FAUNA OF CONSERVATION AREAS 9

FAUNA
OF
NANDA DEVI BIOSPHERE RESERVE

A World Heritage Site

ZOOLOGICAL SURVEY OF INDIA

1997

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Cover photograph : *Ochotona roylei* (Ogilby, 1839), Royle's Pika: the most sighted mammal of Nanda Devi Biosphere Reserve

FAUNA OF NANDA DEVI BIOSPHERE RESERVE

CONTENTS

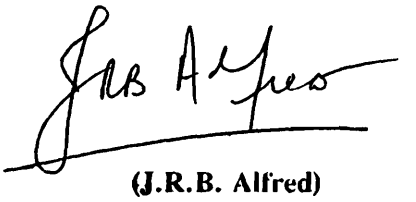
FAUNAL DIVERSITY

FOREWORD

Biosphere Reserves offer ideal habitats for diverse group of living organisms. India has identified 14 such areas of which eight have been officially declared, each being located in a distinct ecosystem. The scientists of Zoological Survey of India have been investigating faunal resources of these conservation areas for the last 15 years and have already produced 8 documents between 1987-1995 and a series of such publications is under preparation.

The present publication being 9th in the series, brings together a new set of data enlisting more than 400 taxa belonging to 20 faunal groups from Nanda Devi Biosphere Reserve in western Himalaya in Uttar Pradesh. This is the result of four extensive surveys within the buffer zone of the Biosphere carried out by the Survey scientists between 1989-1993. Earlier, Zoological Survey of India scientists have documented higher vertebrate fauna (mammals and birds) of the reserve (*Fauna of Conservation Areas 1*, 1987).

In view of the national need to inventorise biodiversity at species and ecosystem level, the present document is a valuable input. It is expected that it will be useful to the management authorities of the reserve as also to the scientific community engaged in the area of studies on biodiversity in India. I would like to express my sincere thanks to all the scientists who have worked in the field and in the laboratory to make this programme a success. I would also like to record my appreciation to Drs. Arun Kumar and P.C. Tak for their efforts in coordinating the programme and bringing out this publication.



1997

(J.R.B. Alfred)
Director

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It is my pleasent duty to acknowledge thanks to the Director, Nanda Devi Biosphere Reserve for extending the financial support for the fourth survey in Milam area (September, 1993).

I would also like to acknowledge the brave and untiring efforts of my various colleagues namely, Drs. P.C. Tak, J.P. Sati, P. Ray and others for having undertaken the faunistic surveys of the biosphere with very limited resources that were made available, and under rather arduous physical conditions. But for their efforts, it would not have been possible to study the faunal diversity that we did. Thanks are also due to Dr. P.C. Tak for his painstaking and enthusiatic efforts to bring the photographs from Biosphere.

I would not let the opportunity go without acknowledging my grateful thanks to the scientists who have studied various faunal groups, both at Northern Regional Station and at Headquarter, without whose contributions, the final submission of this document would not have been possible.

Last but not the least, I would acknowledge with thanks the help of various colleagues in Technical and Administrative sections at NRS in completion of this work.

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FAUNA OF NANDA DEVI BIOSPHERE RESERVE : AN OVERVIEW

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India represents three of the major realms (the Oriental, Palaearctic, and the Indo-Malayan) and more than three biomes (tropical humid forests, tropical dry deciduous forests and warm deserts/semideserts, etc.). These include 10 biogeographic regions. It has also two of the 18 identified hot spots the eastern Himalaya and the western Ghats.

The faunal wealth of our country is immensely diverse and comprises a total number of estimated 81,000 species which represent about 6.4 percent of the world fauna. However, the rich biodiversity of the nation is constantly and severely threatened by human activities like expansion of industry and agriculture, urbanization and large scale development projects like dams, highways, deforestation and mining, etc. These activities have resulted in eco-degradation, destruction of habitats, pollution, trade in endangered species and over utilization of bio-resources, thus resulting in the rapid erosion of our biodiversity. Based on the present estimates 20 species have been categorised as *'possibly extinct'*, the most noteworthy examples are of the *Indian Cheetah, Pink-headed Duck* and the *Mountain Quail,* which have not been cited in the present century at all. 81 species of mammals, 47 forms of birds, 15 reptiles, three amphibians and a large number of butterflies, moths and beetles are considered vulnerable and endangered.

Nevertheless, India has a rich tradition of respect for conservation of wild life, and a long history of *in-situ* conservation of fauna in protected areas which are concerned with selected keystone species of both ecological and aesthetical value, including those which have become endangered due to degradation of their habitat. A significant contribution has been made in this direction in restoring a viable population of important animal species, such as the tiger, lion, rhinoceros, crocodile and snow leopard, etc.

However, in depth studies have indicated, it is not enough to conserve a species or a habitat, but it is to be ensured that the unhindered development of the micro-organisms, plants and animals takes place in totality, and as a part of the natural ecosystem.

Based on the above comprehensive concept of conservation evolved by UNESCO, Man and Biosphere (MAB) programme was started in 1971. The Ministry of Environment & Forests has designated eight Biosphere Reserves including Nanda Devi Biosphere Reserve for such conservation measures. Further under world heritage convention, five natural sites in India have been

declared as *World Heritage Sites*, the Nanda Devi Biosphere Reserve has recently been declared as one such site.

The biosphere is located in the high mountain ranges of the western Himalaya (Rishi Ganga Valley) in northern Uttar Pradesh. It includes parts of three districts of Garhwal and Kumaon hills namely, Chamoli, Pithoragarh and Almora. The total area of the biosphere is 2236. 74 sq km, including the core zone of 624.62 sq km (the buffer zone is 1612.12 sq km). Initially the area designated as Nanda Devi sanctuary is presently marked as the *Core Zone*,the outer area of sanctuary as the *Recreation Zone*, and the outer slopes of the adjoining high mountain ranges and their peripheral area as the *Special Use Area* or the *Buffer Zone* (Fig. 1).

Not only the core zone of this biosphere but also the approach routes are snow-covered for most parts of the year. The above fact, along with the very difficult terrain, makes Nanda Devi the most natural and ecologically undistrubed Biosphere Reserve in India.

Faunal and floral diversity in this protected area is very varied and rich. The faunal components exhibit many adapations to the temperate and high altitude environmental conditions prevalent in the region. In last about three decades many naturalists and wildlifers have made attempts to study various aspects of its fauna; the important studies have been listed in Table 1. It is note-worthy to specially mention the studies of Lamba (1987a & 1987b) on the fauna of this biosphere, in which 14 speies of mammals and 80 species of birds were listed. He also made detailed observations (*loc. cit.*) on the status of endangered and threatened mammals (7 spp.) and birds (8 spp.) from the present *Core Zone* of the biosphere.

Project Document number 3 (undated) by Indian National Man and the Biosphere committee, Ministry of Environment and Forests, New Delhi, enlists threatened species of mammals and birds from NDBR (pp. 28-29). It further states (pp. 29) that *"There are no records, published or otherwise, of the invertebrate fauna, including insects, from the above reserve, if the richness of flora (op. cit.) is any indication of the insect life, the entomological component of the fauna should be tremendous. It is hoped that the study of invertebrate fauna will be given top priority in the bench-mark studies to be undertaken in the Biosphere Reserve"*.

In the light of the above observations a working plan was prepared by the scientists of the Zoological Survey of India, Dehra Dun to undertake systematic exploration of invertebrate as well as vertebrate fauna of the buffer zone of this biosphere. Consequent to which four extensive faunistic surveys were conducted in NDBR during the months of August and September in the years 1989 *(Reni-Malari area, district Chamoli)*, 1990 *(Pindari area, district Almora)*, 1991 *(Roopkund area, district Chamoli)*, and 1993 (*Milam area, district Pithoragarh*).

During the above faunistic surveys valuable samples of non-schedule invertebrate fauna were collected from as many as 40 localities at different altitudes and simultaneously sighting and listing of bird and mammal species was also carried out in the biosphere. The analysis of the

fauna thus studied indicate a quantum increase in our knowledge of so far known faunal records from Nanda Devi Biosphere Reserve *(cf. MAB Project Document no. 3; Lamba, 1987a & 1987b; Tak and Kumar 1983a & 1983b, 1987, to quote a few).*

A brief description of total faunistic surveys and research studies carried out in this biosphere is presented in Table 1.

An annotated list of 427 taxa belonging to 20 faunal groups is included in the present document, the details of which are as under: Invertebrates 218 spp., and Verterbrates 209 spp.; of the 218 forms of invertebrates, there are 15 species of Mollusca, six of Annelida, 17 of Arachnida, one Thysanura, two Collembola, six of Odonata of, 14 Orthoptera, seven Dermaptera, 13 Hemiptera, four Neuroptera, 80 Lepidoptera, two Trichoptera, 24 Diptera, 24 Hymenoptera and three Chilopoda. Among vertebrates one species of Pisces, eight of Amphibia, three of Reptilia, 175 of Aves and 22 of Mammalia have been recorded.

Table 1. Summary of Faunistic Surveys and Research Studies carried out in Nanda Devi Biosphere by Zoological Survey of India, Dehra Dun.

1. FAUNISTIC SURVEYS :

Sl. no.	Area of biosphere surveyed	Theme of the survey	Task force	Year	Duration	Remarks
1.	Ramani Area (Core Zone)	Status Survey of Endangered & Threatened Mammals & Birds	B.S. Lamba P.C. Tak G. Kumar	1981	6 weeks	Under MAB programme
2.	South Rishi Glacier (Core Zone)	– do –	P.C. Tak G. Kumar	1982	5 weeks	– do –
3.	Common Base Camp (Core Zone)	– do –	– do –	1983	6 weeks	– do –
4.	North Rishi Glacier (Core Zone)	– do –	– do –	1984	6 weeks	– do –
5.	Reni-Malari-Girthi (Buffer Zone)	General Faunistic Survey (First time Coll. of of invertebrates was made)	P.C. Tak P. Ray	1989	4 weeks	Under Faunistic Survey of Conservation Areas

Sl. no.	Area of biosphere surveyed	Theme of the survey	Task force	Year	Duration	Remarks
6.	Pindari Area (upto Zero Point) (Buffer Zone)	– do –	– do –	1990	3 weeks	– do –
7.	Roopkund Area (Buffer Zone)	– do –	– do –	1991	3 weeks	– do –
8.	Milam Area (Buffer Zone)	– do –	J.P. Sati P.C. Tak	1993	4 weeks	– do –

2. RESEARCH STUDIES:

2.1 By the Zoological Survey of India, Dehra Dun :

Faunistic studies were carried out at Nanda Devi Biosphere Reserve under two different programmes, namely:

2.1.1. MAB Programme entitled *"Status Survey of Endangered and Threatened Species of Mammals and Birds* (1981-84)" : During the course of this study a total of 14 mammalian and 80 avian species were enumerated and the status (numerical abudance/absolute density) of seven endangered and threatened mammals and eight bird spp. inhabiting the area was arrived at

Consequently the following research papers/reports were published.

Arora. G.S. and Tak. P.C. (1996). Conservation of Biological Resources in Nanda Devi Bisophere Reserve. *Conservation and Management of Biological Resources in Himalaya.* Ramakrishnan *et al.* (Eds). : 509-520. G.B. Pant Institute of Himalayan Environment and Development & Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi.

Lamba, B.S.1987 a. Status Survey of Fauna: Nanda Devi National Park (Mammals and Birds), *Rec. Zool. Surv. India, Occ. Paper,* **103** : i-v+1-50.

Lamba, B.S.1987 b. Fauna of Nanda Devi National Park (Mammals and Birds). *Fauna of Conservation Areas* : *Zool. Surv. India,* i-v+1-36.

Tak, P.C. 1986. Status and distribution of Mammals at Nanda Devi National Park. *Cheetal,* **20** (1): 52-56.

Tak, P.C. and Kumar, G. 1983a. Nanda Devi National Park: A suggestion for. *Cheetal,* **25** (1) : 38-39

Tak, P.C. and Kumar, G. 1983b. Nanda Devi National Park: The Home of Several Endangered Mammals and Birds. *Science Reporter*, **20** (10) : 569-574.

Tak, P.C. and Lamba, B.S. 1984. Field Observations on abundance of some smaller mammals at Nanda Devi National Park. *Indian J. Forestry*, **8** (3) : 219-230.

Tak, P.C. and Lamba, B.S.1985. Nanda Devi National Park: A contribution to its mammalogy. *Indian J. Forestry*, **10** (3) : 184-190.

2.1.2. **Fauna of Conservation Areas (Nanda Devi Biosphere Reserve) studies by the Zoological Survey of India (1989-1993)** under **Action Plan** MoEF., New Delhi.

During the course of this study a total of four faunistic surveys were carried out in the Buffer Zone between the years 1989-1993 (*vide* serial numbers 5-8, Table-1).

Consequent to the above surveys faunal samples of a large number of invertebrate groups namely, Arachnida, Annelida, Chilopoda, Thysanura, Collembola, Odonata, Orthoptera, Dermaptera, Hemiptera, Neuroptera, Trichoptera, Lepidoptera, Diptera, Hymenoptera and Mollusca were collected and enumeration of all the vertebrate groups has been done.

2.2 Faunal studies by scientists other than the ZSI :

The following papers have been published on the biodiversity of the Reserve by various amateurs/naturalists

Dang, G.H. 1964. A natural sanctuary in the Himalaya: Nanda Devi and the Rishi Ganga Basin. *Cheetal*, **7** (1) : 34-42.

Lavkumar, K.S. 1979. Nanda Devi Sanctuary-1977. *J. Bombay nat. Hist. Soc.*, **75** (3) : 868-887 (Diamond Jubilee Issue).

Reed, T.M. 1979. A contribution to the ornithology of the Rishi Ganga Valley and the Nanda Devi Sanctuary. *J. Bombay nat. Hist. Soc.*, **76** (2) : 275-282.

Kandari, O.P. 1982. Nanda Devi - India's Highest Himalayan National Park : The problem of resource use and conservation. *Cheetal*, **24** (1&2) : 29-36.

Bhat, V.K. *et al.* 1993. Scientific and ecological expedition Nanda Devi. *Expedition Report Corps. of Engineers*, 19th July, 1993, New Delhi; 1-98 pp.

Ramakrishnan, P.S. *et al.* (Eds.) 1996. *Conservation and Management of Biological Resources in Himalaya.* G.B. Pant Institute of Himalayan Environment and Development & Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, Calcutta; xiii + 1-604 pp.

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BIOGEOGRAPHY

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The Nanda Devi Biosphere Reserve, as already mentioned, forming a part of *Himalayan highland,* includes parts of three civil districts in Uttar Pradesh hills. One in Garhwal Himalaya, *viz.*, Chamoli, in which the major portion of the biosphere falls; and two in Kumaon Himalaya, *viz.*, Pithoragarh on the eastern and Almora on the southern side.

Location : The biosphere is situated between 30° 17'-30° 40' N latitudes and 79° 40'-80° 05' E longitudes. The altitude of the biosphere varies from 1000m to 7817m, highest point being the mount Nanda Devi west.

Villages : The following 17 villages fall within the boundary of biosphere :

I	DIST. CHAMOLI (N and NW part of the bioshphere)	: 1. Reni, 2. Lata, 3. Peng. 4. Tolma, 5. Suraithota/Sigri, 6. Phagti/Pangrasu 7. Jamgavar or Dronagiri, 8. Kaga, 9. Garpag, and 10. Malari;
II	DIST. ALMORA (S and SE part of the biosphere)	: 11. Khati, 12. Dwali, and 13. Phurkia;
III	DIST. PITHORAGARH (E and SE part of the biosphere)	: 14. Kurkuli, 15. Milam, 16. Martoli, and 17. Samdu.

Boundary : The boundary of the biosphere runs from village Reni, in the west, along the river Dhauliganga upto village Malari in the north. Then in a easternly direction along the river Girthiganga upto Unta-Dhar. From where it takes a southernly course through Milam and Samdu, all along the course of river Pinder upto village Khati in the south; where it changes its direction in a south-westernly manner along the Sunderdhunga gad upto Sunderdhunga, roughly covering Rooopkund area then through peaks like Nanda Ghunti, Ronti, etc. till it finally again touches Reni village in west (Fig. 1).

Administrative zones : The diffrent types of administrative areas identified within the boundary of the biosphere are as under:

(a) *Core zone* (624.62 sq km) : This area includes Nanda Devi National Park minus the projection leading to Dhauliganga which includes village Peng.

(b) *Buffer zone* (1612.12 sq km) : This area includes biosphere reserve excluding the area of the core zone as described above. This also includes the area of multiple use zone, recreational and special use area.

(c) *Multiple use zone* : The area of the Buffer zone extends on south-east (upto Pindari glacier), south-west (upto Nanda Ghunti), north-west (from Nanda Ghunti to village Peng), about five kilometer wide strip (including village Garpag) along Dhauliganga river from village Peng to Malari, and in east about four and a half kilometer wide strip along Goriganga from Samdu to Tota Shilling. The multiple use area includes the following areas:-

(i) *Special use area* : This comprises village of Reni, Peng, Lata, Suraithota, Kaga, Malari in the north-west (district Chamoli); Tota Shilling, Milam, Martoli and Samdu in the east (district Pithoragarh); and Phurkia, Dwali and Khati in the south (district Almora).

(ii) *Recreation zone* : Complete special use area has been included in recreation zone. The following trek routes have also been included and are expected to be developed for the tourists,

Munsiyari-Milam-Milam Glacier (Pithoragarh dist.),

Khati-Dwali-Phurkia-Pindari Glacier (Almora dist.),

Debal-Wan-Roopkund-Homkund (Chamoli dist.).

(iii) *Agriculture and horticultural area*: Private land of above mentioned 17 revenue villages has been included in this.

(iv) *Eco-Restoration zone* : Degraded areas in multiple use zone have been included in this zone.

Climate : The biosphere is situated at point where the Himalayan chain changes its trend from NW to SE. During rainy season, the area receives the full blast of the SW monsoon and the rainfall is extremely heavy. However, the climate as a whole is dry, with low annual precipitation. The snow cover is thick and generally seen at lower altitudes on the southern slopes of the biosphere than on the northern slopes. When camping in the area, one can witness almost every day fantastically tumultuous cloud formations with frightening display of lightning over the mountains on south and west. Although the eastern mountains of the area also have daily

cloud build ups, these are far less spectacular, possibly due to the drier climate of the Milam area.

There is considerable inflow of warm air up the gorges, resulting in light mist over the high meadows. This phenomenon has a profound effect on the winter conditions which linger on late into the summer. The mists and low clouds in the month of June keep the soil moist which in turn helps in supporting luxuriant vegetation (Lavkumar, 1978; Lamba, 1987).

Geology : Geologically the core zone of the biosphere has been tentatively divided into four formations, i.e., Lata, Ramani, Kharpatal and Martoli. The rocks are highly metamorphosed crystalline type of the Vaikrita group and the lowest part of Tethysediments (Marou, 1979).

Vegetation : The vegetation of any area/region reflects the climate prevailing there. This distinctive climatic feature is enjoyed by the biosphere. It is very rich in floral diversity.The flora of the reserve comprises 793 species of vascular plants, distributed in 406 genera, and about 120 families (Hazra, 1983; Hazra and Balodi, 1995), while Samant (1993) listed 55 species of rare plants from the reserve. As such this protected area (PA) provides a good habitat for conservation of flora. Some of the rare plants being: *Aconitum* spp., *Allium* spp., *Arnebia benthamii* (Wall ex G. Don) Johnst.,*Circaeaster agrestis* Maxim., *Cypripedium elegans* Recihb. f., *C. himalaicum* Rolfe ex Hemsl., *Dactylorhiza hatagirea* (D. Don) Soo, *Epipogium aphyllum* Sw., *Meconopsis aculeata* Royle, *Nardostachys grandiflora* DC., *Neottia listeroides* Lindl., *Picrorhiza kurrooa* Benth., *Podophyllum hexandrum* Royle, *Saussurea obvallata* (DC.) Sch.-Bip., *Stellera chamaejasme* L., *Thesium himalense* Royle ex Edgew., *Tristeum hirsutum* Wall., etc. (Hazra, 1983).

Altitudinally, the vegetation of the biosphere can be classified broadly into three categories (Plate I) :

i. Subalpine forests,
ii. Moist alpine scrub,
iii. Alpine meadows.

The subalpine forest comprises three different canopies upper, middle and lower or the ground cover. The upper canopy is formed of the large trees species of *Pinus, Quercus, Cedrus, Abies, Rhododendron* and *Betula;* the middle canopy consists of comparatively smaller tree-like shrubs of *Rosa, Viburnum* and *Jasminum;* and the ground cover is composed of various herbs and grass species. This type of three-storeyed forest is generally restricted to an altitude between 1500 and 3500 m.

The moist alpine shrubs - forest consists of several pure strands of *Betula* and *Rhododendron* species.

The alpine meadows are composed of numerous shrubs, *viz.*, *R. anthopogon, Juniper* and *Salix* species; herbs, *viz.*, *Aconitum, Cyanthus* and *Polygonum* species; and grasses, *viz.*, *Dantonia, Fostuca* and *Poa* species (Hazra, 1983; Hazra and Balodi, 1995).

The inhabitants of the villages in the biosphere use various plant resources as medicines, food, fodder, fuel, cultivated tool, house building, fibres, religious and other purposes. A total of 97 species are being utilized by local population. Out of these 17 species are used as medicines, 55 as food (edibles), 15 as fodder, 16 as fuel, 5 as cultivated tools, 8 in house building, 2 as fibres, 6 in miscellaneous uses and 11 for religious purposes (Samant, 1993).

State of Forest Cover : To illustrate the use of remote sensing technology for conservation areas, recently, Sahai and Kimothi (1994-95) have carried out a detailed study entitled *"Resources Survey of Nanda Devi Biosphere Reserve"*. The study has revealed that 66% of the NDBR is under snow/glaciers, 22.2% under forests, 6.6% under wastelands and 4.5% under grasslands/grazing lands, whereas the built-up and agricultural area account for only 0.7% of the biosphere. Mapping of forests, based on density and type, separately for the core and buffer zones indicate that dense forest (density >0.4 or 40% crown cover) constitute 95 percent of the forest area in the core zone where as they form only 40% of the forest area in the buffer zone.

Changes in vegetation cover in NDBR during 1981-91 decade have also been studied, which shows that the core zone has been well preserved. During the eighties even 12 sq km area under the open forst category (10-40% crown cover) has improved to the closed forest category (>40% crown cover). Apparently no biotic interference has taken place resulting in improvement in the vegetation cover. Equally satisfying and heartening is the improvement in the buffer zone. 28 sq km area under open forest category has changed to closed forest category comprising both the Himalayan/moist/dry temperate forests and moist alpine forests. Even 5 sq km of degraded forest (<10% crown cover) has transformed into open forest category. Since the buffer zone was brought under conservation programme only in this zone can be credited to the awareness created amongst local people by the *`Chipko Movement'* of 1973 which prevented any further felling of trees in the region (Sahai and Kimothi, 1994-95).

The forest cover map of the biosphere prepared by the Forest Survey of India, Dehra Dun, is annexed as Figure 3. This map is based on visual interpretation of landsat imagery for the period 1987-90. As per the present estimates 160.80 sq km (8.04%), out of 2000 sq km area of the reserve, is forested with varying composition such as Dense Forest (58.16 sq km or 2.90% with crown density above 40%), Open Forest (86.49 sq km or 4.32% with crown density 10 to 40%), and Scrub (16.15 sq km or 0.80%). The remainder, 1839.20 sq km or 91.96% (of the 2000 sq km), area being non-forest (including water bodies) (Fig. 3).

Accessibility : The major portion of the biosphere area remains under a thick carpet of snow during winter, and it is accessible only for a limited period, i.e., from late June to early October. The alpine meadows of the reserve emerge from underneath and attract the herbivora during accessible period.

To reach the biosphere from Delhi, one can follow the following routes, depending on the area of interest :

Malari area (Dist. Chamoli) : Delhi - Rishikesh - Joshimath - Malari.

Core Zone (Dist. Chamoli) : Delhi - Rishikesh - Joshimath - Reni - Lata on Malari road, then trekking on Nand Devi Trek (70 km from Lata road side to Nanda Devi base camp).

Roopkund Area (Dist. Chamoli) : Either from Rishikesh via Karanprayag - Tharali Debal - Bakarigarh and then trek (50 km upto Roopkund).

Or from Haldwani Almora - Gwaldham - Tharali - Debal - Bakarigarh and then trek (50 km upto Roopkund).

Pindari area (Dist. Almora) : Delhi - Almora - Bageshwar - Song and then trek (50 km upto the zero point of Pindari glacier).

Milam area (Dist. Pithoragarh) : Delhi - Haldwani - Pithoragarh/Tanakpur - Thal - Munsiyari and then trek (50 km upto Milam glacier).

Topography : As already stated, the biosphere is situated in highlands of Himalaya, western Uttar Pradesh, covering a wide range of altitudes varying from 1000m on its southern side to 7817m (Mt. Nanda Devi) on its central-eastern side and can broadly be divided into two zones, *viz* 'Core Zone' and 'Buffer Zone'.

Topographically, the core zone of the biosphere or the original Nanda Devi sanctuary (624.62 sq km), which was established in 1936, is demarcated by a high mountain range, offering ice-falls and corniced ridges to the outer world. Only in the northwest is there an easy access for a short period from late June to September. The Rishi Ganga is difficult to approach. The mountain rim, enclosing the core zone, is rather a cup-like structure and has on it a number of major peaks such as Dunagiri 7066m, Changbang 6864m, Kalanka 6931m, Nanda Devi east 7434m, Nanda Devi west 7817m or 25,645' - the second highest peak of the Himalayan range in Indian territory (from west to east) and Nandakhat 6631m, Devstan 6678m, Maiktoli 6805m, Mrigthuni 6655m, Trisul 7120m, and Bathartoli 6352m (from east to west). This cup like structure is a vast glacial basin segmented by a series of parallel mountain ridges, with a north-south trend in the north and a south-north trend in the south, emanating from the encircling mountain rumparts.

The surrounding valleys encompassing the core zone from all directions, form the topographical feature of the buffer zone and can be broadly divided, from the accessibility point of view, into the following :

a. Dhauli - Girthiganga valley (in Chamoli dist.), north-western part of the biosphere,

b. Roopkund or Neelganga valley (in Chamoli dist.), south and south-western part of the biosphere,

c. Pinder valley (in Almora dist.), south and south-eastern part of biosphere,

d. Milam valley (in Pithoragarh dist.), eastern part of the biosphere,

Out of these four accessible valleys of the buffer zone of the biosphere, all the four valleys were faunistically explored during the years 1989- 93.

Major Glacial and Stream systems : At least ten Glaciers are embraced by this biosphere. The majority (approx. 70%) of these Glaciers are situated in core zone, *viz.*, North Rishi Glacier (gl.), Changbang gl., Ramani gl. (in north), South Nanda Devi gl., South Rishi gl., Trisul gl., Betartoli gl., and Ronti gl. (in south) (all in district Chamoli in which lies the major portion of the biosphere). The remainder in the buffer zone, *viz.*, Milam gl. on the eastern side (dist. Pithoragarh), Pindari gl. on the south eastern side (dist. Almora), and Shail Samudra gl. above Roopkund on the south-western side (dist. Chamoli). The southern glaciers are more active than their northern counterparts,though, like all himalayan glaciers, they have also been retreating and their lower stretches are collapsed heaps of rubble and glacial debris with lateral morains forming high destructive ridges above the subsiding glaciers (Fig. 4; plate I, 2).

Trek and camp sites :

Trek 1. Nanda Devi Main trek : To Nanda Devi base camp or *Sarsopatal* in core zone of the biosphere.

It is a 70 km trek from Lata village road side to Sarsopatal. The altitudinal range covered on this trek varies from 2100m (7000') to 4200m (14,000') through 4500 (15,000') of Dharansi pass. The various camp sites along this trek are Lata village (the first camp or the last village on the trek), Belta-Kharak (2750m), Lata-Kharak (3700m), Dharansi (4150m), Dibrugheta (3350m), Deodi (3300m), Ramani (3500m), Bhujgara (3950m), Patal Khan or Tilchauni (4100m), and Sarsopatal (4200m).

Further various offshoots of the main trek lead to diffrent base camps of other major peaks in the areas like Tala base camp (4750m), Trisul base camp (4200m), and Common base camp (4750m), for Dunagiri, Changbang and Kalanka peaks.

Trek 2. Roopkund trek : To Roopkund area in SW part of the buffer zone of the biosphere.

A comparatively shorter (approx. 50km) and less hazarduous trek from the village Bakarigarh (1400m), to Roopkund (4400m) (Plate-I, 1), through various camps such as : Lohajung (2150m), Wan (2300m), Bedni Bugyal (3300m) and Bhagwabasa (4100) (Fig. 6, Plate-I, 5).

Trek 3. Pindari trek : To Pindari glacier in SE part of the buffer zone of the biosphere. It is a shorter trek (46km) from village Song (1100m), through Loharkhet (1750m), Dhakuri (2750m) (Plate-I, 4), Khati (2210m), Dwali (2754m) (Plate-I, 3 & 6), Phurkia (3260m), to zero point of Pindari glacier (3600m) (Fig. 5, Plate-I, 2).

Trek 4. Milam trek : To Milam glacier in eastern part of the buffer zone of the biosphere.

Again an approximately 50 km trek from Munsiyari village, through Lilam (1800m), Bugdiyar (2600m), Rilkote (3200m), to Milam glacier (4250m) (Fig. 10).

Areas surveyed : All these accessible areas, *viz.*, NW (Reni-Milari area), SE (Pindari area), SW (Roopkund area) and eastern Milam area forming parts of the buffer zone of the biosphere were faunistically explored between August and September during the years 1989, 1990, 1991, and 1993 respectively (Figure 2).

These areas abound a number of remote localities which are situated in high altitudes of the tortuous hilly terrain. To reach these localities, explore them faunistically and make the desired faunal collections is not an easy task as one might think at first. One has to undertake and complete daily hours of ardous trekking through rugged terrain which in itself is an exhausting exercise that too sometimes in very inhospitable climatic conditions. This requires an enormous amount of physical and mental endurance.

But for the toil and devotion of the survey parties members, despite all these limitations and difficulties, as many as 40 diffrent localities (11 in NW or Reni-Malari area, 11 in SE or Pindari area, 10 in SW or Roopkund area, and eight in eastern or Milam area of the biosphere) were surveyed faunistically by way of establishing eighteen camps (three in NW, five in SE, five in SW, and five in eastern part of the biosphere in the years 1989, 1990, 1991 and 1993 respectively (Figures 7 to 10) between 1500m and 4400m altitudes. This resulted into the collection of a total of over 5,000 examples of specimens belonging to 27 diffrent animal groups. The collections, thus made, were sorted and preserved alongwith proper labels right there in the field camps. The method of collection and the standard techniques of preservation varied as greatly as the number of animal groups to which these specimens belonged. Later, these collected materials were studied, in detail, by various experts. In addition, observations were also made for mammalian and avi-fauna of these areas. The result of which are also presented herewith.

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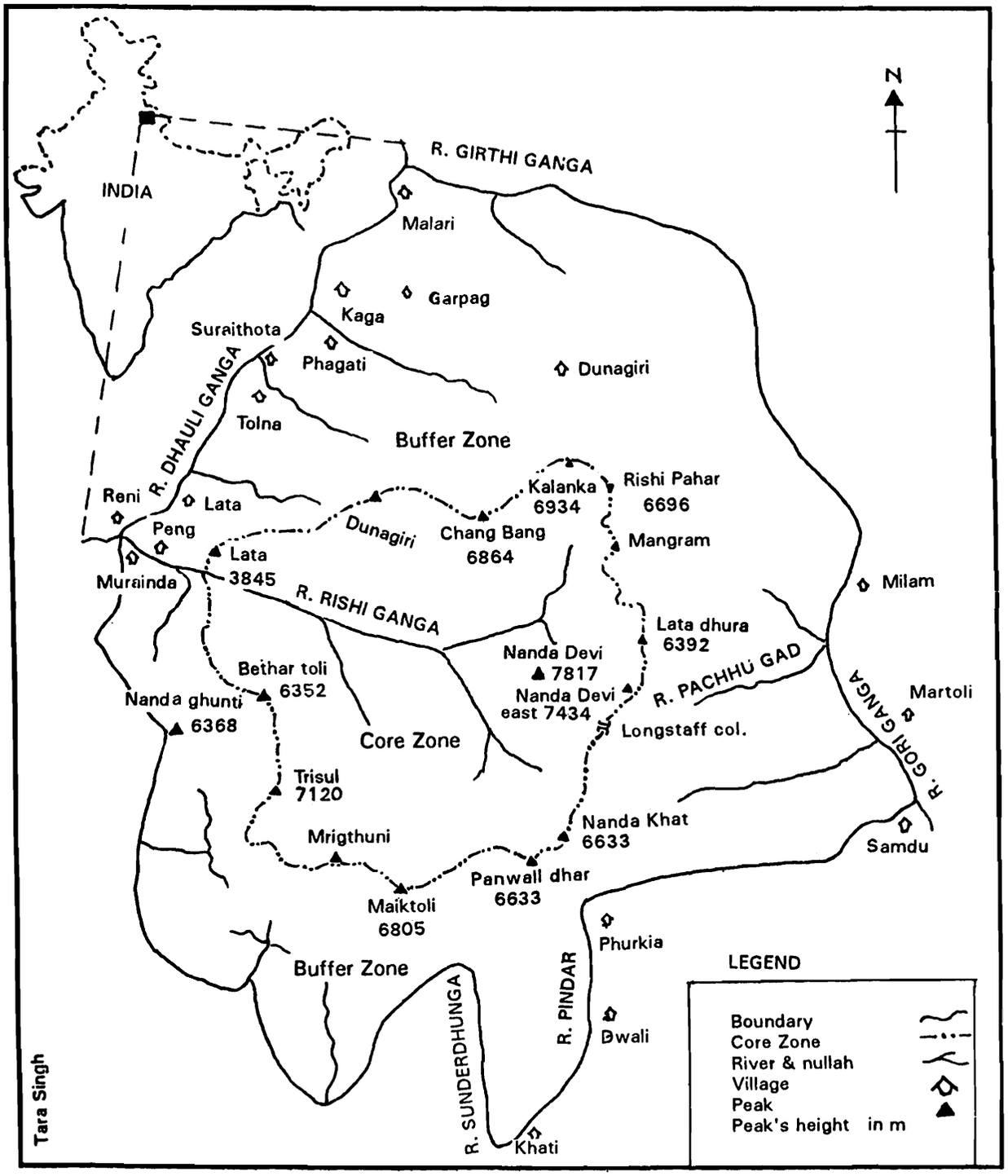


Fig. 1. Map of Nanda Devi Biosphere Reserve showing boundary, villages and peaks.
(Source : Director, NDBR).

