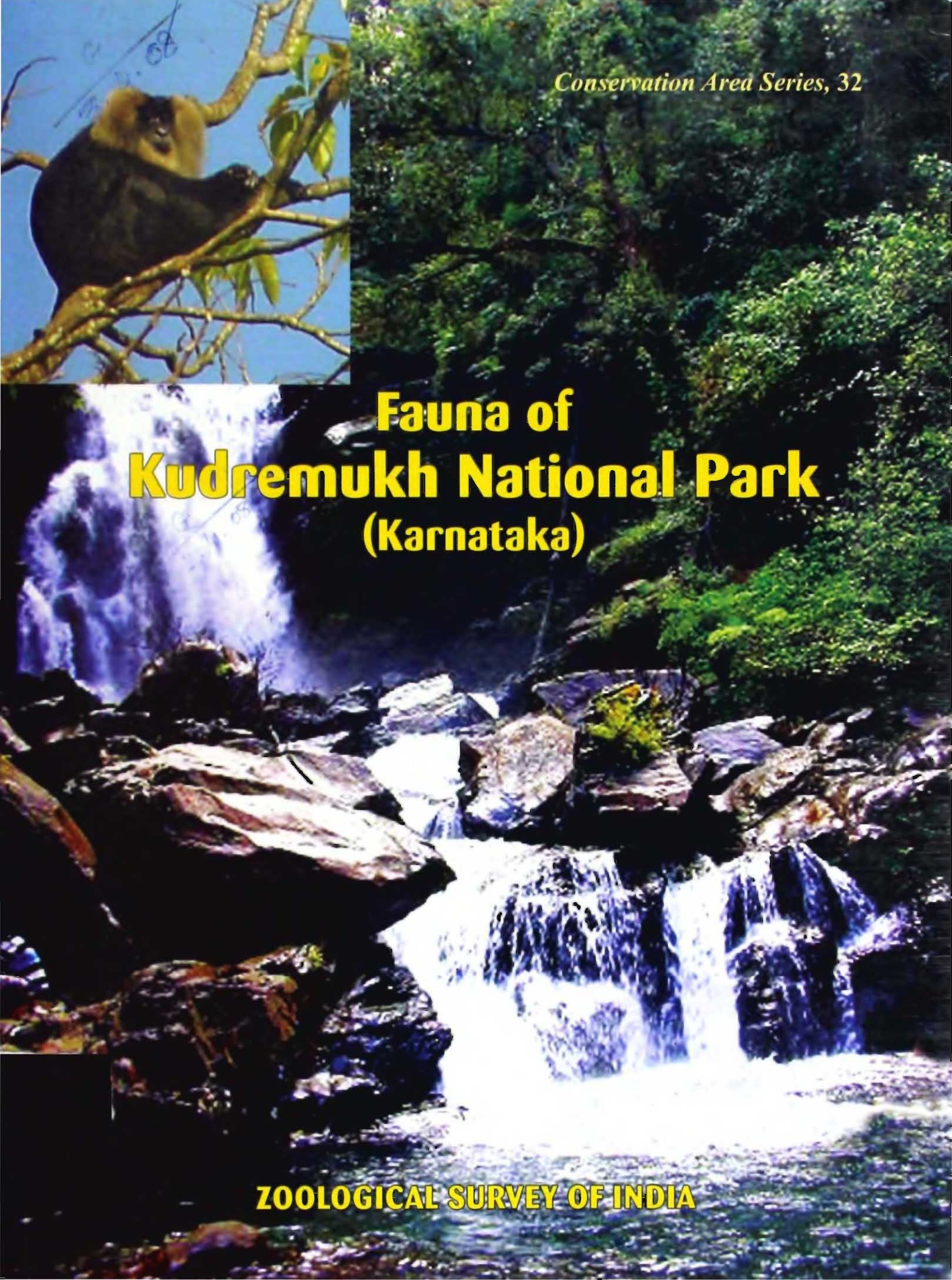




Conservation Area Series, 32

**Fauna of
Kudremukh National Park
(Karnataka)**

ZOOLOGICAL SURVEY OF INDIA

Conservation Area Series, 32

Fauna of Kudremukh National Park (Karnataka)

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FAUNA OF KUDREMUKH NATIONAL PARK, KARNATAKA - AN OVERVIEW

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INTRODUCTION

Kudremukh National Park (KMNP), a conservation area in Karnataka, is the largest declared protected area of tropical wet evergreen forests in Karnataka, harbouring high levels of plant and animal diversity. Kudremukh National Park and its picturesque, mountainous landscapes constitute a prime sector of the forest tracts in the Western Ghats ('Sahyadri Mountains'), one among the world's 34 biodiversity hotspots identified for the conservation of biotic wealth. Kudremukh National Park also comes under the Global Tiger Conservation Priority-I, under the format developed jointly by Wildlife Conservation Society (WCS) and World Wide Fund-USA (WWF). The Park's name is a combination of 'Kudre' meaning horse and 'mukha', face, which together denotes the characteristic 'horse-face' shape of the Kudremukh peak, the highest point in the Park. As the name suggests, it looks like a horse-face, hence called Kudremukh or kudremukha. The Park is also a recognized hill station, rich in iron-ore deposits. The Park, situated about 95 km southwest of Chikmagalur town, is well linked by road, about 114 km and 316 km from Mysore and Bangalore respectively.

HISTORY

Kudremukh region of the State had been declared as a Reserve Forest way back in 1916 itself by the then British Government in order to check the rampant destruction of forests by slash and burn cultivation practices in the forested interiors of the Ghats. A few decades later, Dr. Ullas Karanth, a well known environmentalist and Tiger expert, based on his detailed and systematic survey of the distribution of the endangered Lion- tailed Macaque in Karnataka during 1983-84, observed that suitable and extensive rainforest habitat for Lion- tailed Macaque existed in Kudremukh, and that the tract probably harboured the largest contiguous population of lion tailed macaques in the Western Ghats outside the rainforests of Malabar region. Suggesting the Lion- tailed Macaques as a symbolic 'flagship' species to conserve the entire biotic community in the region, Dr. Ullas Karanth prepared a conservation plan for survival

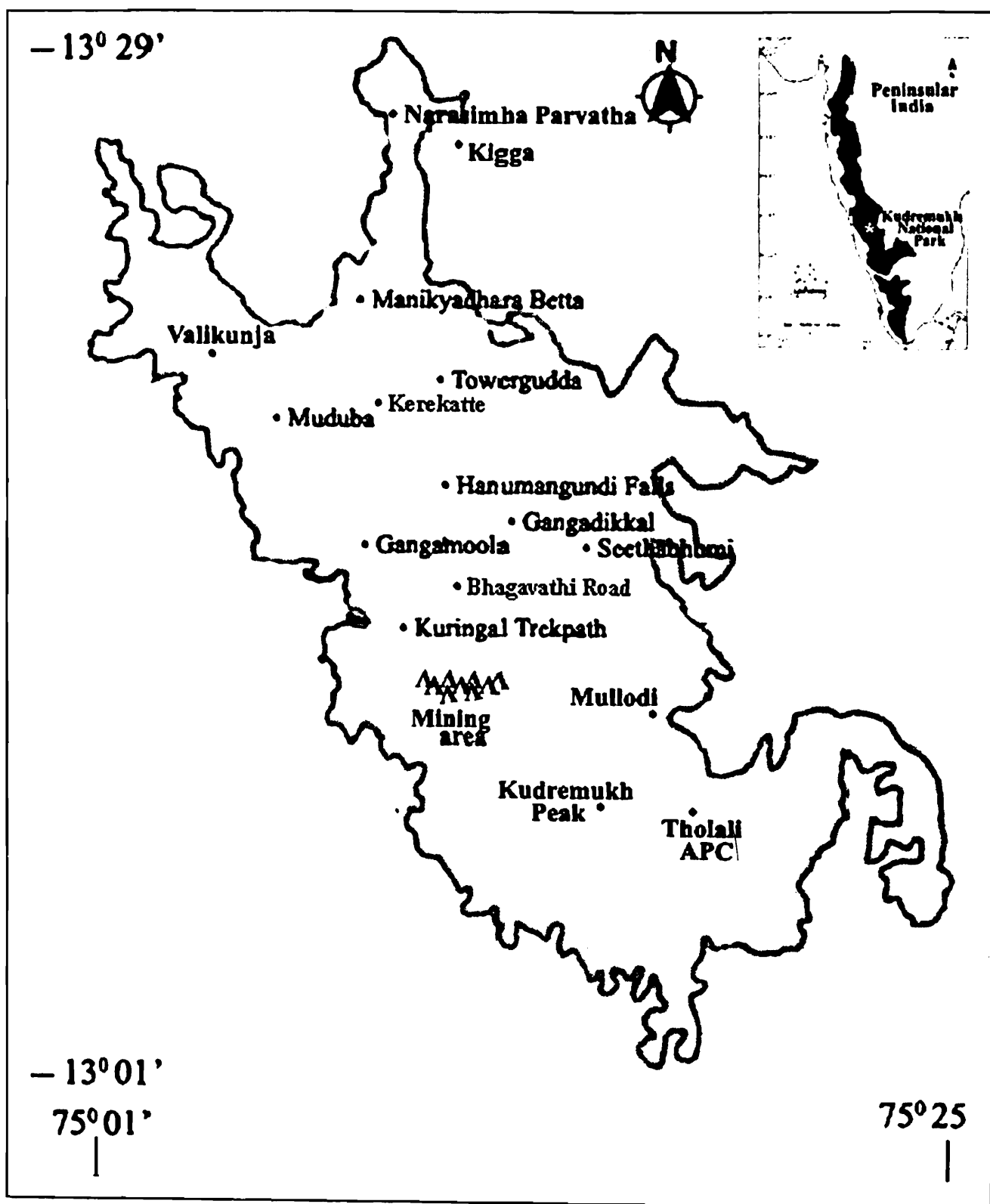
of wild population of Lion- tailed Macaques in the region, delineating the present national park area as a proposed nature reserve. The Karnataka State Wildlife Advisory Board, based on his report, suggested to the Government that Kudremukh National Park be created, and the Government of Karnataka, in turn, issued the first notification of the Kudremukh National Park, in 1987, declaring these Reserved Forests as a National Park.

Although the biodiversity rich Kudremukh Hills and surrounding natural forests received the first, preliminary notification towards being declared a National Park, which brought the area under the purview of the Wildlife (Protection) Act of 1972, disallowing any non-forestry operations, including mining, within a protected area, the KMNP remained as a hub of controversies thereafter. Granted permissions and a 30-year lease in 1969, Kudremukh Iron Ore Company Limited (KIOCL), a Public Sector Undertaking, has been mining weathered iron-ore from Kudremukh Hills within the park premises, on an area of 4,604.55 ha, for over 20 years. Opposition to its activities began, over the years, from environmentalists and wildlife conservationists who were concerned about the threat to the region's flora and fauna, and farmers who were affected by the pollution of the streams that originate in the mining area. On 25 July 1999 the company's lease ended, but operations continued under a "temporary working permission" granted by the Ministry of Environment and Forests, until a petition in the Supreme Court sought to put an end to it all.

After nearly two-year long court battle, the Supreme Court, in a ground-breaking judgement, delivered on 30 October 2002, ordered all mining operations in KMNP to be ceased and recommended that the company make its departure from the area by December 2005. Thus, on 31 December 2005, the curtains came down on the Kudremukh Iron Ore Company Ltd's long disputed mining operations in the protected Kudremukh National Park, one of the most stunning and most disputed landscapes in Karnataka.

PHYSIOGRAPHY

Kudremukh National Park (Map-A), in its natural setting, is nestled on the crest of the mountains, occupying almost a central position in the entire north-south stretch of the Western Ghats. The Park stretching over an area of about 563 sq. km is located between 75° 01' – 75° 25' E longitude and 13° 01' – 13° 29' N latitude, at the tri-junction of Udupi, Dakshina Kannada and Chikmagalur districts of Karnataka State. Its mountainous topography is, characteristically, with a central ridge running north-south through the Park. Altitude varies from range 100 to 1890 m with an average elevation of about 600 m, the highest point being the Kudremukh Peak in the south of the Park. While a forest corridor connects the park to Someshwara Sanctuary on the north-west, the Park's periphery on the west drops down along the abrupt slopes of the Western Ghats to the coastal plains of Arabian Sea.



Map-A: Map of Kudremukh National Park indicating collection localities

The mountainous landscape of the Park is very picturesque, with high hills and steep precipices, broad and deep valleys, undulating plains cloaked with velvety grasslands and interspersed dark-green sholas, and lush evergreen forests dotted with shimmering cascades, which collectively portray the pristine natural beauty and wilderness of the environment. The Park area is the source of the catchments of many streams and rivulets, and three major rivers of the Karnataka State, viz., Thunga, Bhadra and Netravati, take their origins from the hills at “Gangamoola” of the Park.

VEGETATION

The Park’s vegetation constitutes mainly the rainforest biome, with the forest types encompassing evergreen, semi-evergreen forests and high altitude grassland-sholas, in the mountainous landscape of Western Ghats (Sahyadri Mountains). Montane Grassland - shola forests, a unique montane ecosystem of the Western Ghats as also of the Kudremukh region, constitute a natural climatic climax having their unique complement of plant and animal life. The areas adjoining the broken up areas (approximately 2000 hectares) have been planted with exotic species of trees such as the *Eucalyptus* and *Acacia*, as part of the compensatory afforestation programme by KIOCL.

WEATHER

The high-elevation hills of KMNP and its surroundings, as being the integral part of the Western Ghats system, are effective barriers to rain-laden, southwest monsoon clouds during June-September, causing heavy precipitation in the Kudremukh region. Kudremukh National Park receives annual rainfall varying from 1778 to 6350 mm, with an average of 4000 mm, even, occasionally, with a maximum of 7,000 mm also. The park has a pleasant climate, with temperatures ranging from 17° to 28°C.

ECOLOGY

Heavy precipitation and the consequent wet climate, and the tremendous water retentive capacity of the forests and shola grasslands have led to the formation of thousands of perennial streams in the region converging to form three major rivers of the region, Tunga, Bhadra and Nethravathi. In rain forests as found in KMNP, the density of the plant cover, the extent and vertical distribution of the foliage, shading of solar radiation by plants, etc. determine differences between temperature, humidity, wind velocity and rate of evaporation, in the open and forested habitats, resulting in the occurrence of microclimatic conditions offering subtle variations in the habitat diversity (microhabitats).

Highland/montane forest regime of the region offers diverse habitats (Plate-I, Figs.1–4) wherein congenial ecological attributes/factors can play benefiting the floral/faunal communities, and the diverse assemblage of species of both vertebrates and invertebrates, from mammals, including endangered ones, to micro organisms. The Park's ecology and environment, for example, is amply made use by a diverse assemblage of endangered large mammals such as the large mammal predator species Tiger, Leopard and Wild Dogs, with plenty of prey animals to thrive upon.

BIOGEOGRAPHY

KMNP with its associated hills is, geomorphologically, an integral part of the 'Deccan Trap' Area of the Central Western Ghats, yet belongs to a sector wherein the Deccan lava gives way to the Archeans, the change being marked by breaches in the mountain wall by the rivers. The biogeographic significance of KMNP is that it is a geomorphologically influenced borderland characterized by high atmospheric humidity, warm temperature and high rainfall with evergreen biotope and the fauna associated with it.

THREATS

The environmental track record of Kudremukh Iron Ore Company Limited (KIOCL) has been far from satisfactory. KIOCL's transgressions included illegal felling of trees and road building leading to fragmentation of forests, drowning over 300 hectares of shola forests by illegally raising the height of the Lakya tailings dam, blasting operations scaring away the wildlife; drilling of bore-wells on mountains drying up streams and springs, everything in contempt of the law, fundamentally violating the Wild Life (Protection) Act 1972, within the notified Kudremukh National Park.

The topographic and rainfall characteristics in combination with the open cast mining of low grade iron ore and other land-surface disturbances caused by the KIOCL operations have resulted in very high sediment discharge, with over 60% of the total siltation in the Bhadra system being contributed by the mining area.

Another serious problem the Park has been facing is the eviction of the tribals, about 540 families living in 37 villages falling within the limits of the Kudremukh National Park. In 1998, the government started issuing notices to the tribals to quit the national park area, which sparked off a series of agitations by pro active tribal communities and organizations. NGOs spearheading the protest against improper eviction and rehabilitation works have emphasized the reality that the tribal issue is concerning the plight of about 5,000 families comprising of 20,000 people. The decade-long struggle by various organizations against the eviction of tribals

from the Kudremukh National Park has failed to provide any logical solution so far. Presently, the presence of naxalites in the area has added a new dimension to the struggle, thus making the Park premises, politically, a more troubled zone.

Some other major concerns over the Park's protection and conservation in the recent times are the ever-increasing menace of setting grass lands to frequent fires by villagers during dry season for the lush regeneration of grass, weeds and other undergrowths during wet season for their grazing cattle. Villagers' illegal encroachment to the forest land and the evacuation efforts by Park authorities often lead to the disintegration/modification of Park's natural habitat areas.

FAUNAL EXPLORATIONS

The knowledge on the fauna of the Park till the 1980s was far from adequate. Even after the 80s, for a considerable length of time, whatever studies that came out pertaining to the Park fauna were related to the major wildlife like larger animals and other common vertebrate forms. The pioneering eco observation studies of Dr. Ullas Karanth on the population of Lion-tailed Macaque and other mammals associated with the forest habitats of Kudrmukh and its surrounding wilderness are very notable in this context. The urgency and necessity for further studies on the faunal richness and diversity of KMNP, got realized in the recent times only, and the inevitable necessity arrived when the KMNP and KIOCL controversy came up by the close of the last century. In this context, the Indian Institute of Science, Bangalore published, in January 2001, its report titled "Impact of Iron Ore Mining on the Flora and Fauna of Kudremukh National Park and Environs - A Rapid Assessment", which pointed out, *inter alia*, the habitat fragmentation as the single largest threat to biodiversity and biological integrity of the Park.

Zoological Survey of India (ZSI), Western Ghats Field Research Station (WGFRS), Calicut, under the Action Plan Programmes concerning the explorations/surveys of Conservation Areas for the purpose of inventorying, monitoring and documentation of the faunal wealth of the protected areas, conducted a faunistic survey programme to Kudremukh National Park (KMNP) as per the approved annual programme "Fauna of conservation areas: Kudremukh National Park, Karnataka", assigned to the Station for the year 2005-2006. A six-member survey party in its twelve-day field survey, during 17th -28th October, 2005, explored the KMNP premises for the collection/observation of representative faunal samples, as well as data, for scientific studies towards documenting the faunal wealth of the Park.

The survey team explored varied stretches of habitats representing forested, non-forested, and modified or degraded areas, especially in the Northern and Central zones, of the KMNP, for collection/observation of fauna. Owing to certain political insurgency problems, field-survey of some of the biodiversity-rich spots, like Nemmar, Narasimha Parvatha, etc. had to

be skipped by the survey team. Because of the same reason, the subsequent field survey programmes to the Park also could not be undertaken by ZSI, WGFRS, Calicut.

During the survey programme, faunal investigations were carried out in 10 localities, and altogether 2311 faunal examples were collected, besides taking considerable observation data of animals. The collection material on analysis showed the faunal samples representing 6 classes under Invertebrata and Vertebrata. Arthropods, especially entomofauna, dominated the collections. A major part of collection includes innumerable tiny insects of parasitic hymenoptera collected by means of sweep net and other gadgets/techniques viz. malaise traps and yellow-pan traps.

In the case of Lepidoptera and Odonata, common species which could be easily identified from the field were not collected, in view of conservation grounds, instead only sightings were recorded. In the case of higher groups of vertebrates, like birds and mammals, the list provided is exclusively based on two aspects: one based on direct evidence, which includes sightings in the field, and the other based on indirect evidences, like hearing the call, cries, etc. and, or, observing the scats, footprints etc. of the animals. Inferences on their presence were also made by studying the various animal parts collected from the field, like exoskeleton, quills, spines etc. In the case of amphibians and reptiles also, common and easily distinguishable forms were not collected, but taken only data/records of their occurrence in the Park, including evidence of photographs wherever possible.

All the specimens collected during the survey were properly preserved, labeled and deposited in the Western Ghats Field Research Station, ZSI, at Calicut. The taxonomic identities of specimens of various faunal groups, for which expertise is available at the Station, have been handled by the experts of the Station, and for the remaining groups, involvement of experts from other research centres were sought, thus completing the faunal documentation of the Kudremukh National Park based on the collection data of specimens.

10 localities in KMNP wherefrom faunal material/data were collected by the ZSI survey team are viz. A. Kerekatte Range: 1) Kerekatte (18.10.05); 2) Manikyadhara Betta (19.10.05); 3) Hanumangundi Falls (20.1.05); 4) Muduba (21.10.05); 5) Towergudda (22.10.05); B. Kudremukh Range: 6) Bhagavathi Road (23.10.05); 7) Kuringal Treckpath (24.10.05); 8) Seethabhumi and Lakhya Dam area (25.10.05); 9) Gangadikkal (26.10.05); 10) Gangamoola (26.10.05).

The faunal exploration made in the Kudremukh National Park is not exhaustive. The studies made may constitute only a portion of its faunal wealth and diversity. Even so, the findings present an overall picture of the faunal composition of the area (Table-A), also adding much to the existing knowledge, including a few species discovered new to science from the Park.

Table-A : Representative number of families, genera and species in the fauna of Kudremukh National Park, Karnataka.

Sl. No.	Faunal Groups	No. of Families	No. of Genera	No. of Species	Remarks
1	Mantodea: Insecta	3	4	5	
2	Orthoptera: Insecta	6	22	23	
3	Odonata: Insecta	12	34	52	
4	Rhopalocera: Lepidoptera: Insecta	5	93	139	
5	Scelionidae: Hymenoptera: Insecta	1	7	13	5 species new to science
6	Stream Insects:	39			
	<i>[Ephemeroptera</i>	<i>[9</i>	-	-	
	<i>Plecoptera</i>	<i>1</i>	-	-	
	<i>Blattodea</i>	<i>1</i>	-	-	
	<i>Orthoptera</i>	<i>1</i>	-	-	
	<i>Heterocera:</i> <i>Lepidoptera</i>	<i>1</i>	-	-	
	<i>Hemiptera</i>	<i>6</i>	-	-	
	<i>Coleoptera</i>	<i>7</i>	-	-	
	<i>Trichoptera</i>	<i>8</i>	-	-	
	<i>Diptera]</i>	<i>5]</i>	-	-	
7	Pisces	4	9	11	1 species new to science
8	Amphibia	6	11	29	
9	Reptilia	13	37	52	
10	Aves	44	116	149	
11	Mammalia	22	39	49	
	Total	155	372	522	

Among invertebrates and Insecta in particular, the document deals with 5 species of Mantodea under 4 genera and 3 families, 23 species of Orthoptera under 22 genera and 6 families, 52 species of Odonata under 34 genera and 12 families (inclusive of data from articles on Stream Insects and Odonata, put together), 139 species of Lepidoptera (Rhopalocera) under 93 genera and 5 families, 13 species of Hymenoptera under 7 genera and 1 family as well as information on 39 families of Stream Insects [9 of Ephemeroptera, 1 each of

Plecoptera, Blattodea, Orthoptera and Lepidoptera (Heterocera), 6 of Hemiptera, 7 of Coleoptera, 8 of Trichoptera and 5 of Diptera], from a separate study conducted by K.A. Subramanian, Indian Institute of Science, Bangalore.

All the vertebrate groups from Pisces to Mammalia are represented in the study and the document deals with 11 species of Pisces under 9 genera and 4 families, 29 species of Amphibia under 11 genera and 6 families, 52 species of Reptilia under 37 genera and 13 families, 149 species of Aves under 116 genera and 44 families and 49 species of Mammalia under 39 genera and 22 families.

Among the fauna documented, 7 species each of Odonata and Lepidoptera (Rhopalocera), 2 species of Pisces, 20 species of Amphibia 18 species of Reptilia, 6 species of Aves are endemic to Western Ghats. Besides, 12 species of Mammalia recorded from the park are endemic to Western Ghats and Sri Lanka.

The very significant contribution made in this document to our knowledge on the faunal wealth of KMNP pertains to the descriptions of 6 species, 5 of Insects of the group Hymenoptera and 1 of Pisces, all new to science.

ACKNOWLEDGEMENTS

All the contributors in this document are grateful to the Principal Chief Conservator of Forests, Chief Wildlife Warden and Deputy Conservator of Forests (Kudremukh National Park), Karnataka State Forest Department, and the Director, Zoological Survey of India, Kolkata for facilities.

INSECTA : MANTODEA

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INTRODUCTION

Praying mantids occur in various habitats including semi-desert areas. However, they are predominant in tropical rain-forest habitats. About 2210 species under 432 genera are known from the world (Mukherjee *et al.*, 1995). Of the 162 species belonging to 68 genera known from India, 26 species under 22 genera are known from Karnataka. The rich floral composition of Kudremukh National Park is apparently much favourable for the insect diversity. This is reflected by the short sampling done by the survey party in the month of October, 2005. The post monsoon collection reflects that the insects were already in an early breeding stage since the collection contained many nymphs and only a few adults. The nymphs were apparently in their 1st to 2nd instar stages. A total of 5 species under 4 genera are discussed in this account. All measurements are in millimeters.

SYSTEMATIC ACCOUNT

Family HYMENOPODIDAE
Subfamily ACROMANTINAE
Tribe **Acromantini**

***Epestiasula intermedia* Werner 1930**

[Plate – II, Figs: 1a - entire, 1b-anterior part of body and inner view of fore leg]

Material examined : 1 ex. male, Loc. Manikyadhara, coll. K. Rajmohana & party, 19.x.2005;
1 ex. male, Loc. Tower Gudda, coll. K. Rajmohana & party, 22.x.2005.

Remarks : This species is characterized by the dorso-median black line on pronotum and the three black stripes over vertex. The fore femur is oval, its inner face with a thin black line along upper margin extending from base up to a little distance away from the distal end and lower edge with a black patch enclosing two pale whitish spots. Total length 18.5-19.0.

Family IRIDOPTERYGIDAE
 Subfamily TROPIDOMANTINAE
 Tribe **Tropidomantini**

***Tropidomantis (Eomantis) guttatipennis* Stal 1877**

[Plate – II, Figs. : 2a-entire, 2b-inner view of fore leg, 2c- ventral view of abdominal end]

Material examined : 1 ex. female, Loc. Seethabhumi, coll. K. Rajmohana & party, 25.x.2005.

Remarks : Frontal sclerite with whitish patch. External spines long, 1st and 2nd longer; internal spines set inside the row; all spines of fore legs brownish at tips only. Elytra whitish opaque, broad and long. Cerci black, quite long, 15 segmented, proximal segments ring like by being lesser in length than diameter, distal segments longer than its width. Total length 24.0; elytra 20.5; cerci 4.5.

Family IRIDOPTERYGIDAE
 Subfamily Iridopteryginae
 Tribe **Iridopterigini**

***Hapalopeza (Hapalopeza) nilgirica* Wood-Mason 1891**

[Plate – III, Fig: 3-entire]

Material examined : 1 ex. Female, Loc. Kerekatte, coll. K. Rajmohana & party, 18.x.2005.

Remarks : Antennae black at basal 1/3rd, middle brown and blackish at distal 1/3rd length. Back of vertex with four round black spots of which outer two are bigger. Each side of neck with one small elongated black spot. Pronotum strongly constricted; margins of pronotum with black lines. Fore femur with 12 internal spines (5 longer and basal 1st longest); basal internal spines disposed in a zig-zag fashion; internal face with a black elongated patch at distal upper edge. Total length 16.5.

Family MANTIDAE
 Subfamily MANTINAE
 Tribe **Mantini**

***Statilia nemoralis* (Saussure, 1870)**

[Plate – III, Figs: 4a-entire, 4b-head and inner view of fore leg]

Material examined : 1 ex. female, Loc. Muduba, coll. K. Rajmohana & party, 21.x.2005.

Remarks : Entire pronotum finely serrated. In fore leg, coxa internally with a basal black patch and 6 whitish small premarginal spines; femur with 14 internal spines, the typical black line, patch and colouration of spines; tibia with 11 internal and 6 external spines. Fore wing

opaque greenish-white. Total length 55.0; pronotum 18.0 (5.0+13.0); fore wing 31.0; fore coxa 12.0, femur 17.5, tibia 5.0.

