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Ornithological survey of Nanda Devi National Park, India

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The ornithological findings of a 52 day multi-disciplinary expedition, carried out from 2 May to 22 June 1993, are presented. Nanda Devi National Park is perhaps the only protected area in the Himalaya where both geographical inaccessibility and Government policy has resulted in the area being protected totally from human use since 1982. This is in contrast to former years when excessive mountaineering and trekking pressures had a negative impact on the ecosystem. This paper documents the avifauna of the area and compares changes in the abundance of certain species with data available from previous years. Total protection has apparently resulted in a significant increase in the populations of certain species of avifauna.

INTRODUCTION

The Himalaya is perhaps the richest biogeographic zone in India. In all, the Himalaya cover 422,200 km^2 (nearly 13% of India's land surface), and have been classified into north-western, western, central, eastern and trans-Himalaya. Of these the trans-Himalaya occupy the largest area (186,200 km^2 or 44%), while the rest range from 12,000 km^2 (or 3%) to 83,000 km^2 (19%). Within this vast and diverse biogeographic zone exists a protected area network that consists of 58 wildlife sanctuaries and national parks, covering an area of 12,539 km^2 (less than 3%). The western Himalaya have 17 protected areas covering 3,885 km^2 (5%) of its area. Nanda Devi National Park and Biosphere Reserve is an important protected area of this zone.

Nanda Devi at 7,817 m is India's second highest mountain. Conservation efforts in this area began in 1939 when the entire Rishi Ganga basin was declared a sanctuary. However, Nanda Devi and the 20 odd mountains within or rimming the basin were extremely popular to mountaineers and trekkers. As a consequence of the excessive human pressures, primarily from mountaineers and trekkers, this area was closed to all human activity in 1982, when the Nanda Devi National Park was created (Khacher 1983). In 1988, the area surrounding the National Park was declared a Biosphere Reserve. While the buffer zone of the Biosphere Reserve was to be an area of multiple use, the core, Nanda Devi National Park, was to continue to remain inviolate.

Base line information on the flora and fauna of the Nanda Devi National Park exists from surveys done at about the time of the ban on human use (Lamba 1987, Hajra 1983). Thus Nanda Devi is a fascinating and unique