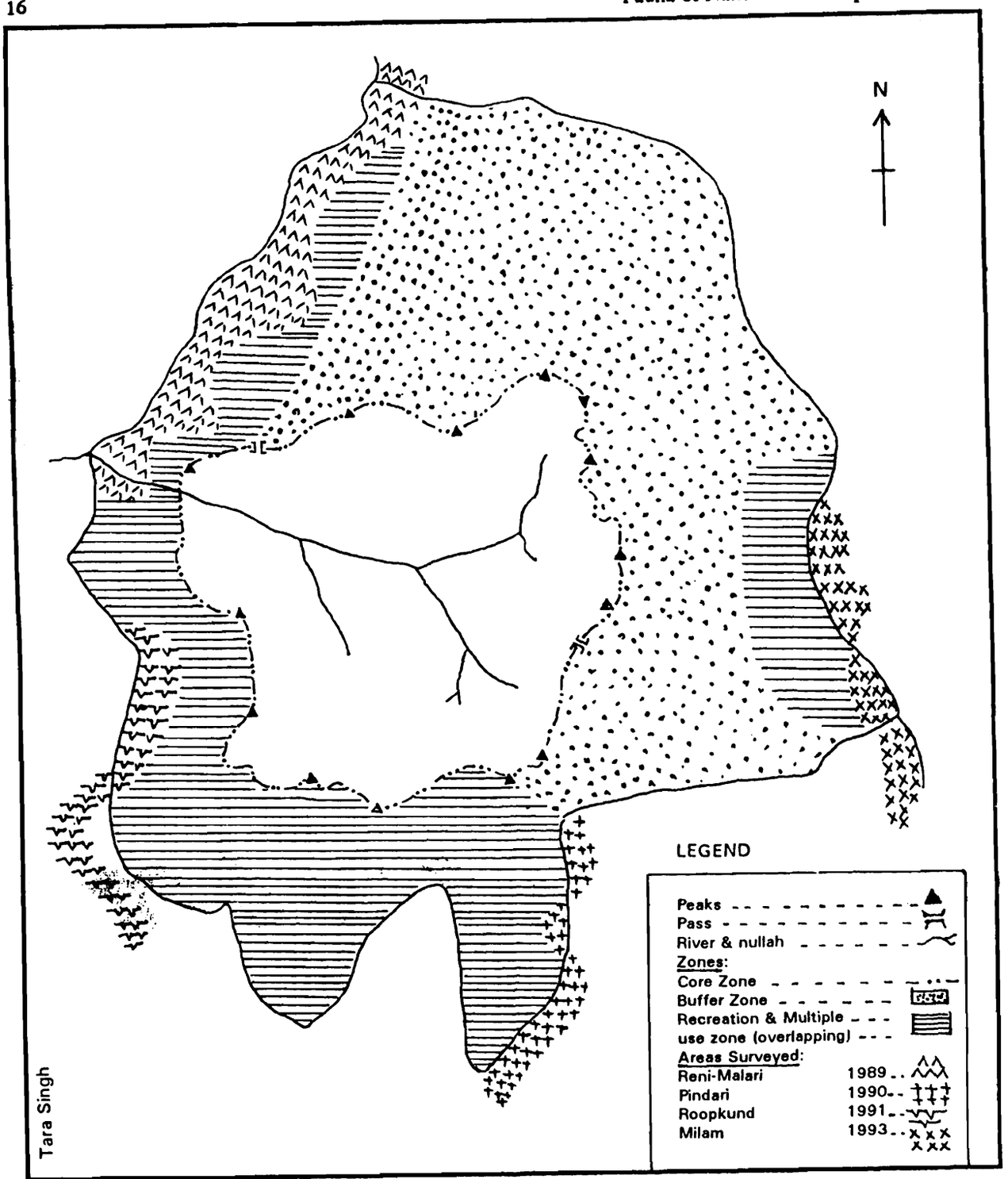


Fig. 2. Map of Nanda Devi Biosphere Reserve showing the areas surveyed.

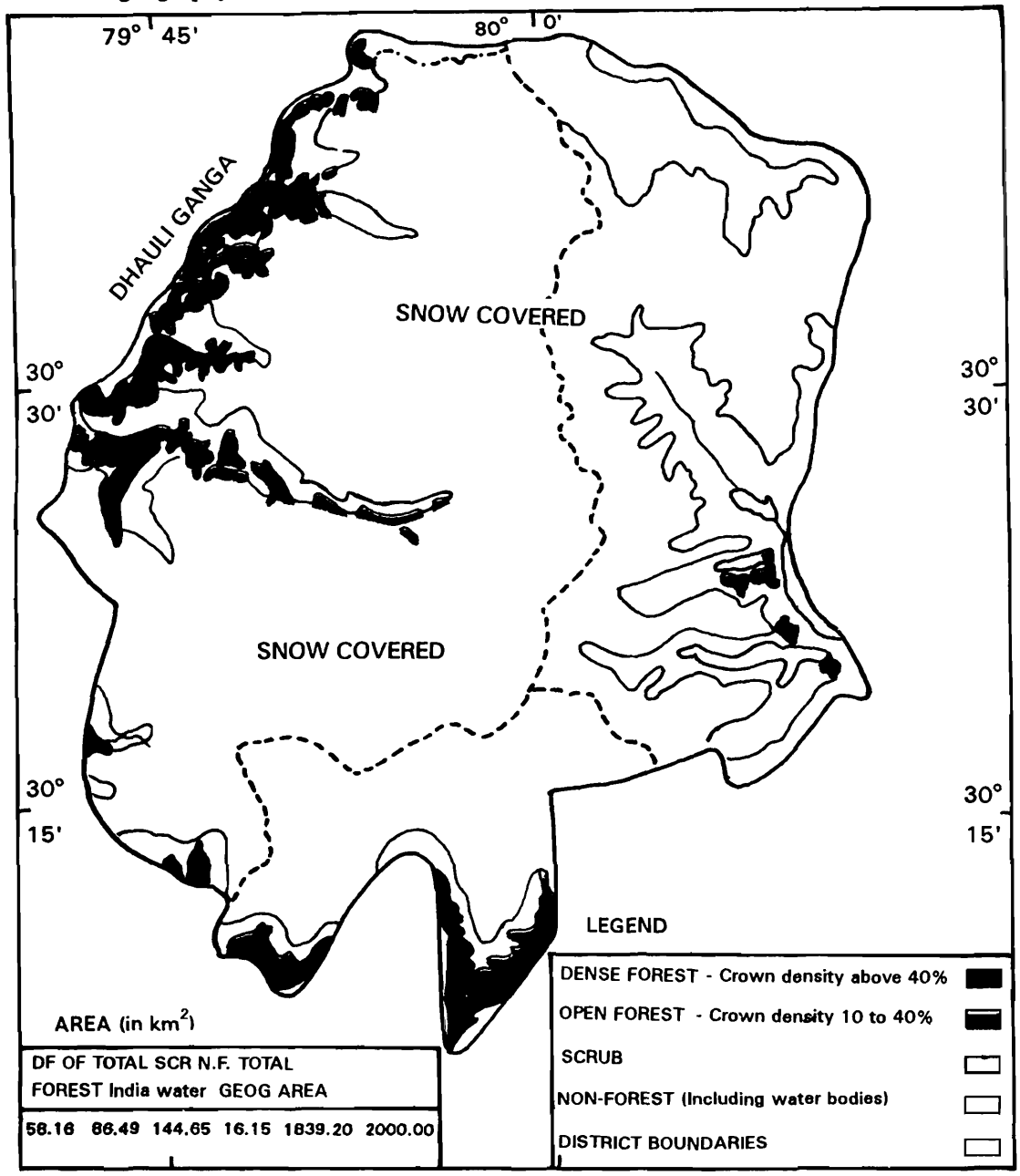


Fig. 3. Forest cover map of Nanda Devi Biosphere Reserve based on visual interpretation of landsat imagery (1987-90) (Source : Forest Survey of India, Dehra Dun).

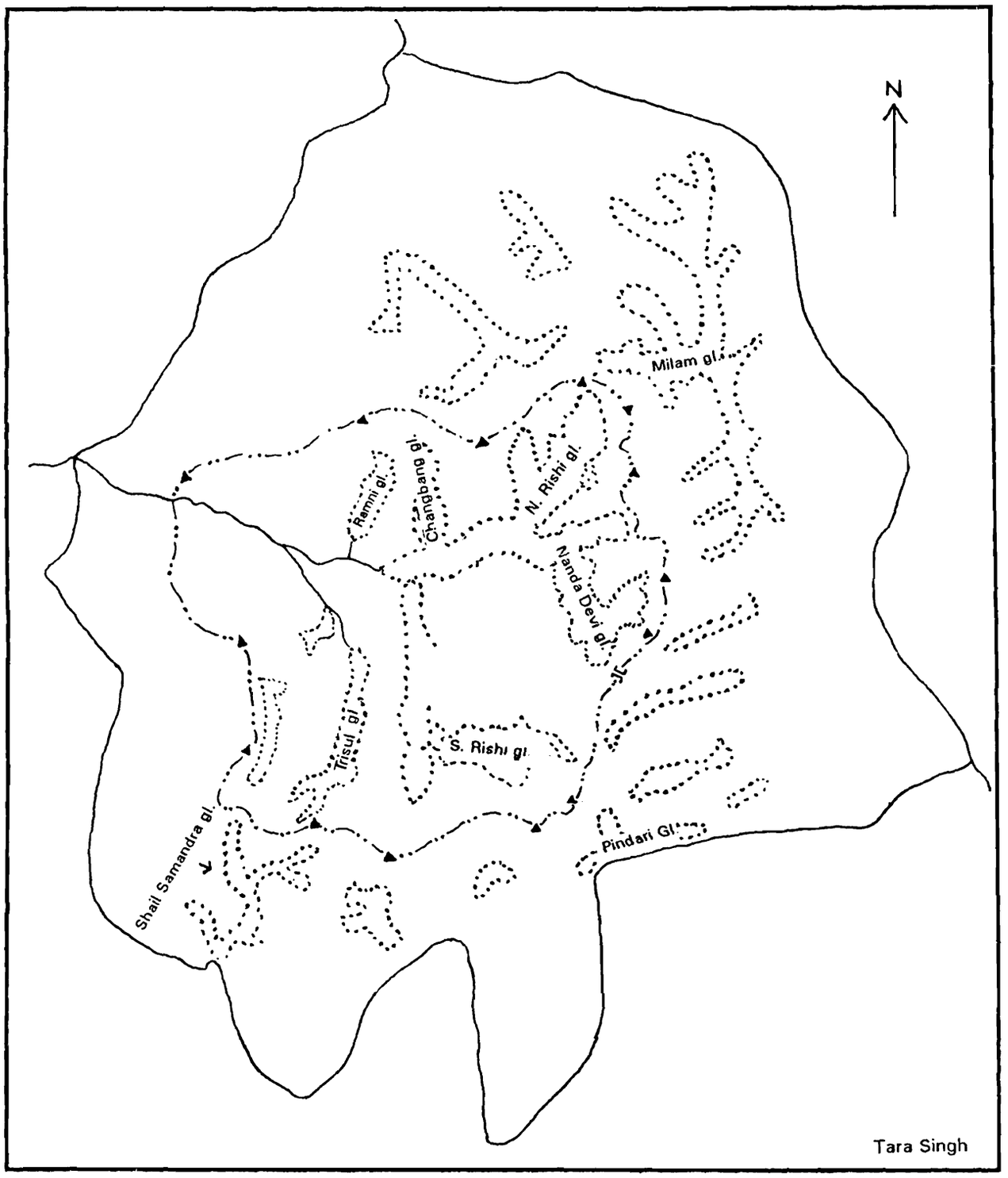


Fig. 4. Map of Nanda Devi Biosphere Reserve showing major glaciers.

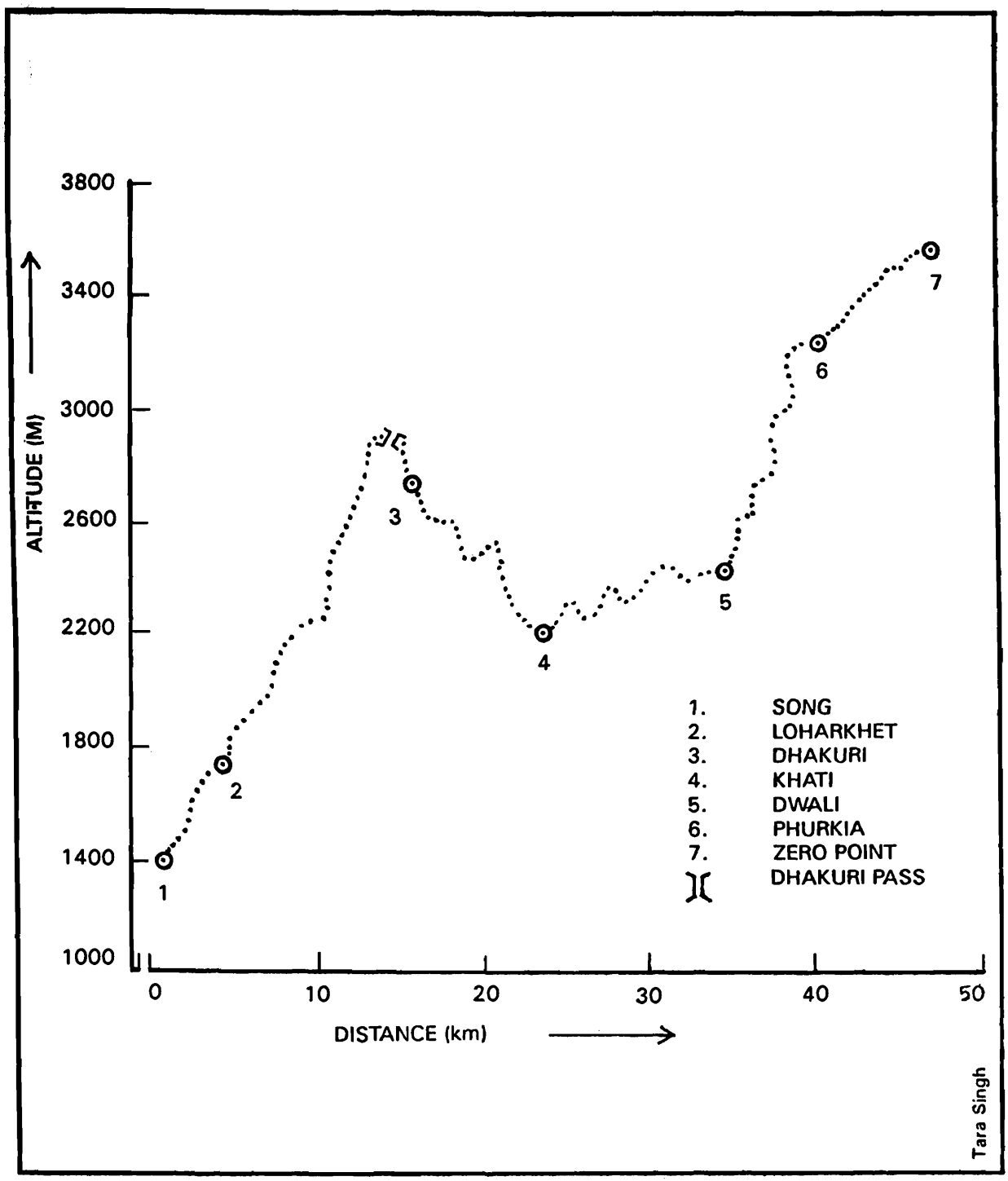


Fig. 5. Pindari Trek : A graphic representation.

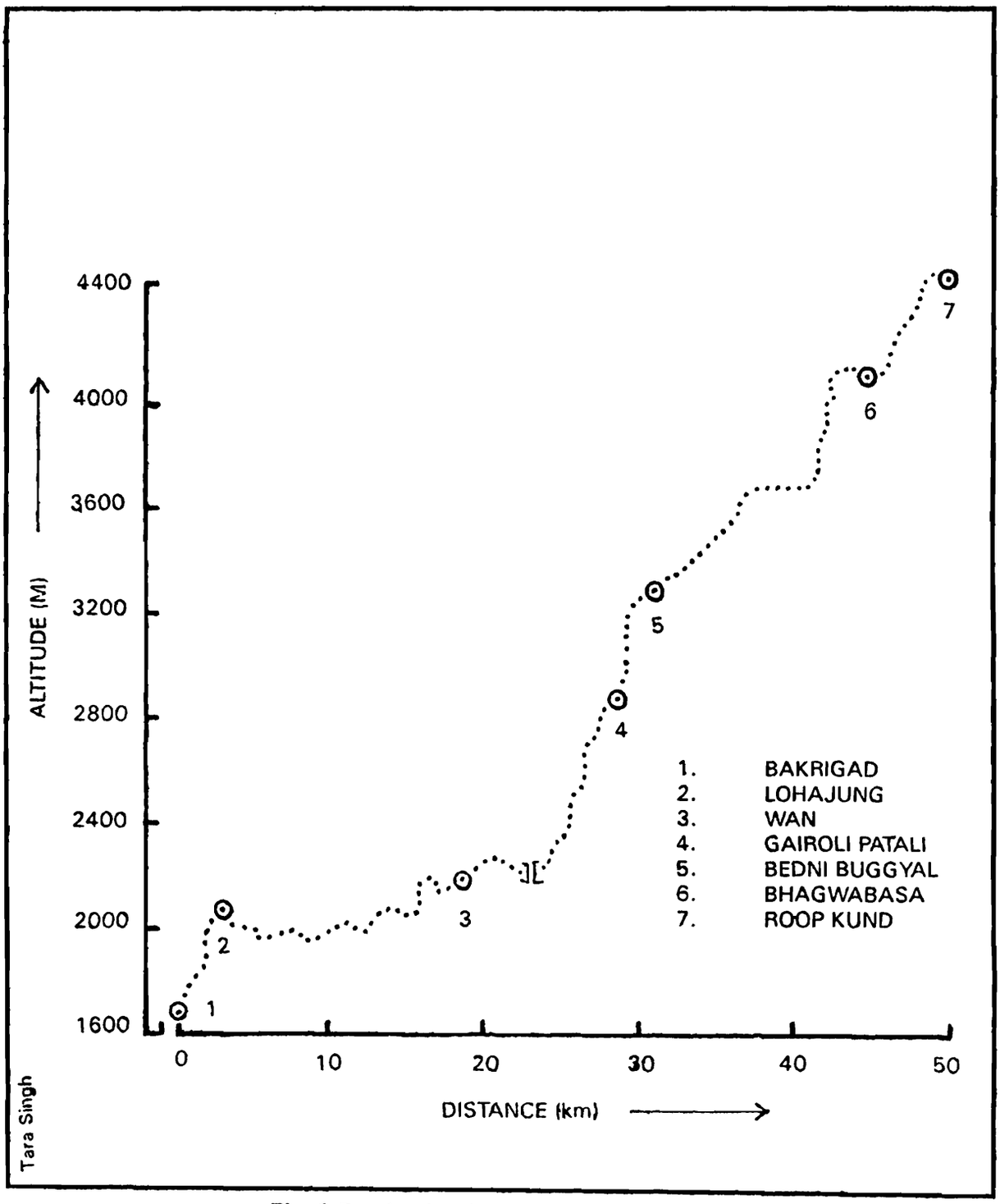
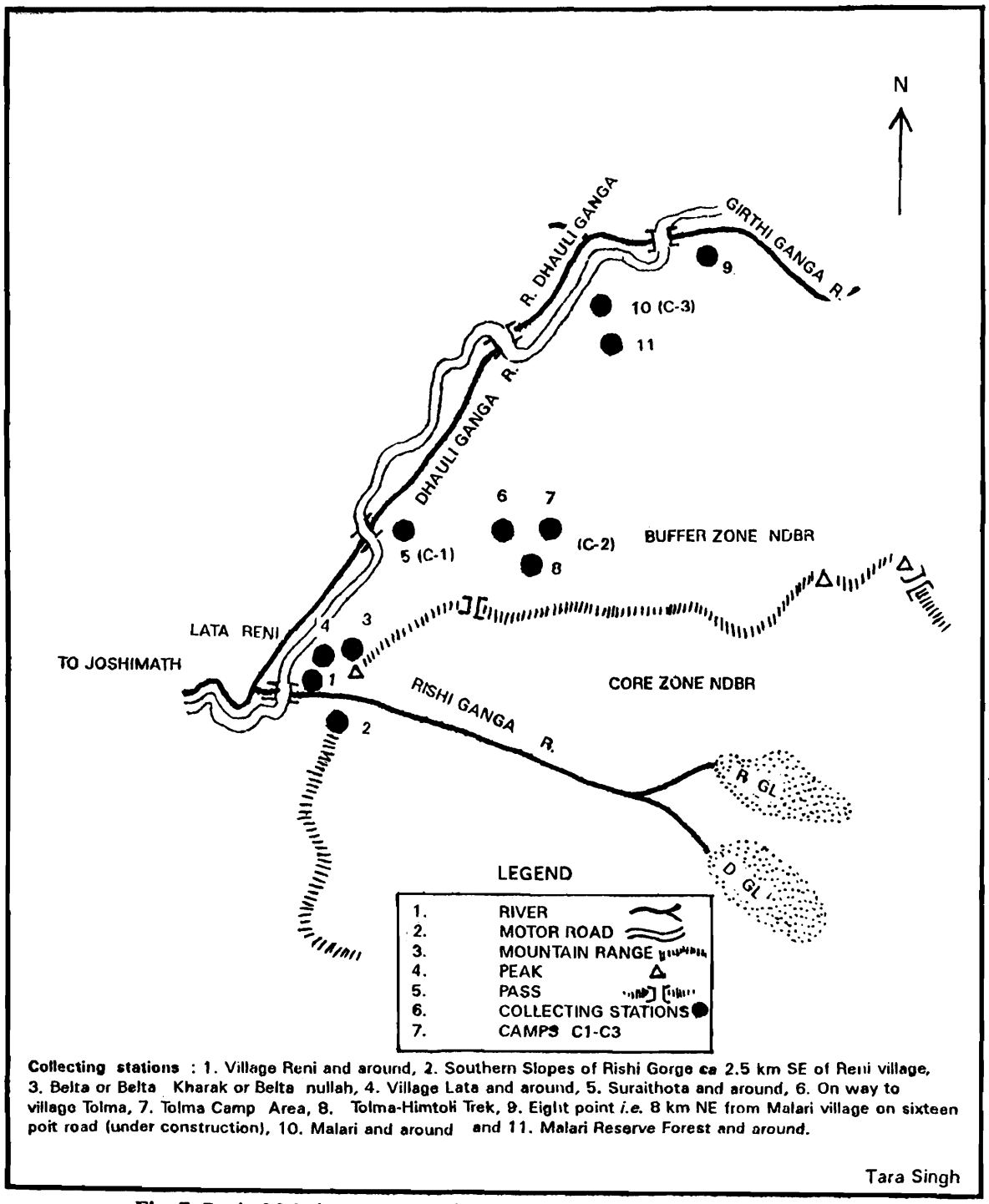


Fig. 6. Roopkund Trek : A graphic representation



Collecting stations : 1. Village Reni and around, 2. Southern Slopes of Rishi Gorge *ca* 2.5 km SE of Reni village, 3. Belta or Belta Kharak or Belta nullah, 4. Village Lata and around, 5. Suraithota and around, 6. On way to village Tolma, 7. Tolma Camp Area, 8. Tolma-Himtoli Trek, 9. Eight point *i.e.* 8 km NE from Malari village on sixteen poit road (under construction), 10. Malari and around and 11. Malari Reserve Forest and around.

Tara Singh

Fig. 7. Reni - Malari Area : Localities (1-11) surveyed during September, 1989.

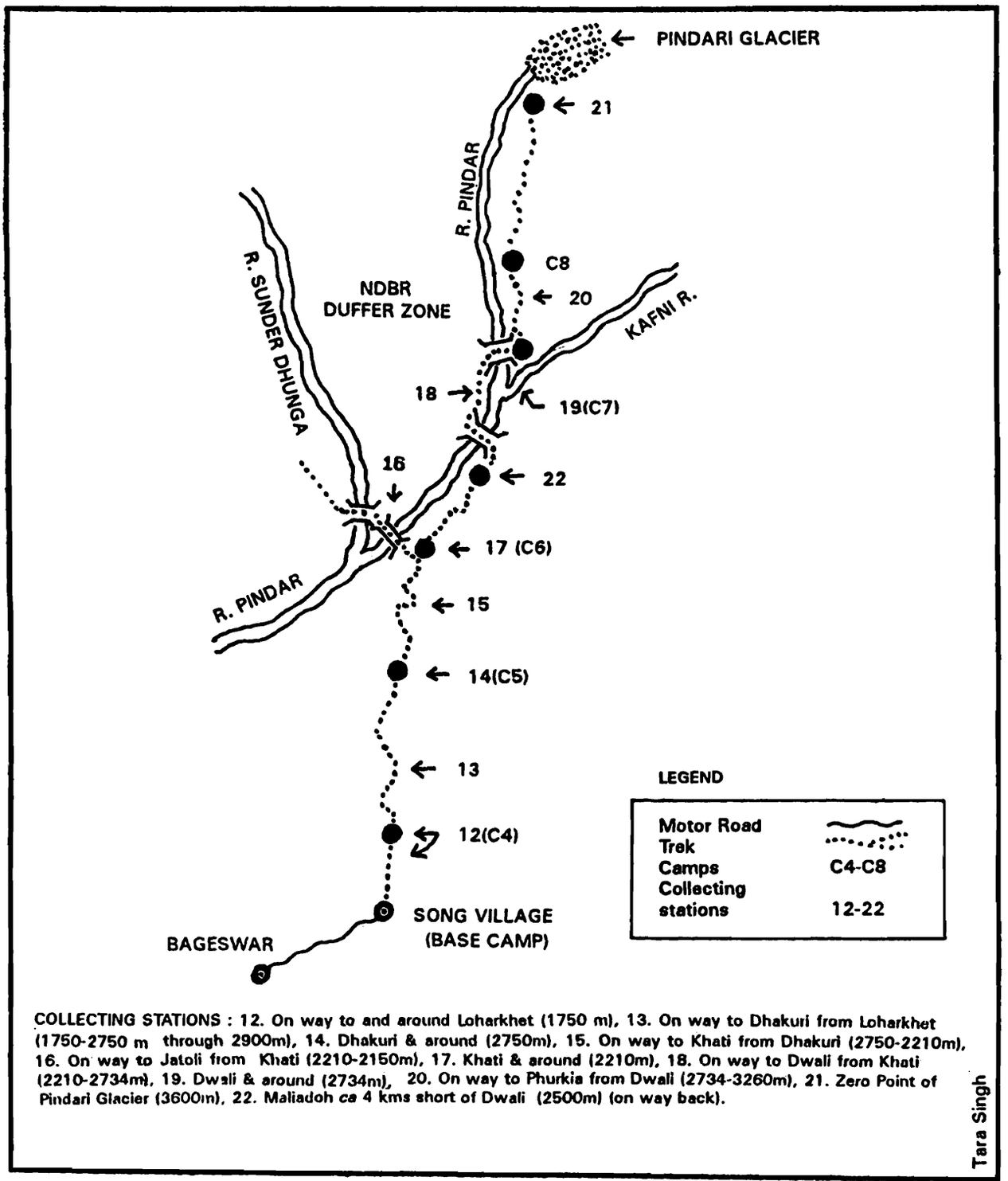
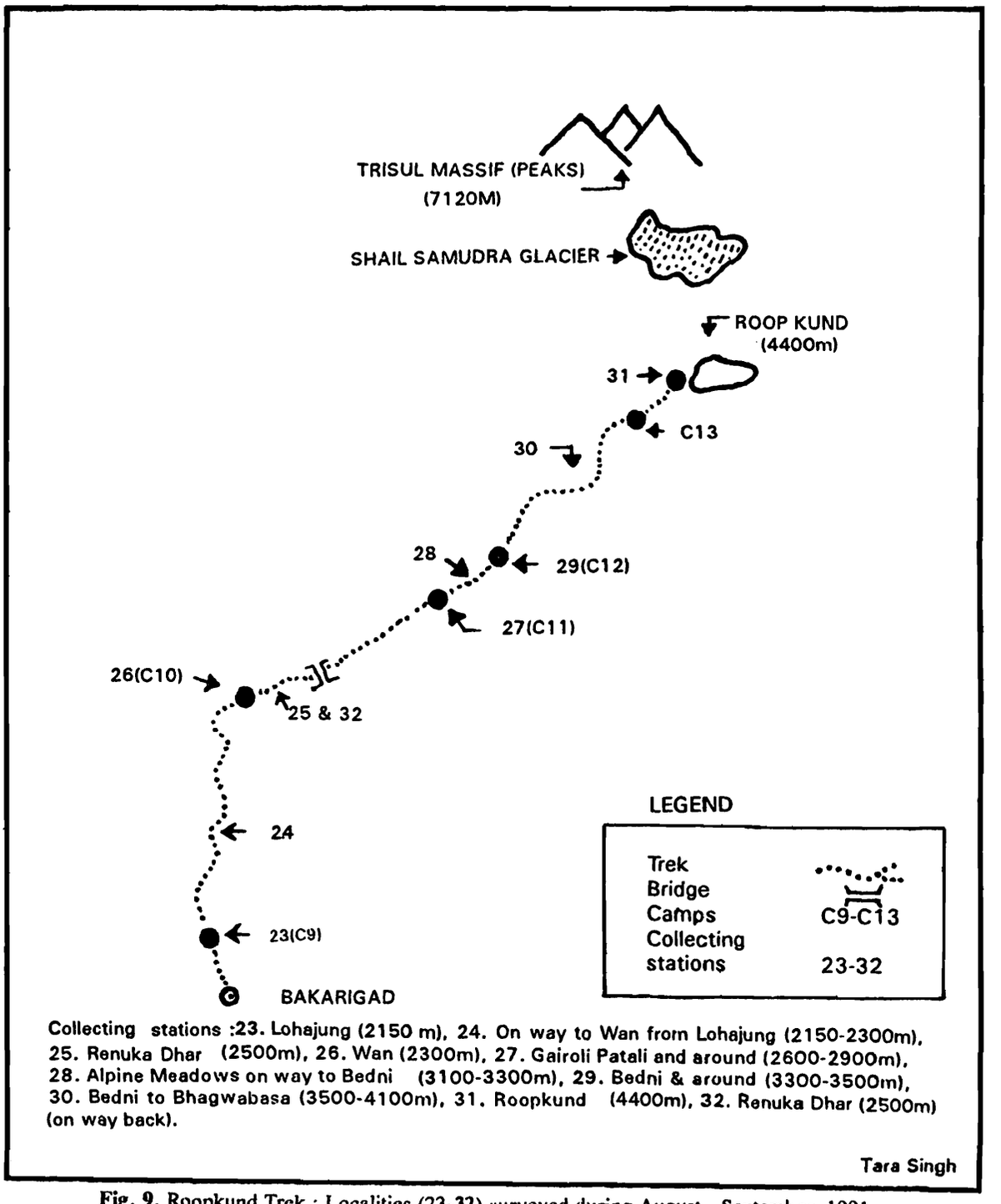


Fig. 8. Pindari Trek : Localities (12-22) surveyed during August-September, 1990.



Collecting stations :23. Lohajung (2150 m), 24. On way to Wan from Lohajung (2150-2300m), 25. Renuka Dhar (2500m), 26. Wan (2300m), 27. Gairoli Patali and around (2600-2900m), 28. Alpine Meadows on way to Bedni (3100-3300m), 29. Bedni & around (3300-3500m), 30. Bedni to Bhagwabasa (3500-4100m), 31. Roopkund (4400m), 32. Renuka Dhar (2500m) (on way back).

Tara Singh

Fig. 9. Roopkund Trek : Localities (23-32) surveyed during August - September, 1991.