Statilia maculata maculata (Thunberg, 1784)

[Plate – III, Figs: 5a-entire and 5b-inner view of anterior part]

Material examined : 1 ex. male, Loc. Tower Gudda, coll. K. Rajmohana & party, 22.x.2005.

Remarks : In a ventral view, a black patch on prosternum near coxal joint, one at base of coxa and one near claw groove; a black line along the bases of internal spines of fore leg. In fore wing, costal area less transparent; stigma with a minute black spot at corners; radial vein with brownish patches along length. Hind wings transparent, apices brownish. Total length 48.0.

REFERENCE

Mukherjee, T.K. Hazra, A.K. and Ghosh, A.K. 1995. The mantid fauna of India (Insecta : Mantodea). *Oriental Insects*, **29** : 185-358.

INSECTA : ORTHOPTERA

S.K. MANDAL, G. P. MANDAL AND A. K. HAZRA

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INTRODUCTION

Order Orthoptera includes both long and short horned grass hoppers, crickets and grouse locusts. So, far no serious effort has been made to study this group of insects from Kudremukh National Park (KMNP). The present paper deals with 23 species under 22 genera of 6 families and forms the first comprehensive report on the Orthopteran fauna of KMNP. All the species and subspecies reported in this account are newly recorded from this conservation area.

The classification followed here is after Dirsh (1961), Chopard (1969) and Rentz (1979).

SYSTEMATIC ACCOUNT

Order ORTHOPTERA

Family TETRIGIDAE

Pronotum almost covers the whole abdomen and conceals the hindwings; tegmina reduced to small lateral scales, while the hindwings are well developed; anterior and middle tarsi consists of two segments, while the posterior ones with three segments; claws of tarsi not provided with an arolium or empodium.

Genus *Thoradonta* Hancock, 1908

1. *Thoradonta pruthii* Gunther

1938. *Thoradonta pruthii* Gunther, *Stettin. Ent. Ztg.*, 99 : 129-130.

Material examined : 1M; 1F, Seethabhumi, 25.x.2005, coll. Rajmohana & party.

Diagnosis : Vertex wider than eye; paired ocelli present below the middle of eyes; antennae situated below the eyes; median carina of pronotum wavy and irregular but not buckled; lateral spines of pronotum narrow even at the base and almost transversely directed.

Distribution : India (Karnataka-present record, Madhya Pradesh and West Bengal).

Remarks : This species is recorded for the first time from Karnataka.

Genus *Criotettix* Hancock, 19082. *Criotettix latifrons* Hebard

1929. *Criotettix latifrons* Hebard, *Revue Suisse Zool.*, 36 : 578.

Material examined : 1M; 1F, Hanumangundi, 20.x.2005, coll. Rajmohana & party 1F, Bhagavathy Nature Camp, 26.x.2005, coll. Rajmohana & party.

Diagnosis : Head not extended above the pronotal surface; vertex boarder than eye; prozonal carinae convergent posteriorly, spine of lateral lobes of pronotum transversely directed.

Distribution : India (Karnataka-present record, Andhra Pradesh, Maharashtra, Tamil Nadu).

Remarks : This species is recorded for the first time from Karnataka.

Genus *Hedotettix* Bolivar, 18873. *Hedotettix gracilis* (De Haan)

1842. *Acridium (Tetrix) gracile* De Haan, *Temminck Verhandel, Orthoptera* : 167, 169.

1914. *Hedotettix gracilis* : Kirby, *Fauna Brit. India, Orthoptera* : 72.

Material examined : 2M, Bhagavathi Nature Camp, 26.x.2005, coll. Rajmohana & party.

Diagnosis : Micro and macropterus forms are found in both the sexes; colour of the dorsum varies from brown to brownish yellow or olive green; dorsum of pronotum smooth or finely granulose, median carina percurrent, a little compresso elevated and straight.

Distribution : India (Throughout); Celebes; Java; Myanmar; Sumatra; Sri Lanka; Taiwan : Thailand and Vietnam.

Genus *Paratettix* Bolivar, 18874. *Paratettix cingalensis* (Walker)

1871. *Tettix cingalensis* Walker, *Cat. Derm. Salt. Brit. Mus.*, 5 : 827.

1914. *Paratettix cingalensis* : Kirby, *Fauna Brit. India, Orthoptera* : 63.

Material examined : 2M, Seethabhumi, 25.x.2005, coll. Rajmohana & party; 2M, 1F, Bhagavathy Nature Camp, 26.x.2005, coll. Rajmohana & party.

Diagnosis : Head a little or not at all exerted; frontal costa rarely sinuate; paired ocelli present between the middle of eyes; tegmina and wings well developed; median carina of pronotum compressed, raised and generally arched in front.

Distribution : India (Karnataka, Arunachal Pradesh, Assam, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Sikkim, Tamil Nadu), Borneo, Hainan, Malaya, Mindanao, Sri Lanka, Sumatra and Taiwan.

Remarks : This species is very common in India.

Family PYRGOMORPHIDAE

Head conical in shape; foveolae of vertex superior and forming the extremity; fastigial furrow present; lower basal lobe of posterior femora mostly longer than the upper, or both of the same length stridulatory mechanism absent.

Genus *Atractomorpha* Saussure, 1861

5. *Atractomorpha crenulata* (Fabricius)

1793. *Truxalis crenulata* Fabricius, *Ent. Syst.*, 2 : 28.

1969. *Atractomorpha crenulata* : Kevan and Chen, *Zool. J. Linn. Soc.*, 48 : 187.

Material examined : 5M, 3F, Kerekatte, 18.x.2005, coll. Rajmohana & party; 1M, Bhagavathy Nature Camp, 24.x.2005, coll. Rajmohana & party.

Diagnosis : Green or pale in colour; body medium and slender; fastigium of vertex short; eyes convex and prominent; lateral pronotal lobes with distinct membranous area, specially in females; hind femora not clearly convex; tegmina pointed, extending for one fourth of their length beyond the hind femora; hindwings normally tyrian pink to light mallow purple at base.

Distribution : India (Throughout), Bangladesh, Malaya, Myanmar, Pakistan, Sri Lanka, N. Sumatra, Thailand and S. Vietnam.

Family ACRIDIDAE

Head of variable shape; foveolae of vertex lateral or inferior; prosternal tubercle present or absent lower basal lobe of posterior femora mostly shorter than or equal to upper one; stridulatory mechanism of various structure found.

Genus *Dnopherula* Karsch, 1896

Subgenus *Aulacobothrus* Bolivar, 1902

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

1871. *Stenobothrus luteipes* Walker, *Cat. Derm. Salt. Brit. Mus.*, 5 Suppl. : 82.

1971. *Dnopherula (Aulacobothrus) luteipes* : Jago, *Proc. Acad. Sci. Philad.*, 123(8) : 243.

Material examined : 1F, Bhagavathy Nature Camp, 24.x.2005, coll. Rajmohana & party.

Diagnosis : Size small; hind femur with three black bands on the dorsal surface and with a black distal end; pronotum subcylindrical with nearly parallel lateral carinae which are weakly concave in the middle part; posterior part of pronotum nearly smooth and posterior margin obtusely angulate; median carina distinct; hind tibiae reddish in the apical part.

Distribution : India (Karnataka, Assam, Bihar, Delhi, Himachal Pradesh, Jammu and Kashmir, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, West Bengal), N. America, China, Europe, Japan, Myanmar and Sri Lanka.

7. *Dnopherula (Aulacobothrus) deciscus* (Walker)

1871. *Stenobothrus deciscus* Walker, *Cat. Derm. Salt. Br. Mus.*, 5 : 80.

1971. *Dnopherula (Aulacobothrus) deciscus* : Jago, *Proc. Acad. Sci. nat. Philad.*, 123 (8) : 24.

Material examined : 4F, Towergudda, 22.x.2005, coll. Rajmohana & party.

Diagnosis : Size small; general colour brownish; fastigium of vertex almost subtriangular; abdomen carinated above; a pale stripe usually running from fastigium to end of pronotum; tegmen rufo testaceous; tibiae with small black spines on each side.

Distribution : India (Karnataka, Arunachal Pradesh, Maharashtra).

Remarks : This species is limited in distribution.

Genus *Mesopsis* Uvarov, 1921

8. *Mesopsis cylindricus* (Kirby)

1914. *Aswathamanus cylindricus* Kirby, *Fauna British India, Orthopt.*, : 101.

1921. *Mesopsis cylindricus* : Uvarov, *Ann. Mag. nat. Hist.* (9)7 : 482.

Material examined : 1M, Seethabhumi, 25.x.2005, coll. Rajmohana & party.

Diagnosis : Body long and cylindrical; head and pronotum smooth; fastigium of vertex long, extending far beyond the eyes as the length of pronotum, antennae much widened and flattened towards the base and tapering towards the apical part; tegmina and wings very long and pointed.

Distribution : India (Karnataka, Arunachal Pradesh, Andhra Pradesh, Bihar and Orissa).

9. *Acrida* sp.

Material examined : 1F, 1M, Towergudda, 22.x.2005, coll. Rajmohana & party.

Diagnosis : *Acrida* sp. varies in size and general colouration from uniformly green to brownish; head less robust and elongated; pronotum slender; pronotal disc relatively narrow.

Distribution : The species is found throughout India.

Remarks : Since the specimens were in their nymphal stages, their specific identity could not be confirmed.

Genus *Gelastorrhinus* Brunner, 1893

10. *Gelastorrhinus* (?) *laticornis* (Serville)

1839. *Opomala laticornis* Serville, *Ins. Ortho.* : 590.

1914. *Gelastorrhinus* (?) *laticornis* : Kirby, *Fauna British India, Orthoptera* : 217.

Material examined : 1F, Manikyadhara, 19.x.2005, coll. Rajmohana & party; 1F, Hanumangundi, 20.x.2005, coll. Rajmohana & party.

Diagnosis : Body large size, slender; head large conical; antennae much thickened and flattened at base pronotum truncate; a dark lateral stripe runs behind each antennae, interrupted by the eye, but extends beyond the pronotum; tegmina longer than abdomen and pointed apex; hind knees produced from above on both sides into spines or lobes, the inner spines distinctly longer than the outer one.

Distribution : India (Karnataka and West Bengal).

Remarks : This species is limited in distribution.

Genus *Heteropternis* Stal, 1873

11. *Heteropternis respondens* (Walker)

1859. *Acrydium respondens* Walker, *Ann. Mag. nat. Hist.*, 4(3) : 223.

1914. *Heteropternis respondens* : Kirby, *Fauna British India, Orthoptera* : 128.

Material examined : 1M, Towergudda, 22.x.2005, coll. Rajmohana & party.

Diagnosis : Body medium in size; head smooth or a little granulated; principal sulcus placed somewhat before the middle; tibiae with unequal internal spines; wings yellowish at base darker towards outside.

Distribution : India (Karnataka, Arunachal Pradesh, Bihar, Orissa, Tamil Nadu, Uttar Pradesh).

Genus *Gastrimargus* Saussure, 188412. *Gastrimargus africanus africanus* (Saussure)

1888. *Oedaleus* (*Gastrimargus*) *marmoratus* var. *africana* Saussure, *Mem. Soc. Phys. Hist. nat. Geneve*, **30**(1) : 39.

1982. *Gastrimargus africanus africanus* : Ritchie, *Bull. Brit. Mus. Nat. Hist. (Ent.)*, **44**(4) : 248.

Material examined : 1F, Manikyadhara, 19.x.2005, coll. Rajmohana & party.

Diagnosis : Body large size; antennae as long as head and pronotum together or slightly larger; pronotum tectiform with high sharp median carina; metazoan of pronotum with X-marking usually effaced and without pale striae; wings with dark brown or black fasciae hind femora brown or blackish.

Distribution : India (Karnataka, Andhra Pradesh, Bihar, Delhi, Goa, Himachal Pradesh, Orissa, Sikkim, Uttar Pradesh, West Bengal); Nepal; Saudi Arabia; Sri Lanka; Thailand; Tibet and Yemen.

Genus *Spathosternum* Krauss, 187713. *Spathosternum pr. prasiniferum* (Walker)

1871. *Heteracris prasinifera* Walker, *Cat. Derm. Salt. Brit. Mus.*, **5** Suppl. : 65.

1936. *Spathosternum prasiniferum prasiniferum* : Tinkham, *Lingman. Sci. Journ. Canton*, **15** : 51.

Material examined : 1M, 3F, Seethabhumi, 25.x.2006, coll. Rajmohana & party; 2M, 1F, Gangadikkal shola, 23.x.2005, coll. Rajmohana & party.

Diagnosis : Body small in size; head considerably shorter than pronotum; antennae short, not reaching the posterior margin of pronotum; hind femora with a rounded genicular lobe; broad black or dark green stripe running behind the lower part of the eyes and below the lateral carinae of pronotum.

Distribution : India (Throughout), Myanmar, S.E. China, Thailand and Vietnam.

Genus *Oxya* Serville, 183114. *Oxya hyla hyla* Serville

1831. *Oxya hyla* Serville, *Ann. Sci. nat. (Zool.)*, **22** : 287.

1971. *Oxya hyla hyla* : Hollis, *Bull. Brit. Mus. nat. Hist. (Ent.)*, **26**(7) : 282.

Material examined : 2M, 3F, Kerekatte, 18.x.2005, coll. Rajmohana & party; 2F, Hanumangundy, 20.x.2005, coll. Rajmohana & party; 1M, Towergudda, 22.x.2005, coll.

Rajmohana & party; Kudremukh road, 23.x.2005, coll. Rajmohana & party; 2M, 4F, Bhagavathy Nature Camp, 24.x.2005, coll. Rajmohana & party.

Diagnosis : Body small and finely rugose, shiny; in male supraanal plate with small tubercle; cercus with subacute apex; in female subgenital plate with two longitudinal ridges extending forwards from posterior margin.

Distribution : India (Karnataka, Arunachal Pradesh, Andhra Pradesh, Assam, Bihar, Goa, Himachal Pradesh, Madhya Pradesh, Meghalaya, Orissa, Rajasthan, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal), Afghanistan, Bangladesh, Madagascar, Nepal, Pakistan, Iran and Sri Lanka.

Genus *Tristria* Stål, 1873

15. *Tristria pulvinata* (Uvarov)

1921. *Tapinophyma pulvinata* Uvarov, *Ann. Mag. nat. Hist.*, (9)7 : 497.

1970. *Tristria pulvinata* : Hollis, *J. nat. Hist.*, 4 : 465.

Material examined : 4F, 2M, Manikyadhara, 19.x.2005, coll. Rajmohana & party; 8M, 6F, Bhagavathy, 26.x.2005, coll. Rajmohana & party.

Diagnosis : Size medium; fastigium of vertex parabolic, moderately narrow, antennae filiform; prosternal tubercle curved backwards, almost square in cross section, strongly widened apically; tegmina and wings extending up to the apex of subgenital plate or shorter; male subgenital plate, almost linear in ventral view.

Distribution : India (Karnataka, Assam, Bihar, Maharashtra, Tamil Nadu, Uttar Pradesh) and Sri Lanka.

Genus *Xenocatantops* Dirsh and Uvarov, 1953

16. *Xenocatantops humilis* (Serville)

1839. *Acridium humile* Serville, *Ins. Orth.*, : 662.

1982. *Xenocatantops humilis* : Jago, *Trans. Amer. Ent. Soc.*, 108 : 450, 454.

Material examined : 6F, 2M, Bhagavathy, 24.x.2005, coll. Rajmohana & party.

Diagnosis : Body medium size, slender, frons in profile straight, moderately sloping backwards; pronotum constricted in middle; male cercus with rounded apex; pronotum and thoracic markings much lighter.

Distribution : India (Meghalaya, Arunachal Pradesh, Assam, West Bengal, Uttar Pradesh, Madhya Pradesh, Tamil Nadu, Karnataka, Kerala), Borneo, Myanmar, Java, Malaya, Nepal, New Guinea, Philippines, Sri Lanka, Sumatra, Thailand, Tibet and Yunnan.

Remarks : The species is generally found in large numbers.

Family TETTIGONIIDAE

Antennae long; hind legs long and much enlarged; tarsi four segmented; lateral auditory organs not present at base of the abdomen; tympanum when present, on fore tibia; ovipositor sickle, dagger, sword or needle shaped.

Genus *Conocephalus* Thunberg, 181517. *Conocephalus maculatus* (Le Guillou)

1840. *Xiphidion maculatum* Le Guillou, *Revue suisse Zool.*, **4** : 294.

1980. *Conocephalus maculatus* : Pitkin, *Bull. Brit. Mus. Nat. Hist. (Ent.)*, **41**(5) : 344.

Material examined : 2F, Manikyadhara, 19.x.2006, coll. Rajmohana & party; 1M, 3F, Bhagavathy, 24.x.2005, coll. Rajmohana & party; 2F, Gangamoola, 26.x.2006, coll. Rajmohana & party.

Diagnosis : Fastigium of vertex moderately wide, pronotum bispinose; tegmina pigmented with large dark spots; hind femora unarmed ventrally; ovipositor very short, relatively straight.

Distribution : India (throughout), Australia, Cameroon, Indonesia, Java, W. Malaysia, Philippines and Sierra Leone.

Genus *Ducotia* Stal, 187418. *Ducotia japonica* (Thunberg)

1815. *Locusta japonica* Thunberg, *Mem. Acad. Sci. St. Petersburg (Sci. Phys.)*, **5** : 282.

1961. *Ducotia japonica* : *Bull. Brit. Mus. Nat. Hist. (Ent.)*, **10**(5) : 182.

Material examined : 1F, Hanumangundi, 20.x.2005, coll. Rajmohana & party; 1F, Towergudda, 22.x.2005, coll. Rajmohana & party; 6M, 2F, Bhagavathy, 24.x.2005, coll. Rajmohana & party; 2M, 1F, Seethabhumi, 25.x.2005, coll. Rajmohana & party.

Diagnosis : Body medium size; tegmina less than 35 mm. in length, posterior radial sector with 5-6 branches; hindwings well developed; cerci with interno ventral ridges at apex; subgenital plate deeply bifurcate with contiguous lobes and without apical teeth.

Distribution : India (Karnataka, Arunachal Pradesh, Assam, Bihar, Jammu & Kashmir, Madhya Pradesh, Manipur, Meghalaya, Sikkim, Tamil Nadu, and West Bengal).

Genus *Elimaea* Stal19. *Elimaea securigera* Brunner

1891. *Elimaea securigera* Brunner, *Verh. Zool. Bot. Ges. Wien, Viena*, **40** : 47.

Material examined : 1M, Towergudda, 22.x.2005, coll. Rajmohana & party.

Diagnosis : Body medium size; fastigium cone shaped, poorly developed, posterior margin of pronotum semicircular; both edge of elytron straight, male subgenital plate hook-shaped with profuse tiny spines arranged inner side; ovipositor in female hook-shaped, epiproct with acute apex.

Distribution : India (Karnataka, Assam, Meghalaya, West Bengal).

Remarks : This species is recorded for the first time from Karnataka.

Family GRYLLIDAE

Big, globular head, tarsi compressed, posterior tibiae armed with spines but never serrulated between these spines.

Genus *Modicogryllus* Chopard, 1961

20. *Modicogryllus confirmatus* (Walker)

1859. *Acheta confirmatus* Walker, *Ann. Nat. Hist.*, (3)4 : 221.

1964. *Modicogryllus confirmatus* : Randell, *Can. Ent.*, 96 (12) : 1584.

Material examined : 1F, Kerekatte, 18.x.2005, coll. Rajmohana & party.

Diagnosis : Body small size; colour pale testaceous to dark-brown; pronotum transverse; in female elytra with 3 free and 4 branches of cubital in dorsal field, all are oblique and regularly distant; lateral field with less curved vein.

Distribution : India (Throughout), Myanmar, Israel, Philippines, Malaya, Nepal, Sri Lanka and Thailand.

Remarks : A very common species distributed throughout India.

Genus *Turanogryllus* Tarbinsky, 1940

21. *Turanogryllus virgulata* (Bolivar)

1900. *Grylloides virgulatus* Bolivar, *Ann. Soc. Ent. France*, 68 : 797.

1967. *Turanogryllus virgulata* : Chopard, *Orthopterorum Catalogus*, part 10 : 36.

Material examined : 1M, Kerekatte, 18.x.2005, coll. Rajmohana & party.

Diagnosis : Body size small; general colour dark; pronotum dark brown with rufous impresses, anterior margin more or less yellowish; in male elytra wide, divided behind the middle by a curved vein; 2 oblique veins.

Distribution : India (Karnataka, Tamil Nadu).

Remarks : This species is recorded for the first time from Karnataka.

Genus *Homonemobius* Chopard

22. *Homonemobius monomorphus* (Bolivar)

1900. *Nemobius monomorphus* Bolivar, *Ann. Soc. Ent. France*, : 68.

1968. *Homonemobius monomorphus*, Chopard, *Fauna of India and The Adjacent Countries, Orthoptera, Grylloidea*, : 172.

Material examined : 1M, Seethabhumi, 25.x.2005, coll. Rajmohana & party.

Diagnosis : Body size small; colour rufo-testaceous; occiput with four well marked light lines; pronotum wider than long; disc with two pale bands on the sides; elytra extended at the apex of 5th abdominal tergites.

Distribution : India (Karnataka, Tamil Nadu).

Family ENEOPTERIDAE

Head big; frontal rostrum with parallel margin; pronotum narrow in front; posterior tibiae armed with spines and serrulated both at the base and between the spines.

Genus *Euscyrtus* Guerin, 1844

23. *Euscyrtus concinnus* (Haan)

1848. *Gryllus (Eneoptera) concinnus* Hann, *Temminck Verhandel, Orth.*, : 231.

1969. *Euscyrtus concinnus* : Chopard, *Fauna of India, Grylloid*, 2 : 394.

Material examined : 1M, Towergudda, 22.x.2005, coll. Rajmohana & party.

Diagnosis : Size small; head with 4 broad brown bands; frontal rostrum as long as the first antennal joints; pronotum with 2 yellowish humeral bands; lateral lobes with a wide brown band; 9th tergite of abdomen large, hollowed in the middle; subgenital plate of male long, acute at apex; mirror with 4 oblique veins; wings caudate.

Distribution : India (Karnataka, Andaman Islands, Arunachal Pradesh, Assam, West Bengal), Asia Tropical, North Australia, Myanmar, Java, Malaya, Moluccas, Philippines, Singapore and Sri Lanka.

SUMMARY

The present paper deals with new records of 23 species and subspecies of long horned and short horned grasshoppers, grouse locusts and crickets from the Kudremukh National Park, Karnataka, India. They belong to 22 genera and 6 families.

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INSECTA ODONATA

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INTRODUCTION

Our knowledge on the odonate fauna of Western Ghats pertains to the work of Fraser (1931, 1933, 1934 & 1936), Rao and Lahiri (1983), Prasad and Varshney (1995), Emiliyamma and Radhakrishnan (2000, 2002, 2003, 2006 a & b), Mitra (2002), Prasad and Kulkarni (2002), Radhakrishnan and Emiliyamma (2003), Emiliyamma (2005), Emiliyamma *et al.* (2005), and Subramanian (2006). But for the work of Subramanian *et al.* (2005) on the impact of riparian land use affecting stream insects of Kudremukh National Park (KMNP) –a part of Western Ghats-, apparently no information is available on the odonate fauna of this Park in scientific literature.

The present study based on a representative faunal collection from KNP comprises of 32 species of Odonata (Insecta) from 21 genera under 7 families, a systematic account of which is presented below. This account forms the first authentic report on the odonate fauna of the Kudremukh National park. The specimens studies are deposited in the faunal depository of Western Ghats Field Research Station, Zoological Survey of India, Calicut.

Abbreviations :

ab	:	anal bridge
ac	:	anal crossing
cuii	:	posterior cubital vein
IA	:	1 st anal vein
Riii	:	3 rd branch of radius of wings
IRiii	:	intercalated branch of radius

SYSTEMATIC ACCOUNT

Order	ODONATA
Suborder	ZYGOPTERA
Family	COENAGRIONIDAE

1. *Aciagrion occidentale* Laidlaw
2. *Agriocnemis pieris* Laidlaw*
3. *Agriocnemis pygmaea* (Rambur)
4. *Agriocnemis splendidissima* Laidlaw*
5. *Ceriagrion coromandelianum* (Fabricius)
6. *Ceriagrion rubiae* Laidlaw*
7. *Ischnura aurora aurora* (Burmeister)
8. *Pseudagrion indicum* Fraser*♣

Family PLATYCNEMIDIDAE

9. *Copera vittata deccanensis* (Selys)* ♣

Family CHLOROCYPHIDAE

10. *Rhinocypha (Heliocypha) bisignata* (Selys)*

Family CALOPTERYGIDAE

11. *Neurobasis chinensis chinensis* Linnaeus
12. *Vestalis apicalis apicalis* Selys*
13. *Vestalis gracilis gracilis* (Rambur)
14. *Vestalis gracilis montana* Fraser*

Family EUPHAEIDAE

15. *Euphaea cardinalis* (Fraser)* ♣
16. *Euphaea fraseri* (Laidlaw)*

Suborder ANISOPTERA

Family CORDULIIDAE

17. *Macromia indica* Fraser*♣

Family LIBELLULIDAE

18. *Cratilla lineata calverti*
19. *Diplacodes trivialis* (Rambur)
20. *Epithemis mariae* (Laidlaw)* ♣
21. *Lathrecista asiatica asiatica* (Fabricius)

* Endemic to India.

♣ Restricted to Western Ghats.

22. *Neurothemis fulvia* (Drury)
23. *Neurothemis tullia tullia* (Drury)
24. *Orthetrum chrysis* Selys
25. *Orthetrum glaucum* (Brauer)
26. *Orthetrum sabina sabina* (Drury)
27. *Orthetrum pruinsum neglectum* (Rambur)
28. *Palpopleura sexmaculata sexmaculata* (Fabricius)
29. *Pantala flavescens* (Fabricius)
30. *Trithemis aurora* (Burmeister)
31. *Trithemis festiva* (Rambur)
32. *Tramea basilaris burmeisteri* Kirby

Key to the suborders of ODONATA

- 1 Forewings and hindwings of the same shape and breadth, petiolate; eyes well separated; body slender; male with two superior and two inferior anal appendages ZYGOPTERA
- Forewings and hindwings of variable shape and hindwings usually broad at base, not petiolate; eyes usually confluent across the middle line or separated (as in Gomphidae); body stout; male with two superior and one inferior anal appendage ANISOPTERA

Key to the super families of ZYGOPTERA

1. Wings with two antenodal nervures, petiolate; postnodal nervures in line with the cross veins below COENAGRIONOIDEA
- Wings with more than two antenodal nervures; slightly petiolated; postnodals not in line with the cross veins below CALOPTERYGOIDEA

Key to the families of Superfamily COENAGRIONOIDEA

- 1 Discoidal cell elongate, the costal or anterior side slightly shorter than the basal, the distal end subacute PLATYCNEMIDIDAE
- Discoidal cell short, the anterior side much shorter than the basal, the distal end very acute COENAGRIONIDAE

Key to the genera of Family COENAGRIONIDAE

- 1 Arc situated at the level of the distal antenodal nervure 2
- Arc situated away from the distal antenodal nervure *Agriocnemis* Selys

2. *ab* arising at the level of *ac*; pterostigma variable; segment 10 of male without dorsal tubercle 3
 - *ab* arising well proximal to *ac*; pterostigma different in shape and size in fore and hindwings of male; segment 10 of male with a pair of closely apposed dorsal apical tubercle
..... *Ischnura* Charpentier [*s* : *aurora aurora* (Burmeister)]
3. A prominent ridge on the frons; postocular spots absent *Ceriagrion* Selys
 - No ridge on the frons; postocular spot present 4
4. Pterostigma in forewing larger than that in the hindwing; female with an apical ventral spine on segment 8 *Aciagrion* Selys (*s* : *occidentale* Laidlaw)
 - Pterostigma in forewing and hindwing equal in size; female without apical ventral spine on segment 8 *Pseudagrion* Selys (*s* : *indicum* Fraser)

Aciagrion occidentale Laidlaw

Aciagrion hisopa Selys, race *occidentale* Laidlaw, 1919, *Rec. Indian Mus.*, **16** : 186.

Aciagrion occidentalis, Fraser, 1923 *J. Bombay nat. Hist. Soc.*, **29** : 749.

Aciagrion occidentale, Fraser, 1933, *Fauna Brit. India Odon.*, **1** : 335 – 337.