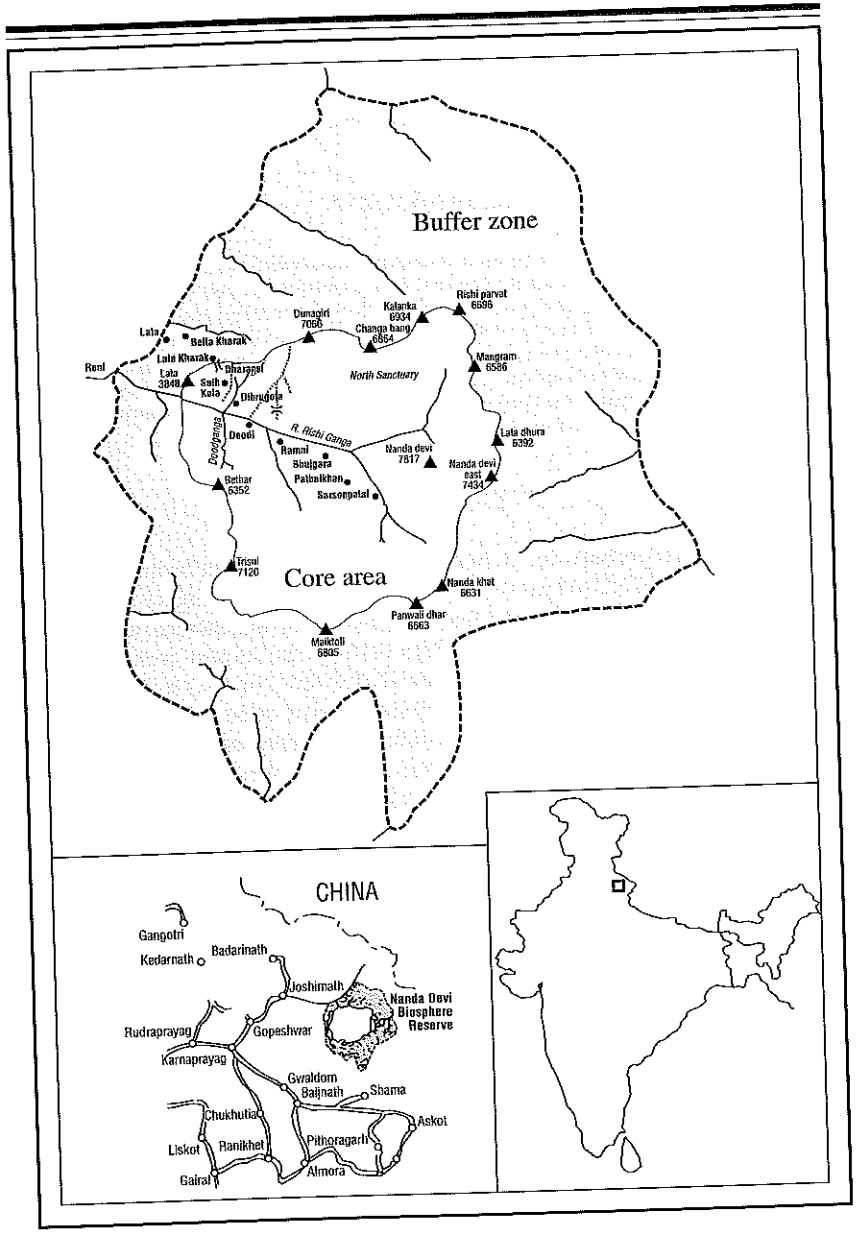

Figure 1. Nanda Devi National Park

example of the effect of absolute protection on the flora and fauna of the Himalaya. In 1993, the Ministry of Environment, Govt. of India, sponsored a survey by a multidisciplinary team comprised of two botanists, a mammalogist, an ornithologist, an entomologist and an environmentalist, with logistic support by the Corps of Engineers (Indian Army), to assess the effect of 12 years of absolute protection on the flora and fauna. I report the findings of the ornithological aspects of the survey.

I had two objectives: a) to prepare a comprehensive list of the avifauna with specific reference to the habitats and altitudes they occurred at, and b) to assess the status of Galliformes.

STUDY AREA

The Nanda Devi Biosphere Reserve (Fig. 1) is situated in the Kumaon and Garhwal region of the western Himalaya, in the civil districts of Chamoli, Pithoragarh and Almora (79°10'-80°05'E and 30°17'-30°11'N). It covers an area of 2,236.74 km^2, with an inner core zone, essentially the Nanda Devi National Park (624.62 km^2) and an outer buffer zone of 1,612.12 km^2. The buffer zone has 15 inhabited villages with a population of less than 2,500. Thus biotic pressures are minimal in this area. Access to Nanda Devi National Park is very difficult, due to a series of high ridges with peaks such as Lata, Jhandidhar, Dunagiri, Kalanka, Rishiparvat, Nanda Devi East, Nanda Khat, Trisul etc., which also form the boundary of the core zone. Thus, not only is Nanda Devi protected by law, but geographic features act as an effective (though surmountable) obstacle to human and livestock entry.

FIELD METHODS AND DATA COMPILATION

This survey lasted for 52 days, from 2 May to 22 June 1993. The amount of time spent in the three main habitat types (see below) was approximately 19 days in the alpine zone (above 3,800 m), 25 days in the subalpine and alpine zone (about 3,000-4000 m) and 8 days in the temperate zone (2,200-3000 m). In addition to this there were three field visits to the temperate forest above Joshimath. Of the three habitat types, the least field time was spent in the temperate zone.

Notes were maintained on all species of birds seen, particularly of the habitats and locations in which they occurred. No attempt was made to measure densities of the avifauna because there was insufficient time to lay transects or carry out a sufficient number of repetitions. However, an abundance ranking is given for the species seen, based on confirmed

sightings or calls heard. In the abundance ranking, a flock was considered as a single sighting.

A simple classification of habitat types was made. Alpine meadows consisted of tree-less alpine grasslands, where woody species were mainly juniper *Juniperus* and dwarf rhododendron *Rhododendron anthopogon.* Subalpine forest was dominated by Himalayan Birch *Betula utilis*, Himalayan Silver Fir *Abies spectabilis*, or rhododendron *R. campanulatum*. Temperate forests were dominated by oak *Quercus*, Blue Pine *Pinus wallichiana*, Himalayan Yew *Taxus baccata* ssp. *wallichiana* and maple *Acer*. Water courses included rivers, streams and glacial lakes. Cliffs were steep (>80 steep) mountain sides usually rocky, and boulder-strewn slopes with sparse vegetation that occurred in the alpine zone and consisted of gentler slopes (20-40 slopes) predominantly covered with large boulders.

Altitudes were compiled from 1: 50,000 scale Survey of India maps. Distances were measured using a pedometer whose setting had been adjusted for relatively small strides.

All birds noted during the survey from Joshimath onwards have been included. The primary reason for this is that temperate oak forest that is present in the NDBR did not occur on the route that this expedition took. The only temperate oak forest that I was able to look at was that above Joshimath en route to Auli. It is presumed that bird species that occurred at Auli would occur within those areas of the NDBR which have temperate oak forest. Furthermore, it was important to compare bird assemblages in habitats which are perhaps used for wintering and lie outside NDNP.

The status of Galliformes was assessed using two methods. Encounter rates (number of individuals sighted or heard per km walk) were estimated for species that were frequently seen or heard and this provided a comparative index of abundance in different localities. The paths taken are given in Map 2. The other method was to record all sightings and calls heard and present it as a total (Table 3), inclusive of repeat counts over subsequent field visits.

RESULTS AND DISCUSSION

Distribution patterns

During this survey, a total of 112 species was recorded, of which 83 were recorded within the NDBR and 29 were recorded around Joshimath and the oak forest at Auli (Appendix 1).

