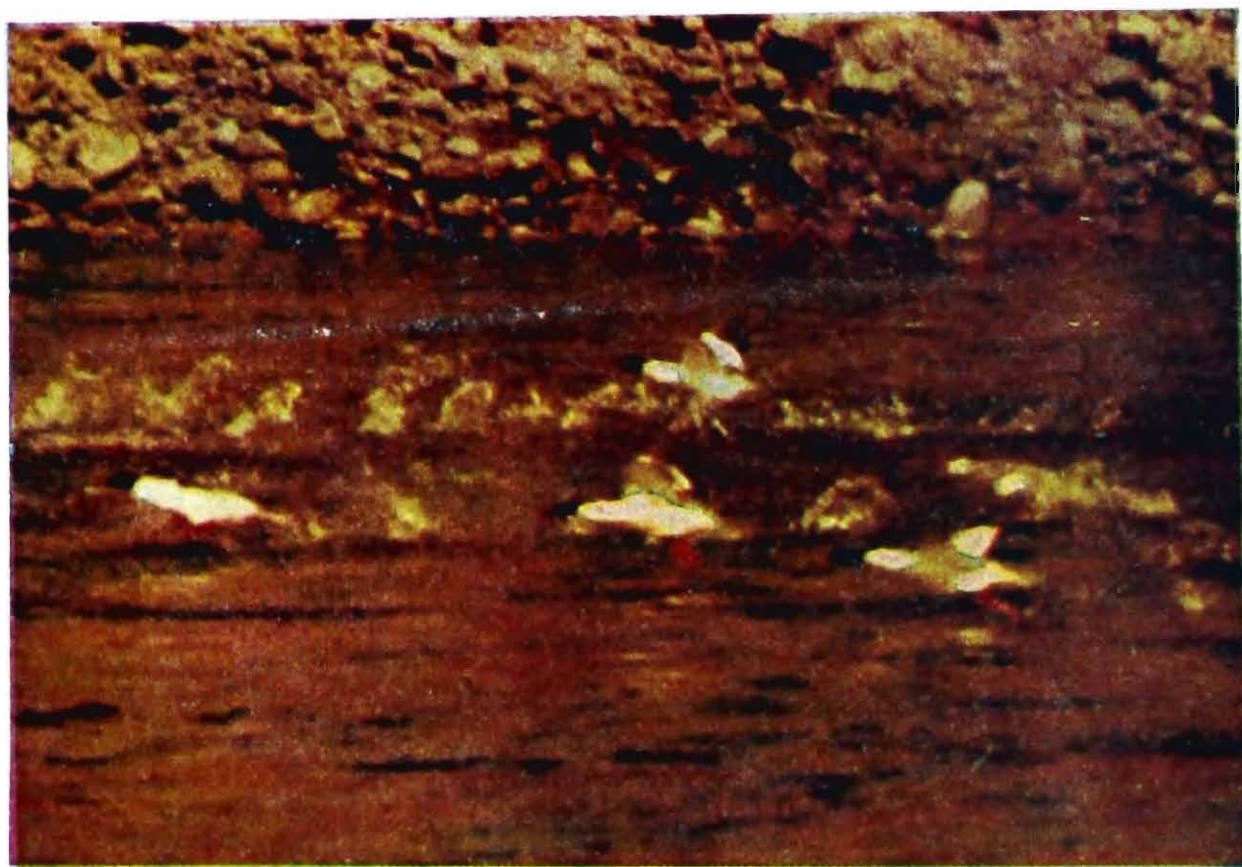
A : The areas that were submerged in two or more successive years, all vegetation dried-up and died except the tree stumps.



