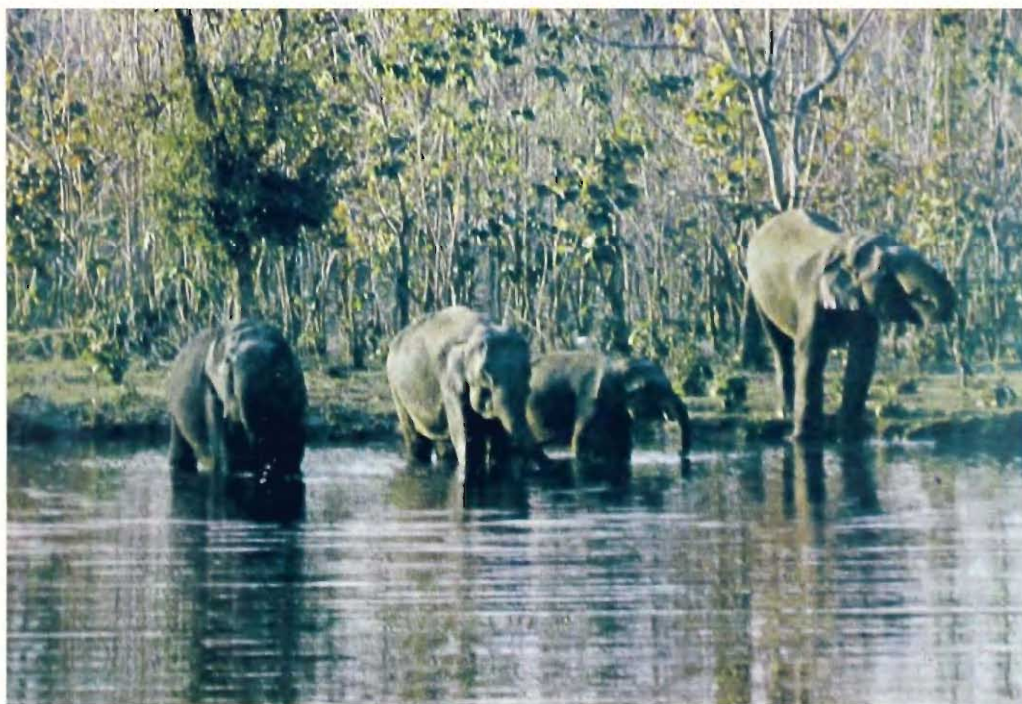


FAUNA OF CONSERVATION AREAS : 5

**FAUNA OF
RAJAJI NATIONAL PARK**



**ZOOLOGICAL SURVEY OF INDIA
1995**

Fauna of Conservation Areas : 5

Zoological Survey of India

Fauna of RAJAJI NATIONAL PARK

Edited by
*The Director, Zoological Survey of India,
Calcutta*



**Zoological Survey of India
1995**

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Fauna of Rajaji National Park

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FOREWORD

The study of Indian Biodiversity has assumed considerable interest obviously because of severe socio-economic pressures in the wake of human population explosions. The Government of India has, in conformity with global concern, taken necessary steps to assess biodiversity and its potential use for development in a sustainable manner.

It was as early as 1982 when the then Prime Minister Late Mrs. Indira Gandhi expressed concern in XVth Meeting of the Indian Board of Wildlife about the lack of requisite information on the faunal wealth of Conservation Areas. The Board, thus, desired and directed the Zoological Survey of India to take up this task of preparing faunal inventories. As a result, the process of qualitative and quantitative analysis of fauna of Conservation Areas was begun.

The Zoological Survey of India has so far published the faunal inventory of two such Conservation Areas of Uttar Pradesh viz., Nanda Devi Biosphere Reserve and Corbett National Park. These, however, have mainly dealt with some higher vertebrate groups like Mammals and Birds.

The Rajaji National Park, also in State of Uttar Pradesh, comprising erstwhile three Wildlife Sanctuaries, Rajaji, Motichur and Chilla, is situated in Siwalik hills of sub-Himalayan mountainous region. These are contiguous to each other and are rich in faunal wealth, because of varied types of ecological niches in the area.

The task of survey & study of the fauna of Rajaji National Park was assigned to the scientists of the Northern Regional Station, Dehradun. This document is, therefore, the first-ever consolidated account of the fauna of this region. The groups covered among vertebrates are : Forty nine species of mammals ; 168 species of birds ; 28 species of snakes ; 12 species of turtles and tortoises ; nine species of lizards ; ten species of toads & frogs ; and 49 species of fishes. Among invertebrates groups covered are 7 species of chilopoda (centipedes) ; 21 species of termites ; 38 species of odonates ; 68 species of butterflies ; and 14 species of hymenoptera.

I would like to express my thanks to Dr. J. R. B. Alfred, Additional Director, for his keen interest and overseeing the progress of publishing this documents. I also

appreciate the efforts of my various scientists colleagues at the Northern Regional Station, Dehradun, who contributed their papers and Dr. G. S. Arora, Scientist SF and the then Officer-in-Charge (since retired) and Dr. Arun Kumar, Scientist SF and present Officer-in-Charge, for having taken the pains for bringing out the document. Thanks are due to Sri G. Sivagurunathan, Publication Consultant and other colleagues of Publication Division for their utmost care in bringing out the volume in the present form.

It is hoped that the faunal inventory of this important Conservation Area of Rajaji National Park will not only be of interest to the Wildlife Wardens/naturalists naturalists and Zoologists but also to laymen alike and create an awareness to conserve the faunal wealth. It is also hoped that the volume will fully serve the purpose for which it has been brought out.

Calcutta
March 1995

A. K. GHOSH
DIRECTOR

INTRODUCTION

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The Rajaji National Park, comprising erstwhile three Sancturies, viz., Rajaji, Motichur and Chilla, and which are contiguous to each other, are rich in its faunal wealth. A thorough knowledge of the living forms of a Conservation Area of a Sanctuary or a National Park, is very essential for proper management of such a vital unit as this. All the living organisms in accordance with their surrounding factors like geological, geographical, climatic, etc., form a viable biotic community whose continuance and maintenance is of great concern for the environmentalists. Such an awareness for conservation and maintenance of important ecotypes in India, is gradually growing and is, therefore, a welcome step in line with general line of thinking of the government and the environmental strategies both within India and elsewhere. Keeping this in view, the Indian Board of Wild Life (IBWL), under the chairmanship of Hon'ble Prime Minister Late Mrs Indira Gandhi, took an important decision for preparation of an inventory of living forms of the Conservation Areas, in India. Therefore, the task of preparing of the faunal inventories of these units was assigned to Zoological Survey of India. Naturally, the Rajaji National Park (U. P.) being in the jurisdiction of the Northern Regional Station, ZSI, Dehra Dun, the inventory of the faunal wealth of Rajaji National Park was assigned to the scientists of the Station. As a result, several surveys were carried out regularly, systematically and lists of all vertebrates and a major invertebrate animal groups were prepared and are presented here. This inventory of animal forms should act as a guide to those who want to work further on these groups. To those who wish to conserve wild life and are responsible for their management, the publication will help to know the faunal wealth of the area so that they can plan their strategies in this direction.

LOCATION

Zoogeographically, it is interesting to note that three different sanctuary-areas, in Rajaji, Motichur and Chilla Forests are contiguous to each other through varied ecological niches, and each area is rich in its faunal wealth. For administrative reasons, these areas were, till August 1983, under the control of different forest authorities. However, considering ecological, geomorphological, faunal, floral and natural wealth of the area, the Government of U. P. declared to constitute this into a National Park on August 12, 1983, for propagating and developing wild life of the area, and was named as RAJAJI NATIONAL PARK and thereby put the management under one authority so that a uniform policy and efforts are exerted in the area for the purpose.

The decision was taken by the IBWL under the chairmanship of the then Prime Minister, Late Shri Rajiv Gandhi and the decision reflects the government's concern to conserve the wild life and their habitat and also largely to protect ecologically fragile areas in the country.

The Rajaji National Park is situated in the Siwalik Hills of the submountain Himalayan region representing various ecosystems which are rich with fauna and flora. It stretches over an approximate area of 831.50 sq. kms. in three districts. Hitherto, the district Saharanpur, Dehra Dun and Pauri Garhwal constituted the Park, but since declaration of Haridwar as an independent district, all those areas which were hitherto under Saharanpur district, have come under the district Haridwar, as far as the Rajaji National Park is concerned. The district-wise area in the park is : Dehra Dun, 248.15 sq. kms. ; Haridwar, 333.56 sq. kms. and that of Pauri Garhwal, 249.80 sq. kms. Besides, additional forests from adjoining blocks have been added to the Park. As such the Rajaji National Park lies between latitude 29°51'N—30°15'N and longitude 77°52'E—78°22'E. In general, the Rawason River and Delhi-Mohund-Dehra Dun National Highway form outer eastern and western boundaries, respectively. Rishikesh-Haridwar-Delhi National Highway passes through the Park between Satyanarain (Song River) and Haridwar. The Park is located about 13 kms SE of Dehra Dun, 9 kms from Haridwar, about 200 kms from Delhi and 500 kms from Lucknow.

The three Sanctuaries forming the Rajaji National Park are as under :

RAJAJI SANCTURY

During British rule, the Dhaulkhand Forest Block in Haridwar dist. and the surrounding areas which till 1989 formed part of Saharanpur Dist., and now under Haridwar dist., were reserved as shooting block for the Viceroy of India. This

practice had been in vogue for more than a century. After Independence when Shri C. Rajagopalacharya became the first Governor General of India in 1947, in place of British Viceroy of India, he was informed about this legacy and was asked for his programme to visit the Shooting Blocks for shikar. The Governor General of India, with great thoughtfulness rejected the offer and on the contrary suggested that the area be, henceforth, declared as a Wild Life Sanctuary, and the faunal wealth be preserved in future. It was, therefore, decided by the Government of Uttar Pradesh to declare these forest blocks in the Siwaliks as a Sanctuary. Hence this Sanctuary, as 'Rajaji Sanctuary', was declared in 1948 vide G.O. No. 2705/XIV-362/1948 dated 8th October, 1948, after Shri C. Rajagopalacharya, who was popularly known as "RAJAJI". At the time of declaration, the initial area covered under the sanctuary was 170 sq. acres which included the forest blocks of Shakumbri, Sahansara, Kotri, Kalawala, Saharanpur, Khajanwar, Mohund, Sukh, Chillawali, Gaj and a part of Andheri. During 1966, the limits of Rajaji Sanctuary were changed under G. O. No. 6890/XIV-A-586/1961 dated 13th October, 1966. The area was enhanced to cover 60,660 acres. With this change, the forest blocks falling west of Delhi-Dehra Dun Road, were excluded and more forest blocks on eastern sides added to it. As a consequence, the forest blocks under the sanctuary were the Sukh, Chillawali, Gaj, Andheri, Molawali, Bam, Betban, Dhaulkhand, Gholna, Harnaul, a part of Mohund block, Chhirak, Rauli, Ranipur, Mayapur and Kharkhari. There are four pucca Watch-Towers and five Rest Houses (two at Mohund and one each at Dhaulkhand, Beribara and Ranipur) with a tarred road from Mohund to Ranipur to facilitate movement of visitors to watch the animals in wild and to stay overnight.

Finally, the Rajaji Sanctuary included forest blocks between Dehra Dun-Delhi road on the western side and Haridwar-Roorkee road on the eastern fringe covering an approximate area of 247.00 sq. kms.

MOTICHUR SANCTUARY

The Motichur Sanctuary was declared, in 1935, with an approximate area of 99.50 sq. kms. The area lies between Satyanarain and Raiwala in dist. Dehra Dun, Kansrao is an important location in the sanctuary. The rivers Song and Suswa cross this sanctuary and finally mingle with the river Ganga.

CHILLA SANCTUARY

The Chilla Sanetuary falls under Pauri Garhwal dist. and covers an approximate area of 249.00 sq. kms. It was declared as a Reserve Forest in 1977.

TOPOGRAPHY AND DRAINAGE

The Siwalik ranges of the Park constitute an alluvial formation and are low ranges between the Himalaya and Indo-Gangetic Plain. These ranges are strongly developed in the Park with a gentle northern slope and steep southern slope. The southern slope is extremely rugged but gets broken up during heavy rains by streams, many of which are generally dry during most part of the year. This region is characterised by conglomerates and soft clay deposits. Underneath lies a considerable thickness of soft sand-stones resting on harder stones of the Nahan stage. The series of more or less parallel ridges run from north-west to south-east direction but gradually are decreasing in height. The altitude in the Park varies from 302 to 1000m. above msl. The land scape is marked with deep gorges and gullies which cut through the un-consolidated strata and forms the floor of the valley.

The river Ganges passes through the Park near Rishikesh and emerges out downstream near Haridwar. The principal tributaries of Ganga in this region are the Song, the Suswa, the Rawason and numerous minor streams passing through the Park. All other water resources (except the perennial ones) remain dried up from March to June, creating acute shortage of drinking water over major portion of the park area during summer.

CLIMATE

There are three distinct seasons, i.e., the winter (from November to February), the summer (from March to June) and the rainy season (from July to October). The movement on foot or on vehicle in the Park is easy from middle of Nov. to middle of June when the forest roads are well maintained. However, during rainy season the roads normally get washed off and movement is possible only on foot or with the help of an elephant.

Minor variations in temperature occur locally on account of altitude but the general temperature over the entire area is always uniform. During winter, the nights

are cold with much frost. In low lying localities, a freezing frost is not an uncommon sight during winter. April and May are fairly hot and June is the hottest period but maximum shade temperature rarely exceeds 44°C. There is a wide variation in annual rain fall with change in altitude and topography. It varies from 400 mm. in outer hills to 2800 mm. in the upper hills. During rainy season, the floods are quite frequent in the main river and its tributaries. The flooded streams flow with great fury and cause damage to roads and bridges. The bulk of the rain is received during monsoon though some winter rains are also received. Effective infiltration of rain-water contributes to recharging of underground aqueducts which improve the water regime.

VEGETATION

The forest in the park is deciduous, with Sal (*Shorea robusta*) as the principal constituent contributing to nearly 75% of the trees. Due to abundant rain fall, favourable conditions are created for diverse forest types like (i) Moist Siwalik Sal (ii) Moist Bhabar Dun Sal (iii) Western Gangetic moist mixed deciduous (iv) Low Alluvial Savannah woodland (v) Dry Siwalik Sal (vi) Northern dry mixed deciduous (vii) Khair Sissoo forest and (viii) Lower Siwalik chir pine forest.

The main species of plants in the park are the Sal (*Shorea robusta*), Bakll (*Anogeissus latifolia*), Sain (*Terminalia tomentosa*), Haldu (*Adina cordifolia*), Bahera (*Terminalia bellerica*), Jhingan (*Lannea coromandelica*), Kharpal (*Garuga pinnata*), Phauri (*Lagerstromia parviflora*), Bula (*Kydia calycina*), Badal (*Stereospermum chelonoides*), Sofed sirus (*Albizia procera*), Tun (*Cadrela tonna*), Gutel (*Trewia nudiflora*), Gular (*Ficus glomerata*) etc.

The under-wood is light and often absent. It consists of Rohini (*Lilolotus philippinensis*), Amaltas (*Cassia fistula*), Sandan (*Ougeinia oojeinensis*), Pipal (*Bauhienia lanzan*), Mahal (*Pyrus pashla*), Chamaror (*Ehretia laevis*), Aonia (*Emblica officinalis*), Kachnar (*Bauhienia variegata*), Ber (*Ziziphus mauritiana*), Chilla (*Casearia tomentosa*), Bel (*Aegle marmelos*), etc.

The under-growth consists of Karaunda (*Carissa opaca*), Gandhala (*Murraya koenigil*), Marorphali (*Helicteres isora*), etc., while the grasses include Gorla (*Chrysopogon fuivus*), Kummeeria (*Heteropogon contortus*) etc.

FAUNAL WEALTH OF RAJAJI NATIONAL PARK

The Rajaji National Park is rich in faunal wealth because of the varied types of ecological niches existing in the area. Since there is no consolidated account of the fauna of (any) Conservation Area, including that of Rajaji National Park, an attempt was made by the scientists of the Northern Regional Station, Dehradun, to survey the area and study various animal forms from this region and an account of all the vertebrates and major invertebrate-groups have been presented here in the following pages of this publication. The groups cover mammals, birds, reptiles (snakes and lizards), amphibians (frogs and toads) and fishes, and the invertebrate groups mainly the Scorpions, Centipedes, Odonata (dragon and damselflies), Hymenoptera (wasps, bees etc.), Isoptera (termites) and Lepidoptera.

Several important herbivores like wild elephants, spotted deer, sambhar, goral, blue bull, hog deer, wild boar, herd of monkeys and common langur occur in the park. Among the important carnivores are tigers and leopards, the smaller carnivores as co-predators are leopard cat, jungle cat and civet cat. Besides, other mammals like hyaena, jackal and bengal fox are not an uncommon sight and work as scavengers in the park.

In all 49 species of mammals belonging to 42 genera, in 21 families and nine orders have been recorded.

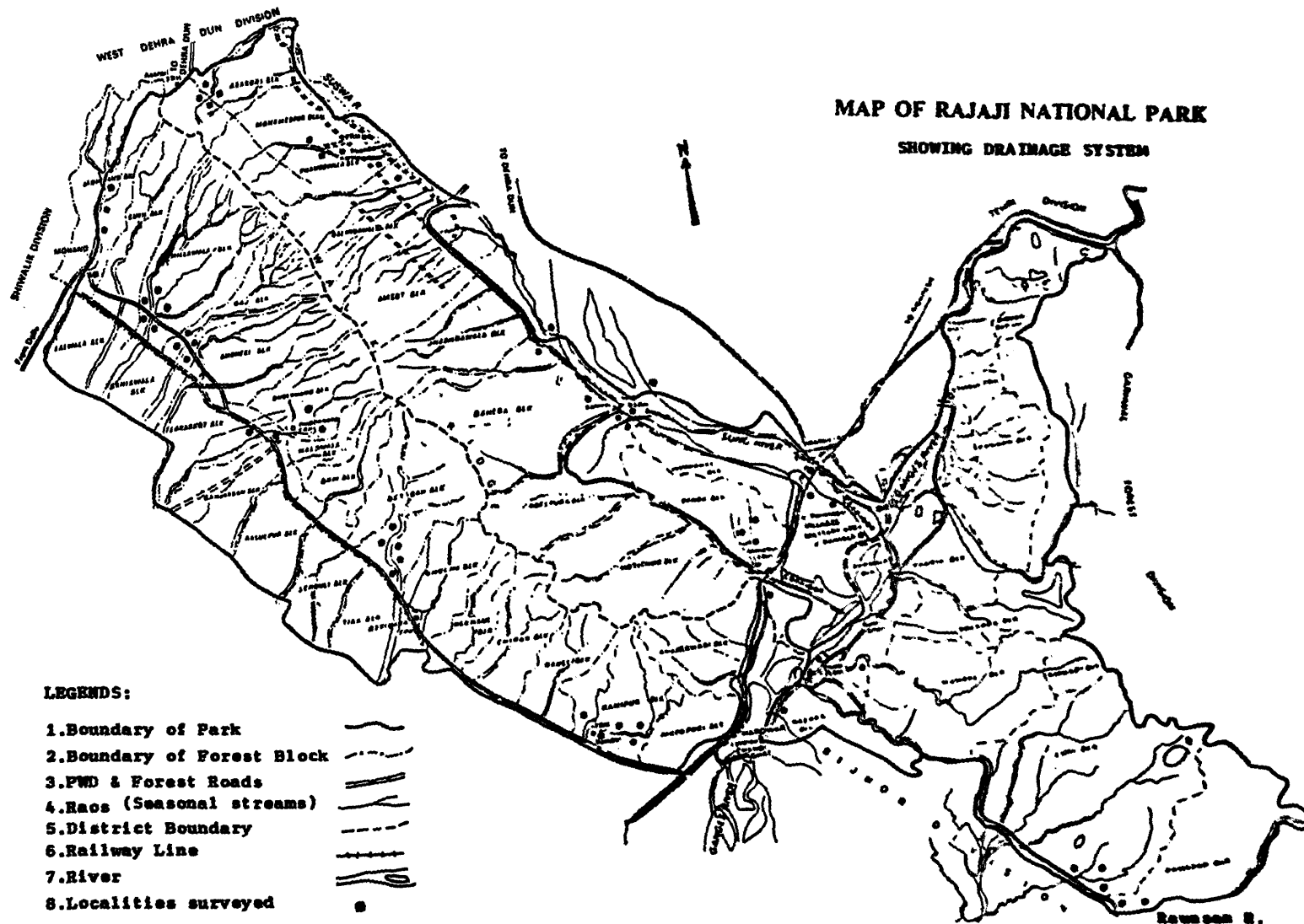
168 species of birds are reported to occur in the park. Birds like ducks, teals, cormorants, egrets, lapwing, pond herons, pea fowl, jungle fowl, various species of partridges and pheasants, common and king crows, owlets and nightjars, birds of prey etc, are quite common.

Twenty eight species of snakes, 12 species of turtles & tortoises and 9 species of lizards among Reptilia are being recorded from the park.

Ten species under six genera and four families belonging to Order Anura (toads & frogs) with their developmental stages have been recorded and presented with illustrations. *Upeerodon systoma*, *Polypedates maculatus* and *Rana crassa* were recorded for the first time from the park. Besides, an interesting phenomenon of breeding of Bufonids were observed, which showed that *B. stomaticus* & *B. melanostictus* breeds during July-August on the northern slope of Siwalik whereas the same species breeds up to November on the southern slope. *Polypedates maculatus*, which inhabits the live tree-holes, breeds only in July.

As many as 49 species of fish fauna have been recorded here, including a small loach *Nemacheilus doonensis* as new to the park, and a species *Berillius dimorphicus* as new to science. Valuable information on the chemical condition (pH, temperature), aquatic vege-

SHOWING DRAINAGE SYSTEM



tation of some streams, district-wise distributional pattern of some species and a key to their identification has been provided besides common english names.

The Scolopendrid Centipedes (Chilopoda) from the Park are represented by seven species, including one subspecies as new to science and one species as a first record from Uttar Pradesh.

Hymenopterous insects mainly refer to Scolid wasps of the Park and as many as 13 species have been recorded. Out of these, five species are not only new to the area, but to the whole of the U. P.

The butterfly fauna of the Park represents as many as 60 species under eight families out of the known nine families of the order Lepidoptera from these areas, particularly the Garhwal and Kumaon Hills of the Himalaya. The account gives distribution in the area on the basis of actual material studied, their structural variations given and common english names recorded.

A collection of various other animal groups have also been made but their study will take some more time to complete and, therefore, the account on those will be presented in the subsequent publications.

Needless to say that the fauna listed and described in this work constitute the first ever account of important groups of the park, though in some cases the presentation may be far from complete. But it is hoped that the account of the fauna presented here will be of interests not only to wild life enthusiasts and zoologists but to layman alike.

The grateful thanks are recorded for the authorities of Rajaji National Park, particularly, Shri D. S. Raturi, and Shri D.V.S. Khatri, former Directors, Rajaji National Park, for various facilities, including kindly supplying the relevant literature and very valuable informations on the subject.

The author is greatly indebted to the Director, Zoological Survey of India, Calcutta, for the kind permission to work out the fauna of Rajaji National Park and to his colleagues at NRS for their utmost co-operation and ever-willingness for having taken part in various surveys at a short notice.

MAMMALS (MAMMALIA)

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Dehradun*

The Rajaji National Park is situated at the foot hills of Himalayas and on Siwalik ranges. The area consists of bhabhar tract of thick boulder deposits where the water table is very low. The conditions are relatively drier here. The forest type is northern tropical dry deciduous composed of Shivalik sal and mixed forest. This is one of the richest areas for the typical big mammals of northern India. The elephant, the sambar, the barking deer, the chital, the wild boar all abounds in this area. Tiger, leopard, wild dogs are the copredators and the hyaena, the jackal, the bengal fox scavenging on the remains of tiger kill.

In recent years, quite a number of species have restricted in number in this area. This regression is attributed to environmental change arising from alteration, degradation or destruction of natural habitats, deforestation, agricultural expansion right upto the edge of forests, unrestricted grazing and spreading urbanisation and above all and most important is the increased rate of poaching.

The Rajaji National Park is recently established and it is felt that a complete list of fauna present in it should be made. With this object an attempt have been made to record the mammalian fauna present in the park. As no shooting or trapping permit was issued for this work, most of the identification is based on sight records between 1981 and 1987 during the various faunistic survey tours.

The classification is based on Simpson (1945). The two species *Axis porcinus* and *Cuon alpinus* have not been recorded by the author but they were taken from the records of Singh (1979 and 1979a) who have claimed to be recorded in the park area till 1964-65. The distribution and description of the various species have been taken from Ellerman and Morrison-Scott (1951) and Prater (1971).

LIST OF MAMMALS RECORDED FROM RAJAJI NATIONAL PARK

Order I : INSECTIVORA

Family : ERINACEIDAE

1. *Hemiechinus auritus* (Gmelin)

Long-eared Hedgehog

1770. *Erinaceus auritus* Gmelin, Nov. Comment. Acad. Sci Petrop 14 : 519 Astrakhan (Type locality : South-Eastern Russia).

Distribution : Cutch, Sind, Rajputana, Delhi, Palampur, Punjab, Doab between the rivers Jamuna and Ganges, Himalayan mountains.

Family : SORICIDAE

2. *Suncus murinus* (Linnaeus)

House Shrew or Grey Musk Shrew

1766. *Sorex murinus* Linnaeus, Syst. Nat. 12th Ed, 1 : 74 (Type locality : Java).

Distribution : Widely distributed being found throughout the temperate and tropical regions of Europe, Asia, Africa and North America. In India they have been recorded from Dehradun, Kumaon, Punjab, Kashmir in northern India, Gwalior, Nimar in Madhya Pradesh, Bihar, Orissa, West Bengal, Assam, Rajputana Cutch, Western Ghats. They have also been recorded from Sri Lanka.

Order II : CHIROPTERA

Family : PTEROPIDAE

3. *Rousettus leschenaulti* (Desmarest)

Fulvous Fruit-Bat

1820. *Pteropus leschenaulti* Desmarest, Encycl. Meth. Mamm. I : 110 (Type locality : Pondicherry, India).

Distribution : Rajputana, Himalayas-Kumaon, Indian Peninsula, Calcutta, Western Ghats in India and Nepal, Bhutan Duars, Burma, North Siam, Tonkin and Indo-China in the neighbourhood.

4. Pteropus giganteus (Brünnich)

Indian Flying Fox

1782. *Vespertilio gigantea* Brünnich, *Dyrenes Historie*, I : 45 (Type locality : Bengal, India).

Distribution : Widely distributed in Indian Peninsula and are found up to Rajputana, Cutch, Kathiawar, Kumaon, Punjab in north west and north. They are also reported from Sikkim, Assam, Manipur, Nepal, Bhutan Duars, Burma and Sri Lanka.

Family : RHINOLOPHIDAE

5. Rhinolophus affinis Horsfield

Greater Horseshoe Bat

1823. *Rhinolophus affinis* Horsfield, *Zool. Res. Java* (6), pl. figs. a, b, Java (Type locality : Java).

Distribution : Mussoorie, Kumaon in north western India, Nepal, Darjeeling, Bhutan Duars, Burma, Southern China, Hainan, Tonkin, Indo-China, Malay States, Sumatra, Java, Natuna and Anamba Islands.

6. Rhinolophus lepidus Blyth

Horseshoe Bat

1844. *Rhinolophus lepidus* Blyth, *J. Asiatic Soc. Bengal*, 13 : 486 (Type locality : Calcutta, India).

Distribution : Mussoorie, Kumaon, Bengal, Ganges Valley and Central India. These are also reported from Szechun, Yunnan, China and Burma.

7. Hipposideros cineraceus Blyth

Leaf-nosed Bat

1853. *Hipposideros cineraceus* Blyth, *J. Asiatic Soc. Bengal*, 22 : 410 (Type locality : Near Ping Dadan Khan, Salt range, Punjab).

Distribution : In India these are recorded from Dehradun, Simla, Punjab. They were also recorded from Burma, Rehang in Siam, Tonkin in Indo-China, Malay States, Rhio Archipelago, Borneo, Anamba Islands.

Family : VESPERTILIONIDAE

8. *Myotis formosus* Hodgson

Hodgson's Bat

1835. *Vespertilio formosa* Hodgson. *J. Asiatic Soc. Bengal*, 4 : 700 (Type Locality : Nepal).

Distribution : Punjab, Kumaon, Sikkim, Bengal, Assam, Bihar in India and Southern China, Korea, Formosa and Southern Japan.

9. *Nyctalus leisleri* (Kuhl)

Lesser Noctule. Hairy-armed Bat

1818. *Vespertillio leisleri* Kuhl, *Ann. Wetterau Ges. Naturk.* 4, 1 : 46 (Type locality : Hainan, Hessen Nassau, Germany).

Distribution : This is a species of Europe and temperate region and are recorded in northern India from Mussoorie, Kumaon and Punjab.

10. *Pipistrellus coromandra* (Gray)

Indian Pipistrelle

1838. *Scotophilus coromandra* Gray, *Mag. Zool. Bot.* 2 : 498. (Type locality : Pondicherry, Coromondal Coast, India).

Distribution : In India these are reported from Pondicherry, Mussoorie, Dehradun, Kumaon & Sikkim. They are also recorded from Southern China, Hainan, Indo-China, Burma, Bhutan Duars, Sri Lanka & Persia.

11. *Murina grisea* Peters

Peters' Tube-nosed Bat

1872. *Murina grisea* Peters, *Mber. Preuss. Akad. Wiss.* 258. P. Z. S. 712 (Type locality : Mussoorie, India).

Distribution : Mussoorie in Garhwal and Kumaon Hills in north western Himalaya.

Order III : PRIMATES

Family : CERCOPITHECIDAE

12. *Macaca mulatta* (Zimmermann)

Bander, Rhesus Macaque

1780. *Cercopithecus mulatta* Zimmermann, *Geogr. Gesch. Mensch* 2 : 195 (Type locality : India).

Distribution : The Himalayas, Assam and northern and central India as far south as the river Tapi in the West and the Godavari in the east, extending upto Burma and adjoining countries.

13. *Presbytis entellus* (Dufresne)

Langur (Entellus Monkey)

1797. *Simia entellus* Dufresne, *Bull. Soc. Philom. Paris*, I, 7 : 49 (Type locality : Bengal India).

Distribution : Practically the whole of India, from Himalayas to Cape Comorin except the western deserts.

Order IV : PHOLIDOTA

Family : MANIDAE

14. *Manis crassicaudata* (Gray)

Indian Pangolin

1827. *Manis crassicaudatus* Gray, in *Griffith's Cuvier Anim. Kingd.* 5 : 282 (Type locality : India).

Distribution : The Indian Pangolin inhabits the plains and lower slopes of hills of India south of Himalayas. Indian peninsula, Madras, Mysore, Bellary, Kanara, Coorg to Cutch and Bengal.

Order V : CARNIVORA

Family : CANIDAE

15. *Canis aureus* Linnaeus

Asiatic Jackal

1758. *Canis aureus* Linnaeus, *Syst. Nat. 10th Ed. I* : 40. (Type locality : Province of Lar, Persia).

Distribution : South Eastern Europe, South Western Asia, throughout India and Sri Lanka, extending someway into Burma and South Eastern Siam.

16. *Vulpes bengalensis* (Shaw)

Bengal Fox or the Indian Fox

1800. *Canis bengalensis* Shaw, *Gen. Zool. I*, 2 : 330 (Type locality : Bengal).

Distribution : The whole of India from the foothills of the Himalayas to Cape Comorin and Nepal.

17. *Cuon alpinus* Pallas

Dhole, Red Dog or Indian Wild Dog

1811 *Cuon alpinus* Pallas, *Zoogr. Ross. Asiat. I* : 34 (Type locality : Near Udskol Ostrog, Amurland).

Distribution : Central and eastern Asia from the Altai mountain and Manchuria, southward through the forest regions of India and the Malay countries.

Family : URSIDAE

18. *Melursus ursinus* (Shaw)

Sloth Bear

1791. *Bradypus ursinus* Shaw, *Nat. Misc. 2* (unpaged), pls. 58-59 (Type locality : Patna, on the Ganges, Bengal).

Distribution : From base of Himalayas to Assam, Bihar, Bengal and Indian peninsula up to Sri Lanka in forest patches.

Family : MUSTELIDAE

19. Martes flavigula (Boddaert)

Yellow-throated Marten

1785. *Mustela flavigula* Boddaert, *Elench. Anim.* 88 (Type locality : Nepal).

Distribution ; Eastern Siberia, Korea, Manchuria, China, Tibet, Formosa, Indo-China, Siam, Malay States, Sumatra, Java and Burno. In India, the Himalayas and the Assam hill ranges.

20. Lutra perspicillata Geoffroy

Smooth-coated Indian Otter

1826. *Lutra perspicillata* I. Geoffroy, *Dict. Class. H. N.* 9 : 519 (Type locality : Sumatra).

Distribution : Sumatra, Malay States, Indo-China, Western Yunan, Burma, Assam, Nepal Terai, Sind and southwards to Travancore.

Family : VIVERRIDAE

21. Viverricula indica (Desmarest)

Rasse, or Small Indian Civet

1817. *Viverra indica* Desmarest. *Nouv. Dict. N. H.* 7 : 70 (Type locality : India).

Distribution : In India they are found in foothills of Himalayas to Cape Comorin, Sind and Punjab. Southern China, Hainan, Formosa, Sri Lanka, Bhutan, Burma, Indo-China, Siam, Malay States, Sumatra, Java and Bali.

22. Paradoxurus hermaphroditus (Pallas)

Common Palm Civet, or Toddy Cat

1777. *Viverra hermaphrodite* Pallas, in Schreber, *Saugeth* 3 : 426 (Type locality : India).

Distribution : In India Kashmir, the Himalayas and Assam southwards through whole of the peninsula. Southern China, Burma, Indo-China. Siam, Malay States. Sumatra, Java, Borneo, Philippines, Timer, Ceram and Sri Lanka.

23. *Herpestes auropunctatus* (Hodgson)

Small Indian Mongoose

1836. *Mangusta auropunctata* Hodgson, *J. Asiat. Soc. Bengal*, 5 : 235 (Type locality : Nepal).

Distribution : In India from Kashmir to Bengal, Orissa, Assam extending eastward into Burma and Malay countries, Northern Arabia, Iraq, Afghanistan.

24. *Herpestes edwardsi* (Geoffroy)

Indian Grey Mongoose

1818. *Ichneumon edwardsii* Geoffroy, *Deser. Egypte*, 2 : 139 [Type locality : East Indies (Madras)].

Distribution : Arabia, Persia, Iraq, Afghanistan, Baluchistan, N.W. Frontier, southwards over to peninsular India, Assam, Nepal and Sri Lanka.

Family : HYAENIDAE

25. *Hyaena hyaena* (Linnaeus)

Striped Hyaena

1758. *Canis hyaena* Linnaeus, *Syst. Nat.* 10th ed : 1 : 40. (Type locality : Benna Mountain, Laristan, Southern Persia).

Distribution : West coast of Caspian Sea, Southern Russian Turkestan, Uzbekistan, Tadjikistan, Persia, Iraq, Syria, Palestine, Arabia, Afghanistan, Asia Minor, Morocco, Algeria, Egypt, Libya, Somaliland, Sudan and Kenya. In India they are reported from Kashmir to Nepal Terai, Sind, Cutch, southwards to Nilgiri Hills, Indian peninsula and adjoining areas.

Family : FELIDAE

26. *Felis chaus* Güldenstaedt

Jungle Cat

1776. *Felis chaus* Güldenstaedt, *Nov. Com. Acad. Petrop.* 20 : 483. (Type locality : Terek river, north of the Caucasus).

Distribution : Widely distributed from north Africa through south-western Asia to India, Sri Lanka, Burma and Indo-China. A wild cat of India found all over from Himalayas to Cape Comerin, Geoffroy (1844) reported it from Dehradun.

27. *Felis bengalensis* Kerr

Leopard Cat

1792. *Felis bengalensis* Kerr, *Anim. Kingd.* 151. (Type locality : Southern Bengal).

Distribution : Siberia, south-eastern Asia generally northwards to Manchuria and Korea. In India these are found in forest regions from Kashmir to Cape Comorin.

28. *Panthera pardus* (Linnaeus)

Leopard

1758. *Felis pardus* Linnaeus, *Syst. Nat.* 10th ed. I : 41. (Type locality : Egypt).

Distribution : South-western Turkestan, Eastern Siberia, Manchuria, China, Tibet, Asia minor, Persia, Arabia, Baluchistan, Egypt, Algeria, Indo-China, Malay States. In India they are inhabiting forests of whole of country and extends into Burma & Sri Lanka.

29. *Panthera tigris* (Linnaeus)

Tiger

1758. *Felis tigris* Linnaeus, *Syst. Nat.* 10th ed. I : 41. (Type locality : Bengal).

Distribution : 6 races have been distinguished on the basis of its distribution in the world. The Indian race, designated as a typical tiger is found practically throughout India except in desert region. Its range extends up to Burma.

Order VI : PROBOSCIDEA

Family : ELEPHANTIDAE

30. *Elephas maximus* Linnaeus

Indian Elephant

1758. *Elephas maximus* Linnaeus, *Syst. Nat.* 10th. Ed. I : 33 (Type locality : Sri Lanka).

Distribution : Sri Lanka and India along the base of Himalaya from Dehradun to Assam and as far as Burma, Siam, Malay States, Sumatra. They are also found in India between Ganges and Krishna, Western Ghats and Mysore.

Order VII : ARTIODACTYLA

Family : SUIDAE

31. *Sus scrofa* Linnaeus

Wild Boar

1758. *Sus scrofa* Linnaeus, *Syst. Nat.* 10th ed. 1 : 49 (Type locality : Germany).

Distribution : Widely distributed throughout world. They are also distributed throughout India, Burma, Tenneserim, Siam and parts of Malay peninsula. They are equally common in Sri Lanka.

Family : CERVIDAE

32. *Muntiacus muntjak* (Zimmermann)

Indian Muntjak (Barking Deer)

1780. *Cervus muntjak* Zimmermann, *Geogr. Gesch.* 2 : 131. (Type locality : Java).

Distribution : Southern China, Indo-China, Siam, Malay States, Sumatra, Java, Borneo and adjacent islands. In India they are occurring in Assam, peninsular India, Uttar Pradesh and adjoining Nepal and Sri Lanka.

33. *Axis axis* (Erxleben)

Chital, Axis Deer, Spotted Deer

1777. *Cervus axis* Erxleben, *Syst. Regn. Anim.* 312. (Type locality : Banks of the Ganges, India).

Distribution : Sri Lanka, northwards to peninsular India, Kumaon, Sikkim, Bengal and Nepal.

34. *Axis porcinus* (Zimmermann)
Hog Deer (Para)

1780. *Cervus porcinus* Zimmermann. *Geogr. Gesch.* 2 : 131 (Type locality : Bengal).

Distribution : Sind, Punjab, Kumaon, Nepal, Bengal, Assam, Burma, Indo-China and Siam. Conspicuously absent in peninsular India but present in Sri Lanka where it is introduced.

35. *Cervus unicolor* (Kerr)
Sambar

1792. *Cervus axis unicolor* Kerr, *Anim. Kingd.* 300 (Type locality : Sri Lanka).

Distribution : The forested areas of India, Burma and Sri Lanka, extending through the Malay countries and eastwards to the Philippines and beyond.

Family : BOVIDAE

36. *Boselaphus tragocamelus* (Pallas)
Nilgai ; Blue Bull

1766. *Antilope tragocamelus* Pallas, *Misc. Zool.* 5. (Type locality : Plains of peninsular India).

Distribution : Found from base of Himalayas to Mysore and in Indian peninsula only.

37. *Naemorhedus goral* (Hardwicke)
Goral

1825. *Antilope goral* Hardwicke, *Trans. Lin. Soc. London*, 14 : 518. (Type locality : Nepal, Himalaya).

Distribution : Western to eastern Himalayas.

Order VIII : LAGOMORPHA

Family : LEPORIDAE

38. *Lepus nigricollis* Cuvier

Indian Hare ; Black-naped Hare

1823. *Lepus nigricollis* F. Cuvier, *Dict. Sci. Nat.* 26 : 307. (Type locality : Madras, India).

Distribution : Sri Lanka, peninsular India northward to Punjab, Sind, Cutch, Kathiawar, Sikkim, North Kamrup, Java, Nepal, and Bhutan Duars.

Order IX : RODENTIA

Family : SCIURIDAE

39. *Funambulus pennanti* Wroughton

Northern Palm Squirrel

1905. *Funambulus pennantii* Wroughton, *J. Bombay nat. Hist. Soc.* 16 (3) : 413 (Type locality : Rawalpindi, northern Punjab now in Pakistan).

Distribution : They inhabit the Indian peninsula from the base of Himalaya to southwards.

Family : HISTRICIDAE

40. *Hystrix indica* (Kerr)

Indian Crested Porcupine

1792. *Hystrix cristata* var. *Indica* Kerr, *Anim. Kingd.* 213. (Type locality : India).

Distribution : Persia, Baluchistan to Syria, Asia Minor, Palestine. In India they are found from Himalaya to Cape Comorin and Sri Lanka.

Family : MURIDAE

41. *Apodemus sylvaticus* (Linnaeus)

Common Field Mouse

1758. *Mus sylvaticus* Linnaeus, *Syst. Nat.* 10th ed, 1 : 62. (Type locality : Upsala, Sweden).

Distribution : Widely distributed throughout world including India.

42. *Rattus rattus* (Linnaeus)

House Rat, Black Rat

1758. *Mus rattus* Linnaeus, *Syst. Nat.* 10th ed. 1 : 61 (Type locality : Sweden).

Distribution : Widely distributed throughout world and also the Indian continent. This is our common species.

43. *Mus musculus* Linnaeus

House Mouse

1758. *Mus musculus* Linnaeus, *Syst. Nat.* 10th ed. 1 : 62. (Type locality : Upsala, Sweden).

Distribution : Distributed throughout the world. In India these are reported from Dehradun, U. P. Terai and half of Indian plains & foot hills of Himalayas.

44. *Mus booduga* (Gray)

Little Indian Field Mouse

1837. *Leggada booduga* Gray, *Charlesworth Mag. N. H.* 1 : 586. (Type locality : Southern Mahratta country, India).

Distribution : Throughout India and Mt. Popa, Burma.

45. *Golunda ellioti* Gray

Indian Bush Rat

1837. *Gollunda ellioti* Gray, *Charlesworth Mag. N. H.* 1 : 586. (Type locality : Dharwar, India).

Distribution : Sri Lanka, peninsular India, northwards to Cutch, Sind, North West Frontier, Punjab, Nepal, Bhutan Duars and Kamrup.

46. *Bandicota bengalensis* (Gray and Hardwicke)

Lesser Bandicoot Rat"—Indian Mole Rat"

1833. *Arvicola bengalensis* Gray & Hardwicke, *Illustr. Ind. Zool.* 2, pl. 21. (Type locality : Bengal, India).

Distribution : Sri Lanka, peninsular India northwards to Kathiawar, Sind, Punjab, Kashmir, thence to Nepal, Assam and Burma, Penang Island, Sumatra, Java.

47. *Bandicota indica* (Bechstein)

Large Bandicoot Rat

1800. *Mus indicus* Bechstein, *Ueber Vierf. Thiere*, 2 : 497. (Type locality : Pondicherry, India).

Distribution : Sri Lanka, peninsular India, north to Kathiawar, Uttar Pradesh, Assam, Nepal, Burma, Yunan, Formosa, Indo-China, Java, Sumatra and Hong Kong.

48. *Nesokia indica* (Gray and Hardwicke)

Short-tailed Bandicoot Rat (Short-tailed 'Mole-Rat')

1832. *Arvicola indica* Gray & Hardwicke, *Illustr. Ind. Zool* 1 : pl. XI. (Type locality : India).

Distribution : Southern Russian and Chinese Turkestan, Baluchistan, Afghanistan, Persia, Iraq, Palestine, Syria, Northern Arabia, Egypt. In India these are found in Punjab, Rajputana, Sind, Kumaon, Dehradun and Rajaji National Park,

49. *Tatera indica* (Hardwicke)

Indian Gerbil ; Antelope Rat.

1807. *Dipus indicus* Hardwicke, *Trans. Linn. Soc. London*, 8 : 279 (Type locality : Between Varanasi and Hardwar, U. P. India).

Distribution : Sri Lanka, peninsular India, Uttar Pradesh, Kumaon, Punjab, Kathiawar, Sind, Baluchistan, Nepal Terai, Persia Iraq, Syria and northern Arabia.

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BIRDS (AVES)

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INTRODUCTION

It is an established fact that birds play an important role in the maintenance of natural ecosystem. Having realised the importance of birds and wildlife in general, the Government of India has created several national parks and sanctuaries where the wildlife including birds receives protection against poaching and destruction of habitat.

District Dehra Dun, in which lies the major part of Rajaji National Park, is quite fortunate as far as the study of the avifauna is concerned. It has received the attention of a large number of ornithologists—both Indians as well as foreigners. The work was initiated by Osmaston (1897-1901, 1918) with his publications on 'Birds nesting in the Tons Valley'. This was followed by his (Osmaston, 1935) paper on 'Birds of Dehra Dun and adjacent hills' in which he listed 405 species of birds. Wright (1949, 1957) contributed to the ornithology of Dehra Dun by publishing a list of 227 species of birds. Joseph (1957, 1962) published a list of birds of New Forest in the campus of Forest Research Institute. Bhatnagar and Mishra (1971, 1972, 1973) published a series of papers on birds of Dehra Dun. Osman (1972, 1974, 1976), a naturalist has captured a few birds of prey and trained them for falconary purposes. Lamba and Narang (1977); Lamba and Tyagi (1977); Narang and Lamba (1976, 1981, 1982, 1984); Narang, Tyagi and Lamba (1980) have published a series of papers on ecology of birds of Dehra Dun.

But all the above mentioned work relates to the birds which are found either in Dehra Dun proper or in Himalayan portion of district Dehra Dun. Not much studies have been made in the area which forms the present-day Rajaji National Park (Rajaj Sanctuary, Motichur Sanctuary, Chila forest and some portion of Shivalik Hills in district Dehra Dun). An attempt has, therefore, been made to prepare a list of

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birds of the present-day Rajaji National Park. About twenty five species, mostly belonging to the family Muscicapidae, which could not be identified in the field but are often observed, can be added to the list of the area. These species cannot be identified unless in hand.

The present studies were carried out from 1982-87. The birds were identified with the help of field binoculars (16 × 50). The following abbreviations have been used :

- R : Resident
 C : Common
 U : Uncommon
 WM : Winter migrant
 SM : Summer migrant

OBSERVATIONS

Order : PODICIPEDIFORMES

Family : PODICIPEDIDAE

1. Little Grebe or Dabchick

Podiceps ruficollis (Pallas) R

Occasionally seen in the ponds near villages located inside and close to park area.

Order : PELICANIFORMES

Family : PHALACROCORACIDAE

2. Large Cormorant

Phalacrocorax carbo (Linnaeus) R

Commonly seen sitting on the banks and flying over Song and Suswa rivers.

3. Little Cormorant

Phalacrocorax niger (Vieillot) R, C

Flocks are seen on the Song and Suswa rivers.

Order : CICONIIFORMES

Family : ARDEIDAE

4. Grey Heron

Ardea cinerea Linnaeus R

Observed on the banks of Song river. Frequently met with at Dhalipur Lake.

5. Pond Heron or Paddybird

Ardeola grayii (Sykes) R

Commonly seen near ponds and rivers flowing through the park.

6. Cattle Egret

Bubulcus ibis (Linnaeus) R,C

Commonly seen attending to grazing cattles in the park.

7. Large Egret

Ardea alba Linnaeus R

Occasionally seen on the banks of rivers flowing through the park.

8. Smaller or Median Egret

Egretta intermedia (Wagler) R

Seen wading through the water of Song and Suswa rivers.

9. Little Egret

Egretta garzetta (Linnaeus) R, C

Observed on the banks of Song, Suswa and Asan rivers.

10. Night Heron

Nycticorax nycticorax (Linnaeus) R, U

Recorded at Dhalipur Lake. Likely to be found at wetlands of the park as well,

11. Chestnut Bittern

Ixobrychus cinnamomeus (Gmelin)

R, U

Observed at Dhalipur Lake. Likely to be found at wetlands of the park as well.

Family : CICONIIDAE

12. Painted Stork

Mycteria leucocephala (Pennant)

R

Observed near Satyanarain and also at Dhalipur Lake.

Family : THRESKIORNITHIDAE

13. Black Ibis

Pseudibis papillosa (Temminck)

R

A specimen was collected from a field near Beri Bara area.

Order : ANSERIFORMES

Family : ANATIDAE

14. Brahminy Duck

Tadorna ferruginea (Pallas)

WM, C

Seen in winter along the banks of Song and Suswa rivers.

15. Pintail

Anas acuta Linnaeus

WM

Observed at Dhalipur Lake. Likely to be found in the park as well.

16. Common Teal

Anas crecca Linnaeus

WM, C

Very common at Dhalipur Lake in winter. Also recorded from small ponds in the park area.

17. Spotbill Duck

Anas poecilorhyncha J. R. Forster

R, U

Seen only once on the banks of Song river.

18. Mallard

Anas platyrhynchos Linnaeus

WM

Commonly seen at Dhalipur Lake in winter. Likely to be found in the park area also.

19. Redcrested Pochard

Netta rufina (Pallas)

WM

Recorded from Dhalipur Lake during winter. Likely to be found in the park area also.

20. Common Pochard

Aythya ferina (Linnaeus)

WM, C

Very common at Dhalipur Lake during winter. Likely to be found in the park area also.

Order : FALCONIFORMES

Family : ACCIPITRIDAE

21. Blackwinged Kite

Elanus caeruleus (Desfontaines)

R

Found throughout the park.

22. Honey Buzzard

Pernis ptilorhynchus (Temminck)

R

Observed on the Hardwar road near Laxman Sidh area.

23. Pariah Kite

Milvus migrans (Boddaert)

R, C

Very common throughout the park.

24. Shikra

Accipiter badius (Gmelin)

R, C

Commonly found throughout the park

25. Sparrow-Hawk

Accipiter nisus (Linnaeus)

WM, U

A specimen was collected from a semiforested area near Jhajra village. Likely to be found in the park as well.

26. White-eyed Buzzard-Eagle

Butastur teesa (Franklin)

R, U

Seen in the Asarori forest.

27. Changeable Hawk-Eagle

Spizaetus limnaeetus (Horsfield)

R, U

Observed near Badshahi Bag.

28. Bonelli's Hawk-Eagle

Hieraaetus fasciatus (Vieillot)

R, U

Occasionally seen in the park area.

29. Tawny Eagle

Aquila rapax (Temminck)

R

Seen on the Mohund-Shakumbhari Devi road.

30. Black or King Vulture

Sarcogyps calvus (Scopoli)

R, U

Occasionally seen in the park area.

31. Longbilled Vulture

Gyps indicus (Scopoli)

R

Frequently seen in the park area.

32. Indian Whitebacked Vulture

Gyps bengalensis (Gmelin)

R, C

Commonest vulture throughout the park.

33. Scavenger Vulture

Neophron percnopterus (Linnaeus)

R, C

Commonly seen in the park area.

34. Crested Serpent Eagle

Spilornis cheela (Latham)

R

Observed near Forest Rest House, Mohund.

Family : FALCONIDAE

35. Laggar Falcon

Falco biarmicus Temminck

R, U

Observed at Forest Rest House, Mohund.

36. Redheaded Merlin

Falco chicquera Daudin

R, U

Single bird seen near Dat Devi temple.

37. Kestrel

Falco tinnunculus Linnaeus

WM, U

Seen near Beri Bara and Kansro Forest Rest House.

Order : GALLIFORMES

Family : PHASIANIDAE

38. Black Partridge

Francolinus francolinus (Linnaeus) R, U

A specimen was collected from a semi-forested area close to Asan river. Likely to be bound in the park as well.

39. Grey Partridge

Francolinus pondicerianus (Gmelin) R, C

Fairly common on the periphery of the park.

40. Jungle Bush Quail

Perdica asiatica (Latham) R, C

Fairly common in the cultivated fields and bushes in the vicinity of the park.

41. Whitecrested Kaleej Pheasant

Lophura leucomelana (Latham) R, C

Commonly seen at dusk and dawn on the Mohund-Beri Bara road.

42. Red Junglefowl

Gallus gallus (Linnaeus) R, C

Commonly found on the Mohund-Beri Bara road.

43. Indian Peafowl

Pavo cristatus Linnaeus R, C

Fairly common throughout the park.

Order : GRUIFORMES

Family : GRUIDAE

44. Sarus Crane

Grus antigone (Linnaeus) R, U

Occasionally met with in the marshy area of Motichur forest and at Dhalipur lake.

45. Demoiselle Crane

Anthropoides virgo (Linnaeus) WM

Seen in the freshly sown wheat fields near Beri Bara area.

Family : RALLIDAE

46. Banded Crabe

Rallina eurizonoides (Lafresnaye) R

Single bird seen in the Chilla forest area.

47. Whitebreasted Waterhen

Amaurornis phoenicurus (Pennant) R, C

Commonly seen in the Satyanarain area.

48. Moorhen

Gallinula chloropus (Linnaeus) R

Commonly met with in the marshes of Motichur forest.

Order : CHARADRIIFORMES

Family : CHARADRIIDAE

49. Lapwing or Green Plover

Vanellus vanellus (Linnaeus) WM

Occasionally encountered in the agricultural fields adjacent to the park area during winter.

50. Redwattled Lapwing

Vanellus indicus (Boddaert)

R, C

Very common. Found along the rivers and streams in the park.

51. Spurwinged Lapwing

Vanellus spinosus (Linnaeus)

R

Occasionally met with on the banks of Song and Suswa rivers.

52. Little Ringed Plover

Charadrius dubius Scopoli

Seen only in winter

Seen on the banks of rivers in the park.

53. Redshank

Tringa totanus (Linnaeus)

WM

Occasionally seen in the park area wading through the water of Song and Suswa rivers.

54. Greenshank

Tringa nebularia (Gunnerus)

WM, C

Commonest wader in the park during winter.

Family : BURHINIDAE

55. Stone Curlew

Burhinus oedicephalus (Linnaeus)

R, U

A specimen was collected from an agricultural field near Karwa Pani.

Family : GLAREOLIDAE

56. Small Indian Pratincole

Glareola lactea Temminck

R, U

A specimen was collected over Asan river near Dhalipur lake.

Family : LARIDAE

57. Blackheaded Gull

Larus ridibundus Linnaeus

WM

Occasionally encountered over the Song, Suswa and Asan rivers. A specimen was collected from Asan river.

58. Indian River Tern

Sterna aurantia J. E. Gray

R

Commonly found flying over the rivers running through the park.

59. Blackbellied Tern

Sterna acuticauda J. E. Gray

R

Commonly seen in association with Indian River Terns over the rivers flowing through the park.

Order : COLUMBIFORMES

Family : COLUMBIDAE

60. Blue Rock Pigeon

Columba livia Gmelin

R, C

Very common.

61. Ring Dove

Streptopelia decaocto (Frivaldszky)

R,C

Commonly seen and heard throughout the park.

62. Red Turtle-Dove

Streptopella tranquebarica (Hermann)

Not certain

Occasionally found on the Mohund-Shakumbhari Devi road,

63. Spotted Dove

Streptopelia chinensis (Scopoli)

R, C

Commonly seen throughout the park.

64. Little Brown or Senegal Dove

Streptopelia senegalensis (Linnaeus)

R

Found in the neighbourhood of forests.

65. Emerald Dove

Chalcophaps indica (Linnaeus)

R

A specimen was collected from Survey of India campus at Hathibarkala. Likely to be found in the park as well.

Order : PSITTACIFORMES

Family : PSITTACIDAE

66. Large Indian Parakeet

Psittacula eupatria (Linnaeus)

R, C

Commonly seen in the cultivated fields on the periphery of the park area.

67. Roseringed Parakeet

Psittacula krameri (Scopoli)

R

Found in the agricultural fields on the periphery of the park area.

68. Blossomheaded Parakeet

Psittacula cyanocephala (Linnaeus)

R, C

Commonly found in the park area.

69. Slatyheaded Parakeet

Psittacula himalayana (Lesson)

Uncertain

A flock was seen near Forest Rest House, Mohund, in September,

Order : CUCULIFORMES

Family : CUCULIDAE

70. Pied Crested Cuckoo

Clamator jacobinus (Boddaert) SM

Commonly seen and heard from May to August.

71. Indian Cuckoo

Cuculus micropterus Gould Not certain

Commonly heard during summer.

72. Cuckoo

Cuculus canorus Linnaeus Not certain

Commonly heard during the breeding season.

73. Koel

Eudynamys scolopacea (Linnaeus) R, C

Commonly seen and heard in villages adjacent to the park area.

74. Sirkeer Cuckoo

Taccocua leschenaultii Lesson R

A specimen was collected from a village near Beri Bara.

75. Crow-Pheasant

Centropus sinensis (Stephens) R

Seen in the sugarcane fields near Kansro.

Order : STRIGIFORMES

Family : STRIGIDAE

76. Great Horned Owl

Bubo bubo (Linnaeus) R

Solitary birds seen at Beri Bara and Kansro.

77. Spotted Owlet

Athene brama (Temminck) R, C

Very common around Forest Rest House, Mohund.

Order : CAPRIMULGIFORMES

Family : CAPRIMULGIDAE

78. Indian Little Nightjar

Caprimulgus asiaticus Latham R

A specimen was collected from a semi-forested area near Chanderbani. Commonly found on the Mohund-Beri Bara road, just before darkness.

Order : APODIFORMES

Family : APODIDAE

79. House Swift

Apus affinis (J. E. Gray) R, C

Seen around Forest Rest House, Mohund. Very common in Dehra Dun city.

Order : CORACIIFORMES

Family : ALCEDINIDAE

80. Pied Kingfisher

Ceryle rudis (Linnaeus) R

Can be seen hovering over the Song and Suswa rivers.

81. Small Blue Kingfisher

Alcedo atthis (Linnaeus)

Not certain

Can be seen flying over the streams and rivers in the park.

82. Whitebreasted Kingfisher

Halcyon smyrnensis (Linnaeus)

R

Normally found near villages located close to the park area.

Family : MEROPIDAE

83. Green Bee-eater

Merops orientalis Latham

R, C

Commonly found in the Mohund area.

Family : CORACIIDAE

84. Northern Roller or Blue Jay

Coracias benghalensis (Linnaeus)

R

Occasionally found in the cultivated fields adjacent to the park area.

Family : UPUPIDAE

85. Hoopoe

Upupa epops Linnaeus

R

Normally seen around villages located close to the park area.

Family : BUCEROTIDAE

86. Common Grey Hornbill

Tockus birostris (Scopoli)

R

Flocks of birds seen in the Motichur forest.

Order : PICIFORMES

Family : CAPITONIDAE

87. Green Barbet

Megalaima zeylanica (Gmelin) R, C

Commonly seen and heard in the forested area of the park. A specimen was collected from Laxman Sidh area.

88. Bluethroated Barbet

Megalaima asiatica (Latham) R

Heard in the Asarori forest.

89. Crimsonbreasted Barbet or Coppersmith

Megalaima haemacephala (P.L.S. Muller) R

Commonly heard and seen near Mohund.

Family : PICIDAE

90. Speckled Piculet

Picumnus innominatus Burton R, U

A specimen was collected from Survey of India campus at Hathibarkala. Likely to be found in the park area also.

91. Blacknaped Green Woodpecker

Picus canus Gmelin R

A specimen was collected from Laxman Sidh area.

92. Small Yellownaped Woodpecker

Picus chlorolophus Vieillot R

Seen in the Karwa Pani and Laxman Sidh area.

93. Goldenbacked Woodpecker

Dinopium benghalense (Linnaeus) R, C

Most common woodpecker of Rajaji National Park. More heard than seen.

94. Yellowfronted Pied Woodpecker

Picoides mahrattensis (Latham) R

Parties of 2-4 birds are frequently met with in the Mohund and Beri Bara forest.

95. Greycrowned Pygmy Woodpecker

Picoides canicapillus (Blyth) R, U

Observed in the Mohund forest.

Order : PASSERIFORMES

Family : ALAUDIDAE

96. Ashycrowned Finch-Lark

Eremopterix grisea (Scopoli) R

Commonly seen in the wasteland along the Asan river.

97. Crested Lark

Galerida cristata (Linnaeus) R

Commonly found in the cultivated fields along the Mohund Shakumbhari Devi road.

Family : HIRUNDINIDAE

98. Wiretailed Swallow

Hirundo smithii Leach Not certain

Observed once in Kansro forest in January.

99. Striated or Redrumped Swallow

Hirundo daurica Linnaeus R, C

Very common all over the park.

Family : LANIIDAE

100. Baybacked Shrike
Lanius vittatus Valenciennes R

Observed near Forest Rest House, Kansro.

101. Rufousbacked Shrike
Lanius schach Linnaeus R

Commonly seen around Mohund and Beri Bara area.

Family : ORIOLIDAE

102. Golden Oriole
Oriolus oriolus (Linnaeus) SM, C

Commonly seen and heard in summer.

103. Blackheaded Oriole
Oriolus xanthornus (Linnaeus) R, U

Occasionally seen in the park area.

Family : DICRURIDAE

104. Black Drongo or King Crow
Dicrurus adsimilis (Bechstein) R, C

Found all over the park.

105. Haircrested Drongo
Dicrurus hottentotus (Linnaeus) R, U

Single bird was seen near Forest Rest House, Kansro, in January.

Family : STURNIDAE

106. Spottedwinged Stare

Saroglossa spiloptera (Vigors) Not certain

A specimen was collected from Rajpur. May be found in the park area as well.

107. Greyheaded Myna

Sturnus malabaricus (Gmelin) R

Flocks of 4-5 birds were seen near Asarori.

108. Blackheaded or Brahminy Myna

Sturnus pagodarum (Gmelin) R, C

Frequently met with on the Mohund-Shakumbhari Devi road.

109. Starling

Sturnus vulgaris Linnaeus WM, C

Flocks of birds were seen in cultivated fields close to the park area.

110. Pied Myna

Sturnus contra Linnaeus R, C

Very common in the villages all around the park area.

111. Common Myna

Acridotheres tristis (Linnaeus) R, C

Commonly seen attending to grazing cattles in the park.

112. Bank Myna

Acridotheres ginginianus (Latham) R, C

Can be seen near Gujar huts in the Beri Bara area.

113. Jungle Myna

Acridotheres fuscus (Wagler) R

Found nesting in the Laxman Sidh forest.

Family : CORVIDAE

114. Tree Pie

Dendrocitta vagabunda (Latham) R, C

Commonly seen and heard all over the park area.

115. House Crow

Corvus splendens Vieillot R

Found near human settlements on the periphery of the park.

116. Jungle Crow

Corvus macrorhynchos Wagler R, C

Very common all over the park area.

Family : CAMPEPHAGIDAE

117. Blackheaded Cuckoo-Shrike

Coracina melanoptera (Rupell) Not certain

A specimen was collected from the roadside near Jhajra village on the Dehra Dun-Paonta road. May be found in the park also.

118. Scarlet Minivet

Pericrocotus flammeus (Forster) R

Flocks of birds were seen near Laxman Sidh and Mohund.

119. Rosy Minivet

Pericrocotus roseus (Vieillot) Not certain

Single specimen from a pair was collected from a semi-forested area near Laxman Sidh.

120. Small Minivet

Pericrocotus cinnamomeus (Linnaeus)

R

Observed in the Asarori forest and at Mohund area.

Family : IRENIDAE

121. Iora

Aegithina tiphia (Linnaeus)

R

Seen only once near Badshahi-Bagh.

122. Goldfronted Chloropsis

Chloropsis aurifrons (Temminck)

R

Observed in the Kansro forest and Beri Bara area.

Family : PYCNONOTIDAE

123. Whitecheeked Bulbul

Pycnonotus leucogenys (Gray)

Seen in winter

Commonly seen in the park during winter.

124. Redvented Bulbul

Pycnonotus cafer (Linnaeus)

R, C

Very common all over the park area.

Family : MUSCICAPIDAE

125. Blackchinned Babbler

Stachyris pyrrhops Blyth

Not certain

A flock of five birds was seen in Asarori Karwa Pani road during winter.

126. Yelloweyed Babbler

Chrysomma sinense (Gmelin)

R, C

Commonly found fluttering from one bush to another in the park area,

127. Common Babbler

Turdoides caudatus (Dumont)

R, C

Commonly found on the Mohund-Shakumbhari Devi road.

128. Jungle Babbler

Turdoides striatus (Dumont)

R, C

Commonly seen and heard throughout the park.

129. Verditer Flycatcher

Muscicapa thalassina Swainson

Seen in winter

Observed near Forest Rest House, Kansro in January.

130. Greyheaded Flycatcher

Culicicapa ceylonensis (Swainson)

Seen in winter

A flock of birds was observed near Doiwala.

131. Whitebrowed Fantail Flycatcher

Rhipidura aureola Lesson

R

Occasionally seen throughout the park.

132. Paradise Flycatcher

Terpsiphone paradisi (Linnaeus)

SM

Seen throughout the park.

133. Plain Wren-Warbler

Prinia subflava (Gmelin)

R

Commonly seen in Defence Colony area near the Rispana river.

134. Ashy Wren-Warbler

Prinia socialis Sykes

R, C

Very common throughout the park.

135. Tailor Bird

Orthotomus sutorius (Pennant)

R, C

Commonly heard and seen throughout the park.

136. Brown Leaf Warbler or Chiffchaff

Phylloscopus collybita (Vieillot)

WM

Seen among the bushes on the Mohund-Shakumbhari Devi road.

137. Greyheaded Flycatcher-Warbler

Seicercus xanthoschistos (G. R. Gray) Observed in winter

Seen along the Mohund-Shakumbhari Devi road.

138. Bluethroat

Erithacus svecicus (Linnaeus)

WM, U

Occasionally seen in winter. A specimen was netted in Dehradun city.

139. Magpie-Robin

Copsychus saularis (Linnaeus)

R

Commonly heard and seen in the park.

140. Black Redstart

Phoenicurus ochruros (Gmelin)

WM

Occasionally seen on the Herbertpur-Timli road during winter.

141. Plumbeous Redstart

Rhyacornis fuliginosus (Vigors) Observed in winter

Seen along the canal running through the Forest Research Institute campus, in winter. May be found in the park as well.

142. Collared Bush Chat

Saxicola torquata (Linnaeus)

WM

Commonly seen on the Mohund-Shakumbhari Devi road during winter.

143. Pied Bush Chat

Saxicola caprata (Linnaeus) R

Fairly common around villages located on the periphery of the park.

144. Dark-grey Bush Chat

Saxicola ferrea G. R. Gray R

Observed near Kansro and Mohund.

145. Whitecapped Redstart

Chaimarrornis leucocephalus (Vigors) Observed in winter

Seen along the canal running through the F. R. I. campus, in winter. May be found in the park as well.

146. Indian Robin

Saxicoloides fulicata (Linnaeus) R

Occasionally seen throughout the park.

147. Blue Whistling Thrush

Myiophonus caeruleus (Scopoli) Not certain

Observed near Forest Rest House, Kansro and around Mohund in winter.

148. Blackthroated Thrush

Turdus atrogularis Jarocki WM

Found throughout the park in winter.

Family : PARIDAE

149. Grey Tit

Parus major Linnaeus WM, C

Common throughout the park during winter.

Family : MOTACILLIDAE

150. Indian Tree Pipit

Anthus hodgsoni Richmond

Observed in winter

Observed on the Mohund-Shakumbhari Devi road.

151. Yellow Wagtail

Motacilla flava Linnaeus

WM

Occasionally seen near water throughout the park during winter.

152. White Wagtail

Motacilla alba Linnaeus

WM, C

Found throughout the park during winter.

153. Large Pied Wagtail

Motacilla maderaspatensis Gmelin

R

Seen near water sources throughout the park.

Family : DICAEDAE

154. Thickbilled Flowerpecker

Dicaeum agile (Tickell)

R

Observed at Forest Rest House campus, Mohund.

155. Firebreasted Flowerpecker

Dicaeum ignipectus (Blyth)

WM

Common throughout the park during winter. More heard than seen.

Family : NECTARINIIDAE

156. Purple Sunbird

Nectarinia asiatica (Latham)

Observed in summer

Common during March to June.

157. Yellowbacked Sunbird

Aethopyga siparaja (Raffles)

Not certain

Seen in Beri Bara area during September

Family ZOSTEROPIDAE

158. White-eye

Zosterops palpebrosa (Temminck)

R, C

Commonly seen throughout the park.

Family : PLOCEIDAE

159. House Sparrow

Passer domesticus (Linnaeus)

R, C

Commonly seen near human settlements throughout the park.

160. Cinnamon Tree Sparrow

Passer rutilans Temminck

WM, U

Occasionally seen in the park during winter months.

161. Yellowthroated Sparrow

Petronia xanthocollis (Burton) Observed in summer

Occasionally seen around villages on the periphery of the park.

162. Baya

Ploceus philippinus (Linnaeus)

R, C

Observed in the Karwa Pani area.

163. Red Munia

Estrilda amandava (Linnaeus)

R

Flocks were seen in grasslands and fields in the park.

164. Whitethroated Munia

Lonchura malabarica (Linnaeus) R

Birds in twos, threes and in small flocks were seen feeding in grasslands and in fields.

165. Spotted Munia

Lonchura punctulata (Linnaeus) R

Found throughout the park.

Family : FRINGILLIDAE

166. Himalayan Greenfinch

Carduelis spinoides Vigors Observed in winter

A specimen was netted in Dehradun city. Could be found in the park also.

167. Rosefinch

Carpodacus erythrinus (Pallas) Observed in March

A flock of five birds was netted in Dehradun city. Could be found in the park as well.

168. Redheaded Bunting

Emberiza bruniceps Brandt Observed in winter

A flock was seen near Asarori.

SUMMARY

Birds play an important role in the maintenance of natural ecosystem. To provide protection to wildlife including birds, the Government of India has created several national parks and wildlife sanctuaries.

A lot of work has been done on the avifauna of Dehradun district. But all these work relate to the avifauna of Dehradun proper or Himalayan portion of Dehradun district. The area which forms the present-day Rajaji National Park was not given much attention by the past workers. An attempt has, therefore, been made to prepare a list of

birds of the present-day Rajaji National Park. In all, 168 species of birds have been recorded from the park. These belong to 17 orders and 47 families. Of the 168 species, 116 species were found to be resident, 35 species were recorded as winter migrant and 5 species were recorded as summer visitors. The status of rest of the 12 species was found to be uncertain. To this list can be added another 25 species which are often observed in the park but these can not be identified unless they are captured and studied in the laboratory.

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AMPHIBIA

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INTRODUCTION

The amphibian fauna of National Parks of India has not been paid due attention with the result that the information on the group is scarce. Considering the paucity of information on the amphibians, an attempt has been made to have a better understanding of the quantum of anuran species distributed throughout the Rajaji National Park of Uttar Pradesh. A detailed study of the amphibians inhabiting the Park has indicated the presence of as many as ten species referable to six genera contained in four families viz., Bufonidae, Microhylidae, Ranidae and Rhacophoridae. In the absence of earlier published records, the present paper is of considerable significance as it focusses our attention on the group with their developmental stages.

The material on which the paper is based has been accumulated in the Northern Regional Station of Zoological Survey of India, Dehradun, Uttar Pradesh since its inception for a period of approximately twenty five years. The important works of Boulenger (1882, 1890, 1920), Annandale (1907, 1916), Nieden (1923), Parker (1934), Waltner (1974), Dubois (1974), Tilak and Husain (1977), Tilak and Ray (1985) and Ray (in press) serve as noteworthy references on the group.

CHECK LIST OF AMPHIBIANS OF RAJAJI NATIONAL PARK, U. P.

Class : AMPHIBIA

Order : ANURA

Family : BUFONIDAE

Genus : Bufo Linnaeus, 1758

1. Bufo melanostictus Schneider, 1789

* National Museum of Natural History, Mysore.

2. **B. stomaticus** Lütken, 1863Genus : **Microhyla** Tschudi, 18383. **Microhyla ornata** Dumeril and Bibron, 18414. **Uperodon systoma** (Schneider, 1799)Family : **RANIDAE**Genus : **Rana** Linnaeus, 17585. **Rana crassa** Jerdon, 18536. **R. cyanophlyctis** Schneider, 17997. **R. limnocharis** Boie in Gravenhorst, 18298. **R. tigerina** Daudin 1802Genus : **Tomopterna** Dumeril and Bibron, 18419. **Tomopterna breviceps** (Schneider, 1799)Family : **RHACOPHORIDAE**Genus : **Polypedates** Tschudi, 183810. **Polypedates maculatus** (Gray, 1832)

SYSTEMATIC ACCOUNT

Genus : **Bufo** Laurenti, 1768

Generic diagnosis : Skin more or less spiny or warty, parotoids distinct. Tongue elliptical, entire and free behind, snout rounded. Absence of any teeth. Fingers free ; toes generally webbed at base. Omosternum absent ; diapophyses of sacral vertebra dilated.

1. **Bufo melanostictus** Schneider, 1799

Common Toad

(Plate I)

1799. *Bufo melanostictus* Schneider. *Hist. Amph.* I : 216 (Type locality : India Oriental).*Material examined* : 456 exs. (43 adults and 413 tadpoles)

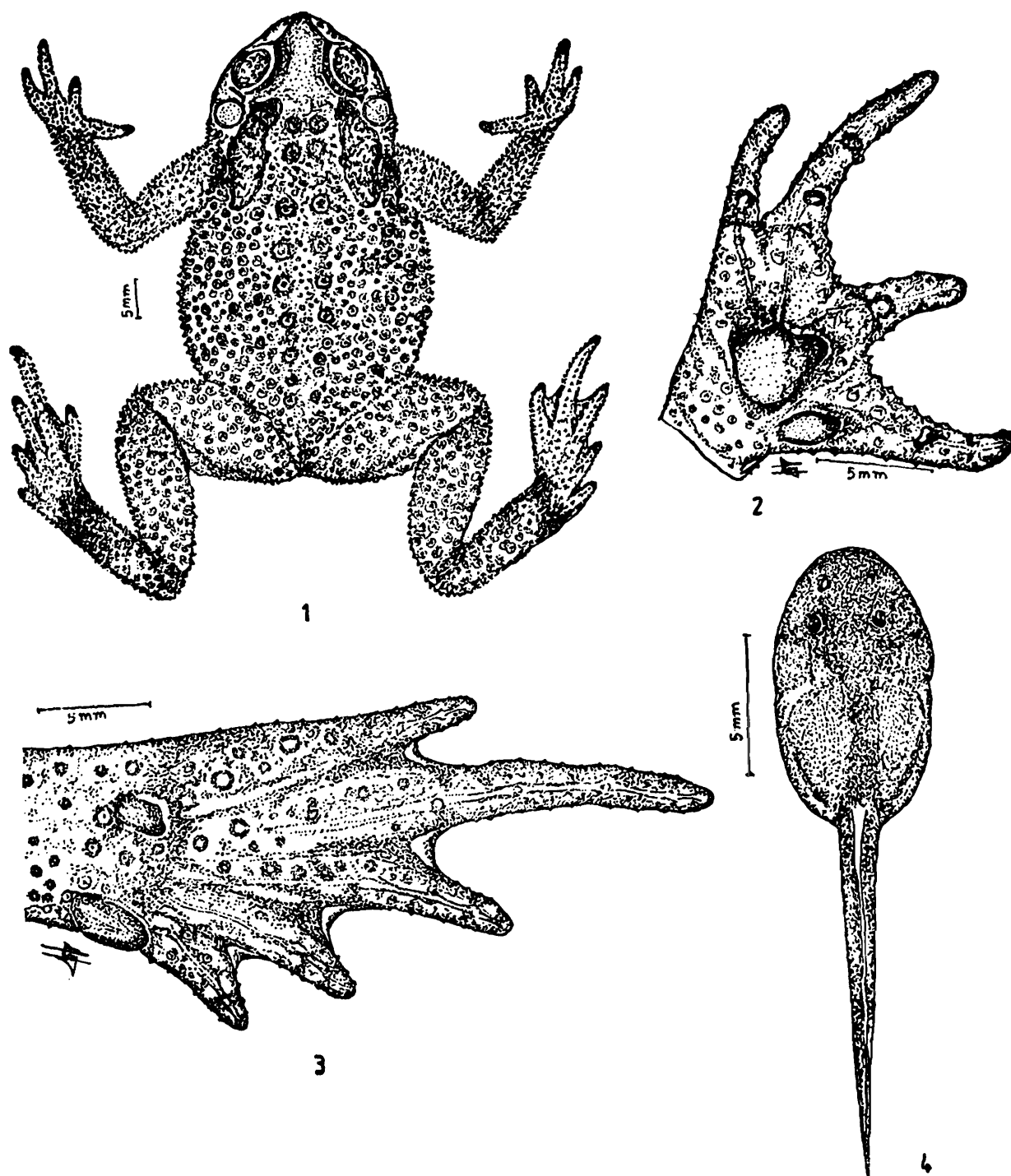


PLATE 1: *Bufo melanostictus* Daudin

- Fig. 1. Adult female (Dorsal view)
 2. Hand (Ventral view)
 3. Foot (Ventral view)
 4. 10 days' old Tadpole (Dorsal view).

Measurements : SVL 8 mm – 120 mm.

Diagnosis : Adult. Head with prominent cornified ridges, tympanum distinct at least 2/3 of eye, snout short and blunt. First finger longer than second, toes less than 1/2 webbed with simple subarticular tubercle ; outer and inner metatarsal tubercle distinct. Parotoids elongated ; skin with spiny warts ; Two series of large warts along the middle of the back. Males smaller than females, breeding males with black callosities on dorsal aspect of first and second finger and a subgular vocal sac.

Tadpole : Head and body oval, rounded at snout, slightly flattened above. Nostrils dorsal, open, rim not raised, much closer to eye than to tip of snout ; internarial slightly larger than interorbital. Oral disc ventral, subterminal, small papillae in a single row confined to the angles of lips. Upper lip with outer uninterrupted and inner broadly interrupted row of labial teeth, lower lip with three rows of uninterrupted labial teeth, but the inner one slightly notched medially ; beaks black at margin, finely serrated. Spiracle sinistral. Anal tube median. Head and body dark pigmented above, less pigment below ; Caudal muscle dark at all points ; dorsal fin pigmented except at tip of tail, ventral fin only pigmented near base.

Distribution : India, Nepal, Burma, Hongkong, China, Java, Borneo, Phillipines, Pakistan and Sri Lanka.

Remarks : One of the commonest toad found to occur throughout the Park. Their activity and abundance is correlated with the breeding season (Mid March to August) only during dark. Exact habitat other than breeding season confined to understones, fallen tree trunks and also underneath loose soil.

***Bufo stomaticus* Luetken, 1863**

Marbled Toad

(Plate II)

1863. *Bufo stomaticus* Luetken, *Videnrk. Meddr. danrk. naturk. Foren*, 14 : 305 (Type locality: Not known).

Material examined : 784 exs. (54 adults and 730 tadpoles).

Measurements : SVL 10 mm to 80 mm.

Distribution : India [Assam, West Bengal, Rajasthan, Uttar Pradesh (Agra) and Maharashtra], Nepal, Burma, Sri Lanka and Arabia.

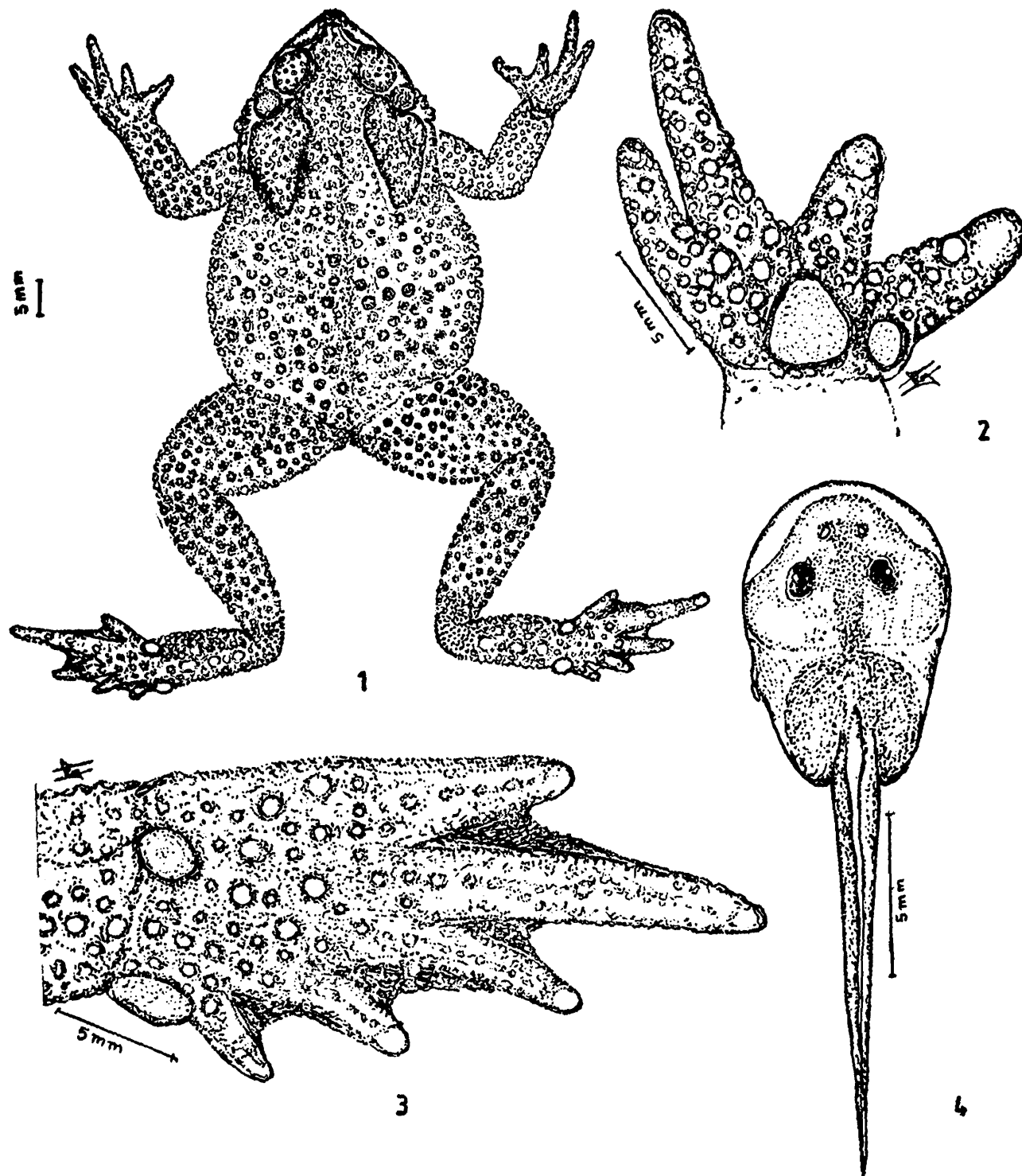


PLATE II : *Bufo stomaticus* Luetken

- Fig. 1. Adult female (Dorsal view)
 2. Hand (Ventral view)
 3. Foot (Ventral view)
 4. 10 days' old Tadpole (Dorsal view).