There are four earlier expeditions from which bird lists are available for this area (Casebolt 1979, Reed 1979, Halberg and Petersen 1984, Tak and Kumar 1987).

During this survey seven major habitat types were surveyed. Species

Table 1. Distribution of bird species among different habitat types

Habitat Type	Total species	Exclusive species
Alpine meadow	32	9
Subalpine forest	43	18
Upper temperate	47	24
Water courses/bodies	8	7
Cliffs	13	2
Boulder strewn slopes	6	3
Agriculture/habitation	20	8

Table 2. Distribution of bird species according to altitude

Altitude	Total species	Species overlap
4,800-5,800	4	3
3,800-4,800	28	8
2,800-3,800	51	18
1,800-2,800	66	8
		1
		1

richness was highest in temperate forests with 47 species, 24 of which were seen only in this habitat (Table 1). The species richness of temperate forests is likely to be much higher as this was the least surveyed of all habitat types. Birds were apparently most abundant in this habitat type. Subalpine forest ranked the next highest in species richness with 43 species recorded, 18 of which were only seen in that habitat type. This habitat type, along with alpine meadows, were the most intensively surveyed areas. Thirty-two species were recorded in alpine meadows, of which 9 were seen exclusively in this habitat type.

Of the 111 species recorded, 42 (37%), were seen exclusively in forest dominated by oak, fir, birch or rhododendron and 9 (8.7%) were exclusive to alpine meadows. Only 20 species (8 exclusively) were recorded in degraded forest and agricultural land. This could indicate that the majority of the species in the areas surveyed are specialists that require primary forest cover. I could not examine alpine meadows that are subjected to human activity and thus am unable to assess the impact of degradation/disturbance on the avifauna of that habitat type.

There was a significant decline in species richness (and apparently of abundance) as elevation increased (Table 2). Only one species spanned the entire altitudinal range: the Brown Dipper *Cinclus pallasi*, of which I had a

glimpse at the lake at base camp. The decline in species richness with increasing altitude is concurrent with the distributional patterns of avifauna with habitat (Table 1). Temperate forests generally occurred below 2,800 m, subalpine forests between 3,000 and 3,800 m and alpine meadows between 3,800 and 5,000 m.

Notes on the observed movement patterns of birds

Our survey began during very early spring and ended by early summer. This perhaps accounted for the absence of many species of birds which I had expected to see, for example buntings *Emberiza*. On 2 May, when the survey commenced, leafing of birch (the dominant subalpine tree) had only just begun, and it even snowed occasionally. It was obvious that the immigration into alpine and subalpine areas had only just commenced. The most abundant of the first arrivals appeared to be *Phylloscopus* warblers, Black-crested Tits *Parus melanolophus*, Yellow-bellied Fantails *Rhipidura hypoxantha*, Orange-flanked Bush-Robins *Tarsiger cyanurus*, Blue-fronted Redstarts *Phoenicurus frontalis*, Olive-backed Pipits *Anthus hodgsoni* and Rosy Pipits *Anthus roseatus*. Three species of corvids, Yellow-billed Chough *Pyrrhocorax graculus*, Red-billed Chough *P. pyrrhocorax* and Large-billed Crow *Corvus macrorhynchos*, and one pigeon, the Snow Pigeon *Columba leuconota*, were commonly seen.

Abundance of avifauna was low and, though territories were being established (e.g. Black-crested Tits were exceedingly vocal at Dibrugeta), this appeared to be an inconsistent activity among species generally. Many birds seemed to cover larger areas in search of food e.g. the Yellow-bellied Fantail. Some species, notably the tits (Green-backed and Black-crested) and the Orange-flanked Bush-Robin had commenced nesting, as was evidenced by individuals observed with nesting material (hair and fur of Himalayan Tahr *Hemitragus jemlahicus* and Himalayan Musk Deer *Moschus chrysogaster*). I had expected to see a substantial change in species richness with the onset of warmer weather and the emergence of vegetation, but this did not occur. The only apparent change was a considerable increase in bird abundance, but species richness did not increase dramatically. Later arrivals (some of which occurred earlier in low numbers) included some species of rosefinch *Carpodacus* (e.g. Common Rosefinch *C. erythrinus)* and the Spotted Nutcracker *Nucifraga caryocatactes*, the latter being the most conspicuous late immigrant. Some *Phylloscopus* warblers also appeared to immigrate into subalpine forests later, for instance the Large-billed Leaf-Warbler *P. magnirostris*. En route to Sarsonpatal, this species was recorded only at Deodi, in the subalpine birch/fir forest, alongside the Rishi Ganga river, on 17-19 May. During the return journey, I found this species to be common at Dibrugeta. Similarly, from 7-16 May I had only one sighting of

the Chestnut-crowned Bush-Warbler *Cettia major* at Dibrugeta, while from 13-16 June I came across this species seven or eight times. The Chestnut-crowned Bush-Warbler was also interesting because it only occurred in a very small patch (< 10 ha.) of alpine meadow with cotton easter and rose *Rosa* bushes.