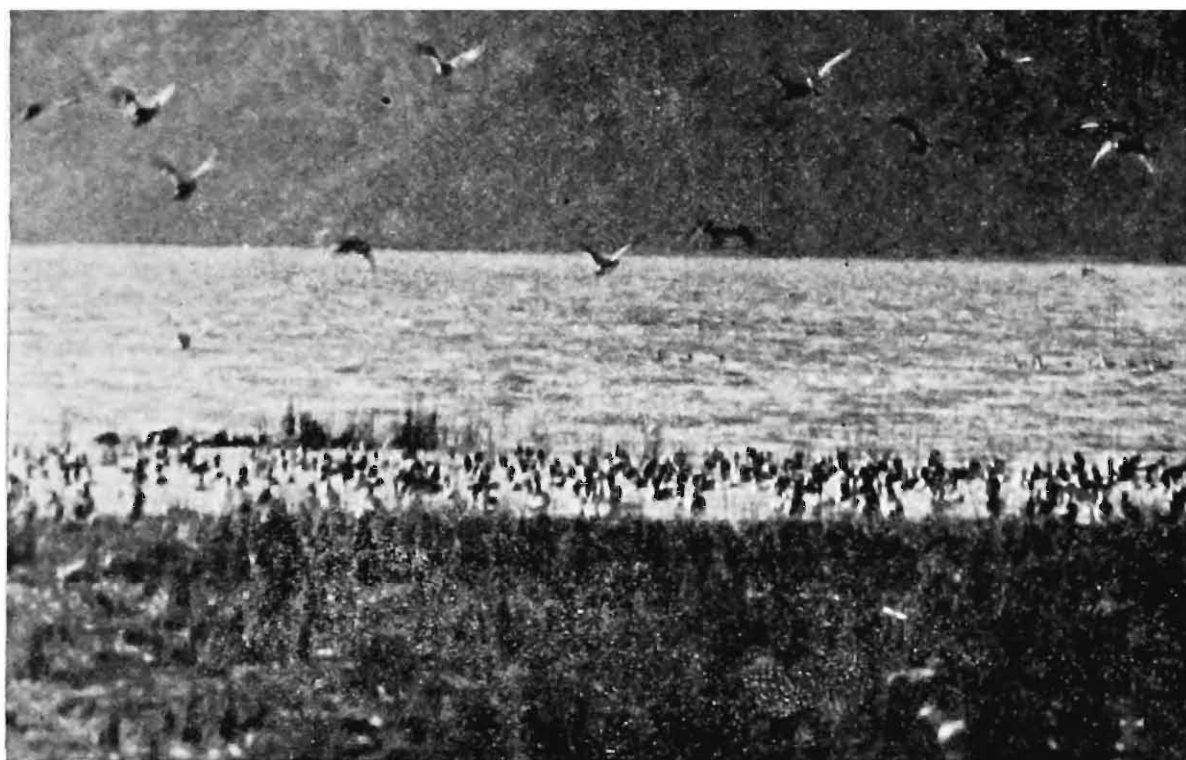
B : Observations were made by visual means using 7×35 prismatic binocular to spot and identify the birds.



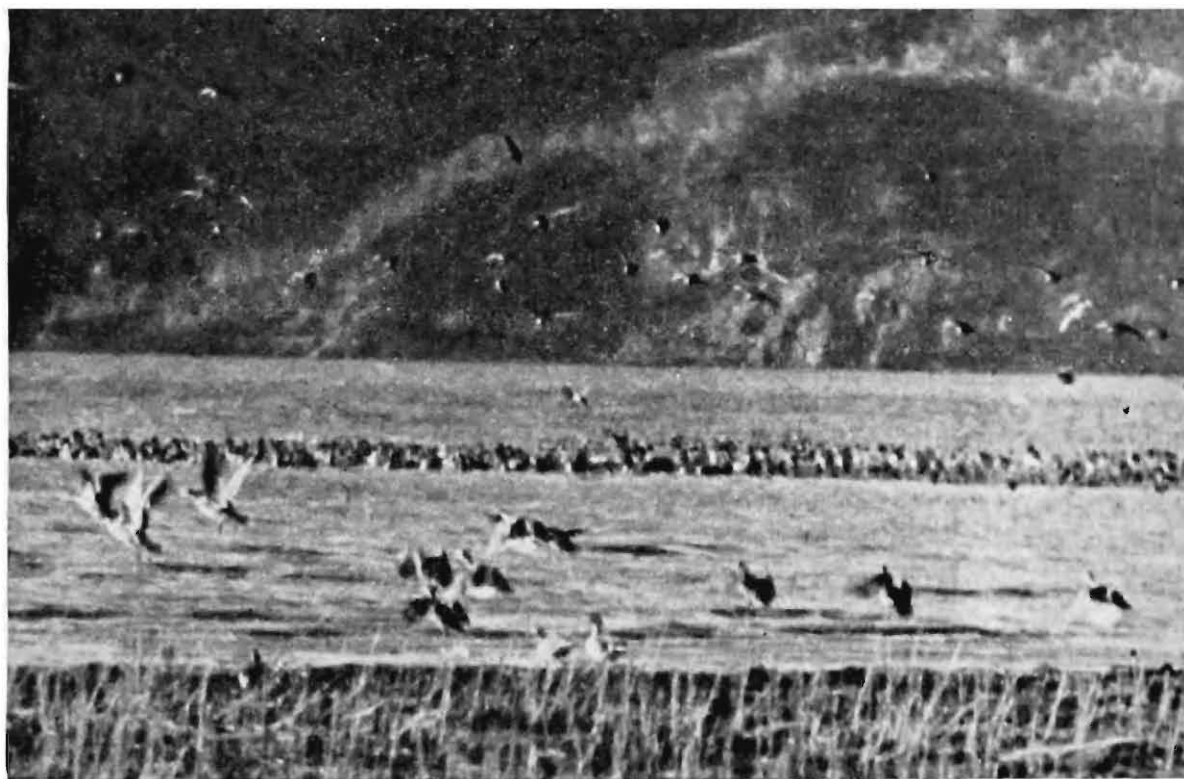
A : The Black Stork, *Ciconia nigra* (Linnaeus).