Diagnosis : Head without cranial ridge, skin of head co-ossified with the nasals and frontoparietals, toes 2/3 to 3/4 webbed, parotoids not so elevated as in *B. melanostictus*, dorsally marbled and the warts are more or less flat, ventrally immaculate sometimes reticulations also pronounce.

Remarks : This species is very much common in the valley and near human settlement. The present material is being named as *B. stometicus* Lütken, 1863. However, Boulenger (1882, 1890) recognised *B. andersonii* are those specimens which possess a tarsal fold whereas *B. stomaticus*, constitute another set of specimens without a tarsal fold. Inger (1972) and Dubois (1974) have synonymised part of *B. andersonii* with *B. stomaticus*. It appears that the tarsal fold is nothing but an artifact of preservation. The detailed taxonomic study will be published elsewhere.

Genus *Microhyla* Tschudi, 1838

Generic diagnosis : Tongue elliptic, entire, free behind. A cutaneous ridge across the palate between the choanae, and another one in front of the oesophagus. Tiny ornamented frog. First finger quite smaller than the second. Toes webbed at the base. Outer and inner metatarsal tubercle present.

Microhyla ornata (Dumeril and Bibron, 1841)

Indian Ornate Frog

(Plate III)

1841. *Engystoma ornatum* Dumeril and Bibron, *Erpet Gen.* 8 : 745.

1882. *Microhyla ornata* Boulenger, *Cat. Batr. Sal. s. Ecaud. Brit. Mus.*, : 165 (Type locality : Malabar Coast, India).

Material examined : 244 exs. (21 adult and 223 tadpoles).

Measurements : SVL 7 mm – 20 mm.

Distribution : India, Nepal, Burma, South China, South East Asia and Taiwan.

Diagnosis : Small well built ornamental frog, snout obtuse as long as the diameter of eye, first finger much shorter than second, toes slender with a rudiment of web, tips of digits rounded and swollen, small outer and elongated inner metatarsal tubercles. Dorsal side with distinct reddish brown patches,

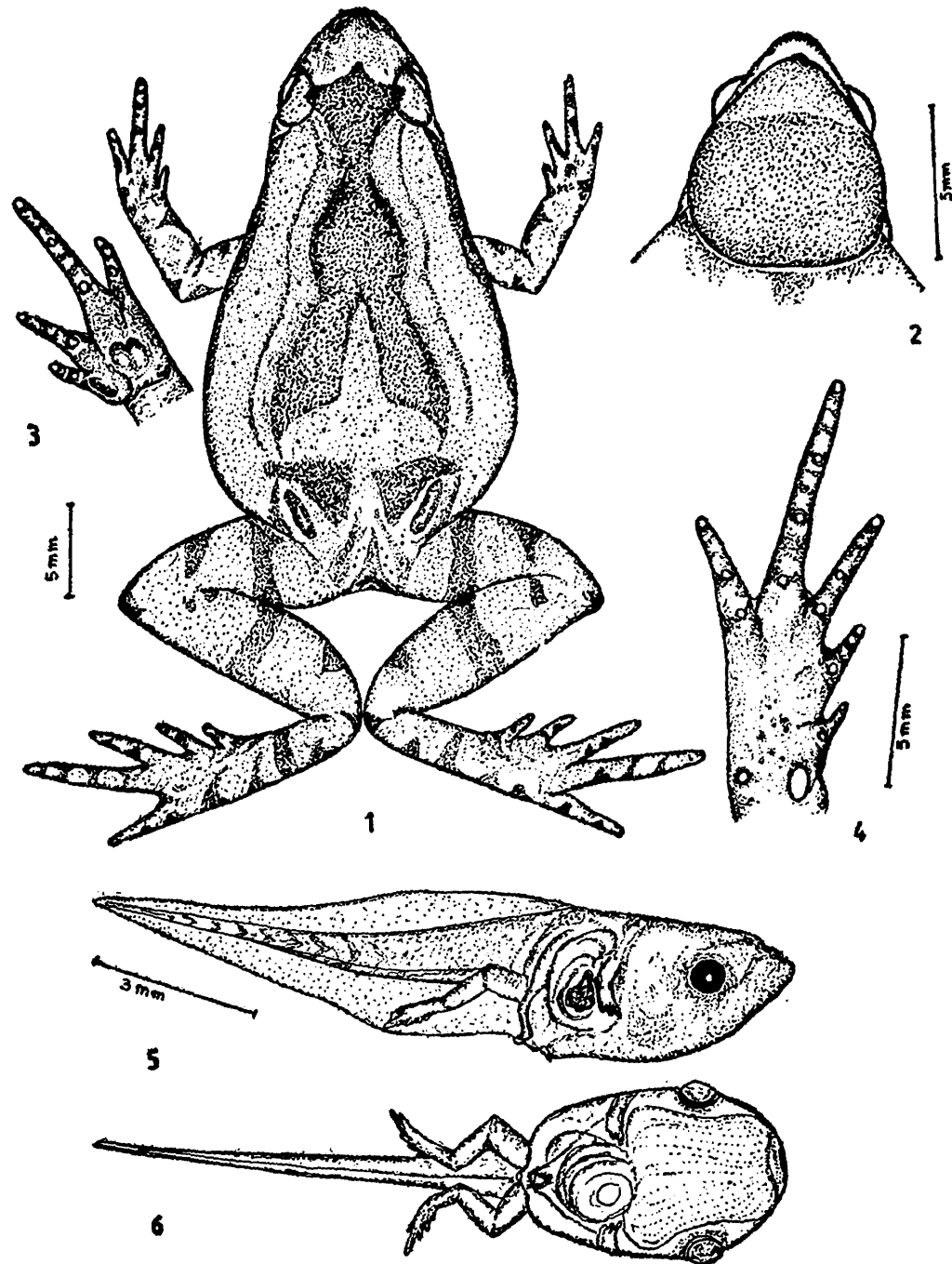


PLATE III : *Microhyla ornata* Dum. & Bibr.

- Fig. 1. Adult female (Dorsal view)
 2. Throat of male (Ventral view)
 3. Hand (Ventral view)
 4. Foot (Ventral view)
 5. 30 days' old Tadpole (Lateral view)
 6. 30 days' old Tadpole (Ventral view).

Remarks : The ornate frog appears to be common in the moist places and the areas under cover. However, it is a secretive species and is strictly nocturnal in its habit. The call of the male is rather weak and it is like a rasping note. Food comprises mainly apterous insects like ants, termites and small isopods.

Genus *Uperodon* Dumeril & Bibron, 1841

Generic diagnosis : Tongue oval entire free behind. Choanae large, two small bony prominences close together, between and on a level with the hinder edge of choanae. Narrow denticulated dermal ridge across the sphenoidal region. Tympanum hidden. Outer metatarsals united by muscle. Hind leg with powerful spade-shaped inner metatarsal tubercle as digging aid. Clavicles procoracoid and omosternum absent.

Uperodon systoma (Schneider, 1799)

Marbled Balloon Frog

(Plate IV)

1799. *Rana systoma* Schneider, *Hist. Amph.* I : 144.

1931. *Uperodon systoma* Parker, *Archeiv. Zool. Ital.*, XVI : 1243 (Type locality : Eastern India).

Material examined : 58 exs. (5 adults and 53 tadpoles)

Measurements : SVL 23 mm to 46 mm.

Distribution : Himachal Pradesh (Sirmour), Karnataka, Kerala, Orissa, Tamil Nadu, Uttar Pradesh (Agra, Allahabad, Saharanpur), West Bengal. The material under study is of added significance because the frog is recorded for the first time from Rajaji National Park at an altitude of 1000 m in the sub-himalayan area.

Diagnosis : Robust and stout, small head with rounded snout. Dark brown irregular marblings throughout dorsal aspect distinctly differentiate from any other frogs, inter-orbital space twice the width of upper eyelid, first finger quite shorter than second, two compressed well developed shovel-shaped (inner large as long as first toe and outer small) inner metatarsals tubercles obliquely placed on the foot, toes rather short with a web restricted to the base. Males with distinct vocal sac.

Remarks : These frogs are strictly burrowing forms and quite adapted for

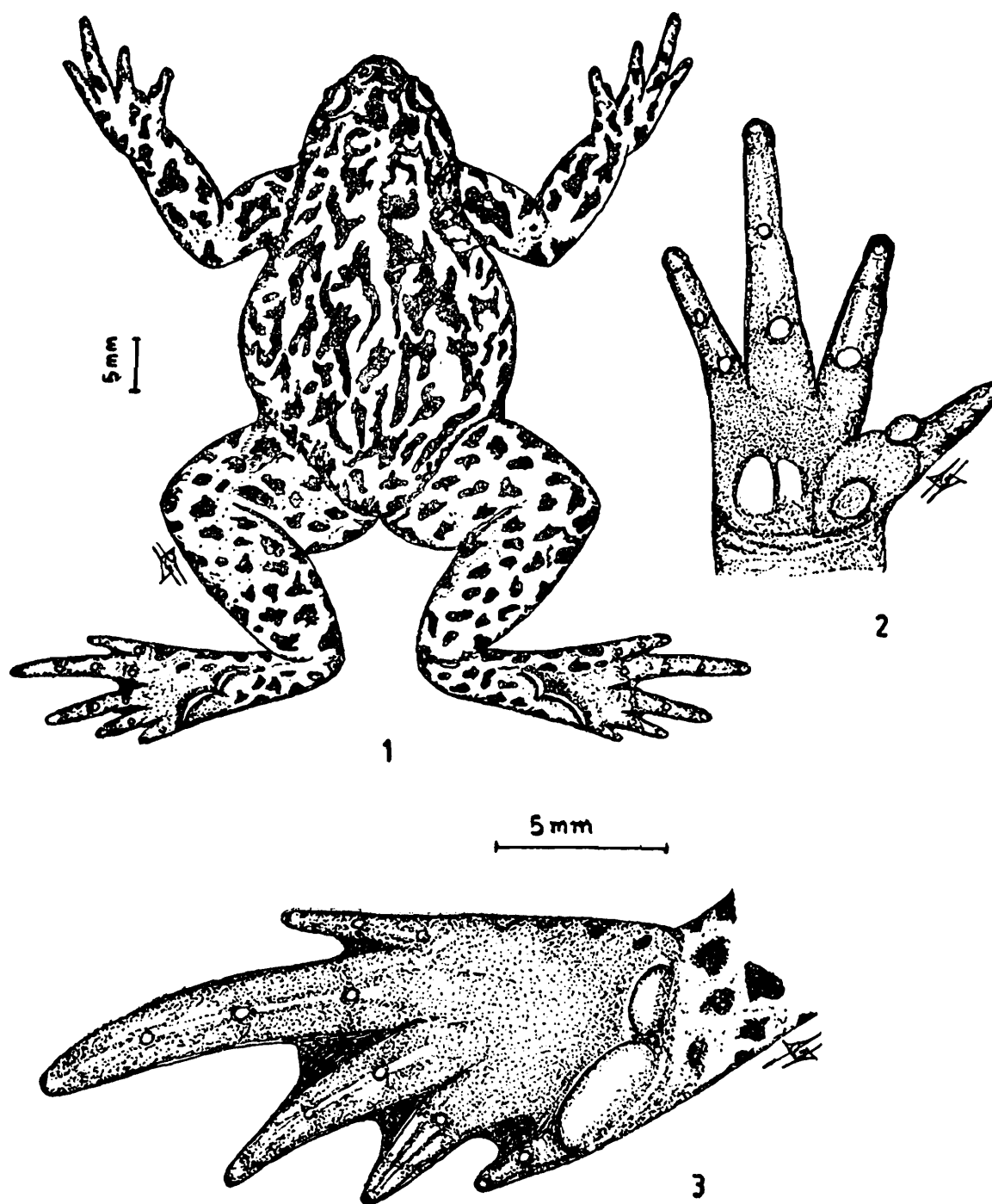


PLATE IV : *Uperodon systoma* Schneider

Fig. 1. Adult female (Dorsal view)

2. Hand (Ventral view)

3. Foot (Ventral view).

their subterranean life, rarely seen, only during breeding season they can be located near well wooded water lodged area in the Park.

Rana crassa Jerdon, 1853

Jerdon's Bullfrog

(Plate V)

1853. *Rana crassa* Jerdon, J. Asiat. Soc. Bengal, 22 : 581 (Type locality : Madras).

Material examined : 66 exs. (7 adults and 59 tadpoles).

Measurements : SVL 47 mm – 72 mm.

Distribution : India, Nepal and Sri Lanka. It has been reported earlier from Banaras and Agra in Uttar Pradesh. The material under study is of added significance because the frog is recorded for the first time from Rajaji National Park at an altitude of 500 m.

Diagnosis : This frog is almost similar to that of its closely allied species i.e. *Rana tigerina* Daudin, but differs from it in the following characters. Outer rim of the upper jaw expanded on sides of the head, no vertebral streak on the mid-dorsal side, tibiotarsal articulation not extending beyond the posterior margin of tympanum, heels not overlapping, when hind legs folded at right angle to the body, strong, compressed and shovel-shaped inner metatarsal tubercle ; on the dorsum 8 to 9 discontinuous elongated broken glandular folds present. Dorsally marked with distinct bold black patches interspersed on the grey background.

Remarks : These frogs have long been confused with the Indian Bullfrog (*Rana tigerina*) as both the species are similar in appearance and rare as well. The present study reveals that there are several characters by which it can be easily distinguishable and its rarity is due to its burrowing habit. The author (P. R.) have been able to locate a large population of Jerdon's Bullfrog in the Terai region of Uttar Pradesh. In the Rajaji National Park, this frog is restricted to the forested zone where during monsoon season rainwater pools readily afford their breeding. It usually takes refuge under moist soil and in the holes near water bodies. It makes use of its powerful shovel-shaped inner metatarsal tubercles for digging in the soft soil.

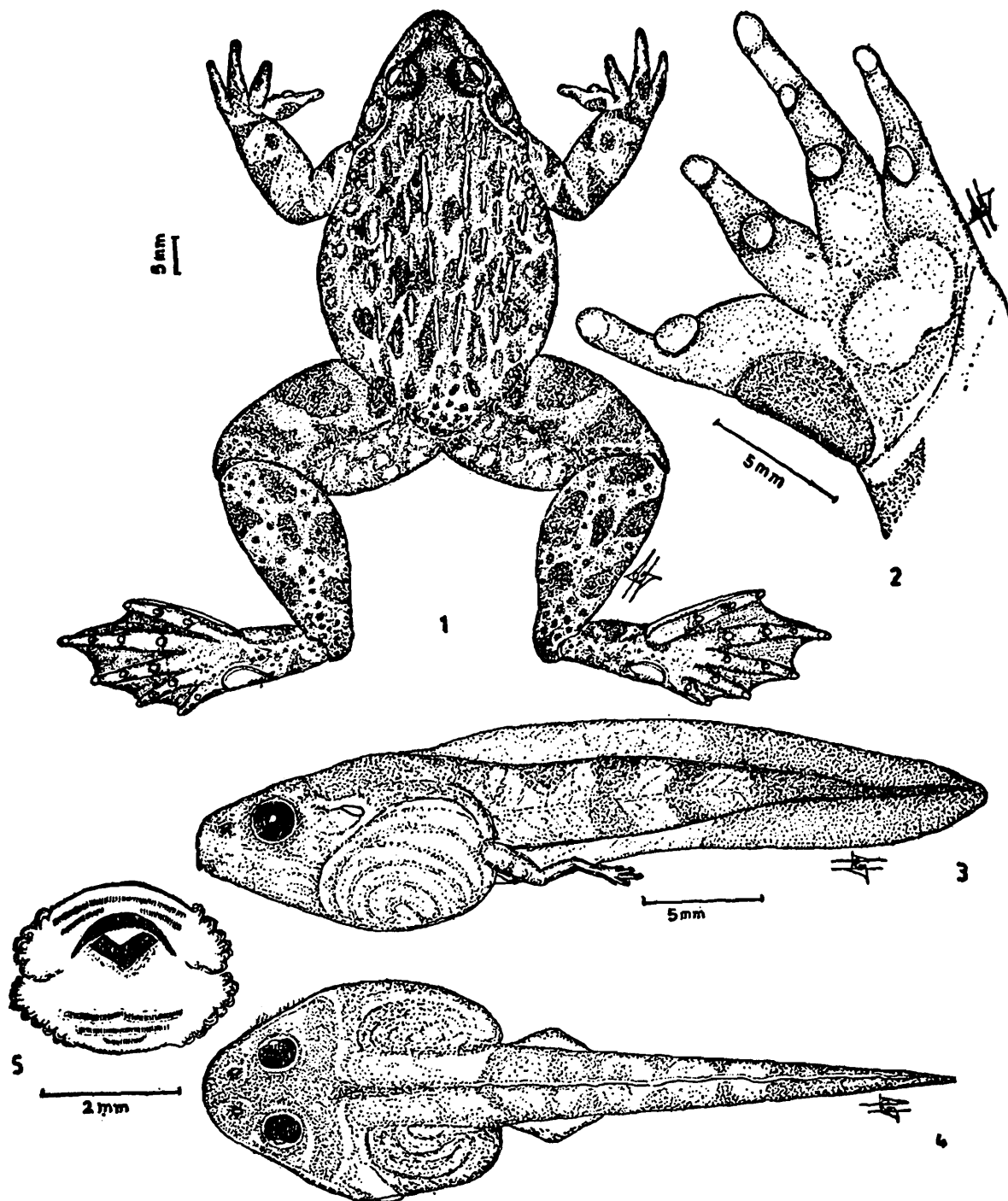


PLATE V : *Rana crassa* Jerdon

- Fig. 1. Adult male (Dorsal view)
 2. Hand (Ventral view)
 3. 10 days' old Tadpole (Lateral view)
 4. 10 days' old Tadpole (Dorsal view)
 5. Oral disc of same Tadpole (Ventral view).

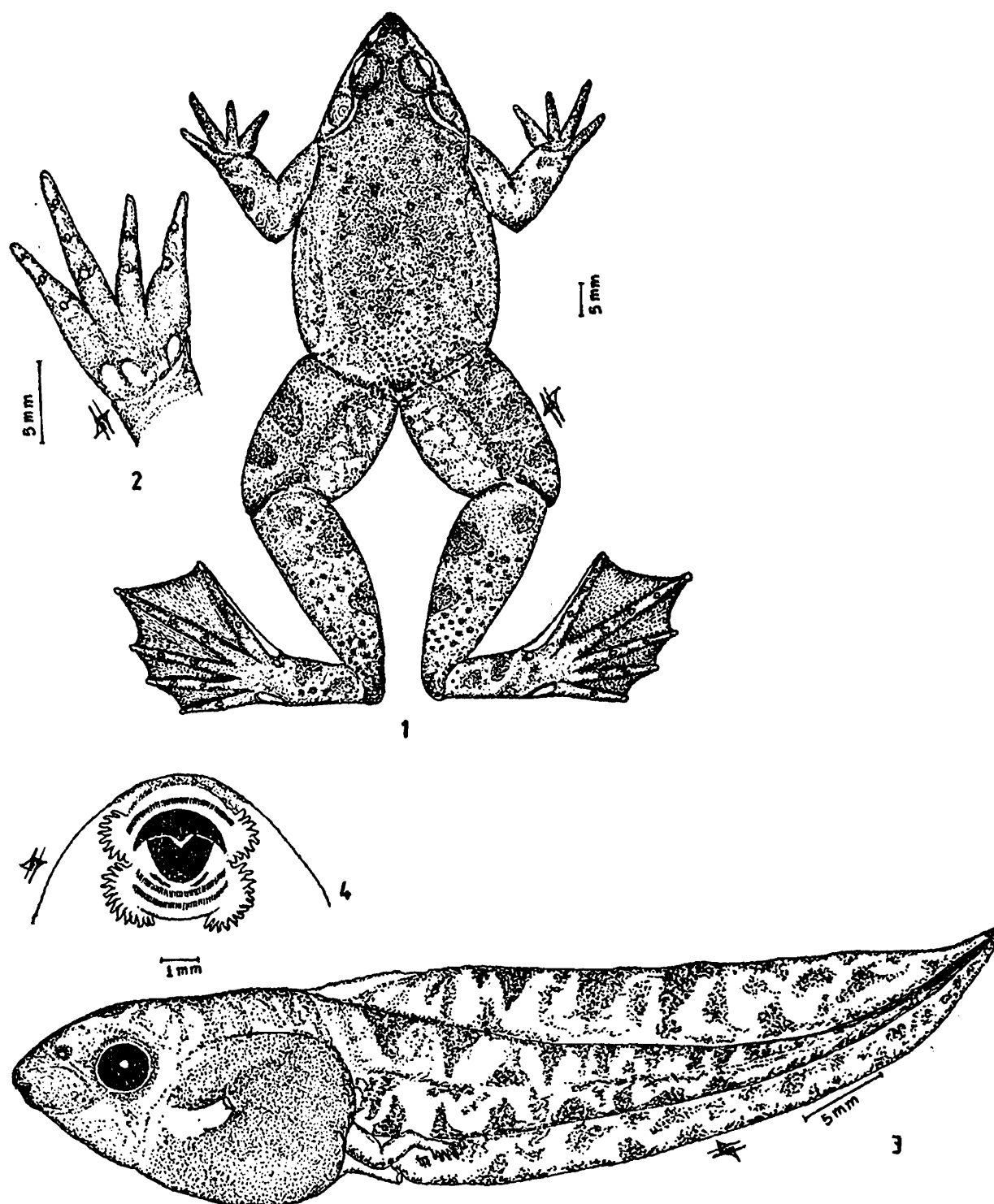


PLATE VI: *Rana cyanophlyctis* Schneider

- Fig. 1. Adult female (Dorsal view)**
2. Hand (Ventral view)
3. 15 days' old Tadpole (Lateral view)
4. Oral disc of same Tadpole (Ventral view).

***Rana cyanophlyctis* Schneider, 1799**

Skipping or Skittering Frog

(Plate VI)

1799. *Rana cyanophlyctis* Schneider, *Hist. Amph.*, 1 : 137 (Type locality : India Orientali)

Material examined : 435 exs. (123 adults and 312 tadpoles).

Measurements : SVL 21 mm – 53 mm.

Distribution : Throughout India up to 1800 m. elevation, Pakistan, Iran, Saudi Arabia, Nepal, Thailand and Sri Lanka.

Diagnosis : Brown olive above, dark spotted or marbled, two black stripes on the hinder margins of thigh ; ventrally immaculate to often speckled with a network of dark brown colour. Skin with small tubercles and warts above, sometimes girdle of cysts on the ventrum. Fingers with acutely pointed tips, first and second fingers are almost equal in length and dimension. Toes completely webbed, inner metatarsal tubercle digitiform. Vomerine teeth placed in between choanae. Tongue free anteriorly with two long cornua at tip and a median lobe in between. Males much smaller with two external vocal sacs opening laterally by two longitudinal slits.

Remarks : This frog is quite common in water bodies and it floats on the surface of water. When disturbed, it skips over the surface of water in mass and submerged for a while to come up again. It seems to tolerate salinity and even thrives in extreme polluted water near sewage system. It congregates in large number wherever the water is available. The hibernation phase is less pronounced. During winter months, it usually seek shelter near the river bed or hides near the banks. It feeds mostly on floating aquatic insects.

***Rana limnocharis* Boie in Gravenhorst, 1829**

Paddy-field frog

(Plate VII)

1829. *Rana limnocharis* Boie in Gravenhorst, *Delic. zool. Vrat.*, 41 (Type locality : Not mentioned).

Material examined : 222 exs. (143 adults and 79 tadpoles),

Measurements : SVL 12 mm – 42 mm.

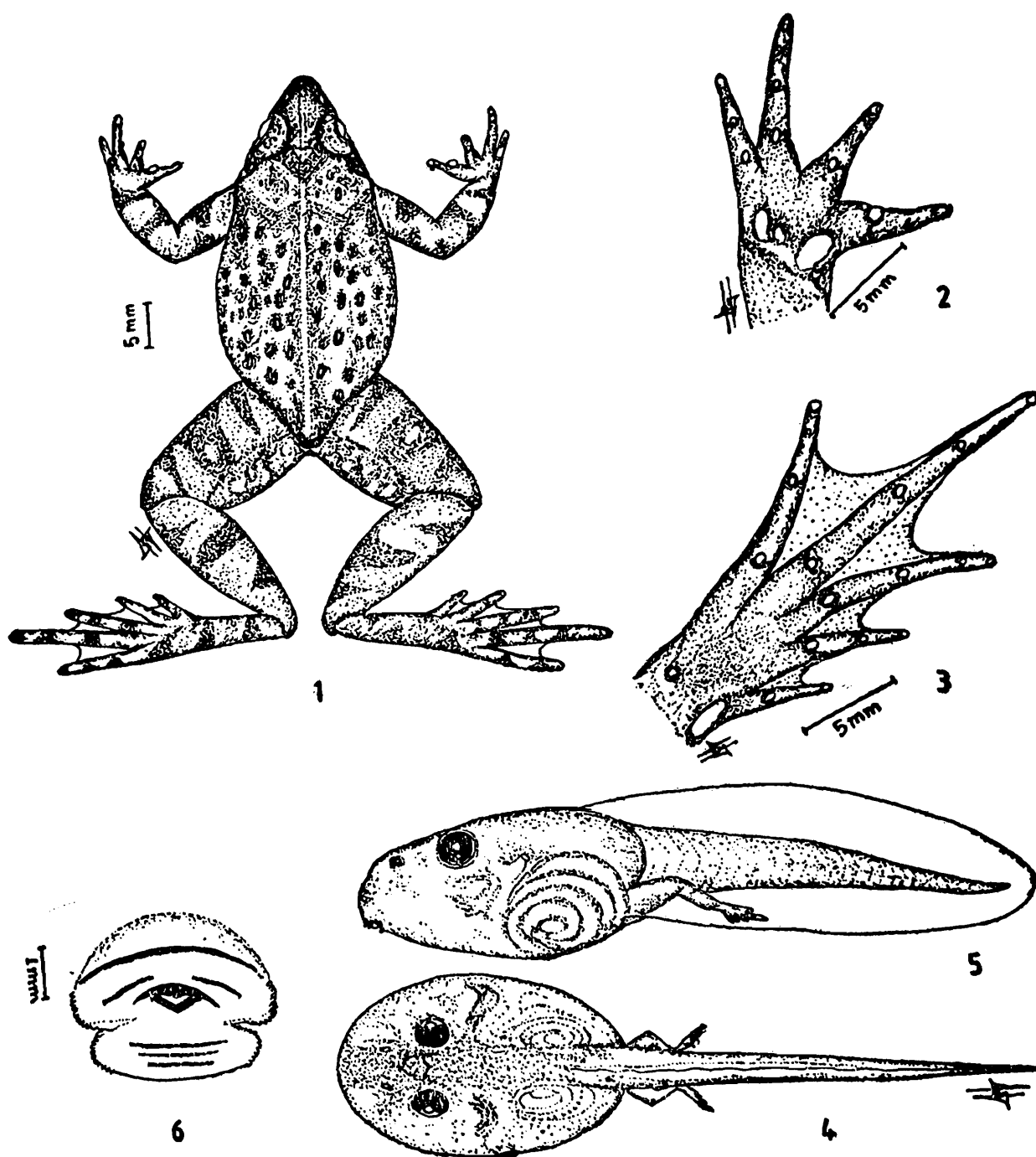


PLATE VII : *Rana limnocharis* Boie (in Gravenhorst)

- Fig. 1.** Adult female (Dorsal view)
2. Hand (Ventral view)
3. Foot (Ventral view)
4. 10 days' old Tadpole (Dorsal view)
5. 10 days' old Tadpole (Lateral view)
6. Oral disc of same Tadpole (Ventral view),

RAY & TILAK

PLATE VIII



Photograph of male *Rana tigerina* Daudin

Distribution : Throughout India up to 2000 m. elevation. Malay peninsula, Phillipines, Borneo, Lombok, China, Japan, Pakistan, Nepal and Sri Lanka.

Diagnosis : Grey or brown above, sometimes with darker spots, hinder side black and white marbled, usually with a yellow vertebral streak. Upper parts with several prominent smooth warts and broken elongated glandules. Nostrils either equidistant from the anterior corner of eye and the tip of the snout or somewhat nearer to the former. Snout acuminate. Interorbital space two-thirds the width of eyelid. Fingers with slightly swollen tip, first extending much beyond the second, subarticular tubercles well developed. Incomplete webbing in between toes i.e., two and half distal phalanges of fourth and one distal phalange of rest toes free of web ; inner metatarsal tubercle oval and compressed, half of the first toe, outer tubercle small rounded. Males smaller in size and with two lateral slits of vocal sac.

Remarks : This is rather commonly found small frog on the water edges or understones near water bodies. Its colouration mathes with the background and usually conceals its presence. It is more terrestrial than aquatic.

***Rana tigerina* Daudin, 1803**
Indian Bullfrog
(Plate VIII)

1803. *Rana tigerina* Daudin, *Hist. Rain. Gren. Crap.* : 64.

Material examined : 201 exs. (47 adults and 154 tadpoles).

Measurements : SVL 52 mm – 143 mm.

Distribution : Throughout India up to an elevation of 1800 m. Nepal, Pakistan, Sri Lanka, Burma, South China, Phillipines, Java and Borneo.

Diagnosis : Head moderate, snout obtusely pointed ; Interorbital space narrower than the upper eyelid. Tympanum circular, distinct almost two-thirds of the diameter of eye. Vomerine teeth in two series commencing from the anterior angle of choanae, anteriorly two distinct bony knob like process on the lower jaw. Fingers stout with nodular tip, first extending beyond second. Toes anteriorly webbed with obtuse tips, web in between toes incurved medially. Tibiotarsal articulation reaches eye or little beyond when the hind limb being carried forwards along the body ; inner metatarsal tubercle blunt and elongated. Heels overlapping when limbs folded at right angles of the body. A supratympanic fold and back with 5-6 incomplete longitudinal folds. Typical large sized frogs with brilliant

golden yellow mixed with olive blotches. Hind legs bear black to olive bold spots. Males with ventrolateral vocal sacs and in breeding season nuptial pad appear on the dorsal aspect of the first finger.

Remarks : The Indian bullfrog is essentially an aquatic amphibian and is rarely found far from water. It is a voracious feeder and will feed on anything that it can overcome. Its mating call is loud and "quonk", "qyonk".

Genus *Tomopterna* Dumeril and Bibron, 1841

Generic diagnosis : Fingers completely free, toes with reduced webbing ; metatarsal bounded by muscles ; inner metatarsal tubercle distinctly shovel-shaped.

Tomopterna breviceps (Schneider, 1799)

Indian Burrowing Frog

(Plate IX)

1799. *Rana breviceps* Schneider, *Hist. Amph.* 1 : 140.

1987. *Tompterna breviceps* Inger and Dutta, *J. Bombay nat. Hist. Soc.* 83 (Suppl.) : 184. (Type locality : Madras).

Material examined : 190 exs. (17 adults and 173 tadpoles)

Measurements : SVL 15 mm to 43 mm.

Distribution : India, Nepal, Pakistan, Sri Lanka and Upper Burma.

Diagnosis : Head broader than long, tip of snout rounded. Body short and stout. Nostrils nearer to the tip of snout than the anterior corner of eye. Diameter of eye greater than the length of snout. Distinct tympanum, about two-thirds the diameter of eye. First finger longer than second with distinct subarticular tubercles. Hind limb robust, outermetatarsal united, webbing restricted to the base of toes. Heels quite apart when folded at right angles of the body.

Remarks : This frog resembles a toad largely owing to its fossorial and nocturnal way of life. It is seen when it emerges for feeding and for breeding. Its powerful hindlegs equipped with dagger-like metatarsal tubercles helps it to burry deep in the loose soil. Its breeding starts on the onset of monsoon.

Genus *Polypedates* Tschudi, 1838

Generic Diagnosis : Species of the genus moderately large, skin of body and limbs

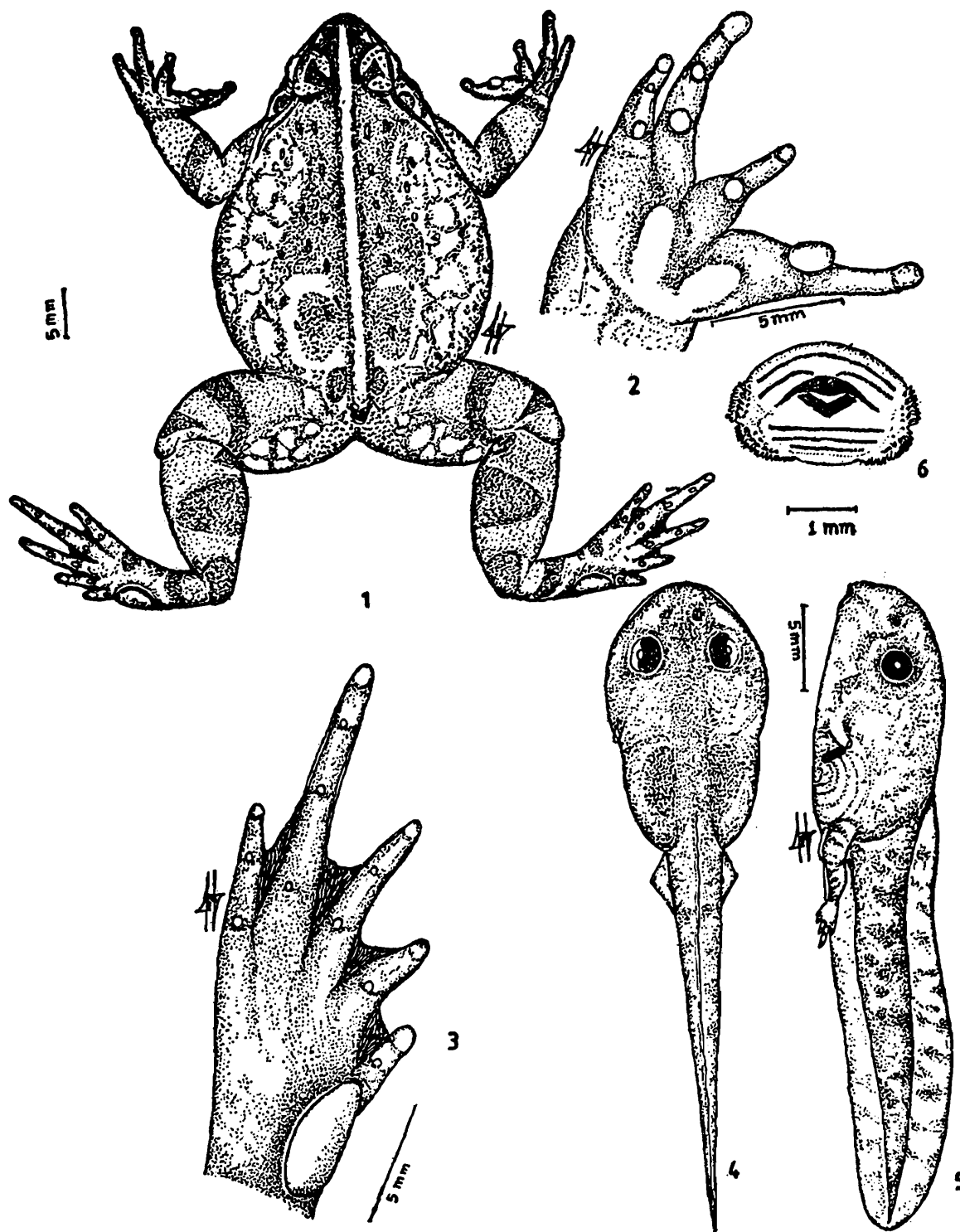


PLATE IX : *Tomopterna breviceps* Schneider

- Fig. 1.** Adult female (Dorsal view)
2. Hand (Ventral view)
3. Foot (Ventral view)
4. 10 days' old Tadpole (Dorsal view)
5. 10 days' old Tadpole (Lateral view)
6. Oral disc of same Tadpole (Ventral view).

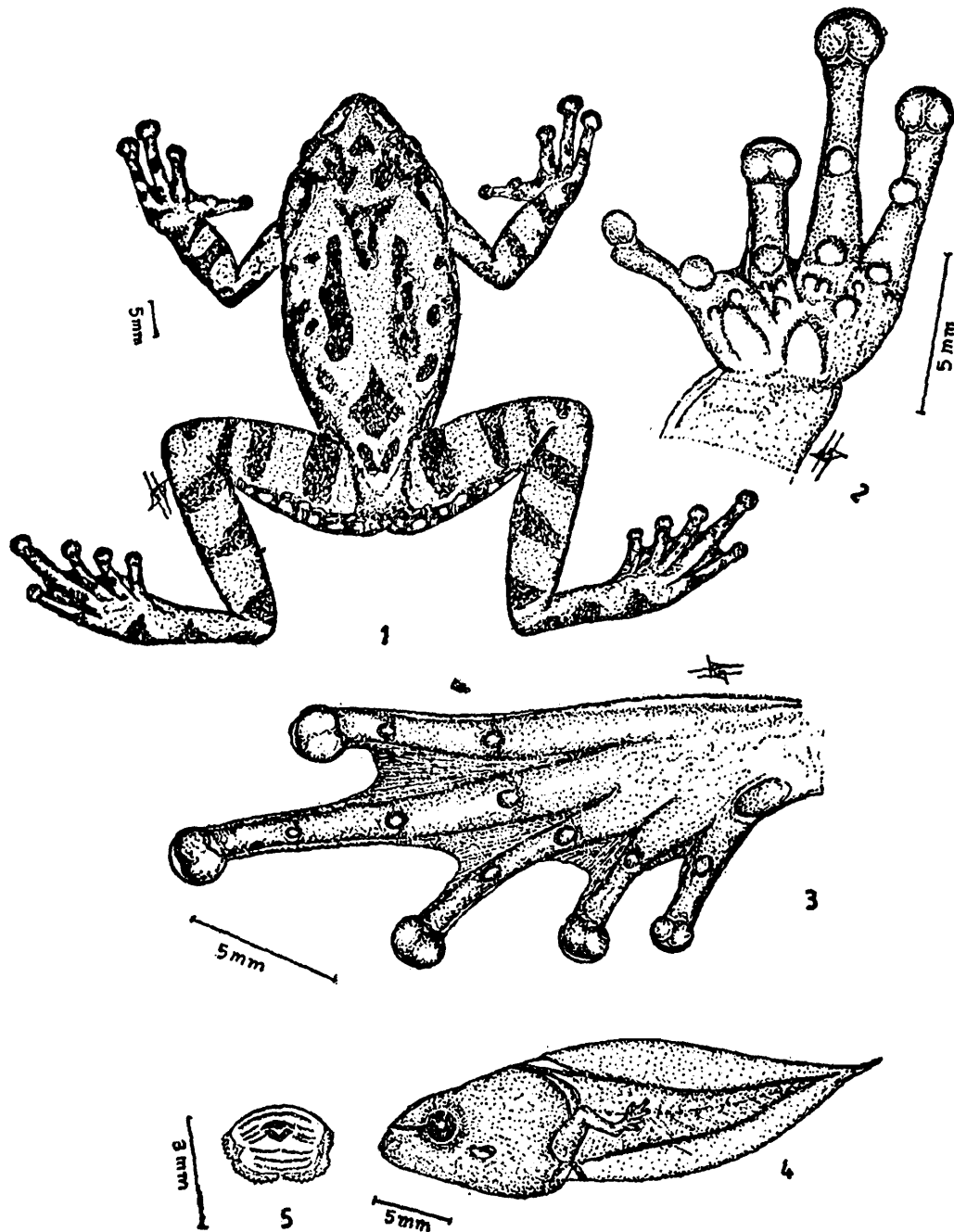


PLATE X : *Polypedates maculatus* Gray

- Fig. 1. Adult female (Dorsal view)
 2. Hand (Ventral view)
 3. Foot (Ventral view)
 4. 10 days' old Tadpole (Lateral view)
 5. Oral disc of same Tadpole (Ventral view).

smooth. Digital discs large. Terminal phalanges of fingers and toes 'y' shaped. An intercalary, ossicle between the penultimate and terminal phalange.

***Polypedates maculatus* (Gray, 1832)**

Indian Tree Frog

(Plate X)

1832. *Hyla maculata* Gray, III. *Ind. Zool.* : 82.

1858. *Polypedates maculatus* Guenther, *Cat. Batr. Sal. Brit. Min.* : 78 (Type locality : India).

Material examined : 24 exs. (7 adults and 17 tadpoles).

Measurements : SVL 42 mm to 53 mm.

Distribution : India, Nepal, Cochin China, Borneo, Tennasserim and Sri Lanka. It has earlier been reported from the plains of Uttar Pradesh. The material under study is of added significance because the tree frog is recorded for the first time from Rajaji National Park.

Diagnosis : Tip of snout obtusely pointed, head broader than long, nostrils much nearer to the tip of snout than to the anterior corner of eye. Distinct tympanum. Tip of digits with enlarged disc having circummarginal groove. Rudiment of web in between the base of first and second finger, subarticular tubercles well developed. Toes half webbed. Innermetatarsal tubercle elliptical, outer tubercle absent. Posterior margin of thigh with round yellow spots.

Remarks : First record for the National Park. The material under study has been picked up from the moist tree holes.

ACKNOWLEDGEMENTS

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TURTLES AND TORTOISES

(Reptilia : Testudines)

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INTRODUCTION

The turtle and tortoise fauna of Rajaji National Park has drawn practically no attention by herpetologists during the past. In the present communication, a brief account of the species inhabiting the Park and its contiguous areas have been given. Notes on their maximum size, habitat and habits have also been provided.

The North Indian Roofed Turtle, *Kachuga tecta* (Gray) is the only species of the group reported from the river Ganga in the region (Siwaliks) by Joshi and Kumar (1970), and Gupta and Sinha (1978). The present record of other species from the Park is based on the material from the area or its vicinity, local information and the distribution in the area and its vicinity as per the literature records by Smith (1931), Gupta and Saxena (1979), Tikader and Sharma (1985), Murthy (1985), and Lamba (1987).

Annandale (1912), Chaudhuri (1912), Prashad (1914), Murthy & Pillai (1986), Daniel (1989) and other workers referred in the work of Smith (1931) have given interesting information on various aspects of the species dealt herewith.

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SYSTEMATIC ACCOUNT OF SPECIES

Class : REPTILIA

Order : TESTUDINES

Family : EMYDIDAE (Freshwater Tortoises/Terrapins)

1. *Geoclemys hamiltoni* (Gray)

Spotted Pond Turtle, Spotted Black Terrapin

Emys hamiltoni Gray, 1831. *Illus. Indian Zool.*, Pt. 6, pl. 9 ; Gray, 1931, *Syn. Rept.*, : 21, 72 (type-locality : India).

Description : Shell dark brown or black above marked with yellow spots and radiating streaks. Head, neck and limbs dark with yellow spots. Plastron with dark patches. Shell 310 mm in length.

Distribution : India (Ganga and Indus river systems); Pakistan; Bangladesh. Fossil records from Siwalik hills.

Remarks : It inhabits shallow waters with plenty of vegetation and is very rarely found. It feeds mainly on snails.

The record is based on local information and the range of its distribution (Smith, 1931 ; Tikader & Sharma, 1985).

2. *Hardella thurgi* (Gray)

Brahminy River Turtle

Emys thurgi Gray, 1831. *Illus. Indian Zool.*, Pt. 7, pl. 7 ; *Syn. Rept.* ; : 22, 72 (type-locality : India).

Description : Shell dark brown or black above ; yellowish with dark patches below. Head with orange bands on snout, below nostrils and behind eye. Limbs yellowish brown. Shell 650 mm in length, much smaller in male.

Distribution : India (Ganga, Brahmaputra and Indus river systems); Pakistan ; Nepal ; Bangladesh.

Remarks : It inhabits slow moving streams, canals and ponds. It rarely comes out to bask. It is herbivorous and feeds on fruits and vegetables. It makes nests on sandy river banks and lays oval shaped eggs.

The record is based on local information and the range of its distribution (Tikader & Sharma, 1985).

3. *Kachuga kachuga* (Gray)

Sail Terrapin

Emys kachuga Gray, 1831. *Illus. Indian Zool.*, Pt. 5, pl. 9 ; Vol. 1, pl. 74 (type-locality : Northern India).

Description : Shell olivaceous or brownish above, yellowish below. Neck light brown with 7 reddish longitudinal streaks. Lateral sides of head bluish, underside with a pair of oblong red or yellow spots. During breeding season, the dorsal side of head of male becomes bright red and female is without reddish streaks on the neck. Shell 390 mm in length, smaller in male.

Distribution : India (Ganga river system) ; Nepal ; Bangladesh.

Remarks : It inhabits water bodies with plenty of aquatic vegetation. It is herbivorous. The female lays about five elongated or spherical eggs on the sandy river banks.

The record is based on local information and the range of its distribution (Smith, 1931 ; Tikader & Sharma, 1985).

4. *Kachuga smithi* (Gray)

Brown River Turtle, Smith's Terrapin

Batagur smithii Gray, 1863. *Proc. Zool. Soc.*, : 253 (type-locality : Chenab river).

Description : Shell pale olive dorsally with blackish vertebral keel ; yellowish ventrally with each shield having a dark blackish patch. Head black dorsally ; reddish or pink spots behind eye. Neck with light brown longitudinal stripes. Young ones with an orange band on the anterior part of vertebral keel and two orange spots just behind the nape. Shell 254 mm in length.

Distribution : India (Ganga and Indus river systems) ; Pakistan ; Bangladesh.

Remarks : It swims very fast in clear waters. It is omnivorous but chiefly feeds on rotten flesh. The female lays 5-8 elongated eggs in a single clutch and burries them in the sand of the river bank.

The record is based on the material from around park and the range of its distribution (Tikader & Sharma, 1985).

5. *Kachuga tecta* (Gray)
Tent Turtle, Roofed Terrapin
(Plate I)

Emys tectum Gray, 1830. *Illus. Indian Zool.*, Pt. 2, pl. 7 ; *E. tecta*, Gray, 1831, *Syn. Rept.*, : 23, pl. 5
 (type-locality : India).

Description : Shell olivaceous dorsally in young with small black dots and with an orange or reddish vertebral stripe which is more prominent on first three shields. The ground colour becomes darker and the black dots almost merge with it with the advancement of age. Reddish or yellowish ventrally with dark brown or blackish patches. Head blackish dorsally ; temporal region yellowish or orange. Neck blackish with fine yellowish longitudinal stripes. Limbs dark olive with yellowish spots ; back of thighs pale with dark cross bars. Shell 305 mm in length, much smaller in male.

Distribution : India (Ganga, Brahmaputra and Indus river systems) ; Pakistan ; Bangladesh. Fossil records from Siwalik hills.

Remarks : It prefers water bodies with plenty of aquatic vegetation. It is very active in its movements on land and also swims very fast. It feeds on vegetable matter. The female lays at least four elongated or spherical eggs in a single clutch.

The record from the area is based after Joshi & Kumar (1970) and Gupta & Saxena (1978), material from the vicinity (Sailani river near Biharigarh, Dist. Hardwar) and the range of its distribution (Smith, 1931, Tikader & Sharma, 1985).

6. *Melanochelys tricarinata* (Blyth)
Three-keeled Turtle,
Red-striped Freshwater Tortoise

Geoemyda tricarinata Blyth, 1856. *J. Asiat. Soc. Bengal*, 24 : 714 (type-locality : Chaibasa district, Chota Nagpur).

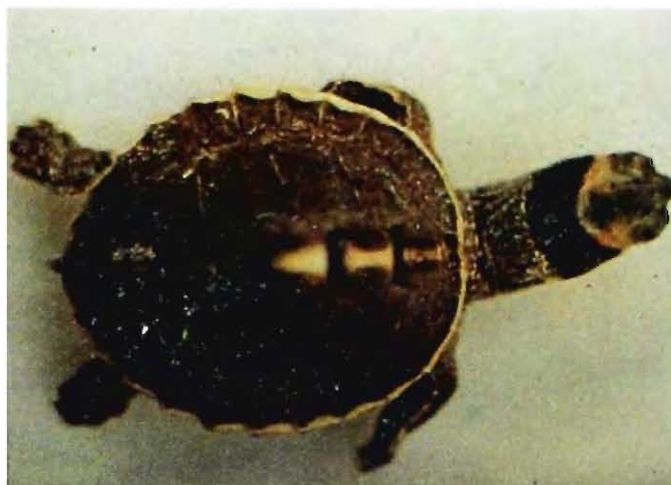
Description : Shell dark plum-coloured dorsally, with three light brown keels ; yellowish brown ventrally. Head and limbs dark plum or blackish above ; a broad reddish stripe on each side of head and a similar stripe below the gape (obscure in old males). Limbs may be with yellowish spots. Shell 170 mm in length.

Distribution : India (Uttar Pradesh, Bihar, West Bengal, Assam, Madhya Pradesh).

Remarks : It is almost terrestrial in habits. It is mainly herbivorous. The female lays 3-6 elongated eggs in a single clutch. It breeds throughout the year.

HUSAIN & TILAK

PLATE I



Kachuga tecta (Gray) Dorsal view & ventral view.

HUSAIN & TILAK

PLATE II



Lissemys punctata (Bonnaterre)—dorsal view & ventral view.

The report is based on local information and its occurrence in the adjoining area of Pauri district (Lamba, 1987).

7. *Melanochelys trijuga* (Schweigger)

Pond Terrapin

Emys trijuga Schweigger, 1814, *Prodr. Monog. Chel.*, : 41 (type locality : 'Java').

Material examined : 1 ex. (144 mm), Song river, Satyanarain, Dist. Dehra Dun, 26.ii.1972, Coll. R. N. Chopra.

Description : Shell light brown in juveniles, dark brown or blackish above in adult ; plastron dark with yellowish margins ; lateral keels yellowish. Head greyish with yellow or pink markings in young. Shell 230 mm in length.

Distribution : India (Uttar Pradesh, Bihar, West Bengal, Maharashtra, Goa, Karnataka, Tamil Nadu, Kerala).

Remarks : It is mainly aquatic and found at the base of hills. It feeds on vegetable matter.

The material was collected from the vicinity (Gola Tappar, Doon Valley) also.

Family : TESTUDINIDAE (Land Tortoises)

8. *Geochelone elegans* (Schoepff)

Indian Starred Tortoise

Testudo elegans Schoepff, 1792. *Hist. Test.*, : 111, pl. 25 (type-locality : India).

Description : Shell black dorsally ; each vertebral and coastal shield with a yellow areola from which radiate eight or more yellow streaks imparting star-like pattern ; plastron with similar markings. Head and limbs yellowish, spotted with dark brown or black. In juveniles shell entirely yellow or orange, with black marks along sutures. Shell 280 mm in length, much smaller in male.

Distribution : India (Uttar Pradesh, generally central and southern India including Karadura and Rameswaram Islands) ; Pakistan ; Sri Lanka.

Gupta and Saxena (1979) reported it from Bijnor, the adjoining district.

Remarks : It inhabits hilly tracts and forests at the base of hills. It avoids heat of the day and conceal itself under thick tuft of grass or bushes. On being disturbed, it

plunges quickly into water, where it often remains for about half an hour or so at a time. It feeds on grasses, flowers, fruits and other vegetable matter. It is very active during rainy season when mating also takes place. The female lays 3-6 elongated or spherical eggs during winter in a single clutch in a self-dug pit at the root of tufts of grass and later covers with mud.

It is included in the list due to its occurrence in the adjoining area of Bijnor district (Gupta & Saxena, 1977).

Family : TRIONYCHIDAE (Freshwater and Mud Turtles)

9. *Chitra indica* (Gray)

Narrow-necked Soft-shell Turtle

Trionyx indicus Gray, 1831. *Syn. Rept.*, : 47, and *T. aegypticus* var *indica* Gray, 1831. *Illus. Indian Zool.*, Vol. 1, pl. 80 (type-locality : Ganges, Fatehgarh).

Description : Shell light olive dorsally with splashes and large angular yellowish markings in adult, dark vermiculations or black dots in young ones ; plastron yellowish with brownish patches, Head and neck with light, black-edged longitudinal streaks and a Λ -shaped mark in front of shell. Markings fade with age. Shell 900 mm in length.

Distribution : India (Northern India) ; Pakistan ; Nepal ; Bangladesh ; Malaysia ; Thailand.

Remarks : It prefers shallow waters with sandy bed. It is very dangerous and is much feared for its fierce biting. It feeds on fishes, molluscs, crustaceans and other small animals. The female lays 8-10 spherical eggs in a single clutch.

The report is based on the range of its distribution (Smith, 1931, Tikader & Sharma, 1985 ; Murthy, 1985).

10. *Lissemys punctata* (Bonnaterre)

North Indian Flap-shell Turtle

(Plate II)

Testudo punctata Bonnaterre, 1789, In : *Daubenton's Tab. Encycl. Meth. Erept.*, : 30, pl. 6 (type-locality : "Les grandes indes").

Description : Shell olive brown dorsally with numerous dark-edged yellow spots ; yellowish ventrally. Head and snout also spotted with yellow. The spots tend to disappear with age. Shell 275 mm in length, smaller in male.

Distribution : India (Ganga and Indus river systems, Sikkim) ; Pakistan ; Nepal ; Bangladesh ; Myanmar.

Remarks : It, generally, inhabits ponds and ditches and rarely leaves its habitat. It is fond of basking on exposed portions of logs and stones. It feeds on frogs, fishes, snails, shrimps and fruits. The female lays about 12 spherical eggs in a single clutch.

The record is based on local information, occurrence in the adjoining area (Prem Nagar, Dehradun) and wide range of distribution (Tikader & Sharma, 1985).

11. *Trionyx gangeticus* Cuvier

Ganga Soft-shell Turtle

Trionyx gangeticus Cuvier, 1824. *Oss. Foss.*, 5 : 186, 203, 206, pls. 11, 12 (type-locality : Ganges).

Description : Shell olive green dorsally, whitish ventrally. Juveniles greenish with black reticulations on carapace. Head greenish with a black streak between eyes and nape and three oblique black streaks, one on either side diverging from it, another streak behind eye. Markings on head and shell on young may get faded with age. Shell 720 mm in length.

Distribution : India (Ganga, Mahanadi and Indus river systems) ; Pakistan ; Nepal ; Bangladesh.

Remarks : It inhabits deep turbid waters. It is generally seen basking on sandy river banks or resting in shallow waters with its head out. It feeds both on animal (birds, frogs, fishes, molluscs, crustaceans etc.) and aquatic plant matter but prefers old rotten flesh. It breeds after rainy season. The female lays spherical eggs on sandy river banks.

The report is based on its range of distribution as shown by Tikader & Sharma (1985).

12. *Trionyx leithi* Gray

Peninsular Soft-shell Turtle

Trionyx leithii Gray, 1872, *Ann. Mag. nat. Hist.*, (4) 10 : 334 (type-locality : Poona).

Description : Shell dark olive-green dorsally with lighter vermiculations, whitish ventrally. Young ones more grey and marked with four or more well defined ocelli. Head greenish with a black, longitudinal streak between eyes and snout and 2-3 oblique black streaks diverging from it on either side and another behind eye. Shell 500 mm in length,

Distribution : India (Ganga and rivers of peninsular India, Krishna and its tributaries in Kurnool district, Andhra Pradesh).

Remarks : It inhabits deep turbid waters of rivers, canals, ponds, etc. It has been found basking on sand near river banks or lurking in shallow waters with its head projecting out. It feeds both on plant and animal matter. Its eggs are slightly oval in shape.

The report is based on its range of distribution (Tikader & Sharma, 1985).

SUMMARY

The paper presents a brief descriptive account of species of turtles and tortoises inhabiting the Rajaji National Park and its contiguous areas. Besides the systematic account, information is given about the colour, maximum length of shell, general distribution, habitat and habits of the various species.

ACKNOWLEDGEMENTS

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LIZARDS

(Reptilia : Sauria)

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INTRODUCTION

Little is known of the fauna of the Rajaji National Park. The mammals and fishes, (Hussain, 1975) have received some attention by the zoologists so far. But the reptilian fauna is completely neglected though its study is also of significance. An attempt is, therefore, made to enumerate the species of lizards found in the Park. Nine species belonging to five families have been recorded as a result of the current studies.

Rajaji National Park is located at the meeting point of lesser Himalayan foot hills. The area is about 820 sq. kms in extent. The skyline is marked by the jagged outline of the Garhwal Shiwalik. This terrain provides diverse rich and productive life support system for a wide range of biodata.

For purpose of study and collection the following stations were selected : Mohand, Dholkhand, Beribara & Ranipur in the Dist. Saharanpur, Kansaro, Motichur, Phandowaia in Dist. Dehradun, Chila Dist., Pauri Garhwal.

The studies were taken up in 1986. The entire material is deposited in the N.R.S., Z.S.I., Dehradun.

LIST OF SPECIES

I. Family : GEKKONIDAE

1. Hemidactylus flaviviridis Rüppell

This species has a wide distribution in the Park. All the examples have been

collected from the residential areas either inside the rooms or outside the walls of the forest rest houses and staff quarters.

2. Hemidactylus brooki Gray

Nearly all the specimens have been collected from under the logs lying in the forest area.

II. Family : AGAMIDAE

3. Calotes versicolor (Daudin)

It is erroneously called "Blood sucker", as the male assumes a brilliant crimson or scarlet colour in the breeding season. It is common throughout the park. All the specimens have been collected from the small bushes in the open forest.

4. Agama tuberculata Gray

This species has mostly been found on rocks. They have a diurnal habit. At night they hide to the crevices of the rocks. It has been observed that they feed on insects as well as on vegetable matter. The specimen were collected from Mohand and Ranipur forests of the park.

III. Family : SCINCIDAE

5. Mabuya macularia Blyth

6. Mabuya dissimilis Hallowell

7. Riopa punctata Gmelin

All the three species are extremely active in their movements, rendering their capture a little difficult. These have been collected from under the trees under the fallen dry leaves.

IV. Family : LACERTIDAE

8. Ophiosops jerdoni Blyth

It has been collected from the open grassy land in Chila forest.

V. Family : VARANIDAE

9. *Varanus bengalensis* (Schneider)

This species is not collected, but seen frequently. It is very common in Beribara, Mohand and Ranipur forests. It is a protected species.

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SNAKES

(Reptilia : Serpentes)

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INTRODUCTION

This paper presents brief descriptions of twenty-eight species of snakes recorded from Rajaji National Park and its vicinity. Besides distinguishing features and colour, it includes information on their maximum recorded size, range of distribution, habitat and habits.

Hitherto, Walton (1911) recorded seven species, viz. *Python molurus*, *Ptyas mucosus*, *Bungarus caeruleus*, *Naja naja*, *Ophiophagus hanna*, *Vipera russelli* and *Trimeresurus monticola* from Dehra Dun. Bhatnagar (1969) reported the extension of the range of *Elaphe radiata* to Doon Valley and Doon Siwaliks. Joshi and Kumar (1970) recorded five species, viz. *Typhlops porrectus*, *Eryx johani*, *Python molurus*, *Ptyas mucosus* and *Naja naja*, while Gupta and Sinha (1978) recorded six species, viz. *Python molurus*, *Bungarus caeruleus*, *Ophiophagus hanna*, *Naja naja*, *Vipera russelli* and *Trimeresurus monticola* from Siwaliks. The records by Singh and Gupta (1979) were also the same from eastern Dehra Dun. Sanyal *et al.* (1979) reported *Ahaetulia nasuta* from Doon Valley. Upadhyaya and Upadhyaya (1980) recorded only three species, viz. *Ptyas mucosus*, *Naja naja* and *Agkistrodon himalayanus* from Garhwal. *A. himalayanus*, the Himalayan Pit Viper, is a species of high altitudes (between 2,134 m and 4,877 m). Osmaston and Sale (1989) also reported *Python molurus*, *Bungarus caeruleus*, *Naja naja* and *Ophiophagus hanna* from the Park. Recently, Husain and Ray (1993) reported the occurrence of *Lycodon jara* in the Rajaji National Park and Doon Valley. Husain and Ray (in press) reported 38 species from Dehra Dun and Pauri Garhwal districts, out of which, 28 species (mentioned in this work) are common with Rajaji National Park.

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As a result of the present study, it has been possible to add sixteen more species making a total of twenty eight species. The species *Bungarus walli* and *Trachischium fuscum*, reported from the adjoining area (Bijnor) of Park by Kant and Joshi (1971) and Gupta and Saxena (1979), have been included in the list of the species in Park. The record of other species is based on the material from the area or its vicinity, distributional records in literature and information from local people and other sources.

Miller (1904), Wall (1906, 1907 a, b, 1908, 1909, 1912, 1913, 1914, 1921, 1923 a, b, c, 1924 a, b, Gharpurey (1935), Smith W. J. L. (1935), Smith, H. C. (1936), Mustill (1936) Smith, M. A. (1943), Deoras (1965), Waltner (1975), Whitaker (1978), Mahendra (1983), Murthy (1985, 1990), Murthy and Pillai (1986), Daniel (1989), Bhargava (1991) and Sharma (1991) have given interesting accounts on various aspects (systematics, maximum length, geographical and altitudinal distribution, habitat, feeding habits, breeding and other habits) of the species dealt herewith. These references may help for further details on the species.

SYSTEMATIC ACCOUNT

Class : REPTILIA

Order : SERPENTES

Family : TYPHLOPIDAE

1. *Ramphotyphlops braminus* (Daudin)

Common Blind Snake

Eryx braminus Daudin, 1803, *Hist. Nat. Rept.*, 7 : 279 (type-locality : Vishakhapatam).

Hindi names : Andha samp, Telia samp.

Material examined : 1 ex., Park area, Dist. Hardwar, 28.vii.1962, Coll. T. D. Soota ; Chandi Range, Hardwar-Chila road, Dist. Pauri, 5.iii.1963, Coll. T. D. Soota ; 1 ex., Park area, Dist. Hardwar, 20.v.1963. Coll. T. D. Soota ; 1 ex., Ranipur, Dist. Hardwar, 12.ii.1964, Coll. T. D. Soota.

Description : Head, belly and back covered with minute shining scales. Nasal shield completely divided. Body blackish brown dorsally, lighter ventrally. Snout, anal region and tip of tail whitish. 203 mm in length.

Distribution : India (up to 1,000 m including Andaman and Nicobar Islands) ; Sri Lanka ; South-east Asia ; Indo-Australian Islands ; Middle East (Iran, Arabia) ; Africa

(South of Equator); Madagascar; Southern Mexico. Introduced into Lakshadweep Islands (India) and Hawai (USA) by human agency.

Remarks : It lives around roots and decayed logs of wood and come out only at night. It feeds on insect larvae and pupae. It lays 2-8 elongate, self-fertilised eggs. It is harmless.

2. *Typhlops diardi* Schlegel

Diard's Blind Snake, Large Blind Snake

Typhlops diardi Schlegel, 1839, *Abbild. Amphib.* 1 : 39 (type-locality : not known).

Hindi name : Andha samp.

Description : Head and body covered with minute scales. Nasal shield incompletely divided. Body brownish or blackish above, paler below. 43 Cm in length.

Distribution : India (Uttar Pradesh, Bihar, West Bengal, Assam, Meghalaya); Bangladesh; Myanmar; Indo-China; Thailand.

Remarks : It lives under logs, humus and in flower pots and feeds on worms, larvae and eggs of insects. It is ovoviviparous. The female gives birth to 3-14 young at a time. It is harmless.

The report is based on local information and the material collected from the vicinity (Dharmawala and Garhi, Doon Valley).

3. *Typhlops porrectus* Stoliczka

Slender Blind Snake, Stoliczka's Blind Snake

Typhlops porrectus Stoliczka, 1871, *J. Asiat. Soc. Bengal*, 40 : 426, pl. 25, figs. 1-4 (type-locality : Bengal).

Hindi name : Andha samp.

Description : Head and body covered with minute scales. Nasal shield incompletely divided. Body blackish or brownish dorsally, lighter ventrally. Snout, chin and anal region whitish. 28.5 Cm in length.

Distribution : India; Pakistan; Sri Lanka; Myanmar.

Remarks : It lives in the upper loose soil around bushes both in plains and hills (up to 2,000 m). It feeds on larvae of small insects. It is harmless.

The record is based after Joshi & Kumar (1970).

Family : BOIDAE

Subfamily : PYTHONINAE

4. *Python molurus* (Linnaeus)

Indian Python

Coluber molurus Linnaeus, 1758, *Syst. Nat.*, 10th ed., : 225 (type-locality : India).

Hindi name : Ajgar.

Description : Plates on belly broad only in middle, not covering entire width of belly ; anal entire ; subcaudals paired. Body light yellowish or brownish above with a series of large, more or less subquadrangular or rhomboidal dark-edged spots. Head with a lance-shaped or spear-shaped mark on dorsal side and a dark band on the sides ; another dark and oblique band below the eye. Ventral side yellowish. Tail marbled with black and yellow. 10 m in length.

Distribution : India ; Pakistan ; Bangladesh ; Sri Lanka.

Remarks : It is found in plains and hills (up to 2,000 m) and inhabits thick forests and scruby jungles dotted with streams in the vicinity and is also found near *jheels*. It is fond of water. It climbs well and aided by its prehensile tail is capable of suspending itself from branches of trees. It is active and alert both by day and night. It usually feeds on mammals, birds, reptiles, amphibians but large individuals prefer large mammals (deers, leopards, jackals, oxen, wild boar etc.). It kills its prey by constriction. The mating takes place during hibernation. The female, after depositing elongated eggs (numbering from 8 to 107) in a clutch, coils round them and incubates the clutch until they hatch out after 50-60 days. It is non-venomous.

The record is based after Gupta & Sinha (1978) and Osmaston & Sale (1989).

Subfamily : BOINAE

5. *Eryx johni* (Russell)

John's Sand Boa, Red Sand Boa

Boa johnii Russell, 1801, *Indian Serp.*, 2 : 18, 20, pls. 16, 17 (type-locality : Tranquebar).

Hindi names : Domoo samp, Do muha, Dumai.

Description : Body sandy grey or yellowish dorsally ; scales brown or edged with

brown ; uniform or with more or less distinct dark cross bands usually more distinct on tail. Ventral side whitish, spotted with dark brown or entirely brown. 1.25 m in length, males shorter than females.

Distribution : India (Uttar Pradesh, Delhi, Punjab, Rajasthan, Andhra Pradesh, Tamil Nadu) ; Pakistan ; Afghanistan.

Remarks : In hills it occurs up to 600 m elevation. It generally occurs in arid regions. It is nocturnal and burrowing in habit. It is liable to be seen around rains. It feeds on rats, mice, squirrels, lizards and other snakes. The female gives birth to 1-12 young at a time. It is non-venomous.

The record is based after Gupta & Sinha (1978).

Family : DIPSADIDAE

Subfamily : LYCODONTINAE

6. *Lycodon aulicus* (Linnaeus)

Common Wolf Snake

Coluber aulicus Linnaeus, 1754, *Mus. Adolph. Frider*, 1 : 29, pl. 12, fig. 2 (type-locality: not known).

Hindi names : Garar, Kauriwala, Sankhra.

Description : Ventrals angulate laterally ; anal divided, rarely entire ; subcaudals divided. Colour brown or greyish-brown above with 9-19 yellowish cross bars, enclosing dark islets on body and a triangular patch of same colour on occiput. 83 cm in length, males longer than females.

Distribution : India ; Nepal ; Sri Lanka ; Myanmar.

Remarks : It is found in plains and hills (up to 2,000 m). It is in habit of living in or near human dwellings. It is nocturnal in habit. It can climb small trees and bushes. Its main food consists of geckos, skinks and other lizards but also feeds on frogs, bird eggs and mice. The female lays 4-11 eggs in a single clutch. It is non-venomous but bites with great ferocity.

It is most often confused with Common Krait from its almost identical colour pattern and long teeth on upper and lower jaws which are mistaken for fangs, but can be distinguished by its divided subcaudals.

The report is based on local information and the material collected from the vicinity (Madhuwala, Doon Valley).

7. *Lycodon jara* (Shaw)**Twin-spotted Wolf Snake***Coluber jara* Shaw, 1802, *Gen. Zool.*, 3 : 525 (type-locality : Ganjam).

Material examined : 1 ex. (37 cm), Asarori, Dist. Dehra Dun, 20.viii.1985, Coll. Pranjaleindu Ray.

Description : Dorsals smooth with apical pits ; ventrals broad, simple ; anal and subcaudals divided. Colour brownish or puplish above ; each scale with two yellowish spots. Upper lip and lower surface whitish. 55 cm in length, males slightly shorter than females.

Distribution : India (Uttar Pradesh, Bihar, West Bengal, Assam, Orissa, Tamil Nadu).

Remarks : It is found both in plains and hills (up to about 2,000 m). It lives under loose soil. It is nocturnal in habit and very active in its movements. It feeds on earthworms, small insects and juveniles of frogs.

8. *Lycodon striatus* (Shaw)**Shaw's Wolf Snake, Barred Wolf Snake***Coluber striatus* Shaw, 1802, *Gen. Zool.*, 3 : 527 (type-locality : Vishakhapatam and Hyderabad).

Description : Dorsals smooth, with apical pits ; ventrals broad ; anals and subcaudals paired. Body dark brown above with 11-18 pale cross bars. A white band on the nape sometimes present. Ventral side uniformly pale. 60 cm in length.

Distribution : India ; Pakistan ; Sri Lanka ; Iran.

Remarks : It is found both in plains and hills (up to 1,800 m). It is nocturnal in habit. It feeds on mice and lizards. The female lays 2-4 eggs during rainy season. A timid snake which hides its head beneath its coils when disturbed. It is harmless.

The report is based on local information and the material collected from the vicinity (Chiriamandi, Dehra Dun)

9. *Oligodon arnensis* (Shaw)**Black-striped Kukri Snake***Coluber arnensis* Shaw, 1802, *Gen. Zool.*, 3 : 526 (type-locality : Vishakhapatam).

Hindi name : Kukri samp.

Description : Dorsal scales smooth ; ventrals angulate laterally ; anal and subcaudals divided. Colour brownish above with 20-60 distinct black bands. Head with three Chevron-shaped dark marks. Underside whitish, often spotted with black. 70 cm in length.

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Sri Lanka.

Remarks : It is found both in plains and hills (up to 2,000 m). It climbs well. It is diurnal in habit. It feeds on geckos, skinks, bird and reptile eggs, mice and other small mammals. Juveniles feed on insects, spiders and their larvae. The female lays 3-7 elongated eggs. It is non-venomous.

The report is based on local information and its wide range of distribution (Whitaker, 1978 ; Murthy, 1985, 1990).

10. *Trachischium fuscum* (Blyth)

Black-Bellied Roughside Snake,
Darjeeling Oriental Worm Snake

Colamaria fusca Blyth, 1854, *J. Asiat. Soc. Bengal*, 23 : 288 (type-locality : Darjeeling).

Description : Scales smooth, those on sides of posterior part of body and base of tail distinctly keeled in male and feebly keeled or smooth in female ; ventrals broad ; anal and subcaudals divided. Body dark brown or blackish above and below, iridescent, and with or without light longitudinal streaks on dorsal side. Juveniles light brown with dark streaks. 70 cm in length, males shorter than females.

Distribution : India along Himalaya (Jammu & Kashmir, Uttar Pradesh, Sikkim, West Bengal, Meghalaya, Assam).

Remarks : It is generally found in hilly regions (up to 3,000 m). It is very gentle snake. It is often encountered in day light about the roads. It feeds exclusively on earthworms. The female lays 3-6 elongated eggs. The young ones emerge during monsoon months. It is harmless.

The report is based on local information and the record from the adjoining area of Bijnor by Kant & Joshi (1971) and Gupta & Saxena (1979).

Subfamily : SIBYNOPHINAE

11. *Sibynophis sagittarius* (Cantor)

Cantor's Black-headed Snake
(Plate I, Fig. 1)

Colamaria sagittarius Cantor, 1839, *Proc. Zool. Soc.*, : 49 (type-locality : Tirhut).

Description : Dorsals smooth ; ventrals broad ; subcaudals paired. Body brownish above with a vertebral series of black dots. Head and nape dark brown or black with an elongate yellowish patch on each side at back ; a yellow border behind nuchal patch. Lower side of head and body pale ; a black dot on each side of ventral shield. 30.5 cm in length.

Distribution : India (Western Himalaya, Uttar Pradesh, West Bengal, Madhya Pradesh, North-Eastern India).

Remarks : It occurs in plains and hills (up to about 1,000 m). It is active at dusk and moves quickly. It swallows its prey rapidly. It is harmless.

The record is based on local information and the material collected from the vicinity of the Park (Bhagwatpur Forest Block, Mohand Forest Range).

Family : NATRICIDAE

12. *Amphiesma stolata* (Linnaeus)

Buff-striped Keelback

Coluber stolatus Linnaeus, 1758. *Syst. Nat.* 10th Ed. : 219 (type-locality : Asia).

Hindi names : Hurwa, Seeta ki lat.

Material examined : 1 ex., Phandowala, Dist. Dehra Dun, 17.ii.1972, Coll. R. N. Chopra.

Description : Dorsals strongly keeled except the outer row which is smooth ; ventrals broad ; anal and subcaudals divided. Body olive-greenish above with black spots or reticulated cross bars interrupted by two dorso-lateral yellow stripes. Belly whitish. Head olive. Margin of scales adorned with blue-grey or pale-blue. 85 cm in length, females shorter than males.

Distribution : India ; Pakistan ; Sri Lanka ; Myanmar ; South China ; Indo-China ; Thailand.

Remarks : It is found both in plains and hills (up to 2,000 m). It commonly inhabits river banks, pond edges, marshy areas, paddy fields, grassy lands, gardens or near plants grown in pots. It avoids hot weather and often hides in holes in the ground, drains, culverts etc. and comes out during the rains. It is diurnal in habit. It is fond of water. It feeds on frogs, toads, lizards and occasionally on rodents. The young feeds on insects, tadpoles and small frogs and toads. The mating takes place during dry season and 1-15 (usually 5-10) eggs in a clutch are laid in later period. It is inoffensive gentle snake. It is often mistaken for young Cobra and needlessly killed by undiscerning gardeners and house-holders.

13. *Xenochrophis piscator* (Schneider)

Checkered Keelback, Common Pond Snake

(Plate I, Fig. 2)

Hydrus piscator Schneider, 1799. *Hist. Amph.*, 1 : 247 (type-locality : East Indies).

Hindi names : Dhoria, Pani ka samp.

Material examined : 1 ex., Kansrao, Dist. Dehra Dun, 13.iv.1960 (purchased) ; 2 exs., Satyanarain, Dist. Dehra Dun, 29.vi.1960. Coll. T. D. Soota ; 1 ex., Mohand, Dist. Hardwar, 11.ix.1986, Coll. Raj Tilak.

Description : Dorsals keeled except for outer one or two rows which are smooth ; ventrals broad ; anal and subcaudals divided. Body yellowish olive with black spots quincuncially arranged. Head olive-brown with two oblique black streaks, one below and the other behind eye. Underside whitish or yellowish. 2 m in length, males shorter than females but have relatively longer tails.

Distribution : India (including Himalaya and Andamans) ; Pakistan ; Bangladesh ; Sri Lanka ; Myanmar ; Southern China ; Taiwan ; Indo-China ; Malayan region ; Borneo.

Remarks : It is a snake of plains and hills (up to 3,000 m). It inhabits marshy areas, water pools, ditches, canals and banks of rivers with plenty of aquatic vegetation. It is usually seen during the day. It swims with great ease and vigour. It feeds on fishes, frogs and rodents. The young ones subsist on aquatic insects and tadpoles. It breeds throughout the year. The female is a prolific breeder and lays 8 to 91 elongated eggs in a clutch. Although non-venomous, it is very vicious snake and bites readily when molested.

Family : COLUBRIDAE

14. Ahaetulla nasuta (Lacepede)

Common Green Whip Snake

Coluber nasutus Lacepede, 1789, *Hist. Nat. Serp.*, 1 : 100 ; 2 : 277 ; pl. 4, fig. (type-locality : Ceylon).

Hindi name : Hara samp.

Description : Scales smooth, vertebral rows enlarged ; ventrals broad ; anal and subcaudals divided. Colour grass-green dorsally, light green ventrally ; throat whitish. A white or yellow line along outer margin of ventrals. 2 m in length, males shorter than females.

Distribution : India ; Sri Lanka ; Myanmar ; Indo-China ; Thailand.

Remarks : It is found both in plains and hills (up to 2,500 m). It is frequently seen in bushes and shrubs. It can also climb tall trees. It is diurnal in habit. It feeds on rodents, small birds, lizards and also occasionally on frogs and other snakes. It is ovoviviparous. The female gives birth to 3-23 young ones at a time. It is non-venomous, but its salivary secretion is slightly toxic. This snake can easily be identified by the presence of an elongated fleshy appendage at the tip of snout.

The report is based on the record from the vicinity (Doon Valley) by Sanyal et al. (1979).

15. Argyrogena ventromaculatus (Gray & Hardwicke)

Glossy-bellied Racer

Coluber ventromaculatus Gray & Hardwicke, 1834, *Ill. Indian Zool.*, 2 : pl. 80, fig. 1 (type-locality : not given).

Urdu name : Sagi.

Description : Scales smooth ; ventrals broad, angulate laterally ; subcaudals divided. Body light greyish above with a dorsal series of cross-bands or rhomboidal spots, a series of smaller spots on lateral sides alternating with dorsal bars ; whitish ventrally. 1.09 m in length, females slightly shorter.

Distribution : India (Western Himalaya and plains of north-western India, Rajasthan, Maharashtra) ; Pakistan ; Afghanistan ; Iran,

Remarks : It is found both in plains and hills (up to 1,800 m). It is usually seen basking in open. It feeds on lizards, rats and mice. The young ones subsist on insects and small frogs. The female lays about nine eggs.

The report is based on local information and its occurrence in the adjoining area (Chopra, 1979 ; Lamba, 1987) and wide range of distribution (Waltner, 1975, Whitaker, 1978 ; Murthy, 1985, 1990).

16. *Elaphe helena* (Daudin)

Common Trinket Snake

(Plate II, Fig. 1)

Coluber helena Daudin, 1803, *Hist. Nat. Rept.*, 6 : 277 (type-locality : Vishakhapatam).

Material examined : 1 ex., Mohand, Dist. Hardwar, 30. x. 1986, Coll. Raj Tilak.

Description : Scales glossy ; dorsals keeled on posterior part of body ; ventrals broad, angulate laterally ; anal entire ; subcaudals divided. Body brownish above with blackish cross bands lodged with white ocelli and two longitudinal black stripes. A black vertical streak below the eye and another oblique one behind it. Lower parts yellowish. 1.60 m in length, males shorter than females.

Distribution : India ; Pakistan ; Sri Lanka.

Remarks : It is found in or around forests and near human habitations, common between 500 m and 2,000 m. It feeds mainly on small rodents but frogs, lizards and other snakes have also been found in its diet. Young ones feed on insects and small lizards. It breeds during summer months. The female lays 6-8 elongated eggs. It is non-venomous.

17. *Elaphe radiata* (Schlegel)

Copperhead

Coluber radiatus Schlegel, 1837, *Phys. Serp.*, 2 : 135, pls. 5, 6 (type-locality : Java).

Material examined : 1 ex., Mohand, Dist. Hardwar, 27.iv.1964, Coll. T. D. Soota.

Description : Median rows of dorsals keeled ; ventrals broad, strongly angulate laterally ; anal entire ; subcaudals paired. Body greyish-brown or yellowish-brown above with four black stripes on anterior half or two-thirds of the back. Ventral side yellowish or mottled with grey. Head coppery with a black bar across the occiput and three black

streaks radiating from below and behind eye. 2.135 m in length, females shorter than males.

Distribution : India (Uttar Pradesh, Sikkim, West Bengal, Assam, Orissa); Myanmar; Southern China; Indo-China; Thailand; Malaysia.

Remarks : It is generally found in plains and also in valleys and low hills, where it is met with in cultivated fields and gardens and occasionally in the vicinity of human habitations. It is diurnal in habit. It feeds on rodents. The female lays 5-12 eggs in a clutch. It is non-venomous.

18. *Ptyas mucosus* (Linnaeus)

Common Rat Snake

Coluber mucosus Linnaeus, 1758. *Mus. Ad. Frid.*, 1 : 37, pl. 23; *Syst. Nat. Ed.* 10 : 226 (type-locality : India).

Hindi name : Dhaman.

Material examined : 1 ex., Kansrao, Dist. Dehra Dun, 13.xi.1960 (purchased).

Description : Dorsals smooth or keeled, vertebrals may be slightly enlarged; ventrals broad; anal and subcaudals divided. Body brownish or greyish above with black cross bands on posterior half; pale below. Juveniles light olivaceous with dark edged cross bands anteriorly. 4 m in length, females shorter than males.

Distribution : India; Pakistan; Afghanistan; Bangladesh; Sri Lanka; Southern China; Indo-China; Myanmar; Indonesia.

Remarks : It is partial to plains but is also found in the hills (up to 4,000 m) often in the vicinity of human habitations. It can climb trees and glide with ease from one branch to another. It is a good swimmer. It feeds on rats, frogs, toads, lizards, young pond turtles, snakes, birds and bats. Mating takes place in summer. The female lays 6-14 eggs during monsoon period. It is non-venomous.

19. *Spalerosophis atriceps* (Fischer)

Diadem Snake, Royal Snake

(Plate II, Fig. 2)

Zamenis diadema atriceps Fischer, 1885, *Jahrb. Hamburg Wiss. Anst.*, 2 : 102 (type-locality: Himalaya).