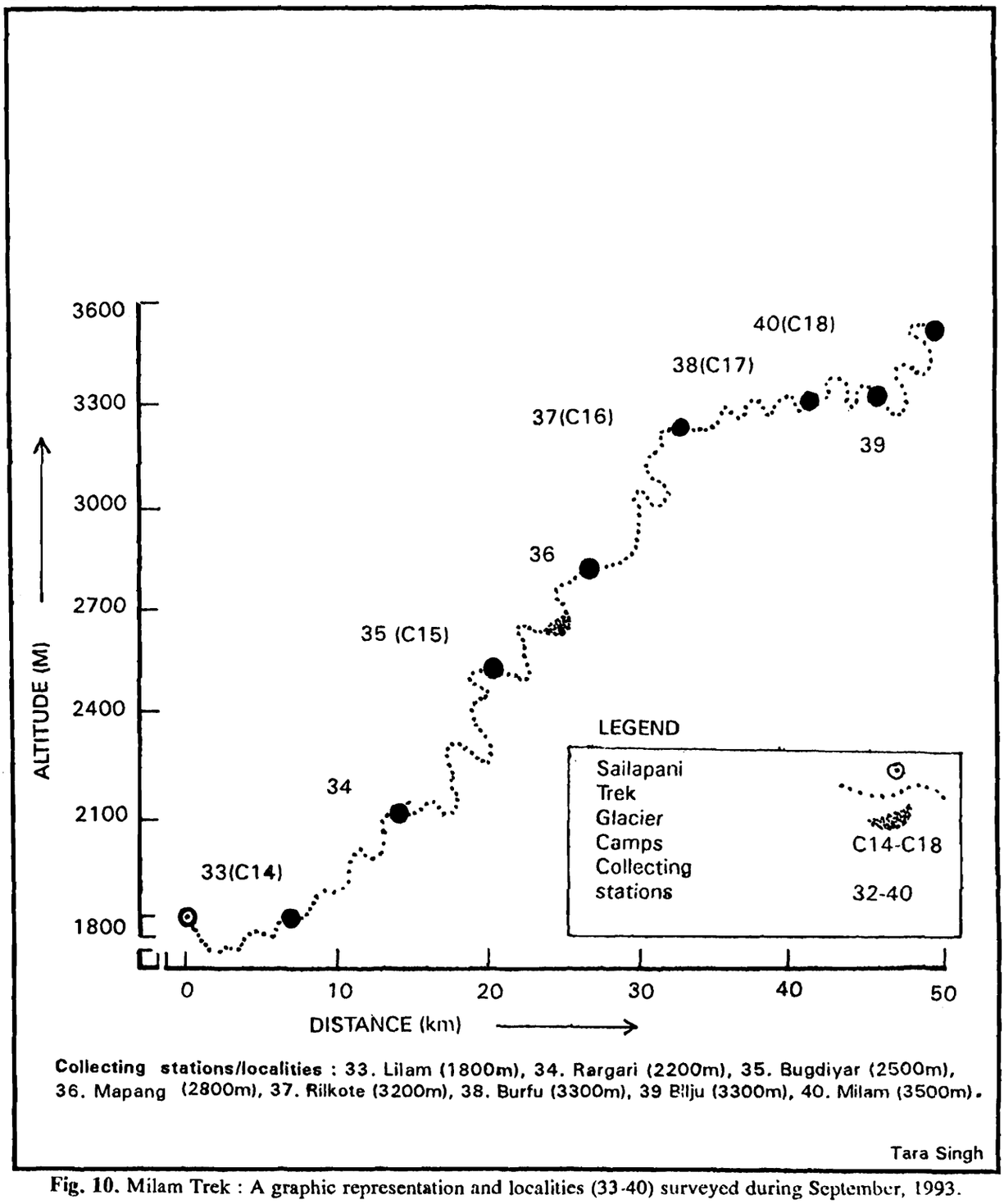


Fig. 10. Milam Trek : A graphic representation and localities (33-40) surveyed during September, 1993.

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MOLLUSCA

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INTRODUCTION

Earlier works on molluscs of western Himalaya include Theobald (1878), Hora (1928), Nevill (1878), Rajagopal & Subba Rao (1968, 1972), Subba Rao & Mitra (1995), etc. However,most of these dealt with species of Kashmir valley. The present report gives a list of species collected from the Nanda Devi Biosphere Reserve during the course of four surveys undertaken in the years 1989 to 1993.

A total of 14 species of molluscs under six genera were collected during these surveys in Nanda Devi Biosphere.

The species of freshwater molluscs are not significant in the sense that all the species collected have all India range of distribution. But among land forms all the species are restricted to the high altitude. The genus *Anadenus* of slug and also other genera like *Bensonia* and *Euaustenia* are Himalayan in their distribution. Though the genus *Ena* is well-distributed in India, the subgenus *Subzebrinus*, to which all the three species collected from Milam belong, is confined to the north-western region and is an immigrant from the Palaearctic region (Gude, 1914). *Ena nivicola* is recorded from 3500 m, and *Ena* is represented in Milam region only.

Region wise highest number of species were collected from Milam (6), Malari-Girthi (5), Pindari (4), and Roop Kund area (2).

SYSTEMATIC ACCOUNT

1. *Macrochlamys nuda* (Pfeiffer)

Material examined : India: U.P., Chamoli dist., southeren slopes of Rishi Gorge (2.5 km SE of Reni village), 2000-2200m, 1 ex., 6.ix.1989, coll. *P.C. Tak* & party.

Distrbution: India: Himachal Pradesh,Uttar Pradesh.

2. *M. indica* (Godwin-Austen)

Material examined : India: U.P., Chamoli dist., Belta Nallah (Kharak), 2700m, 4 exs., 7.ix.1989, coll. *P.C. Tak* & party.

Distribution : India: North-west region.

3. *M. tugurium* (Benson)

Material examined : India : U.P., Chamoli dist., Bedni-Bhagwabasa, 3500-4100, 1 ex., 9.ix.1991, coll. *P.C. Tak* & party.

Distribution : India: North-west region.

4. *Euaustenia monticola* (Pfeiffer)

Material examined : India : U.P., Chamoli dist., Belta Nallah, 2700m, 2 exs., 7.ix.1989; Tolma, 2438m, 2 exs., 12.ix.1989; on way to Tolma, 1828-2438 m, 2 exs., 11.ix.1989; Malari, Reserve Forest, 3290m, 9exs., 18.ix.1989, coll. *P.C. Tak* & party; Pithoragarh dist., Bilju, 3300m, 1 ex., 11.ix.1993, coll. *J.P. Sati* & party.

Distribution : India: North-west region.

5. *Euaustenia* sp.

Material examined : India : U.P., Almora dist., on way to Dhakuri, 1750-2900 m, 1 ex., 25.viii.1990; Chamoli dist., Wan, 2300m, 1 ex., 4.ix.1991, coll. *P.C. Tak* & party.

6. *Anadenus altivagus* (Theobald)

Material examined : India : U.P., Almora dist., on way to Jatoli, 2210-2150 m, 3 exs., 28.viii.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Mapang, 2800 m, 1 ex., 8.ix.1993, coll. *J.P Sati* & party.

Distribution : India : Kashmir, Himachal Pradesh, Uttar Pradesh.

7. *A.schiagintweiti* Heynemann

Material examined : India : U.P., Almora dist., Zero Point of Pindari Glacier, 3600m, 2 exs., 2.ix.1990, coll. *P.C. Tak* & party.

Distribution : India: Himachal Pradesh, Uttar Pradesh, Arunachal Pradesh, Sikkim.

8. *Anadenus* sp.

Material examined : India : U.P., Chamoli dist., Tolma camp area, 2438m, 1 ex. (Juvenile), 12.ix.1989, coll. *P.C. Tak* & party.

9. *Glessula* sp.

Material examined : India : U.P., Chamoli dist., Belta Nallah, 2700m, 1ex., 7.ix.1989, coll. *P.C. Tak* & party.

10. ***Bensonia jacquemonti*** (Von Mortens)

Material examined : India : U.P., Almora dist., on way to Dhakuri, 1750-2900m, 3 exs., 25. viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Punjab, Uttar Pradesh.

11. ***B. convexa*** (Benson)

Material examined : India : U.P., Pithoragarh dist., Bugdiyar, 2500m, 1 ex., 7.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Himachal Pradesh, Uttar Pradesh.

12. ***Ena (Subzebrinus) nivicola*** (Reeve)

Material examined : India : U.P., Pithoragarh dist., Rilkote, 3200m, 2 ex., 10.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : western Himalaya.

13. ***E. (S.) arcuatus*** (Kuester)

Material examined : India : U.P., Pithoragarh dist., Bugdiyar, 2500m, 1 ex., 7.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Kashmir, Himachal Pradesh, Uttar Pradesh.

14. ***E.(S.) mainwaringiana tumida*** Gude

Material examined : India : U.P., Pithoragarh dist., Bugdiyar, 2500m, 1 ex., 7.ix.1993, coll. *J.P.Sati* & party.

Distribution : India : western Himalaya.

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A FOSSIL AMMONITE

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Perisphintes (Aulacosphictes) tibetanus Uligh

Material examined : India : U.P., Chamoli dist., Girthi River Basin near Malari, 3100m, 17.ix.1989, coll. *P.C.Tak* & party.

Remarks : The above specimen (Plate I) resembles closely with the one described by Uligh (1910) and collected from Middle Spiti Shales around Laptal and Chidamu localities of Spiti. An Upper Jurassic age was assigned to it on the basis of ammonites fauna.

The present specimen is almost of the same size as the holotype with a strong biplicate ribbing pattern which are slightly deflected forward and only slightly curved and continuous across the external margin.

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Plate I

Perisphintes (Aulacosphictes) tibetanus **Uligh**

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ANNELIDA

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INTRODUCTION

44 species of earthworms and 20 species of leeches are known from the state of Uttar Pradesh through the extensive works of Bourne (1889), Michaelsen (1907), Stephenson (1914, 1923), Gates (1951), Soota (1970), Soota & Halder (1980), and Julka (1988) on earthworms and Harding & Moore (1927), Bhatt & Bhatia (1958), Bhatt (1960, 1961) and Bhatia & Bora (1973) on leeches. However, so far, there have been no reports of Annelids from NDBR though Julka (1995) recorded 42 species from adjoining eight districts of U.P. Himalaya.

The present report is based on the material collected from the Nanda Devi Biosphere Reserve by the Northern Regional Station, Zoological Survey of India, Dehra Dun. The material comprises five species of earthworms and one species of leech, all recorded for the first time from Nanda Devi Biosphere Reserve.

SYSTEMATIC ACCOUNT

Class OLIGOCHAETA
Order HAPOLOTAXIDA
Suborder LUMBRICINA
Superfamily LUMBRICOIDEA
I Family LUMBRICIDAE

1. *Dendrodrilus rubidus* (Savigny)

Material examined : India : U.P., Almora dist., Khati & around, 2210m, 2 exs., 29.viii.1990; Chamoli dist., Bedni & around, 3300m, 11 exs., 8.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh (Almora, Naini Tal and Uttarkashi disrtricts) present record Nanda Devi Biosphere Reserve (districts Chamoli & Almora), Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Sikkim, Tamil Nadu, West Bengal. *Elsewhere* : Widely distributed, cosmopolitan species.

Remarks : This is a peregrine species originated from Europe and is widely distributed in India and outside. It is recorded here for the first time from Chamoli district as well as from the Nanda Devi Biosphere Reserve.

2. ***Lumbricus eiseni*** Levinsen

Material examined : India : U.P., Almora dist., on way to Dhakuri, 1800-2900m, 3 exs., 25.viii.1990; Dhakuri, 2750m, 9 exs., 26.viii.1990; Dwali & around, 3200m, 2 exs., 31.viii.1990; Chamoli dist., Gairoli Patali, 2900m, 5 exs., 6.ix.1991; Alpine meadows on way to Bedni, 2900-3300m, 10 exs., 7.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh (Naini Tal, Almora, and Chamoli districts). First record from Nanda Devi Biosphere Reserve. *Elsewhere* : Widely distributed, cosmopolitan species.

Remarks : Original home of this peregrine species is Europe and is very rare in India. This species was so far known to occr in India from Naini Tal district. It is now recorded here for the first time from Chamoli and Almora districts as well as from Nanda Devi Biosphere Reserve.

Superfamily MEGASCOLECOIDEA
II Family MEGASCOLECIDAE

3. ***Perionyx nainianus*** (Michaelsen)

Material examined : India : U.P., Almora dist., Dhakuri, 750m, 21 exs., 26.viii.1990; Khati & around, 2210m, 1 ex., 29.viii.1990; Chamoli dist., Wan, 2300m, 24 exs., 4.ix.1991; Gairoli Patali & around, 2900m, 10 exs., 6.ix.1991; Alpine meadows on way to Bedni, 2600-2900m, 1 ex., 7.ix.1991; Bedni & around, 3300m, 3 exs., 8.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh (Naini Tal district). Presnt record from Nanda Devi Biosphere Reserve, Almora and Chamoli districts.

Remarks : This is a very rare endemic species so far known to occur in India from Naini Tal district. It is now recorded here for the first time from Almora and Chamoli districts as well as from Nanda Devi Biosphere Reserve.

4. ***Perionyx*** sp.

Material examined : India : U.P., Almora dist., on way to Dhakuri, 1800-2900m, 3 exs., 25.viii.1990; Dwali & around, 3200 m, 11 exs., 31.viii.1990, coll. *P.C. Tak* & party.

III Family OCTOCHAETIDAE

5. *Eutyphoeus ineommodus* (Beddard)

Material examined : India : U.P., Almora dist., on way to Dhakuri, 2900 m, 5 exs., 25.viii.1990; Dhakuri, 2750 m, 6 exs., 26.viii.1990; Chamoli dist., Gairoli Patali & around, 2900m, 1 ex., and 5 imm. exs., 6.ix.1991; Alpine meadows on way to Bedni, 2900-330m, 1 imm. ex., 7.ix.1991; Bedni, 3300m, 2 imm. exs., 8.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh (Agra, Allahabad, Bara Banki, Dehra Dun, Faizabad, Gorakhpur, Haridwar, Jaunpur, Jhansi, Lucknow, Mirzapur, Pratapgarh, Rai Bareli, Saharanpur, Sonbhadra, Sultanpur, Varanasi districts). Present record from Nanda Devi Biosphere Reserve, Chamoli and Almora districts; Bihar; Chandigarh; Himachal Pradesh; Haryana; Jammu & Kashmir; Madhya Pradesh; Punjab; Rajasthan; West Bengal. *Elsewhere* : Pakistan.

Remarks : This is an endemic species widely distributed in India. It is recorded here for the first time from Almora and Chamoli districts as well as from Nanda Devi Biosphere Reserve.

Class CLITELLATA

Order HIRUDINEA

Suborder ARHYNCHOBDELLAE

IV Family HIRUDIDAE

6. *Haemadipsa zeylanica agilis* Moore

Material examined : India : U.P., Almora dist., on way to Dhakuri, 1800-2900m, 2 exs., 25.viii.1990; Khati, 2210m, 4 exs., 29.viii.1990; Malia Doh, 2500m, 3 exs., 4.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh (Almora district, present record Nanda Devi Biosphere Reserve); Andaman Islands; Arunachal Pradesh; Himachal Pradesh. *Elsewhere* : Nepal.

Remarks : It is a common land leech of eastern and western Himalaya, recorded for the first time from the Nanda Devi Biosphere Reserve.

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ARACHNIDA : ARANEAE

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INTRODUCTION

Spiders form an important component of the biodiversity in a tropical country like India. They are wide spread and found in almost all type of habitats, from underground caves to the nival zone of the Himalaya. They may be found under the bark, stones and fallen logs besides being on various kinds of vegetations.

Recently Araneae have been used as base source for many homeopathic as well as allopathic medicines; the spider venom is being used in many medicines.

A total of 1015 species belonging to 236 genera under 44 families are so far known from the Indian subcontinent. Biswas and Gajbe (1991) have recently chronicled all the available studies on Indian Aranea.

The present comunication lists 17 species belonging to seven families.

SYSTEMATIC ACCOUNT

1. Family OXYOPIDAE

1. *Oxyopes shewta Tikader*

Material examined : India : U.P., Chamoli dist., Alpine meadows on way to Bedni, 2900-3300m, 1 ♀, 7.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : U.P. : Garhwal.

2. Family THERAPHOSIDAE

2. *Pleciophrictus meghalayaensis* Tikader

Material examined : India: U.P., Chamoli dist., Wan, 2300 m, 1♂, 4.ix.1991, coll. *P.C. Tak* & party.

Distribution : India: U.P. : Garhwal.

3. Family ARANEIDAE

3. *Neoscona theis* (Walckenaer)

Material examined : India: U.P., Chamoli dist., Tolma-Himtoli Trek, 2800m, 1 ♀, 13.ix.1989, coll. *P.C. Tak* & party.

Distribution : India: U.P., Garhwal, Maharasthra, Orissa, Gujrat, W. Bengal. *Elsewhere :* South New Guinea.

4. *Neoscona nautica* (Koch)

Material examined : India: U.P., Chamoli dist., village Reni, 2000m, 1 ♀, 5.ix.1989, coll. *P.C. Tak* & party.

Distribution : India: U.P., Garhwal, Maharasthra, W. Bengal, Gujrat, Meghalaya. *Elsewhere:* Pakistan; N. America.

4. Family LYCOSIDAE

5. *Paradosa chambaensis* Tikader & Malhotra

Material examined : India: U.P., Chamoli dist., Bedni and around, 3300-3500m, 3♀. 8.ix.1991; Malari Reserve Forest, 3190m, 1 ♀, 18.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : H.P., Chamba (Banikhet), U.P., Chamoli.

6. *Paradosa alii* Tikader

Material examined : India: U.P., Chamoli dist., Malari Reserve Forest, 3190m, 1♀, 18.ix.1989, coll. *P.C. Tak* & party.

Distribution : India: J & K, Ladakh, Chusul *ca.* 4328 m, U.P., Chamoli, NDBR.

Remarks : Tikader & Malhotra (1980) have recorded it from its type locality, e.g., Chusul *ca.* 4328 m, Ladakh. The present record extends its distribution eastward into Himalaya.

7. ***Paradosa annandalei*** (Gravely)

Material examined : India: U.P., Chamoli dist., Bedni & around, 3300-3500 m, 1 ♀, 8.ix.1991, coll. *P.C. Tak* & party.

Distribution : India: U.P., Bihar, W. Bengal, M.P., Maharashtra, Tamil Nadu, Kerala, Gujrat, Assam and Karnataka. *Elsewhere :* Bangla Desh; Myanmar; Pakistan.

8. ***Paradosa sorgosa*** Tikader & Malhotra

Material examined : India: U.P., Chamoli dist., Malari Reserve Forest, 3190 m, 1 ♂, 18.ix.1989, coll. *P.C. Tak* & party.

Distribution : India: U.P.

9. ***Paradosa birmanica*** Simon

Material examined : India: U.P., Chamoli dist., 8 kms. from Malari on 16 point Rd., 3000-3500 m, 3 ♀♀, 16.ix.1989, coll. *P.C. Tak* & party.

Distribution : India: U.P. H.P., M.P., Orissa, Maharashtra, Gujrat, Punjab, W. Bengal, Meghalaya, Bihar, Tamil Nadu, Andhra Pradesh.*Elsewhere :* Myanmar; Pakistan.

10. ***Lycosa chaperi*** Simon

Material examined : India: U.P., Chamoli dist., Malari Reserve Forest, 3190 m, 1 ♀, 18.ix.1989, coll. *P.C. Tak* & party.

Distribution : India: Punjab, Chandigarh, Andhra Pradesh, U.P.

11. ***Lycosa masteri*** Pocock

Material examined : India: U.P., Chamoli dist., Malari Reserve Forest, 3190 m, 3 ♀♀, 18.ix.1989, coll. *P.C. Tak* & party.

Distribution : India: Maharashtra, U.P. (NDBR).

Remarks : So far the species was known from its type locality in dist. Satara (Maharashtra) (Tikader & Malhotra, 1980). The present record from an altitude of 3190 m is very interesting from its distributional point of view.

5. Family GNAPHOSIDAE

12. ***Zelotes nainitalensis*** Tikader & Gajbe

Material examined : India: U.P., Chamoli dist., Malari Reserve Forest, 3190 m, 4 ♀♀, 18.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : U.P., so far known only from type locality in Naini Tal district.

6. Family HETEROPODIDAE

13. ***Heteropoda phasma*** Simon

Material examined : India: U.P., Almora dist., Dhakuri, 2750 m, 1 ♀, 26.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : U.P.

14. ***Heteropoda sexpunctata*** Simon

Material examined : India: U.P., Chamoli dist., Gairoli Patali and around, 2900 m, 1 ♀, 6.ix.1991; Almora dist., Dhakuri, 2750 m, 1 ♀, 26.viii.1990, coll.*P.C. Tak* & party.

Distribution : India : U.P.

15. ***Olios obesulus*** (Pocock)

Material examined : India: U.P., Almora dist., Dhakuri, 2750 m, 1 ♀, 26.viii.1990, coll.*P.C. Tak* & party.

Distribution : India : U.P.

7. Family CLUBIONIDAE

16. ***Cheiracanthium insigna*** Cambridge

Material examined : India: U.P., Chamoli dist., Bedni and around, 3300-3500 m, 1 ♂, 8.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : U.P.

17. ***Cheiracanthium trivittatum*** Simon

Material examined : India: U.P., Chamoli dist., Tolma-Himtoli Trek, 2800 m, 1 ♀, 12.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : U.P.

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THYSANURA

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INTRODUCTION

The thysanurans are popularly called "Silverfish" and "Bristle-tail". These insects are permanently wingless. Generally these insects have very long many segmented antennae, cerci and median tail. Most species are heavily clothed with scales. The free living forms are found in the forest floor, under bark of trees, under rocks, etc. The order is divided into two suborders. The suborder Microcoryphia has one super family Machiloidea, which consists of two families.

The present study is based on only three examples collected from NDBR area. The area is highly potential habitat for this group of insects, particularly Machiloidea. More surveys are required from this area and we can expect many more taxa under this family.

SYSTEMATIC ACCOUNT

Suborder MICROCORYPHIA

Superfamily MACHILOIDEA

1. Family MEINERTELLIDAE

Subfamily MEINERTELLINAE

1. *Machilanus schmidi* Wygodzinsky

Material examined : India : U.P., Chamoli dist., Bedni and around, 3500-3700m, 1 ♂, 2 ♀♀, 8.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh (Kumaon hills,NDBR).

Remarks : The type locality of the species is Kumaon hills of Uttar Pradesh.

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COLLEMBOLA

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INTRODUCTION

The collembolans are popularly known as "Springtails". These insects are small and permanently apterous. Their distributional range is very wide, occurring in all parts of the world and are found in any atmospheric hibitat. They can tolerate extreme adverse environmental conditions and the collembolans are the only insects which were recorded at 83 degree south latitude in Antarctica, from where no other animal life has been recorded. Many species of collembola are established as bio-indicators of soil pollution as well as soil fertility. The order is divided into two suborders Arthropleona and Symphypleona.

The present study is based on only two examples received from NDBR. It is expected to have many more interesting species of Collembola from this unique habitat.

SYSTEMATIC ACCOUNT

Suborde ARTHROPLEONA
Superfamily ENTOMOBRYOIDEA
1. Family ENTOMOBRYIDAE
Subfamily PARONELLINAE

1. *Dicranocentroides fasciculatus* Imms

Material examined : India : U.P., Almora dist., Zeropoint of Pindari Glacier, 3600m, 1 ex., 2.ix.1990, coll *P.C. Tak* & party.

Distrubution : India : Uttar Pradesh (Kumaon, Pauri Garhwal dist., Dehra Dun dist., NDBR).

Remarks : The type locality of the species is Kumaon.

2. *Salina montana* (Imms)

Material examined : India : U.P., Almora dist., Zeropoint of Pindari Glacier, 3600m, 1 ex., 2.ix.1990, coll.*P.C.Tak* & party.

Distribution : India : West Bengal, Uttar Pradesh (Pauri Garhwal, Tehri Garhwal, NDBR).

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ODONATA

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INTRODUCTION

The odonata fauna of the Himalayan ecosystem has been extensively studied by Kumar & Prasad (1981). Consequently about 240 species, out of a total of 550 known Indian forms, have been recorded from Himalaya, which include a number of new species and new records subsequent to the publication of *Fauna of British India : Odonata (1-3)* (Fraser, 1933-36).

The above studies (Kumar, 1995) though cover districts Chamoli, Almora and Pithoragarh, there is no known record of dragonflies from the biosphere; the present paper records only six species of odonate from the biosphere, all of which are first records from the area. It is expected to have many more interesting species of dragonflies from this unique habitat.

SYSTEMATIC ACCOUNT

Suborder ZYOGPTERA

1. Family PLATYCNEMIDIDAE

1. *Calicnemia eximia* (Selys)

Material examined : India: U.P., Chamoli dist., on way to Wan from Lohajung, 2150-2300m, 1 ♂, 2.ix.1991, coll. *P.C. Tak* and party; Pithoragarh dist., Lilam, 1800 m, 3 ♂♂, 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India: N. western, western, central and eastern Himalaya. Lieftinck (1984) has recorded 2 ♂♂ from Kapkot and Loharkhet (Dist. Almora, Kumaon hills), 26.ix.1973 (2♂♂), V.K. Gupta *et al.* an area which is adjacent to NDBR. In addition the species has been recorded from Kashmir, Himachal Pradesh (Dist. Kinnaur, Sutlej Basin, Sholtu, 2400m,), Dehra Dun Valley in Uttar Pradesh, and from Darjeeling district (W. Bengal), Khasi hills (Meghalaya) and Sikkim. *Elsewhere* :Nepal (Kathmandu valley).

2. *Calicnemia miles* Laidlaw

Material examined : India : U.P., Pithoragarh dist., Lilam, 1800m, 2 ♂♂, 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India: widely distributed in Garhwal Hills, namely dists. Chamoli, Dehra Dun, Pauri, Tehri and Uttarkashi.

3. *Calicnemia pulverulans* Selys

Material examined : India : U.P. Pithoragarh dist., Lilam, 1800m, 1 ♂, 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : A rare species as compared to *C.eximia* and *C.miles.* Restricted in distribution but has been found to occur in dists. Almora, Tehri and Uttarkashi in western Himalaya.

2 Family SYNLESTIDAE

4. *Megalestes major* Selys

Material examined : India: U.P., Chamoli dist., on way to Wan from Lohajung, 2150-2300 m, 1 ♂, 2.ix.1991; Almora dist., on way to Dhakuri from Loharkhet, 1750-2900m, 1 ♀, 25.viii.1990, coll. *P.C. Tak* & party.

Distribution : India: widely distributed species in Himalaya generally between the altitude of 1000 to 2500 m. However, number of individuals are rare in field and generally restrict themselves amidst dry vegetation along small brooks in shady places. The species has been recorded from Himachal Pradesh (Dist. Kulu, Solan and Sirmaur), U.P. (Dists. Almora Chamoli, Dehra Dun and Naini Tal), Meghalaya and Sikkim.

Suborder ANISOPTERA

3. Family AESHNIDAE

5. *Cephalaeschna orbifrons* Selys

Material examined : India: U.P., Almora dist., on way to Dwali from Khati, 2210-2734m, 1 ♂, 30. viii. 1990, coll. *P.C. Tak* & party.

Remarks : Kumar & Prasad (1981) recorded *C. orbifrons* from Simla Hills (H.P.) within

western Himalaya. The present listing of the species from NDBR is the first record from Garhwal hills.

4. Family CORDULEGASTERIDAE

6. *Cordulegaster brevistigma brevistigma* (Selys)

Material examined : India : U.P., Chamoli dist., Belta Kharak, 2700m, 3 ♂♂, 9.ix.1989, coll. *P.C. Tak* & party.

Distribution : The species is fairly distributed from Kashmir to Garhwal hills. The imagos however are not commonly observed in field and generally remain restricted around small brooks between the altitude of 1000 to 2500 m, Kumar (1973) described its larva which was collected from a slow running stream with muddy substratum and plenty of aquatic vegetation.

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ORTHOPTERA

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INTRODUCTION

Orthoptera generally feed on all types of vegetation and include some of the most ancient and widely destructive locust, as well as other plant and domestic pests. The number of known species in the world probably approaches a total of 20,000 of which nearly 900 species are found in India. The representatives of the group are distributed world-wide, but most of them occur in warmer regions. The number of species and individuals fall off sharply at higher altitudes.

Orthoptera of western Himalayan region, specially of Dehra Dun, Almora, Chamoli, Tehri, Pauri, Naini Tal, Pithoragarh and Uttarkashi are discussed by Tandon & Shishodia (1995). They have compiled the recorded fauna of the region and calculated approximately 100 species. The orthopteran fauna of NDBR has not been dealt by other workers uptil now. The present paper reports 14 species. Of these *Gastrimargus africanus africanus*, *Trilophidia annulata* and *Paraconophyma scabra* have been recorded earlier from Chamoli district, which partly falls under NDBR. *Anaptygus rectus* is recorded here after more than fifty years, with both male and female examples.

This study is based on the collections received from the Northern Regional Station, Zoological Survey of India, Dehra Dun. It is hoped that there are more species in the area, yet to be collectd and reported.

SYSTEMATIC ACCOUNT

Order ORTHOPTERA

1. Family ACRIDIDAE

Subfamily ACRIDINAE

1. *Anaptygus rectus* Ragge

Material examined : India : U.P., Almora dist., Zeropoint of Pindari Glacier, 3600 m,

3 ♂♂, 11 ♀♀, 2.ix.1990; around Dwali, 2734 m, 1 ♀, 31.ix.1990, Chamoli dist., Bedni and around, 3500 m, 4 ♂♂, 5 ♀♀, 8.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh (Tehri-Garhwal, 4,000-5,000 m).

Subfamily GOMPHOCERINAE

2. ***Chorthippus almoranus*** Uvarov

Material examined : India : U.P., Pithoragarh dist., Milam area, 3500 m, 1 ♂, 11.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Uttar Pradesh (Almora, Kumaon hills).

3. ***Chorthippus*** sp.

Material examined : India : U.P., Chamoli dist., southern slope at village Reni-Rishi Gorge, 2000-2300 m, 3 ♂♂, 2 ♀♀, 6.ix.1989, coll. *P.C. Tak* & party; Pithoragarh dist., Lilam, 1800m, 1 ♂, 18.ix.1993, coll. *J.P. Sati* & party.

4. ***Dnopherula (Aulacobothrus) luteipes*** (Walker)

Material examined : India : U.P., Chamoli dist., on way to Tolma (Soraithota- Tolma Trek), 2000-2500 m, 1 ♂, 11.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : Assam, Bihar, Delhi, Jammu & Kashmir, Karnataka, Himachal Pradesh, Maharashtra, Orissa, Sikkim, Tamilnadu, West Bengal and Uttar Pradesh. *Elsewhere :* North America; Baltistan; Myanmar; China; Europe; Japan; Pakistan and Sri Lanka.

Subfamily OEDIPODINAE

5. ***Gastrimarqus africanus africanus*** (Saussure)

Material examined : India : U.P., Chamoli dist., at southern slope of Rishi Gorge (2.5 km SE of Reni), 2000-2300m, 1 ♂, 6.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : Arunachal Pradesh, Bihar, Delhi, Goa, Himachal Pradesh, Jammu & Kashmir, Madhya Pradesh, Orissa, Sikkim, Uttar Pradesh, West Bengal. *Elsewhere :* Africa; Saudi Arabia; Myanmar; Nepal; Pakistan; Sri Lanka; China and Thailand.

6. ***Gastrimarqus africanus sulphureus*** Bei-Bienko

Material examined : India : U.P., Pithoragarh dist., Lilam, 1800m, 1 ex., 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Himachal Pradesh (Simla, 1050-2500m), Uttar Pradesh (Garhwal). *Elsewhere :* Nepal; Pakistan.

7. *Oedipoda* sp.

Material examined : India : U.P., Chamoli dist., Reni & around, 2000m, 6 exs., 5.ix.1989, at southern slope of Rishi Gorge (2.5 km SE of Reni), 2000-2500 m, 3 exs., 6.ix.1989; Lata and around, 2000-2500 m, 8 exs., 8.ix.1989; on way to Tolma (Sauraithota-Tolma), 2000-2500 m, 1 ex., 11.ix.1989; Malari and around, 3300 m, 17.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : Jammu & Kashmir. *Elsewhere :* Asia; Europe and N. America.

Remarks : This species differs from *O. himalayana.*

8. *Sphingonotus* sp.

Material examined : India : U.P., Chamoli dist., Lata village and around, 2300 m, 1 ♂, 8.ix.1989, coll. *P.C. Tak* & party.

Distribution : Cosmopolitan. In India, this genus is found in Assam, Arunachal Pradesh, Jammu & Kashmir, Rajasthan, Himachal Pradesh, Uttar Pradesh, Maharasthra, Karnataka and West Bengal.

9. *Trilophidia annulata* (Thunberg)

Material examined : India : U.P., Almora dist., on way to Dhakuri from Loharkhet, 1750-2900 m, 1 ♂, 25.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : widely distributed. *Elsewhere :* Afghanistan; Bangladesh; Borneo; Myanmar; S. China; Japan; Java; Korea; Malaysia; Mongolia; Nepal; Pakistan; Philippines; Sarawak; Singapore; Sri Lanka; Sumatra; Taiwan; Thailand and Vietnam.

Subfamily OXYINAE

10. *Caryanda paravicina* (Willemse)

Material examined : India : U.P., Almora dist., on way to Dwali from Khati, 2210-2734m, 8 exs., 30.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : North-eastern India.

Subfamily CATANTOPINAE

11. *Paraconophyma scabra* (Walker)

Material examined : India : U.P., Almora dist., on way to Dwali from Khati, 2210-2734 m, 2 ♂♂, 3 ♀♀, 30.viii.1990; Chamoli dist., Wan, 2300 m, 2 ♀♀, 4.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Himachal Pradesh, Karnataka, Maharastra, Rajasthan, Tamilnadu, Uttar Pradesh (Bhimtal, Mussoorie) and West Bengal.

2. Family TERIGIDAE

Subfamily TERIGINAE

12. *Paratettix curtipennis* (Hancock)

Material examined : India : U.P., Almora dist., on way to Dhakuri from Loharkhet, 1750-2900 m, 1 ♂, 25.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Arunachal Pradesh, Assam, Meghalaya, Sikkim and West Bengal. *Elsewhere :* Myanmar; Laos; China; Taiwan and Vietnam.

3. Family TETTIGONIIDAE

Subfamily CONOCEPHALINAE

13. *Conocephalus maculatus* (Le Gouillou)

Material examined : India : U.P., Pithoragarh dist., Rilkote, 3200 m, 1 ex., coll. *J.P. Sati* & party.