Material examined : 1 female, 20-x-2005, Hanumanagundi; 1 male, 1 female, 25-x-2005, Seethabhumi; 1 female, 23-x-2005, Kudremukh road, Coll. K. Rajmohana and party.

Diagnosis : A very small and slender damselfly; colour blue with black markings on head, thorax and abdomen; pterostigma in forewing nearly double the size of that of hindwing. **Male** : abdominal segment 8 with a small black triangular dorsal mark; segment 10 with a small 'X' shaped black mark. **Female** : more robust than male, segment 8 with broad and evenly wide dorsal marking, a ventral spine on apical border present; segment 10 entirely blue.

Distribution : Maharashtra, Madhya Pradesh, Orissa, South India and Sri Lanka.

Key to the species of genus *Agriocnemis* Selys

- 1 Labrum metallic blue *pygmaea* (Rambur)
 - Labrum non-metallic 2
2. Thorax with pink antehumeral stripes; abdomen pale blue, marked with black, segment 2 of abdomen with an anchor shaped dorsal marking *peris* Laidlaw
 - Thorax with blue or pink antehumeral stripes; abdomen dark blue, with broad black marking, segment 2 of abdomen with a thistle-head shaped marking
..... *splendidissima* Laidlaw

Agriocnemis pieris Laidlaw

Agriocnemis pieris Laidlaw, 1919, *Rec. Indian Mus.*, **16** : 179-180.

Agriocnemis pieris Fraser, 1923, *J. Bombay nat. Hist. Soc.*, **29** : 747.

Agriocnemis pieris Fraser, 1924, *Rec. Indian Mus.*, **26** : 490.

Material examined : 1 male, Near Kudremukh Iron Ore Company Limited (KIOCL), 24-x-2005, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Thorax with pink coloured antehumeral stripes; abdomen pale blue, marked with black, segment 2 of abdomen with an anchor shaped dorsal marking; pterostigma of wings pale yellow or pink with the center black or gray enclosed in thick black nervures. **Female** : More robust than male, wings with pterostigma golden yellow, suffused with gray at the center; abdomen broadly marked with black on dorsum from segments 1 to 9.

Distribution : Eastern India, Maharashtra and South India.

Agriocnemis pygmaea (Rambur)

Agrion pygmaeum Rambur, 1842, *Ins. Nevro.*, : 278. Brauer

Agriocnemis pygmaea Selys, 1877, *Syn. Agr. 5me Legion : Agrion* (suite fin), : 52; Fraser, 1933, *Fauna Brit. India Odon*, **1** : 398-401.

Material examined : 2 exs (with damaged anal appendages), 22-x-2005, Towergudda; 3 males, 2 females, 25-x-2005, Seethabhumi, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Labrum metallic blue; thorax black on dorsum, marked with narrow antehumeral apple-green stripes, laterally apple green, pale yellow below; wings with pterostigma pale yellow in the fore wings, black in the hindwings; abdominal segments 1 to 7 pale greenish yellow marked with bronzed black; anal appendages brick red; superiors longer than inferiors. **Female** : more robust than male and exhibiting a number of polychromatic forms depending on the age of specimens.

Distribution : Throughout the Oriental Region, Australia and Pacific Islands.

Agriocnemis splendidissima Laidlaw

Agriocnemis splendidissima Laidlaw, 1919, *Rec. Indian Mus.*, **16** : 180-182; Fraser, 1933, *Fauna Brit. India Odon.*, **1** : 392-394.

Material examined : 3males, 24-x-2005, Near KIOCL, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Labrum non metallic, pale blue; thorax black, marked with narrow blue or pink antehumeral stripes; laterally blue with a small black spot on the postero lateral

suture; abdomen blue, marked with black; segment 2 with a broad thistle shaped mark; segments 8 to 10 black, with small basal lateral blue spots on 8 and 9; the sides of all segments blue; anal appendages black, blue internally, as long as segment 10. **Female** : Closely similar to the male, but more robust, the differences being : labrum pale green; thorax black on dorsum, bordered with pale brownish to bluish green on the sides; abdominal segment 2 with much narrower thistle shaped spot.

Distribution : Throughout India.

Key to the species of *Ceriagrion* Selys

- 1 Abdomen bright citron yellow, without markings *coromandelianum* (Fabricius)
- Abdomen bright reddish orange, without markings in male; olivaceous in female
..... *rubiae* Laidlaw

Ceriagrion coromandelianum (Fabricius)

Agrion coromandelianum Fabricius, 1798, *Ent. Syst. Suppl.*, : 287.

Ceriagrion coromandelianum Selys, 1876, *Bull. Acad. Belg.*, (2) 42 : 528; Fraser, 1933, *Fauna Brit. India Odon.*, 1 : 315-316.

Material examined : 1 female, 20-x-2005, Hanumanagundi; 1 female, 21-x-2005, Muduba, Coll. K. Rajmohana & party.

Diagnosis : **Male** : Thorax uniformly olive-green, tinted with ochreous on dorsum, citron-yellow on sides, wings hyaline, pterostigma golden yellow; abdomen bright citron yellow, without markings; **Female** : more robust and dull coloured than male; prothorax and thorax golden olivaceous brown; abdomen uniformly olivaceous, with golden brown tint on dorsum, which deepens on the hinder segments.

Distribution : Oriental region.

Ceriagrion rubiae Laidlaw

Ceriagrion rubiae Laidlaw, 1916, *Rec. Indian. Mus.* 12 : 132-133; Fraser, 1933, *Fauna Brit. India Odon.*, 1 : 318-319.

Material examined : 2 females, 25-x-2005, Seethabhumi, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Thorax bright orange, pale yellow on the sides and beneath; abdomen rich orange or with a vermillion tint on dorsum, pale yellow beneath; anal appendages reddish brown. **Female** : more robust than the male, the reddish or orange colour replaced by olivaceous; thorax olivaceous, pruinose white beneath; abdomen olivaceous, the underside of 1st and 2nd segments pruinose white, other characters are similar to that of male.

Distribution : Orissa and Western Ghats.

***Ischnura aurora aurora* (Burmeister)**

Agrion delicatum Hagen, 1858, *Verh. Zool.-bot. Ges. Wien*, **8** : 479.

Agrion aurora Brauer, 1865, *Verh. Zool.-bot. Ges. Wien*, **15** : 510.

Ischnura delicata Fraser, 1933, *Fauna Brit. India. Odon.*, **1** : 360-362.

Ischnura aurora Ris, 1915, *Nova Caledonia, Zool.*, **2(4)** : 67.

Ischnura aurora aurora Tsuda, 1991, *A distributional list of World Odonata*, : 34.

Material examined : 1 male, 25-x-2005, Seethabhumi; 3 males, 27-x-2005, Kudremukh road, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Wings hyaline, pterostigma larger in the fore wing, kite shaped, rose red for its proximal half, hyaline for the distal; in hindwing, much smaller, pale grey, enclosed in black nervures; abdomen citron yellow; segments 8 to 10 azure blue; **Female** : stouter than male; pterostigma pale pink, shape and size similar to that of the male; abdomen with a broad black dorsal stripe extending the whole length, but interrupted by narrow yellow annules; the sides broadly yellow, pale greenish beneath.

Distribution : Oriental Region.

***Pseudagrion indicum* Fraser**

Pseudagrion indicum Fraser, 1924, *Rec. Indian Mus.*, **26** : 428, 495-497, fig.3.

Material examined : 1 male, 18-x-2005, Kerekatte, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Vertex and occiput black, with large azure blue postocular spots; thorax green on dorsum, marked with medial and humeral black stripes, azure blue laterally with black stripes; abdomen azure blue on segments 1, 2, and basal half of 3; 3 to 7 greenish laterally; 8 to 10 azure blue with black markings; segment 2 with goblet shaped black mark; 3 to 7 with broad black marking, 8 and 9 with bifid or crenate shaped black mark. **Female** : vertex and occiput tinted with golden yellow, postocular spots pale green, thorax green on dorsum, pale yellowish green on sides with three fine black lines along with mid dorsal carina; ground colour of abdomen similar to that of male, markings on segments broad, segment 2 with thistle shaped black mark.

Distribution : Tamil Nadu and Western Ghats.

Family PLATYCNEMIDIDAE**Diagnostic characters of the genus *Copera* Kirby**

Discoidal cell elongate, the costal or anterior side slightly shorter than the basal, the distal end subacute; two hind pairs of tibiae bright citron yellow, very slightly dilated; superior

anal appendages at least half the length of inferiors; posterior lobe of prothorax of female with a pair of divergent, slender and forwardly directed spines.

***Copera vittata deccanensis* Laidlaw**

Psilocnemis vittata Selys, 1863, *Bull. Acad. Belg.*, 16 : 170.

Copera vittata Kirby, 1890, *Cat. Odon.* : 129.

Copera vittata deccanensis Laidlaw, 1923, *Rec. Indian Mus.*, 13 : 322, 337-339; Fraser, 1923, *J. Bombay nat. Hist. Soc.*, 29 : 744.

Material examined : 3 males, 18-x-2005, Kerekatte; 3 males, 25-x-2005, Seethabhumi; 1 male, 26-x-2005, Gangadikkal, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Legs bright citron yellow, the two posterior pairs of tibiae very slightly dilated; anal appendages pale blue or creamy white; superior anal appendages at least half the length of inferiors. **Female** : legs yellow, all femora marked with small spots, like beaded band, on extensor surface; posterior lobe of prothorax with a pair of divergent, forwardly directed spines.

Distribution : Western Ghats.

Key to the Families of Superfamily CALOPTERYGOIDEA

- 1 Wings petiolated, ending proximal to ac; epistome tumid and projecting like a nose in front of face; abdomen shorter than wings CHLOROCYPHIDAE
- Wings not petiolated; epistome normal; abdomen longer than wings 2
2. Sectors of arc arising from the middle or above middle of arc; basal space (median space) entire; discoidal cell straight and shorter than median space Euphaeidae
- Sectors of arc arising from lower third of arc; basal space traversed or entire; discoidal cell convex costal wards and as long as median space CALOPTERYGIDAE

Family CHLOROCYPHIDAE

Diagnostic characters of the genus *Rhinocypha* Rambur

Sectors of arc separated at origin; mesothoracic triangle present, pink in colour; tips of forewings in male opaque black as far as inner end of pterostigma; apical third of hindwing black with a single row of vitreous spots.

***Rhinocypha bisignata* (Selys)**

Rhinocypha bisignata Selys, 1853, *Syn. Cal.* 62; Kirby, 1890, *Cat. Odon.*, : 113; Laidlaw, 1917, *Rec. Indian Mus.*, 13 : 38; Fraser, 1922, *Mem. Dept. Agric. India (Ent.)*, 7 : 80–81.

Material examined : 1 male, 20-x-2005, Hanumanagundi, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Thorax black; mesothoracic triangle large and pink coloured; bases of all wings tinted with yellow, opaque blackish brown in apical area only; forewings with outer fourth or more opaque with brilliant coppery colouration; hindwing with apical third opaque, and marked with two series coppery or violaceous vitreous spots; pterostigma black in all wings; abdomen black, marked with yellow. **Female** : mesothoracic triangle black, finely outlined in yellow; wings entirely hyaline, tinted palely with yellow, apices narrowly enfumed; pterostigma black, with pale creamy center; abdomen black, marked with yellow as in male, but rather extensively.

Distribution : Eastern India and Peninsular India.

Key to the Genera of Family Calopterygidae

1. Arc angulated; basal space traversed; sectors of arc separated at origin, main sectors not forked; forewings of both sexes hyaline, hindwings opaque; pterostigma absent in male, false or absent in female *Neurobasis* Selys. (s : *chinensis chinensis* Linnaeus)
- Arc oblique, not angulated; basal space entire; sectors of arc arising from a single point, most main sectors forked; pterostigma absent *Vestalis* Selys

Neurobasis chinensis chinensis Linnaeus

Libellula chinensis Linnaeus, 1758, *Syst. Nat.*, 10 : 545; Edwards, 1750, *Nat. Hist. Birds*, 3 : Fig.112; *Calopteryx chinensis*, Rambur, 1842, *Ins. Nevro* : 226; *Neurobasis chinensis* Kirby, 1890, *Cat. Odon.* : 102; Fraser, 1924, *Rec. Indian Mus.*, 26 : 428, 479; Fraser, 1934, *Fauna Brit. India Odon.*, 2 : 121-124.

Material examined : 1 male, 19-x-2005, Road to Manikyadhara, Coll. K. Rajmohana and party.

Diagnosis : **Male** : A brilliant metallic green or blue damselfly; forewings hyaline, tinted with pale yellowish green, neuration brilliant emerald green; hindwings opaque, basal two third brilliant metallic green or peacock blue, apical third blackish brown with violet reflections and green metallic nervures; pterostigma absent in all wings. **Female** : Brilliant metallic green or blue; wings tinted with yellow, palely enfumed with brown at apices and along costa in forewings and deeper in tint throughout the whole of hindwings, all wings with an opaque creamy yellow patch at node, a creamy white pterostigma in hindwings, reduced or entirely absent in forewings.

Distribution : Oriental region.

Key to the species of Genus *Vestalis* Selys

1. Tips of wings black *apicalis apicalis* Selys
- Tips of wings hyaline 2

2. Two rows of cells between origins of Cuii and IA *gracilis gracilis* (Rambur)
 – Only a single row of cells between Cuii and IA *gracilis montana* Fraser

***Vestalis apicalis apicalis* Selys**

Vestalis apicalis Selys, 1873, Bull. Acad. Belg., (2) 36 : 612;

Vestalis apicalis apicalis Fraser, 1934, Fauna Brit. India Odon., 2 : 128-130.

Material examined : 1 male, 18-x-2005, Kerekatte, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Labrum, labium, bases of mandibles, cheeks, anteclypeus, two basal segments of antennae and an oblique oval spot on frons bright yellow, rest of head metallic emerald green; thorax and abdomen metallic green; wings hyaline, apices of all wings broadly tipped with blackish brown. **Female** : closely similar to male; labrum usually with a basal line in continuation with the medio-basal black spot; wings with the apical marking usually pale and less sharply defined; abdomen more coppery and less metallic than in male.

Distribution : Eastern Ghats, North East India and Western Ghats.

***Vestalis gracilis gracilis* (Rambur)**

Calopteryx gracilis Rambur, 1842, Ins. Nevro : 224; *Vestalis gracilis* Selys & Hagen 1854, Mem. Soc. Sci. Liege, 9 : 84. *Vestalis gracilis gracilis* Fraser, 1934, Fauna Brit. India Odon., 2 : 126-128.

Material examined : 1 female, 18-x-2005, Kerekatte; 1 male, 21-x-2005, Muduba, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Metallic blue or green coloured damselfly; wings hyaline, iridescent with colours of mother of pearl or blue in some lights, especially in the central part of forewings, the whole of hindwings uniformly tinted variably with greenish yellow; two rows of cells between *Cuii* and *IA*; abdomen metallic green or blue, usually peacock-blue in teneral specimens, emerald green when mature. **Female** : exactly similar to male in colour and markings, but abdomen usually duller metallic and segments 8-10 yellow laterally.

Distribution : Oriental Region.

***Vestalis gracilis montana* Fraser**

Vestalis gracilis amoena Fraser, 1929, J. Bombay nat. Hist. Soc. 33 : 583.

Vestalis gracilis montana Fraser, 1934, Fauna Brit. India Odon, 2 : 128.

Material examined : 1 female, 25-x-2005, Seethabhumi, Coll. K. Rajmohana and party.

Diagnosis : Male and Female : Colour and markings exactly similar to *V. gracilis gracilis*, but the venational character is different, only a single row of cell between *Cuii* and *IA* nervure in hindwing; altogether, this subspecies is smaller than *V. gracilis gracilis*.

Distribution : Arunachal Pradesh and South India.

Family EUPHAEIDAE

Diagnostic characters of the genus *Euphaea* Selys

Tenth abdominal segment with one dorsal spine; hindwings of male shorter than forewings and markedly rounded at tips; the apical half or less of hindwing opaque black and bearing a brilliant metallic blue spot; abdomen in some species bright red, otherwise black.

Key to the species of *Euphaea* Selys

1. Hindwings conspicuously shorter than forewings; antehumeral stripes on thorax bright azure blue; labrum azure blue *fraseri* (Laidlaw)
- Hindwings only slightly shorter than forewings; antehumeral stripes on thorax ochreous; labrum and cheeks bright ochreous *cardinalis* (Fraser)

Euphaea cardinalis (Fraser)

Pseudophaea cardinalis Fraser, 1924, *Rec. Indian Mus.*, **26** : 512-513.

Indophaea cardinalis Fraser, 1929, *J. Bombay nat. Hist. Soc.*, **33** : 295-296.

Material examined : 1 male, 20-x-2005, Hanumanagundi, Coll. K. Rajmohana and party.

Diagnosis : Male : Labrum bright ochreous with a dark brown mediobasal tongue; thorax bright reddish ochreous and black; antehumeral and humeral stripe ochreous; legs entirely reddish; hindwing only slightly shorter than forewing, forewings hyaline, tinted with yellow at extreme base; hindwings with apical half black; abdomen bright vermilion red as far as the basal two third of segment 6, the remaining segments black. **Female :** Labrum coloured similarly to male; thorax bright yellow, marked with black; legs blackish brown; wings hyaline, evenly enfumed with pale greenish brown, hindwings more deeply than forewings and apices dark brown; abdomen black, marked with yellow.

Distribution : Eastern and Southern India.

Euphaea fraseri (Laidlaw)

Pseudophaea fraseri Laidlaw, 1920, *Rec. Indian Mus.*, **21** : 23-27

Indophaea fraseri Fraser, 1929, *J. Bombay nat. Hist. Soc.*, **33** : 296-298.

Material examined : 1 male, 1 female, 19-x-2005, Road to Manikyadhara; 2 males, 21-x-2005, Muduba, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Labrum pale azure blue, with its anterior border broadly black; thorax black, antehumeral stripe bright azure blue; legs bright red, anterior pair reddish brown to black; wings hyaline, palely enfumed with greenish brown; hindwing markedly shorter than forewing and with outer part opaque black, with coppery reflection above and bluish violet below; forewings hyaline, extreme tips brown; abdomen bright vermilion red from segment 1 to 6; segment 7 to 10 black. **Female** : Labrum as in male; thorax black on dorsum, bright yellow on the sides, marked as in male; legs yellow, femora blackish on extensor surface; wings hyaline, palely enfumed, in many specimens the tips of both wings dark brown; abdomen black, marked with bright greenish yellow.

Distribution : South India.

Suborder ANISOPTERA

Key to the families of ANISOPTERA

1. Eyes with a small sinuous projection at the middle of the posterior border; usually the base of hindwing of male strongly angulated; thorax metallic green or blue in colour; tibiae of male with a long membranous keel on the flexor surface CORDULIIDAE
- Eyes without a projection at the posterior border; base of hindwing in both sexes always rounded; thorax rarely metallic coloured; tibiae of male without a membranous keel on flexor surface LIBELLULIDAE

Family CORDULIIDAE

Diagnostic characters of the genus *Macromia* Rambur

The second space from anterior border of wing, immediately distal to node, without a long space free of traversing nervures; humeral or antehumeral stripe absent on thorax, two short, dark, reddish brown rays at the bases of wings in both sexes; abdominal segments 3 to 6 with mid dorsal yellow rings; segment 8 with a well-defined yellow spot; 9 and 10 unmarked.

Macromia indica Fraser

(Plate- IV, Fig. 3)

Macromia indica Fraser, 1924, *Rec. Ind. Mus.*, 26 : 427, 447- 449, pl.25, fig.5. Needham, 1932, *Rec. Ind. Mus.*, 34 : 211-212.

Material examined : 2 females, 18-x-2005, Kerekatte, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Thorax dark metallic blue at sides and upper part of dorsum, dark reddish brown at lower part of dorsum; humeral or antehumeral stripe absent on thorax or only a vestige of same; wings with a dark reddish brown ray at base in hindwing; vestigial in the fore wing; abdomen black, with bright and broad yellow annules; segment 10 with a strong mid dorsal keel and a robust spine. **Female** : thorax same as in male; wings with dark reddish brown rays at costal, subcostal and extending into the median space; abdomen with very broad bright citron yellow annules on segments 2 to 8.

Distribution : Western Ghats.

Key to the genera of Family LIBELLULIDAE

1. Distal antenodal nervure in forewing complete 2
 - Distal antenodal nervure in forewing incomplete 3
2. Small size, posterior lobe of prothorax small, without long hairs; 1 cubital nervure in forewings, 2 or 3 in the hindwings; abdominal segments red at the base; costal side of discoidal cell angulated in forewing; anal loop short, made up of 6 cells *Epithemis* Laidlaw [s : *mariae* (Laidlaw)]
 - Large size, posterior lobe of prothorax large and fringed with long hairs; 1 cubital nervure in all wings, abdominal segments never read; costal side of discoidal cell never angulated; anal loop made up of more than 10 cells *Orthetrum* Newman
3. Posterior lobe of prothorax large and fringed with long hairs 4
 - Posterior lobe of prothorax small, without long hairs 5
4. Frons non-metallic above; costal border of forewing straight; Cuii in hindwing widely separated from posterior angle of discoidal cell; wings hyaline *Diplacodes* Kirby [s : *trivialis* (Rambur)]
 - Frons metallic above; costal border of forewing sinuous near base; Cuii in hindwing arising from the posterior angle of discoidal cell; wings with black and yellow bands *Palpopleura* Rambur [s : *sexmaculata sexmaculata* (Fabricius)]
5. Upper surface of frons metallic blue; frons angulated with a crest; node situated near pterostigma of the wings 6
 - Upper surface of frons non-metallic; frons not angulated, with or without crest; node situated near the base of wings 7
6. Distal antenodal nervure incomplete; abdomen bright red *Lathrecista* Kirby [s : *asiatica asiatica* (Fabricius)]

- Distal antenodal nervure complete; abdomen black, marked with bright yellow *Cratilla* Kirby [s : *lineata* Brauer]
- 7. Pterostigma unequal in size, small in hindwing than that of forewing 8
- Pterostigma equal size in fore and hindwings 9
- 8. Wings with two large black spots at base of hindwing surrounded by a golden yellow areola, neuration in this dark area bright yellow; cells at base of hindwing arranged into straight rows of closely packed narrow cells; genitalia of male projecting outside *Tramea* Hagen [s : *basilaris burmeisteri* Kirby]
- Wings hyaline, without black spots; cells at base of hindwing not arranged into straight rows; genitalia of male not projected outside .. *Pantala* Hagen [s : *flavescens* (Fabricius)]
- 9. Only 1 cubital nervure in all wings; sectors of arc with long fusion; beneath thorax yellowish green, marked with a black square with an angular black line crossing it *Trithemis* Brauer
- Several cubital nervures in forewing, 1 or more in the hindwing; sectors of arc with short fusion in forewing, a long fusion in the hindwing; beneath thorax without square mark ... *Neurothemis* Brauer

Cratilla lineata Brauer

Orthemis lineata Brauer, 1868, *Sitzungsber. Akad. Wien*, vol. 77 : 9.

Cratilla lineata Forster, 1903, *Ann. Mus. Hunger* : 537; Fraser 1936, *Fauna Brit. India Odon.*, 3 : 286-288.

Material examined : 1 female, 23-x-2005, Kudremukh road, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Upper surface of frons dark metallic blue or green; thorax steely or bronzed black, non-metallic, marked with yellow; abdomen black, marked with bright ochreous. **Female** : closely similar to male, but abdomen relatively shorter and more robust.

Distribution : Oriental Region.

Diplacodes trivialis (Rambur)

Libellula trivialis Rambur, 1842, *Ins. Nevro* : 115.

Diplacodes trivialis Karsch, 1891, *Ent. Nachr.* 17 : 246; Fraser, 1936, *Fauna Brit. India Odon.*, 3 : 336-338.

Material examined : 1 male, 2 females, 18-x-2005, Kerekatte, Coll. K. Rajmohana and party.

Diagnosis : Male : Adults : labrum and mandibles creamy yellow; face, frons and vesicle azure blue with a fine black line at base of frons; the whole thorax pruinose blue; legs, black marked with yellow; wings hyaline, a minute yellow point in cubital space of hindwing; abdomen pruinose blue; segments 7 to 10 black; anal appendage creamy white. **Female and sub adult male :** thorax greenish-yellow or olivaceous with sutures fine black, the area between middorsal carina and humeral sutures brown, marked with small black dots; legs greenish-yellow marked with black; abdomen greenish yellow with fine black sutures and broad mid dorsal and subdorsal stripes on segments 1 to 10; anal appendage creamy yellow.

Distribution : Oriental Region and Pacific Islands.

***Epithemis mariae* (Laidlaw)**
(Plate- IV, Fig. 2)

Amphithemis mariae Laidlaw, 1915, *Rec. Indian Mus.*, **11** : 337-339.

Material examined : 1 male, 21-x-2005, Muduba, Coll. K. Rajmohana and party.

Diagnosis : Male : Upper surface of frons and vesicle brilliant metallic bluish green; wings hyaline, extreme base tinted with amber yellow; discoidal field beginning with a single row of cells; abdomen with segments 1,2 and greater part of segment 3 ruby red, apical border of 3 and rest of abdomen black. **Female :** Frons similar to the male; wings hyaline, bases of both fore and hindwings deep amber yellow; abdominal segments 1 to 3 golden yellow, with sutures fine black; segments of 4 to 8 with bright yellow basal annules; remaining segments black.

Distribution : Western Ghats.

***Lathrecista asiatica asiatica* (Fabricius)**

Libellula asiatica Fabricius, 1798, *Ent. Syst., Suppl.*, : 283.

Lathrecista asiatica asiatica Ris, 1909, *Cat. Coll. Selys*, fasc., **9** : 129-132; Fraser, 1918, *J. Bombay nat. Hist. Soc.*, **26** : 147-149, fig. 20-22.

Material examined : 1 male, 20-x-2005, Hanumanagundi, Coll. K. Rajmohana and party.

Diagnosis : Male : Upper surface of frons metallic blue-black; thorax dark coppery-brown on dorsum, bright yellow laterally; dorsum in sub adults bright coppery brown with a pair of parallel yellow stripes, laterally two black 'Y' shaped stripes; wings hyaline with apices usually enfumed; abdomen red with fine black and yellow stripes; segments 3 to 8 bright crimson red; segments 9 and 10 black. **Female :** Resembles the male closely, except for the colour of abdomen, which is rich olivaceous-brown; mid dorsal greenish yellow stripe present on segments 1 to 8; in andromorph females, the abdomen is red as in male.

Distribution : Oriental Region.

Key to the species of Genus *Neurothemis* Brauer

1. Bases of wings in male broadly black, the black area is bordering with an opalescent white band; in female the tips of wings black with sickle shaped stripe on basal half of wings ..
..... *tullia tullia* (Drury)
- Wings dark reddish brown from base to about middle of pterostigma, tips of wings also narrowly reddish brown to partly enclosing a clear and uncoloured area *fulvia* (Drury)

Neurothemis fulvia (Drury)

Libellula fulvia Drury, 1773, III. Exot. Ins., : 2 : 84 – 85.

Neurothemis fulvia Kirby, 1889, Trans. Zool. Soc. Lond. 12 : 271; Fraser, 1936, Fauna Brit. India Odon., 3 : 353-354.

Material examined : 1 female, 18-x-2005, Kerekatte; 2 females, 21-x-2005, Muduba; 1 male, 25-x-2005, Seethabhumi; 1 female, 22-x-2005, Towergudda, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Wings broadly dark reddish-brown from base to about middle of pterostigma, apex of wings also narrowly opaque brown to partly enclose a clear window in each wing at tips; neurulation very close; the whole of the dark area very finely and closely reticulated by bright yellow nervures, except in the clear spaces. **Female** : many forms of females are found, varying from complete isochrome to several different types of heterochromes.

Distribution : Oriental Region.

Neurothemis tullia tullia (Drury)

Libellula tullia Drury, 1773, III. Exot. Ins., 2 : 85.

Neurothemis tullia Kirby, 1890, Cat. Odon., : 8

Neurothemis tullia tullia Ris, 1911, Cat. Coll. Selys. fasc., 13 : 551; Fraser, 1936, Fauna Brit. India Odon., 3 : 360-362.

Material examined : 1 male, 1 female, 21-x-2005, Muduba, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Bases of all wings bluish black, which is bordered outwardly with a milky white band; and transparent at the tips; abdomen black, with a creamy white stripe on segments 1 to 8. **Female** : Differs significantly from the male both in colouration and markings; bases of all wings bright amber-yellow; subcostal space blackish brown; a very large blackish-brown spot at node, which is variably shaped, i.e. round, oval or triangular shape in fore-wing, irregular or curved like a sickle in the hind; tips of all wings opaque blackish-brown; the area between these two opaque parts and costa with pale yellow neurulation.