B : The Common Shelduck, *Tadorna tadorna* (Linnaeus).



A : The Common Teals, *Anas crecca crecca* Linnaeus, along the shoreline near the Lake.



B : The common Teals, *Anas crecca crecca* Linnaeus, swimming in the Lake.



A : The Indian Little Ringed Plover, *Charadrius dubius jerdoni* (Legge)



B : The Great Blackheaded Gull, *Larus ichthyæetus* Pallas.

PLATE—12



A : The Indian white wagtail, *Motacilla alba dukhunensis* Sykes.



B : The Blackheaded or Brahminy Myna, *Sturnus Pagodarum* (Gmelin).



A : The Northern Pied Bushchat, *Saxicola caprata bicolor* Sykes.



B : The Indian Purple Sunbird, *Nectarinia asiatica asiatica* (Latham).
feeding on fleshy petals of *Butea monosperma* (Dhak).

PLATE—14



A : The Indian purple Sunbird, *Nectarinia asiatica asiatica* (Latham) perching on the branch of *Bombax malabaricum* (Semal).

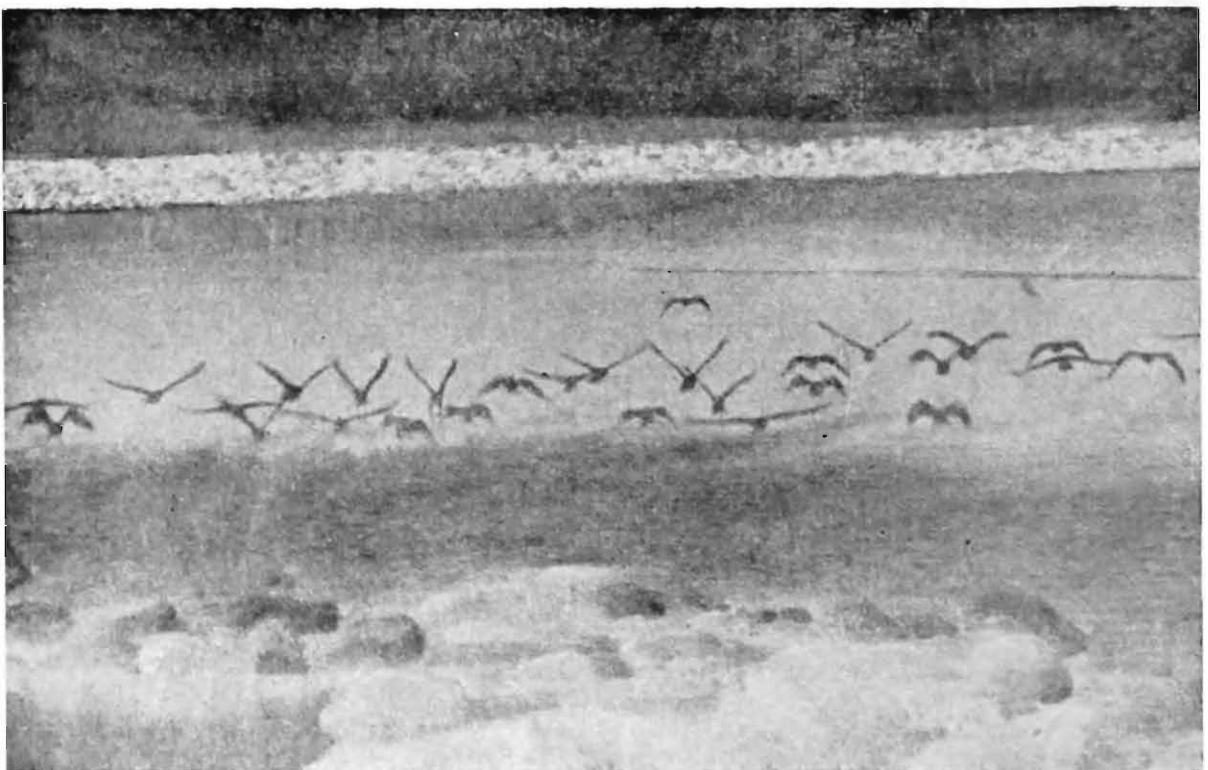


B : The Eastern Redlegged Falcon, *Falco vespertinus amurensis* Raddle.

PLATE—15

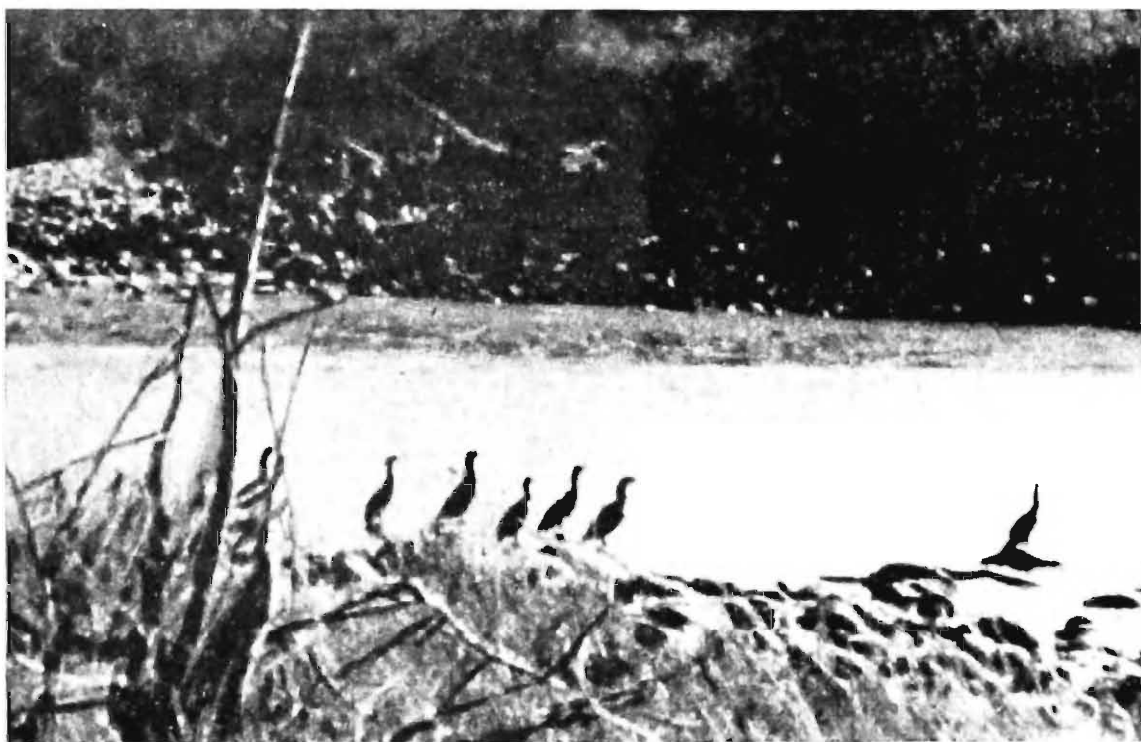


A : The Himalayan Slatyheaded Parakeet, *Psittacula himalayana* (Lesson).