Distribution : India : Orissa, Tripura, West Bengal. *Elsewhere :* Indonesia; Clelebes Is., Moluccas; China (Hong Kong); Phillippines Islands (Mount Makiling, Luzon); Malaya; Singapore.

14. *Velarifictorus* sp.

Material examined : India : U.P., Pithoragarh dist., Milam area, 1800-3500 m, 11 exs., 6.ix., 9.ix. and 14.ix.1993, coll. *J.P. Sati* & party.

Distribution : India; Tropical Africa and Asia; Madagascar and Japan.

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DERMAPTERA

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INTRODUCTION

The present report is based on 183 specimens of Dermaptera comprising 7 species (including two determined up to generic level).

Four species, i.e., one of *Allodahlia* Verhoeff and *Anechura* Scudder and two of *Forficula* L. are typical high altitude forms and represent the dominance of Palaerctic elements. *Labidura riparia* (Pallas) is widely distributed throughout the globe, even sometimes found at high altitudes. The occurrence of *Diplatys* sp., represents typical element in the fauna of the area, which is more commonly found in tropical and subtropical belt but is secondly adapted to high altitude.

All the three species belonging to genera *Allodahlia, Anechura* and *Forficula* are listed by Srivastava (1983) under high altitude forms from India. In view of the varied topography of the area, it is hoped that when further explorations are conducted some more species may be collected.

SYSTEMATIC ACCOUNT

Superfamily PYGIDICRANOIDEA

1 Family PYGIDICRANIDAE

Subfamily DIPLATYINAE

1. *Diplatys* sp.

Material examined : India : U.P., Chamoli dist., Suraithota and around, 2000 m, 4 nymphs, 10.ix.1989, coll. *P.C. Tak* & party.

Present Address : Zoological Survey of India, Fruit Garden, Risa Colony, Shillong-793 003.

Remarks : In the absence of a male it is not possible to determine it up to specific level.

Superfamily ANISOLABOIDAE

2. Family LABIDURIDAE

Subfaimly LABIDURINAE

2. ***Labidura riparia*** (Pallas)

Material examined : India : U.P., Chamoli dist., Gairoli Patali and around, 2600-2900m, 1♀, 6.ix.1991, coll. *P.C. Tak* & party.

Distribution : World wide. The above record in the high altitudes is of interest.

Superfamily FORFICULOIDEA

3. Family FORFICULIDAE

Subfamily ALLODAHLINAE

3. ***Allodahlia macropyga*** (Westwood)

Material examined : India : U.P., Almora dist., Khati and around, 2210 m, 3 ♂♂, 1 ♀,29.viii.1990; Chamoli dist., at southern slope of Rishi Gorge (2.5 km SE of Reni village), 2000-2300 m, 1 ♂, 1 ♀, 6.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : widely distibuted. *Elsewhere :* Nepal; Bhutan; Myanmar; China (Yunan); Thailand; Vietnam and Philippines Islands.

Remarks : It is generally found under stones on the edge of rivers and streams in mountain regions.

Subfamily ANECHURINAE

4. ***Anechura zubovskii*** Semenov

Material examined : India : U.P., Chamoli dist., Malari Reserve Forest and around, 3500m, 4 ♂♂, 8 ♀♀, 1 nymph, 18.ix.1989, coll. *P.C. Tak* & party; Pithoragarh dist., Rargari, 2100 m, 1 ♂, 6.ix.1993; Burfu, 3300 m, 4 ♂♂, 1 ♀, 10.ix.1993; Bilju, 3300 m, 7 ♂♂, 3 ♀♀, 11.ix.1993; Milam, 3500 m, 2 ♂♂, 2 ♀♀, 14.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Kashmir, Himachal Pradesh and Garhwal Himalaya. *Elsewhere :* China (S.W.Tibet).

Remarks : During May-June it can be collected in large numbers under stones on the edge of rivers and streams in Himalaya between 1600 and 4000 m. It occurs under bark of trees as well.

Elytra are dark brownish black with a yellow rounded or oblong spot in middle which is sometimes ill defined. Forceps are generally stout and strongly undulated, sometimes slender and horizontal.

5. *Anechura filchneri* (Burr)

Material examined : India : U.P., Pithoragarh dist., Rilkote, 3200 m, 7 ♂♂, 14 ♀♀, 9.ix.1993; Burfu, 3300 m, 13 ♂♂, 13 ♀♀, 10.ix.1993; Bilju, 3300 m, 9 ♂♂, 5 ♀♀, 11.ix.1993; Milam, 3500 m, 8 ♂♂, 8 ♀♀, 14.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Garhwal Himalaya. *Elsewhere :* China (Szechwan and Kansu).

Subfamily FORFICULINAE

6. *Forficula schlagintweiti* (Burr)

Material examined : India : U.P., Almora dist., on way to Dwali from Khati, 2210-2734 m, 1 ♀, 30.viii.1990; Khati & around, 2210 m, 5 ♂♂, 19 ♀♀, 29.viii.1990; Maliadoh, 2500 m, 2 ♂♂, 6 ♀♀, 4.ix.1990; Chamoli dist., on way to Wan from Lohajung, 2150-2300 m, 2 ♂♂, 2.ix.1991; Alpine meadows on way to Bedni, 3100-3300 m, 1 ♀, 7.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Milam area - Rargari, 2100 m, 1 ♂, 6.ix.1993; Bugdiyar, 2500 m, 2 ♂♂, 3 ♀♀, 7.ix.1993; Mapang, 2800 m, 5 ♂♂, 8.ix.1993; Rilkote, 3200m, 1 ♀, 9.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : all along the Himalaya. *Elsewhere :* Nepal and Bhutan. Also known from Myanmar and China (Tibet and Szechwan).

Remarks : It commonly occurs in Himalaya at an altitude ranging from 1900 m to 4370 m under the stones on the bank of rivers and water bodies.

General body colour is jet black but occasionally specimens with red head are found at higher elevations, i.e., 3000 m. Male forceps are generally polymorphic, may be strongly or weakly curved.

7. *Forficula* sp.

Material examined : India : U.P., Chamoli dist., Malari Reserve Forest and around, 3500 m, 1 ♂, 18.ix.1989, coll. *P.C. Tak* & party.

Remarks : This specimen was found along with those of *Anechura zubovskii* Semenov, but it is smaller in size and pronotum is about as long as broad.

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HEMIPTERA

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INTRODUCTION

The Hemiptera are one of the most important order of exopterygota insects. They are commonly known as bugs and have piercing and sucking type of mouth parts. Most of the species entail direct or indirect injury to various vegetations and are often destructive like leafhoppers (Cicadellidae), the white flies (Aleyrodidae), the plant lice (Aphididae) and the Scale insects (Coccidae). The extensive damage caused by these insects is due to the very fast rate of reproduction by parthenognesis in case of many Homoptera. However, some Coccids are useful to mankind because these insects are either the source of sticklac of commercial importance or of dye stuff. The Hemiptera in general are phytophagous and feed on root, leaves, stem, fruits and seeds. Some cause malformations like galls. Among the Heteroptera, some are predaceous in nature and some like the Cimicidae (Bedbugs), the Triatominae and the Polyctenidae are blood suckers.

Hemipteran insects belonging to certain genera are observed to have restricted distribution, occurring in eastern Himalaya, western Himalaya or Peninsular India and often showing their Indo-Chinese and Malayan affinities.

The examination of a hemipteran collection received from Northern Regional Station, Zoological Survey of India, revealed the existence of 13 species which are dealt with hereunder.

SYSTEMATIC ACCOUNT

Suborder : HOMOPTERA

1 Family : CICADELLIDAE

1. *Evacanthus repexus* (Distant)

Material examined : India : U.P., Chamoli dist., Renuka Dhar, 2500 m, 2 exs., 3.ix.1991, *P.C. Tak* & party.

Distribution : India : Sikkim, Uttar Pradesh, West Bengal, E. Himalaya.

2. ***Evacanthus*** sp.

Material examined : India : U.P., Almora dist., Khati & around, 2210m, 3 exs., 29.viii.1990, coll. *P.C. Tak* & party.

3. ***Cicadula maculata*** Pruthi

Material examined : India : U.P., Almora dist., on way to Phurkia, 2734-3200 m, 2 exs., 11.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : Meghalaya, Sikkim.

4. ***Deltocephalus*** sp.

Material examined : India : U.P., Almora dist., Khati & around, 2210 m, 1 ex., 29.viii.1990, coll. *P.C. Tak* & party.

5. ***Kartica*** sp.

Material examined : India : U.P., Almora dist., Zeropoint of Pindari Glacier, 3600 m, 1 ex., 2.ix.1990, coll. *P.C. Tak* & party.

2. Family CERCOPIDAE

6. ***Aphrophora*** sp.

Material examined : India : U.P., Chamoli dist., Bedni & around, 3300-3500 m, 1 ex., 8.ix.1991, coll. *P.C. Tak* & party.

7. ***Peuceptyelus (=Aphrophora) sigillifer*** (Walker)

Material examined : India : U.P., Chamoli dist., Bedni & around, 3300-3500 m, 1 ex., 8. ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Karnataka, Maharashtra, Meghalaya, Sikkim, Tamil Nadu, Uttar Pradesh. *Elsewhere :* Myanmar; Borneo; China; Philippines islands.

Suborder HETEROPTERA

3. Family PENTATOMIDAE

8. *Dolycoris baccarum* (Linnaeus)

Material examined : India : U.P., Almora dist., Zeropoint of Pindari Glacier, 3600 m, 2 exs., 2.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : Jammu & Kashmir, Maharashtra, West Bengal. *Elsewhere :* Pakistan; common in Palaearctics.

9. *Eysarcoris guttiger* (Jhunberg)

Material examined : India : U.P., Almora dist., Zeropoint of Pindari Glacier, 3600 m, 1 ex., 2.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : Maharashtra, Nagaland, Orissa, Sikkim, South India; Sri Lanka.

4. Family LYGAEIDAE

10. *Lethaeus* sp.

Material examined : India : U.P., Almora dist., Zeropoint of Pindari Glacier, 3600 m, 1 ex., 2.ix.1990, coll. *P.C. Tak* & party.

11. *Deraeocoris* sp.

Material examined : India : U.P., Almora dist., zeropoint of Pindari Glacier, 3600 m, 6 exs., 2.ix.1990, coll. *P.C. Tak* & party.

5. Family GERRIDAE

12. *Gerris gracilicornis* (Horvath)

Material examined : India : U.P., Almora dist., Zeropoint of Pindari Glacier, 3600 m, 15 exs., 2.ix. 1990, coll. *P.C. Tak* & party.

Distribution : India : Assam, Sikkim, West Bengal. *Elsewhere :* China; Taiwan; Japan.

13. ***Chimarrhometra orientalis*** (Distant)

Material examined : India : U.P., Almora dist., Zeropoint of Pindari Glacier, 3600 m, 2 exs., 2.ix. 1990, coll. *P.C. Tak* & party.

Distribution : India : Assam, Himachal Pradesh, Jammu & Kashmir, Punjab, Uttar Pradesh, West Bengal. *Elsewhere :* Pakistan.

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NEUROPTERA

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INTRODUCTION

The present study on the Neuroptera of NDBR comprises only four species, including the indetermined one belonging to three families, namely, Myrmeleontidae, Osmylidae and Hemerobiidae. The account of which is briefed hereunder.

SYSTEMATIC ACCOUNT

1. Family Myrmeleontidae

1. *Distoleon verendus* (Walker)

Material examined : India : U.P., Chamoli dist., village Reni and around, 2000 m, 5 exs. 5.ix.1989; 2 exs., 6.ix.1989; village Lata and around, 2000-2200 m, 1 ex., 8.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : Orissa : West Bengal, "North India", Himachal Pradesh and Uttar Pradesh.

Remarks : The species is not rare in status. Although it was earlier reported from Uttar Pradesh but it is for the first time recorded from the concerned biosphere reserve.

2. *Myrmeleon montanus* Navas

Material examined : India : U.P., Chamoli dist., village Reni and around, 2000 m, 8 exs., 5.ix.1989; 10 exs., 6.ix.1989; village Lata and around, 2000-2200 m, 1 ex., 8.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : West Bengal (Darjeeling) and Uttar Pradesh.

Remarks : The species is rare in status as it is restricted only to the Himalayan region of India. Navas (1914) reported the species from Darjeeling, West Bengal. It is for the first time recorded from Uttar Pradesh including Nanda Devi Biosphere Reserve.

2. Family OSMYLIDAE

3. ***Hyposmylus punctipennis*** (Walker)

Material examined : India : U.P.,Chamoli dist., Malari and around, 3200-3300 m, 1 ex., 17.ix.1989, coll. *P.C. Tak* & party.

Distribution : "India septenrional", "Kunawar" and Uttar Pradesh.

Remarks: Ghosh (1983) reported the species from Uttar Pradesh. The species may be regarded as rare in status and it is restricted only in Himalayan sector of India. However, the species is recorded for the first time from Nanda Devi Biosphere Reserve.

3. Family HEMEROBIIDAE

4. *Hemerobius* sp.

Material examined : India : U.P., Chamoli dist., village Reni and around, 2000 m 1 ex., 5.ix.1989, coll. *P.C. Tak* & party.

Remarks : Due to the paucity of material it is not possible to identify the specimen upto species level. However, it is interesting to note that genus is for the first time recorded from Uttar Pradesh.

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LEPIDOPTERA : RHOPALOCERA

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INTRODUCTION

The butterflies due to their aesthetic and scientific value always attracted the entomologists as well as the naturalists.In the Himalayan ecosystem they form a very important component of the ecological regime due to their vital role in pollination.

Arora *et al* (1995) have recently chronicled the studies on the butterfly fauna of western Himalaya and prepared an annotated list of 223 taxas of butterflies from the eight districts of Kumaon and Garhwal.

In the present study the author has analysed the butterfly fauna of the buffer zone of the biosphere, based on the collections made by field survey task forces of this regional station from the biosphere in the years 1989, 19890, 1991, & 1993. Based on the above surveys and the specimens available with the author 80 forms of butterflies belonging to nine families have been listed (Plate II & III). As Zoological Survey of India, Dehra Dun was conducting the faunal surveys of the Biosphere, the Indian Army organised a scientific expedition to the Nanda Devi (1993). It comprises a small team of scientists, including Major Ashwin Baindur, who in consultation with the author, made a list of 27 species of butterflies from buffer as well as the core zone of the biosphere (Baindur, 1993). There are only 17 common species between the present record and the Army expedition list of butterflies, thus the annotated list of the butterflies from NDBR is brought up to 90 forms. The altitudinal distribution of butterflies in the biosphere ranges between 1500 to 7800 m.

SYSTEMATIC ACCOUNT

The systematic account deals with 80 species of butterflies under nine families. The classification and nomenclature has been adopted mainly after Talbot (1939, 1947), Wynter-Blyth(1957) and Smith (1989).

1. Family PAPILIONIDAE

1. *Atrophaneura aidoneus* (Doubleday), Lesser Batwing

Material examined : India : U.P., Almora dist., Pindari area : on way to Jatoli, 2210-2150 m, 1 ♂, 28.vii.1990, coll. *P.C. Tak* & party.

Distribution : India :U.P., Garhwal.*Elsewhere :* Myanmar (Shan state); Nepal; S. China.

2. *A. polyenctes* (Doubleday), Common Windmill

Material examined : India : U.P., Almora dist., on way to Dhakuri, 2750 m, 1 ♂, 25.viii.1990; on way to Jatoli, 2210-2150 m, 2 ♂♂, 28.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Kashmir to Sikkim, Assam. *Elsewhere :* N. Myanmar.

3. *Papilio protenor protenor* Cramer, Spangle

Material examined : India : U.P., Almora dist., on way to Jatoli, 2210-2150 m, 1 ♂, 28.viii.1990; Pithoragarh dist., Milam, 3500 m, 1 ♂, 14.ix.1993; Lilam, 1800 m, 1 ♂, 18.ix.1993, coll. *P.C. Tak* & party.

Distribution : India : Kashmir to Kumaon. *Elsewhere :* Nepal.

4. *P. polyctor polyctor* Boisduval, Common Peacock

Material examined : India : U.P., Pithoragarh dist., Lilam, 1800 m, 3 ♂♂, 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Chitral to Kumaon.

5. *P. polytes romulus* Cramer, Common Mormon

Material examined : India : U.P., Almora dist., on way to Phurkia, 2734-3260 m, 1 ♀, (form *stichius*), 1.ix.1990; Chamoli dist., Renuka Dhar, 2500 m, 1 ♀ (form *cyrus*), 3.ix.1991, coll. *P.C. Tak* & party.

Distribution : Throughout India. *Elsewhere :* Nepal; Myanmar; Sri Lanka.

6. *P. demoleus demoleus* Linnaeus, Lime Butterfly

Material examined : India : U.P., Almora dist., on way to Khati, 2750-2250 m, 1 ♀, 27.viii.1990, coll. *P.C. Tak* & party.

Distribution : Throughout India. *Elsewhere :* Sri Lanka; Myanmar and Nepal (from terai to 4000').

7. *Graphium cloanthus cloanthus* (Westwod), Glassy Bluebottle

Material examined : India : U.P., Almora dist., on way to Loharkhet, 1750 m, 2 ♂♂, 24.viii.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Lilam, 1800 m, 4 ♂♂, 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Kashmir. *Elsewhere :* Myanmar.

8. *Parnassius hardwickei* Gray, Common Blue Apolo

Material examined : India : U.P., Almora dist., on way to Dwali, 2210-2734 m, 1 ♂, 31.viii.1990; on way to Phurkia, 2734-3260 m, 1 ♂, i.ix.1990; Chamoli dist., Renuka Dhar, 2500 m, 1 ♂, 11.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 2500 m, 1 ♂, 7.ix.1993; Rargari, 2100 m, 1 ♂, 6.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Chitral to Kumaon. *Elsewhere :* Nepal.

2. Family Pieridae

9. *Delias belladonna horsfieldi* (Gray), Hill Jezebel

Material examined : India : U.P., Almora dist., on way to Loharkhet, 1750 m, 11 ♂♂, 24.viii.1990; on way to Khati, 2750-2210 m, 1 ♂, 1 ♀, 27.viii.1990; on way to Jatoli, 2210-2150 m, 1 ♂, 28.viii.1990; Khati 2210 m, 1 ♀, 29.viii.1990; Chamoli dist., Lohajung to Wan, 2150-2300 m, 8 ♂♂, 5 ♀♀, 2.ix.1991; Renuka Dhar, 2500 m, 1 ♂, 3.ix.1991; Wan 2300 m, 1 ♂, 4.ix.1991; Renuka Dhar to Wan, 2300-2500 m, 1 ♂, 11.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Rargari, 2100 m, 1 ♀, 6.ix.1993; Milam, 3500 m, 4 ♀♀, 14.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : H.P., Kulu to Kumaon (U.P.). *Elsewhere :* Nepal.

Remarks : Based on the present collections from all the three districts of the biosphere, the species can fairly be called as *`Common'* in the buffer zone (1750-3500 m). However, Baindur

(1993) records it from Rishi Ganga only (2150-2600 m) in the core zone of the biosphere (encountered single or two specimens).

10. *D. eucharis* (Drury), Common Jezebel

Material examined : India : U.P., Almora dist., on way to Khati, 2750-2210 m, 1 ♂, 27.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Peninsula to about 7000' in Himalaya.

11. *Pieris canidia indica* Evans, Indian Cabbage White

Material examined : India : U.P., Chamoli dist., Reni, 2000-2100 m, 5.ix.1989; Southern slopes of Rishi Gorge, 5 ♂♂, 6.ix.1989; Belta Kharak, 2700 m, 2 ♀♀, 7.ix.1989; Lata village, 2133 m, 2 ♂♂, 8.ix.1989; Suraithota, 1828 m, 1 ♂, 10.ix. 1989; Tolma, 2438 m, 3 ♂♂, 1 ♀, 11.ix.1989; Almora Renuka Dhar, 2500 m, 2 ♂♂, 11.ix.1991; Almora dist., on way to Loharkhet, 1100-1750 m, 3 ♂♂, 24.viii.1990; on way to Khati, 2750-2210 m, 3 ♂♂, 1 ♀, 27.viii.1990; on way to Jatoli, 2210-2150 m, 4 ♂♂, 28.viii.1990; Khati, 2210 m, 1 ♂, 1 ♀, 29.viii.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Rargari, 2100 m, 1 ♂, 6.ix.1993; Bugdiyar, 2500 m, 2 ♂♂, 7.ix.1993; Lilam, 1800 m, 1 ♂, 1 ♀, 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India: Himalaya, Nilgiris, Kerala, Karnataka. *Elsewhere :* North Baluchistan and Chitral to Dawn Range in Myanmar; Nepal.

Remarks : Baindur (1993) did not report this species from core zone of the biosphere. The present records indicate it to be well distributed between 2000 and 2750 m in the buffer zone.

12. *P. brassicae nepalensis* Doubleday, Large Cabbage White

Material examined : India : U.P., Chamoli dist., Malari & around, 3108 m, 3 ♂♂, 17.ix.1989; Malari Reserve Forest, 3190 m, 1 ♂, 3 ♀♀, 18.ix.1989; Wan, 2300 m, 1 ♀, 4.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Rargari, 2100 m, 1 ♂, 6.ix.1993; Rilkote, 3200 m, 1 ♂, 1 ♀, 9.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Common from terai to 12000' in Himalaya. *Elsewhere :* Nepal.

Remarks : The present records from the buffer zone coupled with that of Baindur's (1993) from the core zone indicate that the species is commonly distributed throughout tbe biosphere.

13. *Pontia daplidice moorei* (Rober), Bath White

Material examined : India : U.P., Almora dist., on way to Jatoli, 2210-2150 m, 1 ex., 28.viii.1990, coll. *P.C. Tak* & party.

Distribution : India: Chitral to Punjab. *Elsewhere :* Nepal; Pakistan.

Remarks : Baindur (1993) records it as *'not common'* in core zone of biosphere.

14. *Catopsilia crocale crocale* (Cramer), Common Emigrant

Material examined : India : U.P., Chamoli dist., Suraithota-Tolma Trek, 1828-2438 m, 1♀, 11.ix.1989.

Distribution : Throughout India. *Elsewhere :* Sri Lanka; Myanmar; Nepal.

Remarks : Baindur (1993) records *Catopsilia* sp. as common in the core zone of biosphere.

15. *Gonepteryx rhamni nepalensis* (Doubleday), Common Brimestone

Material examined : India : U.P., Chamoli dist., Belta Kharak, 2700 m, 4 ♂♂, 1 ♀, 7.ix.1989; Lata, 2133 m, 8.ix.1989; Malari & around, 3108 m, 1 ♂, 8.ix.1989; Lohajung, 2150-2300 m, 1 ♂, 1.ix.1991; Renuka Dhar, 7 ♂♂, 3.ix.1991; Wan, 1 ♂, 4.ix.1991; Almora dist., Dhakuri, 2700 m, 1 ♂, 24.viii.1990; on way to Jatoli, 2210-2150 m, 1 ♂, 28.viii.1990; Khati, 2210 m, 1 ♂, 29.viii.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 2500 m, 1 ♂, 7.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Throughout Himalaya. *Elsewhere :* Nepal; Pakistan (Chitral).

Remarks : The species is common in the buffer zone of the biosphere.

16. *Eurema brigitta rubella* (Wallace), Small Grass Yellow

Material examined : India : U.P., Almora dist., on way to Khati, 2750-2210 m, 1 ♂, 27.viii.1990; Chamoli dist., Lohajung, 2150-2300 m, 1 ♂, 1.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Throughout. *Elsewhere:* Sri Lanka; Myanmar; Nepal.

Remarks : The species has been recorded almost throughout the year from terai to 3500m in Himalaya.

17. *E. laeta laeta* (Boisduval), Spotless Yellow

Material examined : India : U.P., Almora dist., on way to Loharkhet, 1100-1750 m, 5 ♂♂, 1 ♀, 27.viii.1990; Chamoli dist., Lohajung, 2150-2300 m, 1 ♀, 1.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Lilam, 1800 m, 1 ♂, 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Peninsula to W. Himalaya.

Remarks : The species has distinct seasonal variations and occur upto an altitude of about 2500 m in W. Himalaya.

18. *E. hecabe fimbriata* (Wallace), Common Grass Yellow

Material examined : India : U.P., Almora dist., on way to Khati, 2210 m, 2 exs., 27.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Punjab, Kumaon Himalaya. *Elsewhere :* Pakistan (Chitral).

19. *Colias electo fieldi* Menetries, Dark Clouded Yellow

Material examined : India : U.P., Chamoli dist., Reni, 2000-2100 m, 3 ♂♂, 5.ix.1989; Belta Nallah, 2700 m, 2 ♂♂, 7.ix.1989; Malari, 3108 m, 1 ♂, 17.ix.1989; Malari Reserve Forest, 3190 m, 1 ♂, 1 ♀, 18.ix.1989; Renuka Dhar, 2500 m, 1 ♀, 3.ix.1989; Bedni, 3300-3500 m, 1 ♂, 8.ix.1989; Renuka Dhar, 2500 m, 1 ♂, 1 ♀, 11.ix. 1991; Almora dist., Dhakuri, 2750 m, 1 ♀, 26 viii.1990; on way to Khati, 2750-2210 m, 2 ♂, 27.viii.1990; on way to Jatoli, 2210-2150 m, 1 ♂, 4 ♀♀, 28.viii.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Mapang, 2800 m, 1 ♂, 8.ix.1993; Bilju, 3300 m, 1 ♂, 11.ix.1993; Milam, 3500 m, 2 ♂♂, 14.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : N.W. Himalaya. *Elsewhere :* Nepal; Myanmar, Pakistan.

Remarks : This is a *`very common'* species in buffer zone (2000-3500 m), Baindur (1993) also records its status as *`very common'* in the core zone of the biosphere, thus the species is uniformly distributed and commonly occurs throughtout the biosphere.

3. Family DANAIDAE

20. *Parantica tytia sita* (Kollar), Chestnut Tiger

Material examined : India : U.P., Almora dist., on way to Jatoli, 2210-2150 m, 7 ♂♂, 28.viii.1990; on way to Dwali, 2210-2734 m, 1 ♀, 30.vii.1990; Chamoli dist., Lohajung, 2150-

2300 m, 1 ♂, 2.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Rargari, 2100 m, 2 ♂♂, 6.ix.1993; Lilam, 1800 m, 1 ♂, 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Kashmir to Kumaon. *Elsewhere :* Nepal.

Remarks : The species is common in the buffer zone of the biosphere.

21. ***Euploea mulciber mulciber*** (Cramer), **Striped Blue Crow**

Material examined : India : U.P., Almora dist., on way to Loharkhet, 1100-1750 m, 1 ♂, 24.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Himachal Pradesh, Peninsula, Tamil Nadu, W. Bengal. *Elsewhere:* Nepal.

Remarks : One of the most beautiful species among genus *Euploea.*

4. Family SATYRIDAE

22. ***Mycalesis mineus mineus*** (Linn.), **Dark Brand Bushbrown**

Material examined : India : U.P., Almora dist., on way to Khati, 2750-2210 m, 2 ♀♀, 27.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : H.P. (Kulu), Andaman Is. *Elsewehre :* Myanmar; Malayasia and China.

23. ***Lethe maitrya maitrya*** de N, **Branded Woodbrown**

Material examined : India : U.P., Almora dist., on way to Phurkia, 2734-3260 m, 2 ♀♀, 1.ix.1990; Maliadoh, 2500 m, 1 ♂, 4.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : H.P. *Elsewehre :* Nepal; Bhutan.

Remarks : It is reported to occur between 2000-3500m in Himalaya, with the present material falling within this range.

24. ***L. jalaurida jalaurida*** (de N), **Small Silverfork**

Material examined : India : U.P., Almora dist., on way to Phurkia, 2734-3260 m, 1 ♂, 1.ix.1990; Chamoli dist., Wan, 2300 m, 1 ♂, 4.ix.1991; Bedni, 3300-3500 m, 7.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : H.P., U.P. Himalaya. *Elsewhere :* western Nepal.

Remarks : The species is `Rare' in the biosphere.

25. *L. baladeva aisa* Fruhsterfer, **Treble Silver Stripe**

Material examined : India : U.P., Almora dist., on way to Dwali, 2210-2734 m, 1 ♂, 1 ♀, 30.viii.1990; Maliadoh, 2500 m, 1 ♂, 4.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : U.P. Himalaya (Kumaon).

Remarks : The species is endemic and is hithertto occur only in Kumaon hills of Uttar Pradesh (2200-2750 m).

26. *L. rohria rohria* (Fabr.), **Common Tree Brown**

Material examined : India : U.P., Almora dist., on way to Khati, 2750-2210 m, 27.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : H.P., Sikkim. *Elsewhere :* Nepal, Myanmar, S. China; Sri Lanka.

27. *L. insana insana* (Koller), **Common Forester**

Material examined : India : U.P., Chamoli dist., southern slopes of Rishi Gorge, 2200 m, 1 ♀, 6.ix.1989; on way to Wan, 2150-2300 m, 2 ♂♂, 2.ix.1991; Almora dist., on way to Dwali, 2210-2734 m, 1 ♀, 30.viii.1990; Dwali, 2734 m, 1 ♂, 31.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : H.P., U.P. Himalaya.

28. *Pararge schakra schakra* (Kollar), **Common Wall**

Material examined : India : U.P., Chamoli dist., Reni village, 2000-2200 m, 1 ♂, 1 ♀, 5.ix.1989; Belta Kharak, 2700 m, 1 ♂, 2 ♀, 7.ix.1989; Lata, 2133 m, 1 ♂, 8.ix.1989; Tolma, 2438 m, 1 ♂, 1 ♀, 11.ix.1989; Lohajung, 1 ♂, 1.ix.1991; Lohajung to Wan, 2300 m, 1 ♂, 2.ix.1991; Almora dist., on way to Khati, 2750-2210 m, 1 ♂, 1 ♀, 27.viii.1990; on way to Jatoli, 2210-2150 m, 1 ♂, 1 ♀, 28.viii.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 2500 m, 1 ♀, 7.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : U.P. Himalaya (Kumaon). *Elsewhere :* Nepal; Pakistan.

Remarks : Based on the present records the species appears to be `common' in buffer zone, though Bhaindur (1993) reports occurrence of single or two specimens from the buffer zone of the biosphere.

29. *Rhaphicera moorei moorei* Butler, Small Tawny Wall

Material examined : India : U.P., Chamoli dist., Tolma, 2438 m, 1 ♀, 11.ix.1989; Almora dist., on way to Dhakuri, 1750-2750 m, 2 ♂♂, 25.viii.1990; on way to Jatoli, 2210-2150 m, 1 ♂, 1 ♀, 28.viii.1990; on way to Dwali, 2210-2734 m, 7 ♂♂, 3 ♀♀, 30.viii.1990; Dwali, 2734 m, 1 ♂, 31.viii.1990; Maliadoh, 2500 m, 1 ♀, 4.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : H.P. (Kulu), U.P. Himalaya, E. Himalaya (Darjeeling). *Elsewhere :* Nepal.

30. *Orinoma damaris* Gray, Tiger Brown

Material examined : India : U.P., Pithoragarh dist., Lilam, 1800 m, 2 exs., 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : H.P. (Kangra), extend upto Myanmar.

31. *Aulocera brahminus dokwana* Evans, Narrow Banded Satyr

Material examined : India : U.P., Almora dist., on way to Phurkia, 2734-3260 m, 3 ♀♀, 1.ix.1990; Pindari Glacier, 3600 m, 1 ♂, 2 ♀♀, 2.ix.1990; Chamoli dist., Lohajung to Wan, 2150-2300 m, 3 ♂♂, 3 ♀♀, 2.ix.1991; Bedni, 3300-3500 m, 2 ♂♂, 1 ♀, 7.ix.1991; Bedni & around, 3300-3500 m, 2 ♂♂, 8.ix.1991; Bedni-Bhagwabasa, 3500-4100 m, 2 ♂♂, 9.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Rilkote, 3200 m, 3 ♀♀, 9.ix.1993, Milam, 3500 m, 1 ♀, 14.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : U.P. : Western Garhwal to Kumaon. *Elsewhere :* Nepal.

Remarks : The species is common and shows considerable altitudinal range (2150-4100) in the Biosphere, as well as in the western Himalaya in general.

32. *A. loha* Doherty, Doherty's Satyr

Material examined : India : U.P., Chamoli dist., Lohajung to Wan, 2150-2300 m, 1 ♀, 2.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 2500 m, 2 exs., 7.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : U.P. Kumaon hills to Assam. *Elsewhere :* Nepal.

Remarks : The specis is `Rare' in the buffer zone (2150-2500 m).

33. *A. swaha swaha* (Kollar)

Material examined : India : U.P., Chamoli dist., southern slopes of Rishi Gorge, 2000-2200 m, 1 ♂, 6.ix.1989; Belta Kharak, 2700 m, 4 exs., 7.ix.1989; village Lata, 2133 m, 2 ♀♀, 8.ix.1989; Suraithota, 1828 m, 2 ♂♂, 3 ♀♀, 11.ix.1989; Malari, 3190 m, 5 ♂♂, 18.ix.1989; Lohagung to Wan, 2150-2300 m, 1 ♂, 2 ♀♀, 1.ix.1991; Renuka Dhar, 2500 m, 4 ♂♂, 3 ♀♀, 3.ix.1991; 1 ex., 11.ix.1991; Gairoli Patali, 2900 m, 1 ♀, 6.ix.1991; Almora dist., on way to Loharkhet, 1100-1750 m, 1 ♂, 24.viii.1990; on way to Dhakuri, 1750-2750 m, 4 ♂♂, 25.viii.1990; Khati, 2210 m, 3 ♂♂, 2 ♀♀, 27.viii.1990; Jatoli, 2210-2150 m, 1 ♂, 28.viii.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 2500 m, 3 ♂♂, 7.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : W. Himalaya, Sikkim. *Elsewhere :* Nepal.