Distribution : Oriental Region.

Key to the species of genus *Orthetrum* Newman

1. Males coloured some shade of red 2
- Males coloured brown or black with yellow markings; often pruinose 3
2. Males bright red, never pruinose; frons bright scarlet red; abdomen bright blood red; lamina of male genitalia with a tuft of stiff black bristles *chrysis* Selys
- Male violaceous red, due to the pruinescence; frons bluish black; abdomen purplish red; lamina of male genitalia without bristles *pruinose neglectum* (Rambur)
3. Abdomen enormously swollen at base and then abruptly slimmed and compressed laterally to the end; black marked with greenish yellow, not pruinose; face and frons yellow
..... *sabina sabina* (Drury)
- Abdomen variable, but never slim or compressed; face and frons black; abdomen and thorax pruinose; abdomen pruinose blue from segment 1 to apical end of segment 8. *glaucum* (Brauer)

***Orthetrum chrysis* Selys**

Libella testacea race? *chrysis* Selys, 1891, *Ann. Mus. Civ. Genova*, **30** : 462.

Orthetrum chrysis Ris, 1900, *Archivfur Natur*, 186; Fraser, 1936, *Fauna Brit. India Odon.*, **3** : 310-311.

Material examined : 1 male, 18-x-2005, Kerekatte, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Bright red; eyes red during life; labium, labrum, face and frons yellowish or pale brown; frons bright scarlet red; thorax dark ferruginous; wings hyaline, with a dark golden-amber coloured spot at base of hindwing; abdomen bright blood-red; lamina of male genitalia with a tuft of stiff black bristles. **Female** : the red colour replaced by bright ochreous throughout; wings without any vestige of yellow basal marking.

Distribution : Oriental Region.

***Orthetrum glaucum* (Brauer)**

Libellula glauca Brauer, 1865, *Verh. zool.- bot. Ges. Wien*, **15** : 1012.

Orthetrum glaucum Kirby, 1890, *Cat. Odon.* : 39; Fraser, 1936, *Fauna Brit. India Odon.*, **3** : 307-308.

Material examined : 2 males, 22-x-2005, Towergudda, Coll. K. Rajmohana and party.

Diagnosis : **Male** : **Adults** : labium, labrum, face and frons glossy black; thorax pruinose dark blue or black; wings hyaline, with extreme base tinted with dark amber yellow, the whole wing suffused evenly with brown in old adults; abdomen ventro dorsally dilated at

segments 1 to 3, then very slim and of even width to the end, pruinose dirty blue from segment 1 to 8, 9 and 10 black. **Subadults Male and Female** : labium, labrum, and face pale olivaceous brown; thorax olivaceous on mid dorsum, bordered by reddish brown humeral stripe; laterally warm reddish brown with two yellowish white narrow stripes; wings similar to male; abdomen reddish brown with a broad greenish yellow stripe on mid dorsum extending from segment 1 to 7; segments 8, 9 and bases of 10 black on mid dorsum.

Distribution : Oriental Region.

***Orthetrum sabina sabina* (Drury)**

Libellula sabina Drury, 1770, *III. Exot. Ins.*, 1 : 114 -115.

Orthetrum sabina Kirby, 1889, *Trans. Zool. soc. Lond.* 12 : 302; Fraser, 1936, *Fauna Brit. India Odon.*, 3 : 300-302.

Material examined : 1 male, 18-x-2005, Kerekatte; 1 male, 19-x-2005, Manikyadhara, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Thorax and abdomen greenish yellow, marked with black; abdominal segments 1 to 3 extremely swollen dorso ventrally as well as laterally; segments 4 to 6 very narrow, cylindrical, segments 7 to 9 dilated but compressed laterally; segment 10 very small; anal appendage creamy white in colour. **Female** : exactly similar to the male both in colour and the remarkable shape of abdomen.

Distribution : Widely distributed in Ethiopian, Oriental and Australian region and throughout Indian subcontinent.

***Orthetrum pruinatum neglectum* (Rambur)**

Libellula neglecta Rambur, 1842, *Ins. Nevro* : 86.

Orthetrum pruinatum neglectum Ris, 1909, *Cat. coll. Selys, fasc.*, 9 : 181, 239-240; Fraser, 1936, *Fauna Brit. India Odon.*, 3 : 311-313.

Material examined : 2 males, 19-x-2005, Manikyadhara, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Violaceous red due to a thin overlying pruinescence; thorax reddish-brown to dull purple according to pruinescence present; wings hyaline, suffused pale brown towards tips in old adults and with a reddish-brown basal marking in hindwing; abdomen bright vermilion red in sub adults; purplish red in adults due to pruinescence. **Female** : dull ochreous; thorax reddish brown or dull ochreous, with brown antehumeral stripe on each side; never pruinose; wings similar to male, but the basal marking paler and almost obsolete; abdomen dull ochreous with all stripes and sutures black, sides of segment 8 dilated and broadly black.

Distribution : Oriental Region.

***Palpopleura sexmaculata sexmaculata* (Fabricius)**

Libellula sexmaculata Fabricius, 1787, *Mant. Ins.*, **1** : 338.

Palpopleura sexmaculata Brauer, 1868, *Verh. zool.-bot. Ges. Wien*, **18** : 716.

Palpopleura sexmaculata sexmaculata Farser, 1936, *Fauna Brit. India Odon.*, **3** : 318-320.

Material examined : 1 female, 22-x-2005, Towergudda, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Frons and vesicle brilliant metallic blue; wings with a black spot at node near the pterostigma in forewing; a black stripe in costal and sub costal space; another stripe between sectors of arc, and a third stripe in cubital space; hindwings usually tinted with yellow from base to proximal end of pterostigma; stripes present only in the sub costal space; stripes on costal space and the intersector area are absent; these stripes very variable according to locality; pterostigma black and center marked with white in adults; abdomen pruinose blue, sides of segments 1, 2 and base of 3 yellow. **Teneral, subadult male and Female** : Frons non-metallic; wings more broadly marked with blackish brown and black and more deeply tinted with amber yellow; neurulation in dark areas golden yellow; pterostigma as in male; abdomen bright ochreous with ventral borders and sutures finely black and with a mid dorsal stripe of black, extending from segment 3 to 10.

Distribution : Oriental Region.

***Pantala flavescens* (Fabricius)**

Libellula flavescens Fabricius, 1798, *Ent. Syst. Suppl.*, : 285.

Pantala flavescens Hagen, 1861, *Syn. Neur. N. Amer.*, : 142; Fraser, 1936, *Fauna Brit. India Odon.*, **3** : 414-416.

Material examined : 2 males, 18-x-2005, Kerekatte; 1 female, 20-x-2005, Bhagavathi camp, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Frons bright golden yellow; thorax olivaceous or ferruginous, covered with yellowish soft, hairs, pale bluish green or greenish white laterally; wings hyaline, the base of hind-wing pale golden yellow with a narrow apical brown spot to the posterior border of wing; pterostigma reddish brown, short and unequal in fore and hindwings; membrane white; *IRiii* and *Riii* extremely sinuous or wavy in their length; abdomen bright ochreous, dorsum tinted with bright brick red, segments 3 to 10 with sharply defined black mid dorsal pyriform spots. **Female** : Similar to the male, but differs in the following characters : wings often evenly and more or less deeply smoky brown and always without the apical brown spot; abdomen without red colour on dorsum.

Distribution : Widely and commonly distributed throughout the tropics.

Key to the species of Genus *Trithemis* Brauer

1. Thorax and abdomen violaceous crimson coloured; base of wings with a broad amber yellow band, with dark yellowish brown rays in subcostal and cubital spaces; neuration crimson *aurora* (Burmeister)
- Thorax and abdomen violaceous black; base of hindwing with a dark brown spot with dark rays in subcostal and cubital spaces; neuration black *festiva* (Rambur)

Trithemis aurora (Burmeister)

Libellula aurora Burmeister, 1839, *Handb. Ent.*, 2 : 859.

Trithemis aurora Brauer, 1868, *Verh. zool.-bot. Ges. Wien.*, 18 : 177, 735; Fraser, 1936, *Fauna Brit. India Odon.*, 3 : 383-385.

Material examined : 1 male, 25-x-2005, Seethabhumi, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Eyes crimson above; vesicle and upper surface of frons metallic violet; thorax dull purple; wings hyaline, with crimson reticulation and a broad amber yellow spot at base of wings, with darker brown rays in subcostal and cubital spaces, neuration crimson; abdomen crimson violet with black mark on the base of 10. **Female** : eyes purplish brown above, lilaceous or gray below; vesicle and frons non metallic; thorax pale olivaceous on sides, darker on dorsum with black stripes; wings hyaline, tipped with brown; reticulation brown, basal marking similar as in male, but pale and without dark rays in subcostal and cubital spaces; abdomen brownish yellow with dorsal, median and lateral black markings. **Teneral** : abdomen bright ochreous; wings with yellow neuration and the basal marking small; thorax yellow or olivaceous without pruinescence and with well defined black markings.

Distribution : Oriental Region.

Trithemis festiva (Rambur)

Libellula festiva Rambur, 1842, *Ins. Nevro* : 92.

Trithemis festiva Brauer, 1868, *Verh. zool.-bot. Ges. Wien.*, 18 : 736; Fraser, 1936, *Fauna Brit. India Odon.*, 3 : 387-389.

Material examined : 1 male, 20-x-2005, Hanumanagundi, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Vesicle and upper surface of frons metallic violet; thorax and abdomen violaceous or bluish black; base of hindwing with a dark brown spot, subcostal and cubital spaces with dark rays, neuration black; abdomen black, segments 1 to 3 with bluish pruinescence. **Female and teneral male** : vesicle and frons non metallic; thorax greenish-yellow or olivaceous, an inverted Y-shaped stripe on mesepimeron and a narrow stripe on

posterolateral suture; wings similar to the male, but in adults broadly dark reddish-brown at tips; abdomen bright yellow, marked with black and wedge shaped yellow spots.

Distribution : Oriental Region.

***Tramea basilaris burmeisteri* Kirby**
(9- IV, Fig.1)

Libellula chinensis Burmeister, 1839, *Handb. Ent.*, **2** : 852.

Tramea burmeisteri Kirby, 1889, *Trans. Zool. Soc. Lond.*, **12** : 316.

Tramea basilaris burmeisteri Fraser, 1936, *Fauna Brit. India Odon.*, **3** : 432 – 434.

Material examined : 1 male, 20-x-2005, Bhagavathi camp, Coll. K. Rajmohana and party.

Diagnosis : **Male** : Wings hyaline, hindwing with two large black or reddish brown spots at base, surrounded by a golden yellow areola, one in cubital space and other in anal area of wing, the two spots narrowly confluent near base of discoidal cell; venation in this dark area bright yellow, in some specimens this marking extending into the basal and subcostal spaces and as far as second antenodal nervure; pterostigma bright ochreous, that of hindwing shorter; abdomen bright brick red, marked with black; hamules slightly overlapping lobe on 2nd segment. **Female** : Resembles the male very closely; wings often tinted with yellow; basal spots similar to male, surrounded by golden areola, but the two spots are well separated; abdomen olivaceous green or yellow with similar black markings as in the male.

Distribution : Oriental Region.

DISCUSSION

32 species of Odonata belonging to 21 genera and 7 families are reported for the first time from Kudremukh National Park, Karnataka. Of these, 12 species are endemic to India and five restricted to Western Ghats.

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INSECTA SCELIONIDAE (PLATYGASTROIDEA) HYMENOPTERA

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INTRODUCTION

Superfamily Platygastroidea is the third largest of the parasitic super families of Hymenoptera, after Chalcidoidea and Ichneumonoidea. Of the two families of Platygastroidea, Scelionidae, being egg parasitoids of a wide range of insects as well as of spiders are with great economic significance in agriculture and forestry. It is one among the four family level taxa which are exclusively egg parasitoids, the others being Trichogrammatidae, Mymaridae and Mymarommatidae (Austin *et al.*, 2005).

Under Scelionidae, 3308 species have been reported worldwide (Austin *et al.*, 2005) and about 200 species in India (Rajmohana 2006a, 2006b, 2007). These figures bear very less significance compared to the magnitude of their true size, as much of the tropical fauna, including that of India, are largely unstudied. The data we currently have are from a few random faunistic surveys over different periods at varied pockets which are apparently biodiversity rich, rather than any continued and concentrated effort to assess the diversity of the taxa of an area. Mani and Sharma (1982) have given a concise documentation of the then known species from India.

The platygastroid fauna of Kudremukh National Park (KMNP), Karnataka is practically unknown and this forms the first report of the group from the area. The present paper reports a total of 13 species of Scelionidae, belonging to 7 genera, of which 5 species are described as new to science. The new species described are *Duta polita* sp. nov., *Paridris armigera* sp. nov. *Psilanteris coriacea* sp. nov. *Psilanteris ferruginus* sp. nov. and *Psilanteris orbitus* sp. nov. A brief diagnosis is provided for all new species. Under appropriate sections, key to species of India are appended. Other aspects of taxonomic relevance dealt in this paper are (1) a replacement name has been suggested for *Baryconus unidentatus* Narendran, in order to solve an issue of homonymy, (2) as per the ICZN norms for the name of the taxon to be valid, a type has been designated for subgenus *Neotrimorus* Rajmohana and Narendran, of *Trimorus* Forester (1997) (Personal communication, Prof Norman. F. Johnson).

In this paper, the terminology used is based on Miko *et al.* (2007), which has been accepted by the Planetary Biodiversity Inventory Workshop on Platygastroid taxonomy at Columbus, Ohio, USA, Feb 2007, as a standard in scelionid taxonomy.

The present collection from KMNP also holds a series of undescribed species, particularly under *Telenomus* Haliday, *Gryon* Haliday and *Inostemma* Foerster (Platygastriidae), which will be studied in detail separately later.

All the material collected is deposited in the faunal holdings of Western Ghats Field Research Station, Zoological Survey of India, Calicut, Kerala.

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Abbreviations

T1-T7= Metasomal tergites from 1-7; S1-S2 : Metasomal sternites 1-2; F1-F10= Flagellar segments 1-10; *sm*=submarginal vein of forewing; *m*= marginal vein of forewing; *stg*= stigmal vein of forewing; *pm*= post marginal vein of forewing; IOS= interorbital space (minimum distance between the orbital margins in front view); LOL= lateral ocellar line (distance between an anterior ocellus and a posterior ocellus); OOL= ocular ocellar line (distance between posterior ocellus and inner orbit of an eye); POL= posterior ocellar line (distance between posterior ocelli); OD= ocellar diameter. L : W=length : width.

Geographical coordinates of collection localities

Kerekatte : Lat. 13° 19.479'N and long. 75° 8.644'E ; Manikyadhara betta : Lat. 13°21. 652'N and long. 75° 07. 902'E; Hanumangundi Falls : Lat. 13° 25.498'N and long. 75° 15.376'E ; Muduba : Lat. 13° 19.420'N and long. 75° 8.635'E; Bhagavathi Road : Lat 13° 19.305'N and long. 75° 09.038'E; Seethabhumi : Lat. 13°14.528'N and long. 75°14.559'E.

SYSTEMATIC ACCOUNT

Order HYMENOPTERA
Superfamily PLATYGASTROIDEA
Family SCELIONIDAE
Subfamily SCELIONINAE

Duta polita sp. nov.
(Figs.1-3)

Diagnosis : Frons, vertex, gena and temples predominantly smooth; coriaceous sculpture restricted to posterior occiput and dorsal mesoscutum; skaphion and notauli distinct; F2 longer

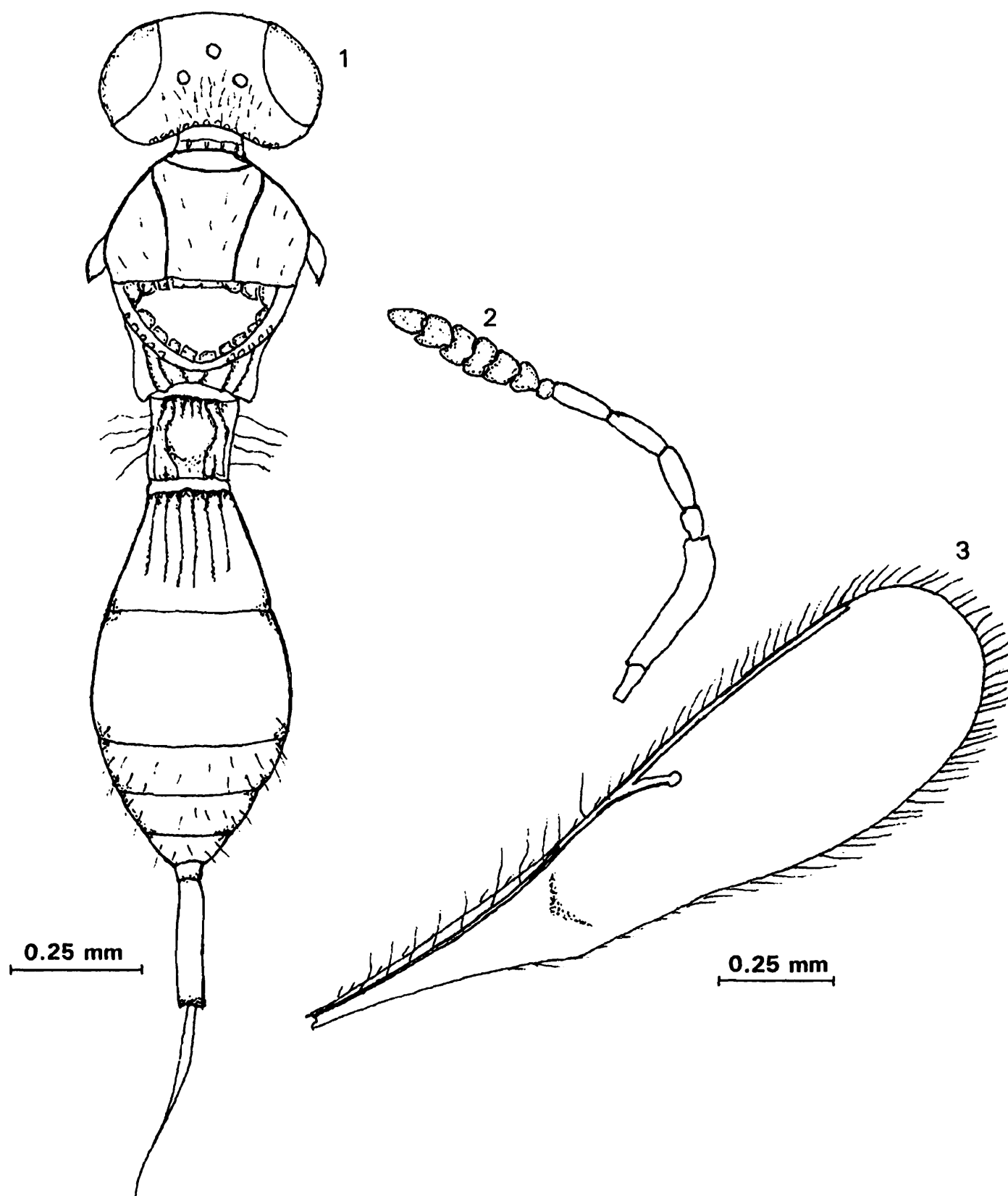
than F1; metanotum unarmed, smooth and plain; lower margin of propodeum carinate and emarginate medially; T1 with a small anteromedian prominence in female; T2 with median longitudinal costae nearly reaching distal margin; T3 smooth; in forewings, *pm* unusually long, nearly 4x *m*.

Description : Holotype : Female. Length = 1.63 mm.

Colour predominantly honey brown; head and F5-F10 blackish brown; rest of antenna, mandibles other than its black tip, legs including coxae, and T1 pale yellowish brown, eyes black with a silvery outer rim; ocelli black; wings slightly infusate; veins brown.

Head : Smooth and shiny; in dorsal view strongly transverse, almost twice wider than long, with very few scattered decumbent hairs; occiput emarginate; occipital carina complete, distinctly crenulate; with a patch of microcoriaceous sculpture with setigerous punctures slightly lower to POL; lateral ocelli separated from orbital margin, by its own diameter OOL OD : POL = 2:2:7; head in lateral view higher than long; eye height /malar space 17/8; IOS / eye height = 25/17; inner orbital margins not parallel, diverging in lower half; eyes large, densely and finely hairy; temples extremely narrow receding behind posterior orbit; hairs on vertex decumbent, exceeding level of anterior ocellus; head on front view sub circular, vertex, frons, gena, and temples smooth and highly polished and glabrous. With a few long scattered semierect hairs towards vertex and one row of setigerous punctures along inner orbits; no keel above interantennal process and only indistinct bulge; malar sulcus deep; mandibles tridentate, dentations roughly equal; clypeus without any sharp lateral corners, lower margin finely convex; antenna clothed with fine pilosity; scape as long as length of next 3.3 segments combined; F1, F2 and F3 cylindrical and elongated; F2 longer than F1; F4 minute, clava abrupt, 6 segmented; maximum width of claval segments twice width of funicular segments. Mesosoma : In dorsal view as long as wide; subequal to width of dorsal head; cervical part of pronotum foveolate; skaphion distinct, smooth and shiny without any sculpture; mesoscutum coriaceous on mid and lateral lobes of mesocutum, almost smooth posteriorly; densely setigerous; notauli fine, wide apart, deeply incised, almost complete; distance between notauli at its apical margin, nearly 1.4x distance between its lower margins non-foveolate; transcutal suture wide and deep; scutellar disc feebly coriaceous and setigerous anteromedially, almost entirely smooth and shiny; scuto scutellar sulcus and prespecular sulcus wide and distinct; metascutellum wide, simple, plain and smooth; propodeum with traces of longitudinal striae; lower margin weakly emarginated and carinate; posterolateral corners pointed. pleura with very less sculpture; netrion distinct; mesopleural carina distinct; area around sternaulus smooth, post acetabular patch not distinct; femoral depression deep and smooth, mesepimeral sulcus and metapleural epicoxal sulcus distinct; metapleural triangle not hairy; metapleural carina distinct; ventral and dorsal metapleural area almost smooth; forewing surpassing apex of metasoma; with 12 erect black bristles on *sm*; *m* slightly longer than *stg*; *pm* 4X longer than marginal; *stg* oblique and knobbed; basal vein distinct.

Metasoma : Excluding partially extended ovipositor system, longer than combined length of head and mesosoma; distinctly longer than wide, but not as wide as mesosoma; T1 slightly



Figs. 1-3. *Duta polita* sp.nov. Female :
1. Body (Dorsal); 2. Antenna; 3. Forewing

longer than wide, with strong longitudinal costae except anteromedially, over median prominence; T1 with 4 lateral setae; length of T1:T2:T3:T4:T5:T6= 11:14:18:8:5:5; T2 with some longitudinal costae reaching to almost distal margin only medially; rest of tergites smooth, with dense pilosity; T3 transverse, wider than long; almost entirely smooth and lustrous; T4-T6 smooth with decumbent pilosity at sides, T6 mostly pilose, T7 exerted along with ovipositor; one pair of bristles on cercus.

Male : Unknown.

Material examined : Holotype : Female, INDIA, Karnataka, Bhagavathi (Kudremukh National Park), 26.x.2005, Mohana, in malaise trap.

Etymology : The species name '*polita*' is derived from the Latin '*politus*' meaning smooth, referring here to vertex, frons, gena, temples and scutellum, which are smooth, glabrous and shiny.

Discussion : *Duta* Nixon is rather a small genus, with only two species hitherto reported from India; they are *D. indica* Mukerjee (1994) and *D. tuberculata* Mohana (2007). A key to the 6 species known from Oriental region has been given in Mohana, 2007. The two Vietnamese species namely *D. xyphona* Kozlov & Le and *D. typhona* Kozlov and Le are distinct from all other Oriental species by the possession of a median keel on frons (Le, 2000).

The new species, *D. polita* described here is similar to *D. tuberculata* in having a median prominence on T1. But the highly smooth and polished areas of frons, vertex, gena, temples and mesoscutum along with its unusually long *pm* and the nearly complete median longitudinal striae on T2 serve to distinguish the two species. The nearly black funicular segments and club of *D. tuberculata* contrast in colour with its pale brownish scape and pedicel, where as in *D. polita*, only the brownish black club segments are slightly contrasting in colour with rest of honey brown antennal segments. The proportion in length of flagellar segments also varies between the species. In *D. polita* sp. nov. F2 is longer than F1, F3 and F1 are almost subequal, whereas in *D. tuberculata* F1 is longer than F2 and F3 is distinctly smaller than F1.

Key to Indian species of *Duta* Nixon.

1. First metasomal tergite with a median prominence 1
 - First metasomal tergite without a median prominence *D. indica* Mukerjee
2. Frons, vertex, gena and temples without coriaceous sculpture; T2 with median longitudinal costae reaching three-fourth to its distal margin; *pm* 4x marginal; F2 longer than F1
 - *D. polita* sp. nov.
 - Frons, vertex, gena and temples with fine coriaceous sculpture; T2 with longitudinal costae only at its median apex : *pm* just over twice marginal; F1 longer than F2...
 - *D. tuberculata* Mohana

***Paridris armigera* sp. nov.**

(Figs. 4-7)

Diagnosis : Body brownish black; eyes densely pubescent; frons smooth, without any sculpture; also without scrobe and central keel; notauli complete; with fine setigerous foveae; metanotum with two widely placed spines on median arched and emarginated plate; T1, T2 and T3 longitudinally striate; *pm* not as long as *stg*; *basalis* and *medialis* faintly indicated.

Description : Holotype. Male. Length = 2.08 mm.

Brownish black. F4-F9, coxae blackish brown, scape, pedicel, F1-F3, F10, mandibles and legs honey brown; eyes and ocelli silvery wings slightly infuscated; veins deep brown.

Head : (L:W= 22:35); smooth and shiny; dorsally transverse; eyes densely pubescent with hairs three-fourth as long as pubescence on head; vertex convex; eyes small; temples feebly sloping, long and smooth curving to occiput; dorsal head without any sculpture, other than some sparse setigerous punctae; ocelli separated from margins by their own diameter; OOL : OD : POL=2:2:6; LOL : POL= 1:2; occipital carina complete and carinate-foveolate; frons smooth and bare medially, without any sculpture, other than sparse setigerous punctae, denser towards vertex; length of pubescence more than twice ocellar height; frons without a scrobe and a central keel; inner orbital margin diverging distally; IOS 1.18x eye height; orbital carina extending till lateral ocellus; malar sulcus distinct; orbital bands absent; 6 or 7 genal carina radiating from mandibular corners, but only upper 2 or 3 carinae reaching to median of lower eye margin; mandibles tridentate, median tooth very small; clypeus with pointed anterolateral corners; lower margin crenulate; interantennal process well developed, finely coriaceous, densely pubescent; antenna 12 segmented, covered with white felt-like hairs. F1-F3 with tyloid ridge; scape as long length of next four segments combined; F4-F9 subequal.

Mesosoma : slightly wider than head dorsally (38/35); cervical pronotum with foveae; pronotum without any sharp lateral corners; smoothly curved; mesonotum with dense setigerous punctae; setae larger than that of dorsal head; notauli foveolate and complete; scutellar disc almost smooth and shiny medially, reticulate-carinate towards margins, with a short stump of median carina towards lower margin; metanotum with two widely placed spines on a median arched and emarginated plate, with reticulate-punctate sculpture; propodeum with highly rugulose sculpture, emarginated medially, lateral margin of emargination produced spine-like; lateral propodeum hairy; pleura without any smooth patch, sculptured throughout; epomial carina not distinct; netrion with large reticulate sculptures; speculum with numerous transverse rugulae throughout; depression deep; acetabular area with deep close punctae; metapleuron full of sculpture; forewings when at rest hardly reaching distal margin of T4, with cloudy large patch of *basalis* and *medialis*; *pm* not as long as *stg*; *stg* 1.6x *pm*; Fore wing L:W= 44:15.

Metasoma : Subequal to width of mesosoma; T1, T2 and T3 longitudinally rugulose; length of T1 : T2 : T3 = 14:19:24. T1 with well organized, widely placed rugulae, in less number; 3-4 large setae on lateral T1; finely reticulate microsculpture between longitudinal striae of T1; T2 with denser longitudinal striae than on T1 and with a smooth band towards lower margin; T3 rather leathery, with longitudinal striae even denser, spaced very close to each other, but very faint and not impressed; T7 distinct; T4-T6 more hairy; S1 and S2 with incomplete longitudinal striae.