Hindi names : Rajatbansi, Rajbansi, Rajitbansar.

Description : Scales obtusely keeled ; ventrals broad ; anal and subcaudals divided. Body light yellowish-brown above, with irregularly scattered dark brown or black spots. Head partly or entirely black. Underside lighter. 2.25 m in length, males shorter than females.

Distribution : India (Uttar Pradesh, Delhi, Rajasthan, Punjab, Himachal Pradesh, Jammu & Kashmir).

Remarks : It occurs both in plains and hilly terrain (up to 2,000 m). It is a good racer and climber. It feeds chiefly on lizards, small snakes, birds and mice. The female lays about six eggs. It is non-venomous. However, when molested, it emits a loud hiss and inflicts painful bite.

The report is based on local information and the material collected from the vicinity (Dehra Dun).

Family : HOMALOPSIDAE

Subfamily : BOIGINAE

20. *Boiga trigonata* (Schneider)

Common Cat Snake, Indian Gamma
(Plate III, Fig. 1)

Coluber trigonatus Schneider, 1802, In : *Bechst. transl. Lacep.*, 4 : 256, pl. 40. fig. 1 (type-locality : Vishakhapatam).

Description : Scales smooth, with apical pits, vertebrals slightly enlarged ; ventrals broad ; anal entire ; subcaudals divided. Body yellowish or greyish-brown above with a vertebral series of large, light, black-edged regular marks. Head with an inverted Y-shaped light mark. Underside whitish mottled with black on sides. 1.25 m in length, males shorter than females.

Distribution : India ; Pakistan ; Sri Lanka.

Remarks : It is found both in plains and hills (up to 1,500 m). It is an arboreal snake, frequenting bushes, scrub or trees, usually close to the ground. It is nocturnal in habit. It feeds on lizards, frogs, mice and small birds. The female lays 3-11 elongated eggs after rains. It is harmless. The mild venom secreted by rear-fangs is utilised for killing its prey. It may bite when handled.

It is sometimes mistaken for the deadly Saw-scaled Viper, *Echis carinatus* for its

triangular head, narrow neck and zigzag marks on the back. However, it lacks minute scales on head—the characteristic feature of vipers.

The report is based on local information and the material collected from the adjoining area (Nayagaon, Doon Valley).

Subfamily : HOMALOPSINAE

21. *Enhydris sieboldi* (Schlegel)

Siebold's Smooth Water Snake
(Plate III, Fig. 2)

Homalopsis sieboldii Schlegel, 1837, *Phys. Serp.*, 2 : 349, pl. 13, figs. 4, 5 (type-locality : Bengal).

Description : Scales smooth ; ventrals broad ; anal divided. Body buff or greenish above with rhomboidal dark tranverse spots and a series of roundish spots along sides alternating with dorsal spots ; lower surface white, checkered with black. 80 cm in length.

Distribution : India (Uttar Pradesh, Delhi, Bihar, West Bengal, Assam, Madhya Pradesh, Maharashtra, Kerala) ; Bangladesh ; Myanmar.

Remarks : It is an aquatic snake, but often found on land in the vicinity of water. It feeds on shrimps, fishes, frogs, toads. It is viviparous. It is harmless.

The report is based on local information and the material collected from the adjoining area in dist. Hardwar.

Family : ELAPIDAE

22. *Bungarus caeruleus* (Schneider)

Common Indian Krait, Blue Krait

Pseudoboa caerulea Scheider, 1801, *Hist. Amphib.*, 2 : 284 (type-locality : Vishakhapatam).

Hindi names : Kala-gandait (in Urdu), Kariyat, Maneer.

Description : Scales smooth, vertebrals distinctly enlarged, hexagonal ; ventrals broad ; anal and subcaudals entire. Body bluish-black above with about forty narrow white cross bands arranged more or less in pairs, least distinct on anterior part of body and

sometimes may be totally absent there, vertebral spots may be present. A white preocular spot usually present. Belly whitish. 2 m in length, females shorter than males.

Distribution : India ; Pakistan ; Sri Lanka.

Remarks : It is found both in plains and hills (up to 1700 m) and generally inhabits in or near termite mounds, rat-holes, piles of bricks and stones and ruins. It is nocturnal in habit. It is fond of water. It feeds mostly on lizards, mice, rats, frogs and toads and occasionally on snakes including its own kind. Young ones feed on blind snakes. The female lays 6-15 elongated eggs in a clutch during summer months.

It is one of the deadliest venomous snakes. The venom is both neurotoxic and haemotoxic in property. It is considered to be fifteen-times more virulent than that of the Cobra. It affects the nervous system and paralyses the respiratory centre and centres concerned with lips, tongue, larynx and pharynx. It destroys red blood corpuscles and also the lining of blood vessels.

The report is based on earlier records (Walton, 1911 ; Gupta & Sinha, 1978, Osmaston & Sale, 1989) and the material collected from the adjoining areas in Doon Valley.

23. *Bungarus walli* Wall

Wall's Krait

Bungarus walli Wall, 1907, *J. Bombay nat. Hist. Soc.*, 17 (3): 608-611, pl. (type-locality : Faizabad, U. P.).

Description : Scales smooth, vertebrae strongly enlarged ; ventrals broad ; anal and subcaudals entire. Body bluish-black dorsally, with 65-80 narrow white cross bars formed of transverse series of small spots. Preocular spot and vertebral spots absent. Lower parts white. Tail suffused with brown. 1.64 m in length, female smaller.

Distribution : India (Uttar Pradesh, Bihar, West Bengal, Orissa).

Remarks : The species is very much allied to *B. caeruleus* from which it differs as follows :—

- (i) White cross bars not arranged in pairs in *B. walli* whereas they are arranged in pairs in *B. caeruleus*.
- (ii) Vertebral spots absent in Wall's Krait while a series of vertebral spots may be present in Common Krait.
- (iii) Preocular spot absent in Wall's Krait which is usually present in Common Krait.

(iv) Dorsal vertebrae form a ridge down the back in Wall's Krait which is not the case in Common Krait.

(v) Tail ending obtusely in Wall's Krait whereas it is pointed in Common Krait.

The report is based on local information and its occurrence in the adjoining area (Kant & Joshi, 1971 ; Gupta & Saxena, 1979).

24. *Naja naja* (Linnaeus)

Common Cobra

Coluber naja Linnaeus, 1758, *Syst. Nat.*, 10th ed., : 221 (type-locality : India).

Hindi name : Nag (male), Nagin (female).

Description : Third supralabial enlarged, extending from eye to nostril shield ; preocular touching internasal ; a small cuneate shield, wedged between the fourth and fifth lower lip shields. Scales smooth ; ventrals broad ; anal entire ; subcaudals divided. Colouration highly variable. Body yellowish, brownish, olive-grey, or black above which may have light or dark bands, variegations or reticulations. Underside white or yellowish. Hood with black and white "spectacle" or binocellate mark ; a black spot on either side of the underside of the hood besides 2-3 broad blackish cross bars on the belly below. The specimens from the north are more often black and the hood mark may not be well defined or may be absent. 2.25 m in length, females slightly shorter than males.

Distribution : India ; Pakistan ; Sri Lanka ; Southern China ; Philippines.

Remarks : It is found in all types of habitats (up to 3,650 m). It inhabits cultivated fields, forests, hollows of old trees, tangle of roots at the base of trees, dens of small mammals, termite mounds, ruined buildings, holes in the embankments, piles of stones, loose brick work, old thatched roofs and vicinity of human habitations. It is usually diurnal in habit. It is extremely fond of water and hence is generally found near it especially during hot weather. It feeds on rats, mice, other small mammals, frogs, toads, lizards, snakes, birds and their eggs. Young ones take insects and as they grow large, they switch over to other animals like the adults. The female lays 8-45 (usually 12-20) oval eggs in a single clutch during summer in the hollows of tree stumps, rat holes or termite mounds. The mating pair remains together untill the young ones emerge and share in guarding the clutch.

It is one of the most dangerous venomous snakes. The venom is basically neurotoxic and haemotoxic. It affects the nervous system leading to the paralysis of respiratory system. It also destroys the clotting power of blood and red blood corpuscles.

The report is based after Walton (1911), Joshi & Kumar (1970), Gupta & Sinha (1978) and Osmaston & Sale (1989).

25. Ophiophagus hanna (Cantor)**King Cobra, Hamadryad**

Hamadryas hanna Cantor, 1836, *Asiat. Res.*, 19: 187, pls. 10, 11 (type-locality: Sundarbans, near Calcutta).

Hindi names : Nagraj, Raj Nag.

Description : Third supralabial enlarged, touching nasal and eye. No wedge shield on lower lip. Scales smooth ; ventrals broad ; anal entire ; subcaudals near vent entire, but those towards the end of tail divided. Colour variable, yellowish, brownish, olive brown, olive-green, blackish-brown or black above with or without lighter cross bands. Young ones dark black above with 40-56 chevron-shaped yellowish bands ; head with four such bands. Tail almost entirely black. Underside whitish. The markings disappear anteriorly and become obscure posteriorly with the advancement of age. 6 m in length, females shorter in length.

Distribution : India (along Himalaya, Uttar Pradesh, Bihar, West Bengal, Assam, Orissa, Andhra Pradesh, Western ghats, Andaman Islands) ; Pakistan ; Nepal ; Myanmar ; Indo-China ; Thailand ; Southern China ; Hongkong ; Malaysia ; Indonesia ; Philippines.

Remarks : It is found both in hills (up to 2,200 m) and plains. It prefers to live near waters and climbs trees and is rarely sighted. It is diurnal in its habit. It feeds exclusively on snakes and sometimes on its own kind, occasionally on monitor lizard, which is the only other reptilian food of this snake. The female lays 20-51 elongated eggs in a clutch during summer in a self built nest made of leaves and sand. The female guards the nest from intruders.

It is the largest venomous snake in existence. The venom is slightly less toxic than that of the Cobra. But the massive venom glands can discharge up to 7 ccs of venom at a bite which is sufficient to kill an elephant or lethal for at least ten persons.

It differs from the Common Cobra in the following characters :—

- (i) Cuneate or wedge shield on lower lip absent in King Cobra whereas it is present between the fourth and fifth lower lip shields in Common Cobra.
- (ii) A pair of large occipital shields behind the parietals on the head are present in King Cobra, which are absent in Common Cobra.
- (iii) Prefrontal touching nasal shield in King Cobra whereas it is not touching in Common Cobra.
- (iv) Preocular separated from internasal by prefrontal in King Cobra whereas it is touching in Common Cobra.

- (v) Subcaudals near the vent entire but those towards the end of tail divided in King Cobra whereas all the subcaudals are divided in Common Cobra.
- (vi) Hood is without "spectacle" mark in King Cobra, whereas it is present in Common Cobra.

The record is based after Walton (1911), Gupta & Sinha (1978), and Osmaston & Sale (1989).

Family : VIPERIDAE

Subfamily : VIPERINAE

26. *Echis carinatus* (Schneider)

Saw-Scaled Viper

Pseudoboa carinata Schneider, 1801, *Hist. Amphib.*, 2 : 285.

Hindi names : Afai, Phoorsa.

Description : Scales on head small, elongate, imbricate and strongly keeled. Nostril small, in a divided nasal. Dorsals also keeled, lateral scales in oblique series with serrated keels ; ventrals broad ; anal and subcaudals entire. Body brownish, greyish or sandy above with a vertebral series of 25-31 pale, dark-edged spots which are connected on each side with a wavy light line on flanks. A light cruciform mark on the head. Underside whitish or speckled with brown. 1 m in length, sexes alike.

Distribution : India ; Pakistan ; Sri Lanka ; South-western Asia ; Africa (North of Equator).

Remarks : It is a snake of the arid and semi-arid regions. Although generally an inhabitant of the plains, it has been met with at about 2,000 m altitude. Being mainly nocturnal in habit, it rarely comes out in day light except for basking in sun after a cold rainy night. It feeds on mice, lizards, smaller snakes, frogs, scorpions, centipedes, earwigs and other arthropods. It is viviparous. The female gives birth to 3-15 young ones at a time during the summer season.

It is one of the most aggressive and feared venomous snakes. The venom is haemotoxic and is said to be five-times more toxic than that of the Cobra and sixteen-times more toxic than that of the Russell's Viper. The venom is anticoagulant and destroys red blood corpuscles and lining of blood vessels leading to internal haemorrhages. The heart is strongly affected through the vasomotor centre and directly on its muscles,

It is included in the list on local information from the adjoining area and as per the range of its distribution (Wall, 1908 ; Smith, 1943, Daniel, 1989).

27. *Vipera russelli* (Shaw)

Russell's Viper

Coluber russelli Shaw, 1797, *Nat. Misc.*, 8 : 291 (type-locality : Coromandal coast).

Hindi names : Daboia, Gonus, Kander.

Description : Scales on head small, imbricate, strongly keeled ; dorsals also strongly keeled except the outer row, which is smooth ; broad plates on belly ; anal entire ; subcaudals divided. Body light brown above with three longitudinal rows of 23-37 large, reddish brown oval spots with black and white edges forming a chain-like pattern on the back and sides ; yellowish white below. Head with two large symmetrical dark brown patches, two light streaks uniting at the tip of snout and diverge behind to gape and a dark stripe from eye to eye. 2 m in length, females slightly shorter than males.

Distribution : India ; Pakistan ; Bhutan ; Sri Lanka.

Remarks : It is found both in plains and hills (up to 3,000 m in Himalaya). It inhabits rock crevices, thick vegetation, scrub jungles, thorny bushes, cactii, grass, paddy fields, termite mounds and around human habitations. It is generally nocturnal in habit and slow in its movements. It feeds mostly on rats and mice, but birds, lizards and frogs are also taken. Cannibalism also occurs. The female gives birth to 20-63 young ones at a time during summer months.

It is one of the most dangerous venomous snakes. The venom is haemotoxic in property. It is considered one-third as toxic as that of the Cobra but the large size (1.6 cm, the largest in Indian vipers) of the fangs contributes to the severity of its bite. The venom affects the vasomotor centre and destroys the red blood corpuscles and the lining of the blood vessels leading to extensive internal haemorrhages. The coagulation property of the blood is reduced. The effect of venom produces convulsions in the body and retards the respiration.

Superficially, it resembles the harmless Common Sand Boa (*Eryx conicus*) which however is a stumpy snake having shorter and blunter tail and irregular blotches forming an uneven chain on the back.

The record is based after Walton (1911), Gupta & Sinha (1978),

Subfamily : CROTALINAE

28. *Trimeresurus monticola* Gunther

Large-spotted Pit Viper

Trimeresurus monticola Gunther, 1864, *Rept. Brit. India* : 388, pl. 24, figs. 13 (type-locality : Nepal).

Hindi name : Hara Gonus.

Description : A deep pit on each side between nostril and eye. Head covered with unequal, smooth, imbricate scales ; dorsals smooth or keeled ; ventrals broad ; anal entire ; subcaudals divided. Body light or dark brown dorsally, with large, squarish, irregularly placed dark brown spots on the back and smaller ones on sides ; whitish ventrally. Head dark brown with light streaks between eye and angle of mouth. 1.10 m in length, males shorter than females.

Distribution : India (Uttar Pradesh, Eastern Himalaya, Assam) ; Pakistan ; Nepal ; Tibet ; South China ; Myanmar ; Indo-China ; Malaysia ; Thailand.

Remarks : It is found in forests around bushes or stones near streams. It is nocturnal in habit, but often seen basking in the sun. It feeds on rats, lizards, frogs and occasionally prey upon birds and their eggs and even small snakes. It is oviparous. The female lays 5-18 eggs in a hole or hollow in the ground or under vegetable debris or in piles of foliage. The eggs are guarded by parent until the emergence of young ones. It is venomous. The venom is low in toxicity.

The record is based after Walton (1911), Gupta & Sinha (1978).

SUMMARY

The present paper deals with the snakes, both harmless and venomous, found in Rajaji National Park and around (Uttar Pradesh). Earlier only twelve species were reported from the Park area but consequent on the current investigations, sixteen more species have been added, making the total to twenty eight. The distinguishing features of each species together with the maximum recorded length, general distribution and details of its habitat and habits, are furnished.

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Fauna of Conservation Area 5 : Rajaji National Park

HUSAIN & TILAK

PLATE I



Fig. 1 : *Sibynophis sagittarius* (Cantor).

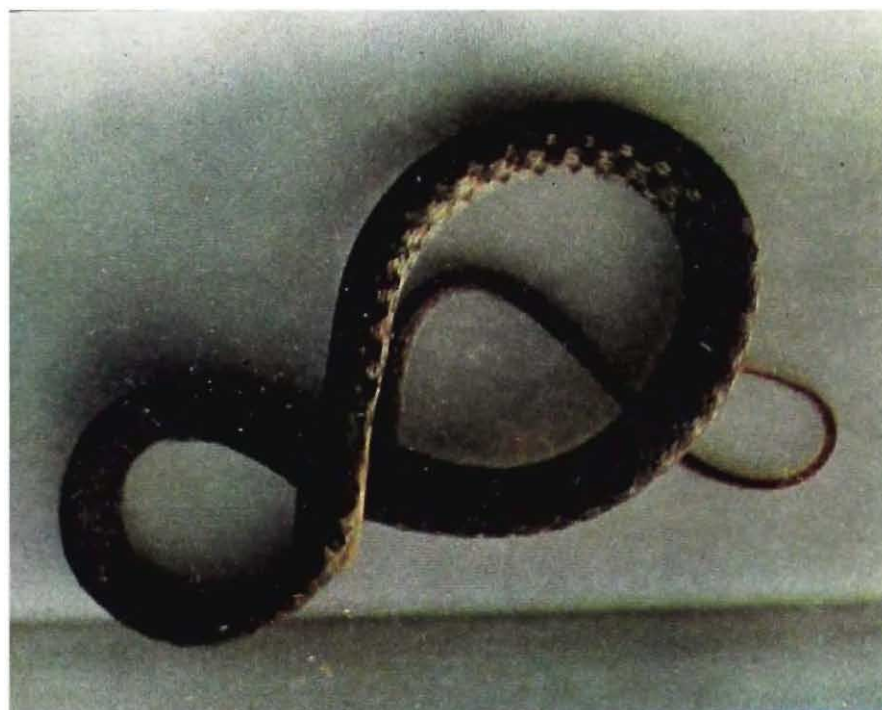


Fig. 2 : *Xenochrophis piscator* (Schneider).

Fauna of Conservation Area 5 : Rajaji National Park

HUSAIN & TILAK

PLATE II



Fig. 1 : *Elaphe helena* (Daudin).



Fig. 2 : *Spalerosophis atriceps* (Fischer).

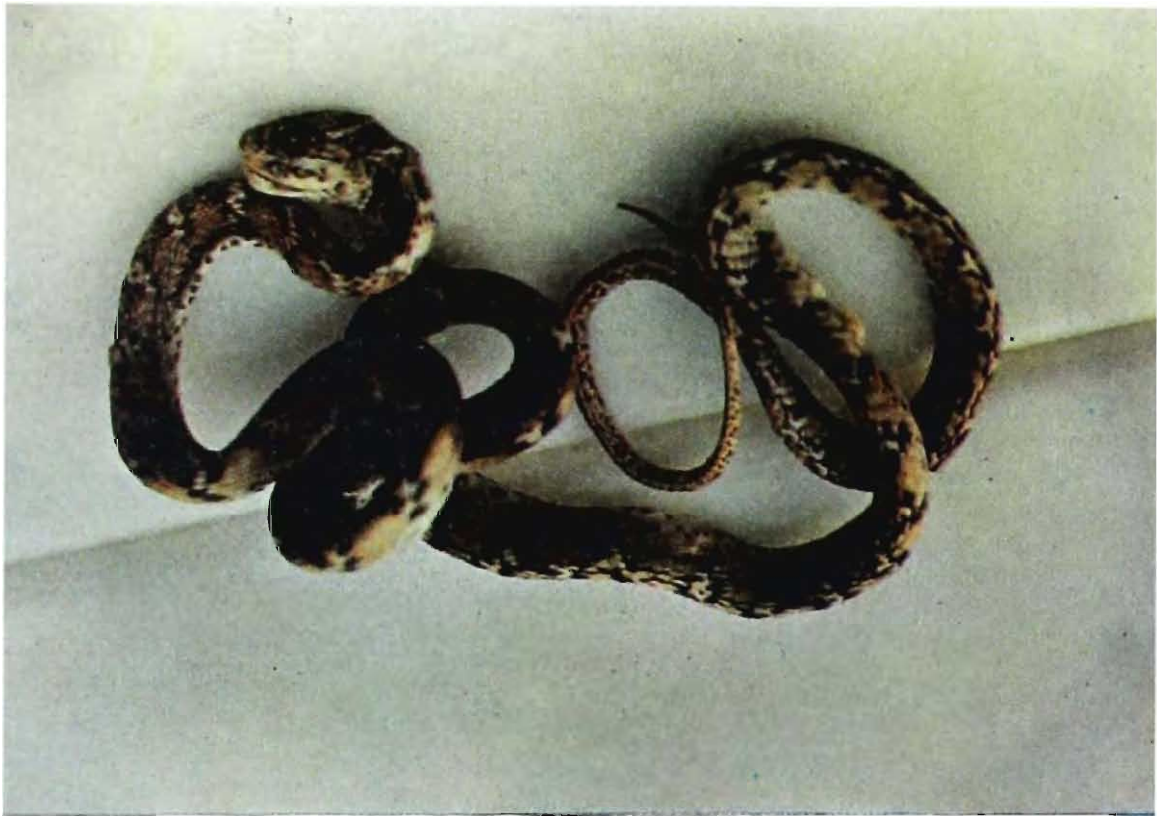


Fig. 1 : *Boiga trigonata* (Schneider).



Fig. 2 : *Enhydryis sieboldi* (Schlegel).

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FISHES (PISCES)

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The wildlife, especially the mammals, birds, and reptiles of National Parks and Sanctuaries has attracted the attention of naturalists and other workers (on forests and wildlife) during the past, but very little importance has been given to the aquatic life, especially the fishes. Husain (1975) for the first time, surveyed various water courses in the then Rajaji Sanctuary and prepared a list of 19 species of fishes. Earlier, Day (1976-78), Hora and Mukerji (1936), Das (1960), Lal and Chatterjee (1963), Singh (1964), Grover (1969, 1970, 1978), Tilak and Husain (1977, 1978) and Husain (1987) also gave information on the fishes found in the extended area of the Park falling within Hardwar and Dehradun districts. Sinha (1978) included the list of fishes given by Husain (1975) in Siwaliks. Recently, Tilak and Husain (1990) described a new species *Barilius dimorphicus* from the Park. It grows to quite a good size and very attractive to look at.

The present report is based on the study of the fish fauna from different water ways in the presently demarcated Rajaji National Park covering three adjacent districts viz., Dehradun, Pauri-Garhwal and Hardwar (Map). The present study identifies 49 species of fishes belonging to 30 genera, 12 families and 4 orders of the group.

The occurrence of *Danio dangila* (Hamilton-Buchanan), *Salmostoma bacaila* (Hamilton-Buchanan), *Labeo calbasu* (Hamilton-Buchanan), *L. pangusia* (Hamilton-Buchanan), *Garra annandalei* Hora, *Mystus cavasius* (Hamilton-Buchanan), and *Glyptothorax telchitta* (Hamilton-Buchanan) reported by Das (1960), Singh (1964) and Grover (1970) from the area is doubtful. The record of *Labeo pangusia*, *Garra annandalei* and *Glyptothorax telchitta* is probably based on misidentifications for *Labeo dyocheilus* (McClelland), *Garra gotyla*

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gotyla (Gray) and *Glyptothorax pectinopterus* (McClelland) respectively. Further, the record of *Mystus gulio* (Hamilton-Buchanan), an estuarine fish, from the area by Singh (1964) and Grover (1970) can not be expected in the area.

Barilius shacra Hamilton-Buchanan reported from river Ganga, Hardwar by Day (1878) was not found during the course of present study.

LOCALITIES SURVEYED

DISTRICT : DEHRADUN

1. Soor Sahab wali Khal, Asarori Forest.
2. Small stream, Asarori.
3. Suswa river near Clement town.
4. Suswa river, Phandowala or near Phandowala Forest Rest House.
5. Suswa river near Forest Chauki, Jhabrawala.
6. Small stream near Phandowala (ca 2 km from Clement Town).
7. Small stream near Phandowala (ca 4 km from Clement Town).
8. Small stream, ca 10 km east of Phandowala Forest House.
9. Small stream ca 6 km north-west of Kansrao Forest Rest House.
10. Song river, Kansrao or near Kansrao Forest Rest House or Pattapul.
11. Song river near Kansrao Railway Station.
12. Song river near Railway Bridge, Kansrao.
13. Song river near Satyanarian.
14. Song river, Pritinagar, Gaurighat near Satyanarian.
15. Ganga river near its union with Song, Gaurighat near Satyanarain.
16. Ganga river near Raiwala.
17. Motichur rao, Motichur or near Motichur Forest Rest House.
18. Motichur rao, Koelpur Forest Block.

DISTRICT : PAURI-GARHWAL

1. Ghasi Ram sot near Chila Forest Rest House.
2. Modhal sot near Chila colony.
3. Small stream, Chila Forest.

4. Small stream, *ca* 5 km east of Chila Forest Rest House.
5. Small stream, *ca* 5 km west of Chila Forest Rest House.
6. Ganga canal near Chila.
7. Stream above Ganga canal, *ca* 12 km from Chila.
8. Seepage water canal along main Ganga canal, *ca* 7 km east of Chila, Pashulok road.
9. Rawasan river, Laldhang.

DISTRICT : HARDWAR

1. Mohand rao Lalpul or near Lalpul or Mohand.
 2. Small stream near Mohand Forest Rest House.
 3. Chilkana rao, Chillawali Forest Block.
 4. Gaj rao, Gaj Forest Block.
 5. Bhinj rao, Andheri Forest Block.
 6. Dholkhand rao near Forest Rest House, Dholkhand Forest Block.
 8. Betban rao, Beribara Betban Forest Block.
 9. Ranipur rao, Ranipur Forest Block.
- (Localities under Hardwar district were earlier part of Saharanpur district).

Table : LIST OF FISHES IN PARK WITH DISTRICT AND DRAINAGE-WISE DISTRIBUTION

Classification and Name	Soor Sahabwali khal and small stream Asarori	District Dehradun						District Pauri-Garhwal						District Hardwar							
		Suswa river	Streams near Phandowala	Stream near Kansrao FRH	Song river	Ganga river	Motichur rao	Ghasi Ram sot	Modhal sot	Ganga canal seepage	Ganga canal	Rawasan river	Other streams nr Chila	Ganga river	Mohand rao & tributary	Chilkana rao	Gaj rao	Bhinj rao	Dholkhand rao	Betban rao	Ranipur rao
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Class : OSTEICHTHYES																					
Order : CYPRINIFORMES																					
Family : CYPRINIDAE (Carps, Minnows)																					
Subfamily : RASBORINAE																					
1. <i>Aspidoparia jaya</i> (Hamilton-Buchanan)		-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
2. <i>Barilius barna</i> Hamilton-Buchanan		-	+	-	-	+	-	+	+	-	+	-	-	+	-	-	-	-	-	-	-
3. <i>Barilius bendilisis</i> Hamilton-Buchanan		+	+	+	+	+	+	+	+	+	-	+	-	-	+	+	+	+	+	+	+
4. <i>Barilius dimorphicus</i> Tilak & Husain		-	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
5. <i>Barilius vagra</i> Hamilton-Buchanan		-	+	+	-	+	-	+	+	+	-	-	+	+	-	+	+	+	+	+	+

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
6. <i>Brachydanio rerio</i> (Hamilton-Buchanan)	-	+	+	-	+	-	+	-	-	-	-	-	-	-	+	-	+	-	+	+	+
7. <i>Danio devario</i> (Hamilton-Buchanan)	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8. <i>Esomus danricus</i> (Hamilton-Buchanan)	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	+	+
9. <i>Parluciosoma daniconius</i> (Hamilton-Buchanan)	-	+	+	-	+	-	+	+	-	+	-	-	-	-	-	-	-	-	-	-	-
10. <i>Raiamas bola</i> (Hamilton-Buchanan)	-	-	-	-	+	-	-	+	+	-	-	-	+	-	+	+	-	-	-	-	-
Subfamily : CYPRININAE																					
11. <i>Chagunius chagunio</i> (Hamilton-Buchanan)	-	+	-	-	+	-	+	+	-	+	-	+	-	-	-	-	-	-	-	-	-
12. <i>Labeo dero</i> (Hamilton-Buchanan)	-	+	-	-	+	+	+	-	-	-	-	+	-	+	+	-	-	-	-	-	-
13. <i>Labeo dyocheilus</i> (McClelland)	-	-	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-
14. <i>Puntius chola</i> Hamilton-Buchanan	-	+	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15. <i>Puntius conchoni</i> Hamilton-Buchanan	-	+	+	+	+	-	+	+	+	+	-	+	+	-	-	-	+	-	-	-	+
16. <i>Puntius sarana</i> Hamilton-Buchanan	-	+	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
17. <i>Puntius sophore</i> Hamilton-Buchanan	-	+	-	-	+	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	+

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
18. <i>Puntius ticto</i> Hamilton-Buchanan	-	+	-	-	+	-	+	-	-	-	-	-	-	-	-	-	+	-	+	-	-
19. <i>Tor chelynoides</i> (McClelland)	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20. <i>Tor putitra</i> (Hamilton-Buchanan)	-	+	-	-	+	+	+	+	+	-	+	+	+	+	-	-	+	-	-	-	-
21. <i>Tor tor</i> (Hamilton-Buchanan)	-	+	-	-	+	+	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-
Subfamily : GARRINAE																					
22. <i>Crossocheilus latius</i> (Hamilton-Buchanan)	-	+	-	-	+	+	-	-	-	+	-	-	-	+	+	-	-	-	-	-	-
23. <i>Garra gotyla gotyla</i> (Gray)	-	+	-	-	+	+	+	-	-	-	-	+	-	+	+	-	+	+	-	-	-
Subfamily : SCHIZOTHORACINAE																					
24. <i>Schizothoraichthys</i> <i>progastus</i> (McClelland)	-	+	-	-	+	+	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-
25. <i>Schizothorax</i> <i>richardsonii</i> (Gray)	-	+	-	-	+	+	-	-	-	-	+	-	-	+	-	-	-	-	-	-	-
Family : BALITORIDAE (Loaches)																					
Subfamily : NEMACHEILINAE																					
26. <i>Nemacheilus beavani</i> Gunther	-	-	-	-	+	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-
27. <i>Nemacheilus botia</i> (Hamilton-Buchanan)	-	+	+	+	+	+	+	+	+	-	-	+	+	-	+	-	+	+	+	+	-

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
28. <i>Nemacheilus corica</i> (Hamilton-Buchanan)	—	—	—	—	+	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—
29. <i>Nemacheilus dayi</i> Hora	+	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
30. <i>Nemacheilus doonensis</i> (Tilak & Husain)	+	—	—	—	+	+	—	+	+	—	—	—	+	—	—	—	—	—	+	—	—
31. <i>Nemacheilus rupecula</i> (McClelland)	+	—	—	—	+	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—
32. <i>Nemacheilus savona</i> (Hamilton-Buchanan)	—	+	—	—	+	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—
Family : COBITIDIDAE (Loaches)																					
Subfamily : BOTIINAE																					
33. <i>Botia rostrata</i> Gunther	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—
Subfamily : COBITIDINAE																					
34. <i>Lepidocephalus guntea</i> (Hamilton-Buchanan)	—	+	+	+	+	—	+	+	—	—	—	—	—	—	+	—	+	+	+	+	+
Order : SILURIFORMES																					
Family : BAGRIDAE (Bagrid catfishes)																					
35. <i>Aorichthys seenghala</i> (Sykes)	—	—	—	—	+	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—	—
36. <i>Mystus bleekeri</i> (Day)	—	+	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
37. <i>Mystus vittatus</i> (Bloch)	—	+	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
38. <i>Pseudeutropius atherinoides</i> (Bloch)	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Family : SILURIDAE (Sheat catfishes)																					
39. <i>Ompok pabda</i> (Hamilton-Buchanan)	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40. <i>Wallago attu</i> (Schneider)	—	—	—	—	+	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Family : AMBLYCIPITIDAE (Torrent catfishes)																					
41. <i>Amblyceps mangois</i> (Hamilton-Buchanan)	+	+	—	—	+	+	+	—	—	—	—	—	—	—	+	—	+	—	—	+	—
Family : SISORIDAE (Sisorid catfishes)																					
42. <i>Glyptothorax pectinopterus</i> (McClelland)	—	+	—	—	+	—	+	—	—	—	—	—	—	—	+	—	—	—	—	—	—
43. <i>Glyptothorax saisii</i> (Jenkins)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	—	—	—	—	—	—
Family : HETEROPNEUSTIDAE (Airsac catfishes)																					
44. <i>Heteropneustes fossilis</i> (Bloch)	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Order : CYPRINODONTIFORMES																					
Suborder : EXOCOETOIDEI																					
Family : BELONIDAE (Needle fishes)																					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
45. <i>Xenentodon cancila</i> (Hamilton-Buchanan)	—	+	—	—	+	—	—	—	—	+	—	—	—	—	—	—	—	—	—	—	—
Order : PERCIFORMES																					
Suborder : PERCOIDEI																					
Family : NANDIDAE (Leaf fishes)																					
Subfamily : BADINAE																					
46. <i>Badis badis</i> (Hamilton-Buchanan)	—	+	+	—	+	—	+	—	—	+	—	—	—	—	—	—	—	—	—	—	—
Suborder : CHANNOIDEI																					
Family : CHANNIDAE (Snakeheads or Murrels)																					
47. <i>Ophiocephalus gachua</i> Hamilton-Buchanan	+	+	+	+	+	—	+	+	—	—	—	—	—	—	+	—	+	+	+	+	+
48. <i>Ophiocephalus punctatus</i> Bloch	—	+	—	+	+	—	+	+	—	+	—	—	—	—	—	—	—	—	—	—	—
Suborder : MASTACEM- BELOIDEI																					
Family : MASTACEMBELIDAE (Spiny eels)																					
49. <i>Mastacembelus armatus</i> (Lacepede)	—	+	—	—	+	—	+	—	—	—	—	—	—	—	—	—	—	—	—	—	—

SYSTEMATIC ACCOUNT OF SPECIES WITH CERTAIN NOTES

1. *Aspidoparia jaya* (Hamilton-Buchanan)

Cyprinus (Cabdio) jaya Hamilton-Buchanan 1822. *Fish. Ganges* : 333-384, 392 (type-locality : rivers of northern Bihar).

Local name : Chahl.

Material examined : 1 ex., near Hardwar, Dist. Hardwar, 30.i.1972, Coll. R. N. Chopra.

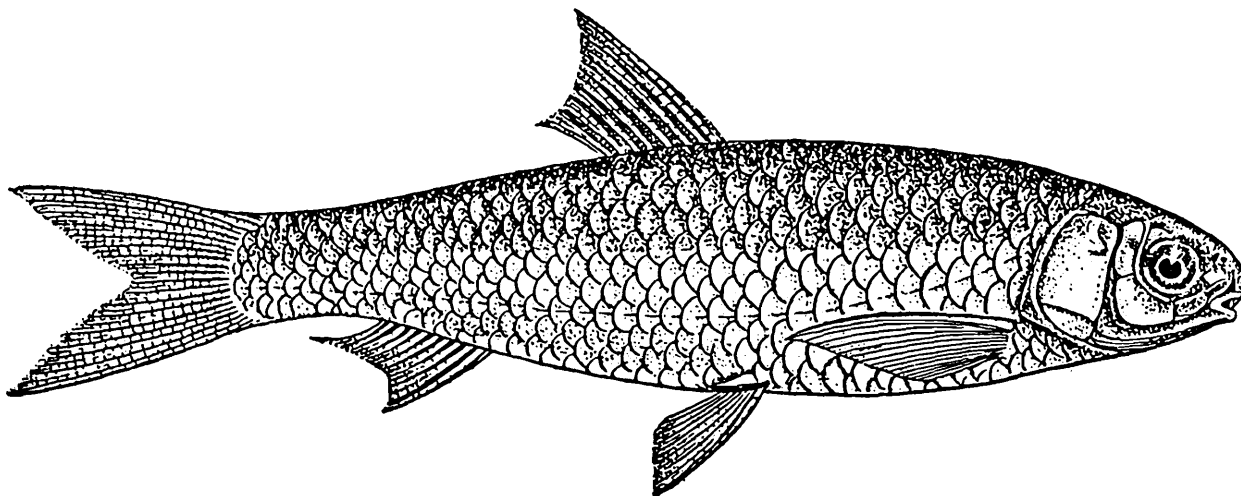


Fig. 1 : *Aspidoparia jaya* (Hamilton – Buchanan)

Maximum length : 150 mm (Talwar & Jhingran, 1991).

Distribution : India (Northern India) ; Nepal ; Bangladesh.

Remarks : It lives in slow moving streams with sandy bed and weeds.

2. *Barilius barna* Hamilton-Buchanan

Barna Baril

Cyprinus (Barilius) barna Hamilton-Buchanan, 1822. *Fish. Ganges* : 268-269, 384. (type-locality : Yamuna and Brahmaputra rivers, extreme branches of Ganges).

Local name : Childi.

Material examined : 1 ex. (73 mm), Motichur rao, Koelpur Forest Block, Dist. Dehradun, 25.ii.1965, Coll. T. D. Soota ; 2 exs., Song river nr. Railway Bridge, Kansrao, Dist. Dehradun, 26.ii.1965, Coll. T. D. Soota ; 1 ex., Suswa river nr. Phadowala FRH, Dist. Dehradun, 4.vi.1965, Coll. T. D. Soota ; 5 exs., Song river, Satyanarain, Dist. Dehradun, 7.iv.1966, Coll. T. D. Soota ; 2 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 16.ix.1966, Coll. Asket Singh ; 4 exs., Song river, Satyanarain, Dist. Dehradun, 5.vi.1970, Coll. J. C. Tripathi ; 8 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 15.ix.1972, Coll. Raj Tilak ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 23.x.1973, Coll. Raj. Tilak ; 1 ex., Small stream, Chila Forest, Dist. Pauri, 2.vi.1987, Coll. J. C. Tripathi ; 8 exs., Small stream, ca 5 km east of FRH, Chila, Dist. Pauri, 11.vi.1987, Coll. Raj Tilak ; 1 ex., Ghasi Ram sot nr. FRH, Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 5 exs., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak.

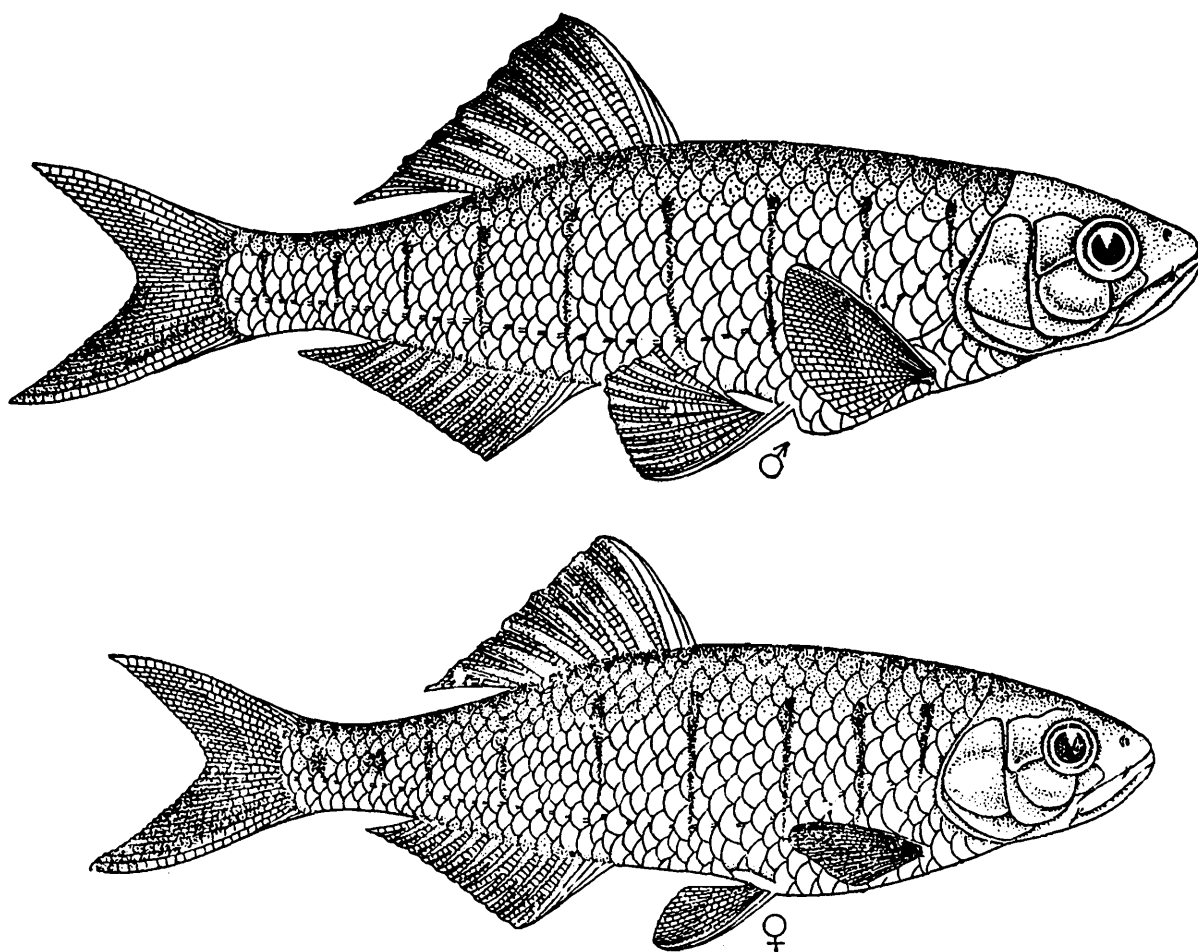


Fig. 2 : *Barilius barna* (Hamilton – Buchanan)—male, female

Maximum length : 127 mm (Day, 1878).

Distribution : India (Northern India, Madhya Pradesh, Orissa, Karnataka) ; Nepal ; Bangladesh ; Myanmar.

Remarks : This species exhibits sexual dimorphism (Husain, 1987) by the presence of fine tubercles on snout, lower jaw and body scales and more developed paired and dorsal fins. It lives in clear waters of hill streams and swims in groups.

3. *Barilius bendilisis* Hamilton-Buchanan

Hamilton's Barila

Cyprinus bendilisis Hamilton-Buchanan, 1807, *Journey Mysore*, 3 : 345, pl. 32 (type-locality: Vedawati stream, head waters of Krishna near Hariura, Mysore).

Cyprinus (Barilius) bendilisis Hamilton-Buchanan, 1822, *Fish. Ganges* : 270-271, 385 (rivers of Mysore).

Local name : Chedra.

Material examined : 85 exs., Mohand rao nr. Lalpul, Dist. Hardwar, 7. v. 1962, Coll. R. K. Bhatnagar ; 32 exs., Mohand rao, Dist. Hardwar, 13.xi.1964, Coll. T. D. Soota ; 4 exs. Mohand rao, Mohand, Dist. Hardwar, 20. xi. 1964, Coll. T. D. Soota ; 34 exs., Mohand rao, Dist. Hardwar, 27.xi.1964, Coll. T. D. Soota ; 15 exs., Suswa river nr. Phandowala FRH, Dist. Dehradun, 4.xii.1964, Coll. T. D. Soota ; 6 exs., Mohand rao, Lalpul, Dist. Hardwar, 18.xii.1964, Coll. T. D. Soota ; 7 exs., Chilkana rao, Chillawali Forest Block, Dist. Hardwar, 18.xii.1964, Coll. T. D. Soota ; 1 ex., (155 mm), Song river, Kansrao Railway Station, Dist. Dehradun, 8.i.1965, Coll. Akhlaq Husain ; 16 exs., (22-44 mm), Song, river, Kansrao Raiway Bridge, Dist. Dehradun, 22.i.1965, Coll. R. K. Bhatnagar ; 9 exs., (38-75 mm), Song river, Kansrao, Dist. Dehradun, 5.ii.1965, Coll. R. K. Bhatnagar ; 36 exs., (82-123 mm), Motichur rao, Motichur, Dist. Dehradun ; 25.ii.1965, Coll. T. D. Soota ; 1 ex., Song river nr. Kansrao Railway Bridge, Dist. Dehradun, 26.ii.1965, Coll. T. D. Soota ; 24 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 20.v.1965, Coll. T. D. Soota ; 84 exs., Small stream nr. Asarori, Dist. Dehradun, 4.vi.1965, Coll. T. D. Soota ; 13 exs., Suswa river nr. Phandowala FRH, Dist. Dehradun, 4.vi.1965, Coll. T. D. Soota ; 54 exs., Gaj rao, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 29.vi.1965, Coll. T. D. Soota ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 30.vi.1965, Coll. T. D. Soota ; 6 exs., Motichur rao, Motichur, Dist. Dehradun, 30.vi.1965, Coll. T. D. Soota : 10 exs., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 3 exs., Kansrao, Dist. Dehradun, 27.x.1965, Coll. Akhlaq Husain ;

3 exs., Chilkana rao, Chillawali Forest Block, Mohand Range, Dist. Hardwar, 26.iii.1965, Coll. T. D. Soota ; 5 exs., Mohand rao, nr. Lalpul, Dist. Hardwar, 26.iii.1965, Coll. T. D. Soota ; 2 exs., Mohand rao, Mohand, Dist. Hardwar, 30.iv.1965, Coll. T. D. Soota ; 8 exs., Beribara, Dholkhand Forest Range, Dist. Hardwar, 9.v.1965, Coll. A. P. Kapur ; 10 exs., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 3 exs., Mohand rao nr. Lalpul, Dist. Hardwar, 16.vii.1965 ; Coll. T. D. Soota ; 1 ex., Mohand rao, Mohand, Dist. Hardwar, 18.ix.1965, Coll. R. K. Bhatnagar ; 10 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 24.ix.1965, Coll. T. D. Soota ; 27 exs., Gaj rao, Dist. Hardwar, 6.xii.1965, Coll. T. D. Soota ; 62 exs., Mohand rao, Mohand, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 24 exs. Gaj rao, Gaj Forest Block, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 18 exs., Bhinj rao, Andheri Forest Block, Dist. Hardwar, 18.iii.1966, Coll. T. D. Soota ; 18 exs., Song river, Satyanarain, Dist. Dehradun, 7.iv.1966, Coll. T. D. Soota ; 17 exs., River Ganga, Gaurighat nr. Satyanarain, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 12 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 16 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 13.iv.1966, Coll. T. D. Soota ; 8 exs., Suswa river, Clement Town, Dist. Dehradun, 14.iv.1966, Coll. T. D. Soota ; 30 exs., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 14.iv.1966, Coll. T. D. Soota ; 13 exs., Bhinj rao, Andheri Forest Block, Dist. Hardwar, 25.v.1966, Coll. Asket Singh ; 27 exs., Mohand rao, Mohand, Dist. Hardwar, 1.vii.1966, Coll. Asket Singh ; 51 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 16.ix.1966, Coll. Asket Singh ; 2 exs., Song river nr. Kansrao Railway Station, Dist. Dehradun, 17.xii.1966, Coll. Asket Singh ; 14 exs., Song river, Satyanarain, Dist. Dehradun, 29.iv.1967, Coll. J. C. Tripathi ; 2 exs., Motichur rao, Motichur, Dist. Dehradun, 23.v.1970, Coll. M. K. Biswas ; 52 exs., Song river, Satyanarain, Dist. Dehradun, 5.vi.1970, Coll. J. C. Tripathi ; 7 exs., Song river, Satyanarain, Dist. Dehradun, 23.iv.1971, Coll. J. C. Tripathi ; 1 ex., Song river, Kansrao, Dist. Dehradun, 27.v.1971, Coll. K. P. Singh ; 2 exs., Motichur rao, Motichur, Dist. Dehradun, 28.x.1971, Coll. Asket Singh ; 5 exs., Motichur rao, Motichur, Dist. Dehradun, 14.i.1972, Coll. M. K. Biswas ; 15 exs., Song river, Satyanarain, Dist. Dehradun, 22.i.1972, Coll. R. N. Chopra ; 18 exs., Ranipur rao, Ranipur, Dist. Hardwar, 8.ii.1972 ; Coll. R. N. Chopra ; 43 exs., (32-87 mm), Betban rao, Beribara, Dist. Hardwar, 8.ii.1972, Coll. R. N. Chopra ; 50 exs., (20-135 mm), Gaj rao, Gaj Forest Block, Dist. Hardwar, 15.ii.1972, Coll. R. N. Chopra ; 7 exs., Dholkhand rao, Dholkhand, Dist. Hardwar, 15.v.1972, Coll. R. N. Chopra ; 4 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 2.iii.1973, Coll. Raj Tilak ; 10 exs. (22-33 mm), Betban rao, Beribara, Dist. Hardwar, 24.iii.1973, Coll. Raj Tilak ; 13 exs., (22-61 mm), Dholkhand rao, Dholkhand, Dist. Hardwar, 24.iii.1973, Coll. Raj Tilak ; 15 exs. (29-66 mm), Dholkhand rao, Dholkhand, Dist.

Hardwar, 27.iv.1973, Coll. Raj Tilak ; 19 exs., (51-112 mm), Mohand rao, Mohand, Dist. Hardwar, 26.ix.1973, Coll. Raj Tilak ; 34 exs., Song river, Satyanarain, Dist. Dehradun, 23.x.1973, Coll. Raj Tilak ; 15 exs., Song river, Satyanarain, Dist. Dehradun, 22.iv.1980, Coll. A. Husain, 2 exs., Song river, Satyanarain, Dist. Dehradun, 14.v.1980, Coll. Akhlaq Husain ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 10.vii.1980, Coll. Akhlaq Husain ; 5 exs., Dholkhand rao nr. Dholkhand FRH, Dist. Hardwar, 27.x.1986, Coll. N. K. Sinha ; 85 exs., Bhinj rao, Andheri Forest Block, Dist. Hardwar, 28.x.1986, Coll. N. K. Sinha ; 32 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 30.x.1986, Coll. Raj Tilak ; 100 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 12.xii.1986, Coll. Raj Tilak ; 40 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 8.i.1987, Coll. Raj Tilak ; 2 exs., Small stream, *ca* 6 km north-west of Kansrao FRH, Dist. Dehradun, 8.i.1987, Coll. Raj Tilak ; 9 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 9.i.1987, Coll. Raj Tilak ; 29 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 13.i.1987, Coll. N. K. Sinha ; 8 exs., (max. 46 mm), Song river nr. Kansrao FRH, Dist. Dehradun, 22.i.1987, Coll. R. N. Chopra ; 113 exs., Suswa river nr. FRH, Phandowala, Dist. Dehradun, 14.v.1987, Coll. Raj Tilak ; 13 exs., Small stream, *ca* 10 km east of Phandowala FRH, Dist. Dehradun, 15.v.1987, Coll. Raj Tilak ; 126 exs., Suswa river nr. FRH Phandowala, Dist. Dehradun, 18.v.1987, Coll. N. K. Sinha ; 8 exs., Small stream nr. Phandowala, *ca* 2 km from Clement Town, Dist. Dehradun, 19.v.1987, Coll. N. K. Sinha ; 38 exs., Suswa river, Phandowala, Dist. Dehradun, 21.v.1987, Coll. A. Husain ; 12 exs., Small stream, *ca* 5 km east of FRH, Chila, Dist. Pauri, 11.v.1987, Coll. N. K. Sinha ; 9 exs., Small stream, *ca* 5 km west of FRH, Chila, Dist. Pauri, 12.vi.1987, Coll. N. K. Sinha ; 10 exs., Ghasi Ram sot nr. FRH, Chila, Dist. Pauri, 9.ix.1987, Coll. Raj Tilak ; 33 exs., Rawasan river, Laldhang, Dist. Pauri, 10.ix.1987, Coll. Raj Tilak ; 1 ex., Ganga canal seepage, *ca* 7 km east of Chila, Dist. Pauri 11.ix.1987, Coll. Raj Tilak ; 32 exs., Modhal sot nr. FRH Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 13 exs., Ghasi Ram sot nr. FRH Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 13 exs., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak ; 69 exs., Motichur rao, Motichur, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak ; 15 exs., Mohand rao, Mohand, Dist. Hardwar, 17.ix.1987, Coll. Raj Tilak ; 121 exs., Small stream nr. Mohand FRH, Dist. Hardwar, 17.ix.1987, Coll. Raj Tilak.

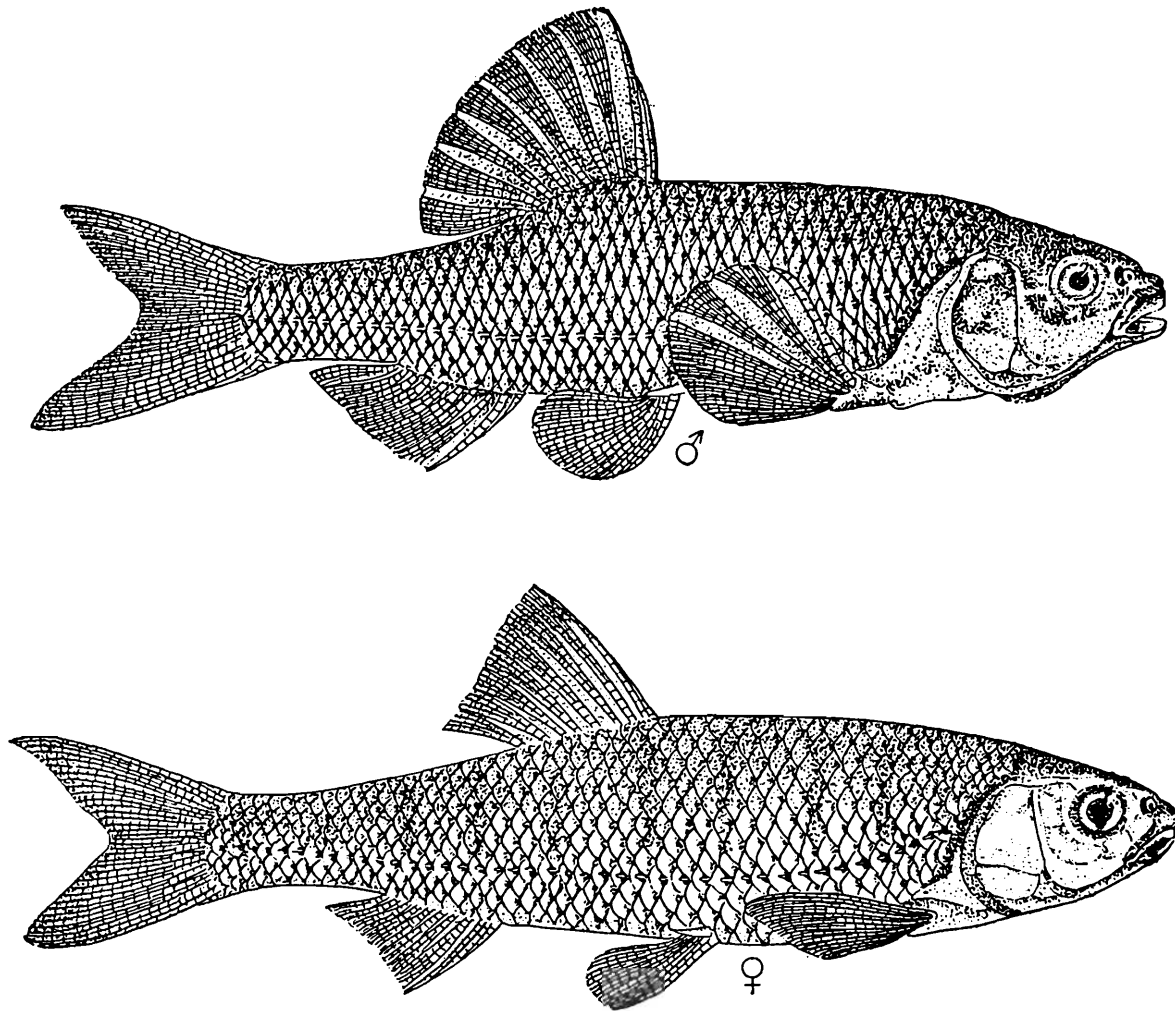


Fig. 3 : *Barilius bendilisis* Hamilton-Buchanan—male, female

Maximum length : 152 mm (Day, 1878).

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Sri Lanka ; Myanmar.

Remarks : This species exhibits marked sexual dimorphism (Tilak & Jaffer, 1982 ; Tilak et al., 1984 ; Grover & Tripathi, 1985 ; Husain, 1987). The adult males are longer in size with snout and body covered with fine tubercles and well developed fins especially paired and dorsal fins. It is a common hill stream fish of the area.

4. *Barilius dimorphicus* Tilak & Husain

Barilius dimorphicus Tilak & Husain, 1990. *J. Bombay nat. Hist. Soc.*, 87 (1): 102-105, figs 1-4 (type-locality: Song river, Satyanarain, Dist. Dehradun; Ghasi Ram sot near Chila, Dist. Pauri-Garhwal, Uttar Pradesh).

Local name : Chilwa.

Material examined : 2 exs. (94-112 mm), Paratypes, Ghasi Ram sot, nr. FRH Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak; 6 exs. (115-185 mm), Holotype and Paratypes, Song river, Satyanarain, Dist. Dehradun, 13 ix.1987, Coll. Raj Tilak; 7 exs., (104-147 mm), Paratypes, Song river, Satyanarain, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak.

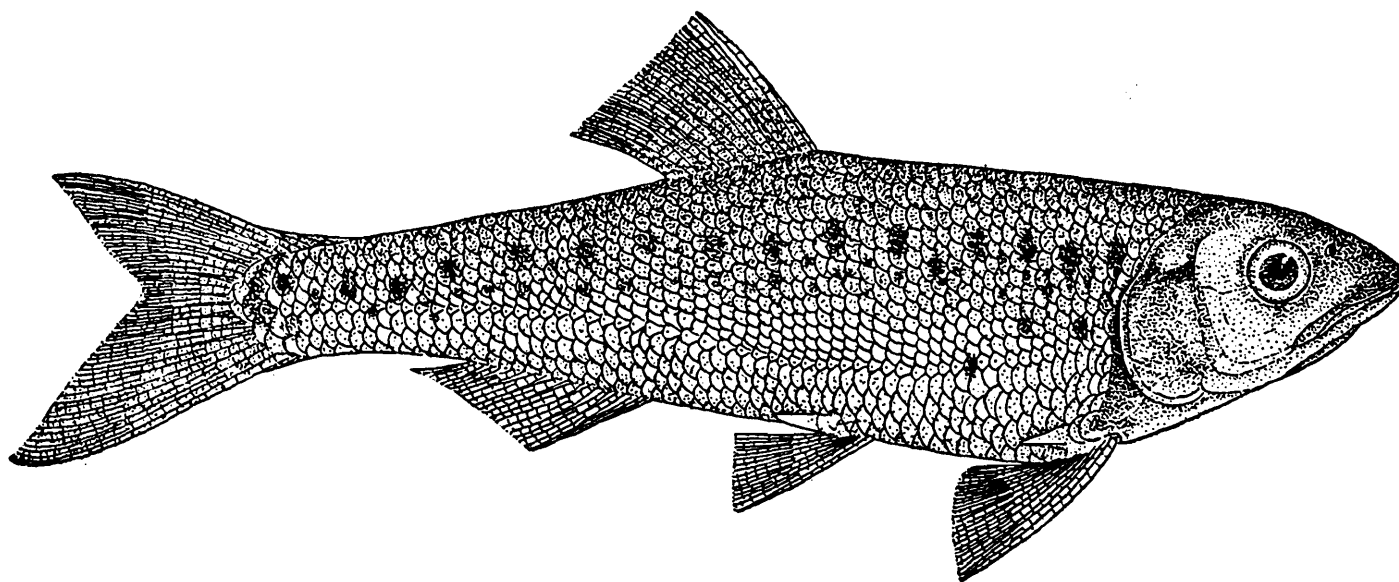


Fig. 4 : *Barilius dimorphicus* Tilak & Husain

Maximum Length : 185 mm (Tilak & Husain, 1990).

Distribution : Northern India (Dehradun and Pauri-Garhwal districts, Uttar Pradesh).

Remarks : This species exhibits sexual dimorphism (Tilak & Husain, 1990). In males the 2nd branched ray of pectoral fin is thickened and the snout and body are covered with fine tubercles. The females lack this character. It lives in clear water streams.

5. *Barilius vagra* Hamilton-Buchanan

Vagra Baril

Cyprinus (Barilius) vagra Hamilton-Buchanan, 1822. *Fish. Ganges*: 269-270, 385 (type-locality: Ganges about Patna).

Local name : Chalra.

Material examined : 77 exs., Mohand rao, Mohand, Dist. Hardwar, 13.xi.1964, Coll. T. D. Soota ; 3 exs., Mohand rao, Mohand, Dist. Hardwar, 20.xi.1964, Coll. T. D. Soota ; 188 exs., Mohand rao, Mohand, Dist. Hardwar, 27.xi.1964, Coll. T. D. Soota ; 3 exs., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 18.xii.1964, Coll. T. D. Soota ; 2 exs., Song river nr. Kansrao Railway Station, Dist. Dehradun, 8.i.1965, Coll. Akhlaq Husain ; 3 exs., Ranipur rao, Ranipur Forest Block, Dist. Hardwar, 24.ii.1965, Coll. T. D. Soota ; 1 ex., Chilkana rao, Chillawali Forest Block, Dist. Hardwar, 26.iii.1965, Coll. T. D. Soota ; 9 exs., Mohand rao, Mohand, Dist. Hardwar, 30.iv.1965, Coll. T. D. Soota ; 9 exs., Beribara Forest Block, Dist. Hardwar, 9.v.1965, Coll. A. P. Kapur ; 3 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 20.v. 1965, Coll. T. D. Soota ; 5 exs., Suswa river nr. Phandowala FRH, Dist. Dehradun, 4.vi.1965, Coll. T. D. Soota ; 22 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 5 exs., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 4 exs., Song river, Satyanarain, Dist. Dehradun, 29.vi.1965, Coll. T. D. Soota ; 2 exs., Motichur rao, Motichur, Dist. Dehradun, 30.vi.1965, Coll. T. D. Soota ; 3 exs., Ranipur rao, Ranipur, Dist. Hardwar, 14.vii.1965, Coll. T. D. Soota ; 2 exs., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 3 exs. Mohand rao nr. Mohand, Dist. Hardwar, 24.ix.1965, Coll. T. D. Soota ; 28 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 24.ix.1965, Coll. T. D. Soota ; 1 ex., Gaj rao, Gaj Forest Block, Dist. Hardwar, 6.xii.1965, Coll. T. D. Soota ; 34 exs., Mohand rao, Mohand, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 12 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 5 exs., Bhinj rao, Andheri Forest Block, Dist. Hardwar, 18.iii.1966, Coll. T. D. Soota ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 7.iv.1966, Coll. T. D. Soota ; 3 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 13.iv.1966, Coll. T. D. Soota ; 3 exs. Suswa river, Clement Town, Dist. Dehradun, 14.iv.1966, Coll. T. D. Soota ; 8 exs., Mohand rao, Lalpul, Mohand, Dist. Hardwar, 14.iv.1966, Coll. T. D. Soota ; 20 exs. Mohand rao nr. Mohand, Dist. Hardwar, 1.vii.1966, Coll. Asket Singh ; 5 exs., Motichur rao, Motichur FRH, Dist. Dehradun, 16.ix.1966, Coll. Asket Singh ; 5 exs., Song river, Satyanarain, Dist. Dehradun, 29.iv.1967, Coll. J. C. Tripathi ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 6.viii.1968, Coll. M. K. Biswas ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 5.vi.1970, Coll. J. C. Tripathi ; 3 exs.,

(34-45mm), Betban rao, Beribara, Dist. Hardwar, 8.ii.1972, Coll. R. N. Chopra ; 2 exs., Dholkhand rao, Dholkhand, Dist. Hardwar, 15.v.1972, Coll. R. N. Chopra ; 7 exs., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 8 exs., (28-45mm), Dholkhand rao, Dolkhand, Dist. Hardwar, 24.iii.1973, Coll. Raj Tilak ; 16 exs. (29-51 mm) Dholkhand rao, Dholkhand, Dist. Hardwar, 27.iv.1973, Coll. Raj Tilak ; 17 exs. (25-34 mm), Mohand rao, Mohand, Dist. Hardwar, 27.viii.1973, Coll. Raj Tilak ; 13 exs. (36-69 mm), Mohand rao, Mohand, Dist. Hardwar, 26. ix.1973, Coll. Raj Tilak ; 4 exs. (33-37 mm), Betban rao, Beribara, Dist. Hardwar, 3.xii.1973, Coll. Raj Tilak ; 2 exs., Dholkhand rao nr. Dholkhand FRH, Dist. Hardwar, 27.x.1986., Coll. N. K. Sinha ; 17 exs. Bhinj rao, Andheri Forest Block, Dist. Hardwar, 28.x.1986, Coll. N. K. Sinha ; 11 exs. (31-60 mm), Mohand rao nr. Mohand, Dist. Hardwar, 30.x.1986. Coll. Raj Tilak , 2 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 30.x.1986, Coll. Raj Tilak ; 5 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 12.xii.1986, Coll. Raj Tilak ; 1 ex., Song river nr. Kansrao FRH, Dist. Dehradun, 8.i.1987, Coll. Raj Tilak ; 1 ex., Motichur rao nr. Motichur FRH, Dist. Dehradun, 9.i.1987, Coll. Raj Tilak ; 5 exs., Song River. nr. Kansrao FRH, Dist Dehradun, 13.i.1987, Coll. N. K. Sinha ; 5 exs. (max. 62 mm), Song river nr. Kansrao FRH, Dist. Dehradun, 22.i.1987, Coll. R. N. Chopra ; 1 ex., Suswa river nr. FRH, Phandowala, Dist. Dehradun, 14.v.1987, Coll. Raj Tilak ; 1 ex., Small stream nr. Phandowala, 4 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 9 exs., Suswa river, Phandowala, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 9 exs., Ghasi Ram sot nr. FRH Chila, Dist. Pauri, 9. ix. 1987, Coll. Raj Tilak ; 5 exs., Rawasan river, Laldhang, Dist. Pauri, 10.ix.1987, Coll. Raj Tilak ; 1 ex., Small stream above Ganga canal, ca 12 km from Chila, Dist. Pauri, 11.ix.1987, Coll. Raj Tilak ; 9 exs., Modhal sot nr. FRH Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 23 exs., Ghasi Ram sot nr. FRH Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 33 exs., Ranipur rao, Ranipur, Dist. Hardwar, 15.ix.1987, Coll. Raj Tilak ; 8 exs., Mohand rao, Mohand, Dist. Hardwar, 17.ix.1987, Coll. Raj Tilak ; 23 exs., Small stream nr. Mohand FRH, Dist. Hardwar, 17.ix.1987, Coll. Raj Tilak ; 12 exs., Ranipur rao, Ranipur, Dist. Hardwar, 17.ix.1987, Coll. Raj Tilak.

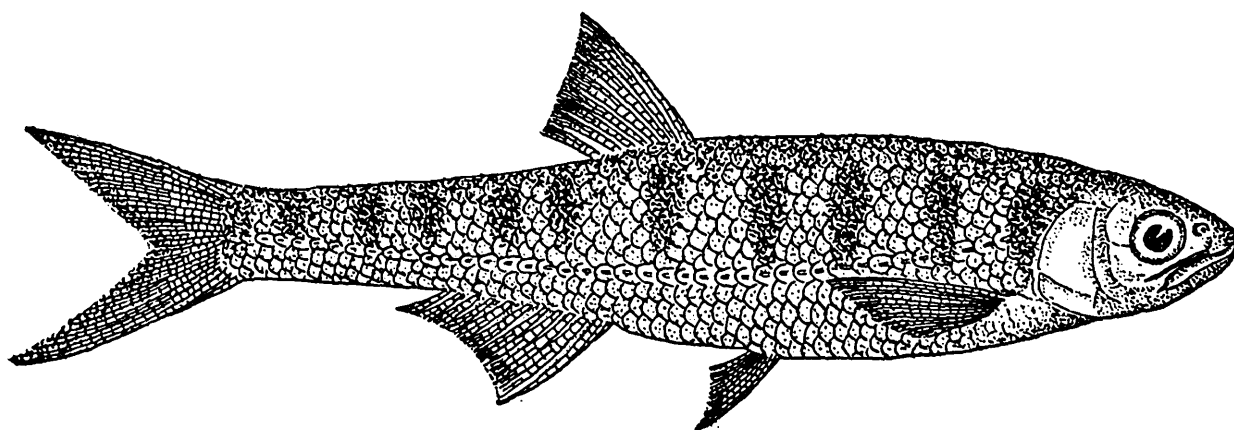


Fig. 5 : *Barilius vagra* Hamilton-Buchanan

Maximum length : 127 mm (Day, 1878).

Distribution : India (along Himalaya); Pakistan ; Afghanistan ; Nepal ; Bangladesh ; Sri Lanka.

Remarks : It is a common fish of the streams in the area. It is a beautifully banded fish.

6. *Brachydani rerio* (Hamilton-Buchanan)

Zebra Danio

Cyprinus (Danio) rerio Hamilton-Buchanan, 1822. *Fish. Ganges* : 323-324, 390 (type-locality: Kosi river).

Local names : Dharidar Salari.

Material examined : 1 ex., Mohand rao, Mohand, Dist. Hardwar, 20.xi.1964, Coll. T. D. Soota ; 34 exs., Mohand rao, Mohand, Dist. Hardwar, 27.xi.1964, Coll. T. D. Soota ; 1 ex., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 18.xii.1964, Coll. T. D. Soota ; 14 exs. (26-35 mm), Song river, Kansrao Railway Bridge, Dist. Dehradun, 22.i.1965, Coll. R. K. Bhatnagar ; 2 exs. (32-34 mm), Song river, Kansrao, Dist. Dehradun, 5.ii.1965, Coll. R. K. Bhatnagar ; 8 exs., Ranipur rao, Ranipur, Dist. Hardwar, 24.ii.1965, Coll. T. D. Soota ; 7 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 4 exs., Motichur rao, Motichur, Dist. Dehradun, 30.vi.1965, Coll. T. D. Soota ; 120 exs., Ranipur rao, Ranipur, Dist. Hardwar, 14.vii.1965, Coll. T. D. Soota ; 1 ex., Mohand rao nr. Lalpul, Dist. Hardwar, 16.vii.1965, Coll. T. D. Soota ; 1 ex., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 2 exs., Mohand rao, Mohand, Dist. Hardwar, 24.ix.1965, Coll. T. D. Soota ; 1 ex., Gaj rao, Gaj Forest Block, Dist. Hardwar, 24.ix.1965, Coll. T. D. Soota ; 13 exs., Mohand rao, Mohand, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 3 exs., Mohand rao, Lalpul, Mohand, Dist. Hardwar, 14.iv.1966, Coll. T. D. Soota ; 1 ex., Motichur rao nr. Motichur FRH, Dist. Dehradun, 16.ix.1966, Coll. Asket Singh ; 31 exs. (26-35 mm), Betban rao, Beribara, Dist. Hardwar, 8.ii.1972, Coll. R. N. Chopra ; 2 exs. (20-23 mm), Gaj rao, Gaj Forest Block, Dist. Hardwar, 15.ii.1972, Coll. R. N. Chopra ; 2 exs., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 8 exs. (24-40 mm), Dholkhand rao, Dholkhand, Dist. Hardwar, 24.iii.1973, Coll. Raj Tilak ; 5 exs. (26-35 mm), Ranipur rao, Ranipur, Dist. Hardwar, 24.iii.1973, Coll. Raj Tilak ; 7 exs. (28-40 mm), Dholkhand rao, Dholkhand, Dist. Hardwar, 27.iv.1973, Coll. Raj Tilak ; 4 exs. (18-27mm), Mohand rao, Mohand, Dist. Hardwar, 26.ix.1973, Coll. Raj Tilak ; 166 exs.

(22-40 mm), Betban rao, Beribara, Dist. Hardwar, 3.xii.1973, Coll. Raj Tilak ; 5 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 8.i.1987. Coll. Raj Tilak ; 73 exs., Small stream, ca 6 km north-west of Kansrao FRH, Dist. Dehradun, 8.i.1987, Coll. Raj Tilak ; 5 exs., Song river nr. Kansrao FRH, Dist. Dehradun 9.i.1987, Coll. Raj Tilak ; 18 exs., Song river nr. Kansrao Railway Station, Dist. Dehradun, 14.i.1987, Coll. N. K. Sinha ; 7 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 20.i.1987, Coll. J. C. Tripathi ; 22 exs., Small stream, ca 10 km east of Phandowala FRH, Dist. Dehradun, 15.v.1987, Coll. Raj Tilak ; 12 exs., Small stream nr. Phandowala, ca 2 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 69 exs., Small stream nr. Phandowala, ca 4 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 8 exs., Small stream nr. Mohand FRH, Dist. Hardwar, 17.xi.1987, Coll. Raj Tilak.

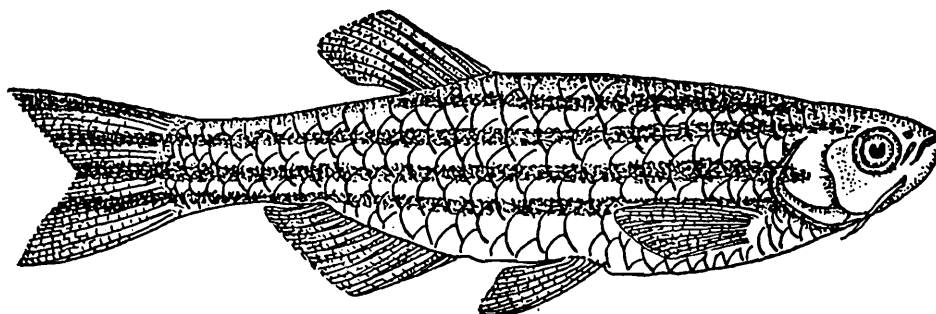


Fig. 6 : *Brachydanio rerio* (Hamilton – Buchanan)

Maximum length : 51 mm (Day, 1978).

Distribution : India (Uttar Pradesh, Himachal Pradesh, Punjab, Bihar, Sikkim, West Bengal, Orissa, Tamil Nadu, Karnataka) ; Pakistan ; Nepal ; Bangladesh ; Myanmar.

Remarks : This species exhibits sexual dimorphism (Ansari and Kumar, 1982). The males are blue and slimmer whereas females have a deeper body colour and bulging sides. It is most popular aquarium fish. It is considered of some value in destroying mosquito larvae (Southwell. 1920). It lives in side pools of slow moving streams.

7. *Danio devario* (Hamilton-Buchanan)

Devario Danio

Cyprinus (Cabdio) devario Hamilton-Buchanan, 1822. *Fish. Ganges* : 341-342, 393, pl. 6, fig. 94 (type-locality : rivers and ponds of Bengal).

Local name : Chand.

Material examined : 11 exs. (60-75 mm), Suswa river nr. Forest Chauki, Jhabrawala Forest Block, Dist. Dehradun, 8.i.1965, Coll. Akhlaq Husain ; 2 exs., Song river nr. Kansrao Railway Station, Dist. Dehradun, 8.i.1965, Coll. Akhlaq Husain ; 4 exs., Song river nr. Railway Bridge, Kansrao, Dist. Dehradun, 26.ii.1965, Coll. T. D. Soota ; 9 exs., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 3 exs., Song river, Kansrao, Dist. Dehradun, 27.x.1965, Coll. Akhlaq Husain ; 5 exs., Song river, Satynarain, Dist. Dehradun, 7.iv.1966, Coll. T. D. Soota ; 7 exs., Song river, Pritinagar nr. Gaurighat, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 9 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 5 exs., Song river, Satyanarain, Dist. Dehradun, 15.ix.1972, Coll. Raj Tilak ; 2 exs., Song river, Gaurighat nr. Satyanarain, Dist. Dehradun, 19.iv.1973, Coll. Raj Tilak ; 1 ex. (75 mm), Song river, Pattapul, Kansrao, Dist. Dehradun, 20.v.1976, Coll. Arun Kumar ; 3 exs. (72-73 mm), Song river, Pattapul, Kansrao, Dist. Dehradun, 16.iii.1978, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak.

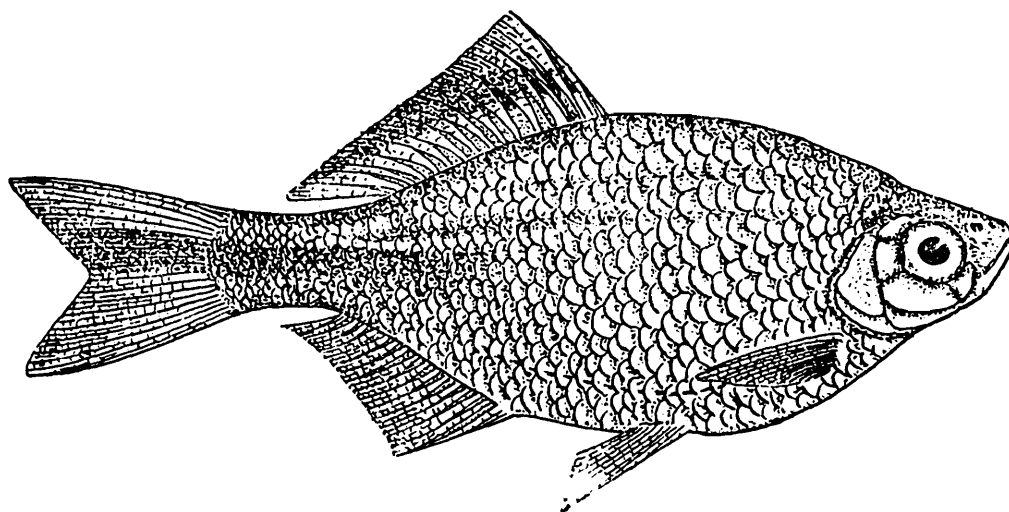


Fig. 7 : *Danio devario* (Hamilton – Buchanan)

Maximum length : 102 mm (Day, 1878).

Distribution : India (Northern states, Madhya Pradesh, Gujarat, Orissa) ; Pakistan ; Nepal ; Bangladesh.

Remarks : It can be used for larvicidal purposes. It lives near the banks in clear waters.

8. *Esomus danricus* (Hamilton-Buchanan)

Flying Barb

Cyprinus (Danio) danrica Hamilton-Buchanan, 1822. *Fish. Ganges* : 325-326, 390, pl. 16. fig. 88 (type-locality : ponds and ditches of Bengal).

Local name : Chal.

Material examined : 2 exs., Ranipur rao, Ranipur, Dist. Hardwar, 24.ii.1965, Coll. T. D. Soota ; 7 exs., Ranipur rao, Ranipur, Dist. Hardwar, 14.vii.1965, Coll. T. D. Soota ; 1 ex., Mohand rao, Mohand, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 1 ex. (53 mm), Betban rao, Beribara, Dist. Hardwar, 8.ii.1972, Coll. R. N. Chopra ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 1 ex. (45 mm), Ranipur rao, Ranipur, Dist. Hardwar, 24.iii.1973, Coll. Raj Tilak.

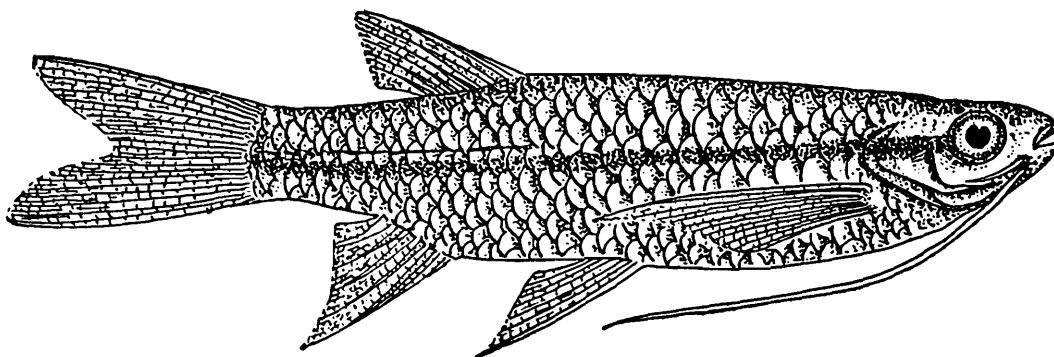


Fig. 8 : *Esomus danricus* (Hamilton – Buchanan)

Maximum length : 127 mm (Day, 1878).

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Myanmar ; Sri Lanka.

Remarks : It has been found to be of great utility for larvicidal purpose (Chaudhuri, 1911 ; Sewell and Chaudhuri, 1912 ; Hodgson, 1914 ; Tilak, 1971 ; Soni et al. 1981). It lives in shallow waters with plenty of aquatic weeds.

9. *Parluciosoma daniconius* (Hamilton-Buchanan)

Striped Rasbora

Cyprinus (Danio) daniconius Hamilton-Buchanan, 1822. *Fish. Ganges* : 327-328, 391, pl. 15, fig. 89 (type-locality : rivers of southern Bengal).

Local name : Bhuri.

Material examined : 1 ex., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 2 exs., Song river, Pritinagar nr. Gaurighat, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 2 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 16.ix.1966, Coll. Asket Singh ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 23.iv.1971, Coll. J. C. Tripathi ; 1 ex., Song river, Gaurighat nr. Satyanarain, Dist. Dehradun 19.iv.1973, Coll. Raj Tilak ; 2 exs. (52-80 mm), Song river, Pattapul, Kansrao, Dist. Dehradun, 16.iii.1978. Coll. Raj Tilak ; 1 ex., Small stream, ca 10 km east of Phandowala FRH, Dist. Dehradun, 15.v.1987, Coll. Raj Tilak ; 1 ex., Small stream nr. Phandowala, ca 2 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 2 exs., Ganga canal seepage, ca 7 km east of Chila, Dist. Pauri, 11.ix.1987, Coll. Raj Tilak ; 1 ex., Ghasi Ram sot nr. FRH Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak.