Why was there an absence of significant change in the species richness as summer progressed? One explanation is that the subalpine forests of NDNP are cut off from forested areas of lower elevations by a ring of high mountains of over 4,500 m. The only forested inlet into the core area is in the Rishi Ganga gorge and this is not contiguous. This lack of suitable habitat through which to move could perhaps be why many species, for example laughingthrushes, do not ascend to the subalpine forests within the core area.

Status of Galliformes

The Himalaya have about 26 species of gallinaceous birds (Ali and Ripley 1983). During this survey four species: Snow Partridge *Lerwa lerwa*, Himalayan Snowcock *Tetraogallus himalayensis*, Himalayan Monal *Lophophorus impejanus* and Koklass Pheasant *Pucrasia macrolopha* were seen, and three more species: Chukar *Alectoris chukar*, Kalij Pheasant *Lophura leucomelanos* and Cheer Pheasant *Catreus wallichii* were reported. The sightings (Table 3) are compared with the data collected by Zoological Survey of India surveys made during 1981-1984 (Table 4). Because Lamba (1987) did not state the location of sightings, I have compared only total numbers recorded.

1. SNOW PARTRIDGE *Lerwa lerwa*. I heard this bird twice at Dibrugeta in the rocky area above the meadow at an altitude of about 4,000 m. I presumed that a covey of 4-6 birds occurred there. One individual was sighted beyond 'Sath Kula', en route to Lata Kharak. I believe this species to be uncommon in NDNP, though Khacher (1978) found them to be 'plentiful'.

2. HIMALAYAN SNOWCOCK *Tetraogallus himalayensis*. This bird was frequently seen from Pathalkhan (4,100 m) onwards, and occurred as high as Camp 2 (5,900 m) on the Nanda Devi mountain. I found them to be very shy and those birds that were flushed at Sarsonpatal invariably flew across the river and landed on the steep rocky cliffs at the base of the Nanda Devi. They occurred at similar densities in the North Sanctuary (Table 3). A comparison of data reveals a significant change in the population of this species between 1981/1984 and 1993 (Table 4). I attribute this change to the total lack of human-related disturbance.

Some expeditions have reported the presence of Tibetan Snowcock *Tetraogallus tibetanus* in NDNP (Reed 1979, Casebolt 1979), and Ali and

Table 3 Status of Galliformes in Nanda Devi National Park

Species	Location	Total seen/heard	Encounter rate/km
Snow Partridge	Dibrugeta	Heard twice	
	Sath Kula	1	
Himalayan Snowcock	Pathalkhan	1	
	Sarsonpatal	28 sightings	2.8
	North sanctuary	>60 calls	2.1
Himalayan Monal	Maltoni pass	3	-
	Dibrugeta	81	4.7
	(On way back	16)	
	Deodi	5	1.25
	Deodi-Ramni	2	0.4
	Bagni Gadera	1	0.8
	Ramni-Bethartoli	2	0.4
	Bethartoli	3	0.6
	Dibrugeta-Dharansi	2	
	Latha Kharak	3	
	Belta Kharak	3+	
Koklass Pheasant	Dibrugeta	2 sightings 14 calls heard	

Table 4 Comparison of sightings of Galliformes in NDNP

Species	This study	Lamba 1987
Himalayan Snowcock	28 sightings	11 (49) >60 calls
Himalayan Monal	121	34 (63)
Koklass Pheasant	2 sightings	15 (48) 14 calls
Lamba (1987):	nos = number of observations ( ) = total individuals seen	

Ripley (1983) have said that the range includes Nanda Devi. None of the individuals that I had a good look at was Tibetan Snowcock. However, the birds around Base Camp seemed to have slightly different calls from those at Sarsonpatal. The existence of Tibetan Snowcock in NDNP needs confirmation.

3. Western Tragopan *Tragopan melanocephalus*. Tak and Kumar (1987) suspected the presence of this bird in NDNP. I did not see or hear any and

inquiries amongst the locals did not result in any information on this species. I believe that this species does not exist in NDNP. It is the rarest pheasant in the western Himalaya (Gaston *et al.* 1981) and its range apparently ends west of Nanda Devi (Ali and Ripley 1983).

4. Himalayan Monal *Lophophorus impejanus*. This pheasant was the most common galliform in NDNP. Ten or more males could be sighted at Dibrugeta meadow in the early morning or late evening. Females were less frequently seen, perhaps because nesting had commenced. (One female with chicks was seen en route to Bethartoli on 20 May 1993; V. K. Pangtey pers. comm.). Himalayan Monal were less frequently seen elsewhere in NDNP, but a few occurred at the tree line throughout the survey route, except at Bhujgara. The lowest altitude Monal was seen was at Belta Kharak (2,800 m), where two females and one male were sighted and were heard a few times.