Female : Unknown.

Material examined : Holotype : Male, INDIA, Karnataka, Kerekatte (Kudremukh National Park), 22.x.2005, Mohana.

Paratypes : 3 [2 males, Bhagavathi (Kudremukh National Park), 26.x.2005, Mohana, in Malaise trap; 1 male, Hanumangundi (Kudremukh National Park), Mohana, 22.x.2005, by net sweeping].

Variation : No observable variations.

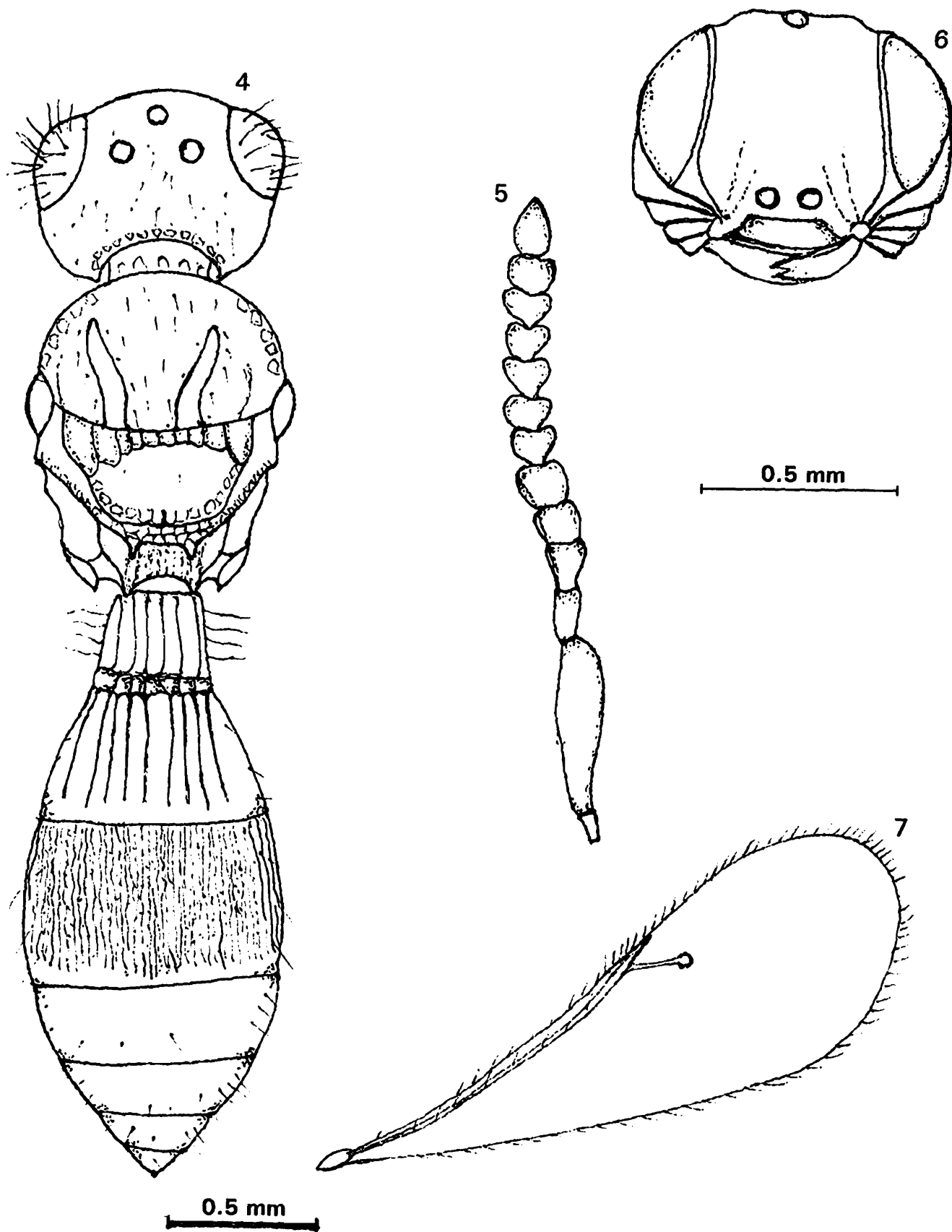
Etymology : Species name '*armigera*', derived from Latin, '*arma*' meaning weapon and '*gero*' meaning to carry, referring to the armed metanotum.

Discussion : Under this genera a total of 6 species viz. *P. pachmarhicus* (Mani), *P. coorgensis* Sharma, *P. mahadeoensis* Sharma (Mani & Sharma, 1982), *P. dubeyi* Sharma and *P. karnatakensis* Sharma (Sharma, 1982) and *P. dunensis* Mukerjee (Mukerjee 1994) have hitherto been reported from India. *P. armigera* sp. nov. is unique from all other species in having *stg* of forewing 1.5x longer than *pm*, whereas in others, *pm* is distinctly longer than *stg*. The globular F4-F9 of *P. armigera*, also differentiate this species with known males of this genus from India, (*P. dubeyi*, *P. karnatakensis* and *P. mahadeoensis* all having cylindrical antennal segments). A key to species of Indian region is hereby provided.

Of the six species from Vietnam, (Le, 2000) viz. *P. bispores* Kozlov & Le, *P. circus* Kozlov & Le, *P. genaris* Kozlov & Le, *P. macrurous* Kozlov & Le, *P. stigmashortis* Kozlov & Le and *P. striaeifrons* Kozlov & Le, *P. armigera* sp. nov. comes close to *P. bispores* and *P. macrurous* in having *stg* longer than *pm*. *P. bispores* differs in lateral ocellar line being 3x ocellar diameter and eyes with short dense pubescence while *P. macrurous* differs in having *stg* 2x length of *pm* and T3 with transverse striae along with longitudinal striae.

Key to Indian species of *Paridris* Kieffer

1. Notauli absent 2
- Notauli present 6



Figs. 4-7. *Paridris armigera* sp. nov. Male :
1. Body (Dorsal); 5. Antenna; 6. Head (Front view); 7. Forewing

2. Lateral ocelli close to eyes 3
 - Lateral ocelli far from eyes 5
3. Metanotum medially with a bidentate plate 4
 - Metanotum unarmed *P. dunensis* Mukerjee
4. Scape length nearly length of 3.30 of following segments combined *P. karnatakensis* Sharma
 - Scape length more than length of pedicel and following four funicular segments combined *P. pachmarhicus* (Mani)
5. T2 and T3 fully striated *P. dubeyi* Sharma
 - Striae on T2 restricted to base only; T3 not striated *P. mahadeoensis* Sharma
6. Post marginal vein of forewing longer than stigmal vein *P. coorgensis* Sharma
 - Post marginal vein not as long as stigmal vein *P. armigera* sp. nov.

***Psilanteris coriacea* sp. nov.**

(Figs. 8-12)

Diagnosis : Body brownish black to black; head and mesosoma with fine uniform coriaceous sculpture throughout; vertex on top towards median ocellus not depressed; central keel on frons restricted to lower scrobal area; eyes large, with fine and minute pubescence, visible only under very high magnification; posterior ocelli nearly contiguous to lateral margin of orbits, hardly separated by half its diameter; skaphion coriaceous; notauli present, though at times faint; metanotum with a triangular pointed spine; *stg* 2.4x *m*; T1 and T2 with longitudinal regular striae. T4-T7 finely coriaceous.

Description : Holotype : female. Length = 1.44 mm

Head and mesosoma black, metasoma reddish brown; forecoxa brownish black; mid and hind coxa, antennal scape, funicular segments and mandibles yellowish brown; eyes silvery; clava brownish black; wings hyaline; veins brown.

Head : Smooth and shiny, with scattered pubescence; transverse. L:W=9:16; vertex on top towards median ocellus not depressed; central keel on frons restricted to lower scrobal area; eyes large, globose, with minute and with fine scattered silver pubescence; inner eye margins diverging; IOS : eye height= 13:19; eyes large; head throughout with coriaceous sculpture, including scrobal area; frontal scrobe very feebly depressed; orbital carina absent; 4 or 5 genal carinae extending under lower eye margins, but gradually merging with coarse sculpture on temples; not coriaceous between genal carinae; malar sulcus not distinct; eye

height : length of malar space = 15:7; posterior ocelli nearly contiguous to lateral margin of orbits, hardly separated by half its diameter; OOL : OD : POL = 0.4 : 1 : 11; LOL : POL = 6 : 11; occiput emarginated, occipital carina crenulate; sparsely pubescent on frons towards vertex, inner orbital margin, mandibular corners and beneath lateral ocellar area; mandibles tridentate; all teeth almost equal, mandibular base without any sculpture; clypeus with sharp lateral corners, with 6 or 7 long hairs; lower margin a little convex, but not crenulate; antennal formula; 1.1.4.6; scape not as long as clava, but longer than combined length of following five segments; F1 longer than F2; F2 –F4 sub equal in length.

Mesosoma : subequal to width of head dorsally; sculpture much similar to that of head; pronotum without any sharp lateral corners; skaphion large and with well distinct coriaceous sculpture; notauli present, though not much pronounced, not foveolate reaching only 3/4th of mesoscutum; distally diverging, separated by about 1.2x its distance between at base; metanotal spine pointed and distinct; trans scutellar articulation narrow medially and wider towards sides; scutoscuteellar sulcus distinct; parascutal carina and post scutellar sulcus present; metascutellar carina distinct; metanotal spine pointed and triangular a little longer than width at its base, margins carinate; propodeum with costae anteriorly, striated medially; smooth basally and laterally; finely hairy towards sides; lateral carina present; netrion distinct; sternaulus region with coarsely punctate; post acetabular patch not distinct; speculum smooth and shiny, femoral depression, not deep, but with three transverse carina towards its upper and lower margin; prespecular sulcus distinct; mesepimeral sulcus not present, though not prominent; metapleural triangle distinct, hairy; metapleural epicoxal sulcus, metapleural epicoxal carina distinct; ventral metapleural area with carinate sculpture; dorsal metapleural area with less sculpture; forewing L:W = 70:25; *sm* : *m* : *stg* = 31:2.5:6. *pm* absent.

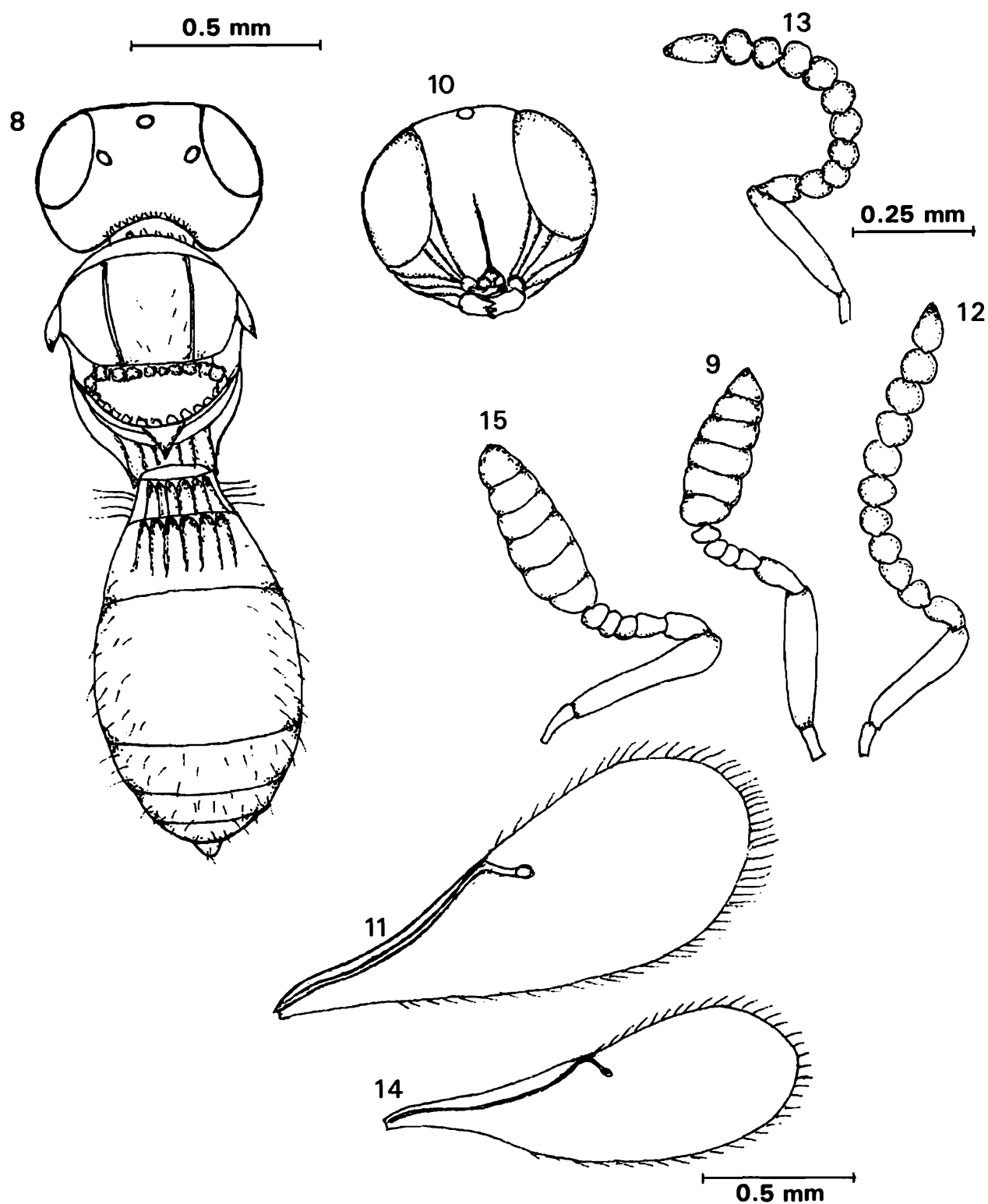
Metasoma : almost subequal to width of mesosoma; distinctly longer than combined length of head and mesosoma (35:31); 4 lateral setae on T1; T1 and T2 with longitudinal striae; proportion of length of tergites being T1:T2:T3:T4:T5:T6:T7= 7:10:20:6:4:3:2; T3 longer than T1 and T2 combined; lateral T3-T7 coriaceous, sculpture similar as that of head and mesosoma; S1 and S2 with striae; rest of sternites smooth.

Varitaion : Variation observed in the state of notauli and color of forecoxae. Notauli seems to be very faint to strongly indicated. Color of fore coxae varies from being yellowish brown to brownish black.

Male : Length 1.44 mm. Resembles females in all aspects except nature of antennae; antenna filiform, scape as long as next 4 segments combined; flagellar segments except F10 globular (Fig. 12).

Material examined : Holotype : Female, INDIA, Karnataka, Kerekatte (Kudremukh National Park), 22.x. 2005, Mohana, by net sweeping.

Paratypes : 5 [1 male, 1 female with same data as that of holotype; 1 female, Kadalundi (Kozhikode district, Kerala), 4.ix.2005, Emiliyamma, in Malaise trap].



Figs. 8-11. *Psilanteris coriacea* sp.nov. Female :
 8. Body (Dorsal); 9. Antenna; 10. Head (Front view); 11. Forewing;
 12. Antenna of *P. coriacea* sp.nov. Male

Figs. 13-15. *Psilanteris ferruginus* sp.nov. Male :
 13. Antenna; 14. Forewing; 15. Antenna of *P. ferruginus* sp.nov.

Etymology : The species name '*coriacea*' derived from 'coriaceous' in Latin meaning leather-like, referring here to the sculpture on the body.

Remarks : *P. coriacea* sp.nov. is different from *P. uttaranchalensis* Mukerjee mainly in characters mentioned in the key to species in this paper. In the presence of notauli and longitudinal striae being confined to T1 and T2, this species is similar to *P. cereus* Kozlov & Le, *P. cinnus* Kozlov & Le, *P. circulus* Kozlov & Le, from Vietnam. But this species differs to *P. cinnus*, in the absence of radiating striae on cheeks, to *P. circulus* in having punctate sculpture of vertex and to *P. cereus* in having different proportion of antennal segments.

As per Masner 1976, *P. atriclava* Kieffer and *P. atriceps* (Kieffer) do not belong to *Psilanteris*, but are probably undescribed genera.

***Psilanteris ferruginus* sp. nov.**
(Figs. 13-15)

Diagnosis : Head black; basal mesosoma and metasoma ferrugineous; vertex on top towards median ocellus not depressed; eyes large, with fine and minute pubescence, visible only under very high magnification; skaphion smooth and glabrous; notauli faintly indicated; metanotum with a short pointed spine; metasoma longer than combined length of T1 and T2; *stg* more than twice *m*; T1 and T2 with longitudinal striae; lateral T2 and whole of T3-T7 coriaceous.

Description : (Since this species is very much similar to *P. coriacea* sp. nov., only those character states which are different in *P. ferruginus* are being mentioned here).

Holotype : Male : Length = 1.76 mm. Cervical pronotum, propodeum and metasoma deep ferruginous; ocelli not contiguous to lateral orbital margin, but separated by almost their own diameter; antenna with 12 segments; richly pubescent; hairs distinctly longer than width of flagellar segments; scape length more than length of following 5 segments combined; flagellar segments, except F10, globular; skaphion smooth and shiny without any coriaceous sculpture; forewing L : W = 1:3; pm absent; *stg* 2.25x *m*; metasoma longer than combined length of T1 and T2.

Female : Length = 1.70 mm. Antennal clava not as long as scape; clava 3x as wide as flagellar segments; F1 longest; scape length more than length of following 5 segments combined.

Material examined : Holotype : Male, INDIA, Karnataka, Bhagavathi (Kudremukh National Park), 26.x. 2005, Mohana, in malaise trap.

Paratype : Female, with data same as that of holotype.

Etymology : This species is named 'ferruginus' after its rusty colored metasoma.

Remarks : This species resembles *P. coriacea* sp. nov. almost in all aspects, except that

skaphion is very smooth and glabrous. Presence of skaphion is an important character in *Psilanteris*. Hence the sculpture on skaphion is much relevant while differentiating the species. Skaphion, if at all present, is smooth and without any sculpture in all species hitherto reported from India except *P. coriacea*.

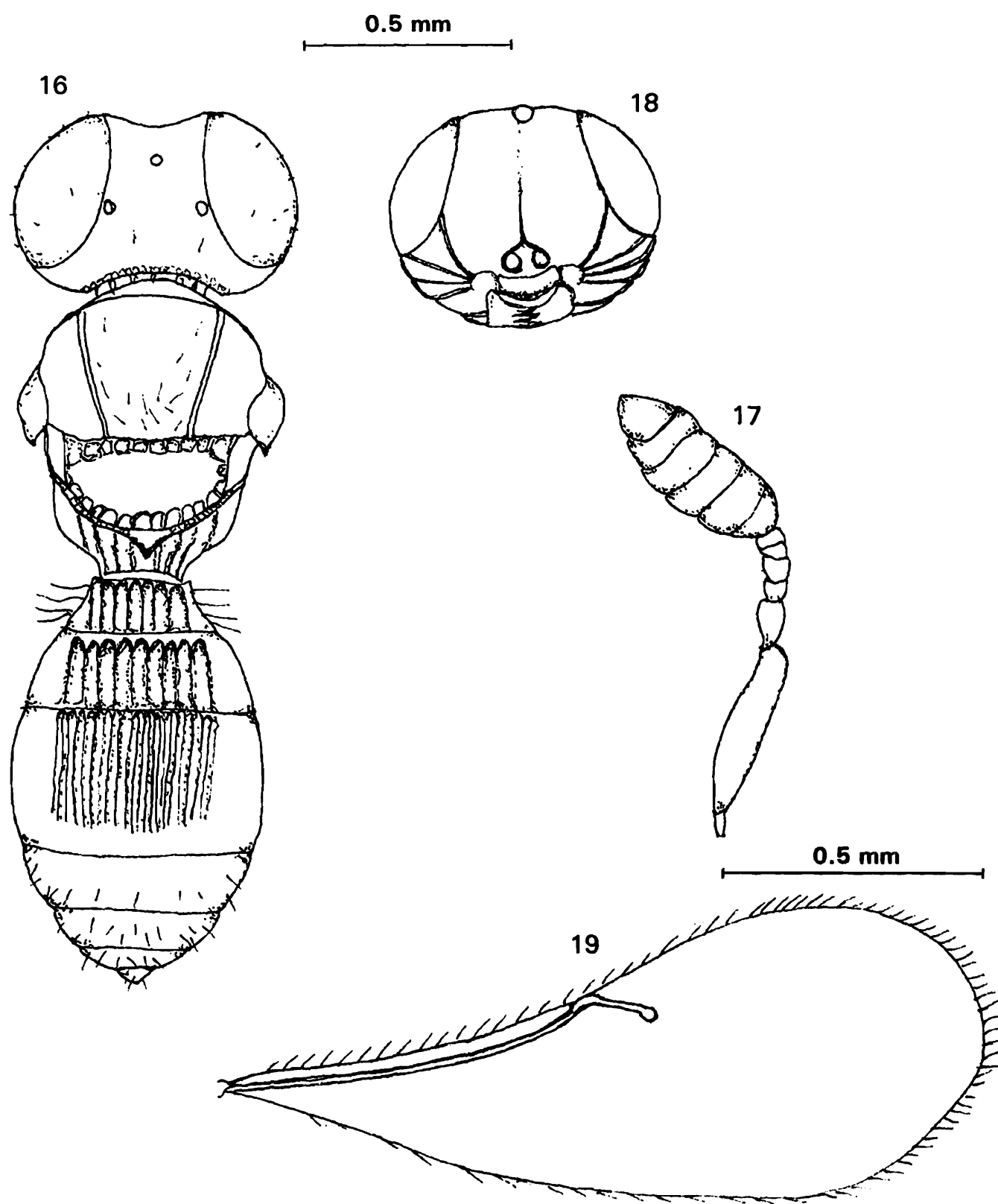
***Psilanteris orbitus* sp. nov.**
(Figs. 16-19)

Diagnosis : Body honey brown; mid lobe of mesonotum black, but lateral lobe honey brown; head and mesosoma with fine uniform coriaceous sculpture throughout; central keel on frons extending as a groove towards median ocellus; eyes large, with fine and minute pubescence; posterior ocelli nearly contiguous with eyes; notauli complete; metanotum with a triangular pointed spine; *stg* 2.3x *m*; T1, T2 and T3 with longitudinal regular striae. T4-T7 with fine coriaceous sculpture.

Description : Holotype : Female. Length = 1.59 mm. Head black; body honey brown; mid lobe of mesonotum black, but lateral lobe honey brown; antennal scape, funicular segments, legs including coxae pale yellowish white; club black; mandibles reddish brown; eyes and ocelli silvery; metanotal spine black; wings hyaline; veins deep brown.

Head : L : W = 1 : 2. Smooth and shiny with scattered pubescence; frons towards median ocellus depressed; eyes large, globose, with minute and very fine hairs; inner eye margins diverging IOS : eye height = 8:18; eyes dorsally occupying large area; lateral ocelli nearly contiguous with eye margins; OOL : OD : POL = 0.3:1:7; LOL : POL = 3:4; occiput emarginated; occipital carina crenulate; temples sloping; frontal scrobe depressed; head with fine uniform coriaceous sculpture throughout, including scrobal depression; frons with a median keel, distinct halfway on scrobal area, bifurcating in front of antennal insertions; keel represented as a median groove towards median ocelli; carinae radiating from mandibular corners, orbital carina absent; 4 or 5 genal carinae extending under lower eye margins, but gradually merging with coarse sculpture; not coriaceous between genal carinae; malar sulcus not distinct; clypeus with sharp lateral corners, with 6 or 7 long hairs; lower margin a little convex, but not crenulate; mandibles tridentate, all teeth almost equal, base without any sculpture; malar length less than half eye length; a few scattered pubescence towards anterior ocellus on vertex, on inner orbital margin and towards mandibular corners, hairs not extending to level of top of median ocellus; antennal formula 1.1.4.6; clava massive, 1.3x length of scape; scape more than length of next five segments combined.

Mesosoma : Almost subequal to head width dorsally; sculpture much similar to that of head; pronotum without any sharp lateral corners; skaphion large and smooth, without any sculpture; notauli deep, complete and narrow, not foveolate; distally diverging, separated distally by 1.54x its distance between base; trans scutellar articulation narrow medially and wider laterally; scutoscutellar sulcus distinct; parascutal carina and post scutellar sulcus present; metascutellar carina present; metanotal spine pointed, smooth dorsally; triangular, length same



Figs. 16-19. *Psilanteris orbitus* sp. nov. Female :
16. Body (Dorsal); 17. Antenna; 18. Head (Front view); 19. Forewing

as width at base, margins carinated; propodeum with anterior costae, striated medially; smooth basally and laterally; finely hairy towards sides; lateral carina present; netrion distinct; sternaulus region coarsely punctate; post acetabular patch not distinct; speculum smooth and shiny, femoral depression deep, with three transverse carina towards its upper and lower margin; prespecular sulcus distinct; mesopleural carina distinct; mesepimeral sulcus present, though not prominent; metapleural triangle distinct, not shiny, but with fine coriaceous sculpture; metapleural epicoxal sulcus and metapleural epicoxal carina distinct; ventral metapleural area with carinate sculpture; dorsal metapleural area with less sculpture; forewing (L:W)= 72:30; *stg* 2.3x *m*.

Metasoma (L : W = 53 : 33); almost subequal to width of mesosoma; length equal to combined length of head and mesosoma; 3 lateral setae on T1; T1, T2 and T3 longitudinally striate; striae on T3 denser and closely placed, reaching $\frac{3}{4}$ th of its length medially; lateral T2 and T3, whole of T4-T7 with fine coriaceous sculpture; T3 with length more than that of T1 and T2 combined; proportions of length of T1 : T2 : T3 : T4 : T5 : T6= 8:13:25:10:6:5. T7 visible; S1 and S2 with striae, rest of sternites smooth.

Male : Unknown.

Material examined : Holotype : Female, INDIA, Karnataka, Muduba (Kudremukh National Park), 27.x. 2005, Mohana, by net-sweeping.

Etymology : This species is named '*orbitus*' after its distinctly large eyes.

Remarks : *P. orbitus* is distinct from all other known species of *Psilanteris* in having longitudinal striae on T1, T2 and on T3 as well. Mesonotum differing in colour between median and lateral lobe is also unique to this species.

This species differs from *P. coriacea* sp. nov. in having:

Much larger eyes, a difference in proportion of dorsal eye length to temples, much deeper scrobal depression, central keel on frons extending as a groove towards median ocellus, longitudinal striations on T3, lateral lobe of mesonotum honey brown.

This species is more robust than *P. coriacea* sp. nov. and *P. ferruginus* sp. nov.

It resembles *P. uttaranchalensis* in the presence of notauli and a triangular median spine on metanotum and differs as per the characters mentioned in the key to species.

Key to Indian species of *Psilanteris* Kieffer

1. Metanotum medially with a short bidentate process *P. indica* Mani
- Metanotum medially with a strong spine 2

2. T1, T2 and T3 with longitudinal striae; lateral lobe of mesonotum honey brown, differing in colour with median lobe *P. orbitus* sp. nov.
- Only T1 and T2 with longitudinal striation; mesonotum with uniform colour 3
3. Skaphion absent; eyes glabrous *P. uttaranchalensis* Mukerjee
- Skaphion present; eyes finely hairy 4
4. Skaphion richly coriaceous; ocelli nearly contiguous with eye margin
..... *P. coriacea* sp. nov.
- Skaphion smooth and glabrous; ocelli separated from ocellar margin nearly by its own diameter *P. ferruginus* sp. nov.

***Macroteleia* sp. nr. *lamba* Saraswat**

Length = 4.87 mm.

Male. Head and body black; pubescence dense; head and mesoscutum densely punctate; frons without a central keel; eyes bare; lateral ocelli close to eyes, separated by their own diameter; antenna with 12 segments; F3 developed as sex segment; $F2 > F3 > F1$; F1 subequal to pedicel; notauli distinct; median depression on pronotum as a line; propodeum, longitudinally striate; wings infuscated; forewing when at rest extending to half of T4; *pm* almost 2x *m*, *stg* slightly longer than *m*. T1-T4 with prominent longitudinal striae; metasoma 2.2x combined length of head and mesosoma.

Female : Unknown.