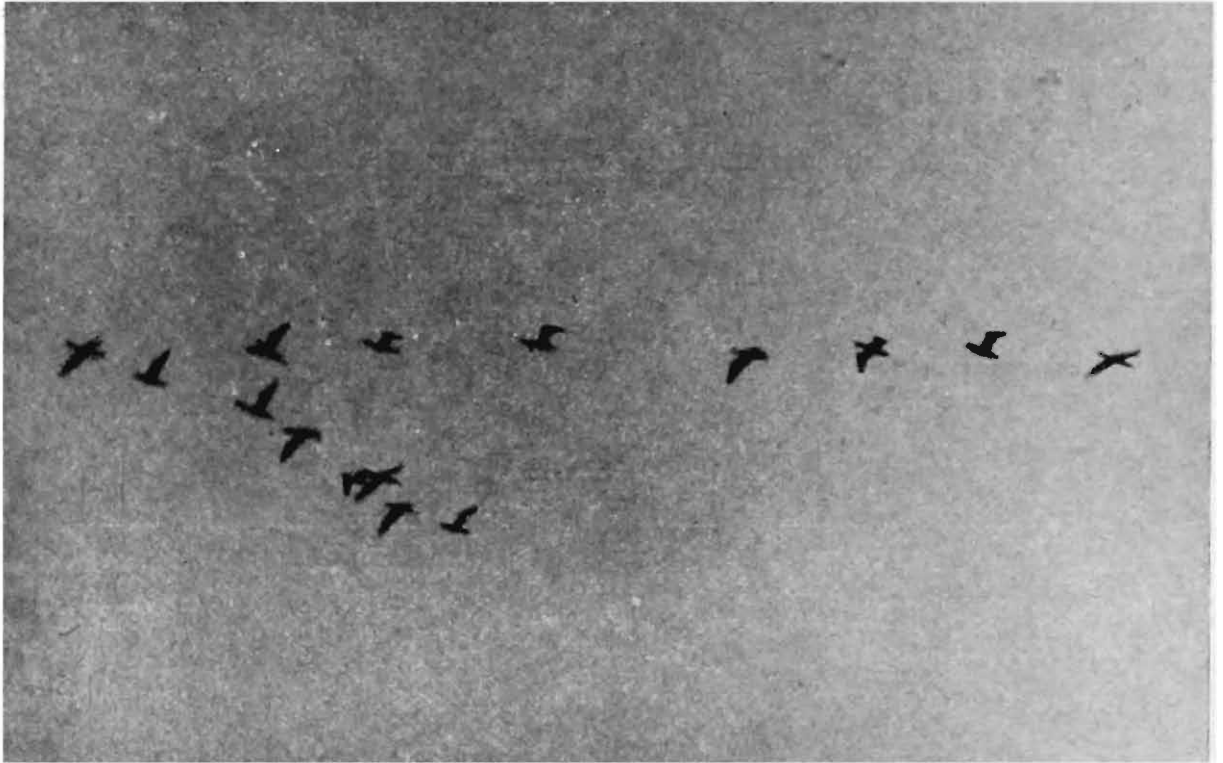


B : Flock of the Large Cormorants, *Phalacrocorax carbo sinensis* (Shaw) near high bank.