There has been a distinct increase in the population of Himalayan Monals in NDNP. Between 1981 and 1984 six expeditions, totalling 167 days, were made to NDNP by Tak and Kumar (1987). Only 63 individuals were sighted by them (Lamba 1987), whereas in less than 35 days in suitable habitat, I sighted or heard Monal on more than 121 occasions. Khacher (1978) did not see any Monal during his survey in 1977, though he documented the presence of suitable habitats. Thus absolute protection has certainly benefited this species.

5. Kalij Pheasant *Lophura leucomelanos*. Not seen during this survey, but is present at Belta Kharak, and in forested areas around Lata and Reni village. Its status there is unknown and some hunting pressure exists on this species.

6. Koklass Pheasant *Pucrasia macrolopha*. A rare bird within NDNP. Occurred only in the forested area below Dibrugeta maidan. A single sighting by me and one by the wildlife guards were the only two records of this species during this survey. However, this bird was heard on at least 14 different occasions and the maximum number of individuals that I heard was five. The feathers of a female pheasant found between Kalikona and Chinwari were possibly of this species. Has the Koklass reduced in number? Lamba (1987) recorded Koklass on 15 occasions with a total of 48 individuals. However, as he did not give the location of his sightings a comparison cannot be made. Khacher (1978) heard them above Lata village, an area I did not survey. Locals confirmed the continued presence of the species in the area.

6. Cheer Pheasant *Catreus wallichii*. Not seen during this survey. This pheasant occurs in the forested areas near Reni village and, like other pheasants that occur near villages, appears to be under some hunting pressure. Possibly one individual was heard at Belta Kharak (Negi, AWLW, pers. comm.). It is unlikely that Cheer exist within NDNP, as they avoid forested areas, but they are often found in association with agriculture (Garson *et al.* 1992).

Conservation

Total protection from all human use is a rarely implemented or achievable conservation strategy in any of the protected areas of India. In the Himalaya, biotic pressures like livestock grazing play a significant role in virtually all temperate, subalpine and alpine areas during the summer months, with deleterious effects on wildlife, particularly because optimal areas for livestock grazing are also prime habitats for species like Himalayan Musk Deer, Himalayan Blue Sheep *Pseudois nayaur* and the Himalayan Monal. In addition to this are the often excessive pressures of adventure sports (e.g. mountaineering and trekking), these having a negative impact, primarily because of high levels of disturbance in areas abutting the trails. Thus Nanda Devi National Park is of particular importance because, while it had been extensively exploited in the past, there has been no, or minimal, human interference in this area for the last 12 years.

This study, and the one on mammals (Sathyakumar 1993), has clearly documented that absolute protection results in a significant increase in mammal and bird abundance, particularly of the species that are easily displaced because of disturbance. Based primarily on this major finding I propose the following conservation strategies.

1) A continuation of the total ban on mountaineering or other expeditions within the Nanda Devi National Park. To even allow limited exploitation could result in a reversion of all that has been achieved in these last 12 years.

2) The buffer of NDBR is a multiple use area, where needs of nearby villages are met, e.g. fuel and fodder. Several areas of the buffer zone are rich in fauna (Rastogi 1993) and hunting and other disturbance to wildlife is apparently widespread. Furthermore, there is probably excessive or unsustainable collection of medicinal plants of commercial value. The need in NDBR is not to waste valuable resources and personnel on the NDNP (which is in excellent condition) but to increase personnel and patrolling in the wildlife rich areas of the buffer zone and adjacent areas, and inculcate the principles of sustainable exploitation of plants of economic value amongst the locals.

3) Almost all species of avifauna in the Himalaya show altitudinal migration, ascending into subalpine and alpine areas in summer to breed, and descending into temperate and tropical areas in the winter when snow and extreme climatic conditions create a resource crunch at higher altitudes. The lower temperate and tropical forests of the Himalaya are perhaps amongst the most vulnerable in this biogeographic zone, simply because this is the inhabited belt. It is in the lower temperate and tropical belt that maximum deforestation is taking place (D. Mohan pers. comm.). Apparently, most protected areas in the western Himalaya are situated at higher altitudes, encompassing mostly alpine or subalpine areas. Do these protected areas have sufficient temperate and tropical forest below them into which birds can descend during winter? Careful consideration needs to be given to the planning and establishment of a protected area network around and below high altitude protected areas so as to ensure that the forested and other areas at lower altitudes, which are used for wintering by birds, are adequately protected. Lack of sufficient protection of wintering areas will result in reduction in the populations that migrate into alpine or subalpine areas to breed.

4) Despite the fact that, during this survey, the forests at Auli (above Joshimath) were the least surveyed, species richness was the highest there. I propose that a specific study is made to find ways and means by which to better protect this excellent forest.