Material examined : Two males [1, Manikyadhara betta (Kudremukh National Park), 19.x.2005, Mohana, by net sweeping; 1, Gangadikkal (Kudremukh National Park), 19.x.2005, Mohana, by net sweeping].

Remarks : This species comes close to *M. lamba* Saraswat (Saraswat & Sharma, 1978). In *M. lamba*, the propodeum is said to have a plate-like projection, and frons is with a central keel, where as in the species, dealt here, such a plate is lacking on propodeum and a keel on frons. Since the usage of the term 'plate' is quite vague, and since the illustrations are also not very promising for this character, only examining the type is needful. After comparison of these characters with that of the holotype, it may be eventually possible to treat this species as new.

***Baryconus* sp. nr. *bharatus* Saraswat**

Length = 2.79 mm.

Female : Body black; Frons reticulate punctate; eyes with very fine minute pubescence; scrobe well developed, carinate and with weak transverse striae; notauli distinct; foveolate;

mesonotum with a median row of large reticulate punctae; metanotum with a median spine, bidentate at its tip; in forewings, length of *m* : *stg* : *pm* being 5:11:35; T1 and T2 with longitudinal striae; T3 granulate-leathery; T4-T7 rugose; last tergite in male and female with two spikes at tip.

Material examined : 1 female, 3 males from Bhagavathi (Kudremukh National Park), 24.x.2005, Mohana; 1 female, Seethabhumi (Kudremukh National Park), 24.x.2005, Mohana, by net sweeping; 1 male, Muduba (Kudremukh National Park), 21.x.2005, Mohana, by net sweeping; 1 male, Kerekatte (Kudremukh National Park), 18.x.2005, Mohana, in Yellow pan trap.

Distribution in India : Kerala, Karnataka.

Remarks : This species keys to couplet 5 of key to Indian species by Narendran, and is very near to *B. bharatus* Saraswat. Instead of median ridge on mesonotum as stated in the description of *B. bharatus*, the species at hand is having a median row of reticulate punctae; some notable difference are also in the proportions of veins in forewing.

Discussion : The author, while studying the species of *Baryconus* Foerster happened to notice an issue of homonymy; the species name *Baryconus unidentatus* Narendran (Narendran, 2001) is preoccupied by *Baryconus unidentatus* Ritchie and Masner (Ritchie and Masner, 1983). Hence after consultation and consent from Prof. Narendran, the author of the species (as per the priority principle of ICZN), the species name '*unidentatus*' is replaced by a new species name viz. '*narendrani*'. This species is to be known hereby as *Baryconus narendrani* Mohana.

***Scelio nilamburensis* Mukerjee, 1979**

Diagnosis : Length = 4–4.87 mm.

Male : Head and body black; antennae honey brown; forewing hyaline; frons and vertex reticulate; gena with very distinct fan-like carinae, frons in middle smooth and shiny and slightly impressed; OD = 2xOOL; notauli absent; pronotal collar sharply angled at sides. in forewing *m* very short, *stg* slender, linear, very much longer than *m*; metasoma narrowing gradually beyond T3; T1 distinctly shorter than width at base; metasoma distinctly longer than head and thorax combined.

Female : Unknown.

Material examined : 3 males, Manikyadhara betta (Kudremukh National Park), 19.x.2005, Mohana, in sweep net; 1 male, Hanumangundi (Kudremukh National Park), 20.x.2005, Mohana, in sweep net; 1 male, Bhagavathi (Kudremukh National Park), 26.x.2005, Mohana, in sweep net; 1 male, Gangadikkal (Kudremukh National Park), 26.x. 2005, Mohana, in sweep net.

Distribution in India : Kerala, Karnataka.

Remarks : This species is reported for the first time from Karnataka. The series of specimens at hand keys to *S. nilamburensis* Mukerjee, in Mukerjee, 1979 and fits satisfactorily to the description of *S. nilamburensis*. But a comparative study with the holotype will be helpful in confirmation.

***Scelio* sp. nr. *dhupgarhi* Mukerjee**

Female : 3.29, male - 3.89 mm. Body black; ocelli not contiguous with orbital margin, but separated by its own diameter, 2 or 3 carinae radiating from mandibular corners, but not reaching lower eye margin; propodeum richly hairy at sides, totally obscuring the sculpture beneath; striations on metasomal tergites very prominent, but with a median smooth area distally; wings infuscated.

Material examined : 1 male, 1 female, Bhagavathi (Kudremukh National Park), 26.x.2005, Mohana, in yellow pan trap.

Distribution in India : Karnataka.

Remarks : Though this species keys to *S. dhupgarhi*, it differs in shape of metasoma, not acute behind T3, but rather spindle shaped; propodeum is different with fine whitish dense pubescence laterally; punctae on head small compared to that on mesoscutum. After comparison of these characters with that of the holotype, it is possible that this species may eventually be treated as a new species.

***Scelio* sp. nr. *spinifera* Mukerjee**

Length = 3.36 mm

Female : Body black; vertex and frons with closely reticulate punctae; gena with three or four radiating carinae from mandibular corner towards lower eye margin; eyes bare; pronotal corners acute; mesoscutum, and scutellum reticulate punctuate; notauli absent; scutellum with a minute spine towards latero median; wings infuscate; metasomal tergites with longitudinal rugulae; a smooth band distally towards each tergite.

Material examined : 1 female, Bhagavathy (Kudremukh National Park), 26.x.2005, Mohana, in Malaise trap.

Remarks : This forms the first report of a female of *S. spinifera* Mukerjee. The holotype is based on a male specimen and no further records of the species are available, after its original description in 1979. Till a comparative study with the holotype is made, this species is tentatively kept under *S. spinifera*, based on the original description available.

Subfamily TELEASINAE

Trimorus dimdicornis Mukerjee, 1981

Diagnosis : Length = 1.86 mm.

Female : Body black; antenna dark brown, except yellowish radicle, scape and pedicel; wings hyaline; vertex and frons longitudinally rugose. OOL= OD; scape 7.4x as long as thick; pedicel 0.19 of scape length; F1 longest, 2.53x pedicel; F2 0.91 length of F1; mesosoma rugosely punctate; notauli absent; metascutellum with a slender spine; petiole, T2 and T3 almost completely striated.

Male : Unknown.

Material examined : 1 female, Hanumangundi (Kudremukh National Park), 26.x.2005, Mohana, in Yellow Pan Trap.

Distribution in India : Kerala, Karnataka.

Remarks : Fairly common species.

Trimorus longispina Mukerjee 1981

Diagnosis : Length = 2.24 mm.

General colour of body reddish brown to black; head black; wings uniformly infuscated light brown; eyes finely and sparsely pubescent; OOL 2xOD; antennal scape about 4x longer than thick; flagellar segments elongated; F1 subequal to scape; notauli complete, but faint; metanotum with a distinct, long and curved spine; in forewing $sm : m = 40:26$. T1 with longitudinal striae extending throughout its length. T2 striated only at its basal three-fourth.

Material examined : 1 male, Hanumangundi (Kudremukh National Park), 26.x.2005, Mohana, in Yellow Pan Trap.

Distribution in India : Karnataka, Uttar Pradesh.

Remarks : Not so common species. Female unknown.

Trimorus (Neotrimorus) scutellospinosus Rajmohana & Narendran, 1997

Diagnosis : Length = 2.07 mm.

Male : Head and body shining black; antenna basally yellowish brown and distally deep reddish brown; frons with longitudinal carinae or rugulae radiating fan-like from lateral clypeal border; a dorsal median ridge extending to front ocellus from top mid margin of antennal scrobe; antenna 14-segmented; scape 4x as long as thick and equal to next two segments combined together; notauli absent; scutellum armed with a stout blunt median spine; metanotum

produced into a stout, long curved longitudinally striated dorsal median spine at an angle 70°; propodeum with pointed lateral spines and simple sculpture; forewings with *sm*, *m* and *stg*; *pm* absent; *m* many times *stg*. T1 and T2 with longitudinal striations extending throughout. T3 with only traces of striae on its upper margin.

Female : Unknown.

Material examined : 1 male, Hanumangundi (Kudremukh National Park), 26.x.2005, Mohana, in Yellow Pan Trap.

Distribution in India : Karnataka, Kerala.

Discussion : In Rajmohana and Narendran 1997, a new subgenus namely *Neotrimorus*, of *Trimorus*, was erected, along with a description of two new species viz. *Trimorus Neotrimorus scutellospinosus* Mohana and Narendran and *Trimorus Neotrimorus spinostriatus* Mohana and Narendran, but the authors missed to designate a type species for the new subgenus. In order to meet the ICZN norms which imply the need of a type species to be designated (pers. communication Norman F. Johnson), in this paper *Trimorus Neotrimorus scutellospinosus* Mohana and Narendran is hereby designated as the type species of subgenus *Neotrimorus* Mohana and Narendran.

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INSECTA : RHOPALOCERA : LEPIDOPTERA

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INTRODUCTION

Watson (1890) published a comprehensive list of butterflies recorded from the Mysore state (the present day Karnataka State) the districts of Shimoga, Hassan, Chickmagalur and Mysore. Subsequently, T.R. Bell (1909-1927) published a series of articles on the butterflies of northern Western Ghats and Kanara region of the central Western Ghats. He listed 290 species, mainly from the north Kanara district of Karnataka and some part of Maharashtra. The Coorg area of the Western Ghats was thoroughly explored by many workers (Hannington, 1916; Home, 1934; Yates, 1931 & 1932). They listed around 250 butterfly species from the Coorg and adjoining Brahmagiri mountains.

Gaonkar (1996) reported 329 species of butterflies from the entire stretch of Western Ghats, of which 313 were stated to be from Karnataka. However, the most recent compilation of all butterfly species of Western Ghats has been done by Krishnamegh Kunte (2006), listing 332 species from Western Ghats which includes 316 from Karnataka.

The only information available on the butterfly fauna of Kudremukh National Park pertains to the monsoonal checklist of Mohandas (2004). He listed 81 species from the Park during the southwest monsoon season, covering three months.

In the present study, altogether 139 species of butterflies belonging to 93 genera under 5 families are recorded from the Kudremukh National Park. The family Nymphalidae dominated with 53 species followed by Hesperidae (25 species), Lycaenidae (24 species), Papilionidae (19 species) and Pieridae (18 species). Of these, seven species are endemic to the Western Ghats viz. the Malabar Raven, Malabar Rose, Malabar Banded Swallowtail, Buddha Peacock, Southern Birdwing, Malabar Tree Nymph and the Blue Oak Leaf. The nomenclature followed in this account is after Gaonkar (1996) and the English Common Names adopted from Wynter-Blyth (1957).

During the present study, species like Blue Mormon, Common Blue Bottle, and Common Jay were observed to indulge in mud-puddling activities. Species such as the Common Map, Common Nawab, Blue Banded Pierrot and the Southern Rustic were found being attracted

to otter droppings or regurgitations. Large aggregations of danaid butterflies on *Crotalaria* plants have been observed during the present study. Members of Dark Blue Tiger, Common Crow, and Double-branded Crow were found to aggregate on *Crotalaria* plants sucking the oozing plant sap.

18 species recorded in this study falls under the various protected categories as per the Indian Wildlife (Protection) Act of 1972. Among them, the Crimson Rose, Malabar Banded Swallowtail and the Danaid Eggfly are placed under Schedule -I of the Act.

SYSTEMATIC ACCOUNT

Family PAPILIONIDAE

1 *Troides minos* Cramer (Plate – V, Fig. 1)

Southern Birdwing

Larval Food Plants : *Aristolochia indica*, *A. tagala*, *Thottea siliquosa*.

Remarks : Uncommon. It is the largest butterfly of India, endemic to southern India. They were found frequently visiting the *Lantana* flowers.

2. *Pachliopta aristolochiae* (Fabricius)

Common Rose

Larval Food Plants : *Aristolochia indica*, *A. tagala*, *A. bracteolate*, *Thottea siliquosa*.

Remarks : Uncommon. Small numbers were observed during the survey.

3. *P. hector* (Linnaeus)

Crimson Rose

Larval Food Plants : *Aristolochia indica*, *Thottea siliquosa*.

Remarks : Common. A frequent visitor to the flowers of *Leucas*. The species is placed under Schedule-I of Indian Wildlife (Protection) Act, 1972.

4. *P. pandiyana* Moore

Malabar Rose

Larval Food Plant : *Thottea siliquosa*.

Remarks : A few observations from the Park. *Thottea siliquosa*, the only known larval food plant, was found well distributed in the park.

5. *Graphium sarpedon teredon* (Felder & Felder)

Common Blue Bottle

Larval Food Plants : *Cinnamomum malabattrum*, *C. camphora*, *C. macrocarpum*, *C. verum*, *Litsea chinensis*, *Persea macrantha*, *Milusa tomentosum*, *Polyalthia longifolia*.

Remarks : Uncommon. Frequently observed involved in mud-puddling activity along with a few other butterflies.

6. *G. doson eleius* Fruhstorfer

Common Jay

Larval Food Plants : *Annona lawii*, *Cinnamomum macrocarpum*, *C. malabattrum*, *Magnolia grandiflora*, *Michaelia champaca*, *Milusa tomentosum*, *Polyalthia longifolia*.

Remarks : Fairly common in the Park.

7. *G. ugamemnon menides* (Felder & Felder)

Tailed Jay

Larval Food Plants : *Annona reticulata*, *A. squamosa*, *Cinnamomum* spp., *Michelia champaca*, *Polyalthia longifolia*.

Remarks : Uncommon in the areas surveyed.

8. *Papilio clytia clytia* (Linnaeus)

Common Mime

Larval Food Plants : *Alseodaphne semicarpifolila*, *Cinnamomum camphora*, *C. macrocarpum*, *C. zeylanicum*, *Litsea chinensis*, *L. deccanensis*, *Persea macrantha*.

Remarks : Both the forms, *clytia* and *dissimilis*, were observed in the Park.

9. *P. demoleus demoleus* Linnaeus

Lime Butterfly

Larval Food Plants : *Aegle marmelos*, *Citrus* sp., *Glycosmis arborea*, *Murraya koenigii*, *Ruta graveolens*.

Remarks : Uncommon in the Park.

10. *P. liomedon* Moore

Malabar Banded Swallowtail

Larval Food Plants : *Evodia roxburghiana*, *Acronychia pedunculata*.

Remarks : Rare. A single observation from the Muduba area of the Park. Protected under Schedule-I of Indian Wildlife (Protection) Act, 1972.

11. ***P. helenus*** (Hampson)

Red Helen

Larval Food Plants : *Citrus* sp., *Evodia* sp., *Glycosmis arborea*, *Toddalia asiatica*, *Zanthoxylum rhetsa*, *Phellodendron* sp.

Remarks : Uncommon. A fast flier, observed frequently performing criss- cross flights on the forest roads during morning hours.

12. ***P. polytes polytes*** (Linnaeus)

Common Mormon

Larval Food Plants : *Aegle marmelos*, *Citrus* sp., *Glycosmis arborea*, *Murraya koenigii*, *Zanthoxylum rhetsa*, *Atalantia racemosa*, *Tripahsia* sp.

Remarks : Fairly common in the Park.

13. ***P. p. polymnestor*** Cramer

Blue Mormon

Larval Food Plants : *Glycosmis arborea*, *Atalantia racemosa*, *A. wightii*, *Citrus* spp.

Remarks : Uncommon. Blue Mormon is the second largest of the south Indian butterflies and it is restricted to Peninsular India and Sri Lanka.

14. ***P. paris tamilana*** Moore (Plate – V, Fig. 4)

Paris Peacock

Larval Food Plants : *Citrus* sp., *Evodia roxburghiana*, *Toddalia asiatica*, *Zanthoxylum ovalifolium*.

Remarks : Rare. Only two sightings during the survey. One dead specimen was found floating on water at Seethabhumi area of the Park.

15. ***P. Buddha*** Westwood

Buddha Peacock

Larval Food Plants : *Zanthoxylum rhetsa*.

Remarks : Fairly common. Frequently sighted on the flowers of *Lantana camara* and *Clerodendrum paniculatum*. Endemic to Western Ghats. The species is placed under Schedule-II of Indian Wildlife (Protection) Act, 1972.

16. ***P. crino*** Fabricius

Common Banded Peacock

Larval Food Plants : *Chloroxylon swietenia*.

Remarks : Not seen during the survey. Only Earlier Records available.

17. ***P. dravidarum*** Wood-Mason (Plate – V, Fig.2)

Malabar Raven

Larval Food Plants : *Glycosmis arborea*.

Remarks : Uncommon in the Park. The species is endemic to the Western Ghats.

18. ***Pathysa nomius*** (Esper)

Spot Swordtail

Larval Food Plants : *Milusa tomentosum*, *M. velutina*, *Polyalthia longifolia*.

Remarks : Not seen during the survey. Only Earlier Records available.

19. ***P. antiphates*** (Cramer)

Five-bar Swordtail

Larval Food Plants : *Annona elegans*, *A. lawii*, *A. zeylanica*, *Milusa* sp., *Uvaria* sp.

Remarks : Uncommon. A single record from the Seethabhumi area of the Park.

Family PIERIDAE

20. ***Catopsilia pomona*** (Fabricius)

Common Emigrant

Larval Food Plants : *Bauhinia racemosa*, *Buteo monosperma*, *Cassia fistula*, *C. tora*, *C. alata*.

Remarks : Common. Observed visiting the flowers of *Lantana camara* and *Wendlandia thyrsoides*.

21. ***C. pyranthe*** (Linnaeus)

Mottled Emigrant

Larval Food Plants : *Cassia auriculata*, *C. fistula*, *C. tora*, *C. alata*, *Sesbania bispinosa*

Remarks : Uncommon. More numbers were sighted in the Medicinal Plant Garden at Kerekatte.

22. *Eurema brigitta rubella* (Wallace)

Small Yellow

Larval Food Plants : *Cassia* spp.

Remarks : Rare. Very few records from the localities surveyed.

23. *E. hecabe simulata* (Moore)

Common Grass Yellow

Larval Food Plants : *Acacia* spp., *Albizzia* sp., *Caesalpinia* spp., *Cassia fistula*, *C. tora*, *Moulluva spicata*, *Pithecelobium dulce*, *Sesbania bispinosa*.

Remarks : Common in the Park.

24. *E. blanda silhetana* (Wallace)

Three-spot Grass Yellow

Larval Food Plants : *Albizia* spp., *Cassia fistula*, *Delonix regia*, *Moulluva spicata*, *Pithecelobium dulce*.

Remarks : Fairly common in the areas surveyed.

25. *E. laeta laeta* Boisduval

Spotless Grass Yellow

Larval Food Plants : Leguminous plants.

Remarks : Not seen during the survey. Only Earlier Records available.

26. *Delias eucharis* (Drury)

Common Jezebel

Larval Food Plants : *Dendrophthoe falcata*, *Helicanthes elastica*, *Scurrula parasitica*, *Viscum* spp.

Remarks : Found scarcely in the Park.

27. *Leptosia nina nina* (Fabricius)

Psyche

Larval Food Plants : *Capparis* spp., *Cleome viscosa*, *Crateva adansonii*.

Remarks : Fairly common in the Park.

28. *Cepora nerissa phryne* (Fabricius)

Common Gull

Larval Food Plants : *Cadaba fruticosa*, *Capparis spp.*

Remarks : Uncommon in the areas of the Park surveyed.

29. *C. nadina* (Lucas)

Lesser Gull

Larval Food Plants : *Capparis cleghornii*, *C. moonii*, *C. rheedii*.

Remarks : Rare. A single observation from Kerekatte region. The species is protected under Schedule-II of Indian Wildlife (Protection) Act, 1972.

30. *Anaphaeis aurota* (Fabricius)

Caper White/Pioneer

Larval Food Plants : *Cadaba fruticosa*, *Maerua oblongifolia*, *Capparis spp.*

Remarks : Not seen during the survey. Only Earlier Records available.

31. *Appias lyncida latifasciata* Moore

Chocolate Albatross

Larval Food Plants : *Capparis cleghornii*, *Crateva adansonii*.

Remarks : Rare. The species is placed under Schedule-II of Indian Wildlife (Protection) Act, 1972.

32. *A. albina* (Boisduval)

Common Albatross

Larval Food Plants : *Drypetes oblongifolia*, *D. roxbughii*, *D. venusta*.

Remarks : Fairly common. The species is protected under Schedule-II of Indian Wildlife (Protection) Act, 1972.

33. *A. indra* (Moore)

Plain Puffin

Larval Food Plants : *Drypetes oblongifolia*, *D. roxbughii*.

Remarks : Uncommon. Most of the observations were from high ranges of the Park.

34. *Pareronia valeria hippia* (Fabricius)

Common Wanderer

Larval Food Plants : *Capparis* spp.

Remarks : Rare. A single sight record from the Muduba area. The species is placed under Schedule-II of Indian Wildlife (Protection) Act, 1972.

35. *Hebomoia glaucippe australis* Butler

Giant Orange Tip

Larval Food Plants : *Capparis moonii*, *C. spinosa*, *Crateva adansonii*.

Remarks : Uncommon in the areas surveyed.

36. *Prioneris sita* (C. & R. Felder)

Painted Sawtooth

Larval Food Plants : *Capparis tenera*, *C. zeylanica*, *C. horrida*.

Remarks : Uncommon in the sites surveyed.

37. *Ixias pyrene sesia* Fabricius

Yellow Orange Tip

Larval Food Plants : *Capparis sepiaria*.

Remarks : Uncommon in the areas surveyed.

Family NYMPHALIDAE

38. *Melanitis leda leda* (Drury)

Common Evening Brown

Larval Food Plants : *Cyrtococcum* spp., *Oryza sativa*, *Oplismenus compositus*, *Panicum* spp.

Remarks : Common. Many individuals of the species got attracted to light at Kerekatte and Baghavathi nature camp area.

39. *Elymnias hypermnestra caudata* Butler

Common Palmfly

Larval Food Plants : *Areca catechu*, *Arenga wightii*, *Calamus* spp., *Zea* spp., *Cocos nucifera* and Ornamental Palms.

Remarks : Uncommon. A single record of a female butterfly from Kerekatte area of the Park.

40. ***Lethe europa ragalva*** Fruhstorfer

Bamboo Treebrown

Larval Food Plants : Bamboos.

Remarks : Rare in the areas surveyed.

41. ***Lethe rohria neelgheriensis*** Guerin-Meneville

Common Treebrown

Larval Food Plants : *Apluda* sp., *Capillipedium* sp., *Microstegium* sp.

Remarks : Uncommon. A specimen got trapped in the Malaise Trap, set for collecting insects at Kerekatte.

42. ***Mycalesis perseus typhlus*** Fruhstorfer

Common Bushbrown

Larval Food Plants : *Oryza* spp., *Oplismenus compositus*.

Remarks : Common. A few specimens got attracted to the alcohol solution in the Malaise Trap, set for collecting insects during the survey period.

43. ***M. patina junonia*** Butler

Glad-eye Bushbrown

Larval Food Plants : *Oryza* spp., other Grasses.

Remarks : Fairly common. It is restricted to South India and Sri Lanka.

44. ***Orsotrioena medus mandata*** (Moore)

Nigger

Larval Food Plants : *Imperata* sp., *Oryza sativa*.

Remarks : Uncommon in the Park. The genus is monotypic and the species is found from Sri Lanka to Australia.

45. ***Zipoetis saitis*** Hewitson

Tamil Cat's eye

Larval Food Plants : *Ochlandra* sp.

Remarks : Uncommon. The species is restricted to South India.

46. *Ypthima huebneri huebneri* Kirby

Common Fourring

Larval Food Plants : Grasses.

Remarks : Common. A weak flier often trapped in the Malaise trap set for insect collection.

47. *Charaxes bernardus imna* Butler

Tawny Rajah

Larval Food Plants : *Milusa tomentosa*, *Agalaia roxburghiana*, *Tamarindus indicus*.

Remarks : Not seen during the survey. Only Earlier Records available.

48. *Acraea violae* (Fabricius)

Tawny Coster

Larval Food Plants : *Adenia hondala*, *Passiflora edulis*, *P. foetida*, *P. subpeltata*.

Remarks : Uncommon. It is the only south Indian representative of the subfamily Acraeinae. The species is restricted to the Indian subcontinent and Sri Lanka.

49. *Cupha erymanthis maja* Fruhstorfer

Southern Rustic

Larval Food Plants : *Flacourtia* spp.

Remarks : Uncommon in the Park; however, observed often visiting the flowers of *Lantana*.

50. *Phalanta phalantha phalantha* (Drury)

Common Leopard

Larval Food Plants : *Flacourtia* spp., *Salix* sp., *Smilax* sp.

Remarks : Uncommon in the Park. An avid nectar feeder found attracted to flowers of *Acacia instia* plant.

51. *Cirrochroa thais thais* Fabricius

Tamil Yeoman

Larval Food Plants : *Hydnocarpus alpina*, *H. pentandra*.

Remarks : Fairly common. Restricted to South India and Sri Lanka.

52. *Neptis jumbah jumbah* Moore

Chestnut streaked Sailer

Larval Food Plants : *Bombax ceiba*, *Hibiscus* sp., *Moulluva spicata*, *Pongamia pinnata*, *Thespesia populnea*, *Xylia xylocarpa*, *Dalbergia* sp., *Ziziphus* sp.

Remarks : Uncommon in the areas surveyed.

53. *Neptis hylas varmona* (Moore)

Common Sailer

Larval Food Plants : *Bombax ceiba*, *Canavalia gladiata*, *Corchorus* sp., *Flemingia* sp., *Helicteres isora*, *Vigna cylindrica*, *Triumfetta* sp., *Paracalyx scarioisa*, *Mucuna purpurea*, *Xylia xylocarpa*.

Remarks : One of the most common species of the Park.

54. *Neptis viraja kanara* Evans

Yellow Jack Sailer

Larval Food Plants : *Dalbergia latifolia*, *D. racemosa*.

Remarks : Not seen during the survey. Only earlier records available.

55. *Pantoporia hordonia hordonia* (Stoll)

Common Lascar

Larval Food Plants : *Acacia instia*.

Remarks : Fairly common in the Park.

56. *Athyma ranga karwara* Fruhstorfer

Black Vein Sergeant

Larval Food Plants : *Chionanthus mala-elengi*, *Olea dioica*.

Remarks : Rare. A single observation from the Park.

57. *Athyma perius perius* Linnaeus

Common Sergeant

Larval Food Plants : *Glochidion lanceolarum*, *G. velutinum*, *Phyllanthus* sp.

Remarks : Fairly common in the Park.

58. *A. selenophora kanara* Evans

Staff sergeant

Larval Food Plants : *Adina cordifolia*.

Remarks : Uncommon. Sighted only at Towergudda area of the Park. 3 males and one female were located on the top hill adjoining a plantation.

59. *Athyma nefte inara* Doubleday

Colour Sergeant

Larval Food Plants : *Glochidion velutinum*, *G. zeylanica*, *Mussaenda frondosa*.

Remarks : Rare. A female of the species was sighted at Kerekatte area of the Park.

60. *Limenitis procris undifragus* Fruhstorfer

The Commander

Larval Food Plants : *Cadaba fruticosa*, *Mussaenda frondosa*.

Remarks : Uncommon in the areas visited.

61. *Kaniska canace viridis* Evans

Blue Admiral

Larval Food Plants : *Smilax* sp., *Dioscorea* sp.

Remarks : Rare. A single observation from Gangadikal area of the Park.

62. *Parthenos sylvia virens* Moore

Clipper

Larval Food Plants : *Adenia hondala*, *Tinospora cordifolia*.

Remarks : Fairly common. Many observations from the Park.

63. *Tanaecia lepidea miyana* Fruhstorfer

Grey Count

Larval Food Plants : *Careya arborea*, *Melastoma malabathricum*.

Remarks : Uncommon. Protected under Schedule-II of Indian Wildlife (Protection) Act, 1972.

64. *Euthalia aconthea meridionalis* Fruhstorfer

Common Baron

Larval Food Plants : *Mangifera indica*, *Scurrula parasitica*, *Streblus asper*, *Anacardium occidentale*.

Remarks : Umcommon. Protected under Schedule-II of Indian Wildlife (Protection) Act, 1972.

65. *E. lubentina arasada* Fruhstorfer

Gaudy Baron

Larval Food Plants : *Anacardium occidentale*, *Mangifera indica*, *Streblus asper*.

Remarks : Not seen during the survey. Only Earlier Records available.