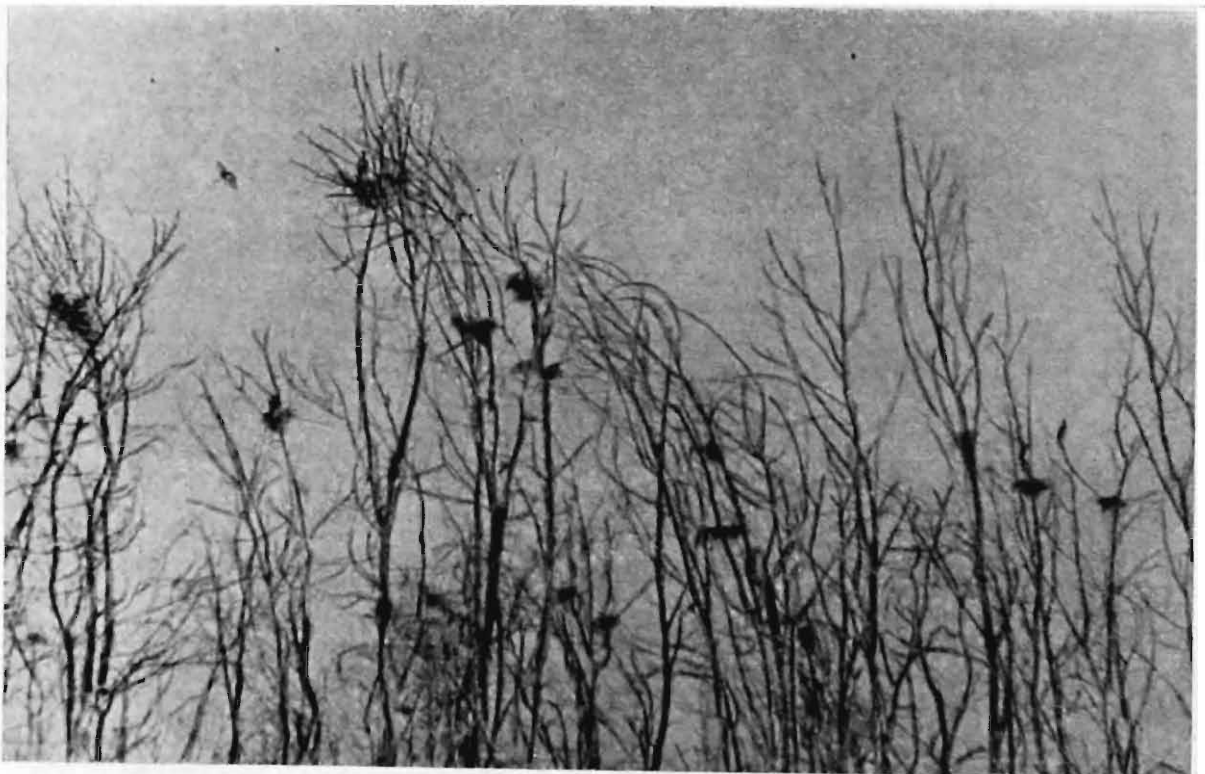
A : The large
Cormorants,
Phalacrocorax
carbo sinensis
(Shaw) resting
on the bank of
Ram Ganga
river.



B : The Little
Cormorants,
Phalacrocorax
niger (Vieillot),
at the nest.



A : Flock of the Little Cormorants, *Phalacrocorax niger* (Vieillot) on their Eastward movement.



B : Roosting place of the Little Cormorants, *Phalacrocorax niger* (Vieillot) 30 to 50 metre outside from shoreline.

A : The Black
winged Kite,
Elanus caeruleus
vociferus
(Latham).



B : The Indian
Scavenger Vulture,
Neophron percnopterus
ginginianus (Latham).



A : The Redwattled Lapwing, *Vanellus indicus indicus* (Boddaert).



B : The Spurwinged Lapwing, *Vanellus spinosus duvaucelii* (Lesson).



A : The Great Stone Plover, *Esacus magnirostris recurvirostris* Cuvier.



B : The Bengal Green Pigeon, *Treron phoenicoptera phoenicoptera* (Latham).