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APPENDIX

ANNOTATED LIST OF THE BIRDS OF NANDA DEVI NATIONAL PARK RECORDED IN 1993 (INCLUDING BIRDS SEEN AT JOSHIMATH AND AULI)

Species	Locations	Habitat	Altitudes	Abundance
Snow Partridge *Lerwa lerwa*	Above Dibrugcta, 'Sath kula'	1,6	4,000	2
Himalayan Snowcock *Tetraogallus himalayensis*	Pathalkhan, Sarsonpatal, N. sanctuary, base camp up to 'camp II'	1,5	4,100-5,900	4
(Black Francolin *Francolinus francolinus*	Around Joshimath	1	2,000-2,300	4)
Koklass Pheasant *Pucrasia macrolopha*	Dibrugeta	2	3,500	3
Himalayan Monal *Lophophorus impejanus*	Belta Kharak to Ramni	1,2,3	2,800-3,900	5
(Rufous-bellied Woodpecker *Dendrocopos hyperythrus*	Auli	3	2,300-2,700	2)
(Himalayan Woodpecker *Dendrocopos himalayensis*	Auli	3	2,300-2,700	3)
Woodpecker Picidae	Dibrugeta	2	3,500	2
(Great Barbet *Megalaima virens*	Auli	3	2,300-2,700	4)
(Eurasian Hoopoe *Upupa epops*	Around Joshimath, Auli	3,7	2,000-2,700	3)
Common Cuckoo *Cuculus canorus*	Dibrugeta to Reni	2,3	2,000-3,900	3
Himalayan Swiftlet *Collocalia brevirostris?*	Rishiganga gorge	5	2,000-2,500	-
Fork-tailed Swift *Apus pacificus*	Rishiganga gorge	5	2,000-2,800	5
Grey Nightjar *Caprimulgus indicus*	Belta Kharak	3	2,800	1
(Rock Pigeon *Columba livia*	Around Joshimath	7	2,000	-)
Hill Pigeon *Columba rupestris*	Near Bethartoli	6	3,700	1
Snow Pigeon *Columba leuconota*	Doodganga & above	1,2,5	2,800-4,500	6
Speckled Wood-Pigeon *Columba hodgsonii*	Reni, Kalikona, Belta Kharak	3	2,100-2,900	4
Oriental Turtle-Dove *Streptopelia orientalis*	Belta Kharak, Auli, around Joshimath	3,7	2,000-2,700	4
Lammergeier *Gypaetus barbatus*	Dibrugeta to Sarsonpatal	1,2,5	3,500-4,500	4
Himalayan Griffon *Gyps himalayensis*	Reni/Latha to Sarsonpatal	1,2,3,4,5	2,000-4,500	6
Eurasian Sparrow-hawk *Accipiter nisus*	Dibrugeta	1,2	3,500	2
Long-legged Buzzard *Buteo rufinus*	Maltoni pass, Malla Dibrugeta	1,2	3,900	2
Golden Eagle *Aquila chrysaetos*	Above Trisul nalla	1,2	3,700-4,200	2
Booted Eagle *Hieraaetus pennatus*	Rishi Ganga gorge, above Bethartoli? & Rishi ganga confluence; Sarsonpatal	1,3,5	2,600-3,900	2
Falcon *Falco*	Doodganga	5	2,800	1
Common Kestrel *Falco tinnunculus*	Dibrugeta to Ramni, Bethartoli	1,5	3,500-3,600	3
(Long-tailed Shrike *Lanius schach*	Above Joshimath, Auli	3,7	2,000-2,500	4)
(Eurasian Jay *Garrulus glandarius*	Auli	3	2,500	2)
(Black-headed Jay *Garrulus lanceolatus*	Auli	3	2,500	1)
(Blue Magpie *Urocissa erythrorhyncha*	Auli	3	2,700	2)
(Grey Treepie *Dendrocitta formosae*	Auli	3	2,500	1)
Spotted Nutcracker *Nucifraga caryocatactes*	Reni/Lata to Ramni	1,2,3	2,200-3,700	4
Red-billed Chough *Pyrrhocorax pyrrhocorax*	Maltoni pass to Pathalkhan	1,2,5	3,700-4,100	6