66. *Dolpha evelina laudabilis* Swinhoei

Red Spot Duke

Larval Food Plants : *Anacardium occidentale*, *Diospyros spp.*

Remarks : Not seen during the survey. Only earlier records available. Protected under Schedule-II of Indian Wildlife (Protection) Act, 1972.

67. *Ariadne ariadne indica* (Moore)

Angled Castor

Larval Food Plants : *Ricinus communis*, *Tragia involucrata*.

Remarks : Uncommon in the areas surveyed.

68. *A. merione merione* Cramer

Common Castor

Larval Food Plants : *Ricinus communis*, *Tragia involucrata*.

Remarks : Fairly common in the Park.

69. *Polyura athamas athamas* Drury

Common Nawab

Larval Food Plants : *Albizzia lebbek*, *A. julibrisin*, *A. molluccana*, *Adenanthera pavoina*, *Grewia* sp., *Pithecelobium* sp., *Delonyx regia*, *Caesalpinia sappan*, *C. nuga*, *C. bonducella*, *Acacia pennata*, *A. concina*, *A. catechu*.

Remarks : Fairly common. Many a time observed attracted to Otter droppings.

70. *Junonia hierta hierta* Fabricius

Yellow Pansy

Larval Food Plants : *Barleria* spp., *Hygrophila auriculata*.

Remarks : Fairly common in the areas surveyed.

71. *Junonia orithya swinhoi* (Butler)

Blue Pansy

Larval Food Plants : *Acanthus* sp., *Barleria* sp., *Hygrophila auriculata*, *Justicia neesii*, *J. procumbens*, *Lepidagathis prostrata*.

Remarks : Uncommon. Mainly sighted at the Manikyadhara Betta area of the Park.

72. *J. lemonias* (Linnaeus)

Lemon Pansy

Larval Food Plants : *Barleria* sp., *Hygrophila auriculata*, *Sida rhombifolia*.

Remarks : Fairly common in the Park. One specimen got trapped in the Malaise trap set for collecting insects at Kerekatte.

73. *J. almana almana* (Linnaeus)

Peacock Pansy

Larval Food Plants : *Acanthus* sp., *Barleria* sp., *Hygrophila auriculata*.

Remarks : Fairly common. Mainly sighted near the paddy fields at Kerekatte.

74. *J. atlites atlites* (Linnaeus)

Grey Pansy

Larval Food Plants : *Barleria* sp., *Hygrophila auriculata*.

Remarks : Uncommon in the areas surveyed.

75. *J. iphita pluvialis* Fruhstorfer

Chocolate Pansy

Larval Food Plants : *Hygrophila auriculata*, *Justicia neesii*, *Carvia callosa*.

Remarks : Fairly common in the areas surveyed.

76. *Cynthia cardui cardui* (Linnaeus)

Painted Lady

Larval Food Plants : *Artemisia* sp., *Blumea* sp, *Zornia gibbosa*, *Tricholepis* sp., *Gnaphalium* sp., *Debregeasia* sp.

Remarks : Rare. A single observation at the S. K. border area of the Park.

77. *Hypolimnias bolina jacintha* Drury

Great Eggfly

Larval Food Plants : *Laportea interrupta*, *Portulaca oleracea*, *Sida rhombifolia*.

Remarks : Fairly common in the Park.

78. *H. misippus* (Linnaeus)

Danaid Eggfly

Larval Food Plants : *Abutilon* sp., *Abelmoscus* sp., *Asystasia lawiana*, *Barleria cristata*, *Hibiscus* sp., *Portulaca oleracea*.

Remarks : Fairly common. Listed in the Schedule- I of Indian Wildlife (Protection) Act of 1972.

79. *Vindula erota saloma* Swinhoe

Southern Cruiser

Larval Food Plants : *Adenia hondala*, *Passiflora edulis*, *P. subpetala*.

Remarks : Uncommon. A few golden orange coloured males were observed during the survey.

80. *Cethosia nietneri mahratta* Felder

Tamil Lacewing

Larval Food Plants : *Adenia hondala*, *Passiflora edulis*, *P. subpetala*.

Remarks : Rare. A single observation from the Towergudda area of the Park.

81. *Cyrestis thyodamas indica* Evans (Plate – V, Fig. 3)

Map Butterfly

Larval Food Plants : *Ficus religiosa*, *F. bengalensis*, *F. glomerata*, *F. nemoralis*.

Remarks : Uncommon. Mainly found along the running streams and frequently resting on the animal droppings along with other butterflies.

82. *Kallima horsfieldi* Kollar

South Indian Blue Oak-leaf

Larval Food Plants : *Carvia callosa*, *Eranthemum malabricum*, *Strobilanthes* sp., *Lepidagathes cuspidata*.

Remarks : Rare. A single observation from the Park. The species is endemic to Western Ghats and is protected under Schedule-II of Indian Wildlife (Protection) Act, 1972.

83. *Parantica aglea aglea* (Stoll)

Glassy Blue Tiger

Larval Food Plants : *Calotropis gigantea*, *Cerpegia bulbosa*, *Cryptolepis buchanani*, *Tylophora indica*, *T. tenuis*.

Remarks : Uncommon; observed in small numbers. Apparently, not a regular butterfly of the Park.

84. *Tirumala limniace exoticus* Gmelin

Blue Tiger

Larval Food Plants : *Asclepias curassavica*, *Calotropis gigantea*, *Tylophora indica*, *Wattakaka volubilis*.

Remarks : Uncommon in the areas surveyed.

85. *Tirumala septentrionis* Butler

Dark Blue Tiger

Larval Food Plants : *Wattakaka volubilis*, *Vallaris heynei*.

Remarks : A common butterfly of the Park

86. *Danaus chrysippus chrysippus* (Linnaeus)

Plain or Common Tiger

Larval Food Plants : *Asclepias curassavica*, *Calotropis gigantea*, *Cryptolepis buchanani*.

Remarks : A common butterfly of the Park.

87. *D. genutia genutia* (Cramer)

Striped Tiger

Larval Food Plants : *Asclepias curassavica*, *Ceropegia intermedia*, *Tylophora tenuis*, *Stephanotis* sp.

Remarks : Uncommon in the areas surveyed.

88. *Euploea core core* (Cramer)

Common Crow

Larval Food Plants : *Ficus bengalensis*, *F. racemosa*, *F. religiosa*, *F. arnottiana*, *Hemidesmus indicus*, *Holarrhena pubescens*, *Ichnocarpus frutescens*, *Nerium odorum*, *N. oleander*, *Streblus asper*, *Tylophora indica*.

Remarks : A common butterfly of the Park.

89. *E. Sylvester coreta* Godart

Double-branded Crow

Larval Food Plants : *Ficus hispida*, *Streblus asper*.

Remarks : Fairly common. A dominant danaine species congregating on the *Crotalaria* plant.

90. *Idea malabarica* Moore (Plate – V, Fig. 5)

Malabar Tree Nymph

Larval Food Plants : *Aganosma cymosa*, *Parsonsia spiralis*.

Remarks : Fairly common. Endemic to the wet evergreen forests of the Western Ghats.

Family LYCAENIDAE

91. *Abisara echerius prunosa* (Moore)

Plum Judy

Larval Food Plants : *Embelia robusta*, *Ardisia* sp.

Remarks : Rare; a few observations from the Park.

92. *Spalgis epius epius* (Westwood)

Apefly

Larval Food : Mealy bugs.

Remarks : Rare in the Park. The larva is carnivorous; it feeds exclusively on mealy bugs (Coccidae).

93. *Castalius rosimon rosimon* (Fabricius)

Common Pierrot

Larval Food Plants : *Ziziphus mauritiana*, *Z. rugosa*.

Remarks : Fairly common in the Park.

94. *Caleta caleta decidia* (Hewitson)

Angled Pierrot

Larval Food Plants : *Ziziphus rugosa*.

Remarks : Common, but less common than Common Pierrot in the areas surveyed.

95. *Tarucus ananda* de Niceville

Dark Pierrot

Larval Food Plants : *Dendrophthoe falcata*, *Ziziphus xylopyrus*, *Loranthus* sp.

Remarks : Rare. A single observation from the Bhagavathi area of the Park.

96. *Discolampa ethion vavasanus* Fruhstorfer

Banded Blue Pierrot

Larval Food Plants : *Ziziphus mauritiana*, *Z. oenoplia*, *Z. xylopyrus*.

Remarks : Fairly common. Found attracted to otter droppings along with a few other butterflies.

97. *Pseudozizeeria maha ossa* (Swinhoe)

Pale Grass Blue

Larval Food Plants : *Nelsonia canescens*, *Strobilanthes* spp., *Oxalis corniculata*, *Tephrosia pauciflora*.

Remarks : Commonly seen in the Park.

98. *Euchrysops cnejus cnejus* (Fabricius)

Gram Blue

Larval Food Plants : *Acacia* spp., *Paracalyx scariosa*, *Ougeinia oojeinensis*, *Pisum sativum*, *Vigna cylindrica*, *V. trilobata*, various grams and beans.

Remarks : Uncommon in the areas surveyed.

99. *Lampides boeticus* (Linnaeus)

Pea Blue

Larval Food Plants : *Butea monosperma*, *Crotalaria* spp., *Pisum sativum*, *Vigna sinensis*, species of gram.

Remarks : Uncommon. Mostly observed at the Muduba area of the Park. The species is protected under Schedule-II of Indian Wildlife (Protection) Act, 1972.

100. *Jamides bochus bochus* (Cramer)

Dark Cerulean

Larval Food Plants : *Butea monosperma*, *Milettia peguensis*, *Tephrosia candida*, *vigna cylindrica*, *Crotalaria* sp., *Pongamia pinnata*, *Xylia xylocarpa*.

Remarks : Rare. A few sightings from the Park.

101. *Jamides celeno aelianus* (Fabricius)

Common Cerulean

Larval Food Plants : *Butea monosperma*, *Abrus precatorius*, *Pongamia pinnata*, *Saraca asoca*, *Xylia xylocarpa*, *Trichilia cannaroides*, *Elettaria cardamomum*.

Remarks : A fairly common butterfly of the Park.

102. *Prosotas nora nora* (Felder)

Common Line Blue

Larval Food Plants : *Acacia catechu*, *Pithecellobium dulce*, and a few unspecified plants from families *Combretaceae*, *Myrtaceae* and *Sapindaceae*.

Remarks : Rare. A single specimen from Gangamoola area of the Park.

103. *Talica narseus narseus* Gurin-Meneville

Red Pierrot

Larval Food Plants : *Kalanchoe* spp.

Remarks : Not seen during the survey. Only Earlier Records available.

104. *Everes lacturnus syntala* Cantlie

Indian Cupid

Larval Food Plants : *Lotus corniculatus*

Remarks : Not seen during the survey. Only Earlier Records available.

105. *Leptotes plinius* Fabricius

Zebra Blue

Larval Food Plants : *Albizia lebbek*, *Dyreophytum indicum*, *Indigofera* sp., *Mimosa* sp., *Plumbago zeylanica*, *Sesbania bispinosa*.

Remarks : Uncommon in the Park.

106. *Magisba malaya twaitlesi* Moore

Malayan

Larval Food Plants : *Allophylus cobbe*, *Erioglossum* sp., *Hemigyroza* sp., *Schleichera oleosa*.

Remarks : Rare. A single observation from the Lakhya Dam area of the Park.

107. *Nepithecops zalmora dharmia* Moore

Quaker

Larval Food Plants : *Glycosmis arborea*.

Remarks : Fairly common near Kerekatte region.

108. *Freyeria trochylus putli* Kollar

Grass Jewel

Larval Food Plants : *Goniogyna hirta*, *Indigofera* sp., *Lotus corniculatus*, *Oxalis corniculata*, *Pisum sativum*, *Rhynchosia minima*, *Vicia* sp.

Remarks : Not seen during the survey. Only Earlier Records available.

109. *Spindasis vulcanus vulcanus* (Fabricius)

Common Silverline

Larval Food Plants : *Cadaba fruticosa*, *Clerodendrum indicum*, *Allophylus cobbe*, *Canthium* sp., *Ziziphus mauritiana*, *Z. rugosa*.

Remarks : Uncommon in the areas surveyed.

110. *Loxura atymnus atymnus* (Cramer)

Yamfly

Larval Food Plants : *Dioscorea pentaphylla*, *Smilax* sp.

Remarks : Fairly common in the Park.

111. *Rathinda amor* (Fabricius)

Monkey Puzzle

Larval Food Plants : *Ixora coccinea*, *Loranthus* sp.

Remarks : Uncommon in the Park.

112. *Tajuria cippus cippus* (Fabricius)

Peacock Royal

Larval Food Plants : *Dendrophthoe falcata*, *Helicanthus elastica*, *Helixanthera wallichiana*.

Remarks : Rare. A single observation from the Kerekatte region of the Park. Protected under Schedule-II of Indian Wildlife (Protection) Act, 1972.

113. *Rapala manea schistacea* (Moore)

Slate Flash

Larval Food Plants : *Acacia* sp. *Antidesma acidum*, *Quisqualis indica*, *Ziziphus* sp.

Remarks : Uncommon. Frequently found visiting flowers of *Stachytrarpeta* sp.

114. *Curetis thetis thetis* (Drury)

Indian Sunbeam

Larval Food Plants : *Abrus precatorius*, *Pongamia pinnata*, *Derris scandens*.

Remarks : Rare. A single observation from Bhagavathy area of the Park.

Family HESPERIIDAE

115. *Matupa aria* Moore

Common Redeye

Larval Food Plants : *Bambusa arundinacea*.

Remarks : Rare. A single observation from the Park.

116. *Hasora taminatus taminatus* Hubner

White Banded Awl

Larval Food Plant : *Brachypterum scandens*.

Remarks : Fairly common. Mostly found around the Hanumangundi falls area of the Park.

117. *Hasora chromus chromus* (Cramer)

Common Banded Awl

Larval Food Plants : *Pongamia pinnata*, *Ricinus communis*, *Trichilia cannaroides*.

Remarks : Uncommon. Very few sightings from the localities visited.

118. *H. badra badra* (Moore)

Common Awl

Larval Food Plants : *Derris* spp.

Remarks : Uncommon in the sites surveyed.

119. *Badamia exclamationis* (Fabricius)

Brown Awl

Larval Food Plants : *Terminalia bellirica*, *Combretum* spp.

Remarks : Not seen during the survey. Only Earlier Records available.

120. *Celaenorrhinus leucocera* (Kollar)

Common Spotted Flat

Larval Food Plants : *Carvia callosa*, *Asystasia gangetica*, *Ecbolium ligustrinum*, *Eranthemum roseum*.

Remarks : Rare in the sites surveyed.

121. *C. ambareesa* (Moore)

Malabar Spotted Flat

Larval Food Plants : *Carvia callosa*, *Daedalacanthus purpurascens*, *Eranthemum roseum*.

Remarks : Uncommon. However, sighted on the edges of the evergreen forests, adjoining a road.

122. *Tagiades gana silvia* Evans

Suffused Snow Flat

Larval Food Plants : *Dioscorea* sp.

Remarks : Uncommon in the sites surveyed.

123. *T. litigiosa litigiosa* Moschler

Water Snow Flat

Larval Food Plants : *Dioscorea* sp., *Smilax* spp.

Remarks : Uncommon in the sites visited during the survey.

124. *Psedocoladenia dan dan* (Fabricius)

Fulvous Pied Flat

Larval Food Plants : *Achyranthes aspera*

Remarks : Uncommon in the sites visited during the survey.

125. *Pseudocladenia indrana* (Moore)

Tricolour Pied Flat

Larval Food Plants : *Xylia xylocarpa*.

Remarks : Uncommon in the sites surveyed.

126. *Sarangesa dasahara* Swinhoe

Common Small Flat

Larval Food Plants : *Asystasia* spp., *Blepharis asperima*.

Remarks : Uncommon in the sites visited during the survey.

127. *S. purendra pandra* Evans

Spotted Small Flat

Larval Food Plants : *Asystasia* spp.

Remarks : Rare in the areas surveyed.

128. *Sipalia galba galba* (Fabricius)

Indian Grizzled Skipper

Larval Food Plants : *Hibiscus* sp., *Sida rhombifolia*, *Waltheria indica*.

Remarks : Rare. A few sightings from the Park.

129. *Ampittia discorides* (Fabricius)

Bush Hopper

Larval Food Plants : *Oryza sativa*.

Remarks : Uncommon. A specimen got trapped in the Malaise Trap, set for insect collection at Bhagavathi Nature camp area.

130. *Iambrix salsala lutipennis* (Plotz)

Chestnut Bob

Larval Food Plants : *Bambusa arundinacea* and grasses.

Remarks : Uncommon. An active butterfly of the wet season.

131. *Psolos fuligo subfasciatus* Moore

Coon

Larval Food Plants : *Stachyphrynium spicatum*, *Zingiber* sp.

Remarks : Fairly common in the Park.

132. *Notocrypta curvifascia curvifascia* (Felder & Felder)

Restricted Demon

Larval Food Plants : *Costus speciosus*, *Curcuma* sp., *Hedychium* spp., *Kempferia rotunda*, *Zingiber* sp.

Remarks : Uncommon in the areas surveyed.

133. *Udaspus folus* (Cramer)

Grass Demon

Larval Food Plants : *Curcuma* sp., *Hedychium* spp., *Zingiber* spp.

Remarks : Rare. A single observation from the Kudremukh area of the Park.

134. *Suastus gremius gremius* (Fabricius)

Indian Palm Bob

Larval Food Plants : *Caryota urens*, *Cocos nucifera*, *Phoenix acaulis*, *P. loureirii*.

Remarks : Uncommon. Found attracted to flowers.

135. *Gangara thyrsis thyrsis* (Fabricius)

Giant Redeye

Larval Food Plants : *Calamus rotang*, *Caryota urens*, *Cocos nucifera*, *Phoenix acaulis*, *P. loureirii*, ornamental palms.

Remarks : Rare. A single butterfly was found attracted to light at Kerraekattae Forest Rest House.

136. *Taractrocera maevis sagara* Moore

Common Grass Dart

Larval Food Plants : Grasses.

Remarks : Not seen during the survey. Only Earlier Records available.

137. *T. ancilla bambusae* (Moore)

Dark Palm Dart

Larval Food Plants : *Oryza spp.*, *Bamboos*.

Remarks : Fairly common in the Park.

138. *Barbo cinnara* (Wallace)

Rice Swift

Larval Food Plants : *Cymbopogon sp.*, *Eragrostis sp.*, *Ischaemum sp.*, *Oryza sativa*, *Pennisetum sp.*

Remarks : Fairly common in the areas surveyed.

139. *Pelopidas mathias mathias* (Fabricius)

Small Branded Swift

Larval Food Plants : Grasses

Remarks : Uncommon in the park.

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STREAM INSECTS

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INTRODUCTION

Insects are the most diverse group of organisms in freshwater. Estimates on the global number of aquatic insect species derived from the fauna of North America, Australia and Europe is about 45,095 (WCMC, 2000). Aquatic insects of riverine ecosystems, comprising some well-known groups like mayflies (Ephemeroptera), dragonflies (Odonata) and caddisflies (Trichoptera) are important group of organisms in stream ecosystem function. Different functional groups of aquatic insects such as shredders, scrapers, filter feeders and predators are important links in nutrient recycling in streams. Aquatic insects primarily process wood and leaf litter reaching the stream from the surrounding landscape. Nutrients processed by aquatic insects of stream are further degraded into absorbable form by fungal and bacterial action. Plants in the riparian zone absorb this nutrient soup transported through forest streams. In addition to this significant ecosystem function, aquatic insects are also a primary source of food for fishes (Merritt *et al.*, 1984 & Wallace and Jackson, 1996).

Aquatic insects are very good indicators of human impact on fresh water ecosystem. Biological monitoring methods using aquatic insects have been developed and reliably tested in both temperate and tropical aquatic systems (Resh, 1979; Armitage *et al.*, 1983; Trivedi, 1991; Sivaramakrishnan *et al.*, 1996).

Well known Indian ichthyologist and zoogeographer-Sunder Lal Hora highlighted the importance of current and substratum as determinants of faunal distribution and morphology in torrential streams 80 years ago (Hora, 1923, 1927, 1936). Unfortunately, tropical Indian streams remained unexplored till 1980's. Since then taxonomy and ecology of south Indian stream insects were being investigated (Sivaramakrishnan & Venkataraman, 1990; Burton & Sivaramakrishnan, 1993; Sivaramakrishnan *et al.*, 1995; Sivaramakrishnan *et al.*, 1996; Sivaramakrishnan *et al.*, 2000; Subramanian and Sivaramakrishnan, 2002; Subramanian and Sivaramakrishnan, 2005a; Subramanian and Sivaramakrishnan, 2005b; Subramanian, 2007).

Preliminary studies on the stream insect communities of the Western Ghats were either restricted to one system (Burton & Sivaramakrishnan, 1993; Sivaramakrishnan *et al.*, 1995), few localities (Sivaramakrishnan *et al.*, 2000) or carried out inadequately (Martin *et al.*, 2000).

Current study provides an overview of diversity of stream insect fauna of Kudremukh National Park, one of biodiversity rich areas of the Western Ghats.

MATERIALS AND METHODS

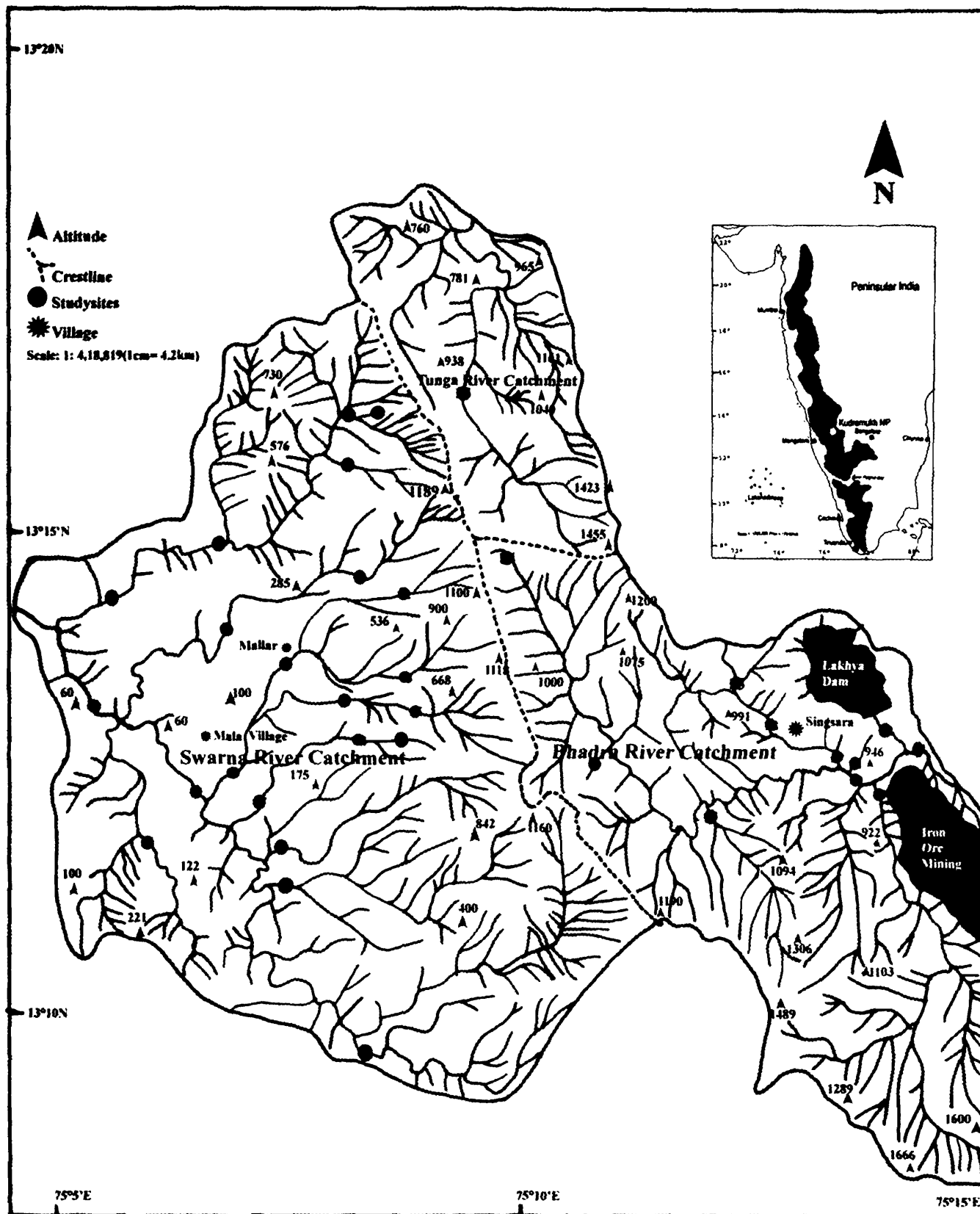
Study area : A study on the stream insect communities, focusing two drainage basins within a landscape was carried out at Kudremukh National Park. The Kudremukh National Park (KMNP), named after the tallest peak of 1892 m of central Western Ghats is located in the state of Karnataka. This 600 km² national park is located between 13°01'00" to 13°29'17"N and longitude 75°00'55" to 75°25'00" E (Map-1). The western and southern sides of the park form a steep slope with an altitude varying from 100m-1880m. This region forms the catchment for the Tunga, Bhadra, Swarna and Netravati Rivers. High rainfall characterizes the region. Average annual rainfall varies from 1800mm to 7000 mm, depending upon the location. The peak rainfall is usually in the month of July with an average of 2800 mm (EIA Report, 2001).

The dominant vegetation types in the Park are evergreen and semi-evergreen forests. The central, northern and eastern portions of the Park comprise a formation of rolling hills with a mosaic of grasslands and sholas (Pascal, 1988). The forest formation in the western slopes below 300m is human influenced and is semi evergreen in nature. A mosaic of landscape element types replaces natural vegetation below c.200m. Plantations of various kinds especially arecanut (*Areca catechu*) dominate this landscape.

An important environmental problem of the region is the iron ore mining by Kudremukh Iron Ore Company Limited (KIOCL). The company mines Banded Magnetite Quartzite from the crest line of Kudremukh Mountains. Though the mine is situated in the heart of the KMNP, the mining area is leased out for the company. The river Bhadra drains the mining area and Malleswara Township and flows eastwards (EIA Report, 2001). On the western slopes, just below the iron ore mines, the river Yannehole drains a portion of KMNP and Mala Village cluster. Due to the ecological problems, the mining was stopped in 2005 by the Supreme Court of India.

Aquatic insect communities were studied in the river Bhadra and Yennehole. The river Bhadra is a major tributary of Tungabhadra-Krishna river system and flows to the Bay of Bengal. On the other hand, the Yennehole joins the Swarna River and flows to the Arabian Sea. These two river catchments together represent all the important landscape element types of the Western Ghats (Nagendra and Gadgil, 1998).

Sampling methods : At each study site, a stretch of approximately 100-150 m was selected for collection of samples from the three target habitats viz., cascades, low gradient riffles and pools. The stream habitats were classified according to MacCain *et al.* (1990).



Map-1: Sampling localities within the Kudremukh National Park

In cascades an “all out search” method was used to collect the aquatic insects. The effort in sampling in cascades was standardized by restricting the collection of aquatic insects from an area of 10 m² for one hour. Within the sampling area, aquatic insects were searched and collected from substrata such as bedrocks, boulders, cobbles, leaf litter and dead wood. In low gradient riffles, aquatic insects were sampled by taking three, 1-minute kick-net samples (mesh opening: 180 µm; area 1 m²). Aquatic insects on water surface of the pools were collected using a nylon pond net (mesh opening: 500 µm; diameter: 30 cm; depth: 15 cm). All out search method was employed to collect aquatic insects from the substratum in the pools.

In addition to this, from all the sampling locations presence of adult odonate species were recorded. Species, which could not be identified in the field, were collected either by hand (Zygoptera) or using a sweep net (Anisoptera).

Identification : Collected samples were preserved in 70% ethanol and assigned to family and genus using taxonomic keys for that particular group (Dudgeon, 1999; Fraser, 1933-36; Morse *et al.*, 1994; Thirumalai, 1989, 1999 and Wiggins, 1996). All the genera encountered during the study were assigned functional feeding group category based on mode of food acquisition and the nature of the food resource (Merritt and Cummins, 1996; and Sivaramakrishnan, 1992).

Analysis : Diversity Estimates : Diversity of stream insects (Plates VI–VIII) were estimated for different habitat types and stream with different riparian land use types. Estimates such as alpha or point diversity and beta or differentiation diversity were measured using family and species richness, Shannon and Jaccard’s indices (Magurran, 1988).