Remarks : Endemic to Himalaya. The species is common and occur widely in the biosphere between 2000-3000 m.

34. *A. saraswati* (Kollar), **Triated Satyr**

Material examined : India : U.P., Chamoli dist., village Reni, 2000 m, 5.ix.1989; village Lata, 2133 m, 3 ♂♂, 1 ♀, 6.ix.1989; Belta Kharak, 2700 m, 1 ♂, 7.ix.1989; Suraithota-Tolma Trek, 1828-2438 m, 2 ♀♀, 11.ix.1989; Lohajung to Wan, 2150-2300 m, 3 ♀♀, 2.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Lilam, 1800 m, 1 ♂, 1 ♀, 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : W. Himalaya, Sikkim. *Elsewhere :* Nepal.

Remarks : The species is reported between 6500' and 7000' in Garhwal hills, between 6000' and 10000' in Kumaon hills; extending eastwards it has been recorded from Nepal (*vide* C. Smith, 1989) between 5600' and 11500'.

35. *Callerebia nirmala nirmala* (Moore), **Common Argus**

Material examined : India : U.P., Chamoli dist., Suraithota-Tolma Trek, 1828-2438 m, 1 ex., 11.ix. 1989; Lohajung to Wan, 2150-2300 m, 1 ♂, 2.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 2500 m, 2 exs., 7.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Kashmir to Kumaon. *Elsewhere :* Nepal.

Remarks : The species is not common both in buffer as well as core zone of the biosphere. Baindur (1993) recorded it from Rishi Gorge (2150-2600 m) and Lata village (2400 m) only.

36. *C. scanda scanda* (Kollar), Pallid Argus

Material examined : India : U.P., Chamoli dist., southern slopes of Rishi Gorge, 2000-2200 m, 5 exs., 6.ix.1989; Lohajung, 2150 m, 7 exs., 1.ix.1991; Renuka Dhar, 2500 m, 1 ♀, 3.ix.1991; Almora dist., on way to Loharkhet, 1100-1750 m, 1 ♂, 24.viii.1990; on way to Dhakuri, 1750-2750 m, 5 ♂♂, 1 ♀, 25.viii.1990; on way to Khati, 2750-2210 m, 3 ♂♂, 1 ♀, 27.viii.1990; on way to Jatoli, 2210-2150 m, 2 ♂♂, 1 ♀, 28.viii.1990; on way to Dwali 2210-2734 m, 1 ♂, 30.viii.1990, coll. *P.C. Tak* & party; Pithoragarh dist, Rargari, 2100 m, 3 exs., 6.ix.1993; Lilam, 1800 m, 2 exs., 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Kashmir to Kumaon, lower Sikkim. *Elsewhere :* Nepal.

Remarks : The species is locally common in the buffer zone (1700-2500 m).

37. *C. hyagriva* (Moore), Brown Argus

Material examined : India : U.P., Almora dist., on way to Loharkhet, 1100-1750 m, 2 exs., 24.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Kashmir to Kumaon, Sikkim. *Elsewhere :* Nepal.

Remarks : The species is `Rare' in the buffer zone of NDBR.

38. *Ypthima nareda nareda* (Kollar), Large Threering

Material examined : India : U.P., Almora dist., on way to Dhakuri, 1750-2750 m, 4 ♂♂, 25.viii.1990; on way to Khati, 2750-2210 m, 1 ♀, 27.viii.1990; Chamoli dist., Lohajung, 2150m, 1 ♂, 1 ♀, 1.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Kashmir to Kumaon. *Elsewhere :* Nepal.

Remarks : The species is known to occur between 600-3000 m in western Himalaya.

39. *Y. avanta* Moore, Jewel Threering

Material examined : India : U.P., Chamoli dist., Suraithota-Tolma trek, 1828-2438 m, 1♀, 11.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : Kashmir to Sikkim. *Elsewhere :* Nepal.

Remarks : It is reported to occur between 300-2000 m in W. Himalaya.

40. *Y. sakra nikaea* Moore, Himalayan Five-ring

Material examined : India : U.P., Almora dist., on way to Loharkhet, 1100-1750 m, 1♂, 24.viii.1990; on way to Dhakuri, 1750-2750 m, 2 ♂♂, 25.viii.1990; on way to Dwali, 2210-2734 m, 1 ♀, 30.viii.1990; Chamoli dist., Lohajung, 2150 m, 3 ♂♂, 1.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : western Himalaya. *Elsewhere :* Nepal; Pakistan (Murree).

41. *Melanitis leda ismene* (Cramer), Common Evening Brown

Material examined : India : U.P., Almora dist., on way to Khati, 2750-2210 m, 2 ♂♂, 1 ♀, 27.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Common throughout. *Elsewhere :* Sri Lanka; Myanmar; Nepal.

Remarks : One of the most common species in India, known to occur between terai and 2200 m in hills. It displays characteristic seasonal variations.

5. Family ACRAEIDAE

42. *Acraea issoria anomala* Kollar, Yellow Coster

Material examined : India : U.P., Almora dist., on way to Loharkhet, 1100-1750 m, 7 ♂♂, 3 ♀♀, 24.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : *Elsewhere :* N.W. Himalaya : Kulu to Kumaon.

Remarks : The species is `locally common' in the buffer zone of NDBR. Abundant in W. Himalaya.

43. *A. violae* (Fabricus), Tawny Coster

Material examined : India : U.P., Almora dist., on way to Phurkia, 2734-3260 m, 1 ♂, 1.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : Throughout. *Elsewhere :* Sri Lanka; Myanmar; Nepal.

Remarks : The species has wide altitudinal distribution in Himalaya (600-3000 m).

6. Family ERYCINIDAE

44. *Dodona durga* (Kollar), Common Punch

Material examined : India : U.P., Chamoli dist., Lohajung to Wan, 2150-2300 m, 1 ♂, 2 ♀♀, 2.ix.1991, coll. *P.C. Tak* & party.

Remarks : The species is rare in the biosphere but common in W. Himalaya (800-2500 m).

45. *D. eugenes eugenes* Bates, Tailed Punch

Material examined : India : U.P., Pithoragarh dist., Lilam, 1800 m, 1 ex., 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : W. Himalaya (Kumaon). *Elsewhere :* Nepal; Western & Central China; Pakistan (Muree).

Remarks : Species is rare in the buffer zone.

7. Family NYMPHALIDAE

46. *Stibochiona nicea nicea* (Gray), Popin Jay

Material examined : India : U.P., Pithoragarh dist., Lilam, 1800 m, 2 exs., 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : H.P. (Kulu). *Elsewhere :* Nepal; east to Myanmar.

Remarks : The species is rare in the buffer zone.

47. *Limenitis danava* Moore, Commodore

Material examined : India : U.P., Pithoragarh dist., Lilam, 1800 m, 1 ex., 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : H.P. (Shimla). *Elsewhere :* Dawna Range (Myanmar).

Remarks : The species is also reported `Rare' in NDBR, but common in Kumaon upto 2500m.

48. *Athyma opalina opalina* (Kollar), Himalayan Sergeant

Material examined : India : U.P., Almora dist., on way to Dhakur, 1750-2750 m, 3 ♂♂, 25.viii.1990; on way to Jatoli, 2210-2150 m, 3 ♂♂, 28.viii.1990; on way to Dwali, 2210-

2734 m, 1 ♂, 30.viii.1990; Chamoli dist., Lohajung to Wan, 2150-2300 m, 1 ♂, 2.iv.1991; Renuka Dhar, 2500 m, 1 ♂, 3.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Kashmir to Kumaon.

Remarks : The species is rather locally common in the buffer zone.

49. *Neptis mahendra mahendra* Moore, **Himalayan Sailer**

Material examined : India : U.P., Chamoli dist., village Reni, 2000 m, 1 ♂, 5.ix.1989; Malari, 3108 m, 2 ♀♀, 18.ix.1989; Lohajung to Wan, 2150-2300 m, 1 ♂, 2.ix.1991; Almora dist., on way to Dhakuri, 1750-2750 m, 1 ♂, 25.viii.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Lilam, 1800 m, 2 exs., 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : N.W. Himalaya. *Elsewhere :* Nepal; W. China; Pakistan (Chitral).

Remarks : The species is well distributed in the buffer zone between the altitude of 1800-3110 m. Baindur (1993) also reports the same altitudinal range from Lata, Belta, etc. in the buffer zone. He records it as 'Not Common' in biosphere.

50. *N. hylas astola* Moore, **Common Sailer**

Material examined : India : U.P., Almora dist., Loharkhet, 1750 m, 1 ♂, 1 ♀, 24.ii.1990; on way to Jatoli, 2210-2150 m, 3 ♂♂, 28.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : HImalaya. *Elsewhere :* Myanmar.

51. *N. soma* Moore, **Sullied Sailer**

Material examined : India : U.P., Almora dist., on way to Jatoli, 2210-2150 m, 1 ♂, 28.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Himalaya. *Elsewhere :* Nepal; Myanmar; W. China.

52. *N. yerburyi yerburyi* (Butler), **Yerburyis Sailer**

Material examined : India : U.P., Chamoli dist., Lohajung to Wan, 2 ♂♂, 1 ♀, 2.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Lilam, 1800 m, 2 ♂♂, 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Kashmir to Kumaon.

53. *Cyrestis thyodamas ganescha* (Kollar), **Map Butterfly**

Material examined : India : U.P., Almora dist., on way to Loharkhet, 2 ♂♂, 24.viii.1990,

coll. *P.C. Tak* & party; Pithoragarh dist., Lilam, 1800 m, 2 exs., 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Kashmir to Kumaon.

Remarks : The species has wide altitudinal range (plains to 2500 m).

54. *Pseudergolis wedah* (Kollar), Tabby

Material examined : India : U.P., Pithoragarh dist., Lilam, 1800 m, 2 exs., 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : H.P. (Kulu), U.P. Himalaya. *Elsewhere :* Nepal; Myanmar.

Remarks : The species is rare in the buffer zone of NDBR.

55. *Precis iphita siccata* (Stichel), Chocolate Soldier

Material examined : India : U.P., Almora dist., on way to Loharkhet, 1750 m, 2 ♂♂, 24.viii.1990; on way to Dhakuri, 1 ♂, 1 ♀, 25.viii.1990; on way to Jatoli, 2210-2150 m, 7 ♂♂, 3 ♀♀, 28.viii.1990; Chamoli dist., Lohajung, 2150 m, 3 ♂♂, 1 ♀, 2.ix.1991, coll. *P.C. Tak* & party, Pithoragarh dist., Lilam, 1800 m, 2 exs., 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Kashmir to Kumaon.

Remarks : Species is locally common in the buffer zone between the altitude of 1750-2750 m.

56. *Cynthia cardui* (Linn.), Painted Lady

Material examined : India : U.P., Chamoli dist., Belta Nallah, 2700 m, 1 ♀, 7.ix.1989; Renuka Dhar, 2500 m, 1 ♀, 3.ix.1991; Almora dist., on way to Dhakuri, 1750-2750 m, 1 ♀, 25.viii.1990; on way to Khati, 2750-2210 m, 4 ♀♀, 27.viii.1990; on way to Jatoli, 2210-2150 m, 28.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Common throughout. *Elsewhere :* Sri Lanka; Myanmar; widely distributed elsewhere except South America.

Remarks : The species is rather common in the buffer zone (2200-2700 m); Baindur (1993) has recorded it between the altitude of 3600-3800 m in the core zone with the `Not Common' status. The species is known to be migratory in nature.

57. *Vanessa indica indica* Herbst, Indian Red Admiral

Material examined : India : U.P., Chamoli dist., Suraithota, 1818 m, 1 ♀, 10.ix.1989; Lohajung to Wan, 2150-2300 m, 2 ♀♀, 2.ix.1991; Almora dist., Loharkhet, 1750 m, 1 ♂, 24.viii.1990; on way to Jatoli, 2210-2150 m, 3 ♂♂, 2 ♀♀, 28.viii.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 2500 m, 1 ♀, 7.ix.1993; Lilam, 1800 m, 1 ex., 18.ix.1993. coll. *J.P. Sati* & party.

Distribution : India : Himalaya (Kashmir to eastward). *Elsewhere :* N. Nepal; N. Myanmar; China and Thailand.

Remarks : Bhaindur (1993) reports it from single or two specimens at Lata village and Belta Kharak in the buffer zone of biosphere.

58. *Kanisha canace himalaya* Evans, Blue Admiral

Material examined : India : U.P., Almora dist., on way to Jatoli, 2210-2150 m, 2 ♂♂, 28.viii.1990; on way to Khati, 2750-2210 m, 1 ♂, 29.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : N.W. Himalaya. *Elsewhere :* Pakistan (Chitral).

59. *Aglais cashmeriensis aesis* Fruhstorfer, Indian Tortoise Shell

Material examined : India : U.P., Almora dist., on way to Dhakuri, 1750-2750 m, 1 ♂, 25.viii.1990; on way to Khati, 2750-2210 m, 1 ♂, 27.viii.1990; on way to Jatoli, 2210-2150 m, 1 ♂, 28.viii.1990; Zero Point of Pindari Glacier, 3600 m, 1 ♂, 2.ix.1990; Chamoli dist., Lohajung, 2150 m, 3 ♂♂, 1.ix.1991; Renuka Dhar, 2500 m, 1 ♂, 3.ix. 1991, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 2500 m, 1 ex., 7.ix.1993; Lilam, 1800 m, 3 exs., 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : H.P. (Kulu) to Sikkim.

Remarks : The species is common in the buffer zone, earlier records indicated it to be very common in W. Himalaya.

60. *Symbernthia brabira* Moore, Himalayan Jester

Material examined : India : U.P., Chamoli dist., on way to Jatoli, 2210-2150 m, 1 ♀, 28.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Kashmir to Kumaon.

Remarks : The species is not common in the biosphere.

61. *S. nlphanda* Moore, **Bluetail Jester**

Material examined : India : U.P., Almora dist., on way to Jatoli, 2210-2150 m, 2 ♀♀, 28.vii.1990, coll. *P.C. Tak* & party.

Distribution : India : Kashmir to Assam hills.

Remarks : The species is not common in the biosphere.

62. ***Fabriciana kamala*** (Moore), **Common Silverstripe**

Material examined : India : U.P., Chamoli dist., southern slopes of Rishi Gorge, 2200 m, 1 ♂, 1 ♀, 6.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : N.W. Himalaya. *Elsewhere :* Nepal; Pakistan (Chitral).

Remarks : The species is not common in the buffer zone; in W. Himalaya its known distribution extends between 1800-3500 m.

63. ***Childrena childreni sakontala*** Kollar, **Large Silver Stripe**

Material examined : India : U.P., Chamoli dist., southern slopes of Rishi Gorge, 2200 m, 1 ♂, 6.ix.1989; Lohajung to Wan, 2150-2300 m, 1 ♂, 2.ix.1991; Almora dist., on way to Dwali, 2210-2734 m, 3 ♂♂, 30.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : N.W. Himalaya. *Elsewhere :* Pakistan (Chitral).

Remarks : The species is not common in the buffer zone, its distribution tallies with the observations of Baindur (1993).

64. ***Argyreus hyperbius hyperbius*** (Johanssen), **Indian Fritillary**

Material examined : India : U.P., Almora dist., on way to Khati, 2750-2210 m, 1 ♂, 24.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Himalaya. *Elsewhere :* Nepal; Pakistan (Chitral).

Remarks : The species is not common in the biosphere, in W. Himalaya its range extends between 600-2700 m.

65. ***Issoria lathonia issoea*** Doubleday, **Queen of Spain Fritillary**

Material examined : India : U.P., Almora dist., Dhakuri, 2750 m, 2 ♂♂ 1 ♀ 26.viii.1990; Zero point of Pindari Glacier, 3600 m, 4 ♂♂, 2.ix.1990; Chamoli dist., Renuka

Dhar, 2500 m, 7 ♂♂, 1 ♀, 3.ix.1991; 1 ex., 11.ix.1991; Bedni & around, 3200-3500 m, 7 ♂♂, 2 ♀♀, 8.ix.1991; Bedni-Bhagwabasa, 3 ♂♂, 1 ♀, 9.ix.1993, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 1 ex., 7.ix.1993; Mapang, 1 ex., 8.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Himalaya. *Elsewhere :* Pakistan (Chitral); N. Myanmar.

Remarks : The species is very common in the buffer zone; Baindur (1993) also reported it be very common in the core zone. The present records establish its vertical distribution between 2400-4500 m in the biosphere.

66. ***Mesoacidalia clara*** (Blanchard), **Silver Streak**

Material examined : India : U.P., coll. Pithoragarh dist., Rilkote, 3200m, 1 ♂, 9.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Garhwal hills to Sikkim. *Elsewhere :* Nepal.

Remarks: The species is not comon in buffer zone; it is a high altitude butterfly found between 3000-4000m.

8 Family LYCAENIDAE

67. ***Lycaena parana*** (Kollar), **White Bordered Copper**

Material examined : India : U.P., Chamoli dist., village Reni, 2000 m, 1 ex., 5.ix.1989; southern slopes of Rihsi Gorge, 2200 m, 1 ex., 6.ix.1989; Belta Kharak, 2700 m, 1 ex., 7.ix.1989; Lohajung, 2150 m, 1 ex., 1.ix.1991; Wan, 2300 m, 5 exs., 4.ix.1991; Almora dist., on way to Jatoli, 2210-2150 m, 3 exs., 28.ix.1990, coll. *P.C. Tak* & party, Pithoragarh dist., Bugdiyar, 2500 m, 4 exs., 7.ix.1993, coll. *J.P.Sati* & party.

Distribution : India : Kashmir to Kumaon. *Elsewhere :* Nepal.

Remarks : The species is locally common in the buffer zone (2000-2700 m); though Baindur (1993) records it as not common from Rishi Gorge (2150-2600m).

69. ***Heliphorus androcles coruscans*** Moore, **Green Sapphire**

Material examined : India : U.P., Almora dist., on way to Jatoli, 2210-2150 m, 5 exs., 28.viii.1990; on way to Dwali 2210-2734 m, 1 ♂, 1 ♀, 30.viii.1990; on way to Maliadoh, 2500 m, 1 ♂, 4.ix.1990; Chamoli dist., Lohajung, 2150 m, 2 ♂♂, 1.ix.1991; Lohajung to Wan, 2150-2300 m, 5 ♂♂, 3 ♀♀, 2.ix.1991; Wan, 2300 m., 2♂♂, 4.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 2500 m, 1 ♂, 1 ♀, 7.ix.1993; Lilam, 1800 m, 5 ♂♂, 4 ♀♀, 18.ix,1993, coll. *J.P. Sati* & party.

Remarks : The species is 'Common' between 2150 and 2500 m in the buffer zone.

70. ***H. brahma*** Moore, Golden Sapphire

Material examined : India : U.P., Pithoragarh dist., Lilam, 1800 m, 1 ♂, 1 ♀, 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Kumaon to Assam. *Elsewhere :* Nepal; Myanmar and W. China.

Remarks : Only one or two specimens were encountered in the buffer zone.

71. ***H. sena*** Kollar, **Sorrel Sapphire**

Material examined : India: U.P., Chamoli dist., Reni, 2000m, 1 ex., 5.ix.1989; Malari, 3190 m, 1 ex., 17.ix.1989, coll. *P.C. Tak* & party.

Distribution : India: Kashmir to Kumaon. *Elsewhere :* Nepal; Pakistan (Chitral).

72. ***Everes argiades diporides*** Chapman, **Chapman's Cupid**

Material examined : India : U.P., Chamoli dist., Renuka Dhar, 2500 m, 1 ex., 1991, coll. *P.C. Tak* & party.

Distribution : India : NW Himalaya. *Elsewhere :* Pakistan (Chitral); Nepal; N. Myanmar.

Remarks : The species is occurring between 4700' and 9300' in Himalaya during April to October.

73. ***Celastrina huegelli huegelli*** Moore, **Large Hedge Blue**

Material examined : India : U.P., Chamoli dist., village Reni, 2000 m, 5 exs., 6.ix.1989; Southern slopes of Rishi Gorge, 2200 m, 3 exs., 6.ix.1989; Lata, 2133 m, 2 exs., 8.ix.1989; Suraithota-Tolma Trek, 1818-2438 m, 1 ex., 11.ix.1989; Lohajung, 2150 m, 2 exs., 1.ix.1991; Renuka Dhar, 2500 m, 3.ix.1991; Wan, 2300 m, 1 ex., 4.ix.1991; Almora dist., on way to Dhakuri, 1 ex., 25.viii.1991; on way to Khati, 2750-2210 m, 3 exs., 27.viii.1990; Khati, 2210 m, 1 ex., 29.viii.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 2500 m, 2 exs., 7.ix.1993; Lilam, 1800m, 4 exs., 19.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Kashmir to Kumaon.

Remarks : The species is widely distributed in the buffer zone. Baindur (1993) recorded it as very common in biosphere from Lata village (2400m) and Belta Kharak (3200m).

74. *Albulina galathea* Blanchard, Large Green Underwing

Material examined : India : U.P., Pithoragarh dist., Lilam, 1800 m, 1 ex., 18.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Kashmir to Kumaon. *Elsewhere :* Nepal.

75. *Choaspes* sp. nr. *benjaminii* Gueren, Indian Awlking

Material examined : India : U.P., Almora dist., on way to Dwali, 2210-2734 m, 1 ex., 30.viii.1990; Maliadoh, 2500 m, 2 exs., 4.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : H.P. (Kulu) to Assam, Tamil Nadu. *Elsewhere :* Nepal; N. Myanmar.

76. *Celaenorrhinus leucocera* (Kollar), Common Spotted Flat

Material examined : India : U.P., Almora dist., on way to Jatoli, 2210-2150 m, 1 ex., 28.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Kashmir to Assam, Maharastra, southern India, W. Bengal. *Elsewhere:* Nepal; Myanmar.

77. *C. patula* (de Nicevel), Large Spotted Flat

Material examined : India : U.P., Almora dist., on way to Jatoli, 2210-2150 m, 1 ex., 28.viii.1990; on way to Dwali, 2210-2734 m, 2 exs., 30.viii.1990; Maliadoh, 2500 m, 3 exs., 4.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : Kumaon to Sikkim, Assam. *Elsewhere :* Nepal; Myanmar.

Remarks : This is the first record from Kumaon hills in western Himalaya.

78. *Notocrypta feisthamelii* (Boisduval), Spotted Demon

Material examined : India : U.P., Almora dist., on way to Dhakuri, 1750-2750 m, 2 exs., 5.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Kashmir to Assam. *Elsewhere :* Nepal; Malaysia; Myanmar; Pakistan (Murree).

79. *Pontanthus dara* Kollar, Himalayan Dart

Material examined : India : U.P., Chamoli dist., Reni, 2000 m, 1 ex., 5.ix.1989; Lohajung, 2150 m, 1 ex., 1.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Kashmir to Kumaon. *Elsewhere :* Nepal; Pakistan.

Remarks : The spceies is common but available only from above 4000' (vide Picle). However, Wynter-Blyth (1957) records it further higher up at 6000'-7000'.

80. *Ploytremis eltola* Hewitson, Yellow Spot Swift

Material examined : India : U.P., Almora dist., Maliadoh, 2500 m, 1 ♂, 4.ix.1990; Chamoli dist., Lohajung to Wan, 2150-2300 m, 1 ♀, 2.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Kashmir to Sikkim, Assam. *Elsewhere :* Myanmar; China and Nepal.

Remarks : The species is common and occurrs from 600-2500 m in Himalaya during March and September.

Table -1 : List of Lepidoptera species (other than recorded in the present communication) from Nanda Devi Biosphere Reserve.

	Name of the secies	Stempffer, Lesse and Barnardi (1952)	Arora *et al* (1977)	Baindur (1993)
1.	*Papilio arcturus arius*	+		
2.	*P. machaon asiatica*	+		+
3.	*Paranassius epaphis hillensis*	+		
4.	*Pachliopta a. aristolochiae*		+	
5.	*Synchloe callidice kalora*	+		
6.	*Colias e. erata*	+		
7.	*Artogeia canidia*			+
8.	*Pontia callidice*			+
9.	*Aporia agathon*			+
10.	*A. leucodice*			+
11.	*Kailasius charltonius*		+	
12.	*Callerebia h. hybrida*	+	+	
13.	*Erebia nirmala*			+

Name of the secies	Stempffer, Lesse and Barnardi (1952)	Arora *et al* (1977)	Baindur (1993)
14. *Vanessa egea*			+
15. *Aglais xanthomelos*			+
16. *Childrena kamala*			+
17. *Albulina metallica*	+		
18. *Polyommatus eros stoliczkana*	+		
19. *Lycaenopsis argiolus huegeli*	+		
20. *Lampides boeticus*			+
21. *Carterocephalus avanti*	+		
22. *Celastrina ladonides*		+	

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TRICHOPTERA

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INTRODUCTION

Popularly called Caddis Flies, the Trichoptera is one of the highly specialesed insect order showing complete metamorphosis in the life cycle. The members pass their early stages in fresh water. The adults are terrestrial resembling small moths. The larvae feed on algae, fungi, decaying leaves, micro-organisms and small invertebrates, the most important phenomenon is related to the energy transfer to aquatic eco-system by the trichopteran larvae which are either filter-feeders or predators. These provide nutrition of fishes and other aquatic vertebrates. The group plays very important ecological role in fresh water.

Major contributions on the taxonomical studies of the Trichoptera were made by Schmid (1970), Wiggins *et al.* (1985) and Ghosh & Chaudhury (*in* press). Out of about 7000 species recorded from the globe over 800 spp. are known from India, of which less than 15% are represented in the Western Himalaya.

This chapter deals with an account of two trichopteran species collected from Nanda Devi Biosphere Reserve (NDBR). Classification has been followed, as cited in the work of Ghosh (1991). Recently Ghosh & Choudhary (1995) recorded 59 species of Trichoptera from U.P.Himalaya.

SYSTEMATIC ACCOUNT

Suborder ANNULIPALPIA

Infra-order CURVIPALPIA

Superfamily HYDROPSYCHOIDEA

1 Family HYDROPSYCHIDAE

Genus *Hydropsyche* Picket

1. *Hydropsyche kaznakovi* Martynov

Material examined : India : U.P., Chamoli dist., Malari Reserve Forest & around, 3300 m, 2 exs., 18.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh (Garhwal Himalaya : NDBR, Kholara, Jhelum, Knert Pass), West Bengal (Darjeeling : Rongpo, Kalimpong). *Elsewhere :* Pakistan; Iran.

Remarks : The species, of which the status and abundance in its natural habitat are unknown, passes through the larval stage in silken non-partable retreats. The larva which has only anal blood-gills, is carnivorous in habit and secures prey by constructing silken snares around the mouth of its aquatic habitation.

Infra-order SPICIPALPIA
Superfamily HYDROPTILOIDEA
II Family GLOSSOSOMATIDAE
Genus *Glossosoma* Curtis

2. *Glossosoma fissum* Martynov

Material examined : India : U.P., Chamoli dist., Malari Reserve Forest & around, 3300 m, 4 exs., 18.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh (Garhwal Himalaya, NDBR, Kumaon Himalaya, Dehra Dun); West Bengal (Darjeeling : Ghoom-Bhanjan); Meghalaya (East Khasi Hills).

Remarks : The species, of which the status is unknown, passes through the larval stage in swift-flowing water. The larva, though belonging to the campodeoid type, lives exceptionally in a transportable case made of small stones. The species is apparently confined to Himalaya.

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DIPTERA

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INTRODUCTION

The Diptera comprising mosquitos, midges and flies are among the most highly spcialised members of the class insecta. Due to their highly adaptive nature they are very widely distributed in different climatic regions. Mostly the adults frequent flowers causing pollination and chiefly feed on nectar. However, some forms have developed the blood sucking habits and thus play a major role in transmitting many human diseases.

The present study lists 24 species, of which 10 are new records from NDBR.

SYSTEMATIC ACCOUNT

Suborder NEMATOCERA

1 Family TIPULIDAE

1. *Tipula (Vestiplex) himalayensis* Brunetti

Material examined : India : U.P., Almora dist., at and around Khati, 2210 m, 2 ♂♂, 29.viii.1990; on way to Dwali from Khati, 2210-2734 m, 3 exs, 29.viii.19990, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh and West Bengal.

2. *Nephrotoma consimills* (Brunetti)

Material examined : India : U.P., Almora dist., at and around Khati, 2210 m, 3 ♂♂. 1 ♀, 29.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Arunachal Pradesh, Sikkim, Uttar Pradesh and West Bengal.

3. *N.serricornis* (Brunetti)

Material examined : India : U.P., Almora dist., on way to Jatoli from Khati, 2210-2150m, 28.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Arunachal Pradesh, Bihar, Sikkim, Uttar Pradesh and West Bengal.

4. *Nephrotoma* sp.

Material examined : India : U.P., Almora dist., on way to Jatoli from Khati, 2210-2150 m, 1 ex. (damaged), 28.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Orissa and West Bengal.

5. *Styringomyia ceylonica* Edwards

Material examined : India : U.P., Almora dist., at and around Khati, 2210 m, 1 ♂, 29.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Orissa and West Bengal.

6. *Limnobia* sp.

Material examined : India : U.P., Almora dist., at and around Khati, 2210 m, 1 ex. (damaged), 29.viii.1990, on way to Dwali from Khati, 2210-2734 m, 1 ex. (damaged), 30.viii.1990, coll. *P.C. Tak* & party.

7. *Amalopis* sp.

Material examined : India : U.P., Almora dist., on way to Phurkia from Dwali, 2734-3260m, 1 ex. (damaged), 1.ix.1990, coll. *P.C. Tak* & party.

2. Family ANISOPODIDAE

8. *Sylvicola divisus* (Brunetti)

Material examined : India : U.P., Almora dist., on way to Dwali from Khati, 2210-2734m, 2♂♂, 1 ♀, 30.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Sikkim and West Bengal.

3. Family BIBIONIDAE

9. *Bibio rufifemier* Brunetti

Material examined : India : U.P., Almora dist., Zeropoint of Pindari Glacier, 3600 m, 2 ♂♂, 3 ♀♀, 2.ix.1990; Chamoli dist., Bedni and around, 3300-3500 m, 1 ♀, 8.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : West Bengal.

10. *Penthetria japonica* Wiedemann

Material examined : India : U.P., Almora dist., on way to Phurkia from Dwali, 2734-3260 m, 1 ♂, 1.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : Arunachal Pradesh, Assam, Bihar, Meghalaya, Uttar Pradesh and West Bengal.

11. *Plecia* sp.

Material examined : India : U.P., Almora dist., on way to Phurkia from Dwali, 2734-3260 m, 1 ♂, 1 ♀, 1.ix.1990, coll. *P.C. Tak* & party.

4. Family SCIARIDAE

12. *Sciara indica* Walker

Material examined : India : U.P., Almora dist., on way to Dwali from Khati, 2210-2734m, 1 ♀, 30.viii.1990; on way to Phurkia from Dwali, 2734-3260 m, 1 ♀, 1.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : Arunachal Pradesh, Uttar Pradesh and West Bengal.

13. *S. nigripennis* Brunetti

Material examined : India : U.P., Almora dist., on way to Jatoli from Khati, 2210-2150 m, 1 ♀, 28.viii.1990; Chamoli dist., Bedni to Bhagwabasa, 3500-4100 m, 1 ♀, 9.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Arunachal Pradesh, Manipur, Sikkim, Uttar Pradesh and West Bengal.

14. *Scythropochroa longinervis* (Brunetti)

Material examined : India : U.P., Almora dist., on way to Jatoli from Khati, 2210-2150 m, 1 ♀, 28.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh and West Bengal.

Suborder BRACHYCERA

5. Family TABANIDAE

15. *Philolichi longirostris* (Hardwicke)

Material examined : India : U.P., Almora dist., at and around Khati, 2210 m, 1 ♀, 29.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh.

6. Family ASILIDAE

16. *Machinus ricardoi* (Bromley)

Material examined : India : U.P., Almora dist., at and around Khati, 2210 m, 1 ♂, 29.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Himachal Pradesh, Meghalaya, Sikkim and West Bengal.

17. *Machimus* sp.

Material examined : India : U.P., Chamoli dist., Alpine meadows on way to Bedni, 3300-3500 m, 1 ♂ (damaged), 7.ix.1991, coll. *P.C. Tak* & party.

Suborder CYCLORRHAPHA

7. Family LONCHOPTERIDAE

18. *Lonchoptera guptai* Joseph & Parui

Material examined : India : U.P., Chamoli dist., Bedni and around, 3300-3500 m, 2 ♂♂, 2 ♀♀, 8.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Uttar Pradesh.

8. Family SYRPHIDAE

19. *Volucella discolor* Brunetti

Material examined : India : U.P., Almora dist., Zeropoint of Pindari Glacier, 3600 m, 1 ♂, 1 ♀, 2.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : Assam.

20. *Syrphus fulvifacies* Brunetti

Material examined : India : U.P., Almora dist., at and around Dwali, 2734 m, 3 ♂♂, 31.viii.1990; Chamoli dist., Wan, 2300 m, 4 ♀♀, 4.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Assam and Kashmir.

21. *S. aneifrons* Brunetti

Material examined : India : U.P., Chamoli dist., Bedni and around, 3300-3500 m, 1 ♂, 8.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Arunachal Pradesh.

22. *Episyrphus balteatus* (DeGeer)

Material examined : India : U.P., Almora dist., at and around Dwali, 2734 m, 1 ♀, 31.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Arunachal Pradesh, Assam, Jammu & Kashmir, Kerala, Meghalaya, Orissa, Sikkim, Tripura and West Bengal.