Yellow-billed Chough *Pyrrhocorax graculus*	Above Ramni to Sarsonpatal	1,2,5	4,000-5,900	6
(House Crow *Corvus splendens*	Around Joshimath	7	2,000	-)
Large-billed Crow *Corvus macrorhynchos*	Joshimath to Dibrugeta	1,2,3,5,7	2,000-3,700	5
(Long-tailed Minivet *Pericrocotus ethologus*	Auli	3	2,200-2,700	3)
Yellow-bellied Fantail *Rhipidura hypoxantha*	Maltoni to Ramni	2	3,400-3,800	5
(Ashy Drongo *Dicrurus leucophaeus*	Around Joshimath	3,7	2,000	4)
(Asian Paradise-Flycatcher *Terpsiphone paradisi*	Above Joshimath	3,7	2,000	2)
Brown Dipper *Cinclus pallasii*	Kalikona to Doodganga, Dibrugeta, Base camp	4	2600-5,000	4
(Blue-capped Rock-Thrush *Monticola cinclorhynchus*	Above Joshimath	3,7	2,000-2,400	2)
Blue Whistling-Thrush *Myiophonus caeruleus*	Reni to Ramni, Bethartoli	1,4,5	2,000-3,800	6
Plain-backed Thrush *Zoothera mollissima*	Dibrugeta	1/2	3,600	2
(Tickell's Thrush *Turdus unicolor*	Auli	3	2,500	2)
White-collared Blackbird *Turdus albocinctus*	Belta Kharak	3	2,500-2,800	1
(Grey-winged Blackbird *Turdus boulboul*	Auli	3	2,500	2)
Eurasian Blackbird *Turdus merula*	Belta Kharak, Auli	3	2,500-2,800	2
Mistle Thrush *Turdus viscivorus*	Dibrugeta	2	3,500	1
Rufous-gorgeted Flycatcher *Ficedula strophiata*	Deodi, Trishul nallah & Rishiganga confluence	2	3,300-3,500	2
Ultramarine Flycatcher *Ficedula superciliaris*	Belta Kharak	3	2,900	1
(Grey-headed Canary-Flycatcher *Culicicapa ceylonensis*	Auli	3	2,300-2,700	2)
White-tailed Rubythroat *Luscinia pectoralis*	Bethartoli, Sarsonpatal	1,6	4,100-4,200	2
Indian Blue Robin *Luscinia brunnea*	Maltoni pass	2	3,800	1
Orange-flanked Bush-Robin *Tarsiger cyanurus*	Maltoni to Ramni, Belta Kharak	2,3	2,800-3,900	5
Blue-capped Redstart *Phoenicurus caeruleocephalus*	Belta Kharak	3	2,900	2
Black Redstart *Phoenicurus ochruros*	Sarsonpatal	1	4,200	1
Blue-fronted Redstart *Phoenicurus frontalis*	Dibrugeta to Sarsonpatal	1,2	3,500-4,300	5
White-capped Water-Redstart *Chaimarrornis leucocephalus*	Reni to Sarsonpatal	4	2,000-4,200	5
Plumbeous Water-Redstart *Rhyacornis fuliginosus*	Kalikona	4	2,600	2
Grandala *Grandala coelicolor*	Sarsonpatal	1	4,300	1
Little Forktail *Enicurus scouleri*	Dibrugeta	4	3,500	1
(Spotted Forktail *Enicurus maculatus*	Above Joshimath, Auli	4	2,000-2,400	2)
(Siberian Stonechat *Saxicola maura*	Around Joshimath	7	2,000	4)
(Grey Bushchat *Saxicola ferrea*	Around Joshimath	7	2,000	4)
(Common Myna *Acridotheres tristis*	Around Joshimath	7	2,000	4)
White-cheeked Nuthatch *Sitta leucopsis*	Dibrugeta	2	3,500	1
Eurasian Tree-creeper *Certhia familiaris*	Dibrugeta	1	3,500	1
Bar-tailed Tree-creeper *Certhia himalayana*	Dibrugeta, Deodi Trishul n.-Rishiganga confluence	2	3,300-3,500	3
Winter Wren *Troglodytes troglodytes*	Deodi, Ramni	6	3,400-3,700	2
Fire-capped Tit *Cephalopyrus flammiceps*	Near Trishulnallah-Rishiganga confluence, Joshimath	2	1,800, 3,500	2
Dark-grey Tit *Parus rufonuchalis*	Deodi, Trishulnallah-Rishiganga confluence	2	3,400-3,700	2
Black-crested Tit *Parus melanolophus*	Belta Kharak/Reni to Ramni, Bethartoli	2,3	2,000-3,800	5
Green-backed Tit *Parus monticolus*	Up to Chinwari, Auli	3	2,000-2,700	4
White-throated Tit *Aegithalos niveogularis*	Deodi, Dibrugeta	2	3,500-3,700	2
Goldcrest *Regulus regulus*	Dibrugeta	2	3,600	3
Himalayan Bulbul *Pycnonotus leucogenys*	Around Joshimath	7	2,000-2,100	5
(Black Bulbul *Hypsipetes leucocephalus*	Auli	3	2,300-2,700	4)
(Oriental White-eye *Zosterops palpebrosus*	Auli	3	2,500	3)