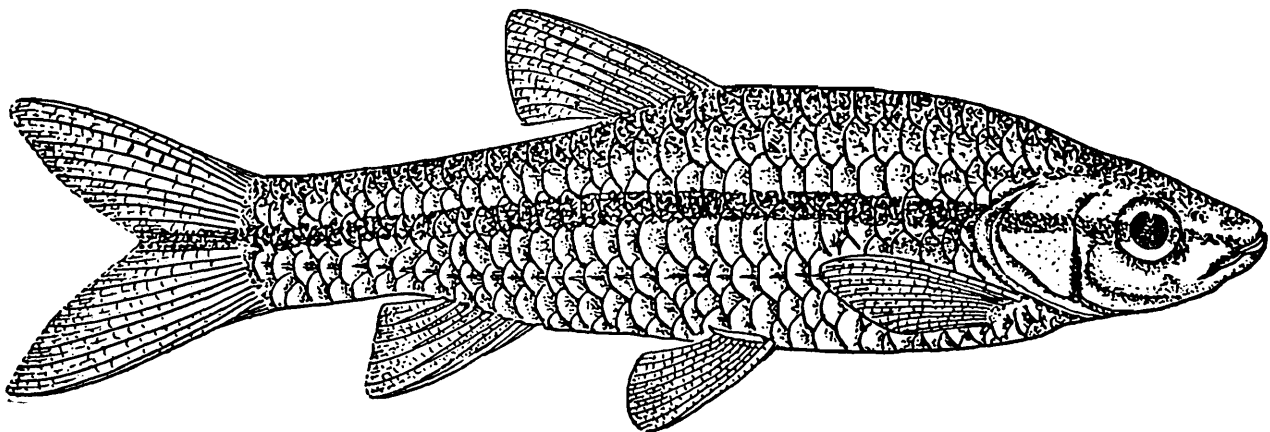


Fig. 9 : *Parluciosoma daniconius* (Hamilton – Buchanan)

Maximum length : 203 mm (Day, 1878)

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Sri Lanka ; Myanmar ; Thailand.

Remarks : It may prove very useful for destroying mosquito larvae (Hora & Mukerji, 1938, Sivakami and Joseph, 1983). It prefers clear and shallow waters.

10. *Raiamas bola* (Hamilton-Buchanan)

Indian Trout

Cyprinus (Barilius) bola Hamilton-Buchanan, 1822. *Fish. Ganges* : 274-275, 385 (type-locality : Brahmaputra).

Local name : Balala.

Material examined : 2 exs., Chilkana rao, Chillawali Forest Block, Dist. Hardwar, 18.xii.1964, Coll. T. D. Soota ; 34 exs., Mohand rao nr. Mohand, Dist. Hardwar, 1.vii.1966, Coll. Asket Singh ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 29.iv.1967, Coll. J. C. Tripathi ; 1 ex. (200 mm), Mohand rao, Mohand, Dist. Hardwar, 26.ix.1973, Coll. Raj Tilak ; 1 ex., Small stream, ca 5 km west of FRH Chila, Dist. Pauri, 12.vi.1987, Coll. N. K. Sinha ; 1 ex., Ghasi Ram sot nr. FRH Chila, Dist. Pauri, 9.ix.1987, Coll. Raj Tilak ; 2 exs., Modhal sot nr. FRH Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 3 exs., Ghasi Ram sot nr. FRH Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak.

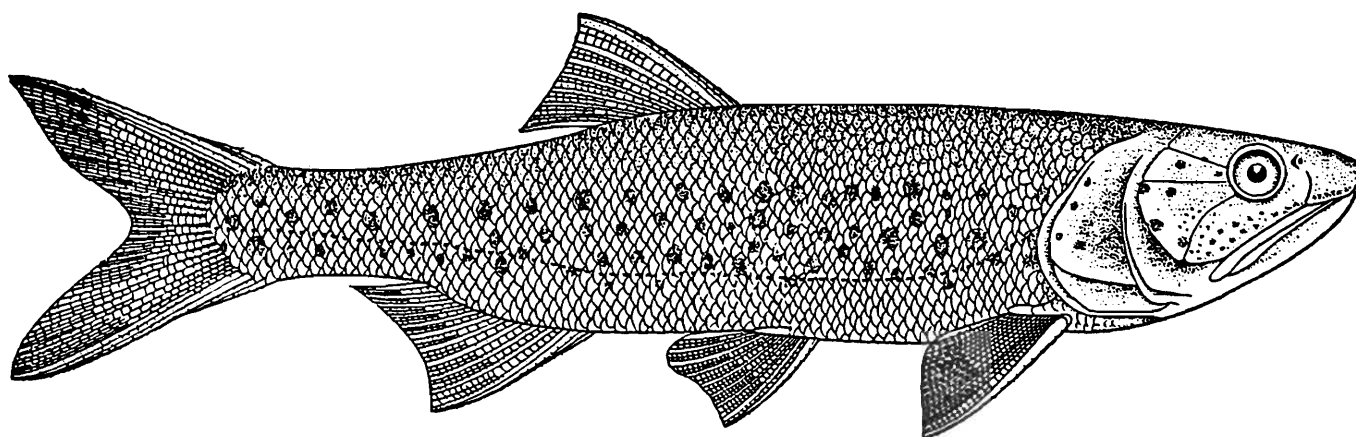


Fig. 10 ; *Raiamas bola* (Hamilton - Buchanan)

Maximum length : 305 mm. (Day, 1878).

Distribution : India (Northern states, Orissa) ; Nepal ; Bangladesh ; Myanmar.

Remarks : This species exhibits sexual dimorphism (Husain, 1987). In males, the snout, lower jaw, outer rays of pectoral and scales on sides of body are covered with fine tubercles. It is known as "Indian Trout" due to its resemblance with the European Trout and is considered a good game fish. It is found in moderate streams with clear water and rocky bed.

11. *Chagunius chagunio* (Hamilton-Buchanan)

Cyprinus (Cyprinus) chagunio Hamilton-Buchanan, 1822. *Fish. Ganges* : 295-297 type-locality : Yamuna and in the northern rivers of Bihar and Bengal).

Local names : Chhibban, Pathali.

Material examined : 2 exs. (123-172 mm), Motichur rao, Koelpur Forest Block, Dist. Dehradun, 25.ii.1965, Coll. T. D. Soota ; 3 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 20.v.1965, Coll. T. D. Soota ; 1 ex., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 6 exs., Song river, Satyanarain, Dist. Dehradun, 7.iv.1966, Coll. T. D. Soota ; 6 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 13.iv.1966, Coll. T. D. Soota ; 3 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 16.ix.1966, Coll. Asket Singh ; 6 exs., Song river, Satyanarain, Dist. Dehradun, 29.ix.1967, Coll. J. C. Tripathi ; 6 exs., Song river, Satyanarain, Dist. Dehradun, 5.vi.1970, Coll. J. C. Tripathi ; 23 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 15.ix.1972, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 10.vii.1980, Coll. Akhlaq Husain ; 5 exs., Rawasan river, Laldhang, Dist. Pauri, 10.ix.1987, Coll. Raj Tilak ; 7 exs., Ganga canal seepage, ca 7 km east of Chila, Dist. Pauri, 11.ix.1987, Coll. Raj Tilak ; 22 exs., Ghasi Ram sot nr. FRH Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 8 exs., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak.

Material examined : 55 examples (85-179 mm).

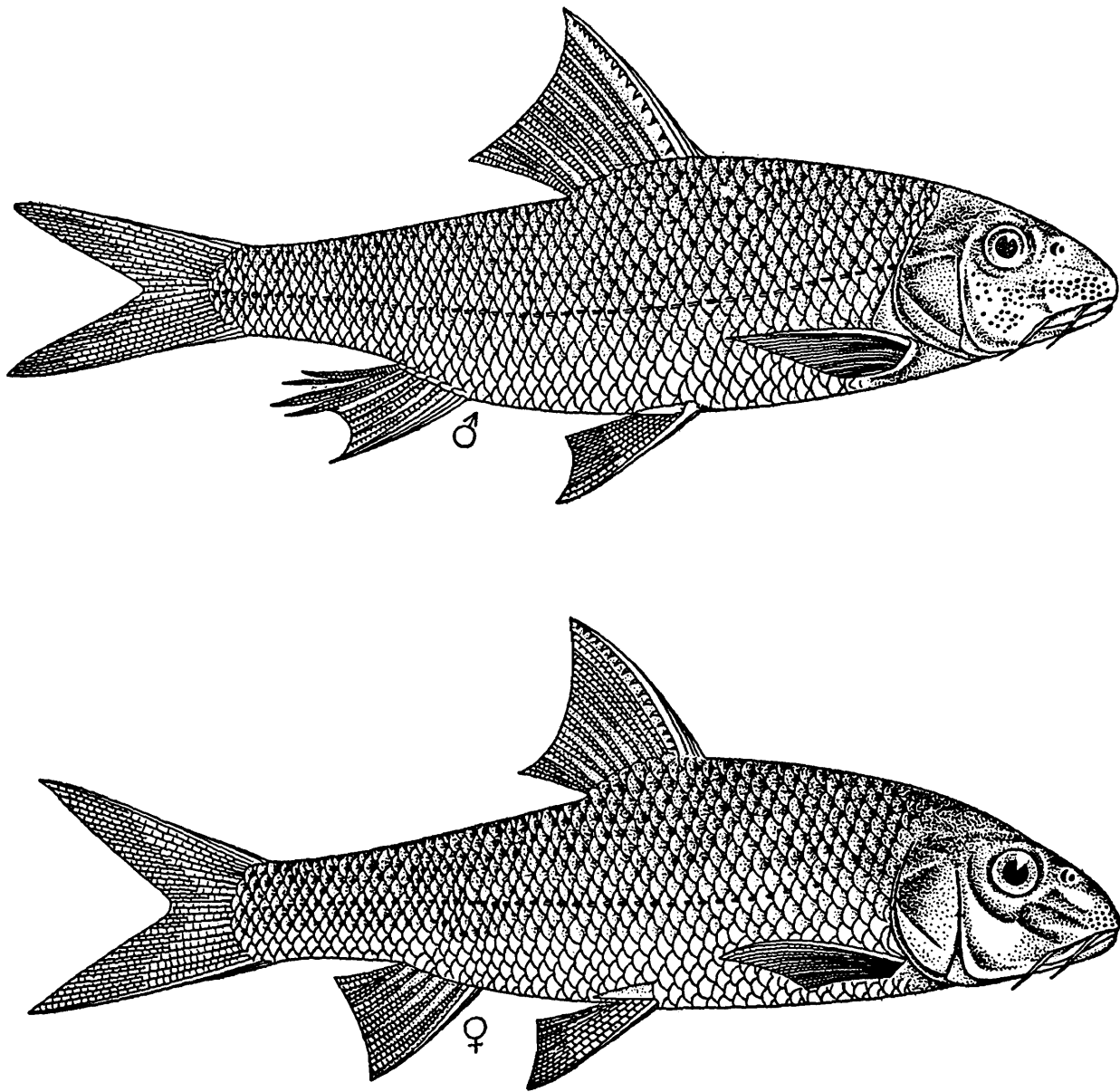


Fig. 11 : *Chagunius chagunio* (Hamilton - Buchanan)—male, female

Maximum length : 457 mm (Day, 1878).

Distribution : India (Northern India, Delhi, Madhya Pradesh, Orissa) ; Nepal ; Bangladesh ; Myanmar ; Thailand.

Remarks : This species exhibits marked sexual dimorphism (Hora & Mukerji, 1933). In adult males, the snout and cheeks are extensively covered with pores and the last anal rays are elongated. In females, the pores on snout are a few and the anal fin is normal. It offers good sport in deeper waters. It inhabits large streams with rocky bed and clear water.

12. *Labeo dero* (Hamilton-Buchanan)
Hilly Labeo

Cyprinus (Bangana) dero Hamilton-Buchanan, 1822. *Fish. Ganges* : 277-278, 385, pl. 17, fig. 78 (type-locality : Brahmaputra river).

Local names : Kalabans, Moili.

Material examined : 1 ex., Mohand rao, Mohand, Dist. Hardwar, 27.xi.1964, Coll. T. D. Soota ; 1 ex., (186 mm), Song river nr. Railway Station, Kansrao, Dist. Dehradun, 8.i.1965, Coll. Akhlaq Husain ; 1 ex. (195 mm), Motichur rao, Motichur, Dist. Dehradun, 25.ii.1965, Coll. T. D. Soota ; 2 exs., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 26.iii.1965, Coll. T. D. Soota ; 10 exs., Mohand rao nr. Mohand, Dist. Hardwar, 1.vii.1966, Coll. Asket Singh ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 6.viii.1968, Coll. M. K. Biswas, 1 ex., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 1 ex., Rawasan river, Laldhang, Dist. Pauri, 10.ix.1987, Coll. Raj Tilak ; 1 ex., Song river, Gaurighat nr. Satyanarain, Dist. Dehradun, 19.iv.1973, Coll. Raj Tilak and specimens seen in local catch from river Ganga.

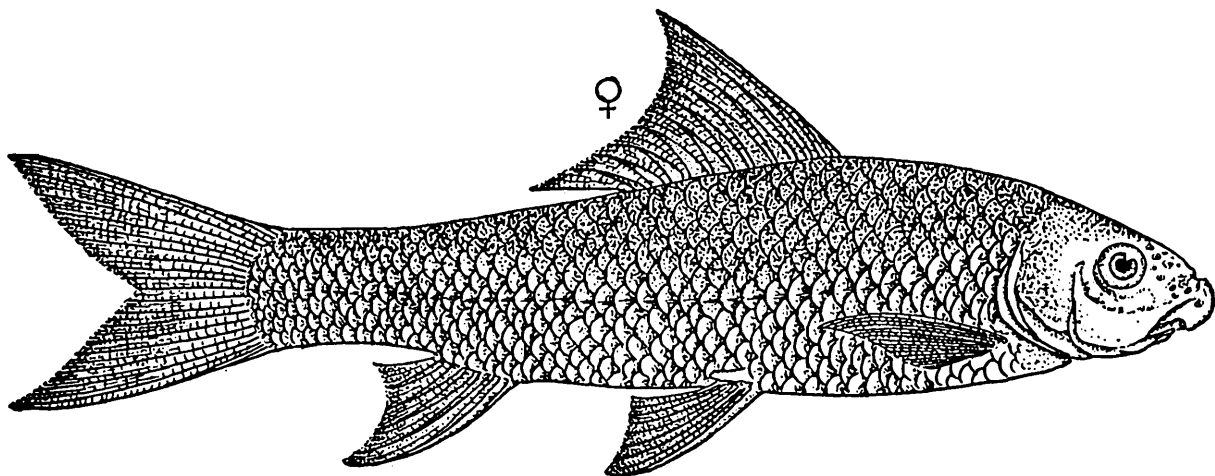


Fig. 12 : *Labeo dero* (Hamilton – Buchanan)—female

Maximum length : 750 mm. (Talwar & Jhingran, 1991).

Distribution : India (along Himalaya, Madhya Pradesh, Orissa) ; Pakistan ; Nepal ; Bangladesh ; Myanmar ; China.

Remarks : This species exhibits sexual dimorphism (Hora & Misra, 1936). In male, the snout is deeply grooved and covered with tubercles and a few anterior rays of dorsal fin are prolonged. In female, the groove and tubercles on snout are less marked and the dorsal fin is normal. It is a game fish of the area. It inhabits near the banks of hill streams.

13. *Labeo dyocheilus* (McClelland)

Brahmaputra Labeo

Cyprinus (Labeo) dyocheilus McClelland, 1839, *Asiat. Res.*, 19 (2), 268, 330, pl. 37. fig. 1 (type-locality : Assam).

Local name : Boalla.

Material examined : 1 ex., River Ganga, Gaurighat nr. Satyanarain, Dist. Dehradun, 12.iv.1966, Coll. T.D. Soota and specimens seen with local fishermen at Raiwala and near Hardwar.

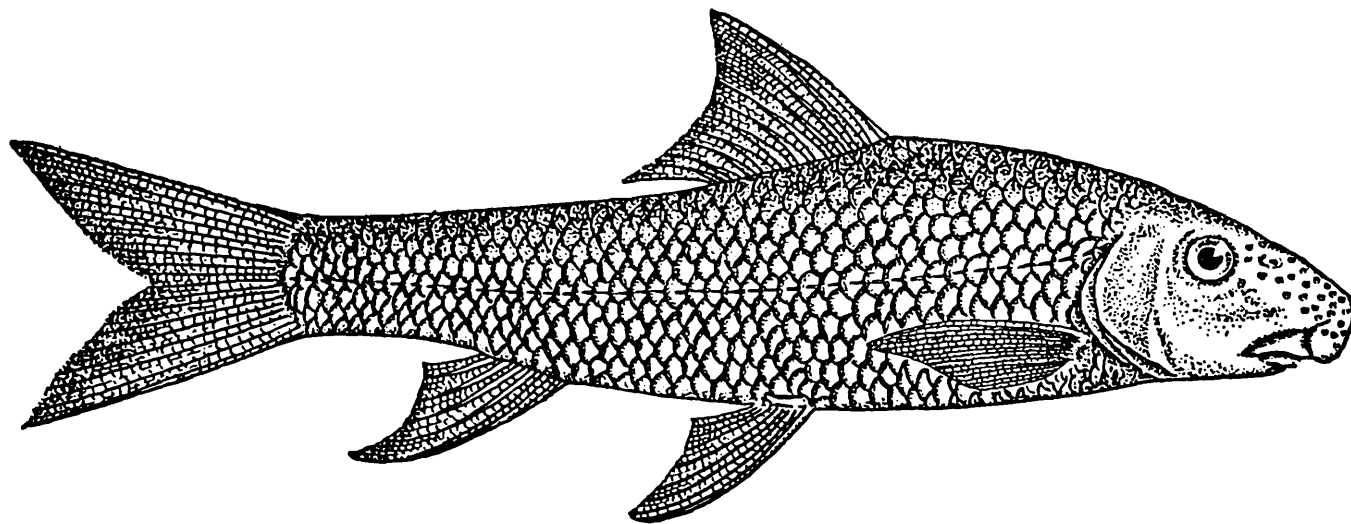


Fig. 13 : *Labeo dyochailus* (McClelland)

Maximum length : 914 mm (Day, 1878).

Distribution : India (along Himalaya, Madhya Pradesh, Rajasthan) ; Nepal ; Bhutan ; Bangladesh.

Remarks : It is a game fish and is found in clear water of larger rivers.

14. ***Puntius chola* Hamilton-Buchanan**
Bitter Carp, Swamp Barb

Cyprinus (Puntius) chola Hamilton-Buchanan, 1822. *Fish. Ganges* : 312-313 (type-locality : North-eastern parts of Bengal).

Local name : Phuti

Material examined : 3 exs., (75-87 mm), Suswa river nr. Forest Chauki, Jhabra-wala Forest Block, Dist. Dehradun, 8.i.1965, Coll. Akhlaq Husain ; 2 exs., Song river nr. Railway Bridge, Kansrao, Dehradun, 26.ii.1965, Coll. T. D. Soota ; 3 exs., Song river, Kansrao, Dist. Dehradun, 27.x.1965, Coll. T. D. Soota ; 1 ex., Song river nr. Kansrao FRH, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 3 exs., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 6 exs., Song river, Gaurighat nr. Satyanarain, Dist. Dehradun, 19.iv.1973, Coll. Raj Tilak.

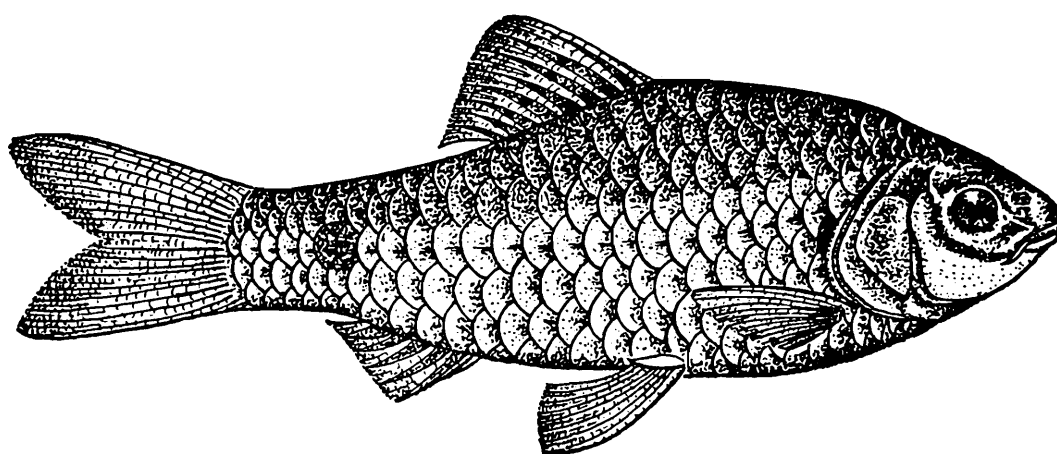


Fig. 14 : *Puntius chola* Hamilton – Buchanan

Maximum length : 129 mm (Husain, 1987).

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Myanmar ; Sri Lanka.

Remarks : The males are distinguished by the orange tinged pelvic and anal fins (Talwar and Jhingran, 1991). It inhabits small streams with low current.

15. ***Puntius conchonus* Hamilton-Buchanan**
Red Barb, Rosy Barb

Cyprinus (Puntius) conchonus Hamilton-Buchanan, 1822. *Fish. Ganges* : 317-318, 389 (type-locality : ponds of north-east Bengal and rivers of Kosi and Ami).

Local name : Phuti.

Material examined : 3 exs., (59-80 mm), Suswa river nr. Forest Chauki, Jhabrawala Forest Block, Dist. Dehradun, 8.i.1965, Coll. Akhlaq Husain ; 35 exs. (54-85 mm), Song river, nr. Railway Station, Kansrao, Dist. Dehradun, 8.i.1965, Coll. Akhlaq Husain ; 44 exs. (14-55 mm), Song river, Kansrao Railway Bridge, Dist. Dehradun, 22.i.1965, Coll. R. K. Bhatnagar ; 9 exs. (25-40 mm), Song river, Kansrao, Dist. Dehradun, 5.ii.1965, Coll. R. K. Bhatnagar ; 16 exs., Ranipur rao, Ranipur Forest, Dist. Hardwar, 24.ii.1965, Coll. T. D. Soota ; 5 exs. (55-68 mm), Motichur rao nr. Motichur FRH, Dist. Dehradun, 25.ii.1965, Coll. T. D. Soota ; 2 exs., Song river nr. Railway Bridge, Kansrao, Dist. Dehradun, 26.ii.1965, Coll. T. D. Soota ; 5 exs., Motichur rao, Motichur, Dist. Dehradun, 30.vi.1965, Coll. T. D. Soota ; 31 exs., Ranipur rao, Ranipur, Dist. Hardwar, 14.vii.1965, Coll. T. D. Soota ; 46 exs., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 47 exs., Song river, Kansrao, Dist. Dehradun, 27.x.1965, Coll. Akhlaq Husain ; 15 exs., Song river, Satyanarain, 7.iv.1966, Coll. T. D. Soota ; 59 exs., Song river, Pritinagar, nr. Gaurighat, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 12 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 14 exs., Song river, Satyanarain, Dist. Dehradun, 5.vi.1970, Coll. J.C. Tripathi ; 15 exs., Song river, Satyanarain, Dist. Dehradun, 23.iv.1971 Coll. J. C. Tripathi ; 21 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 28 exs., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 14 exs., Song river, Gaurighat nr. Satyanarain, Dist. Dehradun 19.iv.1973, Coll. Raj Tilak ; 2 exs., Song river, Pattapul, Kansrao, Dist. Dehradun, 16.iii.1972, Coll. Raj Tilak ; 13 exs., Song river, Satyanarain, Dist. Dehradun 26.xii.1979, Coll. Akhlaq Husain ; 9 exs., Song river, Satyanarain, Dist. Dehradun, 20.ii.1980, Coll. Akhlaq Husain ; 9 exs., Song river, Satyanarain, Dist. Dehradun, 10.iii.1980, Coll. Akhlaq Husain ; 11 exs., Song river, Satyanarain, Dist. Dehradun, 22.iv.1980, Coll. Akhlaq Husain ; 10 exs., Song river, Satyanarain, Dist. Dehradun, 14.v.1980, Coll. Akhlaq Husain ; 5 exs., Song river, Satyanarain, Dist. Dehradun, 10.vii.1980 Coll. Akhlaq Husain ; 8 exs., Motichur rao, Motichur, Dist. Dehradun, 3.xii.1985, Coll. R. N. Chopra ; 2 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 30.x.1986, Coll. Raj Tilak ; 7 exs., a stream, ca 6 km north-west of Kansrao FRH, Dist. Dehradun, 8.i.1987, Coll. Raj Tilak ; 1 ex., Motichur rao nr. Motichur FRH, Dist. Dehradun, 9.i.1987, Coll. Raj Tilak ; 1 ex., Song river nr. Railway Station, Kansrao, Dist. Dehradun, 14.i.1987, Coll. N. K. Sinha ; 25 exs., Song river, Kansrao Forest, Dist. Dehradun, 20.i.1987, Coll. J. C. Tripathi, 13 exs., Suswa river nr. FRH, Phandowala, Dist. Dehradun, 14.v.1987, Coll. Raj Tilak ; 12 exs., a stream, ca. 10 km east of Phandowala FRH, Dist. Dehradun, 15.v.1987, Coll. Raj Tilak ; 54 exs., Suswa river nr. FRH, Phandowala, Dist. Dehradun, 18.v.1987, Coll. N. K. Sinha ; 5 exs., a stream nr. Phandowala, ca 2 km from Clement Town, Dist. Dehradun, 19.v.1987, Coll. N. K. Sinha ; 18 exs.,

a stream nr. Phandowala, ca 2 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 14 exs., a stream nr. Phandowala, ca 4 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 49 exs., Suswa river, Phandowala, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 1 ex., a stream, Chila Forest, Dist. Pauri, 2.vi.1987, Coll. J. C. Tripathi ; 3 exs., Ghasi Ram sot nr. Chila, Dist. Pauri, 3.vi.1987, Coll. Raj Tilak ; 39 exs., a stream, ca 5 km east of FRH, Chila, Dist. Pauri, 11.vi.1987, Coll. N. K. Sinha ; 2 exs., a stream, ca 5 km west of FRH, Chila, Dist. Pauri, 12.vi.1987, Coll. N. K. Sinha ; 1 ex., Ghasi Ram sot nr. FRH, Chila, Dist. Pauri, 9.ix.1987, Coll. Raj Tilak ; 1 ex., Rawasan river, Laldhang, Dist. Pauri, 10.ix.1987, Coll. Raj Tilak ; 10 exs., Ganga canal seepage, ca 7 km east of Chila, Dist. Pauri, 11.ix.1987, Coll. Raj Tilak ; 5 exs. Ghasi Ram sot nr. FRH Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 7 exs., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak ; 15 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak ; 8 exs., Motichur rao, Motichur, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak.

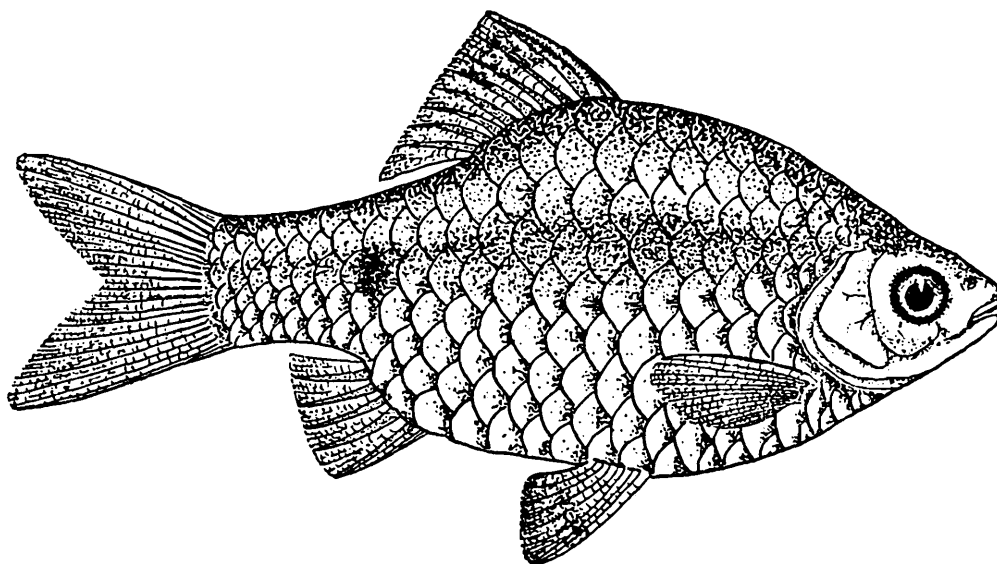


Fig. 15 : *Puntius conchoni* Hamilton – Buchanan

Maximum length : 140 mm (Talwar & Jhingran, 1991).

Distribution : India (Uttar Pradesh, Delhi, Punjab, Bihar, West Bengal, Assam, Manipur, Orissa, Karnataka, Kerala) ; Pakistan ; Afghanistan ; Nepal ; Bangladesh.

Remarks : This species exhibits sexual dimorphism (Frank and Wheeler 1871 ; Pathani & Das, 1978). In males, the dorsal fin and sometimes the pelvic and the anterior few ray of anal fins are tipped black. The upper half of body is greenish, while lower half

is pinkish. The females are silvery. It lives in clear water streams. It is very popular among aquarists.

16. *Puntius sarana* Hamilton-Buchanan
Olive Barb

Cyprinus (Cyprinus) sarana Hamilton-Buchanan, 1822. *Fish. Ganges* : 387-390, 388 (type-locality : ponds and rivers of India).

Local name : Phuta.

Material examined : 1 ex., Suswa river, Clement Town, Dist. Dehradun, 23.vii. 1965, Coll. T. D. Soota ; 2 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 12.iv. 1966, Coll. T. D. Soota ; 1 ex., Ghasi Ram sot nr. Chila, Dist. Hardwar, 12.ix.1987, Coll. Raj Tilak.

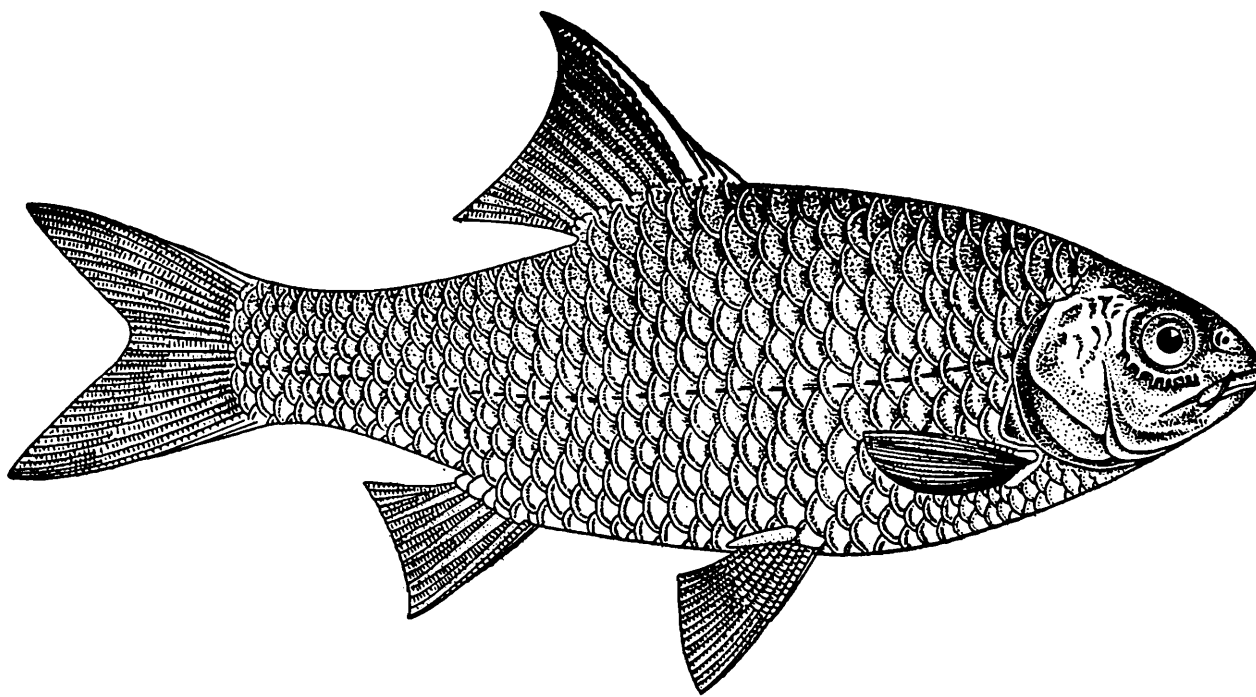


Fig. 16 : *Puntius sarana* Hamilton – Buchanan

Maximum length : 310 mm (Talwar & Jhingran, 1991).

Distribution : India (except south of Krishna river) ; Pakistan ; Nepal ; Bangladesh ; Myanmar.

Remarks ; It is one of the largest barb. It, generally, prefers deeper waters. It is popular among the anglers for its size,

17. *Puntius sophore* Hamilton-Buchanan
Soft-fin Barb

Cyprinus (Puntius) sophore Hamilton-Buchanan, 1822. *Fish. Ganges* : 310-311, 389, pl. 19, fig. 86 (type-locality : ponds, place not given).

Local name : Phuti.

Material examined : 1 ex., Gaj rao, Gaj Forest Block, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 30.vi.1965, Coll. T. D. Soota ; 1 ex., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 23.iv.1971, Coll. J. C. Tripathi ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak, 28 exs., Song river, Gaurighat nr. Satyanarain, Dist. Dehradun, 19.iv.1973, Coll. Raj Tilak.

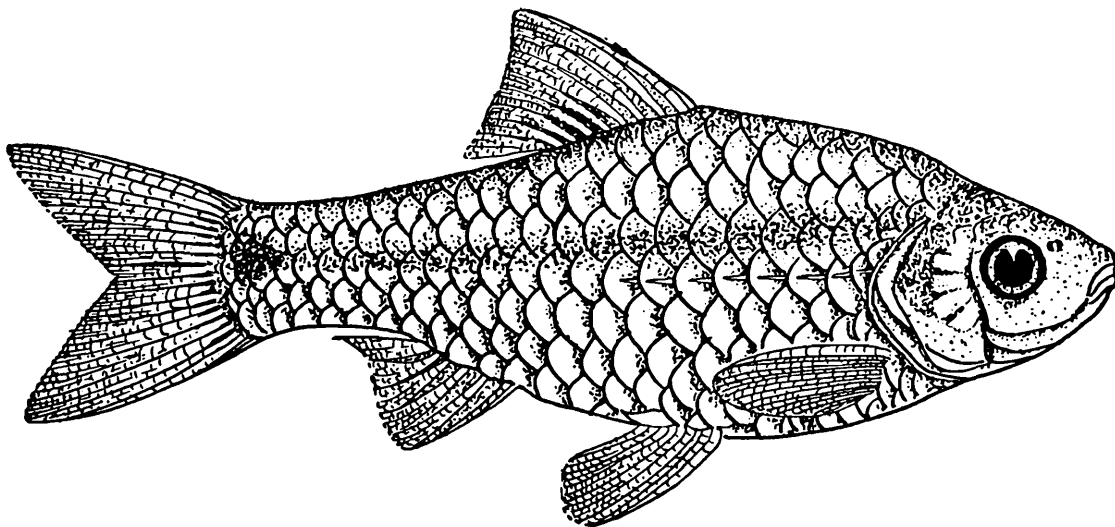


Fig. 17 : *Puntius sophore* Hamilton – Buchanan

Maximum length : 130 mm (Talwar & Jhingran, 1991).

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Sri Lanka ; Myanmar ; China-Yunnan.

Remarks : This species exhibits sexual dimorphism (Mookerjee et al. 1941). The males are with a lateral scarlet band during the breeding season. The females lack this band. It lives in shallow streams.

18. *Puntius ticto* Hamilton-Buchanan
Fire-fin Barb, Two-spot Barb

Cyprinus (Puntius) ticto Hamilton-Buchanan, 1822. *Fish. Ganges*: 314-315, 389, pl. 8, fig. 87
 (type-locality : south-east parts of Bengal).

Local names : Bhuri, Phuti.

Material examined : 2 exs., Suswa river nr. Forest Chauki, Jhabrawala Forest Block, Dist. Dehradun, 8.i.1965, Coll. Akhlaq Husain ; 7 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 20.v.1965, Coll. T. D. Soota ; 1 ex., Suswa river nr. Phandowala FRH, Dist. Dehradun, 4.vi.1965, Coll. T. D. Soota ; 9 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 5 exs., Song river, Satyanarain, Dist. Dehradun, 29.vi.1965, Coll. T. D. Soota ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 30.vi.1965, Coll. T. D. Soota ; 21 exs., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 15 exs., Song river, Kansrao, Dist. Dehradun, 27.x.1965, Coll. Akhlaq Husain ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 7.iv.1966, Coll. T. D. Soota ; 6 exs., Song river, Pritinagar nr. Gaurighat, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 16 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 13.iv.1966, Coll. T. D. Soota ; 14 exs., Suswa river, Clement Town, Dist. Dehradun, 14.iv.1966, Coll. T. D. Soota ; 20 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 16.ix.1966, Coll. Asket Singh ; 15 exs., Song river, Kansrao, Dist. Dehradun, 27.v.1971, Coll. K. P. Singh ; 3 exs., Motichur rao, Motichur, Dist. Dehradun, 28.x.1971, Coll. Asket Singh ; 1 ex. (49 mm), Gaj rao, Gaj Forest Block, Dist. Hardwar, 15.ii.1972, Coll. R. N. Chopra ; 14 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 4 exs., Song river, Satyanarain, Dist. Dehradun, 15.ix.1972, Coll. Raj Tilak ; 7 exs., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 41 exs., Song river, Gaurighat nr. Satyanarain, Dist. Dehradun, 19.iv.1973, Coll. Raj Tilak ; 1 ex. (23 mm), Dholkhand rao, Dholkhand, Dist. Hardwar, 27.iv.1973, Coll. Raj Tilak ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 23.x.1973, Coll. Raj Tilak ; 7 exs. (34-70 mm), Song river, Pattapul, Kansrao, Dist. Dehradun, 20.v.1976, Coll. Arun Kumar ; 1 ex., Song river, Pattapul, Kansrao, Dist. Dehradun, 16.iii.1978, Coll. Raj Tilak ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 12.xi.1979, Coll. Akhlaq Husain ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak.

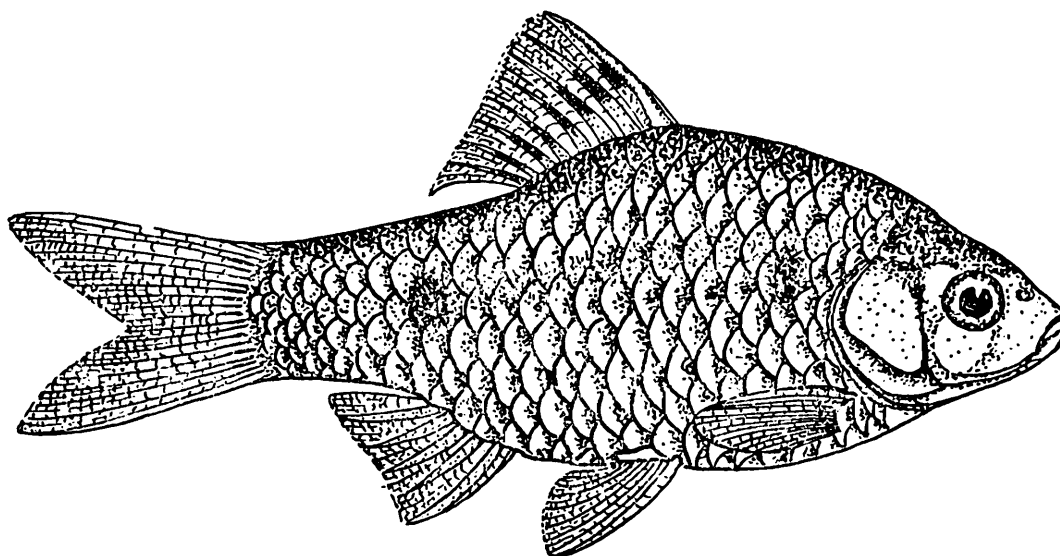


Fig. 18 : *Puntius ticto* Hamilton – Buchanan

Maximum length : 102 mm (Day, 1878).

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Myanmar ; Sri Lanka ; Thailand.

Remarks : It lives in clear and shallow water streams. It is a popular aquarium fish.

19. *Tor chelynoides* (McClelland)

Black Mahseer

Barbus chelynoides McClelland, 1839 : *Asiat. Res.*, 19 (2) : 271, 340, pl. 57, fig. 5 (type-locality : Shimla hills).

Local name : Kala Mahseer.

Material examined : The specimens were not collected by the authors. However, the record is based on the report by Grover (1970).

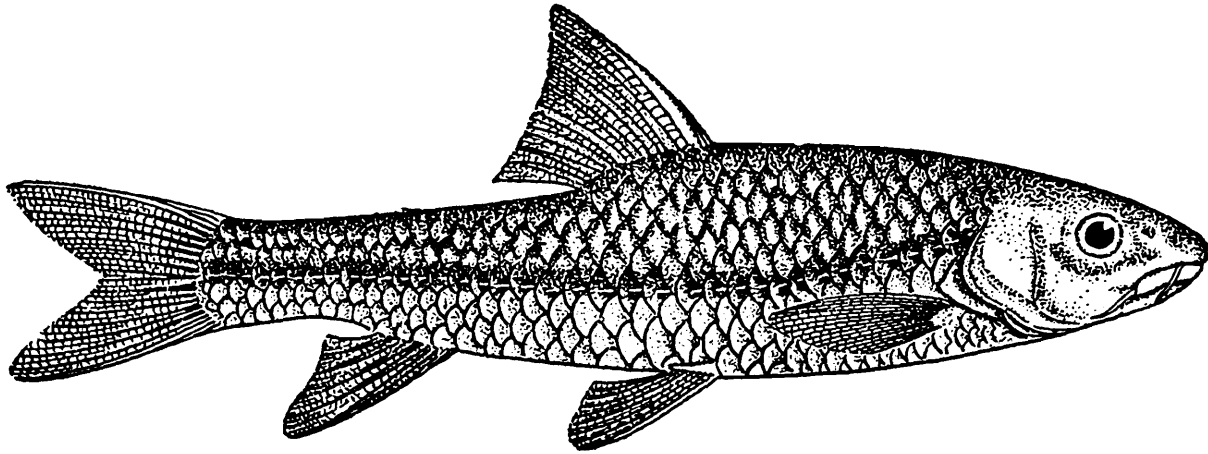


Fig. 19 : *Tor chelynooides* (McClelland)

Maximum length : 762 mm (Day, 1878).

Distribution : India (along Himalaya) ; Pakistan.

Remarks : This species is found in torrential hill streams with cold water. It is an important game fish of the area.

20. *Tor putitora* (Hamilton-Buchanan)

Yellow-finned Mahseer

Cyprinus (Cyprinus) putitora Hamilton-Buchanan, 1822. *Fish. Ganges* : 303-305, 388 (type-locality : eastern parts of Bengal).

Local name : Pila-par Mahseer.

Material examined : 4 exs. (34-40 mm), Song river, Kansrao Railway Bridge, Dist. Dehradun, 22.i.1965, Coll. R. K. Bhatnagar ; 3 exs. (40-51 mm), Song river, Kansrao, Dist. Dehradun, 5.ii.1965, Coll. R. K. Bhatnagar ; 4 exs. (90-137 mm), Motichur rao, Koelpur Forest Block, Dist. Dehradun, 25.ii.1964, Coll. T. D. Soota ; 15 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 20.v.1965, Coll. T. D. Soota ; 8 exs., Song river, Satyanarain, Dist. Dehradun, 29.vi.1965, Coll. T. D. Soota ; 1 ex., Song river, Kansrao, Dist. Dehradun, 27.x.1965, Coll. Akhlaq Husain ; 7 exs., Song river, Satyanarain, Dist. Dehradun, 7.iv.1966, Coll. T. D. Soota ; 2 exs., River Ganga, Gaurighat nr. Satyanarain, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 2 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 12.iv.1966. Coll. T. D. Soota ; 3 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 13.iv.1966, Coll. T. D. Soota ; 31 exs., Motichur rao nr. Motichur FRH,

Dist. Dehradun, 16.ix.1966, Coll. Asket Singh ; 2 exs., Song river nr. Kansrao Railway Station, Dist. Dehradun, 17.xii.1966, Coll. Asket Singh ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 29.iv.1967, Coll. J. C. Tripathi ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 6.viii.1968, Coll. M. K. Biswas ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 23.v.1970, Coll. M. K. Biswas, 1 ex., (158 mm), Gaj rao, Gaj Forest Block, Dist. Hardwar, 15.ii.72, Coll. R. N. Chopra ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 11 exs., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 1 ex., Song river, Gaurighat nr. Satyanarain, Dist. Dehradun, 19.iv.1973, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 23.x.1973, Coll. Raj Tilak ; 3 exs. Song river nr. Kansrao FRH, Dist. Dehradun, 8.i.1987, Coll. Raj Tilak ; 1 ex., Small stream, 5 km west of FRH, Chila, Dist. Pauri, 12.vi.1987, Coll. N. K. Sinha 3 exs., Ghasi Ram sot nr. FRH, Chila, Dist. Pauri, 9.ix.1987, Coll. Raj Tilak ; 2 exs., Rawasan river, Laldhang, Dist. Pauri, 10.ix.1987, Coll. Raj Tilak ; 29 exs., Modhal sot nr. FRH, Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 30 exs., Ghasi Ram sot nr. FRH, Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak and specimens seen in local catch from river Ganga and canal near Chila.

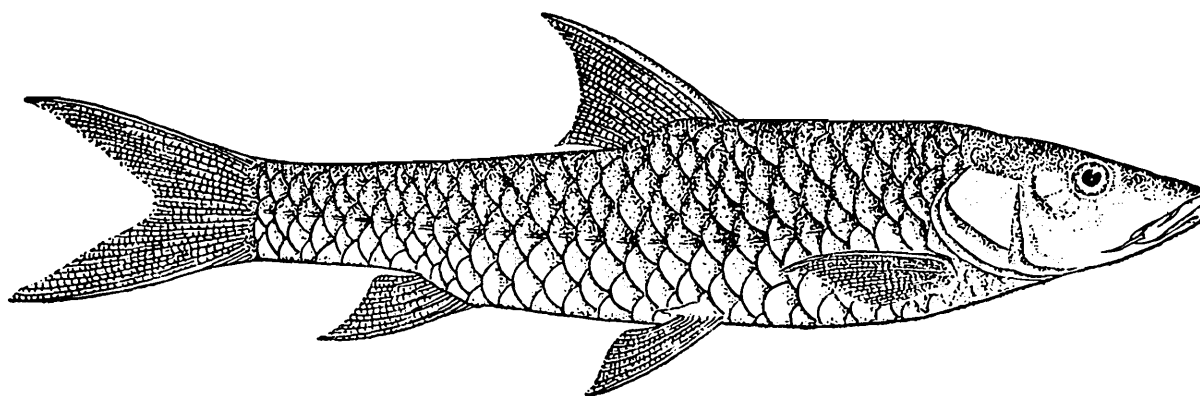


Fig. 20 : *Tor putitora* (Hamilton – Buchanan)

Maximum length : 2743 mm (Hamilton-Buchanan, 1822).

Distribution : India (along Himalaya) ; Pakistan ; Afghanistan ; Nepal ; Bangladesh.

Remarks : It is the well known Mahseer of the area and is very popular among anglers.

21. *Tor tor* (Hamilton-Buchanan)
Red-finned Mahseer

Cyprinus (Cyprinus) tor Hamilton-Buchanan, 1822. *Fish. Ganges* : 305-306, 388 (type-locality : Mahananda river).

Local names : Lal-par Mahseer, Machiyari, Makhni.

Material examined : 6 exs., (145-205 mm), Song river nr. Railway Station, Kansrao, Dist. Dehradun, 8.i.1965, Coll. Akhlaq Husain ; 2 exs., Suswa river nr. Phadowala FRH, Dist. Dehradun, 4.vi.1965, Coll. T.D. Soota ; 1 ex., Song river, Kansrao, Dist. Dehradun, 27.x.1965, Coll. Akhlaq Husain ; 3 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 12.iv.1966, Coll. T.D. Soota ; 4 exs., Song river, Satyanarain, Dist. Dehradun, 5.vi.1970, Coll. J. C. Tripathi ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 23.iv.1971, Coll. J. C. Tripathi ; 5 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 15.ix.1972, Coll. Raj Tilak ; 2 exs. (90-105 mm), Song river, Pattapul, Kansrao, Dist. Dehradun, 16.iii.1978, Coll. Raj Tilak ; 3 exs., Ganga canal seepage, ca. 7 km east of Chila, Dist. Pauri, 11.ix.1987, Coll. Raj Tilak ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak and specimens seen collected from river Ganga near Hardwar.

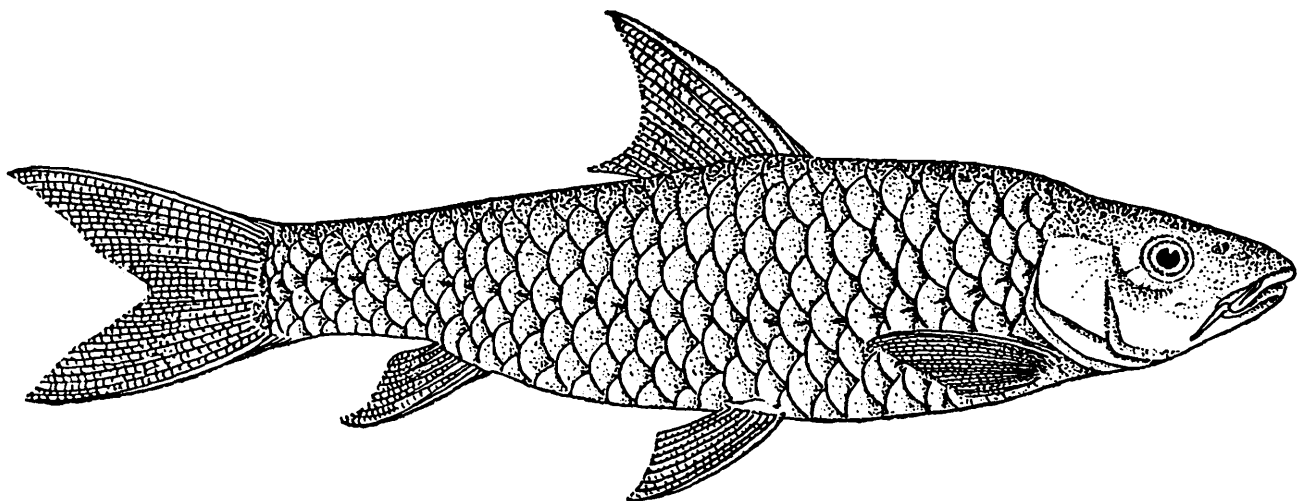


Fig. 21 : *Tor tor* (Hamilton – Buchanan)

Maximum length : 1700 mm (Thomas, 1897)

Distribution : India (Uttar Pradesh, Jammu & Kashmir, Himachal Pradesh, Punjab, Sikkim, Assam, Manipur, Madhya Pradesh) ; Pakistan ; Nepal ; Bangladesh ; Myanmar,

Remarks : It is a game fish of the area, but its population is very thin. Being voracious vegetable feeder, it can be utilised in biological control of aquatic weeds (Tilak & Sharma, 1982).

22. *Crossocheilus latius* (Hamilton-Buchanan)
Gangetic Latia

Cyprinus (Garra) latius Hamilton-Buchanan, 1822. *Fish. Ganges* : 345-346, 393 (type-locality : Tista river).

Local name : Dhanaura.

Material examined : 1 ex., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 18.xii.1964, Coll. T.D. Soota ; 25 exs., Mohand rao nr. Mohand, Dist. Hardwar, 1.vii.1966, Coll. Asket Singh ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 15.ix.1972, Coll. Raj Tilak ; 1 ex., Ganga canal seepage, ca 7 km. east of Chila, Dist. Pauri, 11.ix.1987, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak and specimens seen in local catch from river Ganga.

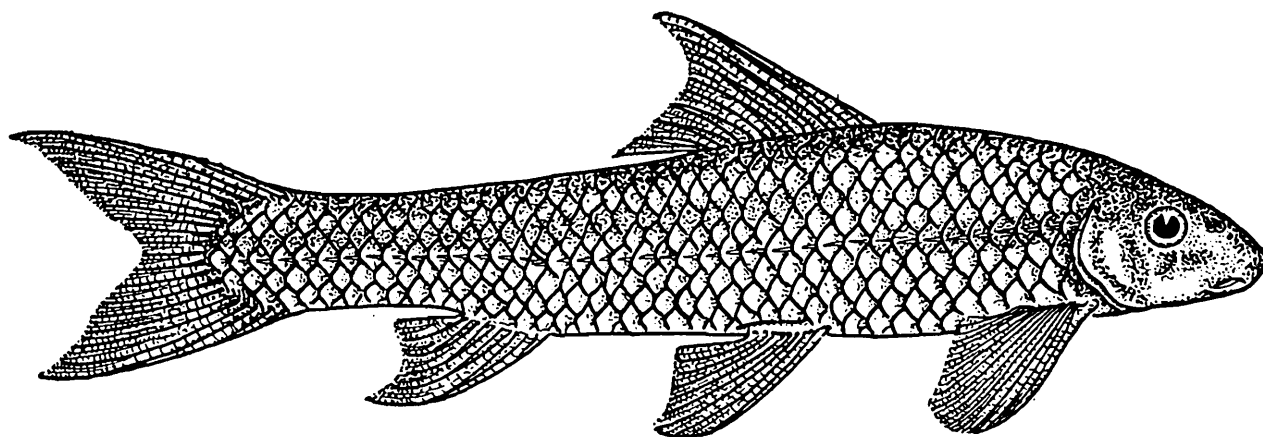


Fig. 22 : *Crossocheilus latius* (Hamilton – Buchanan)

Maximum length : 235 mm (Husain, 1987).

Distribution : India (Ganga and Brahmaputra river systems, Mahanadi drainage in Orissa, Western Ghats, south to head waters of Krishna river) ; Nepal ; Bangladesh.

Remarks : It lives around the stones at the bottom of streams.

23. *Garra gotyla gotyla* (Gary)
Stone Fish

Cyprinus gotyla Gray, 1830-34, III. *Indian Zool.*, 1, pl. 88, fig. 3 (type-locality : not given).

Local names : Dhanura, Gotla.

Material examined : 3 exs., Mohand rao, Mohand, Dist. Hardwar, 13.xi.1964, Coll. T. D. Soota ; 13 exs., Mohand rao, Mohand, Dist. Hardwar, 20.xi.1964, Coll. T. D. Soota ; 1 ex., Mohand rao, Mohand, Dist. Hardwar, 27.xi.1964, Coll. T. D. Soota ; 15 exs., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 18.xii.1964, Coll. T. D. Soota ; 1 ex. (100 mm), Suswa river nr. Forest Chauki, Jhabrawala Forest Block, Dist. Dehradun, 8.i.1965, Coll. Akhlaq Husain ; 1 ex. (100 mm), Motichur rao, Koelpura Forest Block, Dist. Dehradun, 25.ii.1965, Coll. T. D. Soota ; 6 exs., Mohand rao, Mohand, Dist. Hardwar, 30.iv.1965, Coll. T. D. Soota ; 9 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 20.v.1965, Coll. T. D. Soota ; 1 ex., Suswa river nr. Phandowala FRH, Dist. Dehradun, 4.vi.1965, Coll. T. D. Soota ; 10 exs., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 8 exs., Motichur rao, Motichur, Dist. Dehradun, 30.vi.1965, Coll. T. D. Soota ; 4 exs., Mohand rao nr. Mohand, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 1 ex., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 14.iv.1966, Coll. T. D. Soota ; 1 ex., River Ganga, Gaurighat nr. Satyanarain, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 2 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota, 9 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 13.iv.1966, Coll. T. D. Soota ; 1 ex., Suswa river, Clement Town, Dist. Dehradun, 14.iv.1966, Coll. T. D. Soota ; 1 ex., Mohand rao nr. Mohand, Dist. Hardwar, 1.vii.1966, Coll. Asket Singh ; 25 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 16.ix.1966, Coll. Asket Singh ; 2 exs., Motichur rao, Motichur, Dist. Dehradun, 6.viii.1968, Coll. M. K. Biswas ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 5.vi.1970, Coll. J. C. Tripathi, 1 ex., Motichur rao, Motichur, Dist. Dehradun, 28.x.1971, Coll. Asket Singh ; 5 exs. (73-102 mm), Gaj rao, Gaj Forest Block, Dist. Hardwar, 15.ii.1972, Coll. R. N. Chopra ; 6 exs., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 3 exs. (44-65 mm), Mohand rao, Mohand, Dist. Hardwar, 26.ix.1973, Coll. Raj Tilak ; 6 exs. (53-85 mm), Mohand rao, Mohand, Dist. Hardwar, 30.x.1986, Coll. Raj Tilak ; 14 exs., Rawasan river, Laldhang, Dist. Pauri, 10.ix.1987, Coll. Raj Tilak ; 4 exs., Motichur rao, Motichur, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak ; 5 exs., Mohand rao, Mohand, Dist. Hardwar, 17.ix.1987, Coll. Raj Tilak and specimens seen in local catch from river Ganga near Hardwar,

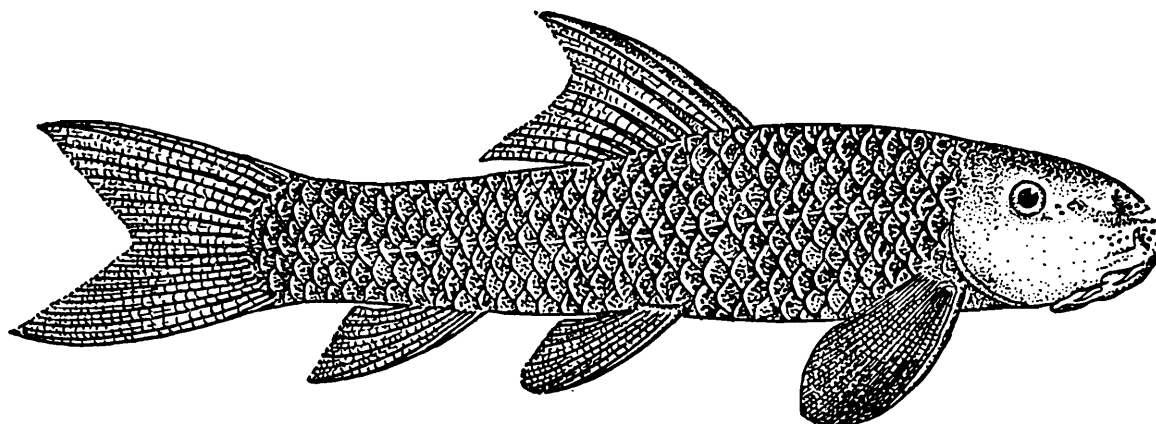


Fig. 23 : *Garra gotyla gotyla* (Gray)

Maximum length : 190 mm in standard length (Menon, 1964).

Distribution : India (along Himalaya, Chota Nagpur plateau, Vindhya-Satpura mountains) ; Pakistan ; Bangladesh ; Myanmar.

Remarks : It is a bottom living fish of the torrents, where it adheres to the stones or rocks with the help of highly developed disc on the chin.

24. *Schizothoracichthys progastus* (McClelland)

Snow Trout

Oreinus progastus McClelland, 1839. *Asiat. Res.*, 19 (2) : 274, 343, pl. 40, fig. 4 (type-locality : Upper Assam).

Local names : Dinnawah, Pahari-machhi.

Material examined : The specimens were not collected by the authors. However the record is based on the material collected by local fishermen from river Ganga.

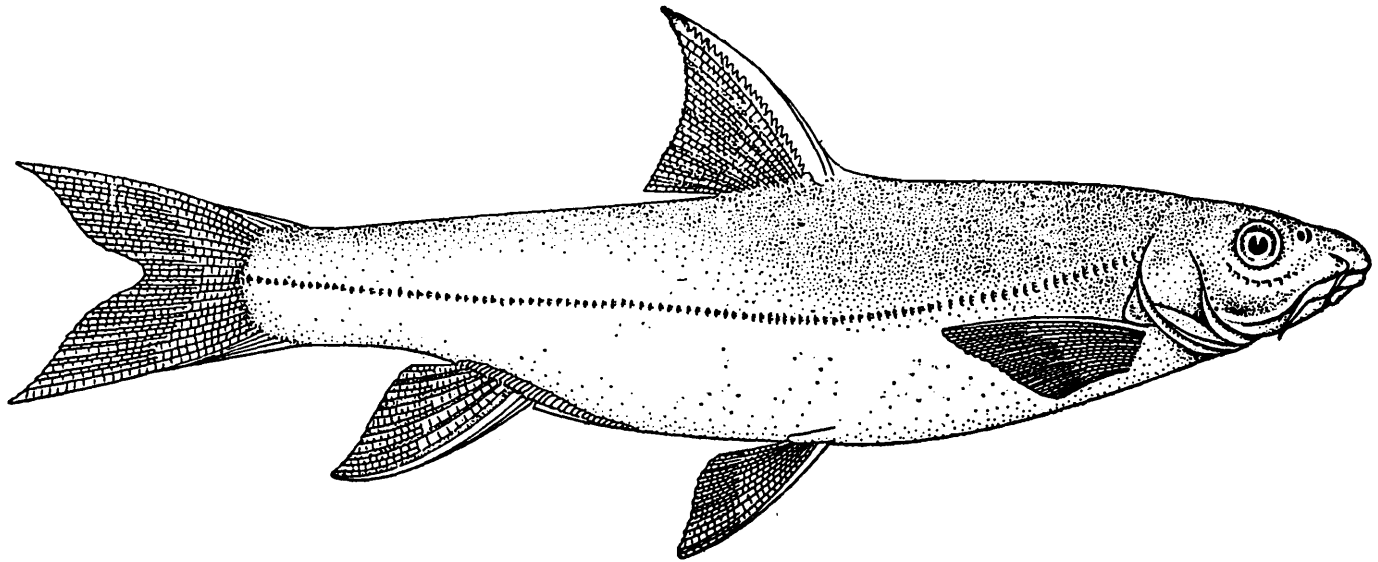


Fig. 24 : *Schizothoracichthys progastus* (McClelland)

Maximum length : 508 mm (Day, 1878).

Distribution : India (along Himalaya) ; Nepal ; Bhutan ; Tibet.

Remarks : It is a game fish of larger rivers of hilly region. It ascends to higher reaches of these rivers during the breeding season. The fry and fingerlings inhabit smaller hill streams.

25. *Schizothorax richardsonii* (Gray)

Snow Trout

Cyprinus richardsonii Gray, 1832, III. *Indian Zool.*, 1, pl. 94, fig. 2 (type-locality : India).

Local name : Asela.

Material examined : The grown up specimens of this species were seen in the local catch from river Ganga.

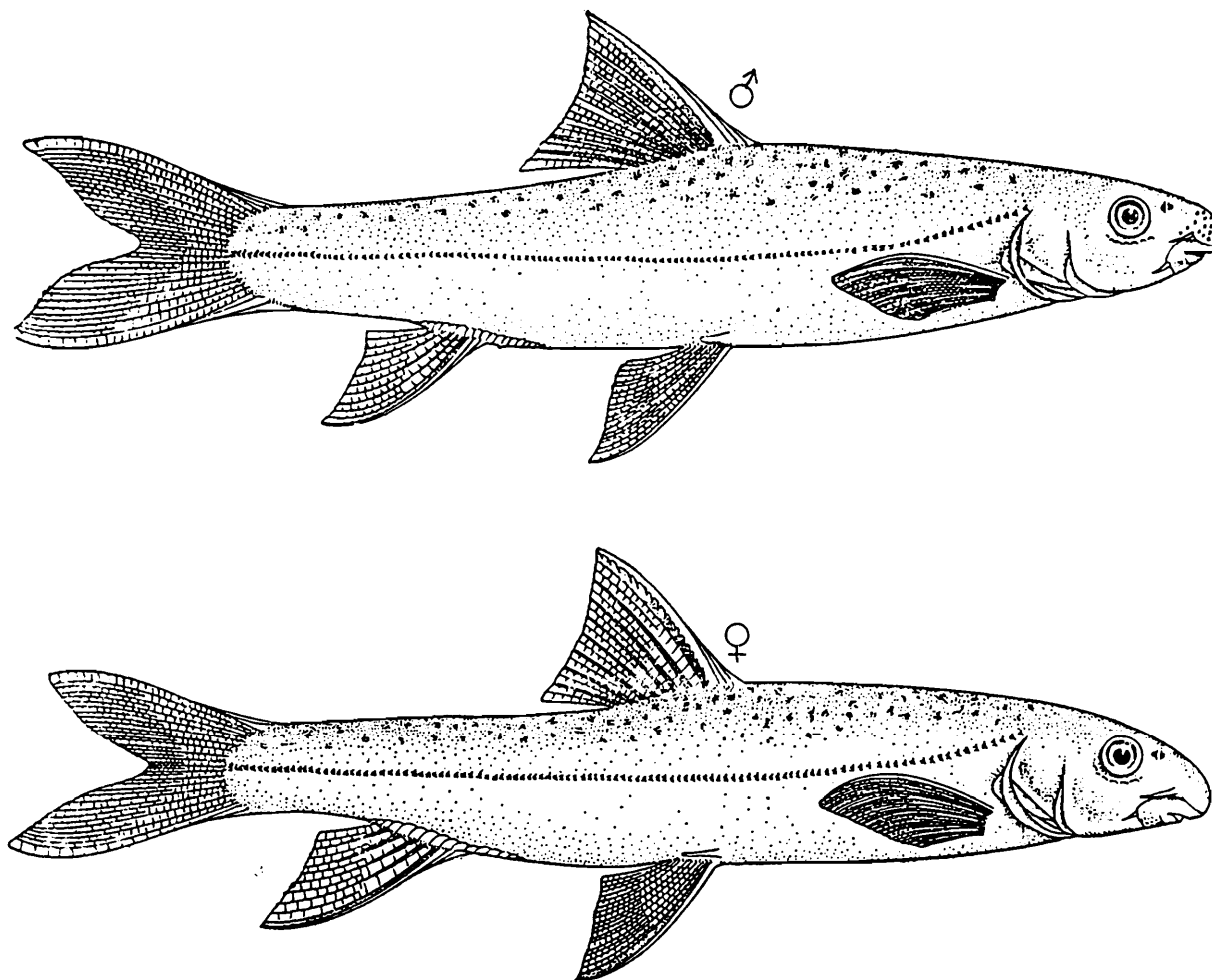


Fig. 25 : *Schizothorax richardsonii* (Gray)—male, female

Maximum length : 610 mm (Day, 1877).

Distribution : India (along Himalaya) ; Afghanistan ; Pakistan ; Nepal ; Bhutan.

Remarks : This species exhibits sexual dimorphism (Misra, 1949 ; Baloni & Tilak, 1986 ; Husain, 1987). In males, the snout is covered with tubercles and the dorsal spine is weak. In females, the snout is smooth, but the dorsal spine is strong. It is a bottom feeder and prefers to live in rocky areas. It is an important game fish.

26. *Nemacheilus beavani* Gunther Beavan's Loach

Nemacheilus beavani Gunther, 1869, *Cat. Fish. Brit. Mus.*, 7 : 350 (type-locality : Kosi river).

Local name : Gadera.

Material examined : 7 exs., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 11 exs., Mohand rao nr. Mohand, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 1 ex. (31 mm), Dholkhand rao, Dholkhand, Dist. Hardwar, 24.iii.1973, Coll. Raj Tilak ; 3 exs. (34-54 mm), Dholkhand rao, Dholkhand, Dist. Hardwar, 27.iv.1973, Coll. Raj Tilak ; 19 exs. (25-40 mm), Mohand rao, Mohand, Dist. Hardwar, 26.ix.1973, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 25.x.1973, Coll. Raj Tilak.

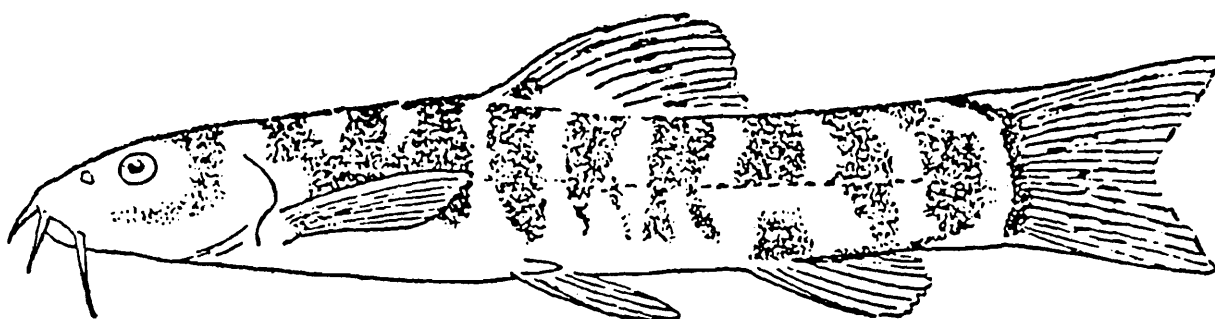


Fig. 26 : *Nemacheilus beavani* Gunther (after Hora, 1935)

Maximum length : 70 mm.

Distribution : India (Kumaon and Garhwal, Northern West Bengal) ; Nepal.

Remarks : It is found in slow moving hill streams at the base of hills. The present material exhibits some variations.

27. *Nemacheilus botia* (Hamilton-Buchanan)

Botia Loach

Cobitis botia Hamilton-Buchanan, 1822. *Fish. Ganges* : 350-351, 394 (type-locality : rivers of north-eastern parts of Bengal).

Local names : Baktia, Gadera, Ghiwa, Nauni.

Material examined : 2 exs., Mohand rao, Mohand, Dist. Hardwar, 27.xi.1964, Coll. T. D. Soota ; 1 ex., Song river nr. Railway Station, Kansrao, Dist. Dehradun, 8.i.1965, Coll. Akhlaq Husain ; 23 exs. (23-54 mm), Song river nr. Railway Bridge, Kansrao, Dist. Dehradun, 22.i.1965, Coll. R. K. Bhatnagar ; 28 exs. (25-63 mm), Song river, Kansrao, Dist. Dehradun, 5.ii.1965, Coll. R. K. Bhatnagar ; 4 exs., Song river nr. Railway Bridge, Kansrao, Dist. Dehradun, 26.ii.1965, Coll. T. D. Soota ; 3 exs., Mohand rao,

Mohand, Dist. Hardwar, 30.iv.1965, Coll. T. D. Soota ; 22 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 20.x.1965, Coll. T. D. Soota ; 8 exs., Suswa river nr. Phandowala FRH, Dist. Dehradun, 4.vi.1965, Coll. T. D. Soota ; 1 ex., Gaj rao, Gaj Forest Block, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 29.vi.1965, Coll. T. D. Soota ; 2 exs., Motichur rao, Motichur, Dist. Dehradun, 30.vi.1965, Coll. T. D. Soota ; 4 exs., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 16.vii.1965, Coll. T. D. Soota ; 4 exs., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 1 ex., Mohand rao, Mohand, Dist. Hardwar, 18.ix.1965, Coll. R. K. Bhatnagar ; 3 exs., Mohand rao, Mohand, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 2 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 1 ex., Bhinj rao, Andheri Forest Block, Dist. Hardwar, 18.iii.1966, Coll. T. D. Soota ; 2 exs., River Ganga, Gaurighat nr. Satyanarain, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 9 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 13.iv.1966, Coll. T. D. Soota ; 13 exs., Suswa river, Clement Town, Dist. Dehradun, 14.iv.1966, Coll. T. D. Soota ; 5 exs., Bhinj rao, Andheri Forest Block, Dist. Hardwar, 25.v.1966, Coll. Asket Singh ; 1 ex., Mohand rao nr. Mohand, Dist. Hardwar, 1.vii.1966, Coll. Asket Singh ; 2 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 16.ix.1966, Coll. Asket Singh ; 8 exs., Song river nr. Kansrao Railway Station, Dist. Dehradun, 17.xii.1966, Coll. Asket Singh ; 4 exs., Song river, Kansrao, Dist. Dehradun, 27.vi.1971, Coll. K. P. Singh ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 28.x.1971, Coll. Asket Singh ; 11 exs. (27-60 mm), Betban rao, Beribara, Dist. Hardwar, 8.ii.1972, Coll. R. N. Chopra ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 15.ix.1972, Coll. Raj Tilak ; 60 exs., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 2 ex. (35-45 mm), Dholkhand rao, Dholkhand, Dist. Hardwar, 24.iii.1973, Coll. Raj Tilak ; 1 ex., Song river, Gaurighat nr. Satyanarain, Dist. Dehradun, 19.iv.1973, Coll. Raj Tilak ; 3 exs. (51-61 mm), Dholkhand rao, Dholkhand, Dist. Hardwar, 27.iv.1973, Coll. Raj Tilak ; 10 ex. (29-38 mm), Mohand rao, Mohand, Dist. Hardwar, 26.ix.1973, Coll. Raj Tilak ; 10 exs., Song river, Satyanarain, Dist. Dehradun, 23.x.1973, Coll. Raj Tilak ; 5 exs. (36-44 mm), Betban rao, Beribara, Dist. Hardwar, 3.xii.1973, Coll. Raj Tilak ; 1 ex. (40 mm), Song river, Pattapul, Kansrao, Dist. Dehradun, 20.v.1976, Coll. Arun Kumar ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 12.xi.1979, Coll. Akhlaq Husain ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 26.xii.1979, Coll. Akhlaq Husain ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 20.ii.1980, Coll. Akhlaq Husain ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 10.iii.1980, Coll. Akhlaq Husain ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 22.iv.1980, Coll. Akhlaq Husain ; 9 exs., Song river, Satyanarain, Dist. Dehradun, 14.v.1980, Coll. Akhlaq Husain ; 1 ex., Bhinj rao, Andheri Forest Block, Dist. Hardwar, 28.x.1986, Coll. N. K. Sinha ; 15 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 8.i.1987, Coll. Raj Tilak ; 5 exs., Small stream, *ca*

6 km north-west of Kansrao FRH, Dist. Dehradun 8.i.1987, Coll. Raj Tilak ; 25 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 9.i.1987, Coll. Raj Tilak ; 27 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 13.i.1987, Coll. N. K. Sinha ; 2 exs. (max. 63 mm), Song river nr. Kansrao FRH, Dist. Dehradun, 22.i.1987, Coll. R. N. Chopra ; 1 ex., Suswa river nr. FRH, Phandowala, Dist. Dehradun, 14.v.1987, Coll. Raj Tilak ; 8 exs., Suswa river nr. FRH, Phandowala, Dist. Dehradun, 18.v.1987, Coll. N. K. Sinha ; 2 exs., Small stream nr. Phandowala, ca 2 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 2 exs., Small stream nr. Phandowala, ca 4 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 7 exs., Suswa river, Phandowala, Dist. Dehradun, 21.vi.1987, Coll. Akhlaq Husain ; 11 exs., Small stream, ca 5 km east of FRH, Chila, Dist. Pauri, 11.vi.1987, Coll. N. K. Sinha ; 2 exs., Small stream, ca 5 km west of FRH, Chila, Dist. Pauri, 12.vi.1987, Coll. N. K. Sinha ; 1 ex., Ghasi Ram sot nr. FRH, Chila, Dist. Pauri, 9.ix.1987, Coll. Raj Tilak ; 3 exs., Rawasan river, Laldang, Dist. Pauri, 10.ix.1987, Coll. Raj Tilak ; 2 exs., Ghasi Ram sot nr. FRH, Chila, Dist. Pauri, 12.ix.1987, Coll. Raj Tilak ; 8 exs., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak ; 44 exs., Motichur rao, Motichur, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak.

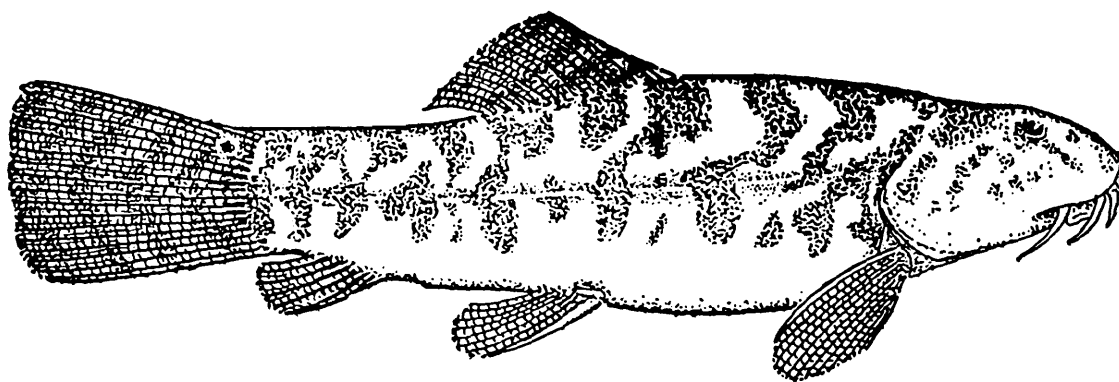


Fig. 27 : *Nemacheilus botia* (Hamilton - Buchanan)

Maximum length : 78 mm (Tilak, 1991).

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Myanmar ; Sri Lanka.

Remarks : This species exhibits sexual dimorphism (Husain, 1987). In males, there is a club-shaped fleshy appendage below the anterior one-third of eye. The females lack this character. It is a bottom living loach of slow moving streams,

28. *Nemacheilus corica* (Hamilton-Buchanan)

Corica Loach

Cobitis corica Hamilton-Buchanan, 1822. *Fish. Ganges* : 359, 395 (type-locality : river Kosi).

Local names : Gadera, Nauni.

Material examined : 1 ex., Motichur rao, Matichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 1 ex. (52 mm), Song river, Pattapul, Kansrao, Dist. Dehradun, 20.v.1976, Coll. Arun Kumar.

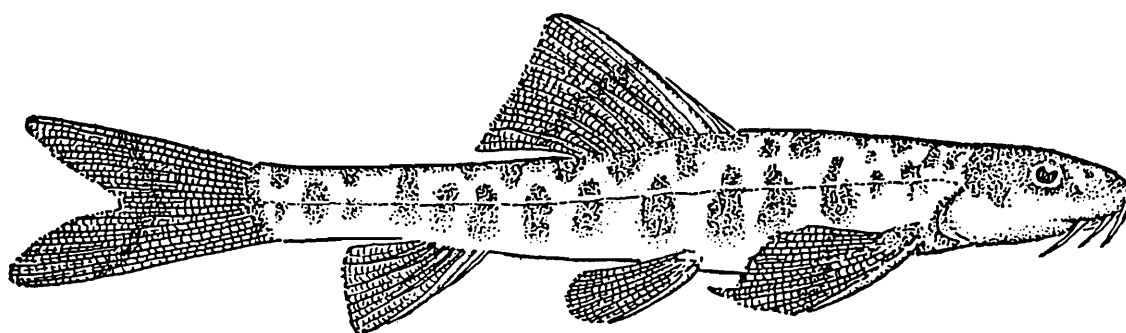


Fig. 28 : *Nemacheilus corica* (Hamilton – Buchanan)

Maximum length : 53 mm (Husain, 1987).

Distribution : India (along the base of Himalaya) ; Pakistan ; Nepal ; Bangladesh.

Remarks : This species exhibits sexual dimorphism (Tilak, 1971 ; Husain, 1987) by the presence of a club-shaped fleshy appendage below the anterior margin of eye in the males. The females lack this structure. It prefers sandy bed around stones.

29. *Nemacheilus dayi* Hora

Day's Loach

Nemacheilus savona Day (*nec.* Hamilton-Buchanan), 1878, *Fish. India* : 619-620, pl. 155, fig. 8 (type-locality : Bengal and N. W. Provinces).

Noemacheilus denisonii : Husain (*nec.* Day). 1975, *Cheetal*, 16 (4) : 56 (Rajaji Sanctuary, U. P.).

Local names : Gadera, Nauni.

Material examined : 30 exs., Small stream, Asarori Forest Block, Dist. Dehradun, 4.vi.1975, Coll. T.D. Soota ; 12 exs., Small stream nr. Phandowala, ca 2 km from Clement

Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 1 ex., Small stream nr. Phandowala, *ca* 4 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain.

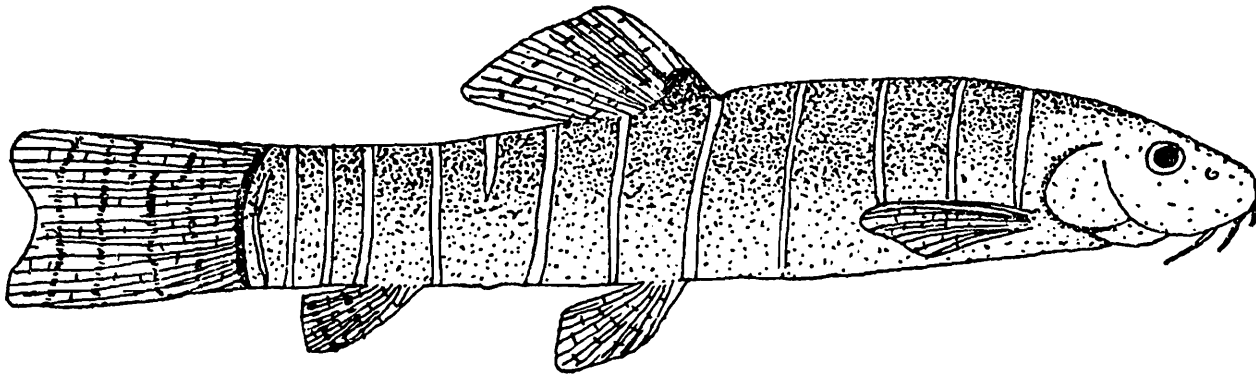


Fig 29 : *Nemacheilus dayi* Hora

Maximum length : 42 mm (Day, 1878).

Distribution : India (Uttar Pradesh, Bihar, West Bengal, Madhya Pradesh) ; Bangladesh.

Remarks : This species is restricted to slow moving streams at lower altitudes.