23. *Sepsis himalayensis* Bruneti

Material examined : India : U.P., Almora dist., on way to Jatoli from Khati, 2210-2150 m, 2 ♂♂, 2 ♀♀ 28.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : Arunachal Pradesh, Meghalaya and West Bengal.

10. Family SCATHOPHAGIDAE

24. *Scathophaga stercoraria* (Linnaeus)

Material examined : India : U.P., Chamoli dist., Wan, 2300 m, 1 ♂, 4.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Himachal Pradesh, Jammu & Kashmir and West Bengal.

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HYMENOPTERA

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INTRODUCTION

The hymenopteran insects, due to their economic and biological importance, are considered to be one of the most beneficial animal group. Among all orders of insects, the order Hymenoptera stands out for its typical way of living on the ground utilizing the environment fully and at the same time controlling other insects. Majority of these insects are beneficial rather than pestilential, as they make food, pollinate crops and destroy myriads of insect pests. However, a relatively small number of them are pests of crops and forests.

Gupta (1995), for the first time, published a consolidated account of the Hymenoptera (12 families) from western Himalaya (U.P.), while Jonathan (1995) dealt with the family Ichneumonidae. So far, only four species of Hymenoptera (Ichneumonidae) have been reported from three different localities falling in buffer zone of the biosphere, viz., *Dyspetes orientalis uttara* Gupta from Dwali (2734 m), *Exetastes longiceps* (Smith) from Phurkia (2504 m), *Ophion mastrus* Gauld from Malari (3100 m) and *Netelia kashmirensis* (Cameron) from Malari (3033 m).

The present communication gives a detailed systematic account of 24 species of Hymenoptera belonging to 19 genera and 10 families. This includes four undescribed species, the descriptions of which will be published separately. The genus *Mellinus* Fabricius (Sphecidae) is being recorded here, for the first time, from the Oriental Region.

The total number of the species known from the biosphere is raised to twenty eight.

SYSTEMATIC ACCOUNT

1. Family PROCTOTRUPIDAE

1. *Phaenoserphus* sp.

Material examined : India : U.P., Almora dist., on way to Phurkia, 2734-3260 m, 1 ♂, 1.ix.1990, coll. *P.C. Tak* & party.

Remarks : Mani & Sharma (1982) reported the family Proctotrupidae for the first time from India by two undescribed species of the genus *Phaenoserphus* Kieffer. One species was collected from Siwalik hills and the other from Mahabaleshwar. The above mentioned specimen, possibly, belongs to one of these undescribed species.

2. Family ICHNEUMONIDAE

2. *Netelia fuscicornis* (Holmgren)

Material examined : India : U.P., Chamoli dist., Lata village, 2133 m, 1 ♀, 8.ix.1989; Malari, 3190 m, 4 ♂♂, 17.ix.1989; Almora dist., on way to Phurkia, 2734-3260 m, 1 ♂, 1.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : J&K, H.P., U.P., West Bengal, Sikkim. *Elsewhere :* Pakistan; Nepal; China; Afghanistan; Russia; Japan; Spain; Sweden; Italy; Macedonia; Turkey; Finland and England.

3. Family TIPHIIDAE

3. *Tiphia magrettii* Cameron

Material examined : India : U.P., Chamoli dist., Malari Reserve Forest, 3350 m, 1 ♀, 18.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : U.P. (Dehra Dun and Chamoli district).

Remarks : This uncommon species is, hitherto, known by a female holotype.

4. *Tiphia* sp.

Material examined : India : U.P., Almora dist., on way to Dwali, 2210-2734 m, 1 ♀, 30.viii.1990, coll. *P.C. Tak* & party.

Remarks : This unique female specimen, belonging to an undescribed species, differs from all the known species of the genus *Tiphia* from India in having forewing with a single submarginal cell instead of two.

4. Family SCOLIIDAE

5. *Megacampsomeris prismatica* (Smith)

Material examined : India : U.P., Chamoli dist., southern slope of the Rishi Gorge, 2.5 km SE of Reni village, 2000-2200 m, 1 ♂, 6.ix.1989; on way to Wan, 2150-2300 m, 1 ♂, 2.ix.1991; Almora dist., on way to Dhakuri, 1750-2900 m, 1 ♂, 25.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : H.P. (Shimla), U.P., West Bengal (Darjeeling dist.), Meghalaya, Assam, Sikkim. *Elsewhere :* Myanmar; Malaysia; Indonesia : Sumatra, Sulawesi; Japan; Taiwan; Philippines; China.

6. *Scolia (Discolia) dehraensis* Betrem

Material examined : India : U.P., Chamoli dist., on way to Tolma, 1828-2438 m, 1 ♀, 11.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : U.P.; H.P.

5. Family VESPIDAE

7. *Vespa velutina auraria* Smith

Material examined : India : U.P., Chamoli dist., Lata village, 2133 m, 2 ♀♀, 8.ix.1989; Almora dist., on way to Dhakuri, 1750-2900 m, 1 ♀, 25.viii.1990; on way to Dwali, 2210-2734 m, 1 ♀, 30.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : J&K, H.P., U.P., Meghalaya, Assam. *Elsewhere :* Nepal; Myanmar.

8. *Vespa vivax* Smith

Material examined : India : U.P., Almora dist., on way to Phurkia, 2734-3260 m, 1 ♀, 1.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : J. & K., H.P., U.P. *Elsewhere :* Myanmar; Thailand; China.

9. *Vespula flaviceps flaviceps* Smith

Material examined : India : U.P., Chamoli dist., Malari Reserve Forest, 3350 m, 1 ☿, 1 ♂, 18.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : H.P., U.P., Manipur, Assam, Sikkim. *Elsewhere :* Myanmar; China; Korea; Southern Primore's.

10. ***Vespula structor*** Smith

Material examined : India : U.P., Almora dist., Dwali, 2734 m, 3 ♀♀, 31.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : J. & K. (Kashmir), H.P., U.P. *Elsewhere :* Nepal; southern China.

6. Family EUMENIDAE

11. ***Eumènes punctata*** Saussure

Material examined : India : U.P., Chamoli dist., Belta Nullah, 2700 m, 2 ♀♀, 7.ix.1989; Lata village, 2133 m, 3 ♀♀, 2 ♂♂, 8.ix.1989; Suraithota-Tolma Trek, 1828-2438 m, 1 ♂, 11.ix.1989; Wan, 2300 m, 1 ♂, 4.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : U.P., Sikkim. *Elsewhere :* Myanmar.

7. Family FORMICIDAE

12. ***Aphaenogaster sagei*** (Forel)

Material examined : India : U.P., Chamoli dist., Bedni, 3300-3500 m, 1 ☿, 8.ix.1991; Almora dist., Zero Point of Pindari Glacier, 3600 m, 2 ☿☿, 2.ix.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Burfu, 3300 m, 7 ☿☿, 10.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : H.P. (Lahaul-Spiti), U.P. *Elsewhere :* China (Tibet).

Remarks : This is the first record of this species from Uttar Pradesh.

8. Family POMPILIDAE

13. ***Auplopus blandus*** (Guerin)

Material examined : India : U.P., Chamoli dist., on way to Wan, 2150-2300 m, 1 ♀, 2.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : The species is widely distributed. *Elsewhere :* Oriental Region, ranging from Sri Lanka and India through Thailand, Vietnam, Malaysia, Singapore, Sarawak and Sumatra to Java.

14. *Auplopus tinctus* (Smith)

Material examined : India : U.P., Almora dist., on way to Dwali, 2210-2734 m, 1 ♀, 30.viii.1990, coll. *P.C. Tak* & party.

Distribution : India : U.P., West Bengal, Sikkim. *Elsewhere :* Myanmar.

15. *Aporus cotesi* Cameron

Material examined : India : U.P., Chamoli dist., Malari, 3190 m, 1 ♀, 17.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : U.P., Bihar (Pusa), West Bengal, Gujarat.

Remarks : The species is being reported, for the first time, from Uttar Pradesh.

9. Family SPHECIDAE

16. *Ammophila punctata* Smith

Material examined : India : U.P., Chamoli dist., Reni village, 2000 m, 1 ♀, 5.ix.1989; Belta Nullah (Kharak), 2700 m, 1 ♀, 7.ix.1989; Tolma-Himtoli Trek, 2450-2700 m, 1 ♂, 13.ix.1989; Malari & around, 3190 m, 1 ♂, 17.ix.1989; Malari Reserve Forest, 3350 m, 1 ♀, 18.ix.1989; on way to Wan, 2150-2300 m, 1 ♀, 2 ♂♂, 2.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : U.P., Sikkim. *Elsewhere :* Myanmar.

17. *Podalonia* sp.

Material examined : India : U.P., Lata Kharak, 3800 m, 2 ♂♂, 20.vi.1993, coll. *A. Baindur* & party.

Remarks : The genus *Podalonia* Fernald is represented in India by a single species, viz., *P. hirticeps* (Cameron) from Gilgit (J&K). The above mentioned two males, belonging to an undescribed species, are very close to that of *P. hirticeps* in having more or less similar punctation on the body. But can be easily differentiated by having entirely fuscous wings and first to

fourth abdominal segments being reddish instead of the wings being hyaline and second to fifth abdominal segments being reddish.

18. ***Psen orientalis*** Cameron

Material examined : India : U.P., Chamoli dist., on way to Tolma, 1828-2438 m, 1 ♀, 11.ix.1989; Almora dist., Khati, 2210 m, 3 ♀♀, 4 ♂♂, 29.viii.1990; Dwali, 2734 m, 1 ♀, 4 ♂♂, 31.viii. 1990; on way to Phurkia, 2734-3260 m, 1 ♀, 1.ix.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 2500 m, 5 ♀♀, 1 ♂, 7.ix.1993; Rilkote, 3400 m, 1 ♀, 1♂, 9.ix.1993; Burfu, 3300 m, 1 ♀, 10.ix.1993; Bilju, 3300 m, 1 ♀, 11.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Meghalaya, U.P.

Remarks : This is the first record of this species from Uttar Pradesh.

19. ***Psenulus montanus*** (Cameron)

Material examined : India : U.P., Almora dist., on way to Phurkia, 2734-3260 m, 5 ♂♂, 1.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : H.P. (Shimla), U.P.

Remarks : This is the first record of this species from Uttar Pradesh.

20. ***Pemphredon fuscipennis*** Cameron

Material examined : India : U.P., Chamoli dist., Tolma-Himtoli Trek, 2450-2700 m, 1 ♂, 13.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : U.P. (Dehra Dun and Chamoli districts).

21. ***Mellinus*** sp.

Material examined : India : U.P., Almora dist., Dwali 2734 m, 1 ♀, 31.viii.1990; on way to Phurkia, 2734-3260 m, 1 ♀, 1.ix.1990, coll. *P.C. Tak* & party.

Remarks : The genus *Mellinus* Fabricius is distributed in the Holarctic Region, where it is represented by 13 species. The above mentioned two females, belonging to an undescribed species, make the first ever record of this genus from the Oriental Region.

10. Family APIDAE

22. *Apis (Megapis) laboriosa* Smith

Material examined : India : U.P., Chamoli dist., Reni village, 2000 m, 1 ☿, 5.ix.1989; Lata, 2133 m, 1 ☿, 8.ix.1989; on way to Tolma (Suraithota-Tolma Trek), 1828-2438 m, 1 ☿, 11.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : Arunachal Pradesh, Sikkim, West Bengal (Darjeeling) *Elsewhere :* Nepal; Myanmar; China.

Remarks : This is the largest honey bee species, and is being recorded here for the first time from western Himalaya.

23. *Bombus tunicatus* Smith

Material examined : India : U.P., Chamoli dist., Lata village, 2133 m, 1 ♂, 1 ☿ 8.ix.1989; Malari, 3190 m, 1 ☿, 17.ix.1989; Almora dist, Dwali, 2734 m, 1 ☿, 31.viii.1990, coll. *P.C. Tak* & party; Milam, 3500, 3500 m, 2 ♀♀, 14.iv.1993, coll. *J.P. Sati* & party.

Distribution : India : U.P.; China.

24. *Bombus flavescens* Smith

Material examined : India : U.P., Chamoli dist., on way to Tolma, 1828-2438 m, 1 ☿, 3 ♂♂, 11.ix.1989; Bedni, 3300-3500 m, 2 ♂♂, 8.ix.1991, coll. *P.C. Tak* & party; Pithoragarh dist., Bugdiyar, 2500 m, 1 ♂, 7.ix.1993, coll. *J.P. Sati* & party).

Distribution : India : U.P., H.P., Sikkim. *Elsewhere :* China.

Remarks : This is the new distributional record of the species from Uttar Pradesh.

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CHILOPODA

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INTRODUCTION

Till recently very little was known about the centipede fauna of India in general and Western Himalaya in particular. Of late some progress has been made on the Himalayan fauna by Gravely (1910), Khanna (1994a and 1994b) and Khanna & Kumar (1984).

Though small, the group Chilopoda forms an interesting component of NDBR fauna. A total of 193 exs. of these multi-legged animals were collected, majority of which belonged to the order Lithobiomorpha, Geophilomorpha and Scutigeromorpha and a few specimens to the order Scolopendromorpha, while only 13 specimens represent the class Diplopoda. From the total collection it appears that the percentage of Scolopendrid centipedes in "Buffer zone" of NDBR is again much less than that of other orders of class Chilopoda, conforming to the pattern of distribution in plateau land of the Indian subcontinent.

SYSTEMATIC ACCOUNT

Class CHILOPODA
Order SCOLOPENDROMORPHA
Family SCOLOPENDRIDAE
Subfamily OTOSTIGMINAE
Tribe OSTOTIGMINI

1. *Otostigmus poonamae* Khanna and Tripathi

Material examined : India : U.P., Chamoli dist., village Reni and around, 2000-2200 m, 1 ex., 5.ix.1989; Southern slope of Rishi Gorge, 2000-2200 m, 1 ex., 6.ix.1989, coll. *P.C. Tak* & party.

Remarks : The species was originally collected and described from Durgathi village, distt. Chamba (Himachal Pradesh) and was subsequently reported by Khanna (in thesis) from Uttarkashi and Chamoli distts. Therefore, the occurrence of this species within perimeter of NDBR is not intriguing but may be considered as an extention of its range.

2. ***Rhysida monalii*** Khanna and Kumar

Material examined : India : U.P., Almora dist., Dhakuri, along Pindari Trek, 1750-2900 m, 1 ex., 29.viii.1990, coll. *P.C. Tak* & party.

Remarks : Rhysida monalii is a well distributed species, occurring widely in the Western Himalaya, Uttar Pradesh, Himachal Pradesh and Jammu & Kashmir. The present record of the species from NDBR is again an extension of range of its distribution.

Family CRYPTOPIDAE

Subfamily CRYPTOPINAE

3. ***Cryptops (Cryptops) doriae*** Pocock

Material examined : India : U.P., Chamoli dist., 8 point (Malari-Girthi Road), 3250-3350m, 1 ex., 16.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : Taloshi, Satara dist., Maharashtra. *Elsewhere :* Java, Myanmar and New Guinea.

Remarks : The genus *Cryptops (Cryptops)* is represented by two species from India. The other known species is *C. (C.) kempi* Silvestri, recorded from Siju caves, Assam. The species *doriae* Pocock differs from *kempi* Silvestri in having its cephalic plate without a pair of longitudinal furrows and also the first tergal segments is without ring furrow (both the characters are present in *kempi*).

C. (C.) doriae is a first record of the species and the genus as well from Western Himalayan region of Uttar Pradesh.

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PISCES

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INTRODUCTION

The NDBR has attracted the attention of various workers on wildlife in the past but no effort has so far been made to explore its fish life though some references (Badola and Singh, 1977, Singh *et al.*, 1987, 1991, Husain, 1995) on ichthyofauna of water sheds around NDBR are available. During the present study of this biosphere reserve two juvenile fish specimens from a torrent were collected and reported here as per the details given below.

SYSTEMATIC ACCOUNT

Class OSTEICHTHYES

Order CYPRINIFORMES

Family CYPRINIDAE

Subfamily SCHIZOTHORACINAE

Schizothorax richardsonii (Gray)
Common Snow Trout

Material examined : India : U.P., Chamoli dist., Wan nala, 2300 m, 2 exs., 4.ix.1991, coll. *P.C. Tak* & party.

Distribution : India : Along Himalaya. *Elsewhere :* Afghanistan; Pakistan; Nepal and Bhutan.

Remarks : It is known as Asela, Maseen or Sahal in the region. It attains quite a good size (61 cm in total length). The occurrence of juveniles in Wan nala (a tributary of Pindar river) during September indicates that the fish breeds in the area around July - August.

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AMPHIBIA

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INTRODUCTION

Present study is based on first-hand observations and selective collection of 13 adults, one juvenile and 349 tadpoles from different localities of Nanda Devi Biosphere Reserve. Systematic analysis reveals the presence of eight anuran species under four genera and two families of which *Rana (Paa) dhakuriensis* is new to science. The identification of tadpoles confirmed to generic level only, further study of different stages at different times along with juvenile and adults may unfold the real diversity more than what is documented. Nevertheless this first ever attempt to explore and document the amphibian diversity is of paramount importance for conservation and management of these delicate animals which can unfold several vital information on aquatic and terrestrial health of environment where they live. It is hoped that the present systematic account would kindle the interest of high altitude amphibian study in future.

SYSTEMATIC ACCOUNT

Order ANURA
Suborder ARCIFERA
1. Family BUFONIDAE

1. *Bufo himalayanus* Gunther

Material examined : India : U.P., Chamoli district, Suraithota and around, 2000 m, one ♀, 10.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : Himalaya, western to eastern. *Elsewhere :* Nepal.

Remarks : Several examples were observed throughout the trek ranging from 1,700 m to 3,000 m. Adults can be easily differentiated from co-gener *Bufo melanostictus* with the absence of cranial ridge and body warts more flattened, parotoid gland low and almost conceals the

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tympanum. Males smaller, near half the length of amplectant females. Black fleshy tadpoles congregate near slow running waterpools, scavanging on the submerged algal encrustations on the rock surfaces and also accumulated debris on the leeward spaces. Largest toad of India feeds on large insects and molluscans like slugs and snails of high altitude.

2. *B. melanostictus* Schneider

Material examined : India : U.P., Chamoli district, Suraithota and around, 1829 m, one ♂, 10.ix.1989; several juveniles observed near Reni village, 05.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : Plains to 2,000 m. *Elsewhere :* Nepal; Pakistan.

Remarks : Widely distributed throughout India ascends upto 2,000 m in Western Himalaya; common near human habitations.

2. Family PELOBATIDAE

3. *Megophrys* sp.

Material examined : India : U.P., Almora district, Dhakuri and around, 2750 m, one hundred forty tadpoles of different stages, 26.vii.1990, coll. *P.C. Tak* & party.

Distribution : India : Western to eastern Himalaya. *Elsewhere :* Myanmar; Nepal; Thailand and Phillipines.

Remarks : Tadpoles were vertically clinging on the surface of water keeping their head upside. Funnel type mouth feeding from the surface material and tail flickering continuously under water. This feeding behaviour isolates them from other Ranid tadpoles available in the same stream.

Suborder FIRMISTERNIA

3. Family RANIDAE

3. *Amolops* sp.

Material examined : India : Uttar Pradesh, near Almora district, Khati and around, 2210 m, five tadpoles, 29.viii.1990, coll. *P.C. Tak* & party; Mapang, 2800 m, five tadpoles, 09.ix.1993, Rilkote, 3200 m, three tadpoles, 08.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Himalaya (Himachal Pradesh, Uttar Pradesh, Darjeeling (West Bengal), Meghalaya, Arunachal Pradesh. *Elsewhere :* Myanmar; South China; Phillipines.

Remarks : Remarkable torrential stream dwelling tadpoles with ventral abdominal sucker. Rare to get enough samples because of camouflaging colouration coupled with adhesive mechanism against substratum in the fast flowing stream. Adaptive modification of oral structure, caudal muscle with thick membrane enhances its success of survival in unique aquatic environs of higher elevations, therefore, study of these tadpoles will certainly reveal important profile of hydrodynamics in future. Two sympatric species *Amolops afghanus, A. formosus,* occurring in the remote mountainous streams of Uttar Pradesh Himalaya (Ray, 1992). Exact correlation with their corresponding adult need special study throughout the year from spawing to the juveniles and adult. Kripalani (1952) tried to solve the problem on the basis of preserved material but not satisfactory as per my own observations in the field and study of several tadpoles belonging to different stages.

5. *Rana (Paa) annandalii* Boulenger

Material examined : India : NDBR, Almora district, Maliadoh and around, 2,500 m, one example (Juvenile), 04.ix.1990, coll. *P.C. Tak* & party.

Distribution : India : West Bengal (Darjeeling District), Western Himalaya (NDBR).

Remarks : The identification based on distinctive morphology described by Boulenger (1920). Dubois (1974, 1975) described *Rana rostandi* morphologically nearest to *Rana annandalii* Boulenger. Present identification is handicapped because of non-availability of enough material. Hence need more collection based study from the same area in future. *Rana annandalii* has so far been recorded from Darjeeling (West Bengal), present record from Almora district is an addition to the amphibian fauna of western Himalaya.

6. *R. (P.) blanfordii* Boulenger

Material examined : India : U.P., Almora district, Loharkhet and around, 1100-1750 m, three examples, 24.viii.1990, Chamoli district, Renuka Dhar, 2500 m, one example, 11.ix.1991, Lohajung - Wan, 2150-2300 m, 23 examples of tadpoles, 02.ix.1991, Wan, 2300m, 50 examples of tadpoles, 04.ix.1991, coll. *P.C. Tak* & party; Almora district, Kalamuni Road, 2900 m, two examples, 07.ix.1993, Bilati, one example, 2900 m, 09.ix.1993, coll. *J.P. Sati* & party.

Distribution : India : Western Himalaya, (1100 m to 3000 m).*Elsewhere :* Nepal.

Remarks : Most widely distributed and shows remarkable variations in colour and size in western Himalaya. Large tadpoles longer than adult male and female with long caudal peduncle; voraciously feed on algal encrustations of the stream bottom strewn with gravels. Camouflaging colouration makes them difficult to locate unless otherwise collected. Riparion frogs of moun-

tainous region. Males with internal vocal sac, mating calls can be heard and supersede echo of water falls. Spawn adheres on the submerged vegetation near the water edges. Microhabitat preference understones near the water edges. Adults gut contents comprise of mostly trichopterans.

7. *Rana (Paa)* sp.

Material examined : India : U.P., Almora district, slow running stream near Dhakuri, one hundred examples of tadpoles, 26.vii.1990, coll. *P.C. Tak* & party.

Distribution : No record.

Remarks : Tadpoles bear characters of Ranid family. Morhpological similarity puts them nearer to the description of *Rana leibigii* Boulenger. Also shows some remarkable differences which restrain me to put them under aforesaid species without study of adults in relation with developmental stages.

8. R. dhakuriensis n. sp.

Material examined : India : Almora district, Dhakuri, under logs on the forest floor, 2750m, six examples, 26.viii.1990, U.P., coll. *P.C. Tak* & party.

Distribution : New to science, available only in the type locality.

Remarks : Six examples of adults collected from moist forest floor under logs. Microhabitat shared with several earthworms, beetles and ground inhabiting ants. Morphologically differs from all other species known from the neighbouring areas. Cryptic colouration perfectly camouflaged these individuals with the natural surroundings. Detailed description will be published after thorough study of the material.

Being in the midst of western Himalayan ecosystem, this Biosphere Reserve shows several species of continuous distribution from north-west to south-east. Northern most snow desert does not favours amphibian to live. But towards southeast species diversity comparatively more in quality than quantity. Slow leaping animal adapted in the temperate to subtropical climate often restricted to a small area. Potentially low movement affected by severe climatic constraints possibly restricted them into a small microhabitat into the Himalayan terrain. Probably aquatic phase - tadpole stage owing to their stream dwelling habit is the only period they can disperse their progeny from one habitat to the other. Migration pattern of tadpole is so uncertain that it is difficult to follow through. Cold tolerant tadpoles immediately feel uncomfortable to the highest temperature thereby distributional pattern only restricted to certain altitude with specific microclimatic conditions. Such species with small range of migration obviously merit for zoogeo-

graphical studies. Habitat occupied with lizards, snakes, scorpions, centipedes as predator on one hand and several prey species of insects ranging from hemiptera, coleoptera, hymenoptera, dermaptera, trichoptera, also oligochaeta and mollusca can forecast some possible interelationship amongst them. Interestingly, field observations indicate some correlation with the oligochaetes (earthworms) and amphibians. It's premature to conclude any substantial hypothesis but after several field survey experience clearly indicates the probable presence of anurans where ever earthworms were available. It is also noticed that the limit of highest altitude preference of earthworms and frogs is almost same as experienced in the Nanda Devi Biosphere Reserve.

Status of collected sample is rare. As their habitat is not so threatened by anthropogenic pressures, it is presumed that except natural disaster their survival value remains as before. More extensive survey may unfold several interesting phenomena of these delicate but interesting group of transitional animals between water and land.

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REPTILIA

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INTRODUCTION

During the recent survey of NDBR a good number of reptiles (lizards and snake) were collected or sighted, out of which the details of three species are reported here. The identity of the lizard material collected from the locality 8-point-(Malari area) during 1989 Survey is being ascertained and will be published elsewhere on completion of the study. No reptile has so far been recorded from this high altitude biosphere reserve by earlier workers though some reports (Annandale, 1907; Wall, 1907; Smith 1935, 1943; Husain 1995) from around are available.

SYSTEMATIC ACCOUNT

Class REPTILIA

1. Order SAURIA

1. Family AGAMIDAE

1. *Agama tuberculata* Gray
Common Rock Lizard

Material examined : Sight records : India: U.P., Chamoli dist., Reni-Malari route, 1800-2500 m, during 1-20.ix.1989 Survey; Roopkund trek, 1800-2500 m, during 29.viii.-19.ix.1991 Survey; Almora dist.; Pindar trek, 1800-2500 m, during 20.viii.-12.ix.1990 Survey, *P.C. Tak* & party; Pithoragarh dist., Milam trek, 1800-2500 m (Lilam, 1800 m; Rargari, 2100 m; Bugdiyar, 2500 m), during 1-26.ix.1993, *J.P. Sati* & party.

Distribution : India : Western Himalaya (Uttar Pradesh), Himachal Pradesh, Jammu & Kashmir). *Elsewhere :* Afghanistan; Pakistan and Nepal.

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2. Family SCINCIDAE

2. *Scincella himalayanum* (Gunther)
Himalayan Skink

Material examined : India : U.P., Chamoli dist., Southern slope of Rishi Gorge, 2.5 km south-east of village Reni, 1829-2134 m, Malari area, 4 exs., 6.ix.1989; Renuka Dhar, 2500 m, Roopkund area, 3 exs., 3.ix.1991; Almora dist., Pindari trek from Loharkhet, 1750 m to Phurkia, 3260 m, 24.viii.1990; Dhakuri, 2750 m, 2 exs., 26.viii.1990; Khati, 2210 m, 2 exs., 30.viii.1990; Dwali, 2734 m, 4 exs., 4.ix.1990, coll. *P.C. Tak* & party; Pithoragarh dist., Burfu, 3300 m, Milam area, 2 exs., 10.ix.1993, *J.P. Sati* & party.

Distribution : India : Western Himalaya (Uttar Pradesh, Himachal Pradesh, Jammu & Kashmir), ascending to 3658 m elevation, common between 1219 m and 2734 m. *Elsewhere :* S. Turkistan; Pakistan and Nepal.

2. Order SERPENTES

3. Family COLUBRIDAE

3. *Amphiesma platyceps* (Blyth)
Mountain Keelback

Material examined : India : U.P., Chamoli dist., Suraithota, 1981 m, Malari area, 1 ex., (snout to vent 50 cm, tail 17 cm), 10.ix.1989, coll. *P.C. Tak* & party.

Distribution : India : Himalaya, generally between 1524 m and 1829 m altitude. *Elsewhere :* Nepal (up to 3658 m).

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AVES

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INTRODUCTION

There is no comprehensive bird list of the biosphere (NDBR) other than those by Reed (1979), Lamba (1987), Tak and Kumar (1987) and Sankaran (1993). In the present study an attempt has been made to prepare a detailed account from the published information and also from the field observations recently made during the course of four successive faunistic surveys in different parts of buffer zone of the biosphere (Plate IV, 5 & 6).

SYSTEMATIC ACCOUNT

Sofar a total of 175 species and subspecies of birds, belonging to 95 genera 37 families and 13 orders have been recorded from the biosphere. The nomenclature followed is after Ali & Ripley (1968-78). The subspecific level is included on the basis of the reported range of the subspecies.

The most notable feature about the avi-fauna of the biosphere is the survival of the much depleted populations of following seven endangered species :

1. *Aquila chrysaetos daphanea* (Severtzov)
   Himalayan Golden Eagle

2. *A. rapax nipalensis* Hodgson
   Eastern Steppe Eagle

3. *Ictinaetus malayensis perniger* (Hodgson)
   Black Eagle

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

5. *Tetragallus himalayensis himalayensis* G.R. Gray
   Himalayan Snowcock

6. *Lophophorus impejanus* (Latham)
   Himalayan Monal Pheasant or Impeyan

7. *Pucrasia macrolopha macrolopha* (Lesson)
   Koklas Pheasant

Status-wise categorization of the 175 species and subspecies resulted in the following (After Ali & Ripley, 1968-78) (*vide* Table-4):

Status	Species Nos.
Resident & / or breeeds (R br)	127
Winter visitor (WV)	10
Summer visitor (SV)	23
Altitudinal migrant (AM)	14
Monsoon visitor (MV)	01
Total :	175

Classification of birds, recorded sofar, according to families and subfamilies revealed that the subfamily Turdinae (Thrushes & Chats) appears to be the most dominant (26 species), followed by family Fringillidae (Finches) with 17 species; Sylvinae (Warblers) and Accipitridae (Hawks & Vultures) 13 species each; and Corvidae (Crows, Magpies, Jays, Choughs, etc.) and Paridae (Tits or Titmice) 10 species each (Table-4).

Habitat-wise analysis for the species richness indicates that it was highest in temperate forest (below 2800 m) with 89 species (25 exclusive species), followed by subalpine forest (between 2800 and 3800m) with 86 species (28 exclusive species) and alpine meadows (3800-5000 m) with 47 species (14 exclusive species) (Table-2).

Theoritically, the species richness of temperate forest is likely to be much higher as this habitat type is least surveyed by the above mentioned workers mainly because the target-bound and time-bound multidisplinary high altitude expeditions do not permit sufficient time to be spent in this particular type of habitat.

The altitudinal records as observed are presented against each bird species in Table-4, which reveals that as many as 69 (out of 175) species and subspecies have been recorded beyond their documented (Ali & Ripley, 1968-78) altitudinal range. This has been idicated with a sign of plus (+), wherever applicable, in column for altitude (Table-4).

Further, altitudinal distribution of the avi-fauna is given separately in Table-3, which denotes a significant decline in species richness as elevation increase. This is in concurrence with the distributional pattern of avi-fauna in respect of habitat type (Table-2).

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Table 1 : Summary of the ornithological studies carried out in Nanda Devi area.

Sl. No.	Worker/year	Total spp. reported	From NDBR	Joshimath	Exclusive spp. **
1.	Reed, T.M. (1979)	93	70 (CZ)	*23	22
2.+	Lamba, B.S. (1987)	80	80 (CZ)	–	23
3.	Sankaran, R. (1993)	114	84 (CZ)	*30	23
4.+	Tak, P.C. & Kumar, G. (1987)	80	80 (CZ)	–	23
5.	Tak, P.C. (1989) Tour Report (M/ss)	33	33 (BZ)	–	04
6.	Tak, P.C. (1990) - do	44	44 (BZ)	–	04
7.	Tak, P.C. (1991) - do -	40	40 (BZ)	–	05
8.	Tak, P.C. (1993) - do	39	39 (BZ)	–	00

Note :

NDBR = Nanda Devi Biosphere Reserve
NDNP = Nanda Devi National Park
CZ = Core Zone = NDNP
BZ = Buffer Zone (1989 = Lata-Girthi area; 1990 = Pindari area; 1991 = Roopkund area & 1993 = Milam area)
\+ = Results of the common study actually conducted under MAB Programme
* = Bird species that were acutally observed in temperate oak forest around Joshimath, but included in NDBR with presumption that the similar temperate oak forest that are present in the NDBR does support these bird species.
** = The number of species which have not been observed by other workers from the biosphere.

Table 2 : Habitat-wise distribution of bird species (Nos. only) in Nanda Devi Biosphere Reserve.

Sl. No.	Habitat type	Total spp.	Exclusive spp.
1.	Alpine meadows	47	14
2.	Subalpine forest	86	28
3.	Upper temperate forest	89	25
4.	Water courses/bodies	08	06
5.	Cliffs	21	08
6.	Boulder strewn slopes with sparse vegetation	06	02
7.	Agriculture/habitation	34	01

Table 3 : Altitudinal distribution of bird species (Nos. only) in Nanda Devi Biosphere Reserve.

Altitude (m)	Total species				Species overlap			
4800 - 5800	08							
				6				
3800 - 4800	47							
		18						
2800 - 3800	61				15		2	
				36				1
1800 - 2800	56							

Table 4 : Showing status, distribution, habitat, altitudes and abundance ranking of birds in Nanda Devi Biosphere Reserve.