Brownish-flanked Bush-Warbler *Cettia fortipes*	Belta Kharak, around Joshimath	3,7	1,800-2,800 5
Chestnut-crowned Bush-Warbler *Cettia major*	Dibrugeta	1	3,600 3
Bush-Warbler *Cettia* sp.	Above Bethartoli	1	4,400 1
Sulphur-bellied Warbler *Phylloscopus griseolus*	Sarsonpatal	1	4,200 2
Pale-rumped Warbler *Phylloscopus chloronotus*	Doodganga	2,3	2,800 1
Greenish Warbler *Phylloscopus trochiloides*	Dibrugeta	2	3,500 2
Large-billed Leaf-Warbler *Phylloscopus magnirostris*	Deodi, Dibrugeta, Belta Kharak	2,3	2,800-3,600 4
Western Crowned Warbler *Phylloscopus occipitalis*	Rishi Ganga gorge, Belta Kharak	2,3	2,200-2,800 3
Blyth's Leaf-Warbler *Phylloscopus reguloides*	Dood Ganga, Dibrugeta	2,3	2,800-3,600 3
Golden-spectacled Warbler *Seicercus burkii*	Dibrugeta	2	3,600 3
Grey-hooded Warbler *Seicercus xanthoschistos*	Doodganga	3	2,800 1
Streaked Laughingthrush *Garrulax lineatus*	Around Joshimath	3,7	2,300-2,700 5
Variegated Laughingthrush *Garrulax variegatus*	Belta Kharak, Auli	3	2,300-3,000 4
Chestnut-tailed Minla *Minla strigula*	Dibrugeta, Deodi	2	3,300-3,500 2
(Rufous Sibia *Heterophasia capistrata*	Auli	3	2,400-2,800 2)
Yellow-bellied Flowerpecker *Dicaeum melanoxanthum*	Reni-Kalikona	3	2,300 1
(House Sparrow *Passer domesticus*	Around Joshimath	7	2,000 -)
Grey Wagtail *Motacilla cinerea*	Rishisanga gorge	4	2,000-2,800 2
Olive-backed Pipit *Anthus hodgsoni*	Dibrugeta - Deodi	1/2	3,300-3,600 4
Rosy Pipit *Anthus roseatus*	Dibrugeta to Sarsonpatal	1	3,500-4,500 5
Alpine Accentor *Prunella collaris*	Pathalkhan	1,5	4,200 2
Robin Accentor *Prunella rubeculoides*	Sarsonpatal	1	4,200 1
Rufous-breasted Accentor *Prunella strophiata*	North Sanctuary	2	
(Fire-fronted Serin *Serinus pusillus*	Around Joshimath	3,7	2,000 6)
Plain Mountain-Finch *Leucosticte nemoricola*	North Sanctuary	1	4,000 2
Common Rosefinch *Carpodacus erythrinus*	Dibrugeta	1	3,600 1
Beautiful Rosefinch *Carpodacus pulcherrimus*	Bethartoli	5	4,000 1
Pink-browed Rosefinch *Carpodacus rodochrous*	Dibrugeta, Pathalkhan	2,6	3,500-4,100 -
Spot-winged Rosefinch *Carpodacus rodopeplus*	Deodi, North Sanctuary, Joshimath	1,2,7	1,900-4,100 -
White-browed Rosefinch *Carpodacus thura*	Dibrugeta	2	3,500 -
Red-fronted Rosefinch *Carpodacus puniceus*	Dibrugeta, Ramni, Sarsonpatal, Joshimath	1,2,7	1,800-4,200 -
Red-headed Bullfinch *Pyrrhula erythrocephala*	Near Ramni	2	3,600 2
(Black-and-yellow Grosbeak *Mycerobas icterioides*	Auli	3	2,500-2,700 2)
Spot-winged Grosbeak *Mycerobas melanozanthos*	Belta Kharak, Dibrugeta, Auli	2,3	2,800-3600 4

Key :

Habitat
1 = Alpine meadow
2 = Subalpine forest
3 = Upper temperate forest
4 = Water courses/bodies
5 = Cliffs
6 = Boulder-strewn slopes with sparse vegetation
7 = Agriculture/habitation

Abundance ranking (based on sightings or calls heard)
1 = 1
2 = 2-5
3 = 6-10
4 = 11-50
5 = 50-100
6 = >100

( ) = indicates species seen only outside NDBR

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Occurrence of some pelagic seabirds (Procellariiformes) in waters off the Indian subcontinent

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Information on the occurrence and movements of petrels Procellariiformes in the northern Indian Ocean is summarised. An attempt is made to integrate these pelagic and migratory species from the southern fringe of the Oriental region more firmly within the avifauna of the Indian subcontinent. Some additions to the regional avifauna are noted.

Petrels, shearwaters and storm-petrels (Procellariidae) are truly pelagic birds, often returning to land only to breed. Many species are also highly migratory at sea, following ocean currents and upwellings in search of food during the non-breeding season (Harrison 1985, Warham 1990). In the Indian Ocean north of the equator there are few known breeding sites and individuals are seldom examined in the hand. Information has been sparse and scattered (Bailey and Bourne 1963, van den Berg *et al.* 1991) and the recording of most species near the coasts of the Indian subcontinent is based largely on sporadic sight records and in some cases specimens (Ripley 1982, Ali and Ripley 1987), the latter usually washed ashore or caught by fishermen.

A search of the literature on seabirds in the Indian Ocean, including the published records of the Royal Naval Bird Watching Society, has revealed much extra information on the occurrence and movements of these birds relative to the subcontinent and its off-shore island groups. It is hoped that summarizing these data, and providing a deliberately long list of references, will help to stimulate further research.

Numbers in parentheses after the scientific name are those used in Ripley (1982). Following the taxonomy of Sibley and Monroe (1990) all the species treated fall within the Procellariidae and Persian Shearwater is treated as a separate species. Nomenclature conforms with that preferred by Bourne and Casement (1993).

NOTES ON SPECIES

Cape Petrel *Daption capense* (6)

A circumpolar species from the Southern Oceans, very occasionally straying north.