30. *Nemacheilus doonensis* Tilak & Husain Dehradun Loach

Noemacheilus doonensis Tilak & Husain, 1977. *Sci. & Cult.*, 43 (3) : 133-135, fig. 1a-c (type-locality : Small stream near village Kandholi on way to Doonga and Soor Sahab wali khal—Small stream nr. Asarori, Dist. Dehradun, Uttar Pradesh).

Local names : Gadera, Nauni.

Material examined : 3 exs., Small stream, Asarori Forest Block, Dist. Dehradun, 4.vi.1965, Coll. T.D. Soota ; 89 exs., Soor Sahab wali khal, Asarori, Dist. Dehradun, 11.vi.1965, Coll. T.D. Soota ; 5 exs., River Ganga, Gaurighat nr. Satyanarain, Dist. Dehradun, 12.iv.1966, Coll. T.D. Soota ; 3 exs., Dholkhand rao nr. Dholkhand FRH, Dist. Hardwar, 27.x.1986, Coll. N. K. Sinha ; 1 ex. (28 mm), Song river nr. Kansrao FRH, Dist. Dehradun, 22.i.1987, Coll. R. N. Chopra ; 7 exs., Small stream, Chila Forest, Dist. Pauri, 2.vi.1987, Coll. J. C. Tripathi ; 7 exs. Small stream, *ca* 5 km east of FRH, Chila, Dist. Pauri, 11.vi.1987, Coll. N.K. Sinha.

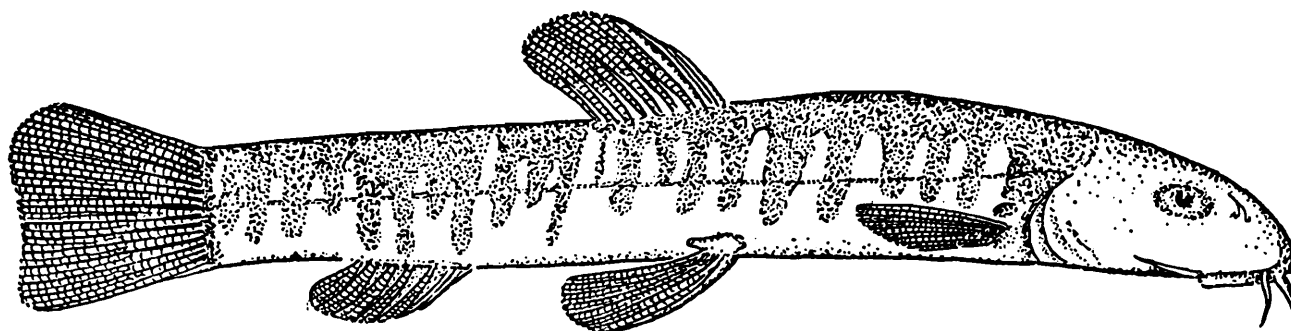


Fig. 30 : *Nemacheilus doonensis* Tilak & Husain

Maximum length : 34 mm (Tilak & Husain, 1977).

Distribution : India (Uttar Pradesh : Dehradun dist.).

Remarks : It is a small sized loach described by the authors (Tilak & Husain, 1977) from the area. It inhabits slow moving hill streams.

31. *Nemacheilus rupecula* (McClelland)

Rupecula Loach

Schistura rupecula McClelland, 1838, *J. Asiat. Soc. Beng.*, 7 : 948, pl. 55, fig. 3 (type-locality : Mountain streams at Shimla).

Local names : Gadera, Nauni.

Material examined : 7 exs., Small stream, Asarori Forest Block, Dist. Dehradun 4.vi.1965, Coll. T.D. Soota ; 39 exs., Small stream, Dehradun-Mohand road, Dist. Hardwar, 16.vii.1965, Coll. T.D. Soota ; 10 exs. (35-57 mm), Mohand rao nr. Mohand, Dist. Hardwar, 1.vii.1966, Coll. Asket Singh.

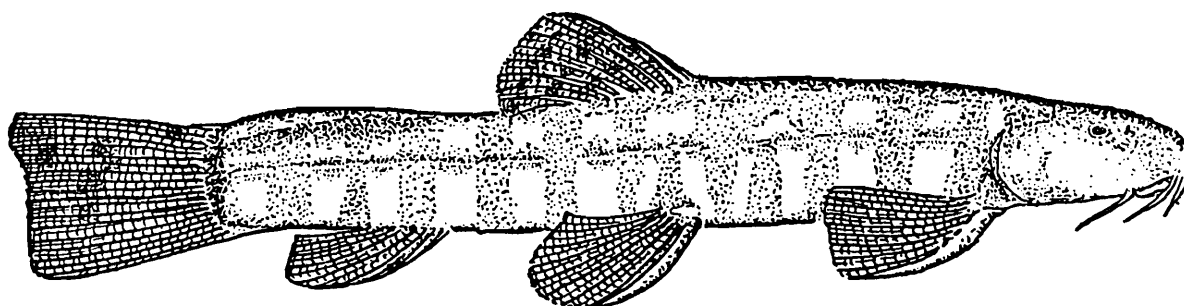


Fig. 31 : *Nemacheilus rupecula* (McClelland)

Maximum length : 102 mm (Hora & Mukerji, 1935).

Distribution ; India (along Himalaya) ; Nepal ; Bangladesh ; Myanmar.

Remarks : It is found mostly in lesser Himalayan zone. However, stray examples may get washed down to lower altitude and settle there.

32. *Nemacheilus savona* (Hamilton-Buchanan) Savon Loach

Cobitis savona Hamilton-Buchanan, 1822, *Fish. Ganges* : 357-358, 394 (type-locality : Kosi river).

Local names : Gadera, Nauni, Savna.

Material examined : 1 ex. (32 mm), Song river, Pattapul, Kansrao, Dist. Dehradun, 16.iii.1978, Coll. Raj Tilak ; 1 ex., Mohand rao, Mohand, Dist. Hardwar, 17.ix.1987, Coll. Raj Tilak ; 1 ex., Small stream nr. Mohand FRH, Dist. Hardwar, 17.ix.1987, Coll. Raj Tilak.

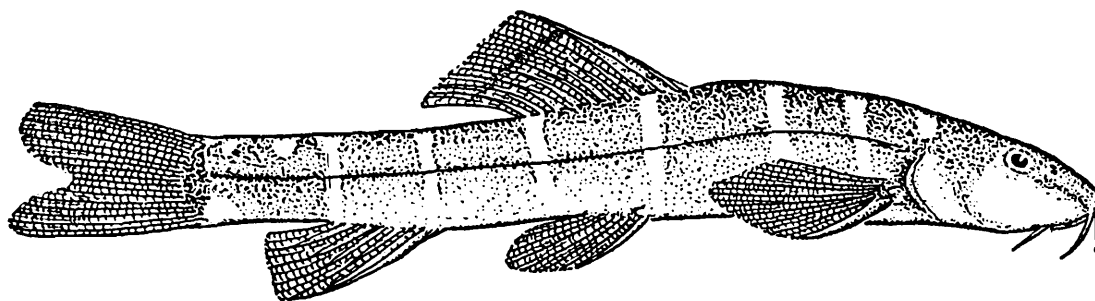


Fig. 32 : *Nemacheilus savona* (Hamilton–Buchanan)

Maximum length : 40 mm (Husain, 1987).

Distribution : India (Uttar Pradesh, Bihar, West Bengal, Assam) ; Nepal, Bangladesh.

Remarks : It is a small sized loach found in slow moving hill streams.

33. *Botia rostrata* Gunther Gangetic Loach

Botia rostrata Gunther, 1868. *Cat. Fish. Brit. Mus.*, 7 : 367 (type-locality : Bengal, Ganges).

Botia geto Day (nec. Hamilton-Buchanan) (in part), 1878, *Fish. India* : 606-607, pl. 154, fig. 2 ; Day (nec. Hamilton-Buchanan) (in part), 1889, *Faun. Brit. India Fish*, 1 : 216-217.

Botia dayi Hora, 1932. *Rec. Indian Mus.*, 34 (4) : 571-573 ; Banarescu & Nalbant, 1968. *Mitt. Hamburg. Zool. Mus. Inst.* 65 : 327-351.

Local name : Boto.

Material examined : 1 ex., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 26.iii.1965, Coll. T.D. Soota.

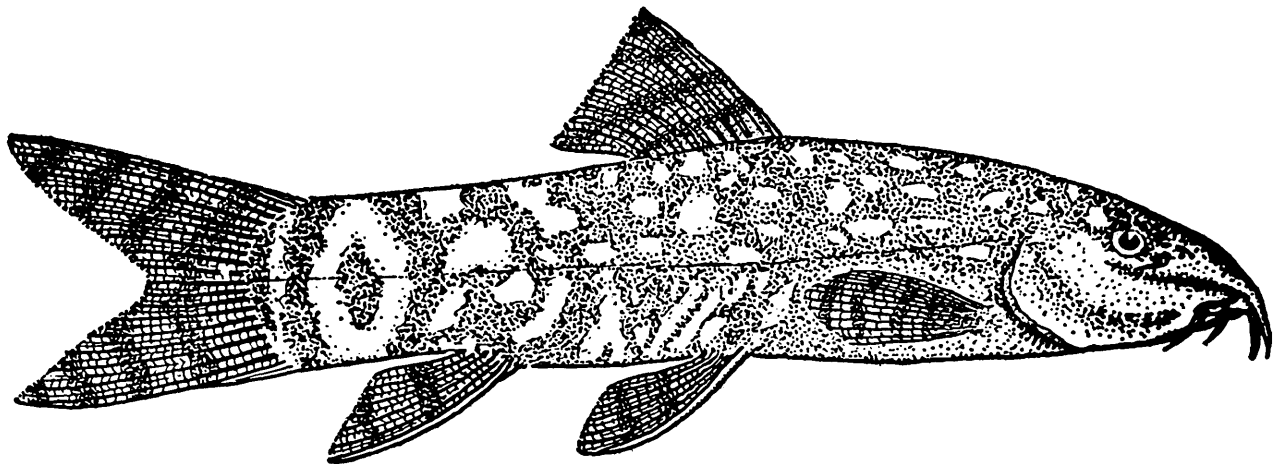


Fig. 33 : *Botia rostrata* Gunther

Maximum length : 122 mm (Misra, 1962).

Distribution : India (along Himalaya, Madhya Pradesh) ; Pakistan.

Remarks : It hides itself in crevices and among stones.

34. *Lepidocephalus guntea* (Hamilton-Buchanan) Guntea Loach

Cobitis guntea Hamilton-Buchanan, 1822. *Fish. Ganges* : 353, 394 (type-locality : ponds and fresh water rivers of Bengal).

Local names : Ghiwa, Nauni.

Material examined: 4 exs., Mohand rao, Mohand, Dist. Hardwar, 27.xi.1964, Coll. T.D. Soota ; 1 ex. (53 mm), Song river, Kansrao Railway Bridge, Dist. Dehradun, 22.i.1965, Coll. R. K. Bhatnagar ; 3 exs. (60-67 mm), Song river, Kansrao, Dist. Dehradun, 5.ii.1965, Coll. R.K. Bhatnagar ; 5 exs., Ranipur rao, Ranipur Forest, Dist. Hardwar, 24.ii.1965, Coll. T.D. Soota ; 3 exs., Song river nr. Railway Bridge, Kansrao, Dist. Dehradun, 26.ii.1965, Coll. T.D. Soota ; 1 ex., Mohand rao, Mohand, Dist. Hardwar, 30.iv.1965, Coll. T.D. Soota ; 4 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 20.v.1965, Coll. T. D. Soota ; 1 ex., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 11.vi.1965, Coll. T.D. Soota ; 14 exs., Ranipur rao, Ranipur, Dist. Hardwar, 14.vii.1965, Coll. T.D. Soota ; 1 ex., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T.D. Soota ; 13 exs., Mohand rao nr. Mohand, Dist. Hardwar, 8.ii.1966, Coll. T.D. Soota ; 1 exs., Bhinj rao, Andheri Forest Block, Dist. Hardwar, 18.iii.1966, Coll. T.D. Soota ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 7.iv.1966, Coll. T.D. Soota ; 47 exs., Suswa river, Clement Town, Dist. Dehradun, 14.iv.1966, Coll. T.D. Soota ; 7 exs., Mohand rao nr. Mohand, Dist. Hardwar, 1.vii.1966, Coll. Asket Singh ; 4 exs., Song river nr. Kansrao Railway Station, Dist. Dehradun, 17.xii.1966, Coll. Asket Singh ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 23.iv.1971, Coll. J. C. Tripathi ; 4 exs., Song river, Kansrao, Dist. Dehradun. 27.v.1971, Coll. K.P. Singh ; 3 exs., Ranipur rao, Ranipur, Dist. Hardwar, 8.ii.1972, Coll. R.N.Chopra ; 9 exs. (49-60 mm), Betban rao, Beribara, Dist. Hardwar, 8.ii.1972, Coll. R.N. Chopra ; 1 ex. (59 mm), Gaj rao, Gaj Forest Block, Dist. Hardwar, 15.ii.1972, Coll. R. N. Chopra ; 4 exs., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972 ; Coll. Raj Tilak ; 3 exs. (48-66 mm), Dholkhand rao, Dholkhand, Dist. Hardwar, 24.iii.1973, Coll. Raj Tilak ; 19 exs. (47-60 mm), Ranipur rao, Ranipur, Dist. Hardwar, 24.iii.1973, Coll. Raj Tilak ; 7 exs. (35-51 mm), Mohand rao, Mohand, Dist. Hardwar, 26.ix.1973, Coll. Raj Tilak ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 23.x.1973, Coll. Raj Tilak ; 78 exs. (33-60 mm), Betban rao, Beribara, Dist. Hardwar, 3 xii.1973, Coll. Raj Tilak ; 1 ex., Song river, Pattapul, Kansrao, Dist. Dehradun, 16.iii.1978 Coll. Raj Tilak ; 4 exs., Song river, Satyanarian, Dist. Dehradun, 26.xii.1979, Coll. Akhlaq Husain ; 7 exs., Song river, Satyanarain, Dist. Dehradun, 20.ii.1980, Coll. Akhlaq Husain ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 10.iii.1980, Coll. Akhlaq Husain ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 3.xii.1985, Coll. R.N. Chopra ; 3 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 8.i.1987, Coll. Raj Tilak ; 32 exs., Small stream, *ca* 6 km north-west of Kansrao FRH, Dist. Dehradun, 8.i.1987, Coll. Raj Tilak ; 12 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 9.i.1987, Coll. Raj Tilak ; 9 exs., Song river nr. Kansrao FRH, Dehradun, 9.i.1987, Coll. Raj Tilak ; 6 exs., Song river nr. Kansrao FRH, Dist Dehradun, 13.i.1987, Coll. N.K. Sinha ; 15 exs., Song river nr. Kansrao Railway Station, Dist. Dehradun, 14.i.1987, Coll. N.K. Sinha ; 10 exs., Song river ; Kansrao Forest, Dist. Dehradun,

20.i.1987, Coll. J.C. Tripathi ; 17 exs. (max. 58 mm), Song river nr. Kansrao FRH, Dist. Dehradun, 22.i.1987, Coll. R. N. Chopra ; 1 ex., Suswa river nr. FRH, Phandowala, Dist. Dehradun, 14.v.1987, Coll. Raj Tilak ; 7 exs., Small stream, ca 10 km east of Phandowala FRH, Dist. Dehradun, 15.v.1987, Coll. Raj Tilak ; 24 exs., Small stream nr. Phandowala, ca 2 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 36 exs., Small stream nr. Phandowala, ca 4 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 9 exs., Ghasi Ram sot, Chila, Dist. Pauri, 3.vi.1987, Coll. Raj Tilak ; 1 ex., Ghasi Ram sot nr. FRH, Chila. Dist. Pauri, 9.ix.1987, Coll. Raj Tilak ; 8 exs., Ranipur rao, Ranipur, Dist. Hardwar, 15.ix.1987, Coll. Raj Tilak.

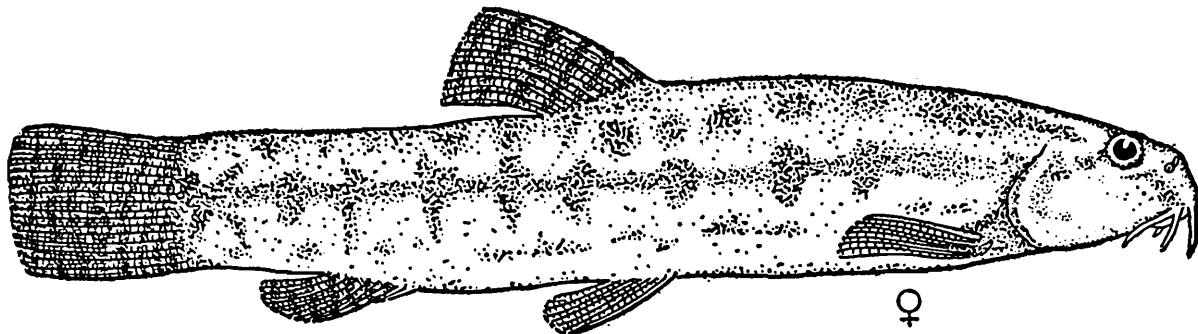


Fig. 34 : *Lepidocephalus guntea* (Hamilton – Buchanan)—female

Maximum length : 150 mm (Talwar & Jhingran, 1991).

Distribution : India (Northern India) ; Pakistan ; Nepal ; Bangladesh ; Myanmar ; Thailand.

Remarks : This species exhibits sexual dimorphism (Banarescu & Nalbant, 1968 ; Tilak & Husain, 1979, 1981 ; Saksena, 1985 ; Husain, 1987). In males, the two inner rays of pectoral fin are fused and ossified, the pectoral fin is longer than head and there is a dark lateral band on the body. In females, the pectoral rays are free, pectoral fin shorter than head and lateral band is not prominently marked. It lives near the banks of slow moving streams with muddy bed.

35. *Aorichthys seenghala* (Sykes) Giant River Catfish

Platyostoma seenghala Sykes, 1838 *Trans. Zool. Soc. Lond.*, 2 : 371, pl. 65. fig. 2 (type locality : Mota Mola river, Pune).

Local name : Singara.

Material examined : The specimens were not collected by the present authors, but included the species on the basis of reports from local fishermen and the record by Grover (1970) from Song river near Raiwala.

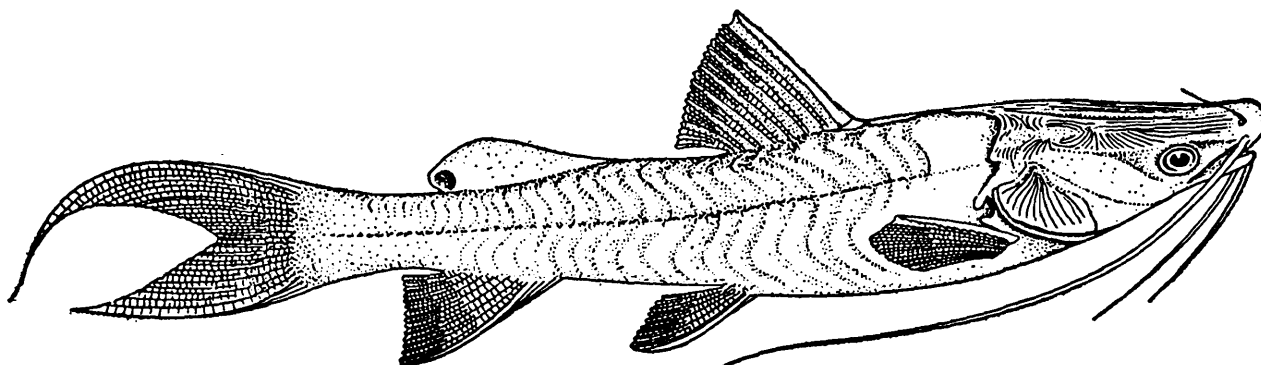


Fig. 35 : *Aorichthys seenghala* (Sykes)

Maximum length : 1500 mm (Jayaram, 1977).

Distribution : India ; Pakistan ; Afghanistan ; Nepal ; Bangladesh ; China.

Remarks : This species exhibits sexual dimorphism (Bhatt, 1970). The males possess a minute urino-genital papilla, especially during the breeding season, which is absent in females. It is an important giant catfish.

36. *Mystus bleekeri* (Day)

Day's *Mystus*

Bagrus keletius Bleeker, 1849. *Nat. Gen. Arch. Ned. Ind.*, 3 (2) : 135 (type-locality : Bengal).

Local name : Kater.

Material examined : 1 ex., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 1 ex. (114 mm), Song river, Pattapul, Kansrao, Dist. Dehradun, 20.v.1976, Coll. Arun Kumar.

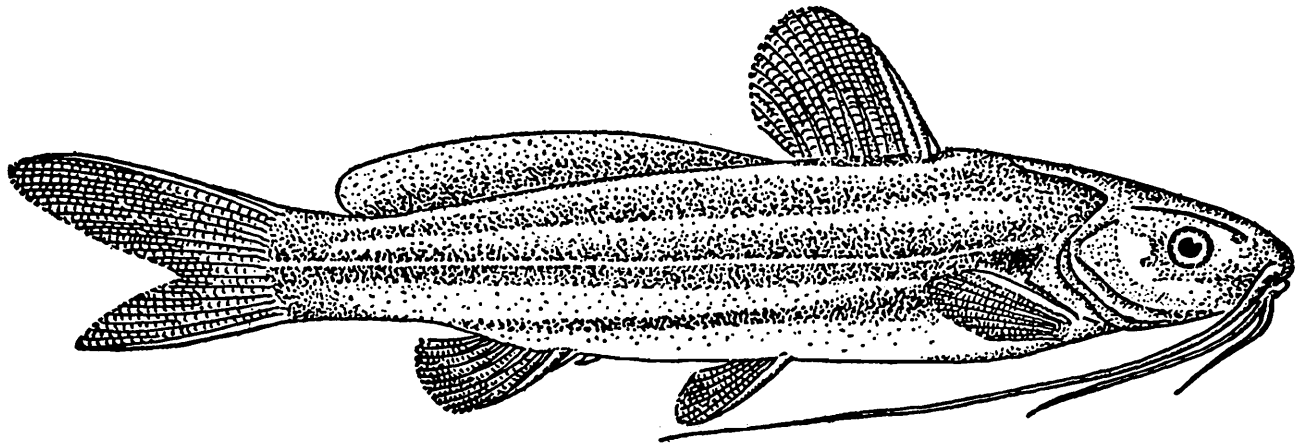


Fig. 36 : *Mystus bleekeri* (Day)

Maximum length : 200 mm (Soni & Srivastava, 1979).

Distribution : India (Uttar Pradesh, Himachal Pradesh, Punjab, Rajasthan, Gujarat, Madhya Pradesh, Orissa, Bihar, West Bengal, Assam, Manipur); Pakistan; Nepal; Bangladesh; Myanmar; Malayasia; Indonesia.

Remarks : This species exhibits sexual dimorphism (Husain, 1987) by the presence of an elongated urino-genital papilla in the males which is very small in females.

37. *Mystus vittatus* (Bloch)

Fiddler Fish

Silurus vittatus Bloch, 1797, *Ichthyol. Hist. nat.*, 11 : 40, pl. 371, fig. 2 (type-locality : Tranquebar).

Local name : Tengra.

Material examined : 1 ex., Song river nr. Railway Bridge, Kansrao, Dist. Dehradun, 26.ii.1965, Coll. T. D. Soota ; 1 ex., Song river, Pritinagar nr. Gaurighat, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 25 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 2 exs., Song river, Gaurighat nr. Satyanarain, Dist. Dehradun, 19.iv.1973, Coll. Raj Tilak,

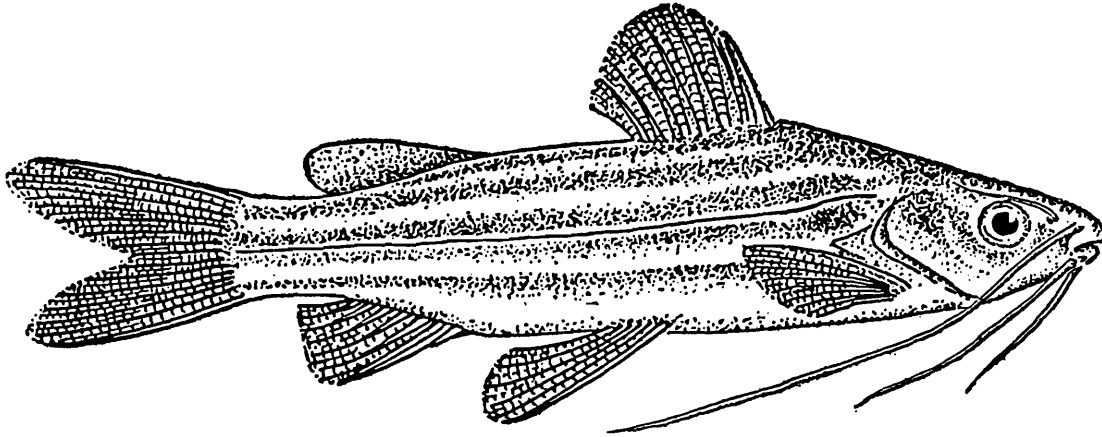


Fig. 37 : *Mystus vittatus* (Bloch)

Maximum length : 203 mm (Day, 1877).

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Sri Lanka ; Thailand ; Malayasia.

Remarks : This species exhibits sexual dimorphism (Bhatt, 1971 ; Bais, 1972 ; Swarup and Swaroop, 1975 ; Tandon and Gupta, 1985). The males possess a well developed urino-genital papilla and spear-shaped thickening at the base of caudal fin. The females lack these characters, but show a spherical swelling between the pelvic and anal fins. *Mystus tengara* (Hamilton-Buchanan) is synonymous with this species (Hora, 1948 ; Roessel, 1964 ; Menon, 1974 ; Husain, 1987).

38. *Pseudeutropius atherinoides* (Bloch)

Indian Potasi

Silurus atherinoides Bloch, 1794. *Natürg. Ausland. Fische.*, 8 : 48, pl. 371, fig. 1 (type-locality: Tranquebar).

Local name : Tengra.

Material examined : 1 ex. (47 mm), Song river nr. Kansrao FRH, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota.

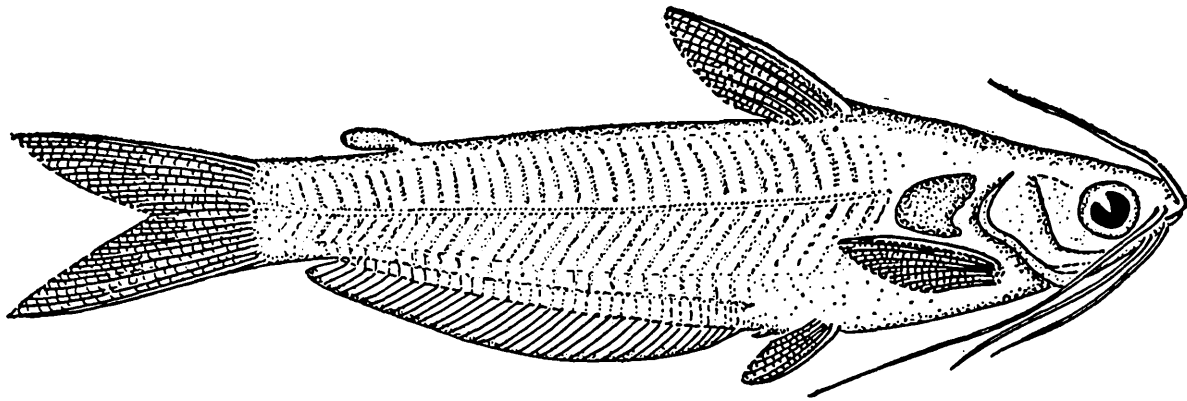


Fig. 38 : *Pseudeutropius atherinoides* (Bloch)

Maximum length : 150 mm (Jayaram, 1977).

Distribution : India (Uttar Pradesh, Punjab, Bihar, West Bengal, Assam, Orissa, Madhya Pradesh, Karnataka, Tamil Nadu, Pondicherry, Kerala) ; Pakistan ; Nepal ; Bangladesh ; Myanmar.

Remarks : This species exhibits sexual dimorphism (Swarup & Swaroop, 1975). In males, the urino-genital papilla is well developed and caudal base thickened. The females lack these characters. It is known among aquarists for silvery colour and small size.

39. **Ompok pabda** (Hamilton-Buchanan)

Butter Fish

Silurus pabda Hamilton-Buchanan, 1822, *Fish. Ganges* : 150-151, 374, pl. 25, fig. 47 (type-locality : ponds and rivers of Bengal).

Local name : Pabda.

Material examined : 1 ex. (140 mm), Song river, Pattapul, Kansrao, Dist. Dehradun, 20.v.1976, Coll. Arun Kumar.

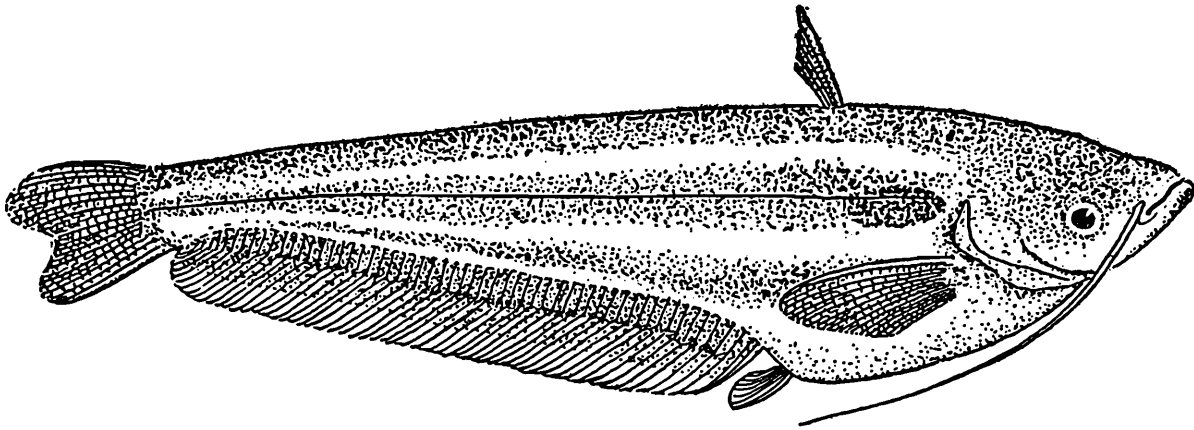


Fig. 39 : *Ompok pabda* (Hamilton – Buchanan)

Maximum length : 172 mm (Parmeswaran et al., 1968).

Distribution : India (Uttar Pradesh, Punjab, Bihar, West Bengal, Orissa, Andhra Pradesh) ; Pakistan ; Afghanistan ; Bangladesh ; Myanmar ; Singapore ; Malayasia.

Remarks : This species exhibits sexual dimorphism (Parmeswaran et al., 1968). The serrations on pectoral spine are more prominent in males than in females. It is found in slow moving streams and is very rare in the area.

40. *Wallago attu* (Schneider) Freshwater Shark

Silurus attu Schneider, 1801. *Syst. Ichth. Blochii* 378, pl. 75 (type-locality : Malabar).

Local names : Lanchi, Parhan.

Material examined ; The specimens were not actually collected, but it is included here, based on the information of local fishermen at Raiwala. The fish has earlier been reported by Grover (1970) from Song river near Doiwala, where it must have ascended from Ganga river during the monsoon months.

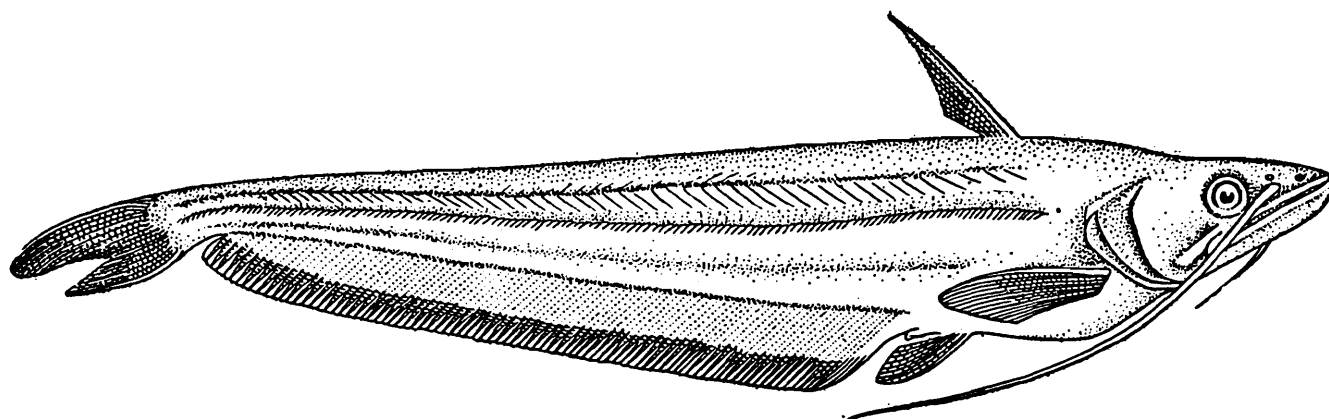


Fig. 40 : *Wallago attu* (Schneider)

Maximum length : 2000 mm (Jayaram, 1977).

Distribution : India ; Pakistan ; Bangladesh ; Myanmar ; China ; Malaysia ; Thailand ; Vietnam ; Kampuchia ; Sumatra ; Java.

Remarks : This species exhibits sexual dimorphism (Husain, 1970, 1987). In mature males, the pectoral spine is strongly and prominently denticulated. In females, the spine is weakly built and finely serrated. It lives in large rivers. It is one of the largest freshwater catfishes. It gives good sport.

41. *Amblyceps mangois* (Hamilton-Buchanan) Indian Torrent Catfish

Pimelodus mangois Hamilton-Buchanan, 1822, *Fish. Ganges* : 199-201, 379 (type-locality : tanks of northern Bihar).

Local name : Chhoti singhi.

Material examined : 1 ex., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 1 ex., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 1 ex., Mohand rao nr. Mohand, Dist. Hardwar, 18.ix.1965, Coll. R. K. Bhatnagar ; 2 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 6.xii.1965, Coll. T. D. Soota ; 2 exs., River Ganga, Gaurighat nr. Satyanarain, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 1 ex., Motichur rao, nr. Motichur FRH, Dist. Dehradun, 13.iv.1966, Coll. T. D. Soota ; 7 exs., Suswa river, Clement Town, Dist. Dehradun, 14.iv.1966, Coll. T. D. Soota ; 1 ex., Motichur rao nr. Motichur FRH, Dist.

Dehradun, 16.ix.1966. Coll. Asket Singh ; 1 ex., Song river, Kansrao, Dist. Dehradun, 27.v.1971, Coll. K. P. Singh ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 15.ix.1972, Coll. Raj Tilak ; 2 exs., Motichur rao, Motichur, Dist. Dehradun, 28.xii. 1972, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 2.iii.1973, Coll. Raj Tilak ; 1 ex. (48 mm), Mohand rao, Mohand, Dist. Hardwar, 26.ix.1973, Coll. Raj Tilak ; 1 ex. (50 mm), Betban rao, Beribara, Dist. Hardwar, 3.xii. 1973, Coll. Raj Tilak ; 9 exs. (41-60 mm), Song river, Pattapul, Kansrao, Dist. Dehradun, 20.v.1976, Coll. Arun Kumar ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 12.xi.1979, Coll. Akhlaq Husain ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 10.iii.1980, Coll. Akhlaq Husain ; 13 ex., Song river, Satyanarain, Dist. Dehradun, 14.v.1988, Coll. Akhlaq Husain ; 2 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 8.i.1987, Coll. Raj Tilak ; 5 exs. (max. 47 mm), Song river nr. Kansrao FRH, Dist. Dehradun, 22.i.1987, Coll. R. N. Chopra ; 11 exs., Suswa river nr. FRH, Phandowala, Dist. Dehradun, 14.v.1987, Coll. Raj Tilak ; 2 exs., Suswa river nr. FRH, Phandowala, Dist. Dehradun, 18.v.1987, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak.

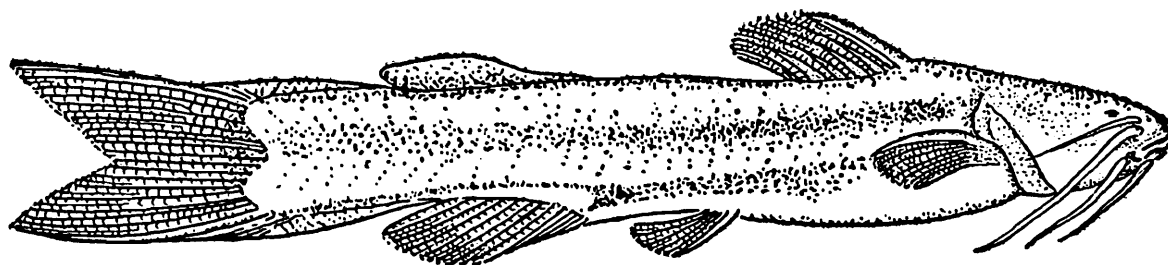


Fig. 41 : *Amblyceps mangois* (Hamilton – Buchanan)

Maximum length : 150 mm (Jayaram, 1977).

Distribution : India (Northern States, Madhya Pradesh) ; Afghanistan ; Pakistan ; Myanmar ; Thailand ; Vietnam ; Malaysia.

Remarks : On handling, the fish may inflict serious injury by its strong pectoral spines. It prefers pebbly-bed streams.

42. *Glyptothorax pectinopterus* (McClelland)
Sucker Catfish

Glyptosternon pectinopterus McClelland, 1842, *Calcutta J. nat. Hist.*, 2 : 587 (type-locality : Simla).
Glyptothorax brevipinnis brevipinnis : Husain (nec. Hora) 1975. *Cheetal*, 16 (4) : 56 (Rajaji Sanctuary, U. P.).

Local name : Pathar-chatti.

Material examined : 1 ex., Mohand rao, Mohand, Dist. Hardwar, 30.iv.1965, Coll. T. D. Soota ; 1 ex., Mohand rao nr. Lalpul, Mohand, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 1 ex., Mohand rao, nr. Lalpul, Mohand, Dist. Hardwar, 16.vii.1965, Coll. T. D. Soota ; 1 ex., Mohand rao nr. Mohand, Dist. Hardwar, 24.ix.1965, Coll. T. D. Soota ; 1 ex., Mohand rao nr. Mohand, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 2 exs., Mohand rao, nr. Lalpul, Mohand, Dist. Hardwar, 14.iv.1966, Coll. T. D. Soota ; 1 ex., Motichur rao nr. Motichur FRH, Dist. Dehradun, 16.ix.1966, Coll. Asket Singh ; 6 exs., Song river, Satyanarain, Dist. Dehradun, 15.ix.1972, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 23.x.1973, Coll. Raj Tilak ; 2 exs. (92-102 mm), Mohand rao, Mohand, Dist. Hardwar, 30.x.1986, Coll. Raj Tilak ; 21 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 8.i.1987, Coll. Raj Tilak ; 39 exs., (max. 104 mm), Song river nr. Kansrao FRH, Dist. Dehradun, 22.i.1987, Coll. R. N. Chopra ; 1 ex., Suswa river nr. FRH, Phandowala, Dist. Dehradun, 14.v.1987, Coll. Raj Tilak ; 8 exs., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak.

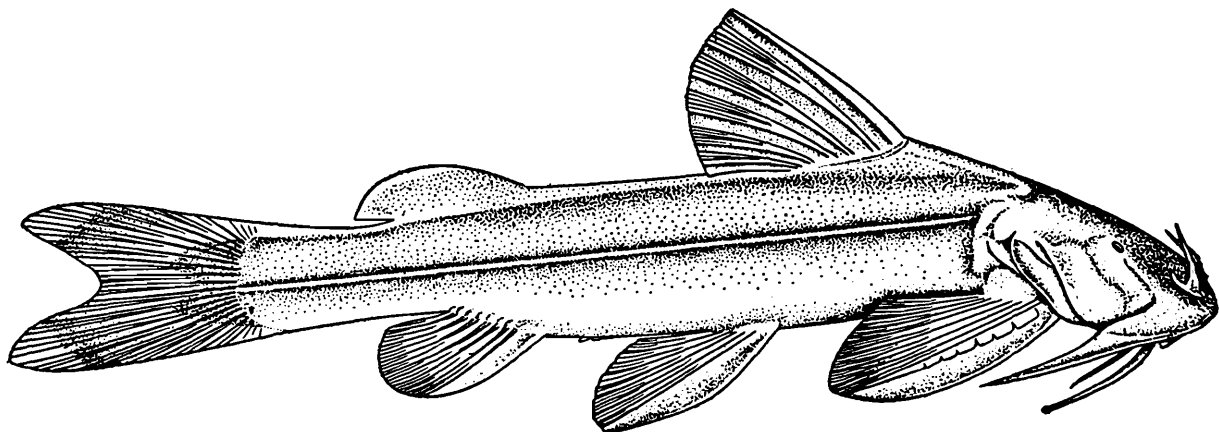


Fig. 42 : *Glyptothorax pectinopterus* (McClelland)

Maximum length : 178 mm in standard length (Talwar & Jhingran, 1991).

Distribution : India (Uttar Pradesh, Punjab, Himachal Pradesh, Jammu & Kashmir) ; Pakistan.

Remarks : This species exhibits sexual dimorphism by the presence of an elongated urino-genital papilla in males ; the papilla is smaller in females (Tilak & Husain, 1973 ; Husain, 1987). It is a bottom living fish of torrents and sticks to the stones with the help of sucker on its thorax.

43. Glyptothorax saisii (Jenkins)
Sucker Catfish

Glyptosternum saisii Jenkins, 1910, *Rec. Indian Mus.*, 5 (2) : 128-129, fig. 1, pl. 6 (type locality : Sita nullah, Paresnath hills, Bihar).

Local name : Pathar-chatti.

Material examined : 1 ex., Mohand rao nr. Mohand, Dist. Hardwar (vide Tilak & Husain, 1978).

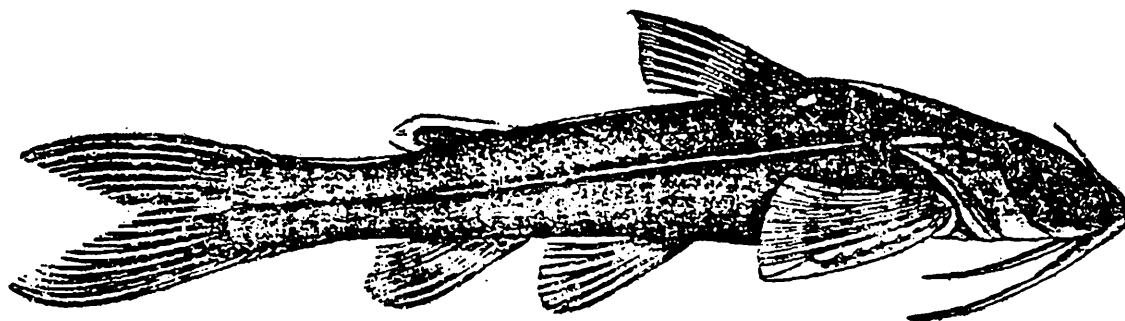


Fig. 43 : *Glyptothorax saisii* (Jenkins)

Maximum length : 70 mm (Hora, 1923).

Distribution : India (Uttar Pradesh, Bihar, Maharashtra).

Remarks : Tilak and Husain (1978) have redescribed this species and extended the range of its distribution to western part of Uttar Pradesh. It lives in slow moving hill streams and attaches itself to stones or rocks with the help of its thoracic sucker.

44. ***Heteropneustes fossilis* (Bloch)**
Scorpion Fish

Silurus fossilis Bloch, 1794, *Naturl. Ausland. Fische*. 8 : 46, pl. 370, fig. 2 (type-locality : Tranquebar).

Local name : Singhi.

Material examined : 1 ex. (138 mm), Song river, Kansrao, Dist. Dehradun, 20.v.1976, Coll. Arun Kumar.

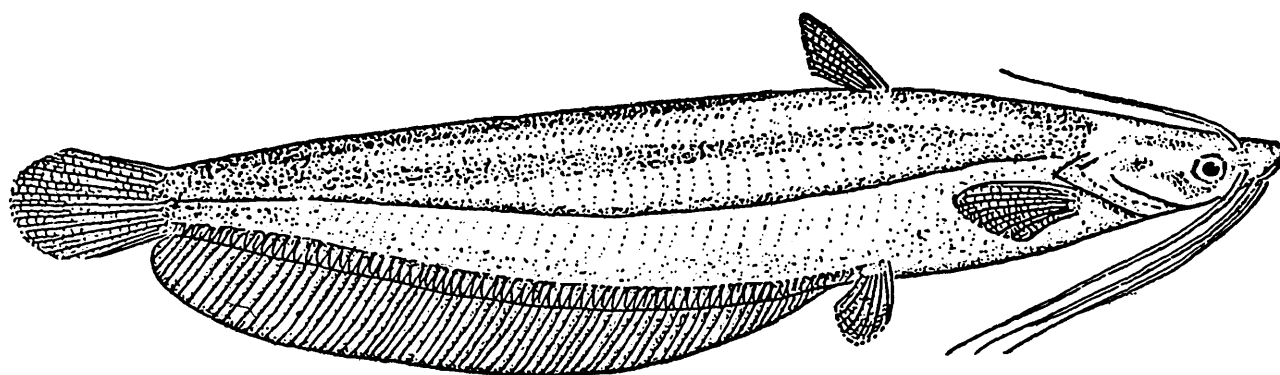


Fig. 44 : *Heteropneustes fossilis* (Bloch)

Maximum length : 305 mm (Day, 1877).

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Myanmar ; Sri Lanka ; Cambodia ; Vietnam ; Laos ; Thailand ; Iraq.

Remarks : This species exhibits sexual dimorphism (Mookerjee et al., 1942 ; Kamalaveni, 1963 ; Sundararaj and Goswami, 1969 ; Bhatt, 1971 ; Dehadrai et al., 1973). The males possess an elongated urino-genital papilla, the females lack this structure. These fishes are much dreaded, because on capture, they may inflict wounds by their bony pectoral spines which are reported to be very poisonous, causing fever and inflammation or even occasionally tetanus (Day, 1877 ; Khan, 1934). The flesh of this fish is known for its invigorating property. It prefers muddy habitat.

45. *Xenentodon cancila* (Hamilton-Buchanan)

Freshwater Garfish, Needle Fish

Esox cancila Hamilton-Buchanan, 1822, *Fish. Ganges* : 213-215, 380, pl. 27, fig. 70 (type-locality : Ponds and smaller rivers of Gangetic provinces).

Local name : Sua.

Material examined : 1 ex., Song river nr. Railway Bridge, Kansrao, Dist. Dehradun, 26.ii.1965, Coll. T. D. Soota ; 1 ex., Suswa river, Clement Town, Dist. Dehradun, 23.vii. 1965, Coll. T. D. Soota ; 2 exs., Song river, Pritinagar nr. Gaurighat, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 7.iv.1966, Coll. T. D. Soota ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 22.iv.1980, Coll. Akhlaq Husain ; 8 exs., Ganga canal seepage, ca. 7 km east of Chila, Dist. Pauri, 11.ix.1987, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak.

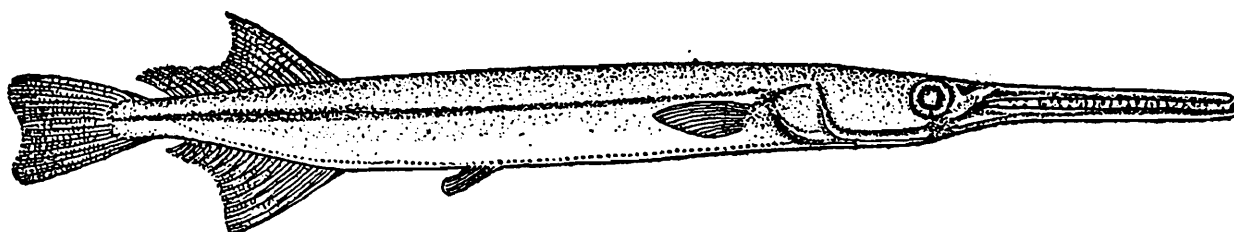


Fig. 45 : *Xenentodon cancila* (Hamilton-Buchanan)

Maximum length : 400 mm (Talwar & Jhingran, 1991).

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Myanmar ; Sri Lanka ; Malaysia ; Thailand ; Borneo ; Sumatra.

Remarks : It, generally, swims in shoals of 5-10 on the surface of water.

46. *Badis badis* (Hamilton-Buchanan)

Dwarf Chameleon Fish

Labrus badis Hamilton-Buchanan, 1822, *Fish. Ganges* : 70-72, 368, pl. 25, fig. 23 (type-locality : Ponds and ditches throughout Gangetic provinces).

Local name : Chiri.

Material examined : 2 exs., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 1 ex., Song river, Gaurighat nr. Satyanarain, Dist. Dehradun, 19.iv.1973, Coll. Raj Tilak ; 1 ex., Motichur rao nr. Motichur FRH, Dist. Dehradun, 9.i.1987, Coll. Raj. Tilak ; 1 ex., Song river nr. Railway Station, Kansrao, 14.i.1987, Coll. N. K. Sinha ; 2 exs., Song river, Kansrao Forest, Dist. Dehradun, 20.i.1987. Coll. J. C. Tripathi ; 1 ex., Small stream, *ca* 10 km east of Phandowala FRH, Dist. Dehradun, 15.v.1987, Coll. Raj Tilak ; 8 exs., Small stream nr. Phandowala, *ca* 2 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 7 exs., Small stream nr. Phandowala, *ca* 4 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 1 ex., Ganga canal seepage, *ca*. 7 km east of Chila, Dist. Pauri, 11.ix.1987, Coll. Raj Tilak ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak ; 4 exs., Song river, Satyanarain, Dist. Dehradun, 14.ix.1987, Coll. Raj Tilak.

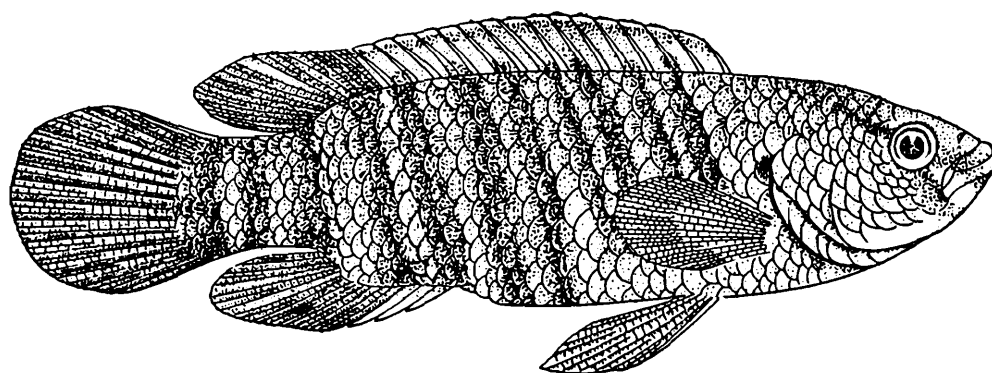


Fig. 46 : *Badis badis* (Hamilton – Buchanan)

Maximum length : 89 mm (Day, 1875).

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Myanmar.

Remarks : It lives in sluggish waters with plenty of vegetation.

47. *Ophiocephalus gachua* Hamilton-Buchanan Asiatic Snakehead

Ophiocephalus gachua Hamilton-Buchanan, 1822, *Fish. Ganges* : 68, 69, 367, pl. 21, fig. 21 (type-locality : ponds and ditches of Bengal).

Local name : Dawla.

Material examined : 4 exs. (70-115 mm), Song river, Kansrao Railway Bridge, Dist. Dehradun, 22.i.1965, Coll. R. K. Bhatnagar ; 9 exs. (50-90 mm), Song river, Kansrao, Dist. Dehradun, 5.ii.1965, Coll. R. K. Bhatnagar ; 2 exs., Ranipur rao, Ranipur Forest, Dist. Hardwar, 24.ii.1965, Coll. T. D. Soota ; 3 exs., Song river nr. Railway Bridge, Kansrao, Dist. Dehradun, 26.ii.1965, Coll. T. D. Soota ; 3 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 20.v.1965, Coll. T. D. Soota ; 1 ex., Soor Sahab wali khal, Asarori, Dist. Dehradun, 11.vi.1965, Coll. T. D. Soota ; 13 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 3 exs., Mohand rao, nr. Lalpul, Mohand, Dist. Hardwar, 11.vi.1965, Coll. T. D. Soota ; 8 exs., Song river, Satyanarain, Dist. Dehradun, 29.vi.1965, Coll. T. D. Soota ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 30.vi.1965, Coll. T. D. Soota ; 22 exs., Ranipur rao, Ranipur, Dist. Hardwar, 14.vii.1965, Coll. T. D. Soota ; 5 exs., Mohand rao, nr. Lalpul, Mohand, Dist. Hardwar, 16.vii.1965, Coll. T. D. Soota ; 3 exs., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 1 ex., Mohand rao nr. Mohand, Dist. Hardwar, 18.ix.1965, Coll. R. K. Bhatnagar ; 8 exs., Mohand rao nr. Mohand, Dist. Hardwar, 24.ix.1965, Coll. T. D. Soota ; 1 ex., Gaj rao, Gaj Forest Block, Dist. Hardwar, 24.ix.1965, Coll. T. D. Soota ; 1 ex., Gaj rao, Gaj Forest Block, Dist. Dehradun, 6.xii.1965, Coll. T. D. Soota ; 2 exs., Mohand rao, Mohand, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 6 exs., Gaj rao, Gaj Forest Block, Dist. Hardwar, 8.ii.1966, Coll. T. D. Soota ; 7 exs., Bhinj rao, Andheri Forest Block, Dist. Hardwar, 25.v.1966, Coll. Asket Singh ; 3 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 16.ix.1966, Coll. Asket Singh ; 8 exs., Song river nr. Kansrao Railway Station, Dist. Dehradun, 17.xii.1966, Coll. Asket Singh ; 2 exs., Motichur rao, Motichur, Dist. Dehradun, 28.x.1971, Coll. Asket Singh ; 1 ex. (62 mm), Gaj rao, Gaj Forest Block, Dist. Hardwar, 15.ii.1972, Coll. R. N. Chopra ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 1 ex. (75 mm), Dholkhand rao, Dholkhand, Dist. Hardwar, 24.ii.1973, Coll. Raj Tilak ; 2 exs. (57-65 mm), Ranipur rao, Ranipur, Dist. Hardwar, 24.iii.1983, Coll. Raj Tilak ; 2 exs. (69-84 mm), Dholkhand rao, Dholkhand, Dist. Hardwar, 27.iv.1973, Coll. Raj Tilak ; 2 exs. (48-84 mm), Mohand rao, Mohand, Dist. Hardwar, 26.ix.1973, Coll. Raj Tilak ; 6 exs. (51-82 mm), Betban rao, Beribara, Dist. Hardwar, 3.xii.1973, Coll. Raj Tilak ; 5 exs., Song river, Pattapul, Kansrao, Dist. Dehradun, 20.v.1976, Coll. Arun Kumar ; 5 exs., Song river, Satyanarain, Dist. Dehradun, 26.xii.1979, Coll. Akhlaq Husain ; 9 exs., Song river, Satyanarain, Dist. Dehradun, 20.ii.1980, Coll. Akhlaq Husain ; 2 exs., Song river, Satyanarain, Dist. Dehradun, 10.iii.1980, Coll. Akhlaq Husain ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 22.iv.1980, Coll. Akhlaq Husain ; 5 exs., Song river, Satyanarain, Dist. Dehradun, 14.v.1980, Coll. Akhlaq Husain ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 10.vii.1980, Coll. Akhlaq Husain ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 3.xii.1985, Coll. R. N. Chopra ; 1 ex., Gaj rao, Gaj Forest Block, Dist. Hardwar, 12.xii.1986, Coll. Raj Tilak ; 7 exs., Small stream, ca. 6 km north-west of Kansrao FRH, Dist.

Dehradun, 8 i.1987, Coll. Raj Tilak ; 1 ex., Song river nr. Railway Station, Kansrao 14.i.1987, Coll. N. K. Sinha ; 4 exs., Song river, Kansrao Forest, Dist. Dehradun, 20.i.1987, Coll. J. C. Tripathi ; 1 ex., Small stream, *ca* 10 km east of Phandowala FRH, Dist. Dehradun, 15.v.1987, Coll. Raj Tilak ; 1 ex., Small stream nr. Phandowala, Dist. Dehradun, 20.v.1987, Coll. R. N. Chopra ; 2 exs., Small stream nr. Phandowala, *ca*. 2 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 1 ex., Small stream nr. Phandowala *ca*. 4 km from Clement Town, Dist. Dehradun, 21.v.1987, Coll. Akhlaq Husain ; 10 exs., Ghasi Ram sot nr. Chila FRH Dist. Pauri, 3.vi.1987, Coll. Raj Tilak ; 11 exs., Ghasi Ram sot nr. Chila FRH, Dist. Pauri, 9.ix.1987, Coll. Raj Tilak ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak ; 1 ex., Motichur rao, Motichur, Dist. Dehradun, 15.ix.1987, Coll. Raj Tilak ; 15 exs., Ranipur rao, Ranipur, Dist. Hardwar, 15.ix.1987, Coll. Raj Tilak ; 1 ex., Small stream nr. Mohand FRH, Dist. Hardwar, 17.ix.1987, Coll. Raj Tilak.

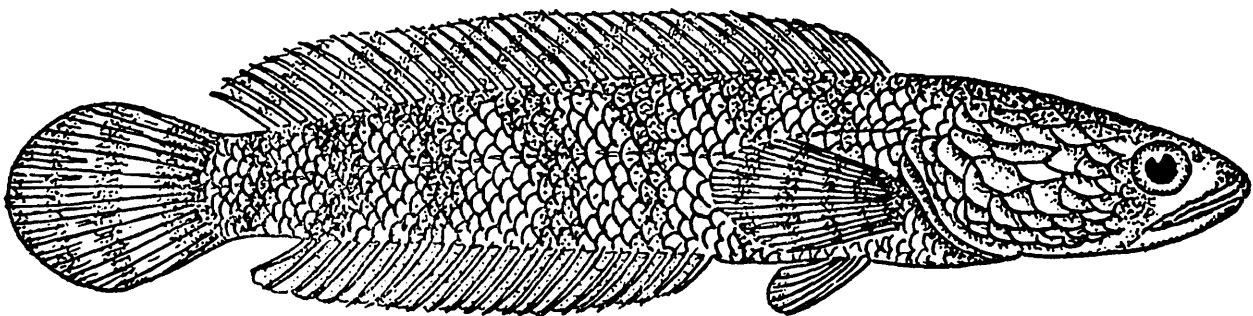


Fig. 47 : *Ophiocephalus gachua* Hamilton-Buchanan

Maximum length : 330 mm (Day, 1876).

Distribution : India ; Pakistan ; Afghanistan ; Iran ; Nepal ; Bangladesh ; Myanmar ; Sri Lanka ; Malaysia ; Thailand ; Indo-China ; China-Yunnan, Hainan ; Sumatra ; Borneo ; Java ; Singapore.

Remarks : It is generally found near the banks of slow moving hill streams. The form without pelvic fins, *Channa orientalis* Bloch & Schneider, is found in Sri Lanka, Myanmar, Java, etc.

48. *Ophiocephalus punctatus* Bloch Spotted Snakehead

Ophiocephalus Punctatus Bloch, 1794, *Naturges, Ausland. Fische.*, 8 : 139, pl. 358 (type-locality : rivers and lakes of Coromandel coast).

Local names : Sauli, Sewal.

Material examined : 1 ex., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 1 ex., Song river, Pritinagar nr. Gaurighat, Dist. Dehradun, 12.iv.1966, Coll. T. D. Soota ; 2 exs., Motichur rao, Motichur, Dist. Dehradun, 28.xii.1972, Coll. Raj Tilak ; 1 ex., Song river, Gaurighat nr. Satyanarain, Dist. Dehradun, 19.iv.1973, Coll. Raj Tilak ; 1 ex., Ghasi Ram sot nr. Chila FRH, Dist. Pauri, 3.vi.1987, Coll. Raj Tilak ; 4 exs., Ganga canal seepage, *ca.* 7 km east of Chila, Dist. Pauri, 11.ix.1987, Coll. Raj Tilak.

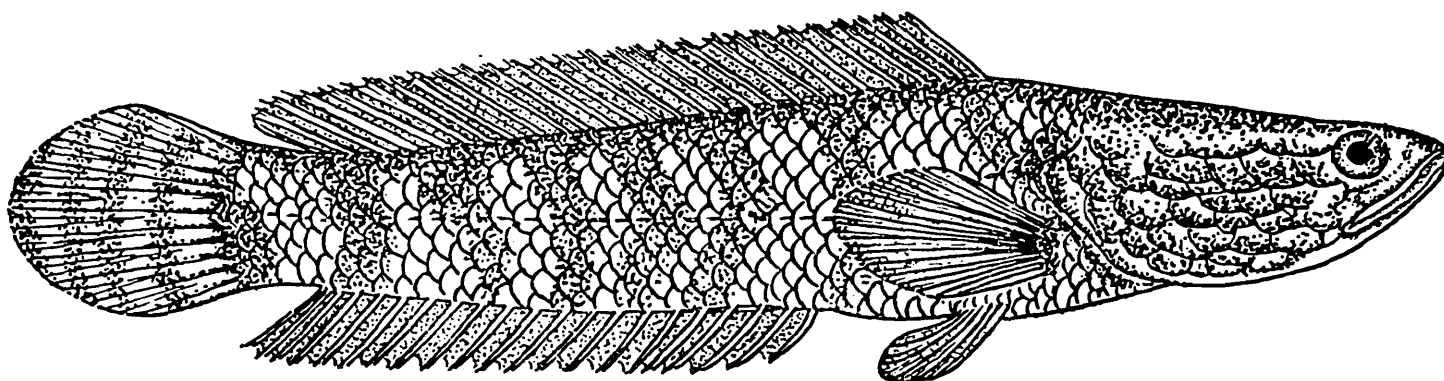


Fig. 48 : *Ophiocephalus punctatus* Bloch

Maximum length : 310 (Talwar & Jhingran, 1991).

Distribution : India ; Pakistan ; Afghanistan ; Nepal ; Bangladesh ; Myanmar ; Sri Lanka ; Malayasia ; China-Yunnan.

Remarks : This species exhibits sexual dimorphism (Dehadrai et al., 1973). In males, the urino-genital opening is elongated, while in females it is circular. It prefers stagnant and muddy waters.

49. *Mastacembelus armatus* (Lacepede)

Tire-Track Spiny-eel

Macrognathas armatus Lacepede, 1800, *Hist. Nat. Poiss.*, 2 : 286 (type-locality : not given).

Local name : Baam.

Material examined : 1 ex., Song river, Satyanarain, Dist. Dehradun, 30.vi.1965, Coll. T. D. Soota ; 1 ex., Suswa river, Clement Town, Dist. Dehradun, 23.vii.1965, Coll. T. D. Soota ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 7.iv.1966, Coll. T.D. Soota ; 2 exs., Motichur rao nr. Motichur FRH, Dist. Dehradun, 13.iv.1966,

Coll. T.D. Soota ; 1 ex., Song river Satyanarain Dist. Dehradun, 14.ix.1972, Coll. Raj Tilak ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 23.x.1973, Coll. Raj Tilak ; 1 ex. (160 mm), Song river, Pattapul, Kansrao, Dist. Dehradun, 20.v.1976, Coll. Arun Kumar ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 22.iv.1980, Coll. Akhlaq Husain ; 1 ex., Song river, Satyanarain, Dist. Dehradun, 14.v.1980, Coll. Akhlaq Husain ; 5 exs., Song river nr. Kansrao FRH, Dist. Dehradun, 8.i.1987, Coll. Raj Tilak ; 5 exs. (max. 275 mm), Song river nr. Kansrao FRH, Dist. Dehradun, 22.i.1987, Coll. R. N. Chopra ; 3 exs., Song river, Satyanarain, Dist. Dehradun, 13.ix.1987, Coll. Raj Tilak.

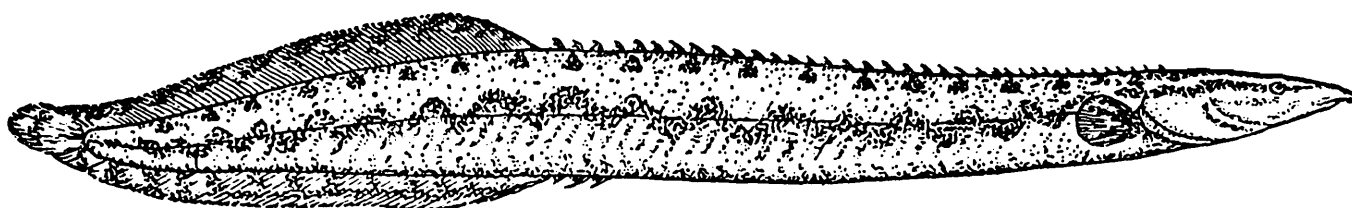


Fig. 49 : *Mastacembelus armatus* (Lacepede)

Maximum length : 914 mm (Job, 1941).

Distribution : India ; Pakistan ; Nepal ; Bangladesh ; Myanmar ; Sri Lanka ; Thailand ; Kampuchia ; Hainan Island, South China ; Malayasia ; Sumatra ; Java.

Remarks : It lives in crevices and under stones on the bed of streams.

Key for Identification of Fishes in Park

1.	Body covered with scales	...	...	11
	Body without scales	...	...	2
2.	Anal fin long (more than 40 rays)	...	...	3
	Anal fin short or moderate (less than 40 rays)	...	...	6
3.	Accessory respiratory organ present	...	...	<i>Heteropneustes fossilis</i> (Bloch)
	Accessory respiratory organ absent	...	...	4
4.	Two pairs of barbels, nasal barbels absent	...	...	5
	Four pairs of barbels, nasal barbels present	...	...	<i>Amblyceps mangois</i> (Hamilton-Buchanan)

5. Eyes with free suborbital margin and lie above level of corner of mouth, not visible from ventral side ; cleft of mouth reaching to or beyond posterior margin of eye ; anal fin with 82-89 branched rays ... *Wallago attu* (Schneider)
- Eyes subcutaneous, lie posterior to level of corner of mouth, visible from ventral side ; cleft of mouth not reaching anterior margin of eye ; anal fin with 53 branched rays ... *Ompok pabda* (Hamilton-Buchanan)
6. Nostrils widely separated ... 7
Nostrils close together ... 10
7. Anal fin long (with 33 branched rays) ... *Pseudeutropius atherinoides* (Bloch)
Anal fin short (with 7-10 branched rays) ... 8
8. A bony neural plate in between occipital process and basal bone of dorsal present ... *Aorichthys seenghala* (Sykes)
No visible bony neural plate between occipital process and basal bone of dorsal ... 9
9. Adipose fin long, dorsal spine smooth ... *Mystus bleekeri* (Day)
Adipose fin short ; dorsal spine serrated on both edges near tip ... *Mystus vittatus* (Bloch)
10. Adhesive thoracic apparatus longer than broad ... *Glyptothorax saisii* (Jenkins)
Adhesive thoracic apparatus broader than long or almost as long as broad ... *Glyptothorax pectinopterus* (McClelland)
11. Jaws prolonged into an elongated beak, bearing sharp teeth ... *Xenentodon cancila* (Hamilton-Buchanan)
Jaws simple, not prolonged ... 12
12. Body eel-like ; dorsal, caudal and anal fins continuous ... *Mastacembelus armatus* (Lacepede)
Body not eel-like dorsal, caudal and anal fins separated from each other ... 13
13. Head snake-like ... 14
Head not snake-like ... 15

- | | | | |
|--|-----|--|----|
| 14. Pectoral fins with vertical bands ; body without bands | ... | <i>Ophiocephalus gachua</i> Hamilton-Buchanan | |
| Pectoral fin without bands ; body with bands or patches | ... | <i>Ophiocephalus punctatus</i> Bloch | |
| 15. Two dorsal fins (spinous and soft) present | ... | <i>Badis badis</i> (Hamilton-Buchanan) | |
| One dorsal fin present | ... | | 16 |
| 16. Barbels 3-4 pairs present (Loaches) | ... | | 17 |
| Barbels 1-2 pairs present or absent (Carps) | ... | | 25 |
| 17. An erectile suborbital spine present | ... | | 18 |
| An erectile suborbital spine absent | ... | | 19 |
| 18. Barbels three pairs ; head with scales ; body elongated | ... | <i>Lepidocephalus guntea</i> (Hamilton-Buchanan) | |
| Barbels four pairs ; head without scales ; body oblong | ... | <i>Botia rostrata</i> Gunther | |
| 19. Dorsal fin large (with 10-11 branched rays) ; upper half of caudal base with black spot | ... | <i>Nemacheilus botia</i> (Hamilton-Buchanan) | |
| Dorsal fin short (with less than 10-11 branched rays) ; upper half of caudal base without black spot | ... | | 20 |
| 20. Nasal barbels present ; lateral lines incomplete | ... | <i>Nemacheilus doonensis</i> Tilak & Husain | |
| Nasal barbels absent ; lateral line complete | ... | | 21 |
| 21. 3rd ray of pectoral fin produced ; body with blotches | ... | <i>Nemacheilus corica</i> (Hamilton-Buchanan) | |
| 3rd ray of pectoral fin not produced ; body with vertical bands | ... | | 22 |
| 22. Head depressed | ... | <i>Nemacheilus rupecula</i> (McClelland) | |
| Head not depressed | ... | | 23 |
| 23. Vertical bands on body dark, broad (and fewer in number 6-9) and almost equal to light interspaces | ... | <i>Nemacheilus beavani</i> Gunther | |
| Vertical bands on body yellowish and narrower than dark ground colour | ... | | 24 |

- | | | | |
|---|-----|-----|--|
| 24. Body marked with 9-10 narrow yellowish bands | ... | ... | <i>Nemacheilus savona</i> (Hamilton-Buchanan) |
| Body marked with 12-14 narrow yellowish band | ... | ... | <i>Nemacheilus dayi</i> Hora |
| 25. A tiled row of elongated scales on both sides of anal region present | .. | | 26 |
| Scales of anal region not longer than those of body | ... | | 27 |
| 26. A hard papillated plate at chin present ; mouth ventral | ... | ... | <i>Schizothorax richardsonii</i> (Gray) |
| No papillated plate at chin ; mouth subterminal | ... | ... | <i>Schizothoracichthys progastus</i> (McClelland) |
| 27. Mouth ventral | ... | ... | 28 |
| Mouth terminal (sometimes subterminal) | ... | ... | 30 |
| 28. Snout continuous with upper lip | ... | ... | 29 |
| Snout separated from upper lip | ... | ... | 30 |
| 29. Head with proboscis ; lower lip with a suctorial disc | ... | ... | <i>Garra gotyla gotyla</i> (Gray) |
| Head without proboscis ; lower lip without a suctorial disc | ... | ... | <i>Crossocheilus latius</i> (Hamilton-Buchanan) |
| 30. Inner surface of lower lip studded with nodular tubercles | ... | ... | <i>Labeo dero</i> (Hamilton-Buchanan) |
| 31. Origin of dorsal fin clearly behind pelvic fins | ... | ... | 32 |
| Origin of dorsal fin opposite pelvic fin or nearly so | ... | ... | 41 |
| 32. Dorsal base not extending to above anal fin | ... | ... | 33 |
| Dorsal base extending to above anal fin | ... | ... | 35 |
| 33. A symphysial knob present in lower jaw fitting into lower jaw ; mouth oblique ; both lips present | ... | ... | 34 |
| A symphysial knob in low jaw absent ; mouth inferior ; lower jaw with a sharp crescentic edge and without a lip | ... | ... | <i>Aspidoparia jaya</i> (Hamilton-Buchanan) |
| 34. Barbels present (maxillary very long) | ... | ... | <i>Esomus danricus</i> (Hamilton-Buchanan) |
| Barbels absent | ... | ... | <i>Parluclosoma daniconius</i> (Hamilton-Buchanan) |

- | | | | |
|--|-----|-----|--|
| 35. Body with longitudinal bands or a reticulum | ... | ... | 36 |
| Body with vertical bands or spots | ... | ... | 37 |
| 36. Body less deep (4·67-5·00 in total length) ; dorsal fin with 7 branched rays | | ... | <i>Brachydanio rerio</i>
(Hamilton-Buchanan) |
| Body deep (3·25-4·00 in total length) ; dorsal fin with 15 branched rays | | ... | <i>Danio devario</i>
(Hamilton-Buchanan) |
| 37. Body with spots ; cleft of mouth extending upto middle or beyond eye... | | | 38 |
| Body with vertical bands ; cleft of mouth extending upto 1/3rd of eye ... | | | 39 |
| 38. Cleft of mouth extending beyond posterior margin of eye | ... | | <i>Raiamas bola</i>
(Hamilton-Buchanan) |
| Cleft of mouth extending upto middle of eye | ... | .. | <i>Barilius dimorphicus</i>
Tilak & Husain |
| 39. Maxillary barbels moderately long ; sexual dimorphism not marked | ... | ... | <i>Barilius vagra</i>
Hamilton-Buchanan |
| Barbels minute ; sexual dimorphism marked | ... | ... | 40 |
| 40. Anal fin with 10-11 branched rays | ... | ... | <i>Barilius barna</i>
Hamilton-Buchanan |
| Anal fin with 7-8 branched rays | ... | ... | <i>Barilius bendilsi</i>
Hamilton-Buchanan |
| 41. Lower lip with a continuous posterior groove forming a central lobe | ... | | 42 |
| Lower lip with an interrupted posterior groove and without a central lobe | .. | ... | 44 |
| 42. Head shorter than body depth | ... | ... | <i>Tor tor</i>
(Hamilton-Buchanan) |
| Head longer than body depth | ... | ... | 43 |
| 43. Lateral line with 32-35 scales | ... | ... | <i>Tor chelynoides</i>
(McClelland) |
| Lateral line with 26-27 scales | ... | ... | <i>Tor putitora</i>
(Hamilton-Buchanan) |
| 44. Snout with median and lateral lobes ; snout and cheeks covered with tubercles or pores | ... | ... | <i>Chagunius chagunio</i>
(Hamilton-Buchanan) |

Snout without lobes ; snout and cheeks smooth	...	...	45
45. 2-4 barbels present	...	...	46
Barbels absent	...	...	47
46. With two barbels (maxillary) dorsal spine smooth	...	<i>Puntius chola</i> Hamilton-Buchanan	
With four barbels ; dorsal spine serrated posteriorly	...	<i>Puntius sarana</i> Hamilton-Buchanan	
47. Dorsal spine bony and smooth ; a black spot at base of middle dorsal rays	...	<i>Puntius sophore</i> Hamilton-Buchanan	
Dorsal spine bony and serrated posteriorly ; no black spot at base of middle dorsal rays	...	...	48
48. Sides of body with two black blotches (one on 4th-5th lateral line scale, and 2nd on caudal peduncle)	...	<i>Puntius ticto</i> Hamilton-Buchanan	
Sides of body with only one black blotch (on caudal peduncle)	...	<i>Puntius conchoni</i> Hamilton-Buchanan	

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SUMMARY

The present paper deals with the fishes of Rajaji National Park, Uttar Pradesh. In all, there are 49 species. It includes a new cyprinid fish *Barilius dimorphicus*, recently described by the authors. The local or English names of the species have been given after the scientific name of each species. Besides first scientific reference of each species, number of specimens examined and maximum length recorded have been given. Further, a table

showing districtwise and drainagewise distributional pattern of species in the Park has been given. Interesting notes on sexual dimorphism, synonyms, habitat etc., have been given. A key for identification of the species in the Park has been provided.

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ODONATA

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INTRODUCTION

Rajaji National Park is situated between latitude 29°51' -30°15' North and longitude 77°52' -78°22' East. The park includes Shiwalik hills falling under three districts of Uttar Pradesh *Viz.*, Dehradun, Pauri Garhwal and Saharanpur. River Ganges with its tributaries (Song, Suswa and Rawason etc.) pass through the park near Rishikesh and emerges out down stream near Haridwar. The forest in the Park is deciduous, with *sal* (*Shorea robusta*) as major plantation.

Odonata fauna of this area has been previously studied by Fraser 1933, 1934 and 1936), Bhasin (1953), Singh and Baijal (1954), Singh (1955 and 1963), Singh *et al.*, (1955), Sahni (1964a, 1964b, 1965a, 1965b, 1970 and 1972), Atkinson (1974), Singh and Prasad (1974, 1975, 1976a and 1976b), Prasad and Singh (1976), Prasad and Kumar (1981) and Kumar and Prasad (1978 and 1981).

The present study is based on the collection of Odonata available in the Northern Regional Station of Zoological Survey of India at Dehradun. Altogether 38 species belonging to 23 genera and 8 families are reported from the Rajaji National Park.

LIST OF ODONATA SPECIES RECORDED FROM RAJAJI NATIONAL PARK

Suborder : ZYGOPTERA

Superfamily : COENAGRIONOIDEA

Family : PLATYSTICTIDAE

1. *Drepanosticta carmichaeli* (Laidlaw)

Family : PLATYCNEMIDIDAE

2. *Copera marginipes* (Rambur)

Family : COENAGRIONIDAE

3. *Pseudagrion rubriceps* Selys
4. *P. decorum* (Rambur)
5. *P. laidlawi* Fraser
6. *Ceriagrion coromandelianum* (Fabricius)
7. *Ischnura forcipata* Morton
8. *I. aurora* (Brauer)
9. *Enallagma parvum* Selys
10. *Agriocnemis pygmaea* (Rambur)
11. *A. clauseni* Fraser

Superfamily : LESTOIDEA

Family : LESTIDAE

12. *Lestes viridula* Rambur

Superfamily : CALOPTERYGOIDEA

Family : CHLOROCYPHIDAE

13. *Aristocypha quadrimaculata* Selys
14. *Heliocypha biforata beelsoni* Fraser
15. *Libellago l. lineata* (Burmeister)

Family : CALOPTERYGIDAE

16. *Neurobasis chinensis chinensis* (Linn.)

Suborder : ANISOPTERA

Superfamily : AESHNOIDEA

Family : GOMPHIDAE

17. *Paragomphus lineatus* (Selys)
18. *Anormogomphus heteropterus* Selys
19. *Onychogomphus modestus* (Selys)

Superfamily : LIBELLULOIDEA

Family : LIBELLULIDAE

20. *Cratilla lineata calverti* Forster
21. *Potamarcha congener* (Rambur)
22. *Orthetrum b. brunneum* (Fonscolombe)
23. *O. taeniolatum* (Schneider)
24. *O. chrysostigma luzonicum* (Brauer)
25. *O. japonicum internum* MacLachan
26. *O. sabina* (Drury)
27. *O. glaucum* (Brauer)
28. *O. t. triangulare* (Selys)
29. *O. pruinatum neglectum* (Rambur)
30. *Palpopleura s. sexmaculata* (Fabricius)
31. *Crocothemis s. servilia* (Drury)
32. *Brachythemis contaminata* (Fabricius)
33. *Neurothemis fulvia* (Drury)
34. *N. in. intermedia* (Rambur)
35. *Trithemis aurora* (Burmeister)
36. *T. festiva* (Rambur)
37. *T. pallidinervis* (Kirby)
38. *Pantala flavesens* (Fabricius)

Key to the genera and species of *Odonata* of Rajaji National Park

1. Eyes well separated ; Fore- and hindwings more or less similar in shape and breadth ; wings petiolate ... 2
- Eyes not well separated, meeting only at a point or broadly confluent ; Fore- and hindwings not similar in shape and breadth ; wings never petiolate ... 17
2. Antenodal nervures 2, rarely 3 ; Arc midway between base of wing and nearer to the node than the base ; Anal vein fused at the posterior border of wing ... 3
- Antenodal nervure 3-5 ; Arc nearer to the base of the wing than the node ; Anal vein away from posterior border ... 14
3. Veins IRIII + V arising nearer the node ... 4
- Veins IRIII + V arising nearer to the arculus ... *L. viridula* (Rambar).
4. The Anal vein present and Cup of normal length ... 5
- The Anal vein may be absent or greatly reduced ; Cup varying from 1 to 2 cells in length ... *D. carmichaeli* (Laid.).
5. Discoidal cell short ; Anal vein separating from wing border, either proximal to AC or distal to AC ; MA and IRIII zigzagged along greater part of their length ... 6
- Discoidal cell elongate ; Anal vein separating from wing border and proximal to AC ; MA and IRIII mostly straight only zigzagged apically or not at all ; Legs bright orange to dull reddish in colour ... *C. marginipes* (Rambur).
6. Arc situated at the level of the distal antenodal nervure ... 7
- Arc situated distal to the level of distal antenodal nervure ... 13
(*Agriocnemis* Selys).
7. AB arising from the hind border of the wing at the point where AC meets it ... 8
- AB arising from the hind border of the wing more or less proximal to the point where AC meets it ... 11
8. A prominent ridge on the frons present ; no post ocular coloured spots on the head ; Head and thorax of uniform colour ; Abdomen uniformly yellowish ... *C. coromandelianum* (Fabr.).
- No ridge on the frons ; post-ocular coloured spots always present ; Head and thorax not of uniform colour ... 9 (*Pseudagrion* Selys).