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
	Class : AVES Order : ANSERIFORMES Family : Anatidae						
1.	*Anser* sp.		Near a col on Nanda Devi	5	7300	1	a
	Order : FALCONIFORMES Family : Accipitridae (Hawks, Vultures etc.)						
2.	*Accipiter nisus* (Linnaeus), Sparrow-Hawk	R br	Dibrugheta, Burfu	1, 2	3300	2	c, h
3.	*Buteo rufinus rufinus* (Cretzschmar), Longlegged Buzzard	br	Maltoni Pass, Malla Dibrugheta	1, 2	3900	2	c
4.	*Hieraaetus pennatus* (Gmelin). Booted Hawk-Eagle	WV/R	Above Rishiganga Gorge, Bethartoli	3, 1, 5	2600-3900	2	c
5.	*Aquila chrysaetos daphanea* (Severtzov), Himalayan Golden Eagle	R &E	Lata, Patalkhan, Changbang bc, Sarsopatal bc, Above the confluence of Trishul nalla & Rishiganga; between Dhakuri & Khati	1,2	2800-4700	2	a-d, f

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
6.	*A. rapax nipalensis* Hodgson, Eastern Steppe Eagle	WV&E	Belta, Joshimath	3	2500	1	a, b, d
7.	*Ictinaetus malayensis perniger* (Hodgson) Black Eagle	R&E	Belta, Dibrugheta	2, 3	+2700-3500	1	b, d
8.	*Sarcogyps calvus* (Scopoli), Black or King Vulture	R	Bakarigad	3	2000	1	g
9.	*Aegypius monachus* (Linnaeus), Cinereous Vulture	R br	Ramani, Bhujgara	2	+3600-3900	2	a
10.	*Gyps himalayensis* Hume, Himalayan Griffon Vulture	R	Throughout the reserve	1-3, 5-7	2500-4500	6	a-h
11.	*G. bengalensis* (Gmelin), Indian Whitebacked Vulture	R	Belta, Joshimath	2	2000	2	a, e
12.	*Neophron percnopterus percnopterus* (Linnaeus), Egyptian Vulture	R	Lata, Joshimath	2	2200	1	a, e
13.	*N. p. ginginianus* (Latham), Indian Scavenger Vulture	R	Suraithota	2	2000	2	b, d
14.	*Gypaetus barbatus aureus* (Hablizl), Lammergeier or Himalayan Bearded Vulture	R&E	Throughout the reserve	1,2,5	+2000-4500	4	a-h

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
	Family : Falconidae (Falcons)						
15.	*Falco peregrinus* Tunstall, Peregrine Falcon	WV	Lata	5	2000	1	a, c
16.	*F. tinnunculus tinnunculus* Linnaeus, European Kestrel	br	Throughout the reserve, mostly in buffer zone	2, 3, 5	2000-3000	3	a-h
	Order : GALLIFORMES						
	Family : Phasianidae (Pheasants, Partridges etc)						
17.	*Lerwa lerwa* (Hodgson), Snow Partridge	R	Satkula, Dharansi, Dibrugheta	1, 6	3500-4700	2	b-d
18.	*Tetraogallus himalayensis himalayensis* G.R. Gray Himalayan Snowcock	R&E	Bhujgara-Patalkhan, Sarsopatal, north sanctuary	1,5	+4000-4900	4	a-d
19.	*Alectoris chukar chukar* (G.E. Gray), Chukor Partridge	R	Sauraithota; Khati; Lilam	3, 7	2000-2500	3	b,d-f,h
20.	*Lophophorous impejanus* (Latham), Himalayan Monal Pheasant	R&E	Belta-Ramani; Tolma, Malari; Gairoli Patali, Bhagwabasa; Phurkia	2,3,1	2800-4200	5	a-g
21.	*Lophura leucomelana hamiltonii* (G.E. Gray), Whitecrested Kaleej Pheasant	R	Belta; Wan	3	2800-3000	2	a, g

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
22.	*Pucrasia macrolopha macrolopha* (Lesson), Koklas Pheasant	R&E	Dibrugheta, Belta, Tolma; Lohajung	2,3	2150-3500	3	b-e, g
	Order : CHARADRIIFORMES Family : Charadriidae (Plovers, Sandpipers, Snipe)						
23.	*Tringa ochropus* Linnaeus, Green Sandpiper	WV	Dhakuri; Milam	1,2	+2900-3500	1	f, h
24.	*Scolopax rusticola rusticola* Linnaeus, Woodcock	br	Belta, Lata Kharak	3,2	2500-3700	2	b, d
	Order : COLUMBIFORMES Family : Columbidae (Pigeons, Doves)						
25.	*Columba leuconota leuconota* Vigors, Himalayan Snow Pigeon	R	Lata Kharak, Satkula, Dharansi, above Dibrugheta, Bhujgara, Patakhan, Sarsopatal, Gufa camp, Tala camp; Bhagwabasa; Burfu & Milam	1, 2, 5	2800-4900	6	a-d,g,h
26.	*C. rupestris turkestanica* Buturlin, Hill Pigeon	R	Girthi valley	5,6	3200	2	c, e
27.	*C. livia intermedia* Strickland, Indian Blue Rock Pigeon	R	Suraithota, Reni-Deodi; Lilam, Bugdiyar	3	2000-2800	2	a, c, e, h

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
28.	*C. hodgsonii* Vigros, Speckled Wood Pigeon	R	Dharansi, Dibrugheta	2,3	+3500-4200	4	b-d
29.	*Streptopelia orientalis orientalis* (Latham), Rufous Turtle-Dove	WV	Lata, Belta	3, 7	+2000-2800	4	b-d
30.	*S. o. meena* (Sykes), Western Turtle-Dove	R br	Loharkhet, Dhakuri, Khati, Dwali, Pindari Zero point; Wan; Rilkote & Burfu	1, 2, 3, 7	2000-3700	4	f-h
31.	*S. decaocto decaocto* (Frivaldszky), Indian Ring Dove	R	Lohajung	3,7	2200	3	g
32.	*S. chinensis suratensis* (Gmelin), Indian Spotted Dove	R	Lohajung, Wan; Loharkhet; Lilam, Bugdiyar	3,7	+2000-2500	4	b, d, f-h
	Order : PSITTACIFORMES						
	Family : Psittacidae (Parrots)						
33.	*Psittacula himalayana* (Lesson), Himalayan Slatyheaded Parakeet	R	Between Dwali & Phurkia; Wan; Rargari on way to Bugdiyar; Tolma	2, 3	+2000-3000	6	f-h
	Order : CUCULIFORMES						
	Family : Cuculidae (Cuckoos)						

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
34.	*Clamator jacobinus serratus* (Sparrman), Pied Crested Cuckoo	MV	Reni	3	2000	2	b, d
35.	*Cuculus canorus canorus* Linnaeus, Cuckoo	R br	Reni-Dibrugheta	2,3	2000-3900	3	b-d
	Order : STRIGIFORMES Family : Strigidae (Owls)						
36.	*Bubo bubo bengalensis* (Franklin), Indian Great Horned or Eagle-Owl	R	Lata, Suraithota	3	2000-2400	1	b, d
	Order : CAPRIMULGIFORMES Family : Caprimulgidae (Nightjars etc.)						
37.	*Caprimulgus indicus hazarae* Whistler & Kinnear, Himalayan Jungle Nightjar	R	Suraithota, Belta Kharak	3, 7	2200-2700	2	c, e
	Order : APODIFORMES Family : Apodidae (Swifts)						
38.	*Collocalia brevirostris brevirostris* (Horsfield) Himalayan Swiftlet	R	Lower Rishi Gorge; Lilam	5	2000-2500	5	c, h
39.	*Apus pacificus* (Latham), Large Whiterumped Swift		Lower Rishi Gorge	5	2000-2800	5	c

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
	Order : CORACIIFORMES Family : Upupidae (Hoopoes)						
40.	*Upupa epops epops* Linnaeus, European Hoopoe	SV/R br	Throughout the reserve	2, 3, 7	2000-4000	3	a-h
	Order : PICIFORMES Family : Capitonidae (Barbets)						
41.	*Megalaima virens marshallorum* Swinhoe, Himalayan Great Barbet	R	Tolma	3	2000-2800	2	e
	Family : Indicatoridae (Honeyguides)						
42.	*Indicator xanthonotus radcliffi* Hume, Orangerumped Honeyguide	R	Deodi	2	3250	1	b, d
	Family : Picidae (Woodpeckers)						
43.	*Picus squamatus squamatus* Vigors, Himalayan Scalybellied Green Woodpecker	R	Belta, Tolma; Between Dhakuri & Khati	2, 3	2700-3200	2	b, d-f
44.	*P. canus sanguiniceps* Baker, Indian Blacknaped Green Woodpecker	R	Between Lohajung &Wan	3	2100-2300	1	g
45.	*Picoides himalayensis himalayensis* (Jardine & Selby), Garhwal Pied Woodpecker	R	Dhakuri; Tolma	2, 3	2200-2800	2	b-f

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
46.	*P. auriceps auriceps* (Vigors), West Himalayan Brownfronted Pied Woodpecker	R	Between Lohajung & Wan	3	2100-2300	1	b, d, g
47.	*Chrysocolaptes indicus sultaneus* (Hodgson), West Himalayan Larger Goldenbacked Woodpecker	R	Belta	3	+2700	1	e
	Order : PASSERIFORMES						
	Family : Alaudidae (Larks)						
48.	*Calandrella cinerea dukhunensis* (Sykes), Rufous Short-toed Lark	WV	Above Dibrugheta	1, 2	4000	4	b,d
	Family : Hirundinidae (Swallows)						
49.	*Hirundo rustica rustica* Linnaeus, Western Swallow	br	Between Dwali & Phurkia	5	2900	4	f
50.	*Delichon urbica cashmeriensis* (Gould), Kashmir House Martin	R br	Bhujgara	5	4900	4	b, d
51.	*D. nipalensis nipalensis* Moore, Nepal House Martin	R	Bhujgara, Belta	5	2700-4000		b, d
	Family : Laniidae (Shrikes or `Butcher Birds')						
52.	*Lanius tephronotus lahulensis* Koelz, Ladakh Greybacked Shrike	R br	Malari	2, 7	3200	1	e

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53.	*L.t. tephronotus* (Vigors), Eastern Tibet Greybacked Shrike	br	Loharkhet; Rilkote	3, 7	2700	1	f, h
54.	*L. schach erythronotus* (Vigors). Rufousbacked Shrike	br	Lata	3, 7	2200	1	a
	Family : Oriolidae (Orioles)						
55.	*Oriolus oriolus kundoo* Sykes, Indian Golden Oriole	SV br	Reni, Lata	3, 7	+2100	1	a
56.	*O. trailli trailli* (Vigros), Indian Maroon Oriole	R	Belta	3	2700	1	a
	Family : Dicruridae (Drongos)						
57.	*Dicrurus leucophaeus longicaudatus* Hay, Indian Grey Drongo	br	Lata	3, 7	2200	1	b, d
58.	*D. hottentottus hottentottus* (Linnaeus), Haircrested or Spangled Drongo	br	Lata	3, 7	2200	1	b, d
	Family : Strunidae (Starling, Mynas)						
59.	*Acridotheres tristis tristis* (Linnaeus), Indian Myna	R	Loharkhet, Khati; Lohajung, Wan; Lilam, Bugdiyar	3, 7	2200	3	f-h

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abundance ranking	Remarks
	Family : Corvidae (Crows, Magpies, Jays)						
60.	*Garrulus glandarius bispecularis* Vigors, West Himalayan Redcrowned Jay	R	Wan	3, 7	2200	1	g
61.	*G. lanceolatus* Vigors, Blackthroated Jay	R	Loharkhet, Bakarigad	3, 7	1700-1900	1	f,g
62.	*Cissa flavirostris cucullata* (Gould), Western Yellowbilled Blue Magpie	R	Loharkhet-Khati; Between Lohajung & Wan, Wan	2, 3,	1700-2900	1	f, g
63.	*C. erythrorhyncha occipitalis* (Blyth), Himalayan Redbilled Blue Magpie	R.	Tolma	3	+2500	1	e
64.	*Dendrocitta formosae occidentalis* Ticehurst, West Himalayan Tree Pie	R	Between Loharkhet & Dhakuri; Lilam	3	2100	1	f, h
65.	*Nucifraga caryocatactes hemispila* Vigors, Himalayan Nutcracker	R	Reni, Lata, Belta, Ramani; Gairoli Patali; Between Dwali & Phurkia	2, 3, 1	2200-3700	2	b-g
66.	*Phyrrhocorax graculus digitatus* Hemprich & Ehrenberg, Yellowbilled or Alpine Chough	R	Lata Kharak-Sarsopatal, North sanctuary, Trishul bc, Dunagiri bc; Malari; Between Burfu & Milam, Milam	1,2,5	+3000-5900	4	a-e, h

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67.	*P. pyrrchocorax centralis* Stresemann, West Himalayan Redbilled Chough	R	Lata kharak-Sarsopatal; Phurkia-Pindari Zero Point; Bedni, Between Bedni & Bhagwabasa; Bugdiyar-Burfu	1, 2, 5	+2800-4200	4	a-d, f-h
68.	*Corvus macrorhynchos intermedius* Adams, Himalayan Jungle Crow	R	Lata-Dibrugheta; Reni, Suraithota, Malari; Dhakuri-Phurkia; Lohajung-Bedni; Lilam-Burfu	1-3, 5, 7	2000-3700	4	a-h
69.	*C. corax* Linnaeus, Raven	R	Lata	3, 7	2000-2200	1	a
	Family : Campephagidae (Cuckoo-Shrikes & Minivets)						
70.	*Pericrocotus ethologus favillaceus* Bangs & Phillips, West Himalayan Longtailed Minivet	SV	Belta, Lohajung	3	+2000-2700	2	a, b, d, g
71.	*P. solaris solaris* Blyth, Yellowthroated Minivet	R	Lata, Deodi	3, 2	+2000-3300	4	a
	Family : Pycnonotidae (Bulbuls)						
72.	*Pycnonotus leucogenys leucogenys* (Gray), Whitecheeked Bulbul	R	Dhakuri, Wan	3, 7	+2300-2700	3	a,f, g
	Family : Muscicapidae						

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	Subfamily : Timallinae (Babblers)						
73.	*Pomatorhinus erythrogenys erythrogenys* Vigors, West Himalayan Rustychecked Scimitar Babbler	R	Wan	3, 7	2100	1	g
74.	*Garrulax albogulris whistleri* Baker, Western Whitethroated Laughing Thrush	R	Dhakuri, Khati	3, 7	2100-2900	2	f
75.	*G. striatus striatus* (Vigors), Western Striated Laughing Thrush	R	Loharkhet-Khati; Wan	2, 3,7	2100-2900	1	f, g
76.	*G. variegatus variegatus* (Vigors), Eastern Variegated Laughing Thrush	R	Belta; Phurkia; Between Wan & Gairoli Patali	2,3,7	2100-3300	1	b-d, f, g
77.	*G. lineatus lineatus* (Vigors), Simla Streaked Laughing Thrush	R	Belta	3, 7	2500-2700	2	b, d
78.	*G. erythrocephalus erythrocephalus* (Vigors) Redheaded Laughing Thrush	R	Belta	3, 7	2500-2700	2	b, d
79.	*Minla strigula simlaensis* (Meinertzhagen), Western Bar-throated Siva/Minla	R	Dibrugheta, Deodi	2	3300-3500	2	c
80.	*Heterophasia capistrata capistrata* (Vigors), Western Blackcapped Sibia	R	Khati; Wan; Lilam	3, 7	2000-2200	3	a, f-h

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81.	*Muscicapa latirostris* Raffles, Brown Flycatcher	SV br	Sarsopatal	1	+4200	1	a
82.	*M. strophiata strophiata* (Hodgson), Orangegorgeted Flycatcher	R br	Deodi, Confluence of Trishul nalla & Rishiganga	2	3000-3500	2	c
83.	*M. superciliaris superciliaris* Jerdon, Whitebrowed Blue Flycatcher	SV br	Dhakuri	3	2700-2900	1	f
84.	*M. leucomelanura leucomelanura* (Hodgson) Western Slaty Blue Flycatcher	AM br	Dibrugheta	2	+3300-3400	3	b, d
85.	*M. sundara whistleri* (Ticehurst), Western Rofousbellied Niltava	R	Dibrugheta; Rilkote	1,2	+3200-3400	1	b, d, h
86.	*Rhipidura hypoxantha* Blyth, Yellowbellied Faintail Flycatcher	AM br	Belta, Dibrugheta, Ramani; Between Wan & Renuka Dhar	2,3	+2700-3800	5	a-d, g
87.	*R. albicollis canescens* (Koelz), Western Whitethroated Faintail Flycatcher	R br	Deodi	2	+3300	1	a
	Subfamily : Sylvinae (Warblers)						
88.	*Cettia major* (Moore) Large Bush Warbler	R br	Dibrugheta	3	3600	3	c

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89.	*Phylloscopus affinis affinis* (Tickell), Tickell's Leaf Warbler	SV br	Sarsopatal; Dwali	1, 2	3200-4200	6	a, f
90.	*P. griseolus* Blyth, Olivaceous Leaf Warbler	SV br	Sarsopatal	1	4200	2	c
91.	*P. fuligiventer fuligiventer* (Hodgson), Smoky Leaf Warbler	AM br	Sarsopatal	1	4200	1	a
92.	*P. proregulus simlaensis* Ticehurst, Western Pallas's Leaf Warbler	AM br	Doodganga	2, 3	2800	1	b-d
93.	*P. maculipenis virens* Ticehurst Western Greyfaced Leaf Warbler	AM	Dwali	2	3200	1	f
94.	*P. magnirostris* Blyth, Largebilled Leaf Warbler	SV br	Belta, Dibrugheta, Deodi	2, 3	2800-3600	4	c
95.	*P. trochiloides viridanus* Blyth, Western Greenish Leaf Warbler	SV br	Sanctuary/Sarsopatal	1	+4200	?	a
96.	*P. occipitalis occipitalis* (Blyth), Large Crowned Leaf Warbler	SV br	Belta, Lower Rishigorge	3, 2	2200-2800	3	c
97.	*P. reguloides reguloides* (Blyth), Blyth's Crowned Leaf Warbler	AM/R br	Doodganga, Dibrugheta	3, 2	+2800-3600	3	c

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98.	*Seicercus burkii whistleri* Ticeurst, Western Blackbrowed Flycatcher-Warbler	SV br	Dibrugheta	2	+3600	3	c
99.	*S. xanthoschistos albosupercilliaris* (Jerdon), Western Greyheaded Flycatcher-Warbler	R br	Doodganga	3	+2800	1	c
100.	*Regulus regulus himalayensis* Bonaparte, Himalayan Goldcrest	R br	Dibrugheta, Deodi, Ramani	2	3200-3600	3	a-d
	Subfamily : Turdinae (Thrushes & Chats)						
101.	*Erithacus pectoralis pectoralis* (Gould), West Himalayan Rubythroat	SV br	Bethartoli, Sarsopatal	1	4000-4200	2	a-d
102.	*E. brunneus* (Hodgson), Indian Blue Chat	SV br	Maltoni Pass	2	+3800	1	c
103.	*E. cynaurus pallidior* (Baker). Kashmir Redflanked Bush Robin	AM br	Belta, Maltoni, Dibrugheta,	3, 2	+2800-3900	5	b-d
104.	*E. chrysaetus whistleri* (Ticehurst), Western Golden Bush Robin	AM br	Dibrugheta	2	3400	1	a, b, d
105.	*Phoenicurus caeruleocephalus* (Vigors), Blueheaded Redstart	AM br	Belta, Dibrugheta, Sarsopatal	1-3	+2900-4200	2	a-d

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106.	*P. ochruros rufiventris* (Vieillot), Eastern Black Redstart	SV br	Sarsopatal, Changbang Glacier	1, 2	4200-4900	2	a-d
107.	*P. frontalis* (Vigors), Bluefronted Redstart	AM br	Dibrugheta-Sarsopatal	2, 1	3500-4300	5	b-d
108.	*P. erythrogaster grandis* (Gould), Guldenstadt's Redstart	R br	Changbang Moraine	1,6	4900	1	a
109.	*Rhyacornis fuliginosus fuliginosus* (Vigors), Plumbeous Redstart	R br	Dibrugheta, Deodi, Gufa camp Tala bc, north Rishi gl. Moraine; Reni, Lata, Belta; Dhakuri, Khati; Wan; Milam, Bugdiyar	4	+2000-4800	2	a-h
110.	*Hodgsonius phoenicuroides phoenicuroides* (Gray), Hodgson's Shortwing or Whitebellied Redstart	SV/ AM br	Dibrugheta	2	3400	1	b, d
111.	*Grandala coelicolor* Hodgson, Hodgson's Grandala	R	Sarsopatal	1	4300	1	c
112.	*Enicurus scouleri scouleri* Vigors, Little Forktail	R br	Dibrugheta, Deodi; Dhakuri, Dwali; Bugdiyar	4	+2700-3500	1	a-d, f, h
113.	*E. maculatus maculatus* Vigors, Western Spotted Forktail	R br	Dibrugheta, Deodi, Reni, Belta; Between Lilam & Bugdiyar	4	+2500-3500	1	a, e, h

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114.	*Saxicola torquata pezevalskii* (Pleske) Tibetan Collared Bush Chat	WV	Reni, Suraithota	3,7	+2000	2	a, b, d
115.	*S. ferra* (Gray), Dark-grey Bush Chat	R br	Reni, Lata	7	2200	2	b, d
116.	*Chaimarrornis leucocephalus* (Vigors), Whitecapped Redstart or River Chat	AM br	Reni-Sarsopatal; Suraithota, Tolma, Malari; Dwali-Pindari Zero Point; Lilam-Milam	4	+2000-4200	4	a-f, h
117.	*Monticola solitarius pandoo* (Sykes), Indian Blue Rock Thrush	SV br	Sarsopatal	1	4200	1	a
118.	*Myiophonus caeruleus temminckii* (Vigors), Himalayan Whistling Thrush	R br	Reni-Sarsopatal, Lata Malari; Loharkhet-Pindari Zero Point; Lohajung-Wan; Lilam-Bugdiyar	1-5	+2000-4200	6	a-h
119.	*Zoothera wardii* (Blyth), Pied Ground Thrush	SV br	Dibrugheta	2	+3400	1	b, d
120.	*Z. mollissima whiteheadi* (Baker), Western Plainbacked Mountain Thrush	AM	Dibrugheta	2	3600	2	b-d
121.	*Z. dauma dauma* (Latham) Smallbilled Mountain Thrush	AM br	Maliadoh; Bedni, Wan	3	3000-3600	1	f, g

Sl. No	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
122.	*Turdus albocinctus* Royle, Whitecollared Blackbird	R br	Belta	3	2500-2800	2	b-d
123.	*T. boulboul* (Latham), Greywinged Blackbird	R. br	Belta, Joshimath/Auli	3	2500-2600	1	a, c
124.	*T. merula maximus* (Seebohm), Tibetan Blackbird	R br	Lata, Belta	3	2500-2800	2	a, c
125.	*T. rubrocanus rubrocanus* G.R. Gray, Western Greyheaded Thrush	R br	Belta	3,	2700	1	b, d
126.	*T. viscivorus bonapartei* Cabanis, Missle Thrush	R br	Dibrugheta	2	3500	1	c
	Family : Troglobytidae (Wrens)						
127.	*Troglodytes troglodytes nipalensis* Blyth, Nepal Wren	R br	Saini Kharak, Deodi, Ramani; Scree areas at base camps	6	3400-3700	2	a-d
	Family : Cinclidae (Dippers)						
128.	*Cinclus pallasii tenuirostris* Bonaparte, West Himalayan Brown Dipper	R	Trishul nalla, River Rishi Ganga, Changbang outwash river; Dhakuri; Tolma	4	+2600-5000	3	a-f
	Family : Prunellidae (Accentors or `Hedge Sparrows')						

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abundance ranking	Remarks
129.	*Prunella collaris wyhmperi* (Baker), Garhwal Alpine Accentor	R br	Patalkhan, Sarsopatal, Rocks above Dibrugheta; Bhagwabasa	5, 1	4000-4300	2	a, c, g
130.	*P. rubeculoides* (Moore), Robin Accentor	R br	Sarsopatal	1	4200	1	c
131.	*P. strophiata jerdoni* (Brooks), Western Rufousbreasted Accentor	R br	Above Dibrugheta, Sarsopatal; Bhagwabasa	2, 1	+4000-4300	1	a-d, g
132.	*P. atrogularis atrogularis* (Brandt), Ural Blackthroated Accentor		Lata	3	2000-2200	2	a
	Family : Paridae (Tits or Titmice) Subfamily : Parinae (True Tits)						
133.	*Parus major nipalensis* Hodgson, Nepal Grey Tit	R	Tolma; Dhakuri, Between Dwali & Phurkia; Between Lohajung & Wan	3, 2	+2500-3000	3	b, d-g
134.	*P. monticolus monticolus* Vigors, Greenbacked Tit	R br	Belta	3	+2000-2700	4	a-d
135.	*P. melanolophus* Vigors, Crested Black Tit	R br	Belta, Reni-Ramani, Bethartoli	3, 2	+2000-3800	5	b-d

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
136.	*P. ater aemodius* Hodgson, Himalayan Coal Tit	R br	Lata Kharak	2	3900	2	a
137.	*P. rubidiventris rufonuchalis* Blyth, Simla Black Tit	R br	Dibrugheta, Deodi, Confluence of Trishul nalla & Rishi Ganga, Between Tolma & Himtoli/Dronagiri	2	+3000-3700	2	a-e
138.	*P. dichrous kangrae* (Whistler), Western Brown Crested Tit	R br	Dibrugheta	2	3300	1	b, d
139.	*Sylviparus modestus simlaensis* Baker, Simla Yellowbrowed Tit	R	Wan	3, 2	2300	2	a, g
	Subfamily : Aegithalinae (Longtailed Titmice)						
140.	*Cephalopyrus flammiceps flammiceps* (Burton), Western Firecapped Tit	SV br	Confluence of Trishul nalla & Rishi Ganga	2	1800-3500	2	c
141.	*Adgithalos concinus iredalei* (baker), Western Redheaded Tit	R br	Belta	3	2400	2	b, d
142.	*A. niveogularis* (Gould), Whitethroated Tit	R br	Dibrugheta, Deodi	2	+3500-3700	2	c
	Family : Sittidae (Nuthatches & Creepers)						
	Subfamily : Sittinae (Nuthatches)						

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
143.	*Sitta leucopsis leucopsis* Gould, Western Whitecheeked Nuthatch	R	Dibrugheta	2	+3500	1	b, d
	Subfamily : Tichodromadinae (Wall Creepers)						
144.	*Tichodroma muraria nipalensis* Bonaparte, Wall Creeper	R br	Between Belta & Lata Kharak, Sarsopatal	5	+2500-4000	1	a, b, d
	Family : Certhiidae (Tree Creepers)						
145.	*Certhia familiaris* Linnaeus, Northern Tree Creeper	R	Dibrugheta, Rishi Gorge	2	4000	1	a-d
146.	*C. himalayana* Vigors, Himalayan Tree Creeper	R br	Dibrugheta, Deodi, Confluence of Trishul nalla & Rishi Ganga, Between Tolma & Himtoli/Dronagiri	2	3000-3500	4	a-e
	Family : Motacillidae (Pipits & Wagtails)						
147.	*Anthus hodgsonii hodgsonii* Richmond, Indian Tree Pipit	SV br	Dibrugheta-Deodi	2, 1	3300-3600	4	a, c
148.	*A. roseatus* Blyth, Vinaceousbreasted or Rosebreasted Pipit	SV br	Dibrugheta-Sarsopatal	2, 1	+3500-4500	5	a, c

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
149.	*A. sylvanus* (Hodgson), Upland Pipit	R br	Sarsopatal; Above Rilkote; Phurkia, Pindari Zero Point	1	+4000-4300	5	a, f,h
150.	*Motacilla caspica caspica* (Gmelin), Grey Wagtail	SV br	Lower Rishi Gorge; Wan nalla; Between Khati & Dwali; Belta	4	+2000-2800	2	a, c, e-g
151.	*M. alboides alboides* Hodgson, Hodgson's Pied Wagtail	WV br	Glaciers around Sarsopatal; Lata-Malari; Loharkhet-Khati; Bedni-Roopkund; Rilkote-Milam; Lata, Reni	1-4	+2000-4400	4	a-h
	Family : Dicaeidae (Flowerpeckers)						
152.	*Dicaeum melanoxanthum* (Blyth), Yellowbellied Flowerpecker	R	Reni-Kalikona	3	2300	1	c
	Family : Nectariniidae (Sunbirds)						
153.	*Aethopyga nipalensis horsfieldi* (Blyth), Western Yellowbacked Sunbird	R	Between Dhakuri & Khati; Lilam	3	+2100-2700	1	f, h
	Family : Ploceidae (Weaver Birds)						
	Subfamily : Passerinae (House & Rock Sparrows)						
154.	*Passer rutilans cinnamomeus* (Gould), Himalayan Cinnamon Tree Sparrow	R br	Lohajung; Bugdiyar	3, 7	2100-2500	5	g, h

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	Family : Fringillidae (Finches) Subfamily : Carduelinae (Goldfinches & Allies)						
155.	*Mycerobas affinis* (Blyth), Allied Grosbeak	R br	Belta	3	2000-2700	1	a, b, d
156.	*M. carnipes carnipes* (Hodgson), Himalayan Whitewinged Grosbeak	R br	Sarsopatal	1	+4000-4200	2	a
157.	*M. melanozanthos* (Hodgson), Spottedwinged Grosbeak	R br	Belta, Dibrugheta	3, 2	+2700-3500	4	c
158.	*Carduelis spinoides spinoides* Vigors, Himalayan Greenfinch	SV br	Reni, Belta, Suraithota, Tolma, Malari; Khati, Dhakuri; Wan; Bugdiyar-Burfu	3, 2,1, 7	2000-3300	4	a, e-h
159.	*Leucosticte nemoricola altaica* (Eversmann), Western Plaincoloured Mountain Finch	R br	North Sanctuary	1	4000	2	c
160.	*Carpodacus erythrinus roseatus* (Blyth), Indian Rosefinch	SV br	Lata, Suraithota; Reni-Dibrugheta; Phurkia	3, 2	2200-3600	1	a, c-f
161.	*C. erythrinus erythrinus* (Pallas), Common Rosefinch or Scarlet Grosbeak	WV	Reni-Dibrugheta	3, 2	+2000-3600	1	a, c
162.	*C. nipalensis nipalensis* (Hodgson), Nepal Dark Rosefinch	AM	Sarsopatal	1,	+4200	2	a

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abund-ance ranking	Remarks
163.	*C. rhodochrous* (Vigors), Pinkbrowed Rosefinch	R br	Dibrugheta, Patalkhan; Rilkote-Milam	2, 1, 6	+3500-4200	2	b-d, h
164.	*C. r. rhodopeplus* (Vigors), Spottedwinged Rosefinch	R	Deodi, North Sanctuary; Dwali	2, 1	+1900-4100	1	e, f
165.	*C. thura* Bonaparte, Whitebrowed Rosefinch	R br	Dibrugheta	2	3500	1	c
166.	*C. pulcherrimus pulcherrimus* (Moore), Himalayan Beautiful Rosefinch	R br	Bethartoli	6	4000	1	c
167.	*C. rubicilloides lucifer* R. & A. Meinerpzhagen, Eastern Great Rosefinch	R br	Rishi Valley	3, 2	2200-3500	2	a
168.	*C. puniceus humii* (Sharpe), Western Redbreasted Rosefinch	R br	Sarsopatal	1	4200	1	a
169.	*Propyrrhula subhimachala* (Hodgson), Redheaded Rosefinch	R	Sarsopatal	1	4200	2	a
170.	*Pyrrhula erythrocephala* Vigors, Redheaded Bullfinch	R br	Lata Kharak, Deodi, Ramani	2	+3700	2	b-d
171.	*P. aurantiaca* Gould, Orange Bullfinch	R br	Belta, Dibrugheta	3, 2	2700-3300	1	b, d

Sl. No.	Systematic List	Status	Distribution	Habitat	Altitude in metres	Abundance ranking	Remarks
	Family : **Emberizidae (Buntings)**						
172.	*Emberiza leucocephala leucocephala* S.G. Gmelin, Pine Bunting	WV	Belta	3, 7	2500-2700	1	b, d
173.	*E. cia stracheyi* Moore, Himalayan Rock Bunting	R br	Deodi, Dibrugheta; Lata, Tolma; Khati; Rilkote, Burfu	3, 2, 1	+2200-3400	3	a, e, f, h
174.	*E. fucata arcuata* Sharpe, Indian Greyheaded Bunting	R br	Lata	3, 7	2200	2	a
175.	*Melophus lathami* (Gray), Crested Bunting	R	Deodi	2	+3300	6	a

Key to the signs/numbers/abbreviations used in the table 4.

Status :

R	=	Resident
WV	=	Winter Visitor
SV	=	Summer Visitor
MV	=	Monsoon Visitor
AM	=	Altitudinal Migrant
E	=	Endangered
br	=	Breeds

Habitat :

1	=	Alpine Meadow
2	=	Subalpine Forest
3	=	Upper Temperate Forest
4	=	Water Corses/Bodies
5	=	Cliffs
6	=	Boulder strewn slopes with sparse vegetation
7	=	Agricultural fields/Human habitation

Altitude (in Metres) :

+	=	Wider than what has been documented in Ali & Ripley, 1968-78

Abundance Ranking :

(Based on number of individuals seen in a sight/sighting/calls heard)

1	=	1
2	=	2-5
3	=	6-10
4	=	11-50
5	=	51-100
6	=	>100

Remarks : (vide Table -1)

a	=	Red, 1979
b	=	Lamba, 1987
c	=	Sankaran, 1993
d	=	Tak & Kumar, 1987
e	=	Tak, 1989
f	=	Tak, 1990
g	=	Tak, 1991
h	=	Tak, 1993

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MAMMALIA

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INTRODUCTION

The mammalian fauna of the reserve exhibit adaptation to a number of high altitude ecological factors like atmospheric cold, aridity, intense insolation, radiation and snow cover, and progressive attenuation of air and humidity with increase in altitude. As a result their bodies are covered with dense hairs to protect them from the severe atmospheric cold. The colour of their body is usually dull and light which provides resistance to these animals against intense insolation and radiation. Thus, indeed, these animals have a resilience which the low land animals often lack.