PLATE—21



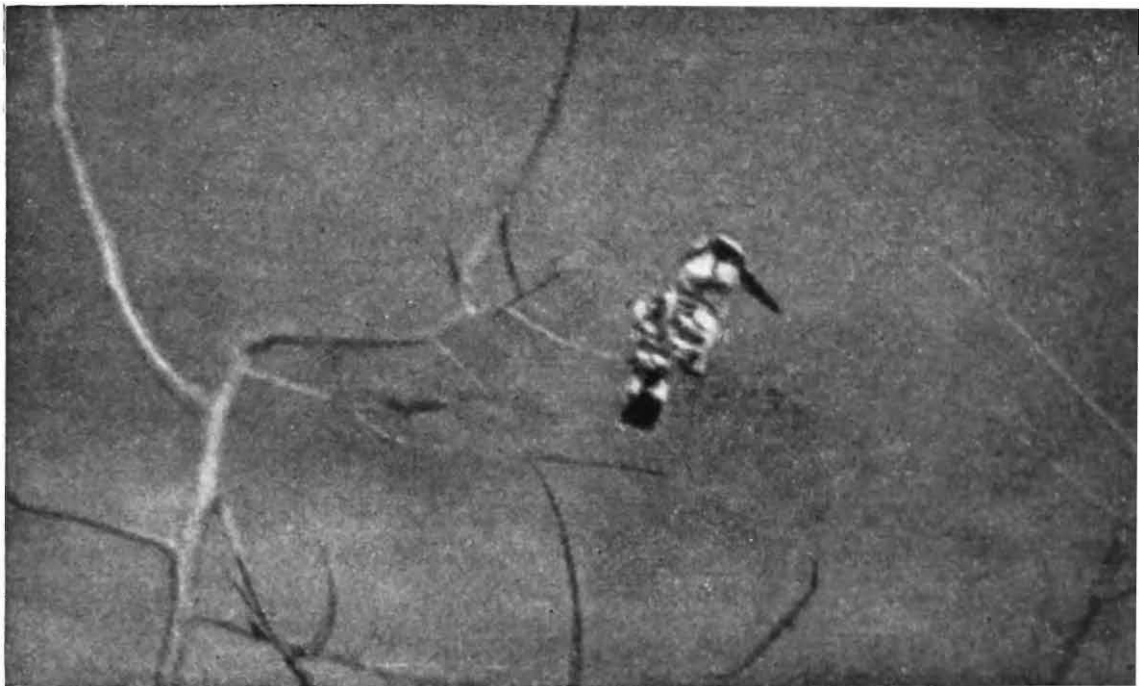
A : The Indian Ring Dove, *Streptopelia decaocto decaocto* (Frivaldszky).



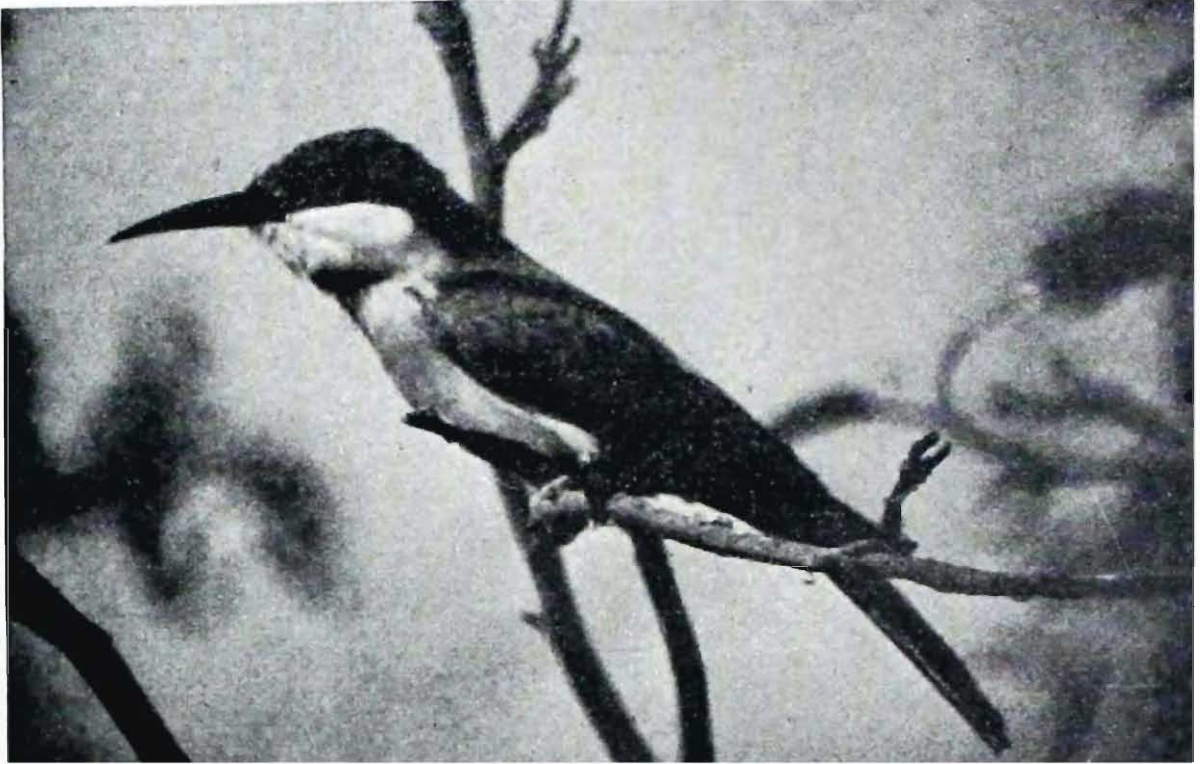
B : The Indian Spotted Dove, *Streptopelia chinensis suratensis* (Gmelin).