- | | | | | |
|-----|---|-----|-------------------------------------|-----------------------------|
| 9. | Face, frons, vertex and occiput blue or green, marked with black | ... | ... | 10 |
| — | Face, frons, vertex and occiput bright reddish orange | ... | <i>P. rubriceps</i> Selys. | |
| 10. | Thorax pale-blue on dorsal side, with three fine black lines, mid-dorsal carinal ridge and a thick black humeral stripe | ... | <i>P. decorum</i> (Rambur). | |
| — | Thorax sky-blue on dorsal side, with medial and humeral black stripes | ... | ... | |
| | ... | ... | <i>P. laidlawi</i> Fraser. | |
| 11. | Pterostigma of the same colour and shape in fore- and hindwings of male, dorsal apical tubercle on segment 10 of male absent | ... | <i>E. parvum</i> Selys. | |
| — | Pterostigma differing in shape and size in fore- and hindwings of male ; dorsal apical tubercle on segment 10 of male present | ... | 12 (<i>Ischnura</i> Charp.). | |
| 12. | Abdominal segment 3 to 6 of lemon colour on dorsal side | ... | <i>I. aurora</i> (Brauer). | |
| — | Abdominal segments 3 to 6 black on dorsal side | ... | <i>I. forcipata</i> Morton. | |
| 13. | Labrum non-metallic | ... | ... | <i>A. clauseni</i> Fraser. |
| — | Labrum metallic-blue | ... | ... | <i>A. pygmaea</i> (Rambur). |
| 14. | The primary antenodals easily identified from the secondaries, base of discoidal cell connected to Radius by the Arculus | ... | ... | 15 |
| — | The primary antenodals indistinguishable from the secondaries ; base of discoidal cell connected to Radius by the Arculus | ... | <i>N. ch. chinensis</i> (Linn.). | |
| 15. | Sector of Arc separated at origin ; pterostigma present in the forewings of both sexes | ... | ... | 16 |
| — | Sector of arc arising from a common point, forewings of male without a pterostigma | ... | <i>L. I. lineata</i> (Burm.). | |
| 16. | Dorsal mesothoracic triangle extending as far as root of wings, apical vitreous spot moderately large, situated partly proximal to the line of pterostigma... | ... | <i>A. quadrimaculata</i> Selys. | |
| — | Dorsal mesothoracic triangle either absent, unicoloured or extending not more than half-way up to root of wings, only apical third of hindwing opaque with a single row of vitreous spots | ... | <i>H. biforata beelsoni</i> Fraser. | |
| 17. | Discoidal cells approximately of the same size and shape in fore- and hindwings ; middle lobe of the Labium large and fissured | ... | ... | 18 |
| — | Discoidal cell differing in size and shape in fore- and hindwings ; middle lobe of Labium very small, not fissured | ... | ... | 20 |

18. Hindwings not excavated at base, with tornus rounded in the male ... *A. heteropterus* (Selys).
 — Hindwings more or less excavated at base, with tornus more or less angulated in the male ... 19
19. Anal loop absent, first postnodal cell not extending proximal to the base of subtrigone in hindwings ; Anal triangle always 3-celled ... *P. lineatus* (Selys).
 — Anal loop present, often rudimentary ; first postanal cell extending more or less proximal to base of subtrigone in hindwings ; Anal triangle 4-celled ... *O. modestus* (Selys).
20. Distal antenodal nervure in forewing complete ... 21
 — Distal antenodal nervure in forewing incomplete ... 29
21. Lobe of prothorax small, inconspicuous and usually naked ... *C. lineata calverti* Forster.
 — Lobe of prothorax large and fringed with long hair ... 22 (*Orihetrum* Newman).
22. Males violaceous-red and pruinocence ... *O. pruinorum neglectum* (Rambur).
 — Males brown or black with yellow markings, often pruinocence ... 23
23. Abdomen enormously swollen at the base and then abruptly slimmed and compressed laterally to the end ... *O. sabina* (Drury).
 — Abdomen variable but never very slim nor compressed laterally ... 24
24. Base of hindwing with a large black triangular marking ... *O. t. triangulare* (Selys).
 — Base of hindwings without a black triangular marking ... 25
25. Cull in hindwing arising from the distal side of discoidal cell ... *O. chryostigma luzonicum* (Brauer).
 — Cull in hindwing arising from the posterior angle of discoidal cell ... 26
26. Abdomen short and broad, almost white with pruinocence ; Thorax with 2 broad greenish or bluish stripes more or less obscured by pruinocence ... *O. japonicum internum* MacLach.
 — Abdomen long and rather narrow, often blue with pruinocence ; Thorax with very narrow whitish or creamy stripes ... 27
27. Moderately large species with black face ... 28
 — Smaller species with bluish face ... *O. taeniolatum* (Schn.)

28. Membrane black *O. glaucum* (Brauer).
 — Membrane pure white *O. b. brunneum* (Fons.).
29. Lobes of prothorax with long hairs ; Frons metallic above ... *P. s. sexmaculata* (Fabr.).
 — Lobes of prothorax without long hairs ; Frons not metallic above ... 30
30. Discoidal field converging at wing border 31
 — Discoidal field parallel or divergent at wing border 34
31. Nervure IRIII present in between RII and RIII ... *Pantala flavescens* (Fabr.)
 — Nervure IRIII absent in between RII and RIII ... 32 (*Trithemis* Brauer).
32. Legs very long and spidery ; pterostigma bicolourous ; Body yellow marked with black ... *T. pallidinervis* (Kirby).
 — Legs not very long and spidery ; Pterostigma unicolourous ; Body colour variable 33
33. Thorax and abdomen violaceous-black ; base of hindwings with a small dark brown spot ; Neuration black *T. festiva* (Rambur).
 — Thorax and abdomen violaceous-crimson ; base of hindwings with a small reddish-brown spot ; Neuration crimson *T. aurora* (Burm.).
34. Wings with more than one cubital nervure ... 35 (*Neurothemis* Brauer).
 — Wings with only one cubital nervure 36
35. Wings dark-reddish brown ; Apices clear with anterior margin reddish-brown ; Neuration close *N. fulvia* (Drury).
 — Wings pale-yellow ; their bases dark yellow ; neuration open ... *N. in. intermedia* (Rambur).
36. Red or yellow species ; basal or medial yellow marking present on wings 37
 — Variable coloured species ; base of wings rarely marked with pale yellow *P. congener* (Rambur).
37. Wings with broad reddish yellow, medial marking ... *B. contaminata* (Fabr.)
 — Wings with small yellow marking *C. s. servilia* (Drury).

Suborder : ZYGOPTERA
 Superfamily : COENAGRIONOIDEA
 Family : PLATYSTICTIDAE

Drepanosticta carmichaeli Laidlaw

1915. *Protosticta carmichaeli* Laidlaw, *Rec. Indian Mus.*, 11 : 390.

1933. *Drepanosticta carmichaeli*, Fraser, *Fauna Brit. India, Odon.*, 1 : 142-144.

Material : 2 ♂♂ ; Lachiwala, 2 ♂♂ ; Kansrao and 1 ♂ ; Motichur.

Distribution : India (Almora, Chamoli, Dehradun, Pauri, Tehri, Uttar Kashi, Sikkim, West Bengal) and Nepal.

Remarks : Adults are commonly found around streams from June to August.

Family : PLATYCNEMIDIDAE

Copera marginipes (Rambur)

1842. *Platycnemis marginipes* Rambur, *Ins. Neurop.*, : 240.

1933. *Copera marginipes*, Fraser, *Fauna Brit. India Odon.*, 1 : 192-197.

Material : 1 ♂ ; Asarori and 4 ♂♂, 4 ♀♀ ; Kansrao.

Distribution : India (Kangra, Sirmaur, Dehradun, Nainital, Pauri, Coorg, Poona, Mahabaleshwar, Bombay, Deccan, Assam, West Bengal), Nepal, Burma, Sri Lanka, Malaysia, Sumatra, Thailand, Java, Sunda Island and Sumba.

Remarks : Commonly occurring near permanent waterbodies in the dense forest.

Family : COENAGRIONIDAE

Pseudagrion decorum (Rambur)

1842. *Agrion decorum* Rambur, *Ins. Neurop.*, : 258.

1933. *Pseudagrion decorum*, Fraser, *Fauna Brit. India Odon.*, 1 : 286-289.

Distribution ; India (Bilaspur, Sirmaur, Dehradun, Nainital, Una, Nilgiris Coorg, West Bengal), Nepal, Burma and Sri Lanka.

Pseudagrion laidlawi Fraser

1922. *Pseudagrion laidlawi* Fraser, *Mem. Dept. Agric. India (Ent.)*, 7(7) : 48-50.

1933. *Pseudagrion laidlawi*, Fraser, *Fauna Brit. India Odon.*, 1 : 294-296.

Distribution : India (Dehradun) and Pakistan.

Pseudagrion rubriceps Selys

1876. *Pseudagrion rubriceps* Selys, *Bull. Acad. Belg.*, 42 : 510.

1933. *Pseudagrion rubriceps*, Fraser, *Fauna Brit. India Odon.*, 1 : 296-299.

Material : 5 ♂♂, 1 ♀ ; Kansrao.

Distribution : India (Bilaspur, Hamirpur, Sirmaur, Dehradun, Nainital, Pauri, Tehri, widely distributed in continental India, West Bengal), Nepal, Burma, Malaysia, Java, Indo-China, Taiwan and Sunda Island.

Remarks : Specimens of this species are found in the Park throughout the year.

Ceriagrion coromandelianum (Fabricius)

1798. *Agrion coromandelianum* Fabricius, *Ent. Syst. Suppl.*, : 287.

1933. *Ceriagrion coromandelianum*, Fraser, *Fauna Brit. India Odon.*, 1 : 315-316.

Material : 10 ♂♂, 3 ♀♀ ; Kansrao, 5 ♂♂, 1 ♀ ; Lachiwala and 3 ♂♂, Mohand.

Distribution : India (Bilaspur, Kangra, Hamirpur, Simla, Sirmaur, Una, Chamoli, Dehradun, Nainital, Uttar Kashi, West Bengal), Nepal, Burma, Sri Lanka, Malaysia, Indo-China and South-China.

Ischnura forcipata Morton

1907. *Ischnura forcipata* Morton, *Trans., ent. Soc. Lond.*, : 306.

1933. *Ischnura forcipata*, Fraser, *Fauna Brit. India Odon.*, 1 : 354-357.

Material : 2 ♂♂, 1 ♂ ; Kansrao, 1 ♂, 2 ♀♀ ; Lachiwala, 1 ♂ ; Motichur and 1 ♀ ; Satnarain.

Distribution : India (Kashmir, Bilaspur, Kangra, Kulu, Manali, Sirmour, Almora, Chamoli, Dehradun, Nainital, Pauri, Tehri, Uttar Kashi, West Bengal), Russia, Afganistan, Pakistan and Burma.

Remarks : It is one of the most common species in the Park. Adults are commonly found near small marshy streams and waterbodies.

***Ischnura aurora* (Brauer)**

1858. *Agrion delicatum* Hagen, *Verh. zool.-bot. Ges. Wien.*, 8 : 479.

1865. *Agrion aurora*, Brauer, *Verh. zool.-bot. Ges. Wien.*, 15 : 510.

1915. *Ischnura, aurora*, Ris, *Nova Caledonia Zool.*, 2 : 4, 67.

1931. *Ischnura aurora*, Fraser, *Rec. Indian Mus.*, 33 : 448.

Material : 2 ♂♂ ; Kansrao, 7 ♂♂, 4 ♀♀ ; Lachiwala, 1 ♂ ; Motichur and 2 ♂♂, 4 ♀♀ ; Satnarain.

Distribution : India (Bilaspur, Kangra, Hamirpur, Solan, Una, Dehradun, Nainital, Tehri, West Bengal), Burma, Sri Lanka, Malaysia, New Guinea, Philippines, Samoa, Sondaic Archipelago, Borneo and Australia.

Remarks : A very common species occurring throughout the Park.

***Enallagma parvum* Selys**

1876. *Enallagma Parvum* Selys, *Bull. Acad. Belg.*, 41 : 537.

1933. *Enallagma parvum*, Fraser. *Fauna Brit. India Odon.*, 1 : 376-378.

Material : 1 ♂ ; Kansrao.

Distribution : Widely distributed throughout India, Nepal, Burma and Sri Lanka.

***Agriocnemis clauseni* Fraser**

1922. *Agriocnemis clauseni* Fraser, *Mem. Dept. Agric. India (Ent.)*, 7 (7) : 53.

1933. *Agriocnemis clauseni*, Fraser, *Fauna Brit. India Odon.*, 1 : 390-392.

Material : 1 ♂ ; Kansrao and 1 ♀ ; Mohand.

Distribution : India (Dehradun, Nainital, West Bengal, Meghalaya), Burma and Thailand.

Remarks : Adults were observed, during June to September, flying on the aquatic vegetation near the stream.

***Agriocnemis pygmaea* (Rambur)**

1842. *Agrion Pygmaeum* Rambur, *Ins. Neurop.*, : 278.

1933. *Agriocnemis pygmaea*, Fraser, *Fauna Brit. India. Odon.*, 1 : 398-401.

Material : 1 ♂, 1 ♀ ; Kansrao, 1 ♀ ; Lachiwala, 1 ♀ ; Motichur and 1 ♂ ; Satnarain.

Distribution : Throughout India, Nepal, Burma, Sri Lanka, Singapore, Java, Manila, Philippines, Seychelles, Taiwan, North Celebes, Sunda Island, China, New Guinea and Australia.

Superfamily : LESTOIDEA

Family : LESTIDAE

***Lestes viridula* Rambur**

1842. *Lestes viridula* Rambur, *Ins. Neurop.*, : 252-253.

1933. *Lestes viridula*, Fraser, *Fauna Brit. India Odon.*, 1 : 45-46.

Material : 2 ♂ ♂ ; Asarori, 1 ♂ ; Lachiwala and 1 ♂ ; Phanduwala.

Distribution : India (Kangra, Bilaspur, Dehradun, Nainital, Pauri, Deccan, South Coorg and Bombay).

Remarks : Adults have a weak and short flight. They were usually seen fluttering within the long and dry grasses. It is rather difficult to locate this species in the jungle as its colour is very much similar to that of the grasses.

Superfamily : AGRIOIDEA

Family : CHLOROCYPHIDAE

***Aristocypha quadrimaculata* Selys**

1853. *Rhinocypha quadrimaculata* Selys, *Syn. Cat.*, : 60.

1956. *Aristocypha quadrimaculata*, Laidlaw, *Trans. R. ent. Soc. London*, 101 : 273.

Material : 2 ♂♂ ; Kansrao, 6 ♂♂, 3 ♀♀ ; Motichur and 2 ♂♂, 2 ♀♀ ; Ramgarh.

Distribution : India (Kashmir, Kangra, Bilaspur, Hamirpur, Sirmaur, Almora, Dehradun, Nainital, Pauri, Tehri, Uttar Kashi, West Bengal, Sikkim, Assam), Nepal and Burma.

Remarks : Genus of this species includes some of the most beautiful species. Fraser (1934) described them as "living jewels of tropical stream". It is fairly a common species and found usually perched on stones twigs and aquatic vegetation in the open stream as well as in the dense forest area. Kumar and Prasad (1977) have also described its larva from the Park.

***Heliocypha biforata beelsoni* Fraser**

1922. *Rhinocypha beelsoni* Fraser, *Mem. Dept. Agric. India. (Ent.)*, 7 : 61.

1934. *Rhinocypha biforata beelsoni*, Fraser, *Fauna Brit. India Odon.*, 2 : 48-49.

Material : 4 ♂♂, 5 ♀♀ ; Kansrao.

Distribution : India (Dehradun) and Burma.

Remarks : Very much similar to the *A. quadrimaculata* Selys. Larva of this species has also been reported by Kumar and Prasad (1977) from the Park.

***Libellago lineata lineata* (Burmeister)**

1839. *Calopteryx lineata* Burmeister, *Handb. Ent.*, 2 : 826.

1934. *Libellago lineata lineata*, Fraser, *Fauna Brit. India Odon.*, 2 : 60-63.

Material : 2 ♂♂ ; Kansrao.

Distribution : India (Sirmaur, Dehradun, Nainital, Pauri, Assam, West Bengal), Burma, Thailand, Penang, Sundaic Archipelgo, Java, Sumatra and Borneo.

Remarks : Adults are rather flying low over the water surface of streams.

Family : CALOPTERYGIDAE

Neurobasis chinensis chinensis (Linn.)

1758. *Libellula chinensis* Linnaeus, *Syst. Nat.*, 1 : 545.

1934. *Neurobasis chinensis chinensis*, Fraser, *Fauna Brit. India Odon.*, 2 : 121-124.

Material : 2 ♂♂, 4 ♀♀ ; Kansrao, 1 ♂, 1 ♀ ; Gulatapper and 2 ♂♂, 2 ♀♀ ; Ramgarh.

Distribution : Throughout India except in the desert area upto 2300 mtrs., Nepal, Burma, Sri Lanka and Thailand.

Remarks : It is a beautiful species and commonly found from February to October. Adults are sun loving and are usually seen fluttering lazily over hanging aquatic vegetation in the streams.

Suborder : ANISOPTERA

Superfamily : AESHNOIDEA

Family : GOMPHIDAE

Anormogomphus heteropterus Selys

1854. *Anormogomphus heteropterus* Selys, *Bull. Acad. Belg.*, 21 : 61.

1934. *Anormogomphus heteropterus*, Fraser, *Fauna Brit. India Odon.*, 2 : 174-176.

Material : 1 ♀ ; Gulatappar and 1 ♀ ; Lachiwala.

Distribution : India (Kangra, Dehradun, Punjab, Bihar) and Pakistan.

Paragomphus lineatus (Selys)

1850. *Gomphus lineatus* Selys, *Rev. Odon.*, : 386.

1854. *Onychogomphus lineatus*, Selys, *Bull. Acad. Belg.*, 21 : 36.

1934. *Mesogomphus lineatus*, Fraser, *Fauna Brit. India. Odon.*, 2 : 230-234.

Material : 1 ♂ ; Asarori and 1 ♂ ; Motichur.

Distribution : India (Kangra, Nainital, Dehradun, West Bengal, Maharashtra, Karnataka, Tamil Nadu), Nepal and Burma.

Remarks : Adults are rare and found near the hill streams.

Onychogomphus modestus (Selys)

1878. *Onychogomphus modestus* Selys, *Bull. Acad. Beng.*, 46 : 423.

1934. *Nepogomphus modestus*, Fraser, *Fauna Brit. India Odon.*, 2 : 285-286.

Distribution : India (Kangra, Sirmaur, Dehradun, West Bengal, Meghalaya, Nagaland), Burma, Malayasia and Sumatra.

Remarks : Specimens of this species are commonly found near the streams.

Superfamily : LIBELLULOIDEA

Family : LIBELLULIDAE

Cratilla lineata calverti Forster

1878. *Orthemis lineata* Brauer, *Sitzungsber. Akad. Wien.*, 77 : 9.

1936. *Cratilla lineata*, Fraser, *Fauna Brit. Odon.* 3 : 286-288.

1949. *Cratilla lineata calverti*, Lieftinck, *Verh. Natural Ges. Basel.*, 64 (1) : 201-202.

Material : 1 ♂ ; Asarori.

Distribution : India (Dehradun, Nainital, Pauri, West Bengal), Burma and Sri Lanka.

Potamarcha congener (Rambur)

1842. *Libellula obscura* Rambur, *Ins. Neurop.*, : 64.

1848. *Libellula congener*, Rambur, *Hist. nat. Ins. Neurop.*, : 70.

1891. *Potamarcha congener*, Selys, *Anal. Soc. Esp. Hist. nat.*, 20 : 221.

Material : 2 ♂ ♂ ; Lachiwala.

Distribution : India (Kangra, Dehradun, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Madhya Pradesh, West Bengal), Nepal, Burma, Sri Lanka, Tibet, Philippines, Taiwan, Malaya Archipelego, Java, Sumatra, New Guinea and North Australia.

Orthetrum brunneum brunneum (Fons.)

1837. *Libellula brunnea* Fonscolombe, *Ann. Soc. Ent. France*, 6 : 141.

1936. *Orthetrum brunneum brunneum*, Fraser, *Fauna Brit. India Odon.*, 3 : 294-295.

Material : 1 ♀ ; Kansrao, 2 ♀ ♀ ; Phanduwala and 1 ♀ ; Ramgarh.

Distribution : India (Kashmir, Sirmaur, Almora, Dehradun, Nainital, Pauri, Tehri, Uttar Kashi, Bihar), Afganistan, Asia Minor, Mesopotamia, South Europe, Africa and Pakistan.

***Orthetrum taeniolatum* (Schneider)**

1845. *Libellula taeniolatum* Schneider, *Stett. Ent. Zeit.*, 6 : 111.

1936. *Orthetrum taeniolatum*, Fraser, *Fauna Brit. India Odon.*, 3 : 296-298.

Material : 1 ♂, 1 ♀ ; Asarori, 3 ♂ ♂, 7 ♀ ♀ ; Kansrao, 2 ♀ ♀ ; Lachiwala, 8 ♂ ♂, 5 ♀ ♀ ; Motichur, 3 ♂ ♂, 1 ♀ ; Phanduwala and 1 ♂ Satnarain.

Distribution : India (Bilaspur, Kangra, Kinnaur, Una, Chamoli, Madhya Pradesh, West Bengal, Sikkim, Dehradun, Nainital, Pauri, Tehri, Uttar Kashi), Nepal and countries bordering mediteranean.

Remarks : Adults were often seen resting in the open rocky and sandy beds of the streams and river. Teneral males are very much similar to the females.

***Orthetrum chrysostigma luzonicum* (Brauer)**

1868. *Libellula luzonicum* Brauer, *Verh. Zool-bot. Ges. Wien.*, 18 : 169, 732.

1936. *Orthetrum chrysostigma luzonicum*, Fraser, *Fauna Brit. India Odon.*, 3 : 298-300.

Material : 1 ♂ ; Motichur.

Distribution : India (Kulu, Kangra, Dehradun, Nainital, Pauri, Tehri, Uttar Kashi, Western Coast of India, Tamil Nadu, Andhra Pradesh, West Bengal, Assam), Nepal, Burma, Sri Lanka, Philippines, Java and Sumatra.

***Orthetrum sabina* (Drury)**

1770. *Libellula sabina* Drury, *III. Exot. Ins.*, 1 : 114-115.

1936. *Orthetrum sabina*, Fraser, *Fauna Brit. India Odon.*, 3 : 300-302.

Material : 1 ♂, 1 ♀ ; Asarori, 1 ♂, 1 ♀ ; Gulatapper, 5 ♀ ♀ ; Kansrao, 1 ♀ ; Motichur, 1 ♀ ; Mohand, 1 ♀ ; Ramgarh and 1 ♀ ; Satnarain.

Distribution : Throughout India, Mesopotamia, Iraq, Nepal, Burma, Sri Lanka, Thailand, Java, Oceania, Samoa, Somali Land, Sumba, Timor, New Guinea, Australia, Egypt, Angola and African continent.

Orthetrum triangulare triangulare (Selys)

1878. *Libellula triangularis* Selys, *Mitth. Mus. Dresden.*, : 314.

1936. *Orthetrum triangulare triangulare*, Fraser, *Fauna Brit. India Odon.*, 3 : 305-307.

Material : 1 ♂ ; Kansrao and 1 ♂ ; Lachiwala.

Distribution : India (Kashmir, Bilaspur, Kangra, Kinnaur, Kulu, Sirmaur, Solan, Chamoli, Dehradun, Nainital, Pauri, Tehri, Uttar Kashi, South Indian Hills, West Bengal, Meghalaya), Nepal, Burma and Sri Lanka.

Orthetrum pruinosum neglectum (Rambur)

1842. *Libellula neglecta* Rambur, *Ins. Neurop.*, : 86.

1936. *Orthetrum pruinosum neglectum*, Fraser, *Fauna Brit. India Odon.*, 3 : 311-313.

Material : 5 ♂♂, 2 ♀♀ ; Asarori, 7 ♂♂, 3 ♀♀ ; Kansrao, 3 ♂♂, 2 ♀♀ ; Lachiwala, 2 ♂♂ ; Mohand and 4 ♂♂ ; Motichur.

Distribution : India (Bilaspur, Kangra, Hamirpur, Mandi, Sirmaur, Una, Chamoli, Dehradun, Nainital, Pauri, Tehri, Uttar Kashi, Bihar, West Bengal, Sikkim, Hills of South India), Nepal, Burma, Sri Lanka, Tibet, Indo-China, Hong Kong, Thailand and Malaysia.

Remarks : A very common species, with wide distribution.

Orthetrum glaucum (Brauer)

1865. *Libellula glauca* Brauer, *Verh. zool-bot. Ges. Wein.*, 15 : 1012.

1936. *Orthetrum glaucum*, Fraser, *Fauna Brit. India Odon.*, 3 : 307-309.

Material : 5 ♂♂ ; Asarori, 2 ♂♂, 2 ♀♀ ; Kansrao, 1 ♂ ; Lachiwala, 3 ♂♂ ; Motichur, 2 ♂♂ ; Ramgarh and 1 ♂ ; Satnarain.

Distribution : Throughout India, except in the plains, Nepal, Sri Lanka, Philippines, Malaya Archipelago, Sumbawa, Sumba, New Guinea, Timor and South China.

***Orthetrum japonicum internum* MacLachlan**

1894. *Orthetrum japonicum internum*, MacLachlan, *Ann. Mag. Hist.*, 13 : 431.

1936. *Orthetrum japonicum internum*, Fraser, *Fauna Brit. India Odon.*, 3 : 304-305.

Material : 1 ♀ ; Kansrao.

Distribution : India (Kashmir, Bilaspur, Kangra, Kinnaur, Kulu, Dehradun, Nainital, Pauri, West Bengal, Submontane area of Assam and Meghalaya), Nepal, Tibet and South West China.

***Palpopleura sexmaculata sexmaculata* (Fabr.)**

1787. *Libellula sexmaculata* Fabricius, *Mant. Ins.*, 1 : 338.

1936. *Palpopleura sexmaculata sexmaculata*, Fraser, *Fauna Brit. India Odon.*, 3 : 318-320.

Material : 3 ♂♂ ; Gulatapper, 10 ♂♂, 2 ♀♀ ; Kansrao, 2 ♂♂ ; Lachiwala and 6 ♂♂, 7 ♀♀ ; Motichur.

Distribution : India (Bilaspur, Hamirpur, Kangra, Kulu, Chamoli, Dehradun, Nainital, Pauri, Tehri, Uttar Kashi, Bihar, West Bengal, Assam, Tamil Nadu, Andhra Pradesh, Karnataka), Nepal, Sri Lanka, Malaysia, Indo-China and China.

Remarks : These are commonly seen from May to October.

***Crocothemis servilia servilia* (Drury)**

1770. *Libellula servilia* Drury, *III Ex. Ins.*, 1 : 112-113.

1936. *Crocothemis servilia servilia*, Fraser, *Fauna Brit. India Odon.*, 3 : 345-347.

Material : 11 ♂♂, 2 ♀♀ ; Asarori, 12 ♂♂, 7 ♀♀ ; Kansrao, 7 ♂♂, 5 ♀♀ ; Lachiwala, 3 ♂♂ ; Mohand, 5 ♂♂, 11 ♀♀ ; Motichur, 2 ♂♂, 6 ♀♀ ; Phanduwalla and 9 ♂♂, 9 ♀♀ ; Satnarain.

Distribution : India (Kangra, Chamoli, Dehradun, Nainital, Pauri, Bihar, Madhya Pradesh, West Bengal, Sikkim, Arunachal Pradesh, Meghalaya), Mesopotamia, Iraq, Nepal, Burma, Sri Lanka, Philippines, Sumba, Australia, Southwards to Sundaic Archipelago and Japan.

Remarks : A very common species in the Park.

Neurothemis fulvia (Drury)

1773. *Libellula fulvia* Drury, *III Ex. Ins.*, 2 : 84-85.

1936. *Neurothemis fulvia*, Fraser, *Fauna Brit. India Odon.*, 3 : 353-354.

Material : 1 ♂ ; Asarori.

Distribution : Throughout India, Iraq, Nepal, Burma, Sri Lanka, Taiwan, Thailand, Ryukus, Timor, Sumba, Seychelles, Japan, Australia, Sunda Island, Micronesia and Philippines.

Remarks : Adults are fast flier and very conspicuous because of their rusty wings.

Neurothemis intermedia intermedia (Rambur)

1842. *Libellula intermedia* Rambur, *Ins. Neurop.*, : 91.

1936. *Neurothemis intermedia intermedia*, Fraser, *Fauna Brit. India Odon.*, 3 : 357-358.

Material : 1 ♂ ; Kansrao, 2 ♂♂, 3 ♀♀ ; Motichur and 1 ♂ ; Phanduwala.

Distribution : India (Kangra, Dehradun, Bombay, Deccan, Mahabaleshwar, West Bengal, Bihar, Madhya Pradesh), Nepal, Burma, Sri Lanka, Malacca and Indo-China.

Brathythemis contaminata (Fabr.)

1793. *Libellula contaminata* Fabricius, *Ent. Syst.*, 2 : 382.

1936. *Brathythemis contaminata*, Fraser, *Fauna Brit. India Odon.*, 3 : 365-366.

Material : 1 ♂ ; Kansrao and 2 ♀♀ ; Lachiwala.

Distribution : Throughout India, Singapore, Malaysia, Taiwan, Philippines, Java, Sumatra and China.

Trithemis aurora (Burmeister)

1839. *Libellula aurora*, Burmeister, *Handb. Ent.*, 2 : 859.

1936. *Trithemis aurora*, Fraser, *Fauna Brit. India Odon.*, 3 : 383-385.

Material : 1 ♂ ; Asarori, 6 ♂♂, 4 ♀♀ ; Kansrao, 2 ♀♀ ; Lachiwala, 2 ♂♂ ; Motichur and 1 ♂ ; Satnarain.

Distribution : Throughout India, Nepal, Burma, Sri Lanka, Penang, Malaysia, Sumatra, Java, Borneo, Philippines, Taiwan, Celebes, Timor, Moluccas, Sumba, New Guinea and Pakistan.

Remarks : A very common species occurring in the Park from May to November.

***Trithemis festiva* (Rambur)**

1842. *Libellula festiva* Rambur, *Ins. Neurop.*, : 92.

1936. *Trithemis festiva*, Fraser, *Fauna Brit. India Odon.*, 3 : 387-389.

Material : 7 ♂♂ ; Asarori, 16 ♂♂, 7 ♀♀ ; Kansrao, 3 ♂♂ ; Lachiwala, 16 ♂♂, 2 ♀♀ ; Motichur, 1 ♂, 1 ♀ ; Ramgarh and 1 ♂ ; Satnarain.

Distribution : India (Bilaspur, Hamirpur, Kangra, Sirmaur, Solan, Chamoli, Dehradun, Nainital, Pauri, Tehri, Uttar Kashi, West Bengal, Assam, Maharashtra), Nepal, Burma, Sri Lanka, Penang, Singapur, Sumatra, Java, Philippines, Malaysia, Taiwan, Celebes, Lesser Sunda and New Guinea.

Remarks : A common species in the Park.

***Trithemis pallidinervis* (Kirby)**

1889. *Sympetrum pallidinervis* Kirby, *Trans. zool. Soc. Lond.*, 12 : 327.

1936. *Trithemis pallidinervis*, Fraser, *Fauna Brit. India Odon.*, 3 : 389-391.

Material : 4 ♂♂ ; Lachiwala.

Distribution : Throughout India, Nepal, Burma, Sri Lanka, Philippines, Taiwan, Thailand, Malaysia and Singapur.

***Pantala flavescens* (Fabricius)**

1798. *Libellula flavescens* Fabricius, *Ent. Syst. Suppl.*, : 285.

1936. *Pantala flavescens*, Fraser, *Fauna Brit. India Odon.*, 3 : 414-416.

Material : 2 ♂♂ ; Asarori, 1 ♂, 1 ♀ Motichur and 1 ♀ ; Phanduwala.

Distribution : Throughout India, Nepal, Burma, Sri Lanka, Micronesia, Tibet, Morocco, Thailand, Penang, Malaysia, Sumatra, Java, Bali and Borneo.

SUMMARY

Altogether 38 species of Odonata under 23 genera and 8 families have been reported from the Rajaji National Park, Uttar Pradesh.

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TERMITES (INSECTA : ISOPTERA)—CHECK LIST, ASSOCIATION IN SPECIES,
AND PEST OF EUCALYPTUS

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INTRODUCTION

The termite fauna of Rajaji National Park has until recently been practically unknown. This project report is based on the extensive collections and observations made by the author (during 1974 to 1987) and the different survey parties of the Zoological Survey of India, Dehradun, from 35 localities in the Rajaji National Park during 1965-1987. The material has been studied by Verma (1986, 1988), Verma and Purohit (1993) and a total of 21 species of termites belonging to 8 genera in two families (Rhinotermitidae and Termitidae) are recorded, of which one is new. Here a check-list is given, whilst a fuller account is published elsewhere (Verma & Purohit, 1993).

During the surveys, sixty records of association of termite species were observed from the Rajaji National Park. Out of these, one record of association of eight species of termites (Verma, 1986), one record of association of four species of termites, twelve records of association of three species and fortysix records of association of two species were encountered. The detailed account will be found elsewhere (Verma & Rathore, 1993 a).

Seven species of termites attacking eucalyptus plantations in Rajaji National Park were observed during the survey. Of these, two species *Coptotermes heimi* and *Odontotermes bhagwatii* are new pests for eucalyptus, four species viz. *Odontotermes guptai*, *O. obesus*, *O. parvidens*, *O. redemanni* are first records for Uttar Pradesh State attacking eucalyptus plantations. These species were observed eating bark portion and lower part of the stem. Now 24 species of termites are known to attack eucalyptus in India. The detailed account will be found elsewhere (Verma & Rathore, 1993 b).

CHECK LIST OF RAJAJI NATIONAL PARK TERMITES

(i) *Detailed Account of the species*

Family : RHINOTERMITIDAE

Subfamily : HETEROTERMITINAE

1. *Heterotermes indicola* (Wasmann)1902. *Leucotermes indicola* wasmann, *Zool. Jb. (Syst.)*, 17 (1) : 118-119, Soldier and worker.*Type locality* : Bombay, Maharashtra, India.*Distribution* : (i) *Rajaji National Park* : Districts of Dehradun, Pauri, and Saharanpur. (ii) *Elsewhere* : India (distributed all over Northern India above 20°N latitude). Nepal, Bangladesh, Pakistan, Afganistan.

Subfamily : COPTOTERMITINAE

2. *Coptotermes heimi* (Wasmann)1902. *Arrhinotermes heimi* Wasmann, *Zool. Jb. (Syst.)*, 17 (1) : 104-106. Imago.*Type locality* : Wallon (Ahmednagar district), Maharashtra, India.*Distribution* : (i) *Rajaji National Park* : Districts of Dehradun and Saharanpur. (ii) *Elsewhere* : India (common), Bangladesh, Pakistan, Bhutan, Indonesia.

Family : TERMITIDAE

Subfamily : AMITERMITINAE

3. *Speculitermes cyclops* Wasmann1902. *Speculitermes cyclops* Wasmann, *Zool. Jb. (Syst.)*, 17 (1) : 160-162. Imago and Worker.*Type locality* : Khandala (near Bombay), Maharashtra, India.*Distribution* : (i) *Rajaji National Park* : Districts of Dehradun and Saharanpur. (ii) *Elsewhere* : India (Jammu & Kashmir, Uttar Pradesh, Rajasthan, Maharashtra, Karnataka).

4. *Microcerotermes beelsoni* Snyder

1933. *Microcerotermes beelsoni* Snyder. *Proc. U. S. Nat. Mus.*, 82 (16) : 12-14. Imago.

Type locality : Chakata Range (Haldwani). Uttar Pradesh, India.

Distribution : (i) *Rajaji National Park* : Districts of Dehradun, Pauri and Saharanpur. (ii) *Elsewhere* : India (Haryana, Delhi, Uttar Pradesh, Madhya Pradesh, Orissa, Bihar, West Bengal), Bhutan, Pakistan, Bangladesh.

Subfamily : TERMITINAE

5. *Angulitermes dehraensis* (Gardner)

1944. *Mirotermes dehraensis* Gardner, *Indian J. Ent.* 6 : 108-110.

Type locality : Dehradun, Uttar Pradesh, India.

Distribution : (i) *Rajaji National Park* : Districts of Dehradun, Pauri, and Saharanpur. (ii) *Elsewhere* : India (Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh), Pakistan, Afganistan.

Subfamily : MACROTERMITINAE

6. *Odontotermes assmuthi* Holmgren

1913. *Odontotermes assmuthi* Holmgren. *J. Bombay nat. Hist. Soc.*, 22 (1) : 112-113. Soldier and Worker.

Type locality : Borivili Jungles (near Bombay), Maharashtra, India.

Distributions : (i) *Rajaji National Park* : Districts of Pauri and Saharanpur. (ii) *Elsewhere* : India (reported from all over the country), Pakistan, Bangladesh.

7. *Odontotermes bhagwatii* Chatterjee & Thakur

1967. *Odontotermes bhagwatii* Chatterjee & Thakur, *Indian Forest Rec.*, 11 (1) : 33-35. Soldier, Worker.

Type locality : New Railway station, Pathankot, Punjab, India.

Distributions : (i) *Rajaji National Park* : Districts of Dehradun, Pauri, and Saharanpur, (ii) *Elsewhere* : India (Jammu & Kashmir, Punjab, Haryana, Uttar Pradesh, Madhya Pradesh).

8. *Odontotermes brunneus* (Hagen)

1858. *Termes brunneus* Hagen, *Linn. Entomol.*, 12 : 133. Imago and Soldier.

Type locality : Bengal, India.

Distributions : (i) *Rajaji National Park* : Districts of Dehradun and Pauri. (ii) *Elsewhere* : India (West Bengal, Bihar, Orissa, Haryana, Rajasthan, Maharashtra, Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka).

9. *Odontotermes dehraduni* (Snyder)

1933. *Termes (Termes) dehraduni* Snyder. *Proc. U. S. Nat. Hist.* 82 (16) : 6-7. Imago.

Type locality : Dehradun, Uttar Pradesh, India.

Distributions : (i) *Rajaji National Park* : Districts of Dehradun and Saharanpur. (ii) *Elsewhere* : India (Jammu & Kashmir, Uttar Pradesh, Delhi, Rajasthan, Nagaland), Pakistan.

Remarks : The queen, soldier and worker castes of the species were reported and described by Verma (1988).

10. *Odontotermes feae* (Wasmann)

1896. *Termes feae* Wasmann, *Ann. Mus. Civ. Stor. nat. Genova*, (2) 16 : 625-626. Soldier and Worker.

Type locality : Carin Cheba, Burma.

Distribution : (i) *Rajaji National Park* : Districts of Dehradun, Pauri and Saharanpur. (ii) *Elsewhere* : India (Arunachal Pradesh, Assam, Manipur, Meghalaya, Nagaland, Tripura, West Bengal, Orissa, Bihar, Uttar Pradesh, Haryana, Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, Daman, Goa, Karnataka, Tamil Nadu, Kerala), Bangladesh, Bhutan, Burma, Nepal, Sri Lanka, Thailand, Vietnam.

11. *Odontotermes guptai* Roonwal & Bose

1962. *Odontotermes bellahunisensis guptai* Roonwal & Bose, *J. Bombay nat. Hist. Soc.*, 58 (3) : 588-593. Soldier and Worker.

Type locality : near Gudha Village, Nagour district, Rajasthan, India.

Distribution : (i) *Rajaji National Park* : Districts of Dehradun, Pauri and Saharanpur. (ii) *Elsewhere* : India (Jammu & Kashmir, Himachal Pradesh, Haryana, Uttar Pradesh, Orissa, Rajasthan, Madhya Pradesh, Maharashtra, Gujarat, Kerala), Pakistan, Bangladesh.

12. *Odontotermes gurdaspurensis* Holmgren & Holmgren

1917. *Odontotermes obesus* form *gurdaspurensis* Holmgren & Holmgren, *Mem. Dept. Agric. India*, 5 (3) : 149. Imago and Soldier.

Type locality : Gurdaspur, Punjab, India.

Distribution : (i) *Rajaji National Park* : Districts of Dehradun and Pauri. (ii) *Elsewhere* : India (Jammu & Kashmir, Himachal Pradesh, Punjab, Haryana, Uttar Pradesh, West Bengal, Rajasthan, Madhya Pradesh, Maharashtra), Pakistan.

13. *Odontotermes horai* Roonwal & Chhotani

1962. *Odontotermes horai* Roonwal & Chhotani, *Proc. Nat. Inst. Sci. India*, (B) 28 (4) : 346-349. Soldier and Worker.

Type locality : Nong Priang Stream (Khasi Hills), Meghalaya, India.

Distribution : (i) *Rajaji National Park* : Districts of Dehradun and Pauri. (ii) *Elsewhere* : India (Arunachal Pradesh, Meghalaya, Nagaland, West Bengal, Uttar Pradesh, Haryana), Nepal, Pakistan.

14. *Odontotermes microdentatus* Roonwal & Sen-Sarma

1960. *Odontotermes microdentatus* Roonwal & Sen Sarma, *Indian Council. Agric. Res. Ent. Mon.* No. 1 : 33-39. Imago, Soldier and Worker.

Type locality : Dehradun, Uttar Pradesh, India.

Distribution : (i) *Rajaji National Park* Districts of Dehradun, Pauri and Saharanpur. (ii) *Elsewhere* : India (Jammu & Kashmir, Himachal Pradesh, Haryana, Uttar Pradesh, Bihar, Orissa, Madhya Pradesh, Gujarat).

15. *Odontotermes mohandi* Verma & Purohit

1993. *Odontotermes mohandi* Verma & Purohit, *Zoology* (J. Pure & Applied Zoology), 3 (3): 200-202. Soldier.

Type locality : Mohand Forest, Saharanpur district, Uttar Pradesh, India.

Distribution : (i) *Rajaji National Park* : Mohand Forest, Saharanpur district. (ii) *Elsewhere* : not reported.

16. *Odontotermes obesus* (Rambur)

1842. *Termes obesus* Rambur, *Histoire naturelle des insectes Neuropteres*, 1 : 304. Imago.

Type locality : Bombay, India.

Distribution : (i) *Rajaji National Park* : Districts of Dehradun, Pauri, Saharanpur. (ii) *Elsewhere* : India (widely distributed), Bangladesh, Pakistan, Bhutan and Burma.

17. *Odontotermes parvidens* Holmgren & Holmgren

1917. *Odontotermes (Odontotermes) parvidens* Holmgren & Holmgren, *Mem. Dept. Agric. India* (Ent.), 5 (3) : Soldier and worker.

Type locality : India : on road from Mysore to Mercara (Karnataka); Dhar (Gurdaspur district, Punjab); Kamakhya hill (553 m.) and Gauhati (Assam). Bangladesh : Chauma Hani (Noakhali district).

Distribution : (i) *Rajaji National Park* : Districts of Dehradun, Pauri and Saharanpur. (ii) *Elsewhere* : India (widespread), Pakistan, Bangladesh, Bhutan.

18. *Odontotermes redemanni* (Wasmann)

1893. *Termes redemanni*, *Wien, Ent. Zeitg.*, 12 (7) : 239-242. Imago, Queen, Soldier, Worker.

Type locality : Colombo, Sri Lanka.

Distribution : (i) *Rajaji National Park* : Districts of Dehradun, Pauri and Saharanpur. (ii) *Elsewhere* : India (Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Haryana, Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, Bihar, West Bengal, Orissa, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala), Bangladesh, Sri Lanka.

19. *Microtermes obesi* Holmgren

1913. *Microtermes obesi* Holmgren, *K. Svenska Akad. Handl.*, 50 (2) : 150. Imago.

Type locality : Khandala (near Bombay), Maharashtra, India.

Distribution : (i) *Rajaji National Park* : Districts of Dehradun, Pauri, and Saharanpur. (ii) *Elsewhere* : India (widely distributed), Pakistan, Bangladesh, Sri Lanka, Burma, Thailand, Cambodia, Vietnam.

20. *Microtermes unicolor* Snyder

1933. *Microtermes unicolor* Snyder, *Proc. Biol. Soc. Washington*, 46 : 92-93. Imago.

Type locality : Dehradun, Uttar Pradesh, India.

Distribution : (i) *Rajaji National Park* : Districts of Dehradun, Pauri, Saharanpur. (ii) *Elsewhere* : India (Jammu & Kashmir, Himachal Pradesh, Haryana, Punjab, Uttar Pradesh, Madhya Pradesh, Rajasthan), Pakistan, Bangladesh.

Subfamily : NASUTITERMITINAE

21. *Trinervitermes biformis* (Wasmann)

1902. *Eutermes biformis* Wasmann, *Zool. Jb. (Syst.)* 17 (1) : 133-135. Imago, Soldier (Major & Minor), Worker.

Type locality : Sri Lanka : Bandarawella. India : Khandala (near Bombay), Maharashtra.

Distribution : (i) *Rajaji National Park* : Saharanpur district. (ii) *Elsewhere* : India (Jammu & Kashmir, Uttar Pradesh, Haryana, Madhya Pradesh, Rajasthan, Gujarat, Maharashtra, West Bengal, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala), Pakistan, Sri Lanka.

(ii) *Synoptic list of species*

Family : RHINOTERMITIDAE

Subfamily : HETEROTERMITINAE

1. *Heterotermes indicola* (Wasmann)

Subfamily : COPTOTERMITINAE

2. *Coptotermes heimi* (Wasmann)

Family : TERMITIDAE

Subfamily : AMITERMITINAE

3. *Speculitermes cyclops* Wasmann

4. *Microcerotermes beelsoni* Snyder

Subfamily : TERMITINAE

5. *Angulitermes dehraensis* (Gardner)

Subfamily : MACROTERTERMITINAE

6. *Odontotermes assmuthi* Holmgren

7. *Od. bhagwatii* Chatterjee & Thakur

8. *Od. brunneus* (Hagen)

9. *Od. dehraduni* (Snyder)

10. *Od. feae* (Wasmann)

11. *Od. guptai* Roonwal & Bose

12. *Od. gurdaspurensis* Holmgren & Holmgren

13. *Od. horai* Roonwal & Chhotani

14. *Od. microdentatus* Roonwal & Sen-Sarma
15. *Od. mohandi* Verma & Purohit
16. *Od. obesus* (Rambur)
17. *Od. parvidens* Holmgren & Holmgren
18. *Od. redemanni* (Wasmann)
19. *Microtermes obesi* Holmgren
20. *Microt. unicolor* Snyder

Subfamily : NASUTITERMITINAE

21. *Trinervitermes biformis* (Wasmann)

iii) *Key to the identification of species*

Soldier Caste

Note : Soldier caste in *Speculitermes cyclops* not known.

The number preceding each species name in the key corresponds to that in the Systematic account.

- | | | | |
|---|-----|--------------------------------------|---|
| 1. Pronotum flat (not saddle-shaped) | ... | ... | 2 |
| Pronotum saddle-shaped | ... | ... | 3 |
| 2. Head capsule rectangular (parallel-sided); fontanelle small. (Posterior margin of pronotum distinctly notched at middle; antennal segments always more than 14). | ... | 1. <i>Heterotermes indicola</i> . | |
| Head capsule oval (narrowed anteriorly); fontanelle large and conspicuous. (Waist of postmentum lying in the middle line connecting the level of maximum width and the hind margin) | ... | 2. <i>Coptotermes heimi</i> . | |
| 3. Mandibles degenerate, non-functional. Head capsule drawn out into a long nasus. (Soldiers dimorphic; apex of rostrum always reddish brown; head bulge index 0.35-0.43) | ... | 21. <i>Trinervitermes biformis</i> . | |
| Mandibles well developed, functional. Head not produced into a long nasus | ... | ... | 4 |

4. Mandibles asymmetrical, twisted. (Head capsule with a distinct prominent frontal projection (length 0.1-0.17 mm), projection apically rounded, not upturned. Mandibles longer (length 1.34-1.47 mm) ... 5. *Angulitermes dehraensis*.
Mandibles symmetrical, curved at tip ... 5
5. Mandibles with inner margin coarsely serrated. (Apices of mandible weakly hooked. Labrum not pentagonal. Pronotum with anterior margin indistinctly notched at middle.) ... 4. *Microcerotermes beesoni*.
Mandibles with inner margin not serrated ... 6
6. Mandibles short, thin, delicate. Left mandible without tooth. Soldiers smaller than workers ... 7
Mandibles large and generally strong. Left mandible with a tooth, variably placed on its inner margin. Soldiers usually larger than workers ... 8
7. Head capsule densely hairy. 2nd segment of antenna shorter than the combined length of 3rd and 4th segments ... 20. *Microtermes unicolor*.
Head capsule moderately hairy. 2nd segment of antenna equal to the combined length of 3rd and 4th segments ... 19. *Microtermes obesi*.
8. Distal segments of antenna distinctly darker than the proximal segments ... 9
Distal segments of antenna uniformly coloured, not darker than the proximal segments ... 16
9. Tooth on the left mandible rudimentary. Mandible long, slender, and with tapering apices. ... 14. *Odontotermes microdentatus*.
Tooth on the left mandible large, strong. Mandibles sabre-shaped, with distinctly incurved apices ... 10
10. Mandibles short (length 0.55-0.68 mm). Smaller species. Postmentum index (width/length) higher, more than 0.75 ... 11
Mandibles longer (length 0.75-1.1 mm). Larger species. Postmentum index (width/length) smaller, less than 0.75 ... 12
11. Outer margin of mandibles substraight, apices weakly hooked, almost straight ... 9. *Odontotermes dehraduni*
Outer margin of mandibles convex, apices strongly hooked... 11. *Odontotermes guptai*.
12. Head capsule rectangularly oval to oval. Inner margin of left mandible not

- strongly hooked beyond the tooth. Tooth on left mandible medium-sized (and placed near the apical third) ... 13
- Head capsule rectangular, its lateral margins parallel. Inner margin of left mandible strongly hooked beyond the tooth. Tooth on left mandible large ... 15
13. Head capsule rectangularly oval, its lateral margins parallel up to bases of antennae. Larger species ... 12. *Odontotermes gurdapurensis*.
Head capsule oval, its lateral margins narrowing to bases of antennae. smaller species ... 14
14. Mandibles longer, strongly bent near the basal third. Labrum longer. Head mandibular index 0.65-0.73 ... 18. *Odontotermes redemanni*.
Mandibles shorter, slender and with weakly curved outer margin. Labrum short and broadly rounded anteriorly. Head mandibular index 0.59-0.66 ... 16. *Odontotermes obesus*.
15. Head index (max. head width/length to lateral base of mandible) higher, 0.965. Postmentum length 0.67 mm.; postmentum index (width/length) 0.82 ... 15. *Odontotermes mohandi*.
Head index lower, 0.75-0.87 Postmentum longer, 0.95-1.2 mm.; postmentum index lower, 0.5-0.58 ... 8. *Odontotermes brunneus*.
16. Tooth on left mandible placed in distal half; inner margin anterior to tooth on left mandible wavy, parrot's beak like ... 6. *Odontotermes assmuthi*.
Tooth on left mandible placed in basal half ... 17
17. Tooth on left mandible prominent and placed near the middle. (Mandible tooth index 0.5-0.54. Head capsule distinctly narrowed anteriorly. Larger species) ... 10. *Odontotermes feae*.
Tooth on the left mandible rudimentary or small, bluntly pointed ... 18
18. Tooth on left mandible placed a little below the middle (mandible tooth index 0.51-0.58). (Head length to base of mandible 1.25-1.75 mm; max. head width 1.1-1.38 mm; pronotum length 0.45-0.6 mm; pronotum width 0.83-0.95 mm) ... 7. *Odontotermes bhagwatii*.
Tooth on left mandible placed near the basal third (mandible tooth index 0.58-0.66) ... 19
19. Head capsule distinctly narrowed anteriorly. Antennae 17 segmented.

Comparatively larger species. Postmentum budged out in posterior third.
 ... 17. *Odontotermes parvidens*.

Head capsule with sides almost parallel, indistinctly narrowed anteriorly.
 Antennae 16-segmented. Smaller species. Postmentum not bulged out in posterior third
 ... 13. *Odontotermes horai*.

ASSOCIATION IN TERMITE SPECIES IN RAJAJI NATIONAL PARK

i) Observations :

When a termite nest is excavated in regions where they are abundant, it is common to find several species in close proximity to one another in an ecological niche, e.g. a mound, a log of wood, a tree trunk, cattle dung, rotten leaves on forest floor, etc. These cases of inquilinism may simply be a matter of association of species with similar ecological and nutrient requirements in a favourable microclimate ; or, perhaps, the establishment of dominant species being able to modify the local conditions in such a way as to favour the establishment of other species.

Sixty records of association of termite species were observed from Rajaji National Park from Dehradun, Pauri and Shaharanpur districts, (for detailed account, ref. Verma and Rathore, 1993 a). Out of these, one record of association of eight species of termites (on a small decaying wooden log of length 2 m. and diameter 0.5 m, Verma, 1986), One record of association of four species, twelve records of association of three species and forty six cases of association of two species were observed.

Association among eighteen termite species of two families (viz. Rhinotermitidae and Termitidae) and five sub-families were recorded. The dominant species were *Odontotermes microdentatus* Roonwal & Sen Sarma, associated with 14 termite species ; *Odontotermes guptai* Roonwal & Bose and *Odontotermes parvidens* Holmgren & Holmgren with 12 species each ; *Microcerotermes beelsoni* Snyder and *Microtermes obesi* Holmgren with 11 species each ; *Odontotermes assmuthi* Holmgren with 10 species ; *Coptotermes heimi* (Wasmann), *Heterotermes indicola* (Wasmann), and *Odontotermes feae* (Wasmann) with 9 species each , and the remaining species were associated with 1 to 7 termite species (*vide* below).

(ii) *Systematic list of termite species and their association with other termites*

Family I : RHINOTERMITIDAE

Subfamily : COPTOTERMITINAE

1. *Coptotermes heimi* (Wasmann) : with *Heterotermes indicola*, *Microcerotermes beelsoni*, *Odontotermes assmuthi*, *Odontotermes bhagwatii*, *Odontotermes feae*, *Odontotermes guptai*, *Odontotermes microdentatus*, *Odontotermes parvidens* and *Microtermes obesi*.

Subfamily : HETEROTERMITINAE

2. *Heterotermes indicola* (Wasmann) : with *Coptotermes heimi*, *Microcerotermes beelsoni*, *Odontotermes assmuthi*, *Odontotermes feae*, *Odontotermes guptai*, *Odontotermes microdentatus*, *Odontotermes parvidens*, *Microtermes obesi* and *Microtermes unicolor*.

Family II : TERMITIDAE

Subfamily : AMITERMITINAE

3. *Speculitermes cyclops* Wasmann : with *Microcerotermes beelsoni*, and *Microtermes obesi*.
4. *Microcerotermes beelsoni* Snyder : *Coptotermes heimi*, *Heterotermes indicola*, *Speculitermes cyclops*, *Odontotermes assmuthi*, *Odontotermes bhagwatii*, *Odontotermes feae*, *Odontotermes guptai*, *Odontotermes microdentatus*, *Odontotermes parvidens*, *Odontotermes redemanni* and *Microtermes obesi*.

Subfamily : TERMITINAE

5. *Angulitermes dehraensis* (Gardner) : with *Odontotermes guptai*, and *Microtermes obesi*.

Subfamily : MACROTERTITINAE

6. *Odontotermes assmuthi* Holmgren : with *Coptotermes heimi*, *Heterotermes indicola*, *Microcerotermes beelsoni*, *Odontotermes dehraduni*, *Odontotermes feae*, *Odontotermes guptai*, *Odontotermes microdentatus*, *Odontotermes parvidens*, *Microtermes obesi* and *Microtermes unicolor*.

7. *Odontotermes bhagwatii* Chatterjee and Thakur : *Coptotermes heimi*, *Microcerotermes beelsoni*, *Odontotermes guptai*, *Odontotermes microdentatus* and *Odontotermes mohandi*.
8. *Odontotermes dehraduni* Synder : with *Odontotermes assmuthi*, *Odontotermes microdentatus*, *Odontotermes obesus*, *Odontotermes parvidens*, *Microtermes obesi* and *Microtermes unicolor*.
9. *Odontotermes feae* (Wasmann) : with *Coptotermes heimi*, *Heterotermes indicola*, *Microcerotermes beelsoni*, *Odontotermes assmuthi*, *Odontotermes guptai*, *Odontotermes microdentatus*, *Odontotermes parvidens*, *Microtermes obesi* and *Microtermes unicolor*.
10. *Odontotermes guptai* Roonwal and Bose : with *Coptotermes heimi*, *Heterotermes indicola*, *Microcerotermes beelsoni*, *Angulitermes dehraensis*, *Odontotermes assmuthi*, *Odontotermes bhagwatti*, *Odontotermes feae*, *Odontotermes microdentatus*, *Odontotermes obesus*, *Odontotermes parvidens*, *Microtermes obesi*, and *Microtermes unicolor*.
11. *Odontotermes gurdaspurensis* Holmgren and Holmgren : with *Odontotermes microdentatus*, *Odontotermes parvidens*, and *Microtermes unicolor*.
12. *Odontotermes microdentatus* Roonwal and Sen-Sharma : with *Coptotermes heimi*, *Heterotermes indicola*, *Microcerotermes beelsoni*, *Odontotermes assmuthi*, *Odontotermes bhagwatii*, *Odontotermes dehraduni*, *Odontotermes feae*, *Odontotermes guptai*, *Odontotermes gurdaspurensis*, *Odontotermes obesus*, *Odontotermes parvidens*, *Odontotermes redemanni*, *Microtermes obesi* and *Microtermes unicolor*.
13. *Odontotermes mohandi* Verma & Purohit : with *Odontotermes bhagwatii*.
14. *Odontotermes obesus* (Rambur) : with *Odontotermes dehraduni*, *Odontotermes guptai*, and *Odontotermes parvidens*.
15. *Odontotermes parvidens* Holmgren and Holmgren : with *Coptotermes heimi*, *Heterotermes indicola*, *Microcerotermes beelsoni*, *Odontotermes assmuthi*, *Odontotermes dehraduni*, *Odontotermes feae*, *Odontotermes guptai*, *Odontotermes gurdaspurensis*, *Odontotermes microdentatus*, *Odontotermes obesus*, *Odontotermes redemanni* and *Microtermes obesi*.
16. *Odontotermes redemanni* (Wasmann) : with *Microcerotermes beelsoni*, *Odontotermes microdentatus* and *Odontotermes parvidens*.
17. *Microtermes obesi* Holmgren : with *Coptotermes heimi*, *Heterotermes indicola*, *Speculitermes cyclops*, *Microcerotermes beelsoni*, *Angulitermes dehraensis*, *Odontotermes*

assmuthi, *Odontotermes dehraduni*, *Odontotermes feae*, *Odontotermes guptai*, *Odontotermes microdentatus* and *Odontotermes parvidens*.

18. *Microtermes unicolor* Snyder : with *Heterotermes indicola*, *Odontotermes assmuthi*, *Odontotermes dehraduni*, *Odontotermes feae*, *Odontotermes guptai*, *Odontotermes gurdaspurensis*, and *Odontotermes microdentatus*.

TERMITE PESTS OF EUCALYPTUS IN RAJAJI NATIONAL PARK

Ever since the introduction of eucalyptus into India, about a century ago, several species have been planted extensively all over the country. Termites proved serious pests of eucalyptus of nurseries and young plantations. The plantations of *Eucalyptus* hybrid in Rajaji National Park (Mohand, Beribara, and Ranipur forests in Saharanpur district) were started during 1970-71.

Seven species of termites attacking eucalyptus plantation (eating away the bark portion and lower parts of the stem) in the park were collected during November 1986 to September 1987 (Table 1). Of these, two species *Coptotermes heimi* (Rhinotermitidae) and *Odontotermes bhagwatii* (Termitidae) are new pests for eucalyptus ; four species viz. *Odontotermes guptai*, *Odontotermes obesus*, *Odontotermes parvidens* and *Odontotermes redemanni* (Termitidae) are first records for Uttar Pradesh State, attacking eucalyptus plantation. *Odontotermes feae* was earlier reported from Uttar Pradesh damaging eucalyptus. There were ten to twelve termite species present in the plantation area (Table 2), but only seven species were reported damaging plantations. Now 24 species of termites are known to attack eucalyptus in India (Verma and Rathore, 1993 b).

Table 1 : Termite species attacking bark portion and lower part of stem of *Eucalyptus* hybrid in Rajaji National Park, Uttar Pradesh, India.

Termite species. + , Present ; —,absent	Saharanpur District			Remarks
	Mohand Forest	Beribara Forest	Ranipur Forest	
Family : RHINOTERMETIDAE				
1. <i>Coptotermes heimi</i> (Wasman)*	—	—	+ (15.9.87)	*Collected in association with <i>Odontotermes guptai</i> Roonwal & Bose.
Family : TERMITIDAE				
2. <i>Odontotermes bhagwatii</i> Chattejee & Thakur**	+ (17.9.87)	—	+ (16.9.87)	**At Mohand forest associated with <i>Odontotermes guptai</i> Roonwal & Bose.
3. <i>Odontotermes feae</i> (Wasmann)	—	+ (12.11.86)	+ (15.9.87)	
4. <i>Odontotermes guptai</i> Roonwal & Bose***	+ (17.9.87)	—	+ (15.9.87)	***At Mohand forest collected with <i>Odontotermes bhagwatii</i> Chatterjee & Thakur and at Ranipur forest with <i>Coptotermes heimi</i> (Wasmann)
5. <i>Odontotermes obesus</i> (Rambur)	—	—	+ (15.9.87)	
6. <i>Odontotermes parvidens</i> Holmgren & Holmgren	—	+ (12.11.86)	—	
7. <i>Odnototermes redemanni</i> (Wasmann)	—	—	+ (16.9.87)	

Table : 2 Termite Fauna present in plantations in three localities

S. No.	Termite species + , present ; - , absent	Saharanpur District		
		Mohand Forest	Beribara Forest	Ranipur Forest
Family : RHINOTERMITIDAE				
Subfamily : HETEROTERMITINAE				
1.	<i>Heterotermes indicola</i> (Wasmann)	+	+	+
Subfamily : COPTOTERMITINAE				
2.	<i>Coptotermes heimi</i> (Wasmann)	+	+	+
Family : TERMITIDAE				
Subfamily : AMITERMITINAE				
3.	<i>Speculitermes cyclops</i> (Wasmann)	+	-	-
Subfamily : MACROTERTERMITINAE				
4.	<i>Odontotermes assmuthi</i> Holmgren	+	-	+
5.	<i>Odontotermes bhagwatii</i> Chatterjee & Thakur	+	+	+
6.	<i>Odontotermes feae</i> (Wasmann)	+	+	+
7.	<i>Odontotermes guptai</i> Roonwal & Bose	+	+	+
8.	<i>Odontotermes microdentatus</i> Roonwal & Sen Sarma	+	+	-
9.	<i>Odontotermes mohandi</i> Verma & Purohit	+	-	-
10.	<i>Odontotermes obesus</i> (Rambur)	+	-	+
11.	<i>Odontotermes parvidens</i> Holmgren & Holmgren	-	+	-
12.	<i>Odontotermes redemanni</i> (Wasmann)	-	+	+
13.	<i>Microtermes obesi</i> Holmgren	+	+	+
14.	<i>Microtermes unicolor</i> Snyder	-	+	+
Subfamily : NASUTITERMITINAE				
15.	<i>Trinervitermes biformis</i> (Wasmann)	+	-	-
TOTAL :		12 species	10 species	10 species

SUMMARY

1. A list of known species of termites (Insecta : Isoptera) from Rajaji National Park (situated in Siwalik ranges of Himalayas, northern part of Uttar Pradesh, India), together with their distribution is given. The list comprises 21 species of termites in 8 genera belonging to two families Rhinotermitidae and Termitidae. A key based on the soldier caste is provided for identification the known species of termites from Rajaji National Park.
2. Sixty records of association of termite species were observed from Rajaji National Park. One record was association of 8 species of termites, one record of 4 species, 12 records of association of 3 species and 46 records of association of 2 species. These were reported among 18 termite species of two families (viz. Rhinotermitidae and Termitidae). Systematic list of termite species and their association with other species in park is given.
3. Seven species of termites (Rhinotermitidae and Termitidae) as pest of eucalyptus were reported in Rajaji National Park. These were found attacking bark portion and lower parts of stem of *Eucalyptus* hybrid plantations in Mohand, Beribara and Ranipur forests (Saharanpur district). A list of termite species occur in plantation is given. So far, 24 species of termites are known to attack eucalyptus in India.

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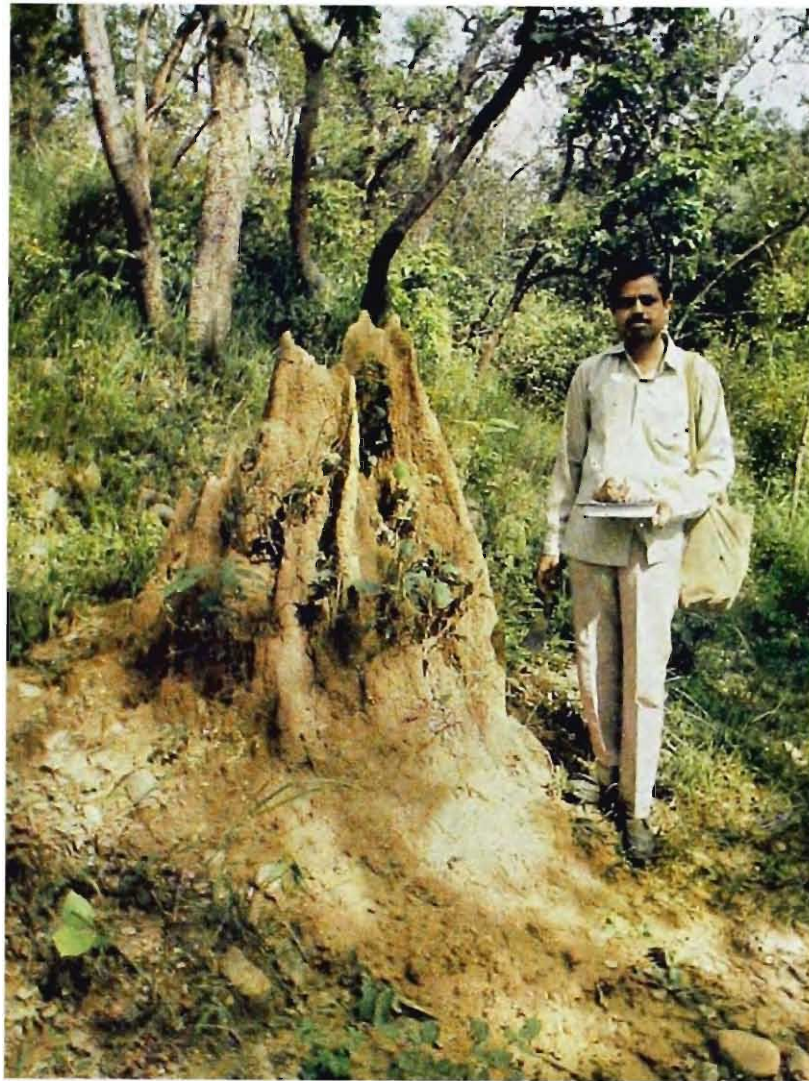
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Fauna of Conservation Area 5 : Rajaji National Park

VERMA

PLATE



A mound of *Odontotermes obesus* (Rambur) in Rajaji National Park, Uttar Pradesh, India. (Author is standing by the side of the mound).

SOME ECOLOGICAL OBSERVATIONS ON THE CENTIPEDE *CORMOCEPHALUS DENTIPES* POCK, WITH COMMENTS ON THE SEXUAL DIMORPHISM IN THE SPECIES AND ON THE STATUS OF *C. PSEUDONUDIPIES* JANGI AND DASS

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The centipedes are essentially the animals of the forest floor inhabiting damp and dark places. Because of being photonegative in habit they tend to hide under stones, bricks, cowdung, logs of fallen woods, bark of the trees or mosses grown on trees, leaf litters, etc. The centipede found in non-wooded area including the man made environment are the 'relic of the forest fauna' adopting to new conditions of life following deforestation.

Except for the aforesaid informations there is hardly any study on the habitat utilisation by individual centipede species. The efforts were, therefore, directed during the course of the field surveys in the past few years to record the cases of individual habitat utilisation, seasonal incidence, reproductive behaviour and food and feeding habits in some of the selected species occurring commonly around Doon Valley. The species selected were *Cormocephalus dentipes* Pocock, *Rhysida monalii* Khanna and Kumar, *Rhysida nuda immarginata* Porath and *Otostigmus amballae* Chamberlin. It was found that though occurring sympatrically all these species occupy different ecological niches and occur at different periods of the year.

The species *Cormocephalus dentipes* Pocock is one of the most common species occurring abundantly in Western Himalaya, U. P. The ecological observations on the species, recorded mainly at Motichur Forest, District Dehradun, Rajaji National Park, have been presented here.

The species so far known to be endemic and restricted to the eastern part of India,

in Punkhabari and Darjeeling (West Bengal), is now found to be a widely distributed species in Western Himalaya, U. P. (Khanna and Kumar, 1984, Khanna 1987 ; Khanna and Tripathi 1985), Himachal Pradesh (Khanna, unpublished record) ; Andaman and Nicobar Islands (Ahmed, 1980) and Madhya Pradesh, Orissa and Maharashtra (Jangi and Dass, 1984).

The ecological observations recorded and interpretations thereon have been given. Some morphological variations in the species and its taxonomic status has also been discussed.

I. ECOLOGICAL OBSERVATIONS

SEASONAL INCIDENCE

Khanna and Tripathi (1984) have reported that the seasonal incidence or abundance in *Cormocephalus dentipes* Pocock is maximum after the spell of rains during the months of October to November, dwindling gradually in the following months i.e. December and January, when Dehradun witnesses a second spell of rains (winter rains) resulting into considerable fall of temperature. The incidence rises again during February to March or early April, when the soil is not wet enough to decay their bodies and the atmospheric temperature is conducive to survival and normal activity of the animal, and the food is plentiful.

Cormocephalus dentipes has been collected by the author in large numbers during several field surveys conducted in Motichur Sal Forests, Shivalik ranges, in Rajaji National Park (in east Dehradun) and other forested patches around.

During the period of abundance and increased activity most of the samples collected were found to be fully grown adults. The population of the species found during intervening period i.e., late April to the middle or end of the September remains at appreciably a low ebb, confirming to the earlier observations of Khanna and Tripathi (1984). The little collection that was, however, available during this period was in juvenile stages. The juveniles too take to refuge under deep soil up to about 60-90 cms deep during the unfavourable periods. These observations were recorded by digging the soil up to the depth making transacts at different places, where the species was collected in large number during the favourable periods of growth and increased activity.

HABITS AND HABITATS

During the course of numerous field trips to Motichur (Rajaji National Park) the author has observed that *Cormocephalus dentipes* occupies dark shady places under dense canopy of Sal Forests and forms gallery like structures under stones, or wooden logs or in its other hide-outs. The gallery may be one, two or a criss-cross of many such galleries which can be noticed when the stones are removed. The galleries are so designed apparently to keep their bodies concealed on the lateral sides in the centre of the galleries to avoid easy detection and depredation on removal of stones. However, by the time the animal is spotted, it runs very fast in the fine network of galleries, which (it is presumed) have been prepared by the species for defence against enemies. The very peculiar record is that the galleries under one stone or object are often so closely inter-connected with other such galleries under different objects nearby (with grass roots or leaf litters in between the gap of the two objects) that the animal makes its defensive escape from enemies very easy and once missed it penetrates deep into the soil through these galleries in no time.

However, the presence of galleries in such habitats suggest the possible occurrence of *C. dentipes* in the area, even though the galleries are often found empty.

Because of the centipedes being photonegative in nature, slightest light thrown on them by removal of objects would alert them of possible danger, resulting into very quick movement of the animal for defensive asylum elsewhere in the network. At the same time the dark purple, black or dark olive green colour of the animal helps them mimic with the surrounding.

In dry season the specimens of *C. dentipes* could only be found under cowdung, a micro-habitat ensuring high humidity, abundant food (largely in the form of termites and other caprophagous insects) and possible protection against the adversities of nature.

The absence of larger individuals in the dry season reflects the behavioural differences also between the age groups. A "dry season diapause" has been reported by Khanna and Tripathi (1984) basing it on the sudden disappearance of the species from the forest floor in Western Himalaya, U. P., during the summer months of the year. After thorough investigations into this aspect of the species the author has come to the conclusion that the adults, during the "so called" dry season, penetrate deep into the soil through network of the galleries or through the cracks formed onto the earth by drying up of the soil, to a depth which still remains humid and provides temperature and other conditions conducive to the normal activity, growth and survival of the animal. The species comes out for surface feeding only after the first spell of rains when the crevices in the earth get filled with rain water.

REPRODUCTIVE BEHAVIOUR

Though bisexual yet copulation in strict sense does not seem to occur in centipedes. The male deposits its spermatophores on the ground which later finds attachment to the genital orifice of the females, passing accidentally over the batch.

It has been observed by the author that the female of *C. dentipes* deposits her eggs singly which later are held together by her in a sticky mass, released by her, enclosing the brood-spore within. The female then places her batch of eggs ensheathed in between her legs lifted up off the ground so as, possibly, to save them from fungal or acarine infections.

During the repeated surveys in the area, the author has observed that the eggs laying in *C. dentipes* takes place before the onset of monsoon enabling both mature females and adolescent young stadia to benefit from abundant food available during the wet spell.

II. TAXONOMIC STATUS AND MORPHOLOGICAL VARIATIONS

Cormocephalus dentipes Pocock, 1891

- 1891. *Cormocephalus dentipes*, Pocock, R. I., *Ann. nat. Hist. Ser.*, 6/7 : 66 & 67 (Type locality: India, Bengal).
- 1930. *C. (Cormocephalus) dentipes*, Attems, C., *Das Tierr.*, 54 (2) : 96-97.
- 1975. *C. dentipes*, Jangi & Dass, *J. zool. Soc.*, 27 (1 & 2) 113-116 (Sexual dimorphism).
- 1980. *C. (C.) dentipes*, Jangi & Dass, *J. nat. Hist.*, 14 : 49-53 (Revisionary notes).
- 1984. *Cormocephalus pseudonudipes*, Jangi and Dass, *J. Scient. Indl. Res.*, 27 : 37 (Type locality : India, Nasik, Maharashtra) (New synonym)
- 1984. *C. dentipes*, Khanna and Tripathi, *Uttar Pradesh J. zool.*, 4 (2) : 217-219 (Seasonal incidence).
- 1987. *C. dentipes* Khanna, *D. Phil Thesis, Garhwal University, Srinagar, U. P.*, pp. 81-86 and 194-196 (Redescription).

Status : Monotypic, Polytopic.

Distribution : West Bengal, Bihar, Andaman and Nicobar Islands, Madhya Pradesh, Orissa, Maharashtra, Uttar Pradesh and Himachal Pradesh.

Jangi and Dass (1980) have already redescribed the species basing their description on the study of the holotype. They have also proposed a new form of sexual dimorphism (Jangi and Dass, 1975) in *C. dentipes*, with bearing on its taxonomy. In 449 examples of this species studied by the author (366 from Western Himalaya, U. P., 11 from U. P. Plains and 72 from U. P. Terai area) besides those collected and examined from Rajaji National

Park (as reported by Khanna, in press) the author has noticed certain variations in the morphological characters of taxonomic value as described by Attems (1930) and Jangi and Dass (1980). The author also does not feel satisfied with the new form of sexual dimorphism proposed by Jangi and Dass (l.c.), as well also with the validity of *Cormocephalus pseudonudipes* Jangi and Dass, 1984.

Variations in characters noticed by the author are given below :

VARIATION IN CHARACTERS OF TAXONOMIC VALUE

1. The *colour* of the animal recorded here is purplish black to dark olive green or sometimes black. Whereas Ahmed (1980) in his Andaman collection found reddish green variety, which is, it is presumed, to be a local variant or a mutant.

2. The *total body length* of the specimens collected from Western Himalaya, U. P. ranges from 41-52 mm and is 58 mm in specimens collected from U. P Terai.

3. The *process of Coxopleura* is tipped generally with 2 curved spines ; in four abnormal cases 2 spines were found on the left and 4 on the right side.

REMARKS ON THE SEXUALLY DIMORPHIC CHARACTERS

Anal leg prefemur in males of the *Cormocephalus dentipes* are always studied with tuberculations according to Jangi and Dass, 1975, suggesting a form of sexual dimorphism but in samples studied by the present author out of the 449 examples only 39 were identified as males. Of these the "so called" males only 20% confirmed to the Jangi and Dass's (1980) version of sexual dimorphism and in the rest of the specimens the tubercles were either lacking or too weakly formed even in full grown individuals, as this can not be taken as sexual dimorphism. Almost similar is the case with the *lateral tergal emargination*. Jangi and Dass (l.c.) state that the emargination of the tergites in males begins from 13th segment whereas in females it begins from 16th segment. In the samples identified as males (i.e., those carrying tubercles on anal leg prefemur) the lateral margin started from a segment later than 13th, and before 16th in the samples identified as females (i.e., prefemur without tubercles). The three sexually dimorphic characters described and proposed by Jangi and Dass (l.c.) for separating male and female sexes do not appear to hold good in all the adult specimens and it is difficult to sex a juvenile, as also mentioned by them.

The occurrence of the tubercles on anal leg prefemur could be a seasonal adaptation of the species, possibly during breeding season but we can not consider it as a stable charac-

ter in absence of the consistency of the character. The emargination of tergites could, however, be taken as ranging from 13-16th segments.

The genital organ is the single and most reliable character for determination of sexes at any level of the development. Of course, the external genitalia are normally retracted within the body in both sexes and do not normally submit to examination without damage.

Cormocephalus pseudonudipes Jangi and Dass vis-a-vis *Cormocephalus dentipes* Pocock

Jangi and Dass (1984) described a new species *C. pseudonudipes* from Andhra Pradesh, Tamil Nadu and Maharashtra (Type Locality : Nasik). It, on the basis of the characters enumerated, is found to tally in all respects with *C. dentipes* though according to them it differs from the latter in lack of tuberculations on the anal leg prefemur (as in the case of so called females of *C. dentipes*) and endtergite broader than long (which in many cases gets compressed or elongated on account of improper preservation). The number of marginate tergites is same as in the females of *C. dentipes* (i.e. 16-21). It is, therefore, felt that *C. pseudonudipes* does not appear to have enough evidence to be considered as a separate species and, therefore, is proposed as a synonym of *C. dentipes* Pocock.

SUMMARY

The present paper deals with the taxonomic and ecological studies on the centipede, *Cormocephalus dentipes* Pocock. Observations on seasonal incidence and habit and habitat utilisation etc. have been recorded, besides some stray notes on reproductive behaviour of the species. The variations noted in the morphological characters have been discussed and in light of the sexually dimorphic characters proposed by Jangi and Dass (1975), the species *C. pseudonudipes* described by Jangi and Dass (1984) has been proposed and placed as synonym of *C. dentipes* Pocock.

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LEPIDOPTERA : BUTTERFLIES

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INTRODUCTION

The Rajaji National Park, comprising erstwhile three sanctuaries, viz., Rajaji, Motichur and Chilla, are contiguous to each other and fall within three districts of Uttar Pradesh, viz., Dehradun, Haridwar and Pauri districts. It may be mentioned here that till 1989, the Park contained the districts of Saharanpur, Dehradun and Pauri. After Haridwar having been declared as a new district, all the areas hitherto referred under Saharanpur part of Rajaji National Park now form a part of Haridwar district. The Northern Regional Station, Zoological Survey of India, Dehradun, since its inception, had been conducting regular surveys of the areas in its jurisdiction, including Rajaji National Park. As a result, a varied groups of animals, including butterflies were collected. Besides, the author undertook extensive tours of the areas in the year 1990 during pre-monsoon, monsoon and post-monsoon periods for a specific purpose of the survey of butterfly fauna, which were inadequately represented in the collections of NRS, and could report several additional species of butterflies for the present study. Although, serious efforts were made for the collections, it is believed that the study is far from complete and deserves concerted and prolonged surveys to collect those species which have not been collected, though believed to be occurring in the area, or poorly represented, like Satyridae, Lycaenidae, Hesperiidae. The poor representation of these groups may be due to changed ecological conditions, caused by the periodic burning of the ground grass/undergrowth, dead and fallen leaves (which is regular practice in forest-management), or due to these being overlooked by the collectors. Very often the collectors are attracted

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by the larger and brightly coloured specimens, or those which are easy to catch. Hence, the drab coloured specimens of Satyridae, or the delicate specimens of BLUES, the Lycaenidae and unattractive Hesperiidæ remain poorly represented.

Nevertheless, the presentation of these species in this account is of great significance and interest, since this constitutes the first-ever account of the butterflies from the Conservation Areas of Rajaji National Park, and will not only bring to light the butterfly-wealth of the Area to the Zoologists and Wildlife specialists alike, but will also act as a guide for further studies as well as for proper management of the area so that these delicate creatures can be preserved in their habitats in totality.

The systematic arrangement in this account is followed after Talbot (1939, 1947). For those families not dealt with by Talbot, works of Evans (1932), Common & Waterhouse (1972), Corbet & Pendlebury (1978), Eliot (1969, for Neptini) have been followed. Cantlie (1962) has been consulted for the Lycaenid part of the paper. For the butterflies of Mussoorie, the papers of Mackinnon & de Niceville (1898) and for Kumaon, Doherty (1886) and Hannington (1910-1911) have been consulted. Although this account is not meant to be a taxonomic revision, an attempt has been made to present faunistic wealth of the area, and the latest taxonomic changes have been incorporated as far as possible. To all those who are interested in further work and revisionary studies, consultation of the relevant literature is suggested.

Majority of the collections of butterflies have been made while "on wings" or in flight, or on a damp patch from a congregating group, under the leadership of the author unless otherwise stated. The study is based on over 950 exs., representing 68 species in 50 genera and eight families.

SYSTEMATIC ACCOUNT

Family : PAPILIONIDAE

The species of this family, commonly known as "Swallow-tails", are among the largest and most beautiful butterflies in the Indian Region. The species are predominantly black or black-brown in colour, with exception of Apollos, *Parnassius*, which are predominantly white, spotted with red, black or blue spots. The latter species are, however, high altitudinal species and are not available in Rajaji National Park.

Though several species are tailed, which forms one of the characteristic features of the family, the tail-less forms are equally attractive, large or small, predominantly black

and are not uncommon. The large "Birdwings", or the smaller "Blue Bottles" and "Jays", are reported to be occurring in this part of the country, but have not been collected from ji National Park presently.

The species are active, fast fliers and immediately retract into the forest cover, if disturbed. Nearly all the species are fond of visiting flowers and some settle on a damp ground for 'drink', either alone or in a congregating group of Papilionids, or of Pierid butterflies, like *Eurema* and *Catopsilia*.

The species are characterised by their forelegs being fully developed in both sexes; the hindwings with the precostal spur present, vein 1b absent and inner margin of hindwing never channelled to receive the abdomen; claws generally simple.

The study includes only three species, one of which, viz., *P. polytes* (Cramer) is well known for its polymorphism in females. The present study reports all the hitherto known three different forms of females from Rajaji National Park.