A number of articles dealing with various aspects of the mammals of the area have been published. These are mainly by Tilman (1935), Shipton (1936), Dang (1964), Sah (1976), Lavkumar (1979), etc. The more comprehensive and relevant being by Lamba (1985, 1987 a & 1987 b), Tak (1986), Tak & Kumar (1983 a & 1983 b), Tak & Lamba (1984, 1985), Sathyakumar (1993), and Arora & Tak (1996).

As there is no comprehensive list of mammals of the biosphere (NDBR) as such, an attempt has been made to prepare the same from the above mentioned published information and also from the field observations made by the present author during the years 1981-85 in Core Zone and 1989-93 in Buffer Zone.

As many as 22 species* of mammals belonging to 20 genera, 12 famalies and seven different orders have so far been observed and recorded from the biosphere area. Out of these 22 species reported here, 11 (50%) are schedule animals listed in different schedules of the Wildlife (Protection) Act 1972 (ammended upto 1990), it is noteworthy that six (27.27%) out of the 22 species are included in the Schedule I of the Act. For classification and nomenclature Ellerman and Morrison-Scott (1951), Grooves and Grubb (1985), and Wilson and Reeder (1993) have been followed.

*Sathyakumar (1993) mentions about a probable sighting of *Petaurista petaurista* (Red Gaint Flying Squirrel) from the biosphere by Ravi Sankaran, though he remarks that it needs further confirmation. The present author has never come across the species in this protected area.

SYSTEMATIC ACCOUNT

Class MAMMALIA

I. Order INSECTIVORA

1. Family SORICIDAE

1. Genus *Suncus* Ehrenberg, 1833

1. *Suncus* sp.,
Shrew

Status : Uncommon.

Distribution : Observed and recorded only once, a single individual was seen at Khati (PWD, Dak Bungalow) during night on 27.viii.1990.

II. Order CHIROPTERA

2. Family VESPERTILIONIDAE

2. Genus *Eptesicus* Rafinesque, 1820

2. *Eptesicus serotinus* (Schreber, 1774)
Serotine Bat

Status : Uncommon.

Distribution : Recorded only once, a single dead specimen brought to our camp at Rilkote (3200 m, on Milam Trek), by a ITBP personnel on 16.ix.1993.

3. Genus *Pipistrellus* Kaup, 1829

3. *Pipistrellus* sp.
Common Pipistrelle

Status : Common.

Distribution : Confined to southern and eastern part of the Buffer Zone of the Biosphere. The crepuscular activities of atleast six different colonies of this smaller bat were observed and recorded at Dhakuri, 2750 m (Three colonies on Pindari Trek, August-September, 1990), at Wan and Gairoli Patali, 2300 m and 2900 m respectively (One colony at each on Roopkund trek, August-September, 1991), and at Bugdiyar, 2500 m (One colony on Milam Trek, September, 1993).

III. Order PRIMATES

3. Family CERCOPITHECIDAE

Subfamily CERCOPITHECINAE

4. Genus *Macaca* Lacepede, 1799

4. *Macaca mulatta villosa* (True, 1894)
Rhesus Macaque

Status : Uncommon.

Distribution : Restricted to southern and eastern periphery of the biosphere. A group of five individuals was sighted across the river Gori Ganga at Lilam on 18.ix.1993 at 0800 hrs. and a single male was seen roaming on a ridge near village Khati on 28.viii.1990 at 1000 hrs. The local people of village Lata and Reni and also the Wildlife staff of the biosphere posted at these places confirmed its existence that the troops do invade the Maize crops during May - June.

Subfamily COLOBINAE

5. Genus *Semnopithecus* Eschscholtz, 1821

5. *Semnopithecus entellus schistaceus* (Hodgson, 1840)
Common Langur

Status : Common.

Distribution : A total of 87 individuals were sighted in six sightings which gives an average of 14.5 individuals per sighting. The troop size varied from 2 to 25 individuals. All the sightings were made between 2000 and 3700 m, two at each place, *viz.*, Belta Kharak and Deodi in the core zone of the biosphere and on way to Lohajung from Wan in SW part of the buffer zone of the biosphere.

More field data on its population dynamics, feeding, social and reproductive behaviour are required from high altitude region in order to understand the total biological resilience of this species.

IV. Order CARNIVORA

4. Family CANIDAE

6. Genus *Canis* Linnaeus, 1758

6. *Canis aureus* Linnaeus, 1758
Asiatic Jackal

Status : Uncommon.

Distribution : It was sighted in the lower regions of the Nanda Devi Biosphere Reserve out side the National Park (Sathyakumar, 1993).

7. Genus *Vulpes* Oken, 1816

7. *Vulpes vulpes* Linnaeus, 1758
Common Red Fox

Status : Common.

Distribution : Three sightings of Red Fox were had, one of which was between Patalkhan and Sarsopatal and two between Sarsopatal and Nanda Devi Base Camp (Sathyakukar, 1993).

5. Family MUSTELIDAE

8. Genus *Martes* Pinel, 1792

8. *Martes flavigula* Boddaert, 1758
Yellow-throated Marten

Status : Uncommon.

Distribution : Observed once at Ramani area in core zone of the biosphere (Sathyakumar, 1993).

9. Genus *Mustela* Linnaeus, 1758

9. *Mustela kathiah* Hodgson, 1835
Yellow-bellied Weasel

Status : Common.

Distribution : A total of eight records of this mustelid were obtained : three at Dharansi (4000 m), three at Patalkhan (4300 m), and one each at Tolma (2240 m) and Bilju (3300 m). In all, 12 individuals were seen with the range varying from one to three individuals per singhting. All the sightings were made when it was either playing or hiding itself among boulders on or around which the pioneer vegetation was in abundance during July-mid September, when the snow have melted (Plate-IV, 3).

Remarks : Recently Sathyakumar (1993) records one sighting of *Mustela sibirica* from Trisul nullah which may be a sighting of a closely allied species i.e. *M. khatiah*, earlier recorded and also confirmed by photograph from Dharansi area of the biosphere (Lamba, 1987 a & b; Tak, 1986; Tak and Lamba, 1984, 1985).

Corbet and Hill (1991) while discussing the distribution of *Mustela* species mentions that *M. khatiah* is distributed in W. Himalaya - S.China, while *M. sibirica* is found in Siberia - Himalaya, Thailand and Japan.

6. Family URSIDAE

10. *Selenarctos thibetanus* (G. Cuvier, 1823)
Asiatic Black Bear

Status : Common.

Distribution : Although no black bear was sighted, probably on account of its nocturnal habit, yet plenty of foot prints were seen and recorded between 2200 and 3400 m altitudes. All the records were obtained from the steep forested hills of the Biosphere in the localities such as Dibrugheta (3400 m), Belta (2750 m), on way to Dwali (2750 m) from Khati (2210 m) along Pindari Trek, and on way to Bedni (3300 m) from Wan (2300 m) along Roopkund Trek etc.

7. Family FELIDAE

11. Genus *Panthera* Oken, 1816

11. *Panthera pardus* (Linnaeus, 1758)
Panther or Leopard

Status : Common.

Distribution : Only on three occasions pugmarks of this large felid were recorded during 1981-84 and 1989-91. Once in Pine forest above Belta Nullah (2700 m) on 02.vii.1983, once in Fir forest near Dibrugheta (3000 m) on 15.vii.1983 (in core zone of the biosphere); and once in forest surrounding Gairoli Patali (2900 m) and on trek above Bedni on 10.ix.1991 on Roopkund Trek (in SW portion of Buffer Zone of the Biosphere) (Plate-IV, 4). This low frequency of occurrence of this large cat in the biosphere was probably related to the less amount of time spent in the habitat of this species, otherwise the enquiries made from the local people and porters of the villages like Lata, Wan, Khati, Lohajung, Loharkhet etc., who accompanied our expeditions, revealed that this large cat often visit their villages especially for their Sheep, Goats and Buffalo which together form a part of its diet. The existence of this species in Fir forest and above tree-line can easily be questioned here especially when the records are based on indirect

observations (Pugmarks). The possible explanation for this appears to be considerable existence of himalayan thar, which forms an important component of its diet. Almost a similar conclusion based on analysis of 12 leopard scats was drawn by Gaston *et al.* (1981).

12. *Panthera uncia* (Schreber, 1776)
Snow Leopard or Ounce

Status : Rare and endangered.

Distribution : A total of five records of this highly endangered felid were obtained during 1983-84. All these records were based on indirect observations : four on sets of field tracks (pugmarks) and the remainder on this carnivore's kill a half eaten prey (Bharal, *Pseudois nayaur*). Cent percent records were obtained, well above the tree line, between 3700 and 4200m in core zone of the biosphere, which is slightly wider than the altitudinal range of this mammal given by Prater, 1971 (3600-3965 m).

V. Order ARTIODACTYLA

8. Family BOVIDAE

12. Genus *Hemitragus* Hodgson, 1941

13. *Hemitragus jemlahicus* (H. Smith, 1826)
Himalayan Tahr

Status : Uncommon.

Distribution : On five occasion this mountain goat could be observed between 3900 and 4200 m at and around Dharansi in core zone of the biosphere. As many as 14 individuals were seen, which gives an average of 2.8 individuals/sighting and the range varied from one to eight.

13. Genus *Naemorhedus* H. Smith, 1827

14. *Naemorhedus sumatraensis* Bechstein, 1799
Serow

Status : Undetermined.

Distribution : This goat-antelope could not be observed because the area that abounds its habitat in the biosphere, somehow, remained unexplored. But the enquiries made from local people confirmed its existence, in fairly good numbers, in southern part of the lower Rishi Gorge.

15. *Naemorhedus goral* (Hardwicke, 1825)
Goral

Status : Uncommon.

Distribution : No goral was seen, but through its distinctive tracks together with some droppings a total of four records were obtained from slopes of the ridges around Belta locality in NW part of the biosphere.

14. Genus *Pseudois* Hodgson, 1846

16. *Pseudois nayaur* (Hodgson, 1833)
Bharal or Blue Sheep

Status : Very common.

Distribution : An endangered but one of the most sighted mammal of the biosphere. A total of 232 individuals were seen in 27 sightings which gives an average of 8.7 individuals/sighting. The range varied widely from one to 50 individuals in a sight. All the individuals were observed between 3500 and 4950 m, mostly in the upper Rishi Gorge i.e. Eastern Half of the core zone. Recently, a group of 16 individuals was seen grazing on a slope above Bilju (3300 m) along Milam Trek in buffer zone on 15.ix.1993 at 0800 hrs.

9. Family MOSCHIDAE

15. Genus *Moschus* Linnaeus, 1758

17. *Moschus chrysogaster* Linnaeus, 1758
Musk Deer

Status : Common

Distribution : Although a solitary and secretive deer yet as many as six individuals were seen in three sightings which gives an average of two. The maximum number of individuals seen in a sight was four. Also several "Latrine" sights were recorded at and around Dibrugheta, Deodi, Ramani etc. in core zone of the biosphere. All these recordings were made between 3400 and 3700 m altitude (Plate IV, 2).

VI. Order LAGOMORPHA

10. Family LEPORIDAE

16. Genus *Ochotona* Link, 1795.

18. *Ochotona roylei* (Ogilby, 1839)
Royle's Pika or Mouse Hare

Status : Very common.

Distribution : This Leporid (Royle's Pika) is perhaps the most sighted mammal of the biosphere. It occurs throughout between 2500 and 4450 m. Although Prater (1971) restricts the lower limit of distribution of this species only to the eastern Himalaya, India. Robert (1977) does not report from the forests in Pakistan. The recent observations made by Gaston *et al.* (1981), Tak and Lamba (1984) have revealed the lower distribution of this species as 2500 in the western Himalaya, India also (Plate IV, 1).

VII. Order RODENTIA

11. Family HYSTRICIDAE

17. Genus *Hystrix* Linnaeus, 1758

19. *Hystrix indica* (Kerr, 1792)
Indian Crested Porcupine

Status : Uncommon.

Distribution : Restricted to only SE part of the biosphere (Pindari area). Some indirect evidences of this large rodent such as quills, tracks etc. were obtained from Loharkhet to Dwali on Pindari Trek.

12. Family MURIDAE

Subfamily MURINAE

18. Genus *Rattus* Fischer, 1803

20. *Rattus* sp.
Rat

Status : Uncommon.

Distribution : An individual was seen only once during night at Khati PWD, Dak Bungalow on Pindari Trek on 27.viii.90.

19. Genus *Mus* Linnaeus, 1758

21. *Mus* sp.,
Mouse

Status : Uncommon.

Distribution : Only one individual of this small mouse was seen at Lata Kharak (3700 m) on 12.viii.1981.

Subfamily MICROTINAE

20. Genus *Alticola* Blanford, 1881

22. *Alticola roylei* Gray, 1842
Royle's High Mountain Vole

Status : Uncommon.

Distribution : A single individual of this small vole, feeding on grass, was observed at upper Deodi (3850 m) on 07.vii.1983 in core zone of the biosphere.

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THREATENED FAUNA OF NANDA DEVI BIOSPHERE RESERVE

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Conservation status :

	Species	Red Data Book ZSI 1994	IUCN 1993	W(P) Act 1972	CITES	Current status
	AVES Order : Falconiformes Family : Accipitridae					
1.	*Gypaetus barbatus aureus*(Hablizl). Himalayan Bearded Vulture	En	–	Sch-1	–	+
	Order : Galliformes Family : Phasianidae					
2.	*Lophophorus impejanus* (Latham) Himalayan Monal Pheasant	En	–	Sch-1	–	+
3.	*Pucrasia macrolopha macrolopha* (Lesson) Koklas Pheasant	Vu	–	Sch-1	–	+
	MAMMALIA Order : Carnivora Family : Felidae					
1.	*Panthera pardus* (Linnaeus) Panther or leopard	Vu	–	Sch-1	App-I	+

	Species	Red Data Book				
		ZSI 1994	IUCN 1993	W(P) Act 1972	CITES	Current status
2.	*Panthera uncia* (Schreber) Snow Leopard or Ounce	En	En	Sch-1	App-I	+
	Order : Artiodactyla Family : Bovidae					
3.	*Naemorhedus sumatraensis* (Bechstein) Serow	Vu	–	Sch-1	App-II	+
4.	*Hemitragus jemlahicus* (H. Smith) Himalayan Tahr	En	–	Sch-1	–	+
5.	*Pseudois nayaur* (Hodgson) Bharal or Blue Sheep	Vu	–	Sch-1	–	+
	Family : Moschidae					
6.	*Moschus chrysogaster* (Linnaeus) Musk Deer	En	–	Sch-1	App-I	+

Abbreviations used :

En	=	Endangered
Vu	=	Vulnerable
Sch.	=	Schedule
App.	=	Appendix
W(P)Act	=	Wildlife (Protection) Act 1972
CITES	=	Convention on Inernational Trade in Endangered Species
+	=	Present

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FAUNAL ANALYSIS (BASED ON AVAILABLE DATA)

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INTRODUCTION

The fauna of Nanda Devi Biosphere Reserve exhibits considerable diversity comprising 20 groups of Invertebrates and Vertebrates. The invertebrates are represented by 218 species under 158 genera and 63 familes, where as the vertebrates by 209 species under 124 genera and 56 famileis.

Among invertebrates insects show maximum diversity having 177 species followed by Arachnida 17 species, Mollusca 15 species, Annelida six species and Chilopoda three species. Among insect orders Lepidoptera is represented by 80 species followed by Diptera and Hymenoptera 24 species each, Orthoptera by 14 species, Hemiptera 13 species, Dermaptera seven species, Odonata six species, Neuroptera four species and Collembola and Trichoptera two species each. Order Thysanura is represented by a single species.

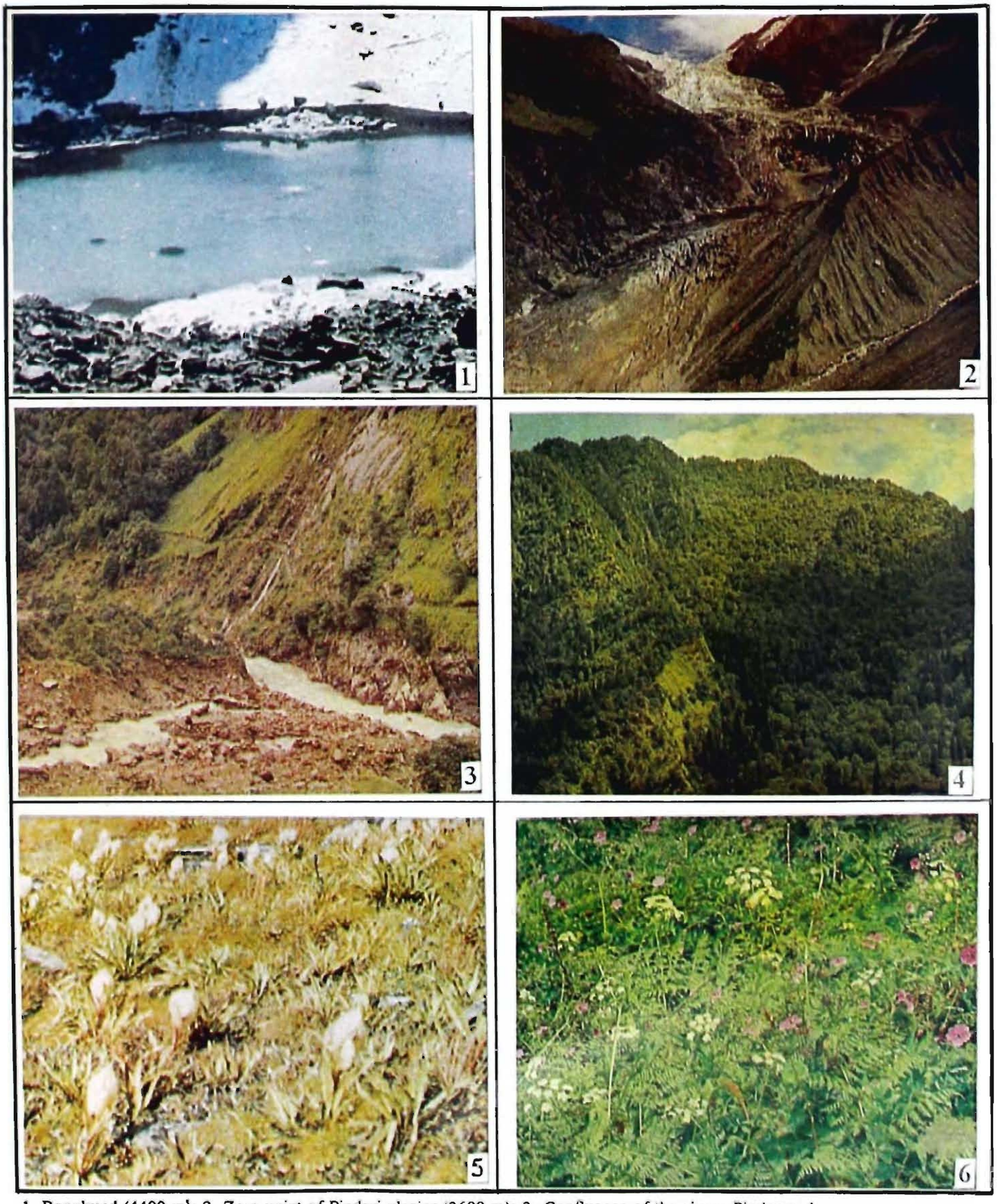
Among vertebrates, the class Aves has more diversity representing 175 species, followed by Mammals 22 species, Amphibia eight species and Reptiles three species, while the Fishes are represented only by a single species from the reserve. The details are appended in Table-1.

Table - 1 : Summary of Faunal Diversity of Nanda Devi Biosphere Reserve.

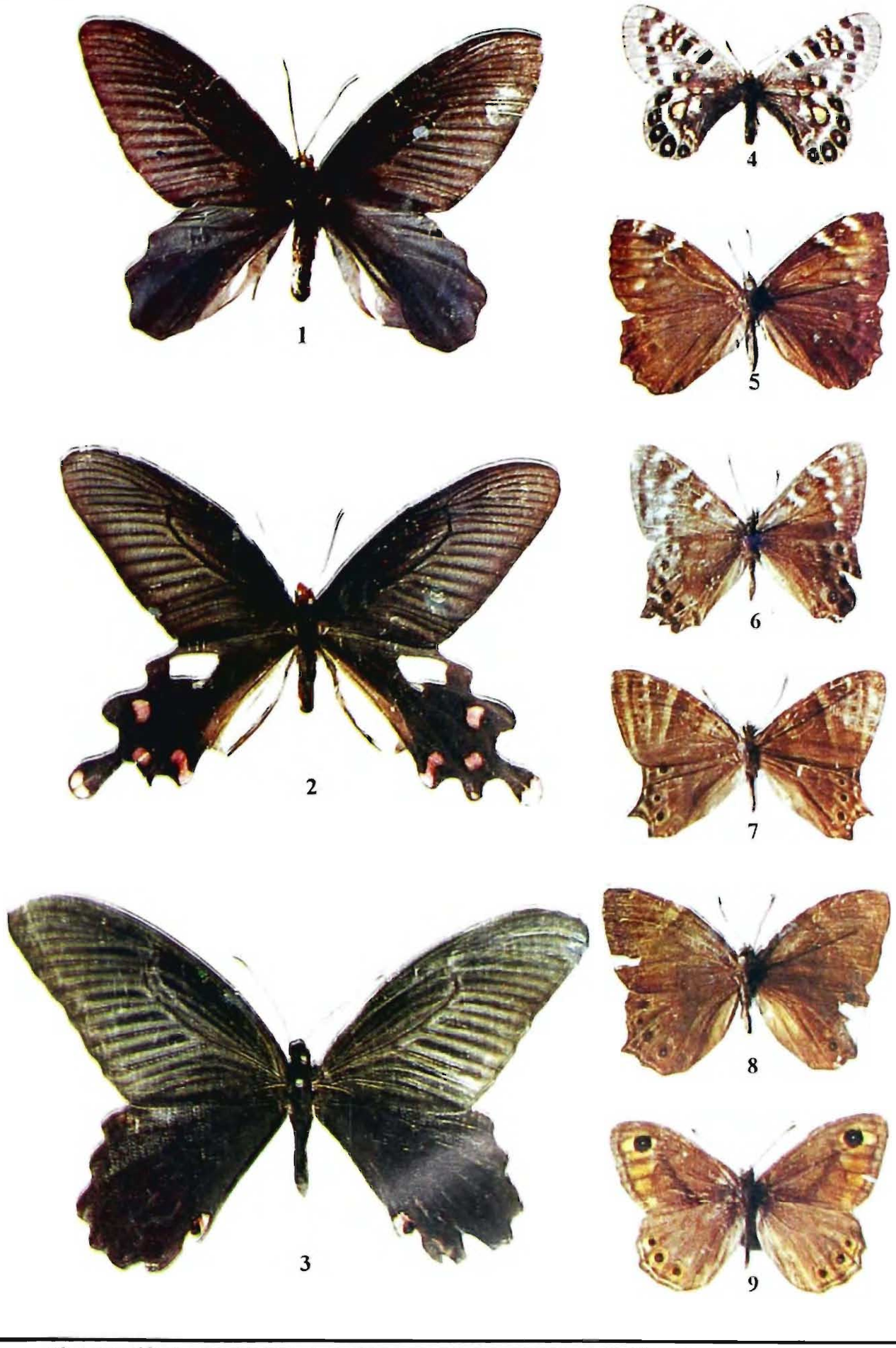
Sl. No.	Group	Families	Genera (Numbers only)	Species
	INVERTEBRATA			
1.	**Mollusca**		08	15
2.	**Annelida**	03	05	06
3.	**Arachnida**	07	09	17
	Insecta			
4.	Thysanura	01	01	01

Sl. No.	Group	Families	Genera (Numbers only)	Species
5.	Collembola	01	02	02
6.	Odonata	04	05	06
7.	Orthoptera	03	11	14
8.	Dermaptera	03	05	07
9.	Hemiptera	05	12	13
10.	Neuroptera	03	04	04
11.	Lepidoptera	09	53	80
12.	Trichoptera	02	02	02
13.	Diptera	10	19	24
14.	Hymenoptera	10	19	24
15.	**Chilopoda**	02	03	03
	VERTEBRATA			
16.	**Pisces**	01	01	01
17.	**Amphibia**	03	04	08
18.	**Reptilia**	03	03	03
19.	**Aves**	37	95	175
20.	**Mammalia**	12	21	22
	Total	119	282	427

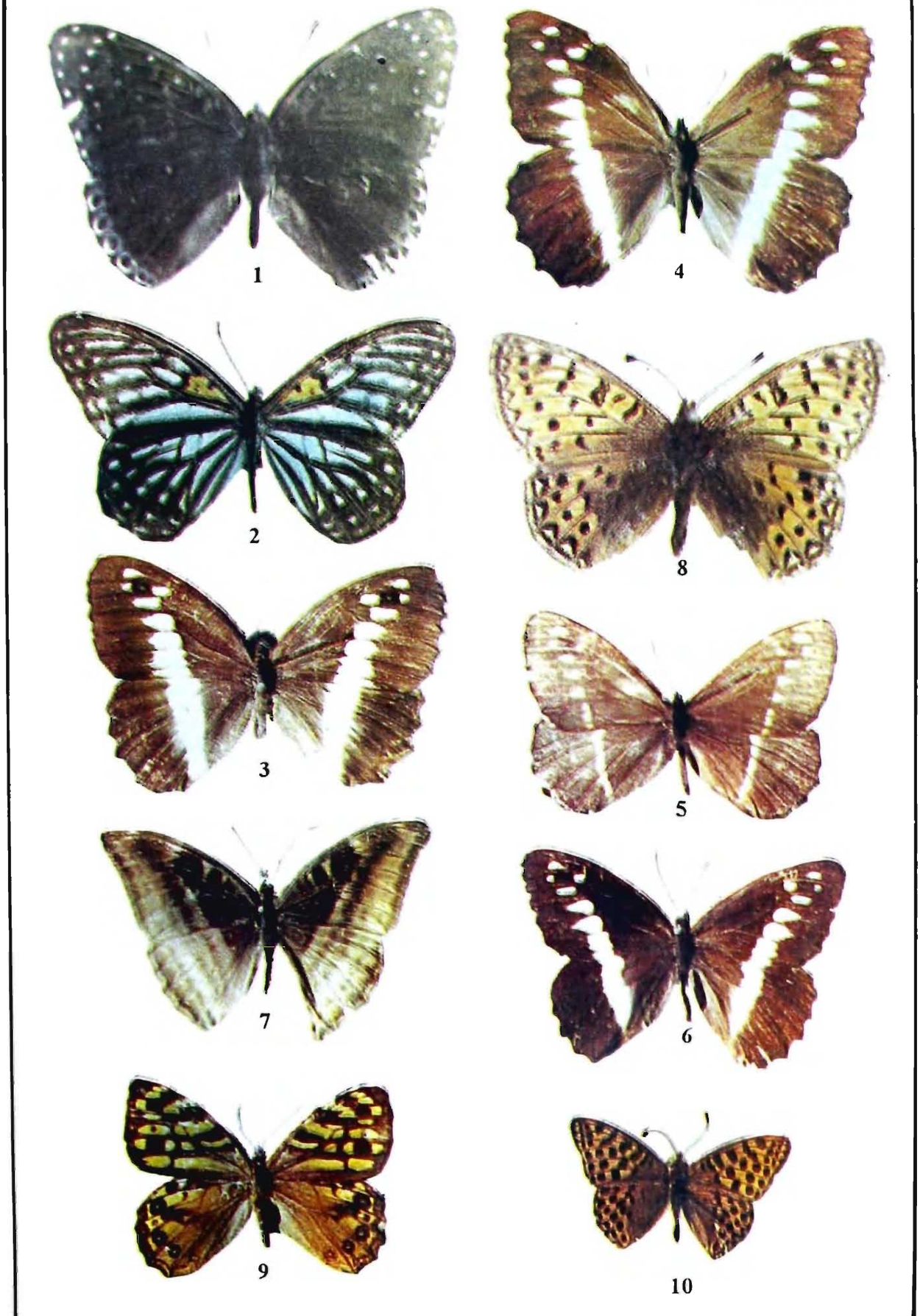
PLATE -I



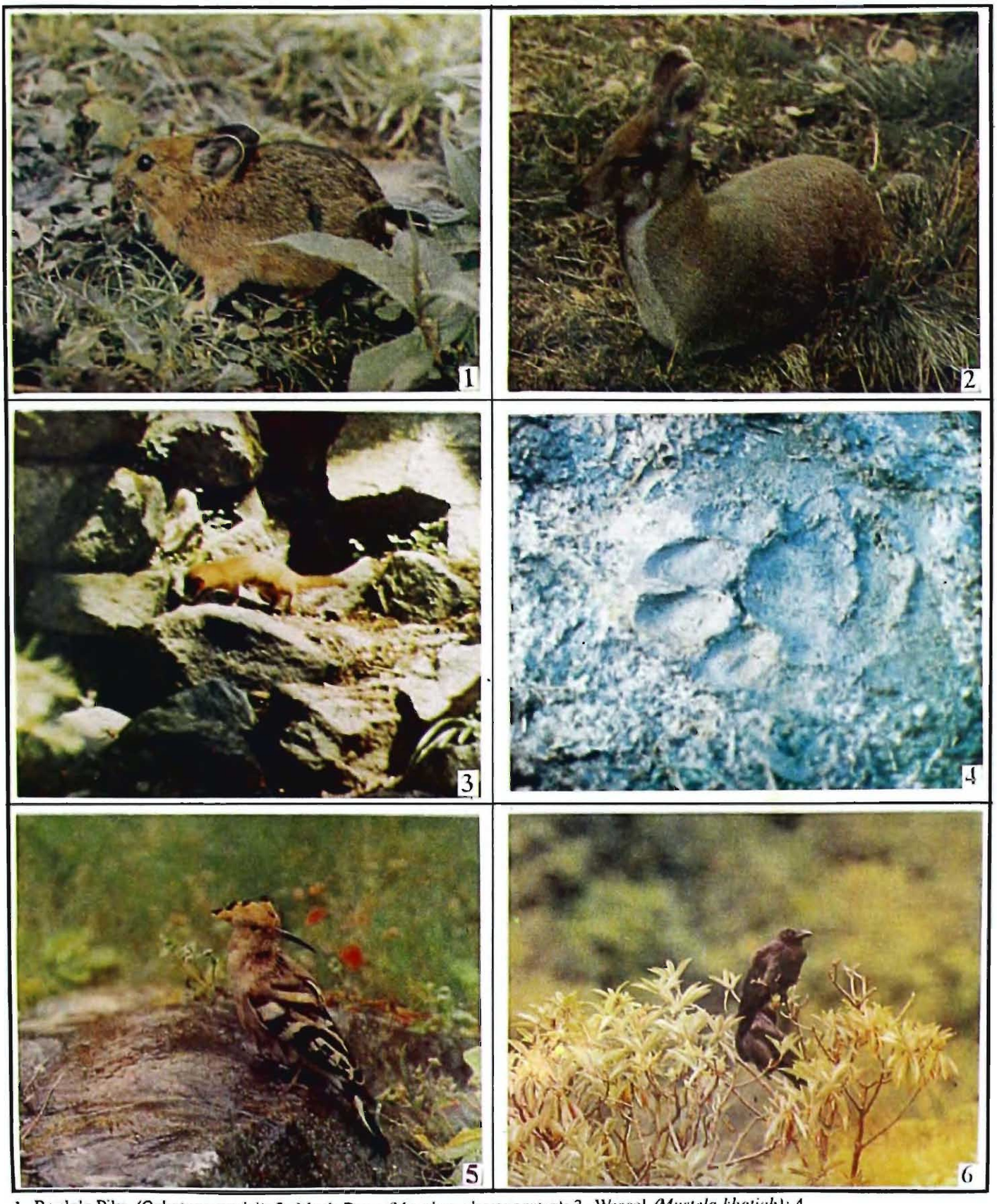
1. Roopkund (4400 m); 2. Zero point of Pindari glacier (3600 m); 3. Confluence of the rivers Pinder and Kafni; 4. Dhakuri forest on way to Pindari; 5. Brahmkamal at Bhagwabasa (4150 m); 6. Ground cover vegetation near Dwali on way to Pindari.



1. *Atrophaneura aidoneus* (Doubleday); 2. *A. philoxenus philoxenus* (Gray); 3. *Papilio protenor protenor* Cramer; 4. *Parnassius hardwickei* Gray; 5. *Lethe maitriya maitriya* de N.; 6. *Lethe jalaurida jalaurida* (deNiceville); 7. *Lethe baladeva asia* Fruhtsorfer; 8. *Lethe insana insana* (Kollar); 9. *Pararge schakra* (Kollar).



1. *Stibochione nicea nicea* (Grau); 2. *Orinoma damaris* Gray; 3. *Aulocera saraswati* Kollar; 4. *Aulocera loha* (Doherty); 5. *Aulocera brahminus dokwana* Evans; 6. *Aulocera swaha swaha* Kollar; 7. *Limenitis danava* Moore; 8. *Mesoacidalia clara* (Blanchard); 9. *Rhaphicera moorei moorei* Butler; 10. *Issoria lathonia issoea* Doubleday.



1. Royle's Pika *(Ochotona roylei);* 2. Musk Deer *(Moschus chrysogaster);* 3. Weasel *(Mustela khatiah);* 4. Pug Mark of Panther *(Panthera pardus);* 5. Hoopoe *(Upupa epops);* 6. Jungle Crow *(Corvus macrorhynchos).*