A : The Himalayan Jungle Nightjar, *Caprimulgus indicus hazarae*
Whistler & Kinnear.



B : The Indian Pied Kingfisher, *Ceryle rudis leucomelanura*
Reichenbach.



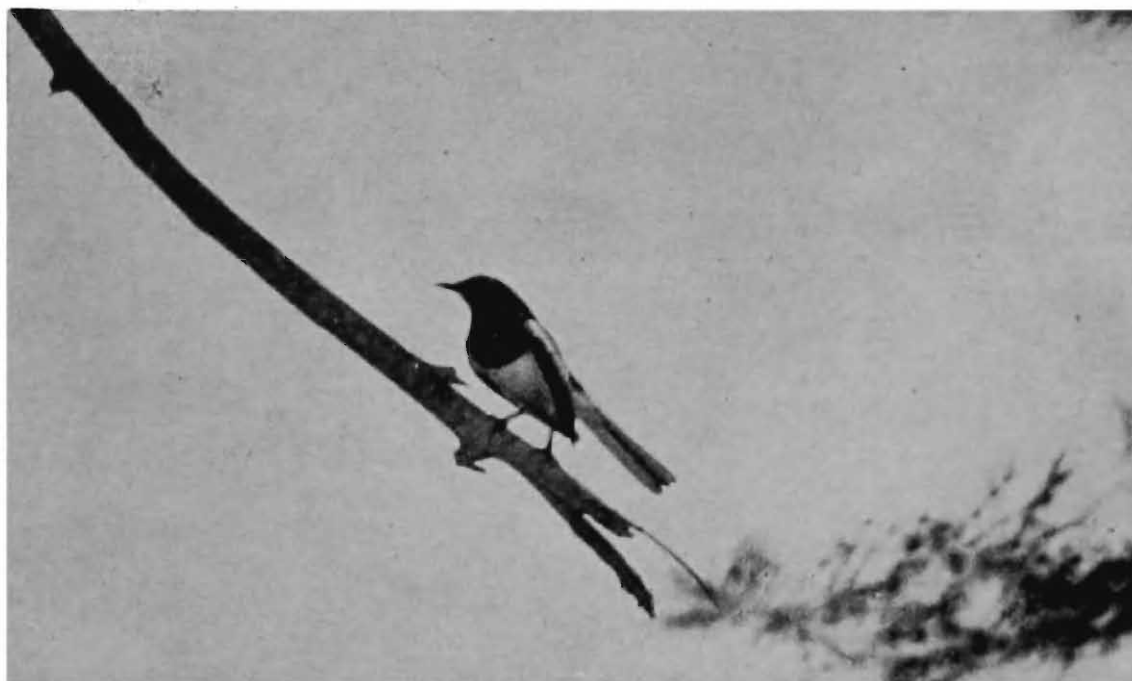
A : The Bluetailed Bee-eater, *Merops philippinus philippinus* Linnaeus.



B : The Northern Roller or Blue Jay, *Coracias benghalensis benghalensis* (Linnaeus).



A : The Rufousbacked Shrike, *Lanius schach erythronotus* (Vigors).



B : The Indian Magpie-Robin, *Copsychus saularis saularis* (Linnaeus).