***Papilio polytes romulus* (Cramer)**

The Common Mormon

(Plate I, figs. 1, 2, 3)

1775. *Papilio romulus* Cramer, *Pap. Exot.*, 1 : 67, pl. 43A.

Material examined : Dehradun Dist., Kansrao, 2 ♂♂, 15.v.68 (*Asket Singh* coll.), 2 ♂♂, 7.xi.90 (*P. C. Tak* coll.), Cherring crossing (on way to Kansrao), 2 ♂♂, 3.v.90; Satyanarayan, 1 ♂, 12.vii.90 (on damp ground near puddle), 2 ♂♂, 12.vii.90 (on ground damped with urine, near faecal matter), 6 ♂♂, 1 ♀ (form *stichius*), 12.vii.90, 3 ♂♂, 4 ♀♀, 12.x.90 (female forms *cyrus* and *stichius*); Motichur, 1 ♂, 1 ♀ (form *romulus*), 12.vii.90, 4 ♂♂ (from a congregating group) 12.x.90; Phandowala, 2 ♂♂, 1 ♀, 7.xi.90 (*P. C. Tak* coll.). Haridwar Dist. : Dholkhand, 1 ♀ (f. *cyrus*), 20.x.62 (*T. D. Soota* coll.), 1 ♂, 6.iii.63 (*T. D. Soota* coll.), 2 ♂♂, 1 ♀ (*stichius*), 22.viii.64 (*R. K. Bhatnagar* coll.); Ranipur, 7 ♀♀ (*stichius*), 30.viii.90, 1 ♀ (form *cyrus*), 30.viii.90; Beribara, 1 ♀ (*stichius*), 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla Forest, 4 ♂♂, 20.ix.87 (*J. C. Tripathi* coll.), 8 ♂♂, 1 ♀, 2.viii.91, 1 ♀ (form *stichius*), 9.viii.91 (*P. C. Tak* coll.); Kunnao, 6 ♂♂, (from a congregating group), 1 ♀ (f. *romulus*), 2.viii.91 (*P. C. Tak* coll.), 4 ♂♂ (from a congregating group), 23.viii.91 (*A. Kumar* coll.).

Wing expanse : Male, 75-94 mm; Female, 88-94 mm.

Distribution : Throughout India,

Remarks : Talbot (1939) recorded the expanse of the wings ranging between 90-100 mm unlike in the present material where the minimum report goes down to 75 mm, which is of zoological interest. The species has three different forms in females, viz, *cyrus*, *romulus* and *stichius*. While the form *cyrus* is like a normal male in colour and pattern, the other two are quite different, i.e., f. *romulus* (collected from Motichur and Kunnao) with the forewing crossed by an oblique white band from beyond middle of cell to tornal angle, but not extending up to the outer margin, unlike in *stichius* where the forewing is crossed by intercellular streaks, obliquely from middle of cell to tornal angle and from beyond cell ; discal white spots not entering into the cell in form *romulus*, unlike in form *stichius*.

Talbot (1939) and Wynter-Blyth (1957) are of the opinion that the species do not visit wet places on the road. The present study reports collection of the material not only from damp ground near puddle, but also on a ground damped with urine near faecal matter. This habit of the butterfly is quite interesting and an unusual sight. This is being reported for the first time (Plate I, figs. 1, 2, 3).

The species is a very fast flier, predominantly black, tailed and continuously keep their wings fluttering while sitting on flowers, or on ground for a "drink".

Status : Very common.

***Papilio demoleus demoleus* Linn.
The Lime Butterfly**

1758. *Papilio demoleus* Linn., *Syst. Nat.*, ed. 10th : 464.

Material examined : Dehradun Dist., : Kansrao, 1 ♀, 7.v.90 ; Satyanarayan, 1 ♂, 3 ♀ ♀, 12.vii.90, 2 ♂ ♂ (on damp ground near puddle in a congregating group of Pierids), 12.vii.90 ; Motichur, 3 ♂ ♂, 2 ♀ ♀, 12.vii.90, 1 ♂, 12.x.90. Haridwar Dist. : Rajaji Sanctuary (no more data), 1 ♀, 24.x.62, 1 ♂, 5.iii.63, 1 ♂, 7.v.63, 2 ♀ ♀, 26, 28.vii.63 (all *T. D. Soota* coll.) ; Dholkhand, 1 ♀, 6.iii.63 (*T. D. Soota* coll.) ; Ranipur, 3 ♂ ♂ (on cowdung), 1 ♀, 30.viii.90 ; Beribara, 6 ♂ ♂, 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla Forest, 3 ♂ ♂, 20.ix.87 (*J. C. Tripathi* coll.), 8 ♂ ♂, 4 ♀ ♀, 2.viii.91, 2 ♂ ♂, 3 ♀ ♀, 9.viii.91 (*P. C. Tak* coll.), 1 ♂, 23.viii.91 (*A. Kumar* coll.) ; Kunnao, 6 ♂ ♂, 2 ♀ ♀, 2.viii.91 (*P. C. Tak* coll.), 18 ♂ ♂ (congregating on damp ground), 23.viii.91 (*A. Kumar* coll.)

Wing expanse : Male, 68-92 mm ; female, 78-96 mm.

Distribution : Throughout India.

Remarks : Very common throughout the Park, the species has been collected during flight, on flowers, on citrus/lime trees and on damp ground near road-side puddle, in the company of Pierids, particularly *Catopsilia* species. In fact, the majority in a congregating group (Plate I, fig. 3 and Plate II, fig. 1) consisted of the genus *Catopsilia* than that of *demoleus* and *polytes*, which were also found in the same batch. One of the male examples, collected at Ranipur, was on cowdung (semi-dry) on the dry river-bed.

The species is a very fast flier and very commonly known as "Lime Butterfly". The hind wing being without tail, unlike in *polytes* which has a small tail in the hind wing.

The material available for study from Motichur and Beribara areas of Rajaji National Park, brings down the range of wing expanse from the recorded minimum of 80 mm to 68 mm.

Status : Very common.

Graphium nomius nomius (Esper)

The Spot Swordtail

(Plate III, fig. 1)

1758-98. *Papilio nomius* Esper, *Die Ausländische Schmetterlinge* : 210, pl. 52, fig. 3.

Material examined : Haridwar Dist. : Dholkhand, 1♂, 2 exs. (w/o abdomen) 20.v.63 (T.D. Soota coll.), 3♂♂, 12.vi.71 (S. Khera coll.). Dehradun Dist. : Lachiwala, 1♂, 17.v.67 (Asket Singh coll.).

Wing expanse : 70-76 mm.

Distribution : India : Southern India ; areas from Peninsular India ; Maharashtra ; Gujarat ; Uttar Pradesh ; Himachal Pradesh ; extending to Sikkim and Assam. Also Sri Lanka and Myanmar.

Remarks : Wynter-Blyth (1957) observes that the record of the species from Simla is the recent one and has not been recorded further west than Dehradun. He concluded that either (i) the species was migrating, or (ii) it escaped attention, or (iii) it was establishing anew in the area.

The present record of the species, although on the basis of material collected

about or over 20 years ago, is of interest. The distribution further extends NW & NS of Dehradun, both in Dehradun and Haridwar districts.

The species is a very fast flier and is characterised by the presence of bands on wings ; hind wings with long and narrow tail.

Status : Not rare.

Family : PIERIDAE

The species are predominantly "White" or "Yellow" in colour, or with orange and black markings. The butterflies are of moderate size, except some like *Leptosia nina* (Fabr.) which are quite small and delicate.

The species, like that in Papilionidae, are characterised by the presence of fully developed fore-legs in both sexes, but unlike in the latter family, the inner margin of hind wing is always channelled to receive the abdomen ; the vein 1b present ; the claws bifid.

The seasonal as well as sexual variations are quite common and well marked in certain species. The males of some of the species, particularly of *Eurema* and *Catopsilia*, congregate on damp ground near road-side puddle/stream, etc.

Although the "Whites" and "Yellows" belong respectively to the subfamily Pierinae and Coliadinae, the exceptions are not uncommon in both the subfamilies. The flight, in both the groups, is very slow and sluggish, but again the fast-flying species are also met with.

As many as fifteen species in 11 genera are being recorded here, eight of the subfamily Pierinae and three of the subfamily Coliadinae. The Pierinae differ from Coliadinae in the pre-costal spur being well developed and distally curved and the labial palpi always hairy unlike in the latter where precostal spur is either absent or if present it is curved towards base, and the labial palpi are not hairy.

Subfamily : PIERINAE

Leptosia nina nina (Fabr.)

The Psyche

Material examined : Dehradun Dist. : Satyanarayan, 2♂♂, 12.viii.90, 3♂♂. 12.x.90; Motichur, 8♂♂, 1♀, 12.x.90; Phandowala, 6♂♂, 7.xi.90 (*P.C. Tak* coll.); Kansrao, 1♂, 1♀, 7.xi.90 (*P.C. Tak* coll.). Haridwar Dist. : Ranipur, 4♂♂, 30.viii.90; Dholkhand, 1♂, 3♀♀, 9.xi.90 (*P.C. Tak* coll.); Beribara, 1♂, 9.xi.90 (*P.C. Tak* coll.). Pauri Dist. : Kunnao, 1♀, 23.viii.91 (*A. Kumar* coll.).

Wing expanse : 29-45 mm.

Distribution : India : Peninsular India to Mussoorie and Andaman Is. ; Also Sri Lanka and Myanmar.

Remarks : The range of expanse recorded here is much less than what has been recorded by Talbot (1939) and Wynter Blyth (1957) as 35 to 50 mm. The species is common throughout the Park, very slow and sluggish in the manner of its flight, never flying more than 2 to 3 feet above the ground and are easily caught. Some of the exs. collected during monsoon are with underside hindwing marked with dark striae.

Status : Very common.

***Aporia agathon caphusa* (Moore)**
The Great Blackvein

1872. *Metaporia caphusa* Moore, *Proc. zool. Soc. Lond.* : 564.

Material examined : Dehradun Dist. : Kansrao, 1♂, 15.vi.68 (*Asket Singh* coll.).

Wing expanse : 62 mm.

Distribution : India : U.P. (Mussoorie to Kumaon).

Remarks : The wing expanse is much smaller than what has been recorded earlier between 80-90 mm. Till date only one example has been collected from Rajaji National Park and it does not seem to be common in the area. Further surveys may reveal its more areas of existence in the Park.

Status : Not rare.

***Delias eucharis* (Drury)**

The Common Jezebel

(Plate III, figs. 2,3)

1773. *Papilio eucharis* Drury, *Illustr. Nat. Hist.*, 2 : pl. 10, figs. 5, 6.

Material examined : Dehradun Dist. : Phandowala, 5♂♂, 2♀♀, 7.xi.90.
Haridwar Dist. : Dholkhand, 2♂♂, 9.xi.90 ; Beribara, 4♂♂, 1♀, 9.xi.90 (all P.C. Tak coll.).

Wing expanse : 66-83 mm.

Distribution : Peninsular India extending up to lower slopes of Himalaya. Also Sri Lanka and Myanmar.

Remarks : The species can be easily recognised by the underside of hind wing being yellow with black veins, and the marginal spots being large and red and pointed outwardly.

Status : Very common.***Cepora nerissa phryne* (Fabr.)**

The Common Gull

(Plate III, fig. 4)

1775. *Papilio phryne* Fabricius, *Syst. Ent.* : 473.

Material examined : Dehradun Dist. : Kuanwala, 1♂, 3.v.90, 1♀, 7.v.90 ; Phandowala, 1♀, 3.v.90 ; Satyanarayan, 6♂♂, 2♀♀, 12.vii.90, 1♂ (on damp ground near road-side puddle in the company of *Catopsilia*), 12.vii.90 ; Motichur, 2♂♂, 1♀, 12.x.90. Haridwar Dist. : Rajaji Sanctuary (no more data), 1 ex. (w/o abdomen) 11.x.62. (T.D. Soota coll.) : Ranipur, 1♂, 30.viii.90 ; Dholkhand, 1♀, 9.xi.90 (P.C. Tak coll.). Pauri Dist. : Chilla, 2♂♂, 29.viii.91 (P.C. Tak coll.) ; Kunnao, 2♀♀, 23.vii.91 (A. Kumar coll.).

Wing expanse : Male, 37-60 mm ; female, 45-52 mm.**Distribution :** Peninsular India to N. W. India. Also Sri Lanka and Nepal.

Remarks : The species is found to be quite common in the Park, settling on flowers, damp ground in the congregating group of *Catopsilia* species. The examples

collected between June and October are mainly wet-season forms and those in November are dry-season forms.

The minimum expanse of the species is also further reduced to about 37 mm. compared to '40mm' as recorded earlier.

The species is hitherto known to occur between June to October, whereas the material is recorded from Rajaji National Park between May and November.

Status : Very common.

***Anapheis aurota aurota* (Fabr.)**

The Pioneer
(Plate III, fig. 5)

1793. *Papilio aurota* Fabricius, *Syst. Ent.*, 3 : 197.

Material examined : Dehradun Dist. : Kuanwala, 2 ♂♂, 1 ♀, 7.v.93 ; Satyanarayan, 1 ♀, 12.vii.90.

Wing expanse : Male 45-50 mm ; female 45-55 mm.

Distribution : Throughout India except Assam and Myanmar in the Indian region. Also occurs in Sri Lanka.

Remarks : The material before study is well within the range of wing expanse as recorded earlier and has a well marked seasonal variation. The material collected in the month of May is referable to the dry-season form and that of July from Satyanarayan is referable to the wet-season form.

Both sexes are reported to visit flowers, but only the males are reported to settle on damp ground for a drink.

Status : Common.

***Appias libythea libythea* (Fabricius)**

The Striped Albatross

1775. *Papilio libythea* Fabricius, *Syst. Ent.* : 471.

Material examined : Pauri Dist. : Chilla, 1 ♂, 2.viii.91 (P. C. Tak coll.).

Wing expanse : 41 mm.

Distribution : Peninsular India to Delhi, Punjab, Simla and U. P. Also Sri Lanka.

Remarks : The material before me for study is quite smaller in wing expanse compared to recorded expanse of 50 to 60 mm (vide Talbot 1939).

Status : Not common.

Artogeia canidia indica (Evans)
The Indian Cabbage White
 (Plate III, fig. 6)

1926. *Pieris canidia indica* Evans, *J. Bombay nat. Hist. Soc.*, 31 : 712.

Material examined : Dehradun Dist. : Cherring crossing (on way to Kansrao), 1 ♂, 3.v.90, 1 ♀, 7.v.90; Phandowala, 1 ♂, 1 ♀, 4.ii.63 (T. D. Soota coll.), 1 ♂, 3.v.90; 1 ♀, 7.xi.90 (P. C. Tak coll.); Motichur, 1 ♂, 12.vii.90; Kansrao, 1 ♂, 15.v.68 (Asket Singh coll.), 1 ♂, 7.xi.90 (P. C. Tak coll.); Satyanaranan, 1 ♂, 12.x.90. Haridwar Dist. : Dholkhand, 7 ♂♂, 7.iii.63 (T. D. Soota coll.).

Wing expanse : 45-55 mm.

Distribution : Pakistan : North Baluchistan to Chitral ; India ; Myanmar.

Remarks : The species is very common in Rajaji National Park, collected between February and November, and does not show much of seasonal variation. However, the females are more heavily marked than the males. Although Wynter-Blyth (1957) states that with the onset of warm weather, these migrate upwards towards cold areas, the collection of this species in February, May, July and November is of ecological interest. Further, Wynter-Blyth (1957) believes that the species occurs between 2500-11000 feet. However, both the above-mentioned localities are at a much lower altitude, i.e., between 1200'-1500' (ca 366-457 m.) (Dehradun being a little over 2000 or 610 m.), and therefore, the altitudinal range of distribution of the species must henceforth be from 1200' (366 m.) and above.

Status : Very common,

Valeria valeria hippia (Fabr.)
The Common Wanderer

1787. *Valeria hippia* Fabricius, *Mant. Ins.*, 2 : 55.

Material examined : Dehradun Dist. : Kansrao, 2 ♀ ♀, 15.v.68 (*Asket Singh* coll.), 2 ♂ ♂, 7.xi.90 (*P. C. Tak* coll.) ; Satyanarayan, 2 ♂ ♂, 12.vii.90, 2 ♂ ♂, 1 ♀, 12.x.90 ; Phandowala, 4 ♂ ♂, 7.xi.90 (*P. C. Tak* coll.) ; Motichur, 5 ♂ ♂, 4 ♀ ♀, 12.x.90. Haridwar Dist. : Ranipur, 2 ♂ ♂, 3 ♀ ♀, 30.viii.90 ; Dholkhand, 1 ♂, 1 ♀, 9.xi.90 (*P. C. Tak* coll.) ; Beribara, 2 ♂ ♂, 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Kunnao, 1 ♂, 23.viii.91 (*A. Kumur* coll.).

Wing expanse : Male, 65-74 mm ; female, 70-75 mm.

Distribution : Throughout India.

Remarks : Common throughout the Park, the species has distinct sexual dimorphism in colouration, the females being black brown with bluish-white markings which are heavy and diffused unlike the males which are pale-blue and the markings clear.

Status : Common.

Subfamily : COLIADINAE

Catopsilia crocale crocale (Cramer)
The Common Emigrant
(Plate I, fig. 3, II, figs. 1,2)

1775. *Papilio crocale* Cramer, *Pap. Exot.*, 1 : 87, pl. 55, Figs. C&D.

Material examined : Dehradun Dist. ; Phandowala, 1 ♂, 3.v.90 ; 2 ♀ ♀, 7.xi.90 (*P. C. Tak* coll.) ; Cherring crossing (on way to Kansrao), 1 ♂, 3.v.90 ; Satyanarayan, 5 ♂ ♂, 4 ♀ ♀ (from a congregating group at damp ground near road-side puddle) 12.vii.90, 2 ♂ ♂, 9 ♀ ♀, 12. vii.90 ; Motichur, 8 ♂ ♂, 12.vii.90, 2 ♂ ♂, 2 ♀ ♀, 12.x.90. Haridwar Dist. : Rajaji Sanctuary (no more data), 1 ♀, 24.viii.63 (*T. D. Soota* coll.) ; Ranipur, 3 ♂ ♂, 1 ♀, 30.viii.90, 1 ♂, 12.x.90 ; Dholkhand, 4 ♂ ♂, 22.viii.64

(R. K. Bhatnagar coll.), 1 ♂, 26.vii.68 (Asket Singh coll.), 2 ♂♂, 12.vi.70 (Asket Singh coll.), 1 ♂, 4 ♀♀, 9.xi.90 (P. C. Tak coll.). Pauri Dist.: Chilla, 4 ♂♂, 1 ♀, 20.ix.87 (J. C. Tripathi coll.), 12 ♂♂, 1 ♀, 2.viii.91, 1 ♀, 9.viii.91; Kunnao, 7 ♂♂, 2 ♀♀, (from a congregating group), 1 ♂, 1 ♀, 2.viii.91 (all P. C. Tak coll.), 11 ♂♂, 23.viii.91 (A. Kumar coll.).

Wing expanse : 42-70 mm.

Distribution : Throughout India.

Remarks : The material collected from Rajaji National Park, includes some of the smallest specimens, measuring about 42 mm on the lower side, compared to the lowest already recorded by Talbot (1939) as 55 mm. Talbot (1939) while dealing with *crocale* treated *pomona* separately and clearly differentiated on the basis of antennae being black in *crocale* unlike red in *pomona*; the forewing on the upperside below apex with a continuous black marginal line in *crocale* unlike macular marginal border in *pomona*; underside of wings without ocelli in *crocale* unlike well developed ocelli in *pomona*. Later, Talbot (1947), quoting Wheeler (1943), believed that these were conspecific species, and *crocale* should be taken as valid and accepted name. Although Varshney (1979) proposed that the two be kept separate as subspecies, viz., *crocale crocale* and *crocale pomona*, Larsen (1987) considers these only 'forms' and considers *pomona* as a valid name.

Keeping these facts in view and the large specimens collected on damp ground (Plate I, fig. 3 and II, fig. 1) from the same habitat in Rajaji National Park, breeding at the same plant (Plate II, fig. 2) and at the same time, often in copulae, it is considered but appropriate to keep the *crocale* as the valid and accepted name, as suggested by Talbot (1947). Further studies on their population and their bearing on the morphological changes may be of some taxonomic interest and solve this problem.

Status : Very common.

Catopsilia pyranthe pyranthe (Linn.)

The Mottled Emigrant

1758. *Papilio pyranthe* Linn., *Syst. Nat.*, 10th ed.: 469.

Material examined : Dehradun Dist.: Kansrao, 3 ♂♂, 7.v.90; Motichur, 2 ♂♂, 2 ♀♀, (1 ♀ from a congregating group), 12.vii.90, 1 ♂, 1 ♀, 12.x.90; Satyanarayan,

1 ♂, 2 ♀ ♀ (one ♂ collected on damp ground near puddle), 12.vii.90. Haridwar Dist. : Ranipur, 1 ♂, 1 ♀, 30.viii.90; Dholkhand, 1 ♂, 22.viii.64 (*R. K. Bhatnagar* coll.), 3 ♂ ♂, 9.xi.90 (*P. C. Tak* coll.); Beribara, 3 ♂ ♂, 9.xi.90 (*P. C. Tak* coll.) Pauri Dist. : Chilla, 4 ♂ ♂, 20.ix.87 (*J. C. Tripathi* coll.), 5 ♂ ♂, 1 ♀, 2.viii.91, 1 ♀, 9.viii.91 (*P. C. Tak* coll.), 1 ♂, 23.viii.91 (*A. Kumar* coll.); Kunnao, 2 ♂ ♂ (from a congregating group), 1 ♂, 1 ♀, 2.viii.91 (*P. C. Tak* coll.).

Wing expanse : 46-60 mm.

Distribution : Throughout India.

Remarks ; Like the preceding species, this was also kept separate from its closely 'allied' species, *florella* by the marginal border on the upperside of forewings below apex, being continuous in *pyranthe* and macular in *florella*. Both these are, however, characterised by the presence of transverse reddish-brown strigae (absent in *crocale*) on the underside of wings.

Wynter-Blyth (1957), Varshney (1979) and Larsen (1987) believe that *florella* is only a DSF of *pyranthe* and hence there seem to be no justification to treat these as separate species, which has been followed.

Status : Very common.

Eurema brigitta rubella (Wallace)
The Small Grass Yellow

1867. *Terias rubella* Wallace, *Trans. ent. Soc. Lond.*, (3) 4 (3) : 323.

Material examined : Rajaji Sanctuary (no more data), 2 ♂ ♂, 13.ix.62 (*S. Lal* coll.).

Wing expanse : 34-40 mm.

Distribution : India, Sri Lanka, Myanmar.

Remarks : The species is characterised by both the wings with black borders usually broad, with the inner edge regular and not excavated. Male without sex brand.

Status : Very common.

Eurema laeta laeta (Boisduval)**The Spotless Grass Yellow**

1836. *Terias laeta* Boisduval, *Spec. Gen. Lep.*, 1 : 674.

Material examined : Dehradun Dist. : Kansrao, 1♂, 7.v.90.

Wing expanse : 36 mm.

Distribution : India ; Peninsular India to N. Western Himalaya.

Remarks : Although very common in status, the species is not as common as *hecabe* in the Park and is distinct by the complete absence of spots on the under-side of both wings. The species has a marked seasonal variation, i.e., in WSF the marginal border is broad, but is not excavated between vein M3 and Culb and does not run onto the inner margin ; in DSF, the border is narrow and does not reach the tornal angle ; in fore-wing the apical end is pointed with the outer margin sharply cut and straight.

Status : Very Common.

Eurema hecabe fimbriata (Wallace)**The Common Grass Yellow**

(Plate III figs. 7,8)

1867. *Terias fimbriata* Wallace, *Trans. ent. Soc. Lond.*, (3) 4 (3) : 323.

Material examined : Dehradun Dist. : Cherring crossing (on way to Kansrao), 1♂, 1♀, 3.v.90 ; Kansrao ; 1♂, 1♀, 7.xi.90 (*P. C. Tak* coll.) ; Satyanarayan, 9♂♂, 4♀♀, 12.x.90 ; Motichur, 6♂♂, 3♀♀, 12.x.90 (collected from a congregating group on damp ground near roadside) ; Phandowala, 2♂♂, 3♀♀, 7.xi.90 (*P. C. Tak* coll.). Haridwar Dist. : Rajaji Sanctuary (no more data), 1 ex., 13.ix.62, 1 ex., 11.x.62, 3 exs., 5,13,26.xi.62, 1 ex. 28.i.63 (all w/o or damaged abdomens), 1♂, 26.viii.63 (all *T. D. Soota* coll.) ; Ranipur, 1♀, 30.viii.90 ; Dholkhand, 1♂, 9.xi.90 (*P. C. Tak* coll.) ; Beribara, 1♂, 1♀, 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla, 1♂, 1♀, 2.viii.91, 1♂, 9.viii.91 (*P. C. Tak* coll.), 2♂♂, 23.viii.91 (*A. Kumar* coll.) ; Kunnao, 1♂, 2.viii.91 (*P. C. Tak* coll.), 3♂♂, 23.viii.91 (*A. Kumar* coll.).

Wing expanse : 33-44 mm.

Distribution : India ; Peninsular India : Punjab to Kumaon. Also Pakistan (Chitral).

Remarks : Very common throughout the Park, the species has very strong seasonal variation ; the WSF having broad borders on fore-wing, with strong-excavation between M3-Culb ; the DSF have on their fore-wing upperside only a very narrow black border, only slightly dentate on inner-side ; underside spots clearly defined, larger and darker ; fore-wing with a subapical, very prominent elongate spot of reddish brown colour, extended downwards from costa but not reaching outer margin ; sometimes there is also a spot onto the tornal area.

The species is well known for its habit of settling on the damp ground near road-side puddle, river/streams, etc., in a group, often attracting other species of this family, i.e., *Eurema*, *Catopsilia*, or the Papilionids like *polytes* and *demoleus*.

The species is very close to *hecabe contubernalis* which is mainly known to occur in the areas from Bengal to Sikkim, except by a very recent record by Mandal (1984) from Tons Valley Expedition (N.W. Himalaya). Because of the very large number of variations in the species, it is quite difficult to give reliable characters to separate these subspecies from each other. Even Talbot (1939) believes that the differentiating characters between these and its closely allied *blanda*, like the presence of two spots on underside of fore wings, are variable, which may be one, two or even three as in *blanda*. The males can easily be recognised by the presence of sex brand on the underside of fore wing.

Status : Very common.

***Colias erate erate* (Esper)**

The Pale Clouded Yellow

1805. *Papilio erate* Esper, *Die Schmetterlinge*, Suppl. 3 : 13, pl. 119, fig. 3 (male).

Material examined : Dehradun Dist. : Cherring crossing (on way to Kansrao), 1♂, 3.v.90.

Wing expanse : 39 mm.

Distribution : Pakistan : Baluchistan to Chitral and India : U.P. (Garhwal & Kumaon).

Remarks : Piele (1937) and Wynter-Blyth (1957) record the species as common

above 5000 feet in Himalaya, between March and July before rains and then between November and March in dry season. Obviously, the collection of a male from only one locality in the Park, at considerably low altitude shows that the species is not common in the Park.

The specimen is quite smaller than earlier record with a minimum expanse of 45 mm.

Status : Not common specially in Rajaji National Park.

***Colias electo fieldi* (Menetries)**
The Dark Clouded Yellow

1855. *Colias fieldi* Menetries, *Enum. Corp. Anim. Mus. Petr.*, 1 : 79, pl. 1, fig. 5 (male).

Material examined : Dehradun Dist. : Cherring crossing (on way to Kansrao), 1♂, 3.v.90.

Wing expanse : 45 mm.

Distribution : Baluchistan (Pakistan) to India : North-Punjab, N. W. Himalayas and Sikkim. Also Myanmar.

Remarks : The species is known to occur between 3000-4500 feet in Himalaya, but Mandal (1984) records the species as high as about 16000 feet (4850 m), from Tons Valley, W. Himalaya. The species, like *erate* is not common in the Park and has been collected from only one locality, occurring along with *erate*. The species, like *erate* is a very fast flier and does not rest at one place for a long period. Although several specimens were found to fly at the place of its occurrence, only a male each of *erate* and *electo fieldi* could be collected. The species shows considerable sexual dimorphism.

Status : Not common in Rajaji National Park.

Family : DANAIDAE

The species of the family Danaidae, commonly known as "Tigers", "Crows" and "Nymphs", are of fairly large size, extremely tough and possess unpleasant and evil-tasting smell and juices, which make them well protected from their natural enemies

like birds and lizards. Being extremely tough, these need persistent and prolonged pressure at thorax for killing. More often when under pressure at thorax, these feign death and are, naturally, released from pressure. Instantly, these are seen to fly away and escape. Several species of other group of butterflies mimic these danaids and are often seen to fly in the population of danaids to escape being chased by the predators.

The species are characterised by the fore-legs being imperfect in both the sexes and the cell closed in both the wings. Hind wings with the pre-costal spur present.

Talbot (1947) recorded only three genera, viz., *Danaus* Kluk (Tigers), *Euploea* Fabr. and *Idea* Fabr. from the Indian region. The present material is referable to only two of these genera; the genus *Idea* is not known to occur in the Rajaji National Park. The present account deals with five species of the genus *Danaus* (*sensu* Talbot, 1947), now under four genera viz., *Danaus* (2 species), *Tirumala* Moore (1 species), *Parantica* Moore (1 species) and *Caduga* Moore (1 species), and one species under *Euploea*.

***Danaus chrysippus* (Linn.)**

The Plain Tiger

(Plate III, fig. 9)

1758. *Papilio chrysippus* Linn., *Syst. Nat.*, 10th ed. : 471.

Material examined : Dehradun Dist. : Phandowala, 3 ♂♂, 3.v.90 ; 1 ♀, 7.xi.90 (*P. C. Tak* coll.) ; Cherring crossing (on way to Kansrao), 1 ♀, 3.v.90 ; Kansrao, 2 ♂♂, 1 ♀, 15.v.68 (*Asket Singh* coll.), 1 ♀, 7.v.90 ; Satyanarayan, 4 ♂♂, 12.x.90 ; Motichur, 1 ♂, 12.x.90. Haridwar Dist. : Rajaji Sanctuary (no more data), 1 ♀, 20.x.62 (*T. D. Soota* coll.) ; Dholkhand, 2 ♀♀, 22.viii.64 (*R. K. Bhatnagar* coll.), 1 ♂, 9.xi.90 (*P. C. Tak* coll.) ; Beribara, 1 ♂, 9.xi.90. Pauri Dist. : Chilla, 1 ♀, 2.viii.91 ; Kunnao, 1 ♀, 2.viii.91, (all *P. C. Tak* coll.).

Wing expanse : 61-85 mm.

Distribution : Throughout India.

Remarks : The species is very common throughout the Park, flying very slowly and sluggishly, and easy to catch. Being extremely tough, the species feigns death at the time of capture and escapes.

The species is predominantly brown in colour, and the male of the species

bears a secondary sexual character in the form of a scent pouch on hind wing, which looks like a fourth spot unlike in female where this is absent and obviously only three spots are present.

Status : Very common.

Danaus genutia (Cramer)
The Common Tiger
(Plate III, fig. 10)

1779. *Papilio genutia* Cramer, *Pap. Exot.*, 3 : 23, pl. 206, figs. C&D.

Material examined : Dehradun Dist. : Phandowala, 2♂♂, 3.v.90 ; Cherring crossing (on way to Kansrao), 1♂, 3.v.90 ; Motichur, 1♀, 12.x.90. Haridwar Dist. : Rajaji Sanctuary (no more data), 1♂, 20.x.62, 1♂, 28.i.63., 2♂♂, 20.v.63, 1♂, 24.vii.63 (all *T. D. Soota* coll.) ; Dholkhand, 1♂, 22.viii.64 (*R. K. Bhainagar* coll.), 7♂♂, 9.xi.90 (*P. C. Tak* coll.) ; Beribara, 3♂♂, 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla, 1♂, 9.viii.91 (*P. C. Tak* coll.).

Wing expanse : 64-87 mm.

Distribution : Common throughout India.

Remarks : Several specimens have been collected from Rajaji National Park, and incidentally all but one ex. from Motichur are males. The females, as mentioned by Wynter-Blyth (1957), are busy selecting food plants/sites for laying their eggs and are believed to be elusive.

Although the earlier records give period of occurrence between May and October, the present material from Rajaji National Park in the months of January and November, is of interest and shows that the species is available throughout the year, though less common in cold weather.

The material from Phandowala, being only 64 mm., brings the wing expanse down from the earlier recorded minimum expanse of 75 mm. The general predominant colour, like the preceding species, is tawny brown and also similar in habits to that species.

Status : Very common,

Tirumala limniace leopardus (Butler)

The Blue Tiger

(Plate IV, fig. 1)

1866. *Danais limniace* var *leopardus* Butler, *Proc. zool. Soc. Lond.* : 52, fig. 10 (female).

Material examined : Dehradun Dist. : Kansrao, 1 ♂, 2 ♀ ♀, 27.v.70 (*Asket Singh* coll.), 1 ♀, 7.v.90 ; Motichur, 1 ♂. 29.v.79 (*Arun Kumar* coll.). Haridwar Dist. : Rajaji Sanctuary (no more data), 4 ♂ ♂, 1 ♀, 13.v.63, 1 ♀, 20.v.63 (*T. D. Soeta* coll.) ; Dholkhand, 1 ♂, 9.xi.90 (*P. C. Tak* coll.) ; Beribara, 4 ♂ ♂, 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla, 1 ♂, 9.viii.91 (*P. C. Tak* coll.)

Wing expanse : 76-100 mm.

Distribution : Baluchistan and Chitral (Pakistan) to Kumaon (India : U. P.) in western Himalaya ; Orissa ; W. Bengal ; Sikkim ; and Assam. Also Sri Lanka and Myanmar.

Remarks : As the common name suggests, the predominant colour is black or dusky-black, with bluish-white semi-hyaline spots and streaks. The species are habitually slow and sluggish in their flight but, when disturbed, fly off quickly into the cover.

The sexual variation is in the form of a pouch in male on the underside of the hind wing. The material collected from these areas brings down the minimum expanse to a new 76 mm from the earlier recorded minimum of 90 mm (vide Talbot, 1947).

Status : Very common.**Parantica aglea melanoides (Moore)**

The Glassy Tiger

(Plate IV, fig. 2)

1883. *Parantica melanoides* Moore, *Proc. zool. Soc. Lond.*, : 247.

Material examined : Dehradun Dist. : Cherring crossing (on way to Kansrao), 1 ♂, 7.v.90 ; Phandowala, 5 ♂ ♂, 2 ♀ ♀, 7.xi.90 (*P. C. Tak* coll.). Haridwar Dist. : Dholkhand, 2 ♂ ♂, 1 ♀, 9.xi.90 (*P. C. Tak* coll.) ; Beribara, 1 ♂, 1 ♀, 9.xi.90 (*P. C. Tak* coll.).

Wing expanse : 70-80 mm.

Distribution : Kashmir to Sikkim and Assam in India.

Remarks : Talbot (1947) recorded the species from Mussoorie and Kumaon hills of U. P. and states that the species is common between 2500-5000 feet. Piele (1937) on the other hand, states that the species is not common in Mussoorie hills and found only in September-October, and in Kumaon from April to May and July to October. The localities from where the material has been collected are at a much lower altitude and the period of occurrence is also different and is of ecological interest.

The male is different from the preceding species by the absence of pouch or a fold on underside of hind wings and by the presence of two scent patches on the upperside of hind wings ; and by the anastomosis of vein R1 with Sc in fore wing.

Status. : Fairly common.

Caduga sita sita (Kollar)
The Chestnut Tiger

1844. *Danais sita* Kollar, In Hugel's : *Kaschmir und das Reich der Seick*, 4 : 424, pl, 6.

Material examined : Dehradun Dist. : Phandowala, 1♂, 7.xi.90 (P. C. Tak coll.).

Wing expanse : 94 mm.

Distribution : Afghanistan. India : Kashmir to Sikkim ; and Assam. Also Myanmar and Bhutan.

Remarks : The species is not common in the Park, as well as not reported to be common in Dehradun and Mussoorie. Besides, its occurrence in the Park particularly in the month of November is of considerable ecological significance, since it is reported to occur between May and October.

The species, like *aglea melanoides* is characterised by the presence of two scent patches on the upperside of hind wings of male, though these are slightly differently located. However, it differs from *aglea melanoides* by the vein R1 being free from Sc in fore wing, which is a feature of "Melaneus" Group.

Status : Not rare.

***Euploea core core* (Cramer)**
The Common Crow

1780. *Papilio core* Cramer, *Pap. Exot.*, 3 : 133, pl. 267, figs. E, F.

Material examined : Dehradun Dist. : Cherring crossing (on way to Kansrao), 5 ♂♂, 3.v.90, 3 ♂♂, 7.v.90 ; Phandowala, 2 ♂♂, 3.v.90 ; 1 ♂, 3 ♀♀, 7.xi.90 (*P. C. Tak* coll.) ; Kansrao, 1 ♂, 7.v.90 ; Satyanarayan, 3 ♂♂, 12.vii.90, 1 ♀, 12.x.90 ; Motichur, 1 ♀, 29.v.79 (*Arun Kumar* coll.), 2 ♂♂, 13.ix.87 (no coll. data), 1 ♀, 12.vii.90, 3 ♀♀, 12.x.90. Haridwar Dist. : Rajaji Sanctuary (no more data), 1 ♂, 20.v.63, 3 ♂♂, 7,24.viii.63 (all *T. D. Soota* coll.) ; Ranipur, 3 ♂♂, 1 ♀, 30.viii.90 ; Dholkhand, 3 ♀♀, 9.xi.90 (*P. C. Tak* coll.) ; Beribara, 2 ♂♂, 4 ♀♀, 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla, 6 ♂♂, 1 ♀, 23.ix.87 (*J. C. Tripathi* coll.), 2 ♂♂, 4 ♀♀, 2.viii.91, 1 ♂, 9.viii.91 (*P. C. Tak* coll.), 1 ♂, 23.viii.91 (*A. Kumar* coll.) ; Kunnao, 1 ♂, 3 ♀♀, 2.viii.91 (*P. C. Tak* coll.).

Wing expanse : 78-102 mm.

Distribution : Throughout India.

Remarks : The species is very common throughout the Park areas, and as the name suggests, it is one of the species of 'Black Crows', and is very slow and sluggish in flight, extremely tough to be killed. At some places like Phandowala, in May, the species was found in large numbers, flying lazily over low-growing jungle flowering-plants.

The species is easily recognised by its dark-brown colour, the wings marked with antemarginal series of white spots. The male also with a single short narrow sex brand on forewing upperside.

Status : Very common.

Family : SATYRIDAE

The species of this family are predominantly brown in colour, mostly weak in flight, with slow jerky or bouncing movements. Most of the species fly close to the shaded-ground, particularly the one littered with dead and fallen leaves. However,

some species, particularly in the hilly regions, preferring open meadows and grasslands with small bushes/shrubs, are not an uncommon sight. Most of these species do not visit flowers, but are often attracted to over-ripe fruits.

The seasonal variations are best known in this family, particularly in the "Evening Brown", where no two specimens in the dry season are alike and harmonise perfectly with "dead leaves", often with fungus-like markings, looking all the more natural. Naturally, these sort of variations give the species an enough natural protection.

Like Danaids, the members of this family are with imperfect fore legs in both sexes and the cell closed in both the wings, but the species are not tough.

The study includes only nine species, but it is hoped that further surveys and the collection will bring to light several species from the Park. Nevertheless it is believed that periodic fire burning in the forest, to burn dead & fallen leaves, adversely affects the Satyrid fauna in Park.

***Mycalesis perseus blasius* (Fabr.)**

The Common Bushbrown

(Plate IV, fig. 3)

1798. *Papilio blasius* Fabricius, *Ent. Syst.*, Suppl. : 426.

Material examined : Dehradun Dist. : Phadowala, 1♂, 3.v.90 ; 2♂♂, 7.xi.90 (P. C. Tak coll.) ; Satyanarayan, 2♂♂, 12.x.90. Haridwar Dist. : Ranipur, 1♂ (WSF), 30.viii.90 ; Dholkhand, 5♂♂, 1♀, 9.xi.90 (P. C. Tak coll.) ; Beribara 1♂, 9.xi.90 (P. C. Tak coll.).

Wing expanse : 42-48 mm.

Distribution : India : Himachal Pradesh (Kangra) ; U.P. extending to Myanmar.

Remarks : Piele (1937) recorded the species as rare both in Dehradun and Mussoorie hills, although elsewhere it may be quite common. The species shows remarkable seasonal variation ; the material from Ranipur is referable to WSF, with the marking quite prominent, compared to the rest of the material from other localities from where the DSF specimens have been collected, where the ocelli on wings have been reduced to mere white specks.

The species is characterised by the presence of black-brown sex brand, with ochreous hair pencil ; all the spots on the hind wing underside are in line except

the one in area 2 which is moved inwards.

Status : Very common.

***Mycalesis mineus mineus* (Linn.)**

The Dark Brand Bushbrown

1767. *Papilio mineus* Linn., *Syst. Nat.*, 12 ed : 768.

Material examined : Haridwar Dist. : Ranipur, 1 ♂, 30.viii.90 (WSF). Pauri Dist. : Chilla, 2 ♂ ♂, 9.viii.91 (*P. C. Tak* coll.), 3 ♂ ♂, 1 ♀ 23.viii.91 (*A. Kumar* coll.).

Wing expanse : 45 mm.

Distribution : India : Himachal Pradesh (Kulu) ; U.P. ; Andaman Is., extending to Myanmar.

Remarks : Like *perseus* this is also without any cavity on the upperside of fore wing, a characteristic feature of 'Mineus' Group. The species, however, differs from *perseus* by the spot on hind wing underside being in line and that in the area 2 not moved inwards.

Status : Very common.

***Erebia hyagriva* (Moore)**

The Brown Argus

1857. *Ypthima hyagriva* Moore, In Horsfield & Moore *Cat. Lep. Ins. E. I. C.*, 1 : 236.

Material examined : Dehradun Dist. : Kansrao, 1 ♂, 16.vi.68 (*Asket Singh* coll.).

Wing expanse : 57 mm.

Distribution : India : Kashmir to Kumaon.

Remarks : The specimen is larger compared to earlier recorded wing expanse of 42-46 m.

Status : Rare.

Ypthima ceylonica huebneri (Kirby)**The Common Fourring**

1871. *Ypthima huebneri* Kirby, *Syn. Cat. Diurn. Lep.* : 95.

Material examined : Haridwar Dist. : Ranipur, 1♂, 1♀, 30.viii.90 ; Dehradun Dist. : Satyanarayan, 2♂♂, 1♀, 12.x.90. Pauri Dist. : Chilla, 1♀, 9.viii.91 (P. C. Tak coll.).

Wing expanse : 30-34 mm.

Distribution : Throughout peninsular India to Assam. Also Myanmar.

Remarks : The nomino-typical form, viz. *ceylonica ceylonica* Hewitson and *ceylonica huebneri* mainly differ from each other in the hind-wing being whitish on the posterior half in *ceylonica ceylonica* ; *c. huebneri* is further differentiated from *ceylonica kasmira* by the presence of discal and submarginal brown bands on hind wing underside.

The two subspecies, viz. *huebneri* and *kasmira* are quite close to each other and seem to overlap each other in their range of distribution.

The species is characterised by the presence of four rings on the hind wing underside, one in subapical and three in tornal area, the latter contiguous to each other.

Status : Very common.

Ypthima ceylonica kasmira (Moore)**The Common Fourring**

1884. *Ypthima kasmira* Moore, *J. Asiat. Soc. Beng.*, 53 (2) : 17.

Material examined : Dehradun Dist. : Phandowala, 1♀, 3.v.90 ; 3♂♂, 1♀ (DSF), 7.xi.90 (P. C. Tak coll.) ; Cherring crossing (on way to Kansrao), 1♂, 3.v.90, 1 ex. (abdomen damaged), 7.v.90 ; Rajaji Sanctuary (no more data), 1♀, 29.vii.71 (M. Prasad coll.). Haridwar Dist. : Rajaji Sanctuary (no more data), 1♀, 6.ix.62 (T. D. Soota coll.).

Wing expanse : 33-38 mm.

Distribution : India : Kashmir to U.P. (Kumaon).

Remarks : As the name suggests, the species, like *c. huebneri*, is easily recognised by the presence of four ocelli on the hind wing underside, and is very close to the latter, except that this is more darker and of more uniform colour ; underside of both wings is dull brown, bands obsolete, or the submarginal one present on forewing.

Status : Not rare.

***Ypthima lisandra avanta* (Moore)**
The Jewel Fourring

1874. *Ypthima avanta* Moore, *Proc. zool. Soc. Lond.* : 567.

Material examined : Dehradun Dist. : Motichur, 2 ♂♂, 12.vii.90, 1 ♀, 12.x.90.

Wing expanse : 32 mm.

Distribution : India : Kashmir to Sikkim.

Remarks : The species is well within the range of distribution and its expanse.

Status : Not rare.

***Ypthima baldus baldus* (Fabr.)**
The Common Sixring
(Plate IV, fig. 4)

1775. *Papilio baldus* Fabricius, *Syst. Ent.*, (3) 1 : 829.

Material examined : Dehradun Dist. : Phandowala, 1 ♂, 1 ♀, 7.xi.90 (*P. C. Tak* coll.) ; Haridwar Dist. : Beribara, 1 ♂, 1 ♀, 9.xi.90 (*P. C. Tak* coll.).

Wing expanse : 38 mm.

Distribution : India : N.W. Himalaya to Assam. Also Myanmar.

Remarks : Common in the Park, the species is characterised by the presence, on the underside of hind wing, of ocelli in pairs, i.e., two in tornal, two in medial and two in subapical area ; the bands prominent on underside ; the apical one-third area paler. Although Wynter-Blyth (1957) has mentioned this as "THE COMMON

FIVERING" there are in fact "Six Rings or Ocelli on the underside of hind wings (vide Talbot, 1947).

Status : Very common.

Melanitis leda ismene (Cramer)

The Common Evening Brown

(Plate IV, figs. 5-8)

1775. *Papilio ismene* Cramer, *Pap. Exot.*, 1 : 40, pl. 26, figs. A, B.

Material examined : Dehradun Dist. : Satyanarayan, 9 ♂♂, 10 ♀♀, 12.x.90 (all DSF) ; Motichur, 1 ♀ (WSF), 12.x.90 ; Phandowala, 1 ♂, 1 ♀ (DSF), 7.xi.90 (P. C. Tak coll.). Haridwar Dist. : Dholkhand, 1 ♀ (WSF), 9.xi.90 (P. C. Tak coll.).

Wing expanse : 62-70 mm.

Distribution : Throughout India.

Remarks : The species, commonly known as Evening Brown, is usually active at dawn and dusk time, when it is easy to catch. The species is best known for its seasonal variation, i.e., the WSF specimens are with the ocelli well marked on underside of both wings, unlike in DSF specimens where the ocelli on the underside are obsolete, reduced to three or four minute submarginal spots, which may further be reduced to mere specks ; the underside of wings perfectly harmonise with the dead and fallen leaves or with the plants on which these settle, when it becomes difficult to locate unless disturbed.

Both the forms have been collected from Rajaji National Park. At some places in October, when the season is just changing to dry weather, both the forms have been found to fly together. The species is quite common up to November, or early December, after which their appearance declines in extreme winter season.

Status : Very common.

Elymnias hypermnestra undularis (Drury)

The Common Palmfly

(Plate V, figs. ♂ 1,2, ♀, 3, 4)

1773. *Papilio undularis* Drury, *Ill. Exot. Ins.*, 2 : pl. 10, figs., 1, 2.

Material examined : Dehradun Dist. : Motichur, 1♂, 12.x.90 ; Phandowala, 1♂, 7.xi.90 (*P. C. Tak* coll.) ; Kansrao, 1♀, 7.xi.90 (*P. C. Tak* coll.). Haridwar Dist. : Ranipur, 2 ♂♂, 30.viii.90.

Wing expanse : 62-67 mm.

Distribution : India : U.P. (Dehradun) to W. Bengal ; Madhya Pradesh ; Assam. Also Myanmar.

Remarks : The species is a very good example of sexual dimorphism, while the male is very beautiful, the wings being blackish brown, with purplish gloss and a series of marginal blue spots on forewings, the female is a good mimic of "Tawny Tigers" of the Danaidae. The male was seen to fly around Palm tree and settle on the same, at Motichur. The flight is weak and does not last long.

The material collected from Rajaji National Park, is much too smaller in expanse as given above, compared to the earlier range of 72-86 mm (vide Talbot, 1947).

Status : Common.

Family : ACRAEIDAE

The members of this family, like some in Danaidae, are tawny or yellow in colour, very sparsely scaled and with the forelegs imperfect in both sexes ; the cell closed in both wings, but unlike in Danaidae, the Anal veins are free in forewing.

The family is represented in India, by only a single genus and two species, viz, *Acraea issoria* (Hübner) and *A. violae* (Fabr.), and only one is being recorded from Rajaji National Park, as under.

Acraea violae (Fabr.)

The Tawny Coster
(Plate V, figs. 5, 6)

1775. *Papilio violae* Fabricius, *Syst. Ent.* : 460.

Material examined : Haridwar Dist. : Dholkhand, 2 ♂♂, 9.xi.90 (*P.C. Tak* coll.).

Wing expanse : 48-56 mm.

Distribution : India : Peninsular region to Punjab and the lower altitudes of Himalaya ; W. Bengal ; Bihar and Sikkim. Also Sri Lanka.

Remarks : The species is nearly within the recorded wing expanse, i.e., 50-65 mm. Although, this is the only species of the genus *Acraea*, having been recorded from Rajaji National Park, at lower elevations, the probability of the occurrence of the other species *A. issoria* (Hübner) is not remote, since the latter has already been recorded from 'Dun' (vide Mackinnon, 1898), though it may not be at such a low altitude as of *violae*. Further surveys in the Park may bring to light not only the new records of *violae* but the occurrence of *issoria* too in the Park.

Status : Common.

Family : NYMPHALIDAE

The species of the family Nymphalidae are among the most active, fast-flying and beautiful butterflies. Majority of species visit flowers, being fond of sunshine and basking. Several species are attracted to over-ripe fruits, dipped in beer, or dung. Although it is difficult to generalise the predominant colours in the species, most of these are with tawny or black background. The wings may be spotted, striped, blotched, or with different pattern. The hind wings may be evenly rounded, sharply toothed or angled, tailed or indented, etc. However, all the species are characterised by the forelegs being imperfectly developed in both the sexes and the cell open in both the wings. The latter character differentiates this family from Danaidae where the forelegs are imperfectly developed, likewise in both the sexes.

As many as 22 species in 14 genera are being recorded from Rajaji National Park, mainly Dehradun, Haridwar and Pauri districts.

***Moduza procris procris* (Cramer)**

The Commander

(Plate V, figs. 7,8)

1777. *Papilio procris* Cramer, *Pap. Exot.*, 2 : pl. 106, figs. E, F.

Material examined : Haridwar Dist. : Beribara, 2 ♂♂, 9.xi.90 (P.C. Tak coll.).

Wing expanse : 47-mm.

Distribution : India : U. P (Dehradun) to Sikkim. Also Southern China Myanmar and Indo-China.

Remarks : The material collected from Rajaji National Park is much smaller in wing expanse, compared to an already recorded range of expanse of 60-75 mm (vide Wynter-Blyth, 1957). While Evans (1932) and Wynter-Blyth (1957) state that the species is 'not rare', Piele (1937) on the other hand states this species as rare in its status at Dehradun, between March and September, and in 'Kumaon' between November and January.

The species is very beautiful both on upper and underside wings, is a fast flier and available at low altitude.

Status : Not rare.

***Athyma perius* (Linn.)**
The Common Sergeant
(Plate V, figs. 9-10)

1758. *Papilio perius* Linnaeus, *Syst. Nat.*, ed. 10th : 471, no. 79.

Material examined : Rajaji Sanctuary (no more data), 1 ♀, 6.ix.62 (T. D. Soota coll.).

Wing expanse : 62 mm.

Distribution : India : Southern India ; Himachal Pradesh (Simla), extending to Myanmar.

Remarks : It is one of the commonest species in this genus, characterised by the presence of four cell-streak-spots on forewing upperside and by the presence of prominent row of black spots on the inner edge of the post discal band on hind wing underside. It is close to *Athyma opalina* Kollar, which is available in western Himalaya but not known to occur in Rajaji National Park, by the cell streak being divided into four spots, unlike in *opalina* where the black spots on the discal band are absent.

Status : Very common.

Pantoporia hordonia hordonia (Stoll)

The Common Lascar

(Plate VI, figs. 1-2)

1790. *Papilio hordonia* Stoll, In Suppl. Cramer Pap. Exot. : 149, pl. 33, figs. 4, 4D.

Material examined : Dehradun Dist : Satyanarayan, 2 ♂♂, 12.x.90 ; Motichur, 1 ♂, 1 ♀, 12.x.90 ; Phandowala, 1 ♂, 1 ♀, 7.xi.90 (*P. C. Tak* coll.) ; Kansrao, 2 ♂♂, 3 ♀♀, 7.xi.90 (*P. C. Tak* coll.). Haridwar Dist : Dholkhand, 2 ♂♂, 9.xi.90 (*P. C. Tak* coll.) ; Beribara, 1 ♀, 9.xi.90 (*P. C. Tak* coll.),

Wing expanse : 40-42 mm.**Distribution :** India : Southern India ; U. P. (Dehradun) to Myanmar.

Remarks : The species is very common in Park and is characterised by the cell-streak and the spot beyond being conjoined. The species is further characterised by the presence of very fine brown streaks on underside ; markings being yellow on wings and the spots conjoined.

Larsen (1987), regarding distribution of the species states that the species occurs in southern India and from U. P. (Kumaon) to eastwards, obviously skipping "Dun". The present record of the species from Park is of ecological interest and confirms its earlier record from Dun to eastwards.

Status : Very common in Park.**Neptis mahendra** Moore

The Himalayan Sailer

(Plate VI, figs. 3-4)

1872. *Neptis mahendra* Moore *Proc. zool. Soc. Lond.* : 560, pl. 32, fig. 3.

Material examined : Dehradun Dist : Cherring crossing (on way to Kansrao), 2 ♂♂, 7.v.90. Haridwar Dist : Rajaji Sanctuary (no more data), 1 ♂, 5.xi.62 (*T. D. Soeta* coll.) ; Dholkhand, 1 ♂, 6.iii.63 (*T. D. Soeta* coll.) ; Khajanawala (Mohund, Range), 1 ♂, 7.iii.63 (*T. D. Soeta* coll.).

Wing expanse : 52-55 mm.

Distribution : Pakistan (Chitral) to India : U. P. (Kumaon).

Remarks : The species is very close to *Neptis hylas astola* particularly in the markings on the underside hindwing being black-edged and the cell-spot and basal streak being quite separate from each other. However, *Neptis mahendra* differs in the basal band on underside hind wing widening towards costa unlike in *hylas astola* where the same is of uniform width throughout.

Status : Common.

Neptis hylas astola Moore
The Common Sailer
(Plate VI, figs. 5-6)

1872. *Neptis astola* Moore, *Proc. zool. Soc. Lond.* : 560.

Material examined : Dehradun Dist. : Kansrao, 8 ♂♂, 7.v.90 ; 2 ♀♀, 7.xi.90 (*P. C. Tak* coll.) ; Motichur, 1 ♂, 12.x.90 ; Phandowala, 2 ♂♂, 7.xi.90 (*P. C. Tak* coll.). Haridwar Dist. : Khajanawala (Mohund Range), 1 ♂, 7.iii.63 (*T. D. Soota* coll.) ; Dholkhand, 3 ♂♂ 2 ♀♀, 9.xi.90 (*P. C. Tak* coll.) ; Beribara, 1 ♂, 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Kunnao, 1 ♂, 23.viii.91 (*A. Kumar* coll.).

Wing expanse : 45-55 mm.

Distribution : India : Kashmir to Karen Hills, Myanmar.

Remarks : The species is very common throughout the Park, and is slightly smaller in expanse, compared to the earlier minimum recorded expanse of 55 mm. For differences from *N mahendra*, see above.

Status : Very common.

Neptis yerburyi (Butler)
The Yerburyi's Sailer

1886. *Neptis yerburi* Butler, *Proc. zool. Soc. Lond.* : 360.

Material examined : Dehradun Dist. : Phandowala, 2 ♀♀, 7.xi.90 (*P. C. Tak* coll.) ; Kansrao, 1 ♂, 7.xi.90 (*P. C. Tak* coll.). Haridwar Dist. : Dholkhand, 1 ♂, 1 ♀, 9.xi.90 (*P. C. Tak* coll.).

Wing expanse : 60-70 mm.

Distribution : India : Kashmir to U. P. (Kumaon).

Remarks : *Neptis yerburi yerburi* Butler is very close to both the species, viz., *N. mahendra* and *N. hylas*, in the placement of white discal spots in median space being in line with those in cubital area. However, in this species, unlike in the latter species, the black edging to the white discal spots is absent on underside hind wing, and by the cell-end spot and cell-streak being often conjoined on underside forewing.

Status : Not rare.

Cyrestis thyodamas ganescha (Kollar)
The Map Butterfly

1844. *Amathusia ganescha* Kollar, In Hugel's : *Kashmir und das Reich der Seick*, 4 (2) : 430, no. 1, pl. 7. figs., 3, 4.

Material examined : Dehradun Dist. : Phandowala, 1 ♀, 7.xi.90 (P. C. Tak coll.).

Wing expanse : 45 mm.

Distribution : India : Kashmir to U. P. (Kumaon).

Remarks : Evans (1932) recorded four subspecies from India, including one from Andamans, viz., *thyodamas andamanica*, and two others from the Indian mainland, viz., *thy. indica* from southern India and *thy. thyodamas* from Sikkim to Burma. The *thy. ganescha* from this region is characterised by the apical and terminal area on the upperside forewings being darker and narrow; the wings being whitish in male and yellowish in female.

Hypolimnias bolina (Linn.)
The Great Eggfly
(Plate VI, figs. 7-8)

1758. *Papilio bolina* Linnaeus, *Syst. Nat.*, ed. 10th : 479, no. 124.

Material examined : Haridwar Dist. : Ranipur, 6 ♀ ♀, 30.viii.90, 1 ♂, 12.x.90.

Dehradun Dist : Phandowala, 1 ♀, 4.ii.63 (T. D. Soota coll.) ; Motichur, 3 ♀ ♀, 12.vii.90, 1 ♀, 12.x.90. Pauri Dist. : Chilla, 1 ♂, 23.viii.91 (A. Kumar coll.).

Wing expanse : 75-90 mm.

Distribution : Throughout India.

Remarks : The seasonal variation is well pronounced, particularly on the underside of wings, since the upperside is different in both sexes, the male being close in appearance to that of *H. misippus*. The DSF from Phandowala is larger, being 90 mm., with the underside paler, the submarginal series of dots reduced in size, nearly becoming obsolete near apex. The WSF are darker on underside, marking prominent particularly the marginal series ; besides the forewings have an oblique series of patches from costa, beyond discocellular to cubital area 1a, and in the hind wing from a little below costa to inner margin, touching the lower angle of cell on its way. The patch, however, may be diffused or well marked, showing transition from one season to another.

The sexual dimorphism is well marked on its upperside ; the male resembling that of *H. misippus*, but with an additional series of submarginal and prominent dots on both wings ; the upperside being dark indigo-blue, with a large white discal patch shot with blue, on each wing. For remarks about female, see *misippus*.

Status : Common.

***Hypolimnas misippus* (Linn.)**

The Danaid Eggfly

(Plate VI, figs. 9-10)

1764. *Papilio misippus* Linnaeus, *Mus. Utr.* : 264, no. 83.

Material examined : Haridwar Dist. : Ranipur, 1 ♂, 30.viii.90, 1 ♂, 12.x.90.

Wing expanse : 65 mm.

Distribution : Throughout India, Sri Lanka and Myanmar.

Remarks : The species derives its common name 'Danaid Eggfly', on account of the female being a very good 'mimic' of the Danaid *Danaus chrysippus* Linn. The species is not only a very good example of 'Protective Mimicry', but also a good example of sexual dimorphism. The female, being a mimic of *D. chrysippus*, is predominantly tawny brown in colour, unlike that of the female of *bolina*, which is

blackish brown ; like *chrysippus*, the female also has a white-banded black apex. The female, however, differs from that of *chrysippus* by the absence of three black discal spots, typical of *chrysippus*, instead there is only one costal spot in hind wing. The male, being indigo-blue, with a large white patch shot with blue on each wing on upperside ; the underside similar to that in *bolina*.

Status : Common.

Kallima inachus (Boisduval)
The Oakleaf Butterfly

1836. *Papilio inachus* Boisduval, Crochard's ed. Cuvier's *Reg. Anim. Ins.*, 2 : pl. 139, fig. 3.

Material examined : Dehradun Dist. : Phandowala, 1 ♂, 7.v.90. Haridwar Dist. : Rajaji Sanctuary (no more data), 1 ♀, 7.v.63 (*T. D. Soota* coll.).

Wing expanse : Male 85 mm ; female 65 mm.

Distribution : India : N. W. Himalaya from Mussoorie to Sikkim and Assam ; Orissa ; and Maharashtra.

Remarks : Only two subspecies are known to occur in the Indian region, *inachus inachus* from Sikkim to Assam, and *inachus huegelli* from Kashmir to Kumaon. The material collected from the Park is referable to *inachus huegelli* (Kollar). There is well marked seasonal variation in this species, the DSF being paler than WSF.

It is one of the most beautiful butterflies of Nymphalidae, with the upperside being beautiful and brightly coloured ; the underside harmonising perfectly with the 'dead leaf', with leaf's marking of veins and veinlets. Often it is difficult to locate the species once it settles down on a twig, riverside boulders, or on ground.

The species is a very fast flier and attracted to over-ripe fruits, but immediately disappears into the forest once disturbed.

Status : Not rare.

Precis hierta (Fabr.)
The Yellow Pansy
(Plate VII, figs. 1-4)

1798. *Papilio hierta* Fabricius, *Ent. Syst. Suppl.*, 4 : 424, no. 281.

Material examined : Dehradun Dist. : Kansrao, 1 ♂, 1 ♀, 7.v.90 ; Satyanarayan, 1 ♂, 12.vii.90. Haridwar Dist. : Ranipur, 1 ♂ 30.viii.90 ; Beribara, 1 ♂, 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla, 1 ♂, 9.viii.91 (*P. C. Tak* coll.).

Wing expanse : 48-50 mm.

Distribution : Throughout India.

Remarks : The species is quite common in Park. *P. hierta* and the following species *P. orithya* prefer hot and sunny places in the forest, particularly fond of river beds, stony uncultivated grounds and roads, and very often fly just in front of the collector, as one pursues the same for collection, or fly slightly above the ground and intermittently settling and flying not far from the collector's sight. Very often it becomes difficult to collect the species unless the same settles on flower.

As the name suggests, the species has a prominent yellow patch on wing and with blue costal patch on upperside of hind wing. The species is also very beautiful. The female has two small discal ocelli in area 2 and 5 on upperside hind wing.

Status : Very Common.

***Precis orithya swinhoei* (Butler)**

The Blue Pansy

(Plate VII, figs. 5-6)

1885. *Junonia swinhoei* Butler, *Ann. Mag. nat. Hist.*, (5) 16 : 309.

Material examined : Dehradun Dist. : Cherring crossing (on way to Kansrao), 1 ♂, 1 ♀, 3.v.90 ; Kansrao, 2 ♂ ♂, 7.v.90 ; Satyanarayan, 1 ♂, 12.vii.90 ; Motichur, 4 ♂ ♂, 12.vii.90. Haridwar Dist. : Rajaji Sanctuary (no more data), 1 ♂, 25.xi.62 (*T. D. Soota* coll.). Pauri Dist. : Chilla, 1 ♀, 9.viii.91 (*P. C. Tak* coll.).

Wing expanse : 35-45 mm.

Distribution : Throughout India.

Remarks : In habits it is close to the preceding species *hierta*. The species is predominantly blue, particularly at the basal area in hind wing ; the apical area in fore wing is brownish, marked with white bands. Two prominent ocelli on each wing present, but variable in size.

The species has a seasonal variation, the material collected from the Park is

referable to both these forms. The DSF being pale stone-grey in colour on underside, compared to that in WSF.

Status : Very common in the Park.

***Precis lemonias persicaria* Fruhstorfer**

The Lemon Pansy

(Plate VII, figs. 7-8)

1912. *Precis lemonias persicaria* Fruhstorfer, In Seitz *Macrolepidoptera of the World*, 9 : 52.

Material examined : Dehradun Dist. : Cherring crossing (on way to Kansrao), 2 ♂♂, 7.v.90 ; Kansrao, 1 ♂ 1 ♀, 7.v.90 ; 1 ♂, 7.xi.90 (*P. C. Tak* coll.) ; Satyanarayan, 1 ♂, 3 ♀♀, 12.viii.90 ; Motichur, 1 ♂ 12.vii.90, 3 ♂♂, 12.x.90 ; Phandowala, 1 ♂, 2 ♀♀ (♀♀ DSF, ♂ WSF), 7.xi.90 (*P. C. Tak* coll.). Haridwar Dist. : Rajaji Sanctuary (no more data), 1 ♂, 6.ix.62 (*T. D. Soota* coll.) ; Ranipur, 2 ♂♂ (WSF), 30.viii.90 ; Dholkhand, 3 ♂♂, 9.xi.90 (*P. C. Tak* coll.) ; Beribara, 1 ♂, 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla, 11 ♂♂, 1 ♀, 2.viii.91, 6 ♂♂, 2 ♀♀, 9.viii.91 (*P. C. Tak* coll.), 4 ♂♂, 23.viii.91 (*A. Kumar* coll.) ; Kunnao 9 ♂♂, 1 ♀, 9.viii.91 (*P. C. Tak* coll.).

Wing expanse : 42-53 mm.

Distribution : India : Kashmir to U. P. (Kumaon).

Remarks : The species is quite common in the Park, particularly in the area closer to jungle and visits flowers, but its occurrence along with *ailites* around wet places is not uncommon. The seasonal variation is quite well marked, with the ocelli on wings prominent in WSF and reduced in DSF.

Both the forms have been collected at the same place and time at Phandowala in the month of November, the colour being dark brown in WSF and reddish brown in DSF, with the ocelli reduced.

Status : Common.

Precis almana (Linn.)

The Peacock Pansy

(Plate VII, figs. 9-10)

1758. *Papilio almana* Linnaeus, *Syst. Nat.*, ed. 10th. : 472, no. 89.

Material examined : Dehradun Dist. : Phandowala, 1 ♂, 27.vi.68 (*Asket Singh* coll.); Kansrao, 2 ♂♂ (DSF), 7.v.90; 1 ♂ (DSF), 7.xi.90. (*P. C. Tak* coll.); Motichur, 1 ♂ (WSF), 1 ♀ (DSF), 12.x.90. Haridwar Dist. : Rajaji Sanctuary (no more data), 2 ♂♂ (DSF), 26.xi.62 (*T. D. Soota* coll.); Ranipur, 1 ♀ (DSF), 12.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla, 2 ♂♂ (WSF), 2.viii.91 (*P. C. Tak* coll.).

Wing expanse : 47-53 mm.

Distribution : Throughout India and outer Himalaya up to 6000 feet (*ca* 1830m).

Remarks : Among the Pansies, and the Nymphalidae in general, the species is one of the best examples of seasonal variation. In fact for a very long time both the forms in this species were treated as independent species, the WSF as *asteric* and DSF as *almana*. The species is quite beautiful, tawny brown in colour in both sexes; those in WSF, the ocelli are well marked on hind wing underside, the margins of wings smooth; in DSF the apex in fore wing is prominently toothed, the hind wing is produced into a narrow tail, with the underside markings on both wings dull, 'dead leaf-like' and perfectly harmonise with the surroundings. Several intermediate stages in between DSF & WSF, and vice-versa, can be collected in the field. At times, both DSF and WSF have been collected at the same place and date.

The species is quite common in the Park and available in both the moist as well as dry jungle areas. The material collected from the Park is much smaller in wing expanse, as given above, compared to the earlier recorded minimum expanse of 60 mm (*vide Wynter-Blyth, 1957*).

Status : Common.

Precis atlites (Linn.)

The Grey Pansy

(Plate VIII, figs. 1-2)

1763. *Papilio atlites* Linnaeus, *Cent. Ins.* : 24, no. 72.

Material examined: Dehradun Dist.: Kansrao, 1 ♂, 7.v.90: 5 ♂♂ (WSF), 1 ♀ (DSF), 7.xi.90 ((*P. C. Tak* coll.); Motichur, 7 ♂♂ (WSF), 4 ♀♀ (WSF), 12.vii.90, 4 ♂♂, 12.x.90; Satyanarayan, 1 ♂, 12.vii.90 (WSF). Haridwar Dist.: Ranipur, 1 ♂, 12.x.90; Beribara, 7 ♂♂ (DSF, WSF), 9.xi.90 (*P. C. Tak* coll.). Pauri Dist.: Chilla, 1 ♂, 23.viii.91; Kunnao, 1 ♂, 23.viii.91 (both *A. Kumar* coll.).

Wing expanse: 48-56 mm.

Distribution: Common throughout the plains of India, particularly in the areas of heavy rainfall.

Remarks: The species is not common in Himalaya, particularly in the area of scanty rainfall. The males are paler than females but in a series of specimens collected from the Park in the month of May from Kansrao and Beribara in the month of November, the specimens are paler than those collected in July from Motichur and Satyanarayan, the latter are having prominent ocellated spots on underside both wings, which represent WSF.

The species is quite different in its habits and habitat, than those of *hierta* and *orithya*, being abundant in moist areas of the jungle and very fond of settling on shrubs close to wet areas. As a result, most of the specimens collected are more WSF than DSF. This particular habit was observed in Motichur area of the Park, where the concentration of the species was observed around wet and nearly marshy land. Also specimens of *lemonias* were observed flying at the same place but much scarce in number.

Status: Common.

***Precis iphita* (Cramer)**
The Chocolate Pansy
(Plate VIII, figs. 3-4)

1779. *Papilio iphita* Cramer, *Pap. Exot.*, 3: pl. 209, figs. C&D.

Material examined: Dehradun Dist.: Cherring crossing (on way to Kansrao), 2 ♂♂, 3.v.90; Kansrao, 1 ♀, 15.v.68 (*Asket Singh* coll.); 1 ♂, 7.xi.90 (*P. C. Tak* coll.); Motichur, 1 ♂, 12.x.90; Phandowala, 7 ♂♂, 1 ♀, 7.xi.90 (*P. C. Tak* coll.). Haridwar Dist.: Rajaji Sanctuary (no more data), 2 exs. (abdomen damaged) 5.xi.62 (*T. D. Soota* coll.); Dholkhand, 5 ♀♀, 9.x.90 (*P. C. Tak* coll.).

Wing expanse: 50-60 mm.

Distribution : India ; Kashmir to U. P. (Kumaon).

Remarks : Like *atlites*, this species is also very fond of visiting damp shaded-ground and moist areas, and is never available in dry and open areas.

Both sexes are predominantly brown in colour, with obscure brown bands ; ocelli poorly developed. It is the only species of the genus *Precis* being drab and unattractive, compared to beautiful species like *hierta* and *orithya*, and the seasonal variant tawny *almana*.

The material collected from the Park, is slightly smaller in expanse compared to the earlier minimum record of 55 mm. and is referable to the subspecies *siccata*.

Status : Common.

Cynthia cardui (Linn.)

The Painted Lady

(Plate VIII, figs. 5-6)

1758. *Papilio cardui* Linnaeus, *Syst. Nat.*, ed. 10th : 475. no. 107.

Material examined : Dehradun Dist. : Cherring crossing (on way to Kansrao), 2 ♀ ♀ , 3, 7.v.90.

Wings expanse : 50-55 mm.

Distribution : Throughout India.

Remarks : The species is very common throughout India, right from sea-level to an altitude of up to 15,000' (ca 4575 m.) in Himalaya. It is not rare in the Park, though only two specimens have been collected so far. Because of the species being very restless, it flies very swiftly in a dashing manner from one side to another, and is difficult to catch unless resting on flowers.

The species is a well known example as a migratory species, all over the world except South America. The species is characterised by the presence of pinkish-red patch on both wings, particularly in their latter part ; hind wings are further characterised by the presence of a submarginal series of black dots.

The species is slightly smaller in expanse compared to minimum recorded expanse of 55 mm. The fore wing upperside, like *Vanessa indica*, has three conjoined

spots on the innerside and four separate white spots in the apical area ; the outer margin in fore wing being rather straight and in hind wing being smoothly curved.

Status : Common.

***Vanessa indica* (Herbst)**
The Red Indian Admiral

1794. *Papilio atalanta indica* Herbst, *Nat. Syst. Schmett.*, 7 : 171, pl. 180, fig., 1, 2.

Material examined : Dehradun Dist. : Phandowala, 1 ex. (damaged), 7.xi.90
(P. C. Tak coll.)

Wing expanse : 60 mm.

Distribution : India : Kashmir, extending to Myanmar.

Remarks : Wynter-Blyth (1957) treated this species, along with *atalanta* and *cardui* in one group, which is characterised by the white spots on upperside fore wing (see *cardui*) and margin, etc. The species *cardui* has since been treated under the genus *Cynthia* and the species *atalanta* not known to occur in the Park, this, therefore, is the only species being treated under the genus *Vanessa* presently from the Park.

Status : Common.

***Symbrenthia hippoclus* (Cramer)**
The Common Jester
(Plate VIII, figs. 7-8)

1779. *Papilio hippoclus* Cramer, *Pap. Exot.*, 3 : 46, pl. 220, figs. C&D.

Material examined : Dehradun Dist. : Kansrao, 2 ♂♂, 15.v.68 (*Asket Singh* coll.). Haridwar Dist. : Ranipur 1 ♀, 30.viii.90.

Wing expanse : 40-47 mm.

Distribution : India : Himachal Pradesh (Kulu) to the hills of N. E. Himalaya. Extending to Myanmar.

Remarks : The species is characterised by the presence of conjoined yellow spots on fore wing and very closely resembles *Pantoporia hordonia*. In both the species, the underside wings is marked with brown lines. However, in *hippoclus* the darker brown line run from just near the base in hind wing to middle of costa and continued on to the fore wing up to the apex ; the hind wing being toothed unlike smooth curved in *hordonia*.

The mode of flight in both the species, viz., this as well as *hordonia* is quite similar and both are often found to fly together.

The material collected from the Park is referable to the subspecies *hippoclus khasiana* Moore.

Status : Fairly common.

Argyreus hyperbius hyperbius (Johanssen)
The Indian Fritillary
(Plate IX, figs. 1-2)

1764. *Papilio hyperbius* Johanssen, *Amoen Acad.*, 6 : 408, no. 75.

Material examined : Dehradun Dist. : Cherring crossing (on way to Kansrao), 1 ♂, 3.v.90 ; Kansrao, 1 ♂, 7.v.90 ; 1 ♀, 7.xi.90 (*P. C. Tak* coll.). Haridwar Dist. : Dholkhand, 1 ♂, 9.xi.90 (*P. C. Tak* coll.) ; Beribara, 1 ♂, 9.xi.90 (*P. C. Tak* coll.).

Wing expanse : 60-67 mm.

Distribution : India : Madhya Pradesh, extending to Myanmar. Pakistan (Chitral).

Remarks : Common in the Park, the species is one of the beautiful species of the family and is characterised by the presence of irregular silver stripes on underside hind wings, which are tinged with green inwardly ; the female with the apex dark-blue and white banded.

Status : Common.

Phalanta phalantha (Drury)
The Common Leopard
 (Plate IX, figs. 3-4)

1770. *Papilio phalantha* Drury, *Illustr. Exot. Ent.*, 1 : pl. 21, figs. 1, 2.

Material examined : Dehradun Dist. : Phandowala, 1 ♂, 27.vi.68 (*Asket Singh* coll.) ; Kansrao, 3 ♂♂, 7.v.90 ; 1 ♂, 7.xi.90 (*P. C. Tak* coll.) ; Cherring crossing (on way to Kansrao), 1 ♂, 1 ♀, 7.v.90 ; Motichur, 1 ♀, 28.v.79 (*Arun Kumar* coll.) 1 ♂, 2 ♀♀, 12.vii.90. Haridwar Dist. : Ranipur, 2 ♂♂, 2 ♀♀, 30.vii.90 ; Dholkhand, 6 ♂♂, 9.xi.90 (*P.C. Tak* coll.) ; Beribara, 1 ♂, 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla, 3 ♂♂, 1 ♀, 9.viii.91 (*P. C. Tak* coli.).

Wing expanse : 44-60 mm.

Distribution : Throughout India.

Remarks : Common throughout the Park, the species is reported to be uncommon in monsoon season in Himalaya. Wynter-Blyth (1957) states that the species is completely absent in monsoon when the insects passes its life in egg stage. The collection of the material continuously from May to August, including monsoon period in July and August, from the Park is of ecological interest. Hence based on the material collected, it can be presumed that the species is also available during monsoon period, and the material collected during monsoon period, from Ranipur and Motichur, is prominently marked on upperside and underside of wings, compared to those of DSF. The females are considerably larger, though falling within the recorded expanse, whereas the males are, at their minimum expanse smaller than the minimum record of 50 mm.

The species resembles in appearance to "The Fritillaries" except that there are no silver markings/stripes etc., on the underside of wings, a characteristic feature of the 'Fritillaries'.

Status : Very common in Park.

Ariadne merione (Cramer)
The Common Castor
 (Plate IX, figs. 5-6)

1777. *Papilio merione* Cramer, *Pap. Exot.*, 2 : pl. 144, figs. G, H.

Material examined : Dehradun Dist. : Kansrao, 2♂♂, 15.v.68 (*Asket Singh* coll.) ; 1 ♂, 7.xi.90 (*P. C. Tak* coll.) ; Phandowala, 1 ♂, 7.xi.90 : (*P. C. Tak* coll.). Haridwar Dist. : Ranipur, 1 ♂, 30.viii.90. Pauri Dist. : Chilla, 1 ♀, 9.viii.91 (*P. C. Tak* coll.).

Wing expanse : 49-57 mm.

Distribution : India : Kashmir ; U. P. (Kumaon) ; Orissa ; and Madhya Pradesh.

Remarks : The material, referable to *tapestrina* Moore, is the only subspecies known to occur in this range of distribution, and is presently recorded from the Park. Besides, there are four more subspecies, viz., *m. taprobana* Wd. from Sri Lanka, *merione merione* Cr. from Southern India to Maharashtra, *m. assama* Evans from Sikkim to N. Myanmar and *m. pharis* Fruh. from Myanmar.

The WSF are darker and richly coloured. The flight is weak and the species prefers to fly close to ground and in the neighbourhood of their host-plant.

Status : Very common.

Family : LYCAENIDAE

The members of the family Lycaenidae, as are commonly known as "The Blues", are predominantly blue in colour, but various shades of brown, chestnut, or blackish tinge on upperside of wings, are not uncommon. Several species are with their wings glossy shining-blue, green or purple. The upperside of wings may be unmarked, or it may be spotted or banded, with a variety of colours, or it may be completely unmarked ; the hind wings with the outer margin smoothly curved, or the termen produced into a lobe or a tail, which may be long and thread-like. Both the sexes have fully developed forelegs and the precostal spur is absent in the hind wing.

Only eight species are being recorded under this family, although several species are known to occur in Doon Valley and Mussoorie areas, but with no specific record from the Park. Although majority of Lycaenids are very delicate, those belonging to the subfamily Theclinae are more strongly built and fast fliers.

It is hoped that further surveys and study will bring to light several additional

species of Lycaenidae, which have remained neglected, and have not been collected from the Park.

Castalius rosimon (Fabr.)
The common Pierrot

1775. *Papilio rosimon* Fabricius. *Syst. Ent.*, : 523.

Material examined : Haridwar Dist. : Ranipur, 2 ♂♂, 3 ♀♀, 12.x.90 ; Dholkhand, 2 ♀♀ 1 ex. (abdomen damaged), 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla, 1 ♂, 1 ♀, 2.viii.91, 3 ♀♀, 9.viii.91 (*P. C. Tak* coll.); Kunnao, 1 ♂, 1 ♀ (in copulae), 2.viii.91 (*P. C. Tak* coll.).

Wing expanse : 24-28 mm.

Distribution : Throughout India, Sri Lanka and Myanmar.

Remarks : The species is very common in the Park and is characterised by the presence of dark discal band and black spots on white wings.

Status : Common.

Tarucus extricatus Butler
The Rounded Pierrot

1886. *Tarucus extricatus* Butler, *Proc. zool. Soc. Lond.* : 366.

Material examined : Pauri Dist. : Chilla, 2 ♂♂, 2, 9.viii.91 (*P. C. Tak* coll.). 1 ♂, 23.viii.91 (*A. Kumar* coll.).

Wing expanse : 20 mm.

Distribution : India : Punjab ; U. P. (NW. Province) ; Rajasthan and Maharashtra. Pakistan : Sind ; Karachi.

Remarks : The recorded wing expanse is between 23-24 mm.

Status : Not rare.

Chilades laius (Cramer)
The Line Blue

1780. *Papilio laius* Cramer, *Pap. Exot.*, 4 : 62, pl. 329, figs. D, E.

Material examined : Dehradun Dist. : Phandowala, 1 ♂, 7.xi.90 (*P. C. Tak* coll.).

Wing expanse : 24 mm.

Distribution : Throughout India, Sri Lanka and Myanmar.

Remarks : The species is common in the Park.

Status : Common.

Zizeeria maha (Kollar)
The Pale Grass Blue

1848. *Lycaena maha* Kollar, In Hugel's : *Kashmir und das Reich der seick*, 4 : 422.

Material examined : Dehradun Dist. : Phandowala, 3 ♂♂, 1 ♀, 3.v.90 ; 1 ♂, 1 ♀, 7.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla, 1 ♂, 23.viii.91 (*A. Kumar* coll.).

Distribution : Central to Northern India, Assam and Arunachal Pradesh. Also Myanmar and Nepal.

Remarks : The material collected from the Park is referable to the subspecies *maha maha*, with its markings on the underside more prominent and the hind wings tailless, compared to *maha ossa* Swinhoe which is distributed from southern India to central India.

The species in this genus are among the smallest butterflies of the Order Lepidoptera.

Status : Common.

Lampides boeticus (Linn.)
The Peablu

1767. *Papilio boeticus* Linnaeus, *Syst. Nat.*, ed. 12th : 78.

Material examined : Haridwar Dist. : Beribara, 1 ♂, 9.xi.90 (P. C. Tak coll.).

Wing expanse : 32 mm.

Distribution : Throughout India. Also Sri Lanka, Pakistan and Nepal.

Remarks : Like the preceding two species, this also belongs to the subfamily Lycaeninae and is likewise very delicate and tailless. The wings underside, unlike *rosimon* and *maha*, is characterised by the presence of narrow brown bands ; spots restricted only to the tornal area of hind wing.

The species is very common in the Park, though represented only by a single example from Beribara, and is migratory in nature. As a result, the species is widely distributed in the world. The species is also very fond of visiting flowers, open places and often settles on ground or the damp patches.

Status : Very common.

Curetis dentata Moore **The Toothed Sunbeam**

1878. *Curetis dentata* Moore, *Proc. zool. Soc. Lond.* : 137.

Material examined : Rajaji Sanctuary (no more data), 1 ♂, 6.ix.62 (T. D. Soota coll.).

Wing expanse : 36 mm.

Distribution : Southern India ; Madhya Pradesh, Himalaya from Kulu (Himachal Pradesh) to Sikkim ; Assam and Arunachal Pradesh. Also Myanmar and Nepal.

Remarks : The species is stoutly built, as is the feature of subfamily Theclinae, and is characterised by the upperside of fore- and hind-wings with golden-red discal area in male but red or white discal area in female ; the borders on upperside fore wing are very broad, extending from base along costa to inner margin and continued on to the tornal area on the inner margin.

The species is not reported to visit flowers.

Status : Not rare.

Fauna of Conservation Area 5 : Rajaji National Park

ARORA

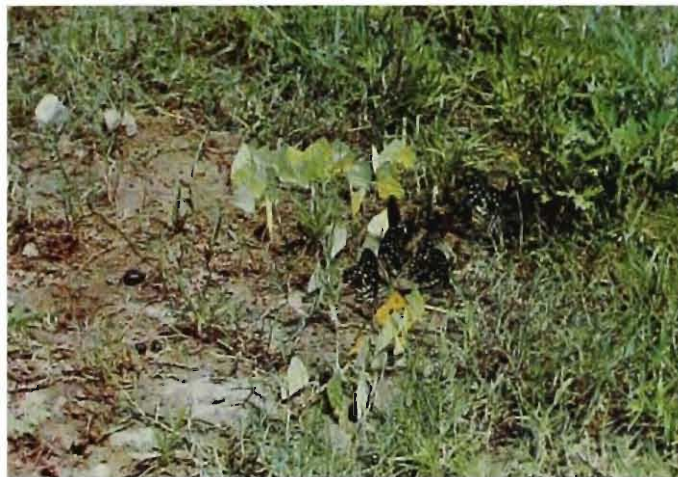
PLATE I



1



2



3

Fig. 1-2 : *Papilio polytes romulus* (Cramer) settled on ground damp with urine near faecal matter.

Fig. 3 : A group of congregating butterflies showing *P. demoleus* (Linn.) several examples, one example of *P. polytes* and several of *Catopsilia* spp.



1



2

Fig. 1 : A group of congregating butterflies showing *P. demoleus* (Linn.) several examples, one examples of *P. polytes* and several of *Catopsilia* spp.

Fig. 2 : Plant with an example of egg laying *Catopsilia* sp. A large number of eggs are seen laid on leaves.

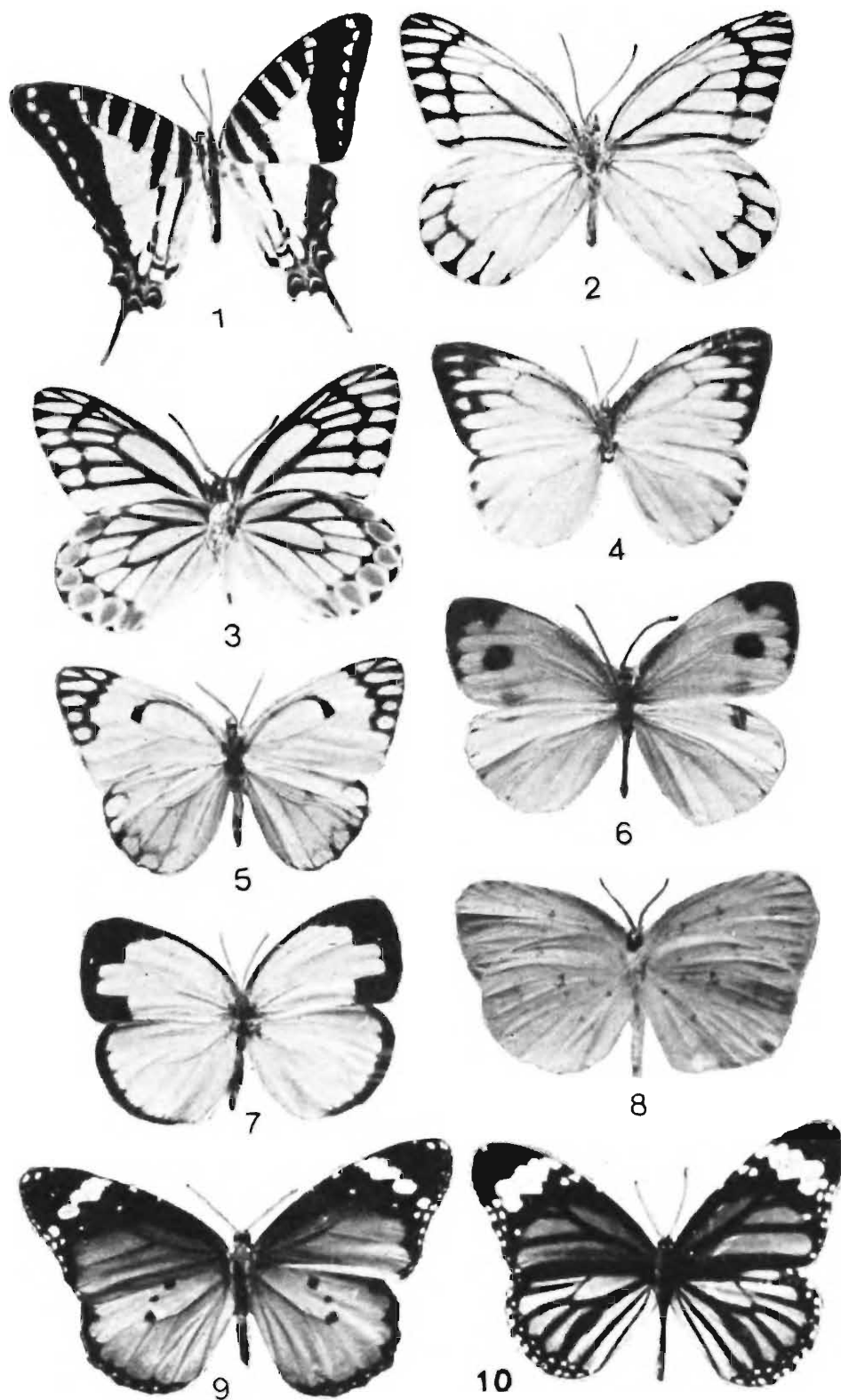


Fig. 1 : *Graphium nomius* (Esper) Fig. 2-3 : *Delias eucharis* (Drury) [2, upper side ; 3, under side]
 Fig. 4 : *Cepora nerissa phryne* (Fabr.) Fig. 5 : *Anapheis aurota aurota* (Fabr.) Fig. 6 : *Artogeia canidia indica* (Evans)
 Fig. 7-8 : *Eurema hecabe fimbriata* (Wallace) [7, upper side : 8, under side]
 Fig. 9 : *Danaus chrysippus* Linn. Fig. 10 : *Danaus genutia* Cramer.

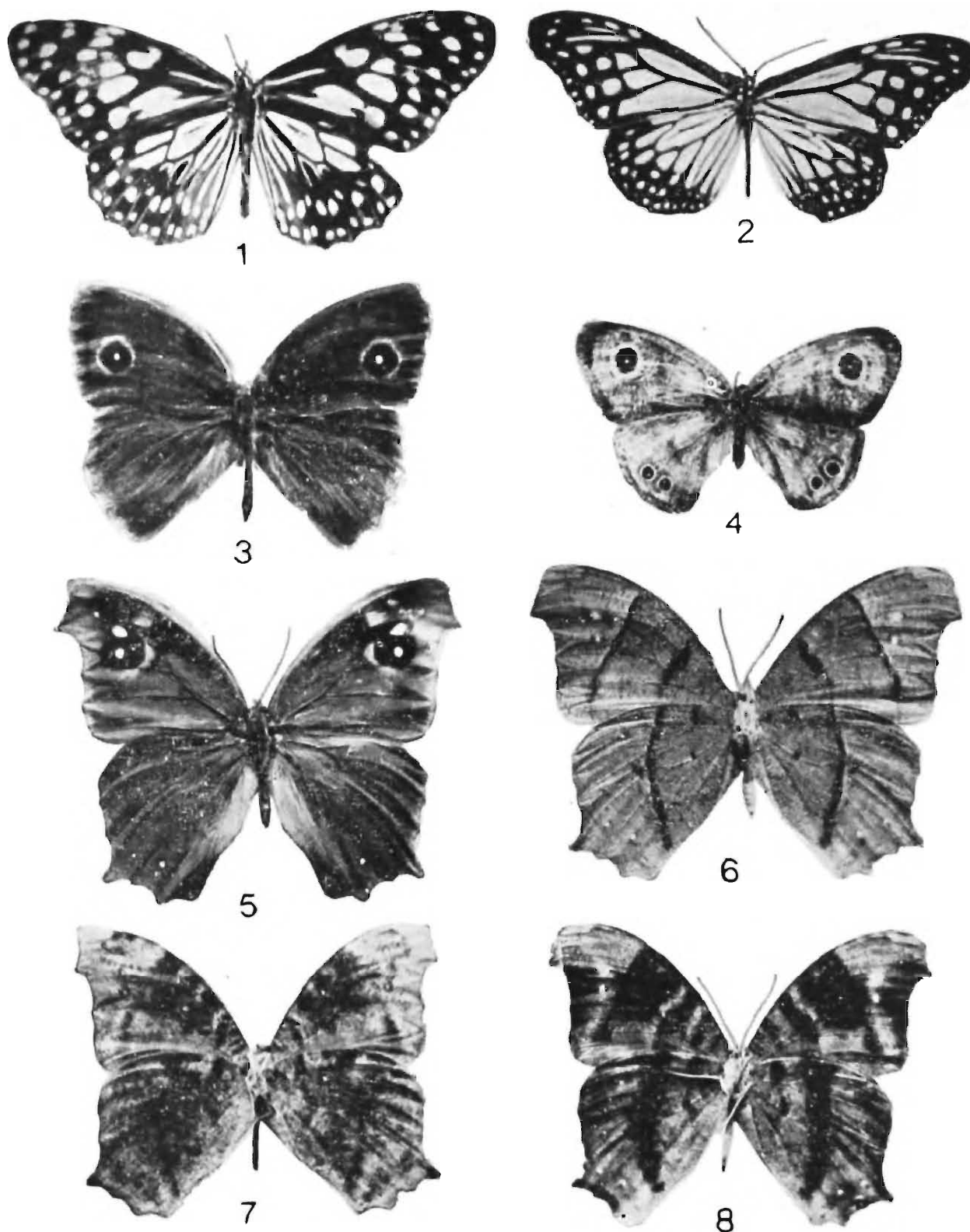


Fig. 1 : *Tirumala limniace leopardus* (Butler) Fig. 2 : *Parantica aplea melanoides* (Moore)
Fig. 3 : *Mycalesis perseus blasius* (Fabr.) Fig. 4 : *Ypthima baldus baldus* (Fabr.)
Fig. 5-8 : *Melanitis leda ismene* (Cramer) [5, upper side ; 6, 7, 8, under side].

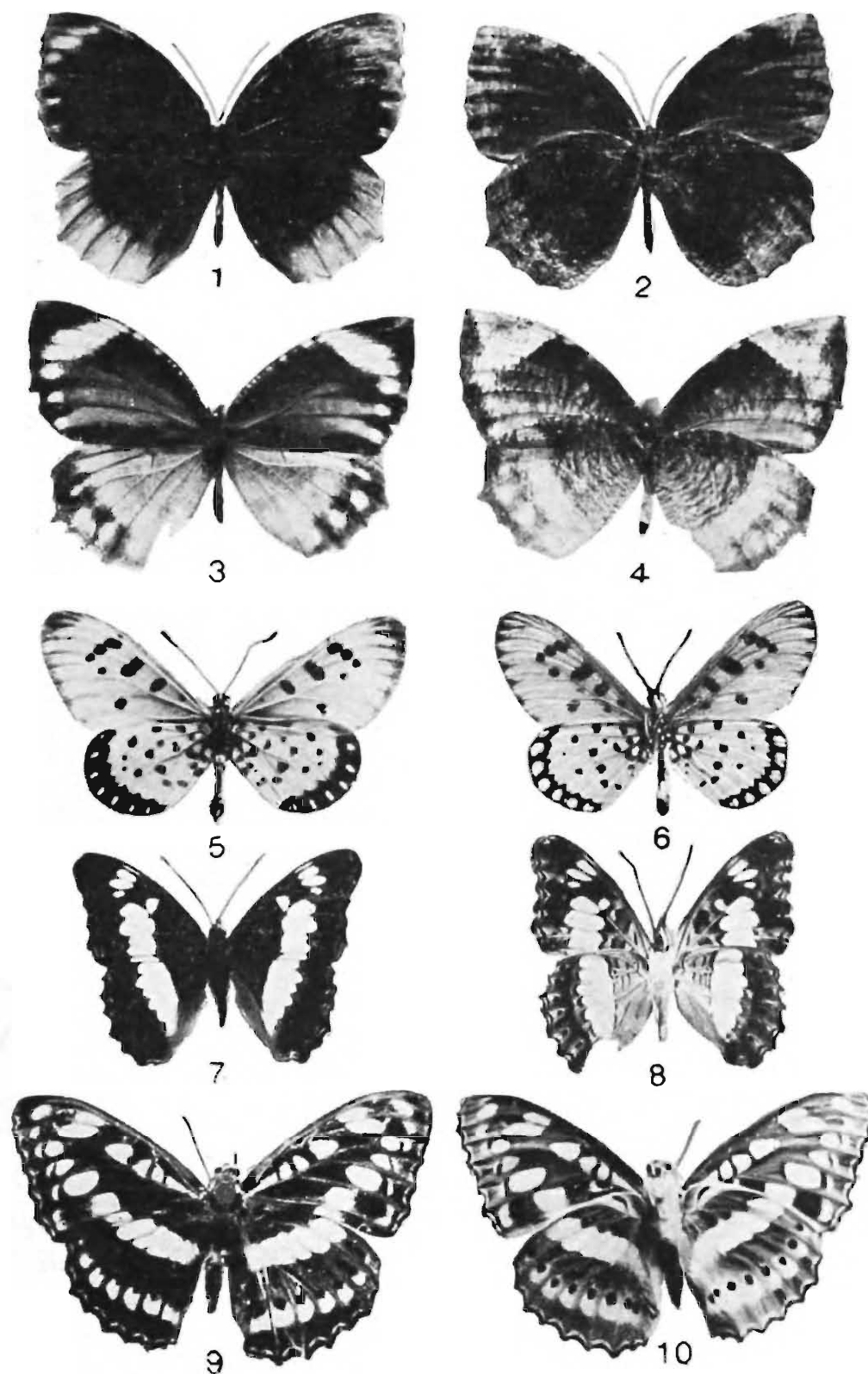


Fig. 1-2 : *Elymnias hypermnestra undularis* (Drury) [male : 1, upper side ; 2, under side]
Fig. 3-4 : *Elymnias hypermnestra undularis* (Drury) [female : 3, upper side ; 4, under side]
Fig. 5-6 : *Acraea violae* (Fabr.) [5, upper side ; 6, under side] Fig. 7-8 : *Moduza procris procris* (Cramer) [7, upper side ; 8, under side] Fig. 9-10 : *Athyma perius* (Linn.) [9, upper side ; 10, under side].

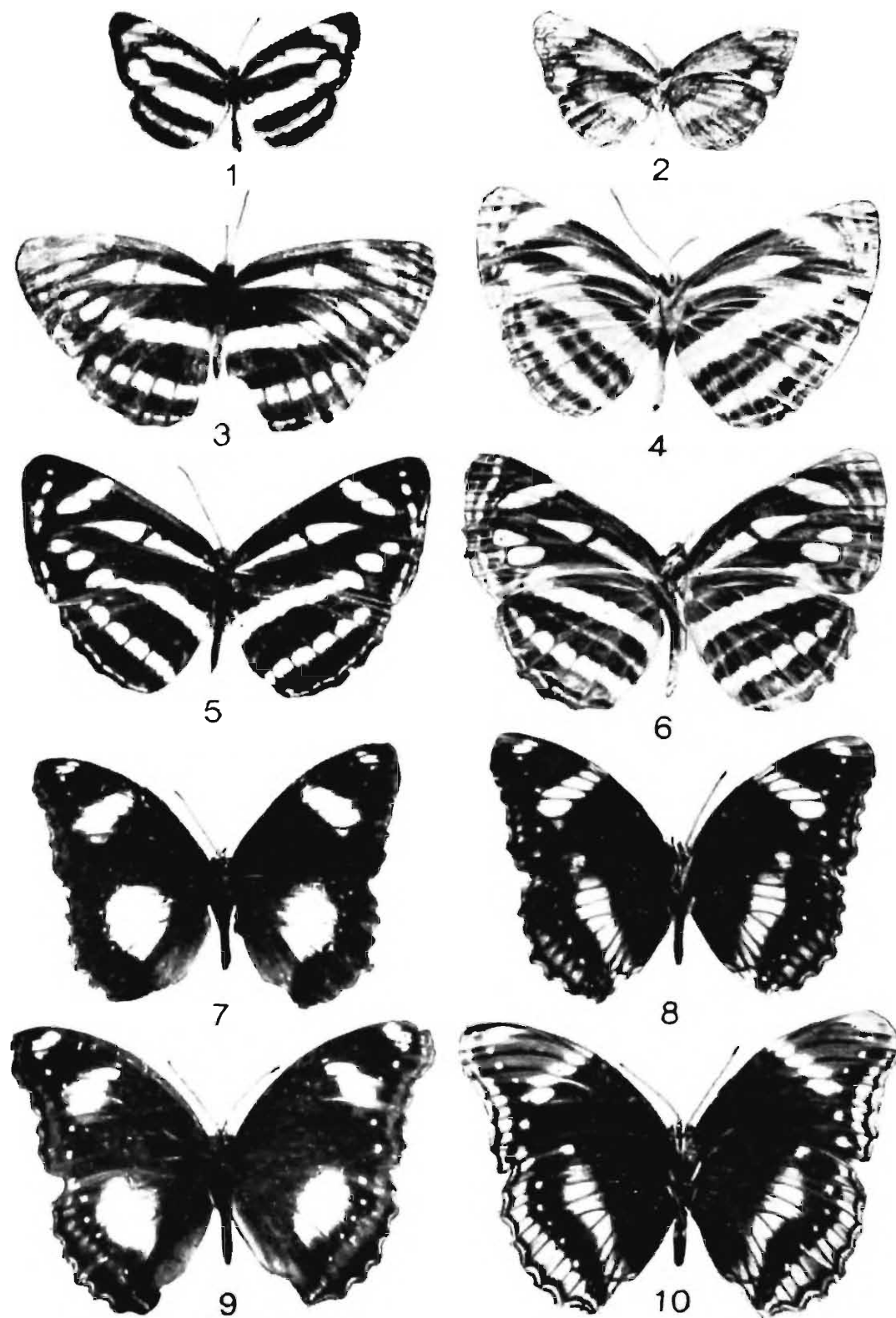


Fig. 1-2 : *Pantaporia hardonia hardonia* (Stoll.) [1, upper side ; 2, under side]
Fig. 3-4 : *Neptis mahendra* Moore [3, upper side ; 4, under side] Fig. 5-6 : *Neptis hylas astola* Moore [5, upper side ; 6, under side] Fig. 7-8 : *Hypolimnias bolina* (Linn.) [male : 7, upper side ; 8, under side] Fig. 9-10 : *Hypolimnias misippus* (Linn.) [male : 9, upper side ; 10, under side].

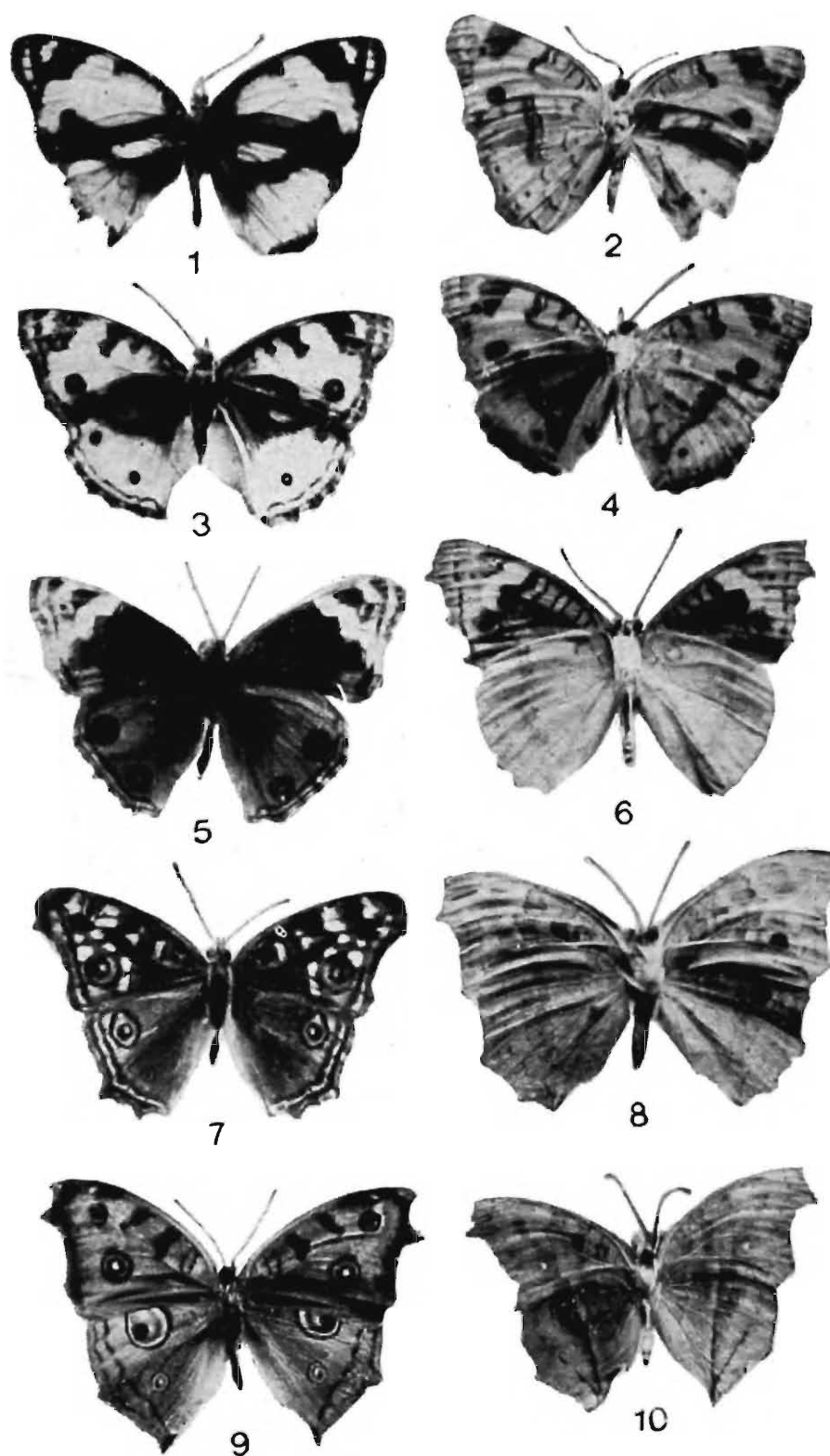


Fig. 1-4 : *Precis hierta* (Fabr.) [male : 1, upper side ; 2, under side] [female : 3, upper side ; 4, under side]
Fig. 5-6 : *Precis orithya swinhoei* (Butler) [5, upper side ; 6, under side] Fig. 7-8 : *Precis lemonias* Linn.
[7, upper side ; 8, under side] Fig. 9-10 : *Precis almana* (Linn.) [9, upper side ; 10, under side].

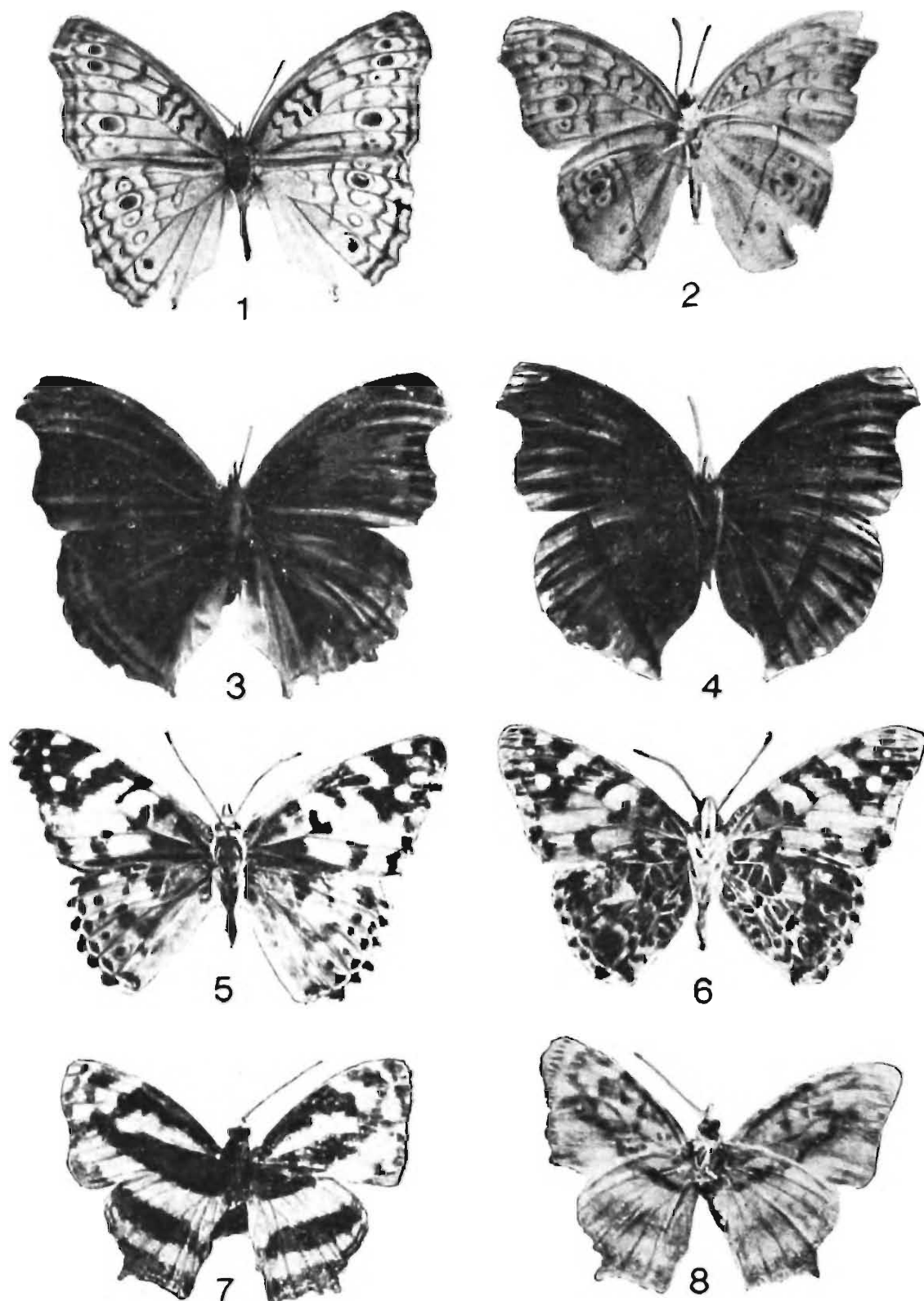


Fig. 1-2 : *Precis atlites* (Johanssen) [1, upper side ; 2, under side] Fig. 3-4 : *Precis iphita* (Cramer) [3. upper side ; 4, under side] Fig. 5-6 : *Cynthia cardui* (Linn.) [5, upper side ; 6, under side]
Fig. 7-8 : *Symbrenthia hippoclus* (Cramer) [7 upper side ; 8, under side].

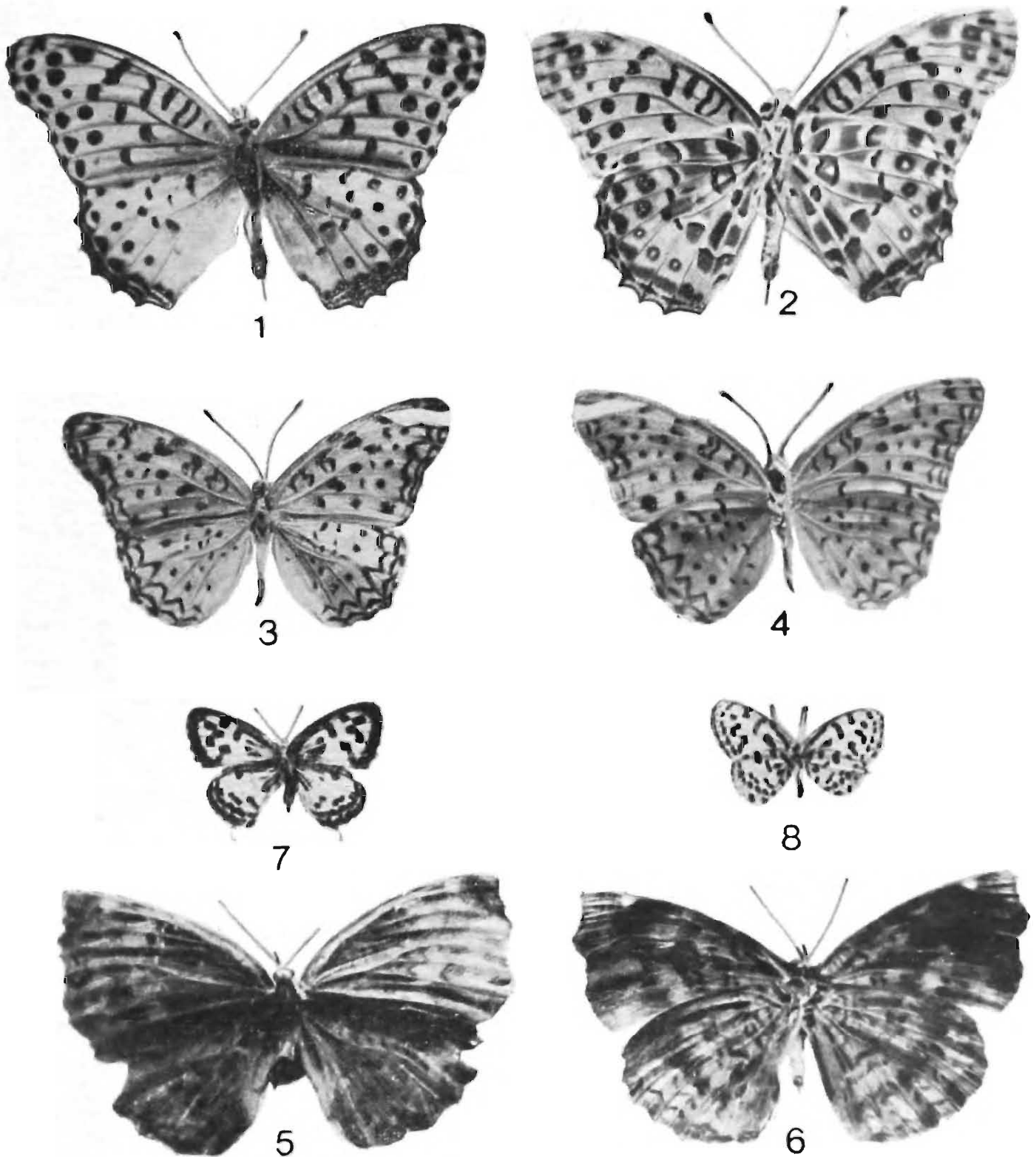


Fig. 1-2 : *Argyreus hyperbius hyperbius* (Johanssen) [1, upper side ; 2, under side] Fig. 3-4 : *Phalanta phalantha* (Drury) [3, upper side ; 4, under side] Fig. 5-6 : *Ariadne merione* (Cramer) [5, upper side ; 6, under side] Fig. 7-8 : *Castalius rosimon* (Fabr.) [7, upper side ; 8, under side].

***Loxura atymnus continentalis* Fruhstorfer**
The Yamfly

1911. *Loxura atymnus continentalis*, Fruhstorfer, *Berl. Ent. Ztsehr.*, 56 : 221.

Material examined : Haridwar Dist. : Beribara, 1 ♂, 9.xi.90 (P. C. Tak coll.).
Pauri Dist. : Chilla, 1 ♂, 9.viii.91 (P. C. Tak coll.).

Wing expanse : 34 mm.

Distribution : Madhya Pradesh to Himalaya (Mussoorie). Also Myanmar.

Remarks : The species is not very common in the Park, orange in colour above, with broad black apex in fore wing, narrowing to the termen ; hind wing with narrow border. Underside pale ochreous, the basal spots, discal and submarginal bands paler. The hind wing tailed, the tail being white tipped.

Status : Common.

***Spindasis lohita himalayanus* Moore**
The Long Banded Silverline

1884. *Aphnaeus himalayanus* Moore, *J. Asiat. Soc. Beng.*, 53 (2) : 26.

Material examined : Dehradun Dist. : Satyanarayan, 1 ♀, 12.viii.90.

Wing expanse : 28 mm.

Distribution : India : U. P (Mussoorie) ; West Bengal ; Assam ; Arunachal Pradesh. Also Myanmar.

Remarks : The species is not very common in the Park, and is recorded by Piele (1937) from Dun in August, low valleys bellow Mussoorie from July to September and Kumaun. The present material is collected in the month of July.

Status : Common.

Family : HESPERIIDAE

The members of this family are "Moth-like" and are very strong and stoutly built butterflies. The species are characterised by all the legs being perfect in both sexes; antennae, unlike all butterflies, are placed wide apart, with the club either thick, or the antennae taper to a point, or these end in a curved hook. The head is quite broad, with the eyes very prominent.

As already mentioned, the family is very poorly represented from the Park in the present account, though in nature it may not be so.

The species, popularly known as "Skippers", are very fast fliers, the flight swift and darting. In fact, it becomes difficult to follow their flight.

Four species are being recorded here from the Park under four different genera, as follows.

Caprona ransonnetti (Felder)
The Golden Angle

1868. *Pterygaspidea ransonnetti* Felder, *Verh. zool. bot. Ges. Wien.* : 284.

Material examined : Haridwar Dist. : Beribara, 1 ♂, 9.xi.90 (*P. C. Tak* coll.). Pauri Dist. : Chilla, 1 ♂, 2.viii.91 (*P. C. Tak* coll.), 1 ♂, 1 ♀, 23.viii.91; Kunnao, 2 ♂ ♂, 23.viii.91 (*A Kumar* coll.).

Distribution : Southern India ; Madhya Pradesh ; Punjab to U. P. (Kumaon) ; and Assam. Also Myanmar and Sri Lanka.

Wing expanse : 37 mm.

Remarks : Not very common in the Park, the material is referable to *ransonnetti potiphera* Hewitson, and falls within the recorded expanse of the species. Referable to the subfamily Celaenorrhinae, the species is characterised by the presence of semi-transparent white spots on wings.

Status : Common in Park.

Oriens gola (Moore)
The Common Dartlet

1877. *Padraona gola* Moore, *Proc. zool. Soc. Lond.* : pl. LViii, fig. 9.

Material examined : Haridwar Dist. ; Beribara, 2 ♂♂, 9.xi.90 (*P. C. Tak* coll.).

Wing expanse : 24 mm.

Distribution : Southern India ; U. P. (Kumaon) ; Sikkim to Assam ; and Myanmar.

Remarks : Referable to the subfamily Erynninae, the species' wings have tawny yellow markings and is generally available in areas of heavy rainfall. The species is fond of visiting flowers, but generally flies closer to the ground, amongst the undergrowth.

Status : Common.

Parnara guttatus (Bremer & Gray)
The Straight Swift

1853. *Eudamus guttatus* Bremer & Gray, *Schmett.* : 10.

Material examined : Haridwar Dist. : Ranipur, 1 ♀, 30.viii.90.

Wing expanse : 33 mm.

Distribution : Pakistan (Chitral) to India (U. P. ; Assam) and Myanmar.

Remarks : Referable to the subfamily Baorinae, the species are powerful fliers. The species are characterised by the antennae being very short, about less than half the length of the fore wing costa.

Status : Common.

Udaspes folus (Cramer)
The Grass Demon

1779. *Papilio folus* Cramer, *Pap. Exot.*, 1 : pl. 74, fig. 7.

Material examined : Haridwar Dist. : Ranipur, 1 ♀, 30.viii.90.

Wing expanse : 38 mm.

Distribution : India : Maharashtra ; Madhya Pradesh ; Gujarat and Himachal Pradesh (Kangra) to Assam. Also Sri Lanka and Myanmar.

Remarks : Referable to the subfamily Notocryptinae, the species is fond of visiting flowers and wet places.

Status : Not rare.

SUMMARY

The account of the Fauna of Rajaji National Park (U. P.), based on the material collected by the author, or other scientists (mentioned as collectors) at ZSI, Northern Regional Station, Dehradun, deals with sixty eight species in fifty genera and 8 families of butterflies from three districts, viz., Dehradun, Haridwar and Pauri. The account brings to light several findings of zoological as well as ecological interest, particularly when the collections have been made during pre-monsoon, monsoon and post-monsoon periods. Particular mention may be made of the presence of all the six species of the genus *Precls* (Nymphalidae), all the female forms of *Papilio polytes* (Papilionidae), and the collection in the monsoon period of *Phalanta phalantha*, which was hitherto not known to occur, or collected, in monsoon period. The extent of material examined shows that the collections have been made almost throughout the year. Besides, the study brings to light several new records of the expanse of wings, particularly on the minimum side, and new altitudinal records.

The account is the first-ever from the Conservation Areas of Rajaji National Park, from where the butterflies have never been studied.

ACKNOWLEDGEMENTS

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Last but not least, thanks are due also to my colleagues at ZSI, NRS, Dehradun, who very willingly, and sometimes at a short notice, participated to undertake these tours. Particular mention may be made of Dr. N. K. Sinha, Dr. P. C. Tak, Shri S. K. Gupta, Dr. P. Ray, Shri Sikander Lal and Shri S. S. L. Verma.

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A P P E N D I X

I. SUMMARY OF THE COLLECTIONS FROM RAJAJI NATIONAL PARK

Name of the species	*Rajaji Sanctuary (with no more data)	Dehradun	Haridwar	Pauri
I. Papilionidae				
<i>Papilio polytes romulus</i> (Cramer)	—	+	+	+
<i>Papilio demoleus demoleus</i> (Linn.)	—	+	+	+
<i>Graphium nomius nomius</i> (Esper)	—	+	+	—
II. Pieridae				
<i>Leptosia nina nina</i> (Fabr.)	—	+	+	+
<i>Aporia agathon caphusa</i> (Moore)	—	+	—	—
<i>Delias eucharis</i> (Drury)	—	+	+	—
<i>Cepora nerissa phryne</i> (Fabr.)	—	+	+	+
<i>Appias libythea libythea</i> (Fabr.)	—	—	—	+
<i>Anapheis aurota aurota</i> (Fabr.)	—	+	—	—
<i>Artogeia canidia indica</i> (Evans)	—	+	+	—
<i>Valeria valeria hippia</i> (Fabr.)	—	+	+	+
<i>Catopsilia crocale crocale</i> (Cramer)	—	+	+	+
<i>Catopsilia pyranthe pyranthe</i> (Linn.)	—	+	+	+

<i>Eurema brigitta rubella</i> (Wallace)	+	—	—	—
<i>Eurema laeta laeta</i> (Boisduval)	—	+	—	—
<i>Eurema hecabe fimbriata</i> (Wallace)	—	+	+	+
<i>Colias erate erate</i> (Esper)	—	+	—	—
<i>Colias electo fieldi</i> (Menetries)	—	+	—	—
III. Danaidae				
<i>Danaus chrysippus</i> (Linn.)	—	+	+	+
<i>Danaus genutia</i> (Cramer)	—	+	+	+
<i>Tirumala limniace</i> <i>leopardus</i> (Butler)	—	+	+	+
<i>Parantica aglea melanoides</i> (Moore)	—	+	+	—
<i>Caduga sita sita</i> (Kollar)	—	+	—	—
<i>Euploea core core</i> (Cramer)	—	+	+	+
IV. Satyridae				
<i>Mycalesis perseus blasius</i> (Fabr.)	—	+	+	—
<i>Mycalesis mineus mineus</i> (Linn.)	—	—	+	+
<i>Erebia hyagriva</i> (Moore)	—	+	—	—
<i>Ypthima ceylonica huebneri</i> Kirby	—	+	+	+
<i>Ypthima ceylonica kasmira</i> Moore	—	+	+	—
<i>Ypthima lisandra avanta</i> Moore	—	+	—	—
<i>Ypthima baldus baldus</i> (Fabr.)	—	+	+	—
<i>Melanitis leda ismene</i> (Cramer)	—	+	+	—
<i>Elymnias hypermnestra undularis</i> (Drury)	—	+	+	—
V. Acraeidae				
<i>Acraea violae</i> (Fabr.)	—	—	+	—
VI. Nymphalidae				
<i>Moduza procris procris</i> (Cramer)	—	—	+	—

<i>Athyma'perius</i> (Linn.)	+	—	—	—
<i>Pantoporia hordonia hordonia</i> (Stoll.)	—	+	+	—
<i>Neptis mahendra</i> Moore	—	+	+	—
<i>Neptis hylas astola</i> Moore	—	+	+	+
<i>Neptis yerburyi</i> (Butler)	—	+	+	—
<i>Cyrestis thyodamas ganescha</i> (Kollar)	—	+	—	—
<i>Hypolimnas bolina</i> (Linn.)	—	+	+	+
<i>Hypolimnas misippus</i> (Linn.)	—	—	+	—
<i>Kallima inachus</i> (Boisduval)	—	+	+	—
<i>Precis hierta</i> (Fabr.)	—	+	+	+
<i>Precis orithya swinhoei</i> (Butler)	—	+	+	+
<i>Precis lemonias persicaria</i> Fruh.	—	+	+	+
<i>Precis almana</i> (Linn.)	—	+	+	+
<i>Precis atlites</i> (Linn.)	—	+	+	+
<i>Precis iphita</i> (Cramer)	—	+	+	—
<i>Cynthia cardui</i> (Linn.)	—	+	—	—
<i>Vanessa indica</i> (Herbst)	—	+	—	—
<i>Symbrenthia hippoclus</i> (Cramer)	—	+	+	—
<i>Argyreus hyperbius hyperbius</i> (Johan.)	—	+	+	—
<i>Phalanta phalantha</i> (Drury)	—	+	+	+
<i>Ariadne merione</i> (Cramer)	—	+	+	+

VII. Lycaenidae

<i>Castalius rosimon</i> (Fabr.)	—	—	+	+
<i>Tarucus extricatus</i> Butler	—	—	—	+
<i>Chilades laius</i> (Cramer)	—	+	—	—
<i>Zizeeria maha</i> (Kollar)	—	+	—	+
<i>Lampides boeticus</i> (Linn.)	—	—	+	—
<i>Curetis dentata</i> Moore	+	—	—	—
<i>Loxura atymnus continentalis</i> (Fruh.)	—	—	+	+

Spindasis lohita himalayanus

Moore

—

+

—

—

VIII. **Hesperiidae***Caprona ransonnetti* (Felder)

—

—

+

+

Oriens gola (Moore)

—

—

+

—

Parnara guttatus Brem.

—

—

+

—

Udaspes folus (Cramer)

—

—

+

—

II. FAMILY-WISE SUMMARY

Family	Total No. (species)	*Rajaji Sanctuary	Dehra- dun	Haridwar	Pauri	Exs.
I. Papilionidae	3	—	3	3	2	151
II. Pieridae	15	1	13	8	7	314
III. Danaidae	6	—	6	5	4	135
IV. Satyridae	9	—	8	7	2	71
V. Acraeidae	1	—	—	1	—	2
VI. Nymphalidae	22	1	19	18	9	248
VII. Lycaenidae	8	1	3	3	4	27
VIII. Hesperiidae	4	—	—	4	1	10
	68	3	52	49	29	958

(*The collectors have not specified other details like districts or particular locality etc. and have just mentioned "Rajaji Sanctuary").

HYMENOPTERA (INSECTA)

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INTRODUCTION

The present study is based on the material (128 exs.) of Hymenoptera, particularly of families Tiphidae and Scoliidae collected by the author and other scientists of the Northern Regional Station, Zoological Survey of India, Dehradun. The collections were made from seven localities in Rajaji National Park, Uttar Pradesh, India, during the years 1987 and 1990.

Bingham (1897) in his *Fauna of British India* for the first time gave a consolidated account of the families Tiphidae and Scoliidae from India. Betrem (1928) treated the Indian Scoliidae in his pioneering monograph of the Indo-Australian members of the family. Allen (1975) published a monograph of the genus *Tiphia* Fabricius from Indian-Subcontinent. Recently Krombein (1975, 1982) published monographs on the Biosystematics of the families Scoliidae and Tiphidae from Sri Lanka.

The members of these families are usually ectoparasitoids of coleopteren larvae, mainly Scarabaeidae which are agricultural pests.

SYSTEMATIC ACCOUNT

Family : TIPHIIDAE

Subfamily : MYZININAE

1. *Mesa petiolata* (Smith)

1855. *Myzine petiolata* Smith, *Cat. Hym. British Mus.*, 3 : 72, Male.
Type-locality : India.

Material examined : Pauri Dist. : Chilla Forest, 1 ♀, 1 ♂, 11-12.vi.1987 (N. K. Sinha & S. K. Gupta coll.); Haridwar Dist. : Ranipur, 1 ♀, 3 ♂, 15.ix.1987 (Raj Tilak & S. K. Gupta coll.).

Distribution : Previous records : India : Bihar ; West Bengal ; Maharashtra ; Pondicherry ; Kerala. Sri Lanka. This is a new record for Uttar Pradesh.

2. *Mesa claripennis* (Bingham)

1897. *Myzine claripennis* Bingham, *Fauna British India Hym.*, 1 : 68, Female.
Type-locality : Burma.

Material examined : Dehradun Dist. : Phandowala, 2 ♀, 18-19.v.1987 (N. K. Sinha & S. K. Gupta coll.); Haridwar Dist. : Ranipur, 1 ♀, 15.ix.1987 ; Saharanpur Dist. : Mohand, 2 ♂, 18.ix.1987 (Raj Tilak & S. K. Gupta coll.).

Distribution : Previous records : India : Bihar ; Gujarat ; Tamil Nadu. Burma and Sri Lanka. This is a new record for Uttar Pradesh.

Subfamily : TIPHIINAE

3. *Tiphia coimbatorea* Allen

1975. *Tiphia (Tiphia) coimbatorea* Allen, *U. S. Dept. Agr., Tech. Bull.* No. 1509 : 14, Male.
Type-locality : India : Coimbatore.

Material examined : Haridwar Dist. : Ranipur, 1 ♂, 16.ix.1987 (Raj Tilak & S. K. Gupta coll.).

Distribution : Previous records : India : Tamil Nadu. Sri Lanka. This is a first record from North India.

4. *Tiphia tequilita* Allen

1975. *Tiphia (Tiphia) tequilita* Allen, *U. S. Dept. Agr., Tech. Bull.* No. 1509 : 16-17. Male.
Type-locality : Godavari (Kathmandu, Nepal).

Material examined : Haridwar Dist. : Ranipur, 1 ♂, 16.ix.1987 (Raj Tilak & S. K. Gupta coll.).

Distribution Previous records : Meghalaya ; Tamil Nadu. Nepal and Sri Lanka. This is the first record from Uttar Pradesh.

5. *Tiphia decrescens* Walker

1859. *Tiphia decrescens* Walker, *Ann. Mag. Nat. Hist.*, (3) 4 : 376. Male.

Type-locality : Ceylon.

Material examined : Saharanpur Dist. : Mohand, 1 ♂, 17.ix.1987 ; Dehradun Dist. : Satyanarain Forest. 1 ♂, 13.ix.1987 (*Raj Tilak & S. K. Gupta* coll.).

Distribution : Previous records : India : Gujarat ; Tamil Nadu. Sri Lanka. This is the first record from Uttar Pradesh.

6. *Tiphia palmi* Krombein

1855. *Tiphia rufipes* Smith, *Cat. Hym. British Mus.*, 3 : 83, Female.

Type-locality. Northern India.

1938. *Tiphia Palmi* Krombein, *Ent. News*, 49 : 187 (new name for *Tiphia rufipes* Smith)

Material examined : Dehradun Dist. : Motichur 9 ♀, 25 ♂, 12.vii.1990 (*G. S. Arora & S. K. Gupta* coll.).

Distribution : Previous records : India : Northern India. Sri Lanka. This is the first record from Uttar Pradesh.

Family : SCOLIIDAE
Subfamily : SCOLIINAE

7. *Micromeriella marginella marginella* (Klug)

1810. *Scolia marginella* Klug, *Beitr. Natur.*, 2 : 214, Male.

Type-locality : India.

Material examined : Dehradun Dist. : Motichur, 1 ♂, 12.ix.1987 (*Raj Tilak & S. K. Gupta* coll.).

Distribution : This taxon is distributed throughout the Indian-subcontinent and has been reported from Thailand also.

8. *Campsomeriella collaris collaris* (Fabricius)

1775. *Tiphia collaris* Fabricius, *Syst. Ent.* : 354, Female.

Type-locality : Indla : Coast of Malabar.

Material examined : Pauri Dist. : Chilla, 5 ♂, 18.vi.1987 (*N. K. Sinha & S. K. Gupta* coll.), 4 ♂, 11.ix.1987 ; Dehradun Dist. : Motichur, 2 ♂, 14.ix.1987 ; Haridwar Dist. : Ranipur, 13 ♂, 15-16.ix.1987. Saharanpur Dist. : Mohand, 4 ♂, 17.ix.1987 (*Raj Tilak & S. K. Gupta* coll.).

Distribution : This is one of the most common and abundantly occurring scoliids in all the ecosystems and in areas of scanty to very heavy rainfall of Indian-subcontinent.

9. *Campsomeriella annulata* (Fabricius)

1793. *Tiphia annulata* Fabricius, *Ent. Syst.*, 2, 225 : Female.

Type-locality : China.

Material examined : Pauri Dist. : Chilla, 1 ♀, 8 ♂, 11-12.ix.1987 ; Saharanpur Dist. : Mohand, 1 ♀, 17.ix.1987 (*Raj Tilak & S. K. Gupta* coll.).

Distribution : This species is widely distributed in the Himalayan ranges of Northern India and ranges eastwards to Sulawesi through Burma and Southeast Asia. It also occurs in China, Taiwan and Japan.

Remarks : This species is reported to parasitise *Papilio* spp. and *Anomala* sp. and has been introduced in U. S. A. for the control of Japanese beetles.

10. *Phalerimeris phalerata phalerata* (Saussure)

1858. *Elis (Campsomeris) phalerata* Saussure, *Ann. Soc. Ent. Franco*, (3) 6 : 233, Female.

Type-locality : Java.

Material examined : Pauri Dist. : Chilla, 3 ♂, 12.ix.1987 ; Haridwar Dist. : Ranipur, 1 ♀, 15.ix.1987 ; Saharanpur Dist. : Mohand, 1 ♂, 18.ix.1987 (*Raj Tilak & S. K. Gupta* coll.).

Distribution : This taxon is widely distributed in Northern India and ranges

eastwards to Sulawesi through Thailand and Southeast Asia. It also occurs in China, Taiwan and Philippines.

11. *Scolia affinis* Guérin

1838. *Scolia affinis* Guérin, *Voy. Cog.* : 254, Female, Male.

Type-locality : India.

Material examined : Pauri Dist. : Chilla, 5 ♂, 11-12.ix.1987 ; Dehradun Dist. : Motichur, 4 ♂, 14.ix.1987 ; Saharanpur Dist. ; Mohand, 1 ♀, 3 ♂, 17-18.ix.1987 (*Raj Tilak & S. K. Gupta coll.*).

Distribution : This is one of the most common and abundantly occurring scoliids of the Indian subcontinent. It also occurs in Southeast Asia.

12. *Scolia binotata binotata* Fabricius

1804. *Scolia binotata* Fabricius, *Syst. Piez.* : 244, Male.

Type-locality : India : Tamil Nadu, Tranquebar.

Material examined : Pauri Dist. : Chilla, 5 ♂, 11-12.ix.1987, Laldhang, 1 ♂, 10.ix.1987 ; Dehradun Dist. : Motichur, 4 ♂, 14.ix.1987 ; Saharanpur Dist. : Mohand. 12 ♂, 17-18.ix.1987, Ranipur, 1 ♂, 16.ix.1987 (*Raj Tilak & S. K. Gupta coll.*).

Distribution : Throughout the Indian-subcontinent.

13. *Scolia cruenta* Klug

1805. *Scolia analis* Klug, *Beitr. Natur.*, 1 : 36. Female.

Type-locality : India : Maharashtra, Pune.

1810. *Scolia cruenta* Klug, *Beitr. Natur.*, 2 : 168 (new name for *Scolia analis* Klug, 1805).

Material examined : Pauri Dist. : Chilla, 2 ♂, 11-12.ix.1987 ; Saharanpur Dist. : Mohand, 1 ♀, 17.ix.1987 (*Raj Tilak & S. K. Gupta coll.*).

Distribution : The species is also known from southern India.

14. *Scolia dunensis* Betrem

1928. *Scolia dunensis* Betrem, *Treubia*, 9 (suppl.) : Male.

Type-locality : India : Uttar Pradesh, Dehradun.

Material examined : Pauri Dist. : Chilla, 1 ♂, 12.ix.1987 (Raj Tilak & S. K. Gupta coll.).

Distribution : This taxon is hitherto known from Dehradun only.

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SUMMARY

Fourteen species of Hymenoptera of the families Tiphidae and Scoliidae, belonging to three subfamilies, viz., Myzininae, Tiphinae and Scoliinae, spread over six genera are reported here from Rajaji National Park, Uttar Pradesh, India. Out of these, six species viz., *Mesa petiolata*, *M. claripennis*, *Triphia coimbatorea*, *T. tequilita*, *T. decrescens* and *T. palmi* are new records for Uttar Pradesh.

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CHILOPODA : SCOLOPENDRIDAE

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INTRODUCTION

The Scolopendrid centipede fauna has, of late, received a little attention. Khanna and Kumar (1984) published an account of the centipedes collected from Western Himalaya, U. P.; Khanna and Tripathi (1985b and 1986) from Himachal Pradesh and Khanna and Tripathi (1985a and 1987) from U. P. Terai and Haryana State, respectively. In yet another paper Khanna (in press) listed the species collected from Corbett National Park, U. P. Besides this, Jangi and Dass (1984) have listed and described some species from Deccan States, India but much remains yet to be known about the faunistics of the group.

Khanna (1987) has revised and updated the check-list of the Indian scolopendrid centipedes provided earlier by Khanna and Kumar (l. c.).

Of the 86 species (including subspecies) reported in the check-list, 24 species belonging to five genera occur in Uttar Pradesh. Of these, 7 species belonging to four genera, as collected from Rajaji National Park, during the extensive surveys of the Park, are reported here.

SYSTEMATIC ACCOUNT

Family : SCOLOPENDRIDAE
Subfamily : SCOLOPENDRINAE
Tribe 1 : SCOLOPENDRINI

1. *Scolopendra morsitans* Linnaeus

1758. *S. morsitans*, Linnaeus, *Syst. nat.*, 10th Ed. : 638.

Material examined : Saharanpur : Dholkhand, 26.iv.1973, 1 ex., Raj Tilak coll. (Reg. No. NRS-A-4169) ; Beribara and around, 17.xii.1986, 2 exs., R. N. Chopra coll. ; 8.xii.1986, 1 ex., J. C. Tripathi coll. ; Dholkhand, 5.v.1987, 3 exs., A. K. Tyagi coll. ; Mohund, 18.vii.1986, 1 ex., J. C. Tripathi coll. ; Dehradun, Motichur, 5.iii.1986, 1 ex., J. C. Tripathi coll. ; Kansaro, 2.xi.1987, 1 ex., R. N. Chopra coll. ; Pauri, Chilla Forest, 11.vi.1987, 1 ex., N. K. Sinha coll. ; 4.vi.1987, 1 ex., Raj Tilak coll.

Scolopendra morsitans Linn. is a cosmopolitan species occurring throughout the year in all types of ecological habitats in various colour forms, sizes and stages of development. Khanna (1987) has redescribed the species on the basis of the material collected from Western Himalaya, U. P.

2. *Cormocephalus dentipes* Pocock

1891. *C. dentipes* Pocock, *Ann. nat. Hist. Ser.*, 6/7 : 66.

Material examined : Saharanpur : Mohund ; Gaj Rao, 15.ii.1972, 3 exs., R. N. Chopra coll. ; 16.ii.1972, 5 exs., R. N. Chopra coll. ; 18.viii.1986, 4 exs., J. C. Tripathi coll. ; Dholkhand, 15.ii.1972, 1 ex., R. N. Chopra coll. ; 5.v.1987, 16 exs., A. K. Tyagi coll. ; 7.v.1987, 1 ex., R. N. Chopra coll. ; 27.x.1986, 1 ex., N. K. Sinha coll. ; Ranipur, 20.xi.1986, 1 ex., J. C. Tripathi coll. ; 16.ix.1987, 1 ex., Raj Tilak coll. ; Beribara, 17.xii.1986, 2 ex., R. N. Chopra coll. ; Dehradun : Motichur, 22.xi.1972, 6 exs., R. N. Chopra coll. ; 5.iii.1986, 70 exs., J. C. Tripathi coll. ; 35 exs., J. C. Tripathi coll. ; 29.i.1988, 2 exs., J. C. Tripathi coll. ; Lachiwala, 21.iii.1986, 1 ex., Vinod Khanna coll. ; Kansaro, 13.i.1987, 7 exs., N. K. Sinha coll. ; Phandowala, 20.v.1987, 2 exs., R. N. Chopra coll. ; Asarori, 21.ii.1969, 1 ex., M. K. Biswas coll. ; Pauri : Chilla Forest, 21.ii.1986, 8 exs., Raj Tilak coll. ; 5.vi.1987, 11 exs., R. N. Chopra coll. ; 11.vi.1987, 4 exs., N. K. Sinha coll. ; 2.vi.1987, J. C. Tripathi coll. ; 4.vi.1987, 1 ex., Raj Tilak coll.

The species *Cormocephalus dentipes* first reported by Gravely (1910) from Parasnath (Bihar), has now started gaining the status of a widely distributed species, in India, as follows :

Parasnath (Bihar), Punkhabari, Darjeeling (West Bengal) ; Delhi ; Port Blair (Andaman and Nicobar Islands) ; Dehradun, Pauri, Uttarkashi, Nainital, Pithoragarh, Saharanpur, Lakhimpur Kheri, Pilibhit (Uttar Pradesh) ; Balaghat (Madhya Pradesh) ; Koenjhargarh and Phulbani (Orissa).

Jangi and Dass (1984) described the species *Cormocephalus pseudonudipes* from

Andhra Pradesh, Tamil Nadu and Maharashtra (Type locality : Nasik). It, on the basis of the characters enumerated, is found to tally in all respects with *C. dentipes* Pocock. Khanna (in press) has discussed the characters of both the species in detail and proposed placing *pseudonudipes* as junior synonym of *C. dentipes*.

Tribe 2 : ASANADINI

3. *Asanada indica* Jangi and Dass

1984. *A. indica*, Jangi and Dass, *J. Scient. Indl. Res.*, 43 : 38.

Material examined : Dehradun : Motichur, 21.iii.1986, 1 ex., J. C. Tripathi coll. ; Saharanpur : Ranipur, 16.ix.1987, 1 ex., Raj Tilak coll.

Described originally by Jangi and Dass (1984) from a single specimen collected from Urlikanchan, Pune (Maharashtra), *Asanada indica* has been redescribed by Khanna (1987) from the material collected from Motichur, Rajaji National Park, adding some additional characters of taxonomic importance. This is the first record of the genus and the species from Uttar Pradesh. However, it is also reported from Palghat (Kerala); Aurangabad, Bir, Nagpur, Parbhani and Pune (Maharashtra). Khanna (unpublished record) has also collected the species from Dudhwa National Park, Dist. Lakhimpur Kheri, U. P.

Subfamily : OTOSTIGMINAE

Tribe 3 : OTOSTIGMINI

4. *Rhysida monalii* Khanna and Kumar

1984. *R. monalii*, Khanna and Kumar, *Uttar Pradesh J. zool.*, 4 (1) : 93.

Material examined : Saharanpur : Dholkhand Forests, 15.xi.1972, 1 ex., R. N. Chopra coll. ; 7.v.1987, 1 ex., R. N. Chopra coll. ; 5.v.1987, 4 exs., A. K. Tyagi coll. ; Mohund, 22.ii.1972, 1 ex., R. N. Chopra coll. ; Dehradun : Kansaro, 22.1.1987, 1 ex., R. N. Chopra coll.

Rhysida monalii Khanna and Kumar is a widely distributed species, occurring in Western Himalaya, U. P., Himachal Pradesh & Jammu and Kashmir, reported from Almora, Nainital, Pithoragarh, Chamoli, Dehradun, Pauri, Tehri, Uttarkashi

(U. P.); Sirmaur, Lakhanpur, Bilaspur and Mahansu (Himachal Pradesh) and Kathua (J. & K.).

5. *Rhysida longicarinulata* Khanna and Tripathi

1985. *R. longicarinulata*, Khanna and Tripathi, *Ann. Entom.*, 3 (1) : 19.

Material examined : Dehradun : Motichur, 25.vi.1974, 1 ex., J. C. Tripathi coll.

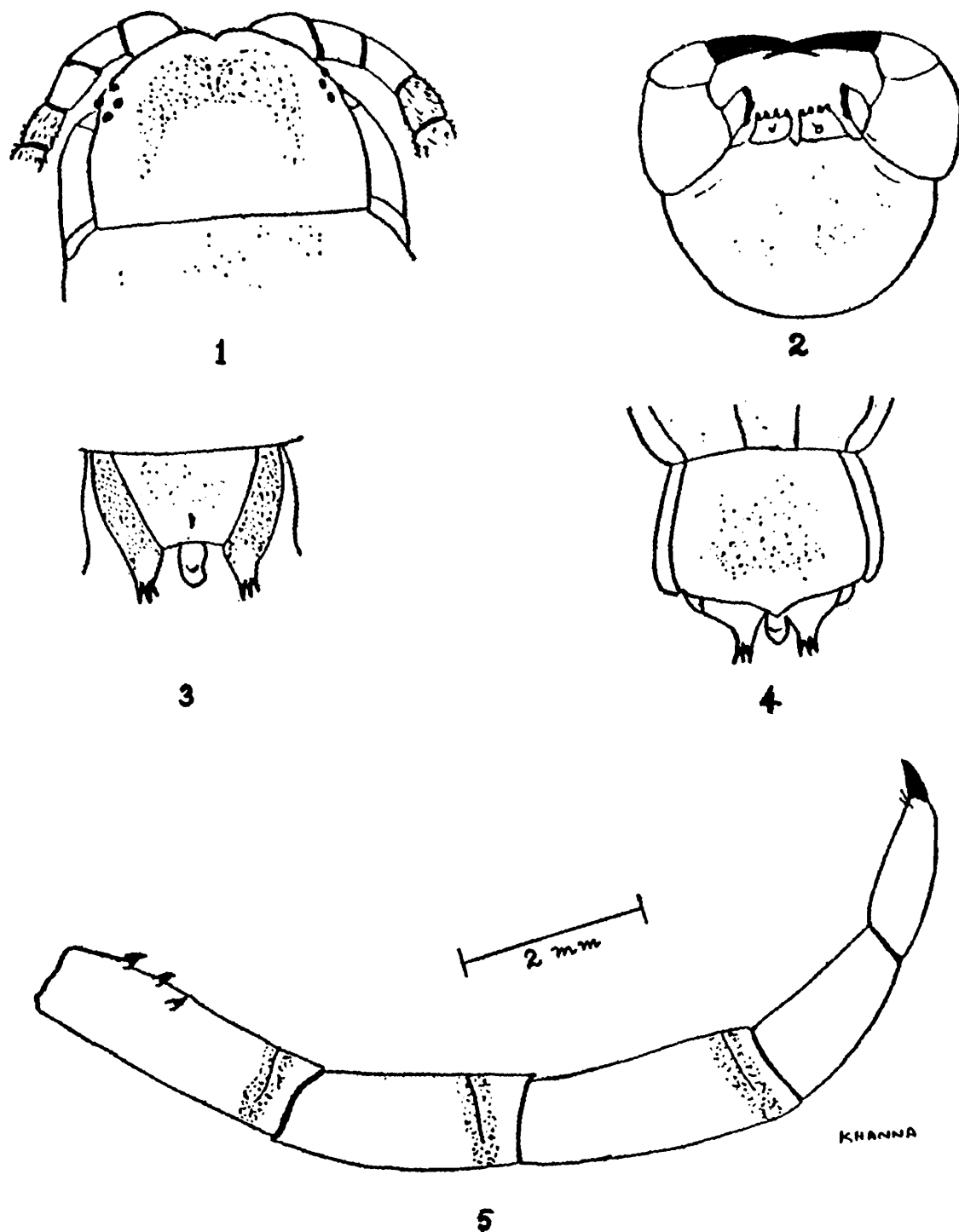
Previously collected and described by Khanna and Tripathi (1985 b) from Sirmaur (Himachal Pradesh) in the Shivalik ranges, it is reported here further south-east in the Shivaliks from Dehradun, which is also a first record of the species from Uttar Pradesh.

6. *Rhysida lithobioides shivalikensis* ssp. nov.

(Figs. 1-5)

Material examined : Uttar Pradesh : Dehradun : Motichur, 5.iii.1986, J. C. Tripathi coll., 1 ex., (Reg. No. NRS-A-4288, Holotype) ; Dhakrani, 9.ii.1978, V. Khanna coll., 1 ex. (Reg. No. NRS-A-4289, Paratype).

Description : *Body length* : 44 mm, including antennae and anal legs. *Colour* : Cephalic plate and antennae dark greenish brown ; tergites light brownish green in centre and brown on the lateral margins ; maxillipedes and sternites brownish yellow ; legs olive green (in specimen preserved in alcohol). *Antennae* : left 19 segmented, right 12 segmented (Broken) with its three basal segments glabrous ; when reflexed reaching to the end of 6th tergal segment ; *Head* : Cephalic plate smooth ; sparsely distributed very small puncts visible only anteriorly ; cephalic plate anteriorly with a small median notch (Fig. 1) ; *Tergites* : Colour of the first tergite as that of the head ; all tergal segments smooth and non-punctate ; 4-20 tergites with complete paramedian longitudinal furrows ; 21st tergite (Fig. 4) without any median sulcus but with its lateral margins slightly outwardly curved in the middle ; posterior margin sinuate ; lateral side emargination of tergites well represented in 19-21st segment, feeble on 17th and a bit more pronounced on 18th. *Sternites* : smooth ; paramedian longitudinal furrows not visible ; endsternite gradually tapering posteriorly ; longer than wide (Fig. 3). *Maxillipedes* : sparsely punctate base of the coxosternum without sulcus ; dental



Rhysida lithobioides shivalikensis s. sp. nov.

Fig. 1 : Head (dorsal view), Fig. 2 : Head (Ventral View), Fig. 3 : Endsternite, Fig. 4 : Endtergite, Fig. 5 : Anal leg showing the arrangement of spines on prefemur ; and transverse furrows on the prefemur, femur and tibial segments.

plate with 4+4 teeth, all separate ; a post dental spur present ; prefemoral process with tridentate margin (Fig. 2). *Coxopleura* : finely punctate process of the coxopleura at the apex with 3 spines each and without spine on the dorsal or lateral margins (Figs. 3 & 4). *Legs* : 1-16 pairs of walking legs with 2 spurs to the first tarsal segment ; 20th pair with one tarsal spur ; 1st pair of legs also with a femoral and a tibial spur present dorsally ; all legs with 2 spurs to the terminal claws. *Anal legs* : Prefemoral spinulation confined to the proximal half only with 1 dorso-medial, 1 ventro-medial and 2 ventro-lateral spines ; 'Eckdorn' absent ; a tranverse groove present ventrally on distal ends of the prefemur, femur and tibial segments ; 1st tarsal segment of the anal legs slightly longer than the 2nd tarsal segment (Fig. 5).

Remarks : *Rhysida lithobioides shivalikensis* ssp. nov. resembles *R. l. trispinosus* Jangi and Dass in many characters but differs from it in having 19 antennal segments (Vs. 21) sharing this character with *R. l. paucidens* ; possession of a tridentate process of coxosternum (Vs. quadridentate) ; emargination of tergites beginning on 19th segment (Vs. 18th segment). The subspecies also does not show any indication of presence of paramedian longitudinal furrows on the sternites (Vs. short paramedian longitudinal furrows). The posterior margin of the endtergite is sinuate as in *R. l. trispinosus* and also the new subspecies bears 3 spines at the apex of the process of the coxopleura.

In India *R. lithobioides* (Newport) is represented by 5 subspecies, viz., *R. l. paucidens* from Pondicherry ; *R. l. trispinosus* from Nasik, Pune, Ratnagiri (Maharashtra) ; Salem, Tirichirapalli (Tamil Nadu) ; *R. l. lithobioides* from U. P. Terai ; *R. l. shivalikensis* ssp. nov. from Rajaji National Park, U. P. and *R. l. kumaonensis* Khanna from Corbett National Park, U. P.

7. *Rhysida nuda immarginata* (Porath)

1876. *Branchiostoma immarginatum*, Porath, *Bih. Svenska K. vet. Akad.*, 4 (7) : 24.

Material examined : Dehradun : Asarori Forest, 24.ii.1969, 1 ex., M. K. Biswas coll. ; Motichur, 24.ix.1987, 1 ex., J. C. Tripathi coll. ; Haridwar : Dholkand, 5.v.1987, 1 ex., A. K. Tyagi coll.

The species is reported from Nainital, Chamoli, Lakhimpur Kheri, Haridwar and Dehradun (U. P.) ; Calcutta, Nareill (West Bengal) and Bangladesh.

SUMMARY

The present paper deals with the scolopendrid centipedes collected from Rajaji National Park, U. P. In all seven species have been collected, *Asanada indica* Jangi and Dass *Rhysida longicarimulata* Khanna and Tripathi have been recorded for the first time from Uttar Pradesh, whereas *R. lithobioides shivalikensis* is described here as a new subspecies. *Cormocephalus pseudonudipes* Jangi and Dass 1984 has been relegated as a junior synonym of *Cormocephalus dentipes* Pocock.

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SCORPIONS (SCORPIONES)

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INTRODUCTION

Rajaji National Park (Approx. 832 sq. km.) is situated in Shiwalic ranges of Himalaya in the state of Uttar Pradesh and lies between latitude 29°51'N-30° 15'N and longitude 77°52'E-78° 22'E. The forest is deciduous with Sal, *Shorea robusta* (75%) as the principal constituent. Sixteen species of scorpions (Arachnida : Scorpiones) of four families viz. Scorpionidae, Buthidae, Chaerilidae, Vaejovidae, have already been recorded from Uttar Pradesh (Tikader & Bastawade, 1983).

The present study is based on a collection of 43 exs. of scorpions from Rajaji National Park during 1974-88 by different survey parties of Zoological Survey of India, Dehradun from nine localities in three districts (viz. Pauri, Dehradun and Saharanpur).

Five species of scorpions (Family : Buthidae, Scorpionidae, Vaejovidae) are reported from Rajaji National Park.

Key to the identification of the Families

- | | | | |
|---|-----|-----|-----------|
| 1. Legs furnished with two pedal spurs | ... | ... | 2 |
| — Legs furnished with single pedal spur | ... | ... | 4 |
| 2. Dorsal arm of movable finger of chelicerae furnished with two, three or four minute teeth on inner margin, sternum triangular, 3rd and 4th pair of legs provided with tibial spurs, trichobothria-A type | | | |
| | ... | ... | Buthidae. |

- Dorsal arm of movable finger of chelicerae furnished with two or three minute teeth on inner margin, sternum pentagonal, 3rd & 4th pair of legs without tibial spurs, trichobothria-B ... 3
- 3. Anterior border of the coxa of 1st pair of legs expanded anteriorly and truncate, anterior margin of carapace straight, trichobothria-B, stigmata circular, two pair of lateral eyes ... Chaerilidae.
- Anterior border of the coxa of the first leg narrow in front, anterior margin of carapace deeply notched in front, trichobothria-C type, stigmata elongate, 3 pair of lateral eyes ... Vaejovidae.
- 4. Hands of pedipalp flat, tail weak, compressed, tarsi without lobate prominence ... Ischnuridae.
- Hands of pedipalp not flat, tail strong, compressed, distal lateral edge of legs produced into a lobate prominence overlapping the base of claw ... Scorpionidae.

Key to the sub-families of the family Buthidae

- 1. 3rd and 4th pair of legs always furnished with tibial spur ... Buthinae.
- 3rd and 4th pair of legs without tibial spur ... Centurinae.

Key to the genera of the sub-family Buthinae

- 1. Carapace with posterior median or lateral carinae, vesicle elongated provided with a strong triangular sub-ocular spine ... *Lychas*.
- Carapace without carinae, vesicle never provided with sub-ocular spine ... *Hemibuthus*.

Key to the sub-genera of the genus *Lychas*

- 1. db is proximal to et or est ... 2.
- db is distal to et ... *Distotrichus*.
- 2. db is placed proximal to et only ... *Alterotrichus*.
- db is proximal to est ... *Endotrichus*.

Key to the species of the sub-genus *Distotrichus*

- 1. Median eyes situated anteriorly in the ratio 1:2, pectines 16-17 ... *Nigristernis*.
- 2. Median eyes situated anteriorly in the ratio 1 : 2.5, pectines 12-13 ... *Gravelyi*.

3. Lateral carinae of carapace weak, sometimes not developed, pedipalp tarsus always furnished with non-linear granules, ventral surface of vesicle granular, provided with sub-ocular nodule *Mesobuthus*.
- Lateral carinae of carapace well developed, pedipalp tarsus furnished with a row of three to four granules just proximal to terminal tooth, ventral surface of vesicle smooth, never provided with a sub-ocular nodule *Androctonus*.

Key to the sub-families of the family Vaejovidae

Median rows of small denticles of inner edge of movable finger pedipalp furnished with large interior and lateral granules, movable finger of chelicera forked, ventral fangs sub-equal in length *Scorpiopsinae*.
(The only sub-family recorded from India)

Key to the genera of the sub-family Scorpiopsinae

1. Three pairs of lateral eyes *Scorpiops*.
- Two pairs of lateral eyes *Parascorpiops*.

Key to the sub-genus of the genus *Scorpiops*

1. External surface of patella provided with 22-26 trichobothries ; 5 eb, 2esb, 2em, 7-10 est and 5-7 et *Neoscorpiops*.
- External surface of patella provided with 17-20 trichobothries 2.
2. External surface of patella provided with not more than 17 trichobothries 5 eb, 2 esb, 2 em, 4 est, 4 et *Scorpiops*.
- External surface of patella provided with 18, 19, or 20 trichobothries ; 5eb, 2esb, 2em, 4-6est, 5-6et *Euscorpiops*.

Key to the species of the genera *Scorpiops*

1. Trichobothries Esb3 placed distal to Dt ; vesicle more than two and half times as long as aculeus ; pectines about two times longer than wide, ventral surface of patella bears 10-11 trichobothries *Montanus*.

- Trichobothries Esb3 placed proximal to Dt ; vesicles less than two and half times as long as aculeus ; pectines generally less than two times longer than wide, ventral surface of patella bears not more than 8 trichobothries ... *Rohtangensis*.
- 2. Angles between trichobothries est 1, 2, 3, on patella and esb 1, 2, 3, on manus acute and Esb2 on manus placed slightly distal from the base of manus, median situated anteriorly in the ratio 1:1.75 ; pectines 2.75 times longer than wide ... *Hardwickei*.
- Angles between trichobothries est 1, 2, 3, on patella and Esb 1, 2, 3, on manus wide and Esb2 on manus placed close to the base of manus ; median eyes situated in the ratio 1:1.90, pectines two times longer than wide ... *Insculptus*.

Key to the sub-genera of the genus *Heterometrus* of Scorpionidae

- I. Rostrolateral margin of carapace with distinct incision next to the posterior lateral eyes, manus of pedipalp longer than wide, smooth or very poorly granular on dorsal surface. Superciliary crest present but may be smooth or granular ... *Heterometrus*.
- II. Rostrolateral margin of carapace continuous, without incision next to the posterior lateral eyes, manus of pedipalp wider than long or as long as wide, granular and carinated on dorsal surface. Superciliary crest may or may not be present ... *Srilankamterus*.

Key to the species of the sub-genera *Heterometrus*

- 1. Body colour dark brown with reddish tint, carapace and mesosomal tergites smooth, lateral eyes equal in size, median eyes situated in ratio 1:1.1, pectines 15/15 ; trichobothria of 2 placed proximal to et 1 and et 3 also est and em placed little distal from esb on patella. Angles between trichobothria Dt to Et5 and Et4 almost 90° ... *Bengalensis*.
- II. Body colour entirely blackish with bluish green tint, carapace and mesosomal tergites entirely coarsely granular, first and second lateral eyes larger than third ; median eyes situated in the ratio 1:1.5 Pectines 11/11, trichobothria et 1-3 placed almost in straight line and also esb, est, em closer to each other on petella. Angles between trichobothris Dt to Et5 and Et4 on manus more than 90° ... *Malapuramensis*.

SYSTEMATIC ACCOUNT

Class : ARACHNIDA
Order : SCORPIONES
Family I : SCORPIONIDAE

1. *Heterometrus (Heterometrus) bengalensis* (Koch)

1842. *Buthus bengalensis* Koch, *Arachn.*, 9 : 3.

Type-locality : India, Bengal.

Material : 2 exs. (♀ ♀) ; Chilla Forest (Dist. Pauri) ; 5.vi.1987.

Distribution : (i) *Previous records* : Uttar Pradesh ; Madhya Pradesh ; Assam Meghalaya ; West Bengal and Maharashtra.

(ii) *Present record* : Rajaji National Park (Chilla Forest, Pauri Dist.).

Family II : BUTHIDAE

2. *Mesobuthus tamulus gangeticus* (Pocock)

1900. *Buthus tamulus gangeticus* Pocock, *Fauna Brit. India, Arachnida* : 25.

Type-locality : India, Uttar Pradesh : Dehradun.

Material : Pauri Dist. : (i) 6 exs. (♂ ♀) : Chilla Forest, 28.10.86. 20-22.9.87. Dehradun Dist. ; (ii) 4 exs. (♂ ♀) : Satyanarayan Forest ; 2.9.74. (iii) 1 ex. (♀) : Lachiwala Forest ; 5.3.86. (iv) 3 exs. Kansaro Forest (♂ ♀), 23.10.86. (v) 6 exs. (♂ ♀) Motichur Forest ; 5.3.86., 21.3.86. Saharanpur Dist. (vi) 6 exs. (♂ ♀) ; Dholkhand Forest ; 21.3.86., 24-28.10.86. (vii) 2 exs. (♀) ; Ranipur Forest, 14-26.9.87.

Distribution : (i) *Previous records* : India, Uttar Pradesh State.

(ii) *Present records* : Rajaji National Park : Districts of Dehradun, Pauri and Saharanpur as above (vide material).

3. *Lychas (Distotrichus) nigristernis* (Pocock)

1899. *Archisometrus nigristernis* Pocock, *J. Bombay Nat. Hist. Soc.*, 12 : 265.

Type-locality : India, Uttar Pradesh : Dehradun.

Material : 1 ex. (♂) ; Dholkhand Forest (Saharanpur Dist.). 7.5.87.

Distribution : (i) *Previous records* : Himachal Pradesh ; (ii) Uttar Pradesh.

(ii) *Present records* : Rajaji National Park ; Dholkhand Forest (Saharanpur Dist.)

Family III : VAEJOVIDAE

4. *Scorpiops (Scorpiops) montanus* Karsch

1879. *Scorpiops corpiops montanus* Karsch., Mitt. Much. Ent. Ges. 3 : 107.

Type-locality : India : Himachal Pradesh, Dharmasala.

Material : Dehradun Dist. (i) 1 ex. (♀) ; Lachhiwala Forest : 11.10.83.

(ii) 1 ex. (♂) ; Phandwala Forest ; 21.5.87. Saharanpur Dist. (iii) 5 exs. (♂ ♀) ; Mohand Forest ; 18.9.87.

Distribution : (i) *Previous records* : India, Himachal Pradesh and Uttar Pradesh.

(ii) *Present records* : Rajaji National Park : Districts of Dehradun and Saharanpur as above (vide material).

5. *Scorpiops (Scorpiops) hardwickei* (Gervais)

1844. *Scorpio hardwickei* Gervais, Walck. Inst. Apt. 3 : 66.

Type-locality : Dehradun, Uttar Pradesh, India.

Material : 1 ex. (♀) ; Mohand Forest (Saharanpur Dist.).

Distribution : (i) *Previous records* : Uttar Pradesh, Uttar Kashi, Almora, Tehri, Pauri Dists.

(ii) *Present records* : India, Uttar Pradesh : Mohand Forest (Saharanpur Dist.).

SUMMARY

Five species of scorpions (Scorpiones) belonging to three families (Scorpionidae, Buthidae and Vaejovidae) are reported from Rajaji National Park, Uttar Pradesh, India.

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