RESULTS

A total of 6,755 individuals belonging to 72 genera and 46 families were collected from 83 sampling sessions (Table-1). In addition to this, 41 species of adult odonates belonging to 31 genera and 11 families were also recorded from the study area (Table-2).

Habitat Diversity : The diversity of family and genera at different habitats shows that the cascades are most diverse (Table-3). The highest diversity for Ephemeroptera was observed in the riffles and for other taxonomic groups such as, Hemiptera, Trichoptera and others maximum diversity was in the cascades (Table-3). The family and genera composition change across habitats. In cascades genera such as *Limnogonus* (Gerridae), *Libellulidae*, *Dineutus* (Gyrinidae), *Helicopsyche* (Helicopsychidae) and *Rhagovelia* (Veliidae) dominate. The rare genera in cascades include *Cybister* (Dytiscidae), Tipulidae, *Aulocodes* (Pyralidae) and *Naucoris* (Naucoridae).

Table-1 : Stream Insects of Kudremukh National Park

Sl. No.	Order	Family	Genera	Functional Feeding Group	Habitat Distribution		
					Cascades	Riffles	Pools
I	Ephemeroptera (Mayflies)						
1.		Baetidae	<i>Baetis</i>	Collector	+	+	+
2.		Caenidae	<i>Caenis</i>	Collector	+	+	
3.		Ephemerellidae	<i>Teloganodes</i>	Collector	+	+	+
4.		Heptageniidae	<i>Epeorus</i>	Scraper	+	+	+
5.		Heptageniidae	<i>Thalerosphyrus</i>	Scraper	+	+	+
6.		Leptophlebiidae	<i>Choroterpes</i>	Scraper	+	+	+
7.		Leptophlebiidae	<i>Indialis</i>	Scraper	+	+	
8.		Leptophlebiidae	<i>Isca</i>	Scraper	+	+	+
9.		Leptophlebiidae	<i>Petersulla</i>	Scraper	+	+	+
10.		Leptophlebiidae	<i>Notophlebia</i>	Scraper	+	+	
11.		Neophimeridae	<i>Neophimeridae</i>	Collector	+	+	
12.		Oligoneuridae	<i>Isonychia</i>	Collector	+	+	-
13.		Potamanthidae	<i>Rheonanthus</i>	Collector	+		+
14.		Trichorythidae	<i>Neurocaenis</i>	Collector	+		
II	Odonata (Dragonflies and Damselflies)						
15.		Chlorocyphidae	<i>Rhynocypha</i>	Predator	+	+	+
16.		Cordulidae	<i>Cordulidae*</i>	Predator	+	-	-
17.		Euphaeidae	<i>Euphaea</i>	Predator	+	+	+
18.		Gomphidae	<i>Gomphidae*</i>	Predator	+	+	+
19.		Gomphidae	<i>Lamelligomphus</i>	Predator	+	+	-
20.		Libellulidae	<i>Libellulidae*</i>	Predator	+	+	+

Sl. No.	Order	Family	Genera	Functional Feeding Group	Habitat Distribution		
					Cascades	Riffles	Pools
21.		Protoneuridae	<i>Protoneuridae</i> *	Predator	+	+	-
III	Plecoptera (Stoneflies)						
22.		Perlidae	<i>Neoperala</i>	Predator	+	+	+
IV	Blattodea (Cockroaches)						
23.		Blaberidae	<i>Blaberidae</i>	Shredder	+	+	+
V	Orthoptera (Grasshoppers)						
24.		Tetrigidae	<i>Scelimena</i>	Scraper	+	+	+
VI	Hemiptera (Bugs)						
25.		Corixidae	<i>Micronecta</i>	Predators	-	+	-
26.		Gerridae	<i>Amemboa</i>	Predators	+	+	+
27.		Gerridae	<i>Aquarius</i>	Predators	+	+	+
28.		Gerridae	<i>Cylindrostethus</i>	Predators	+	+	+
29.		Gerridae	<i>Gerridae</i> *	Predators	-	-	+
30.		Gerridae	<i>Limnogonus</i>	Predators	+	+	+
31.		Gerridae	<i>Metrocoris</i>	Predators	+	+	+
32.		Gerridae	<i>Ptilomera</i>	Predators	+	+	+
33.		Gerridae	<i>Tenagogonus</i>	Predators	-	-	+
34.		Hebridae	<i>Timasius</i>	Predators	+	+	-
35.		Naucoridae	<i>Naucoris</i>	Predators	+	+	-
36.		Notonectidae	<i>Enithares</i>	Predators	-	-	+
37.		Notonectidae	<i>Nychia</i>	Predators	-	-	+
38.		Veliidae	<i>Velidae</i> *	Predators	-	+	-
39.		Veliidae	<i>Rhagovelia</i>	Predators	+	-	+

Sl. No.	Order	Family	Genera	Functional Feeding Group	Habitat Distribution		
					Cascades	Riffles	Pools
VII	Coleoptera (Beetles)						
40.		Curculionidae	<i>Curculionidae*</i>	Shredder	+	+	+
41.		Dytiscidae	<i>Cybester</i>	Perdator	+	+	+
42.		Dytiscidae	<i>Hydaticus</i>	Perdator	-	-	+
43.		Dytiscidae	<i>Laccophilus</i>	Perdator	+	+	+
44.		Dytiscidae	<i>Sandracottus</i>	Perdator	+	-	+
45.		Elmidae	<i>Leptelmis</i>	Scraper	+	+	+
46.		Elmidae	<i>Stenelmis</i>	Collector	+	+	+
47.		Gyrinidae	<i>Dinutus1</i>	Perdator	-	-	+
48.		Gyrinidae	<i>Dinutus2</i>	Perdator	-	-	+
49.		Hydrophilidae	<i>Laccobius</i>	Macrophyte Piercer	+	+	-
50.		Noteridae	<i>Noteridae*</i>	Collector	+	-	-
51.		Psephenidae	<i>Eubrianax</i>	Scraper	+	+	+
52.		Psephenidae	<i>Psephenidae*</i>	Scraper	+	+	-
VIII	Trichoptera (Caddisflies)						
53.		Calamoceratidae	<i>Anisocentropus</i>	Shredder	+	+	+
54.		Glossosomatidae	<i>Agapetus</i>	Scraper	+	-	+
55.		Glossosomatidae	<i>Glossosoma</i>	Scraper	+	-	+
56.		Goeridae	<i>Goera</i>	Scraper	+	+	+
57.		Helicopsychidae	<i>Helicopsyche</i>	Scraper	+	+	+
58.		Hydropsychidae	<i>Hydropsyche</i>	Collector	+	+	+
59.		Hydropsychidae	<i>Leptonema</i>	Collector	+	+	-
60.		Hydropsychidae	<i>Macronema</i>	Collector	+	+	-

					Habitat Distribution		
Sl. No.	Order	Family	Genera	Functional Feeding Group			
					Cascades	Riffles	Pools
61.		Hydropsychidae	<i>Moselyana</i>	Collector	+	+	+
62.		Hydroptilidae	<i>Hydroptilidae</i> *	Collector	-	+	-
63.		Lepidostomatidae	<i>Goerodes</i>	Shredder	+	+	+
64.		Philopotamidae	<i>Chimarra</i>	Collector	+	+	+
65.		Philopotamidae	<i>Wormaldia</i>	Collector	+	+	+
66.		Polycentropodidae	<i>Polycentropus</i>	Predator	+	-	-
IX	Lepidoptera (Moths)						
67.		Pyalidae	<i>Alacodes</i>	Scraper	+	+	+
X	Diptera (Flies)						
68.		Blephariceridae	<i>Philorus</i>	Scraper	+	-	+
69.		Chironomidae	<i>Chironomidae</i> *	Collector	+	+	+
70.		Ephydriidae	<i>Ephydriidae</i> *	Collector	+	+	-
71.		Simuliidae	<i>Simulium</i>	Collector	+	+	+
72.		Tipulidae	<i>Tipulidae</i> *	Shredder	+	+	+

*= Identification only up to the family; +: Present; -: Absent

Table-2 : Dragonflies and Damselflies (Odonata: Insecta) of Kudremukh National Park

Sl. No.	Suborder	Family	Species
	Anisoptera		
		Aeshnidae	
1.			<i>Anaciaeschna jaspidea</i>
2.			<i>Anax guttatus</i>
3.			<i>Anax immaculifrons</i>
4.			<i>Gynacantha dravida</i>
		Gomphidae	
5.			<i>Ictinogomphus rapax</i>
		Libellulidae	
6.			<i>Bradinopyga geminata</i>
7.			<i>Cratilla lineata</i>
8.			<i>Crocothemis servilia</i>
9.			<i>Diplacodes trivialis</i>
10.			<i>Epithemis mariae</i>
11.			<i>Lathrecista asiatica</i>
12.			<i>Neurothemis fulvia</i>
13.			<i>Neurothemis tullia</i>
14.			<i>Orthetrum glaucum</i>
15.			<i>Orthetrum luzonicum</i>
16.			<i>Orthetrum pruinsum</i>
17.			<i>Orthetrum sabina</i>
18.			<i>Pantala flavescens</i>
19.			<i>Rhyothemis variegata</i>
20.			<i>Tetrathemis platyptera</i>
21.			<i>Tramea limbata</i>
22.			<i>Trithemis aurora</i>
23.			<i>Trithemis festiva</i>
24.			<i>Zyxomma petiolatum</i>
	Zygoptera		
		Calopterygidae	
25.			<i>Neurobasis chinensis</i>
26.			<i>Vestalis apicalis</i>
27.			<i>Vestalis gracilis</i>
		Chlorocyphidae	
28.			<i>Libellago lineata</i>
29.			<i>Rhinocypha bisignata</i>

Sl. No.	Suborder	Family	Species
		Coenagrionidae	
30.			<i>Agriocnemis pygmea</i>
31.			<i>Ceriagrion cerinorubellum</i>
32.			<i>Ceriagrion coromandelianum</i>
33.			<i>Ceriagrion olivaceum</i>
34.			<i>Ischnura aurora</i>
35.			<i>Pseudagrion microcephalum</i>
		Euphaeidae	
36.			<i>Euphaea fraseri</i>
		Lestidae	
37.			<i>Lestes elatus</i>
		Platycenemididae	
38.			<i>Copera marginipes</i>
39.			<i>Copera vittata</i>
		Platystictidae	
40.			<i>Protosticta hearseyi</i>
		Protoneuridae	
41.			<i>Esme longistyla</i>

The riffles were dominated by genera such as *Hydropsyche* (Hydropsychidae), *Laccobius* (Hydrophilidae), *Choroterpes* (Leptophlebiidae), *Petersula* (Leptophlebiidae) and *Neoperla* (Perlidae). The rare genera in the riffles include *Aulocodes* (Pyralidae), *Isca* (Leptophlebiidae), *Cybister* (Dytiscidae) and *Neurocaenis* (Tricorythidae). In pools, many genera such as *Meterocoris* (Gerridae), *Amemboa* (Gerridae), *Goera* (Goeridae) and *Enithares* (Notonectidae) which were rare or absent in the cascaded and riffles dominate. The rare genera in pools include *Anisocentropus* (Calamoceratidae), *Stenelmis* (Elmidae), *Simulium* (Simuliidae) and Gomphidae.

The taxa turnover across habitats shows that the cascades and riffles are very similar in composition than the pools. The cascades and riffles share about 63 percent of the families and 59 percent of the genera. However, the cascades and pools share 65 percent of the families and 49 percent of the genera. On the other hand, the riffles and pools share 58 percent of the families and 36 percent of the genera. The family and genera turnover across habitats are depicted as Jaccard's index of dissimilarity in Table-4.

Diversity across riparian land use types : The diversity of stream insects was high for the streams with natural riparian vegetation types such as evergreen and semi evergreen forests. The stream flowing through degraded vegetation types such as scrub, forestry plantations and iron ore mining had the low diversity (Table-5).

Table-3 : Diversity of stream insects across habitat types.

Taxa	Habitat	Diversity	
		Richness	Shannon
Family			
	Cascades	40	2.696
	Riffles	30	2.2687
	Pools	31	1.1516
Genera			
	Cascades	58	3.1217
	Riffles	44	2.6002
	Pools	43	1.2771
Ephemeroptera			
	Cascades	11	1.8463
	Riffles	13	1.6301
	Pools	6	1.5425
Hemiptera			
	Cascades	12	1.9722
	Riffles	6	1.6094
	Pools	10	1.048
Trichoptera			
	Cascades	13	1.8233
	Riffles	9	0.8219
	Pools	8	0.8239
Others			
	Cascades	22	2.2285
	Riffles	16	1.911
	Pools	19	2.4516

Table-4 : Taxa turn over across habitats. Upper and lower diagonal of the table show family and genera turnover respectively.

Habitats	Cascades	Riffle	Pool
Cascades	0	0.3721	0.3488
Riffle	0.4062	0	0.475
Pool	0.4925	0.6406	0

Table-5 : Diversity of taxa across riparian land use types.

Riparian Land Use Types										
		EVG	SEVG	HAB	ARE	GRS	PAD	SCR	FOR	MIN
Family	Richness	34	34	31	29	13	13	12	12	8
	Shannon	1.5666	2.6411	2.5208	2.4818	1.984	1.8769	1.8148	1.8929	1.5582
Genera	Richness	53	44	42	37	15	16	14	17	9
	Shannon	1.7038	3.0284	2.854	2.8752	2.1669	2.024	1.9062	2.1528	1.7728

Legend : **EVG** : Evergreen Forests; **SEVG** : Semi Evergreen Forests; **SCR** : Scrub; **GRS** : Grasslands; **FOR** : Forestry Plantations; **ARE** : Arecanut Gardens; **PAD** : Paddy fields; **HAB** : Habitations; **MIN** : Mine (Iron ore)

The genera such as *Helicopsyche* (Helicopsychidae) *Dineutus* (Gyrinidae), *Enithares* (Notonectidae), *Notoplebia* (Leptophlebiidae), *Limnogonus* (Gerridae), *Hydropsyche* (Hydropsychidae), *Petersula* (Leptophlebiidae) *Agapetus* (Glossosomatidae) and *Blaberidae* (Blattodea) characterize the streams with riparian evergreen and semi evergreen forests, areca nut plantations and human habitations. The insect communities in streams with natural riparian grasslands, forestry plantations and paddy fields were entirely different. The genera such as *Choroterpes* (Leptophlebiidae), *Epeorus* (Heptageniidae), *Eubrianax* (Psephinidae), *Baetis* (Baetidae) and *Simulium* (Simuliidae) characterize these streams.

The streams with mining or scrub as riparian land use types were characterized by genera such as *Choroterpes* (Ephemeroptera: Leptophlebiidae), *Epeorus* (Ephemeroptera: Heptageniidae) *Baetis* (Ephemeroptera: Baetidae) and *Wormaldia* (Trichoptera: Philopotamidae).

DISCUSSION

The abundance and diversity of taxa varies across the habitats. In general the abundance and diversity of taxa was highest in the cascades (Table-3). The high diversity of benthic macroinvertebrates in cascades is known from the previous studies. In addition to high diversity, cascades also had highest number of restricted family and genera. This high diversity in cascades is attributed to the habitat complexity, habitat stability and food availability (Hynes, 1970; Allan, 1995). Cascades, because of its complex habitat structure, traps litter and woody debris. This decaying organic source and shelter in turn promotes colonization of the insects. Across taxa groups, abundance and diversity vary with the habitats. The abundance of Hemiptera was highest in the pools and cascades, and the richness in the cascades (Table-3). The low abundance and diversity of Hemiptera in riffles can be attributed to the physical structure of the habitat. Since the aquatic Hemiptera being largely a group on still water surface (Merritt and Cummins, 1996) the turbulent nature of riffles may not be a suitable habitat. It

is interesting to note that, large hemipterans such as *Limnogonus* and *Amemboa* (Gerridae) are more frequent in pools. On the other hand, small hemipterans such as *Rhagovelia*, *Perittopus* (Veliidae) *Mesovelia* (Mesoveliidae) are more frequent in cascades.

The family and genera turnover across the habitats (Table-4) clearly show that the cascades and riffles are very similar in community composition than the pools. This similarity between cascades and pools is due to the presence of genera such as *Hydropsyche* (Hydropsychidae), *Laccobius* (Hydrophilidae), *Choroterpes* (Leptophlebiidae), *Petersula* (Leptophlebiidae), *Epeorus* (Heptageniidae) and *Neoperla* (Perlidae), which are adapted to the fast flowing waters of the cascades and riffles. Stream insect communities are known to respond to stream habitat morphology (Hynes, 1970; Sivaramakrishnan, 1992). The observed community organization across habitats in the present study may also be due to a change in stream morphology of the cascades, riffles and pools.

The family and generic richness were higher in the streams with natural riparian vegetation than with the human modified ones (Table-5). An exception to this was the stream with riparian grasslands, where the diversity was comparable to that of the stream with riparian paddy fields. The low diversity in the streams with the natural riparian grasslands may be due to reduced detritus input from the surrounding landscape. The detritus from the riparian zone is an important source of food for the stream insects and also plays a significant role in determining the diversity (Allan, 1995). The low diversity in streams with human modified riparian land use type is attributed to change in habitat brought out by decreased detritus input, increased sedimentation and runoff (Hershey and Lamberti, 1998). Similar results were also reported from the river Cauvery, where the streams with natural riparian vegetation had higher richness than the ones with the agriculture (Sivaramakrishnan, 1992).

The taxa composition changes with the riparian land use. The taxa such as *Hydropsyche* (Hydropsychidae), *Macronema* (Hydropsychidae), *Baetis* (Baetidae), *Isca* (Leptophlebiidae), *Choroterpes* (Leptophlebiidae) and *Neoperla* (Perlidae) with tolerance to disturbance characterize streams flowing through human influenced riparian land use types. The taxa with high sensitivity to human disturbance such as *Helicopsyche* (Helicopsychidae), *Dineutus* (Gyrinidae), *Enithares* (Notonectidae), *Limnogonus* (Gerridae), *Goera* (Goeridae), *Blaberidae* (Blattodea) and *Notoplebia* (Leptophlebiidae) are present in the streams with the natural riparian semievergreen and evergreen forests. Similarly, in the river Cauvery, presence of pollution tolerant or intolerant taxa represented the riparian land use pattern (Sivaramakrishnan *et al.*, 1995). Human disturbances such as the riparian deforestation open the canopy, decrease shading and increase sedimentation in the streams. This change in riparian land use alters allochthonous streams to autochthonous, facilitating colonization of aquatic insects adapted to autochthonous streams (Vannote *et al.*, 1980; and Hershey and Lamberti, 1998). In the present study the streams with natural riparian grasslands were dominated by genera with tolerance to disturbance. This could be due to the fact that the genera dominating such streams may be adapted to autochthonous streams with open canopy and decreased detritus input. A

change in the riparian land use alters stream habitat and water quality, and is reflected in the macroinvertebrate communities (Hershey and Lamberti, 1998).

The present study shows that within a landscape, the diversity and distribution of aquatic insect family and genera are influenced by habitat types and the riparian land use. This study also indicates that riverine ecosystems with natural riparian vegetation may also nurture high biodiversity. A riparian land use based approach to study stream fauna could provide valuable insights into aspects of stream ecosystem function. This approach would also be very useful to identify and conserve biodiversity of riverine ecosystems of the region.

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PISCES

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INTRODUCTION

Kudremukh National Park (KMNP), Karnataka, constitutes a prime sector of the forest tracts in the Western Ghats (Sahyadri Mountains), harbouring rich and diverse biota, including many endangered and endemic species. The Park premises form the watershed of innumerable upstreams of the east flowing Thunga and Bhadra Rivers, and of the west flowing Netravati River of the Karnataka State. Aquatic habitats in the park offer a variety of microhabitat niches for diverse fish fauna.

Contributions to the knowledge of fish diversity and richness of the State of Karnataka, India, have come from a number of ichthyologists cum zoogeographers of eminence in the past, such as Jerdon (1849), Day (1878), Blanford (1901), etc. Later, Narayan Rao (1920), Narayan Rao and Sheshachar (1927), Hora (1937, 1942), Bhimachar and Subarao (1947), Chacko and Kurien (1948), etc., and in the recent period Menon (1987, 1999) Jayaram (1995, 1999, 2006) and Talwar and Jhingran (1991) have dealt with a considerable degree of explorative research on ichthyofauna of the state, bringing out considerable output of scientific accounts/enumeration of fish diversity, including illustrations/descriptions of many new taxa. The much-augmented biodiversity studies being carried out nowadays have also enabled to bring to light further documentation works on ichthyofauna from the State (Arunachalam *et al.*, 1997; Bhat, 2002; Chandrashekhariah *et al.*, 2000; and Sreekantha *et al.*, 2006).

A perusal of literature shows that the scientific documentation of the ichthyofaunal diversity of the Kudremukh National Park, Karnataka, has been very poor, except for an unauthenticated, electronic version of checklist of fishes of KMNP, enumerating 43 species, arguably sourced from the Centre for Ecological Sciences, Indian Institute of Science, Bangalore (“[http://www.wildindia.org/wiki/Kudremukh checklist fishes](http://www.wildindia.org/wiki/Kudremukh_checklist_fishes)”).

As part of the survey and exploration of the faunal resources of the Kudremukh National Park, during 17.10.2005 – 28.10.2005, a small collection of ichthyofauna was made from the park’s water bodies at various localities. The fish-samples collected from the water bodies of the Park altogether comprised 109 specimens, belonging to 11 species under 9 genera of

4 families and 3 orders. The present paper deals with the taxonomic study of the fish fauna of Kudremukh National Park based on the above collection of fishes. The identification of fishes is based on the works of Day (1875-78), Talwar and Jhingran (1991), Jayaram (1999; 2006) and Menon (1999).

One of the notable findings of the faunal exploration of the Park areas was that the survey team could make a chance collection of a lone specimen of sisorid catfish, a miniature adult male, of about 32.66 mm in length, with anal papilla, having distinct characteristics of skin tuberculation, barbels, adhesive apparatus and colouration. The efforts to obtain additional specimens from the Park's aquatic habitats were in vain. One logical assumption was that the population of the niche-specific, sisorid catfish could be considered limited to sampling, given the implications of silt sedimentation in the Park's stream habitats, due to soil erosion, as a probable consequence of the open-cast iron-ore mining operations that has been going on in the Park areas till in the recent past. Further collection surveys in the Park areas became impossible, owing to the hazardous insurgency problems in the Park's forested tracts.

On perusal of literature (Misra, 1976; Talwar and Jhingran, 1991; Jayaram, 1999, 2006) and closer examination and study of the specimen of the catfish, it proved to be undescribed of the genus *Glyptothorax* Blyth. Kudremukh National Park as being a biodiversity-rich forest tract and, at the same time, a fragile complex of forest habitats, it seemed appropriate to describe the new species, based on the specimen available at hand, at the earliest thus documenting its occurrence in the Park's stream waters for future biodiversity monitoring purposes.

SYSTEMATIC LIST OF SPECIES

Class	ACTINOPTERYGII
Division	TELEOSTEI
Order	CYPRINIFORMES
Family	CYPRINIDAE
Subfamily	DANIONINAE

1. *Salmostoma boopis* (Day)
2. *Danio malabaricus* (Jerdon)
3. *Rasbora daniconius* (Hamilton-Buchanan)

Subfamily CYPRININAE

4. *Puntius conchoni* (Hamilton-Buchanan)
5. *Puntius fasciatus fasciatus* (Day)
6. *Puntius vittatus* Day

7. *Osteochilichthys nashii* (Day)

Subfamily GARRINAE

8. *Garra mullya* (Sykes)

Family BALITORIDAE

Subfamily NEMACHEILINAE

9. *Schistura denisoni denisoni* (Day)

Order PERCIFORMES

Family CHANNIDAE

10. *Channa orientalis* (Bloch-Schneider)

Order SILURIFORMES

Family SISORIDAE

11. *Glyptothorax kudremukhensis* sp. nov.

SYSTEMATIC ACCOUNT

Family CYPRINIDAE

Subfamily DANIONINAE

1. *Salmostoma boopis* (Day)1873. *Chela boopis* Day, *Proc. Zool. Soc. Lond.*, : 708 (type locality : South Canara).1991. *Salmostoma boopis* Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, Vol. 1 : 322.

Diagnostic characters : Body elongate, compressed, its ventral profile more convex than that of dorsal. Mouth oblique, lower jaw with a rudimentary symphysial process. Dorsal fin inserted well in advance of anal fin. Anal fin with 12-14 branched rays. Lateral line scales 39-42.

Material examined : 12 exs. 39-76 mm SL., V/F. 1741, Muduba, 21.x.'05, K. Rajmohana; 12 exs. 41.2-60.4 mm SL., V/F. 1753, Bhagavathi Road, 26.x.'05, K. Rajmohana.

Distribution : Peninsular India: Western Ghats: Karnataka and Maharashtra.

Habitat : Upper reaches of rivers.

2. *Danio malabaricus* (Jerdon)1849. *Perilampus malabaricus* Jerdon, *Madras J. Lit. Sci.*, 15 : 325 (type locality: Malabar).1991. *Danio malabaricus* Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, Vol. I : 370-371.

Diagnostic characters : Body elongate and strongly compressed. A weak pre-orbital spine directed backwards from anterior rim of orbit. Two pairs of rudimentary/vestigial barbels. Dorsal fin with 10-12 branched rays. Lateral line scales 32-34. A species with bright metallic colouration of three or four steel blue longitudinal bands along flanks.

Material examined : 6 exs. 47. 2-62.4 mm SL., V/F. 1748, Hanumangudi, 20.x.'05, K. Rajmohana; 7 exs., 28.3-51.8 mm SL., V/F. 1747, Muduba, 21.x.'05, K. Rajmohana; 11 exs., 17.6-28.8 mm SL., V/F. 1751, Manikyadhara Betta, 19.x.'05, K. Rajmohana.

Distribution : Peninsular India: From headwaters of Krishna River in Maharashtra, Karnataka to Kerala. Sri Lanka.

Habitat : Mountain streams to streams in the plains; rarely in tanks and rice fields.

3. *Rasbora daniconius* (Hamilton-Buchanan)

1822. *Cyprinus daniconius* Hamilton, *Fish Ganges*, : 327, pl. 15, Fig. 89 (type locality : Rivers of southern Bengal).

1878. *Rasbora daniconius* Day, *Fish. India*, : 584, pl. 146, fig. 2, 3.

1991. *Parluciosoma daniconius* Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, Vol. I : 382-383.

1999. *Rasbora daniconius* Jayaram, *Freshwater Fishes of the Indian Region* : 82-83.

Diagnostic characters : Body elongate, compressed. Abdomen rounded. Mouth large, cleft oblique. Lips thin, simple. Lower jaw prominent with three well-defined prominences. Barbels absent. Lateral line nearly complete with 31-34 scales; lateral transverse scale-rows 4 ½ -2 ½. A distinct black mid-lateral stripe from eye to base of caudal fin.

Material examined : 12 exs., 42-67.2 mm SL., V/F. 1740, Gangamoola, 26.x.'05, K. Rajmohana; 7 exs., 38.8-67.6 mm SL., V/F. 1746, Muduba, 21.x.'05, K. Rajmohana; 15 exs., 43- 55.8 mm SL., V/F. 1750, Bhagavathi Road, 26.x.'05, K. Rajmohana.

Distribution : Throughout India. Sri Lanka, Pakistan, Nepal, Bangladesh, Myanmar and Thailand.

Habitat : Clear, slow flowing streams, pools and ditches in the uplands and plains.

Remarks: one of the commonest species found in the country.

Subfamily CYPRININAE

4. *Puntius conchoni* (Hamilton-Buchanan)

1822. *Cyprinus conchoni* Hamilton-Buchanan, *Fish. Ganges*, : 317, 318, 389 (type locality : Ponds of northeast Bengal and rivers Kosi and Ami)

1878. *Barbus conchoni* Day, *Fish. India*, : 578, pl. 143, fig. 7.

1991. *Puntius conchoni* Talwar and Jhingran, *Inland Fishes of India and Adajacent Countries*, Vol. I: 266.

Diagnostic characters : Body deep, compressed. No barbels. Dorsal fin inserted equidistant between tip of snout and base of caudal fin; its last unbranched ray osseous, moderately strong and serrated. Lateral line incomplete, ceases after 10-13th scale; 24-28 scales in longitudinal series.

Material examined : 1 ex., 38.8 mm SL., V/F. 1742, Muduba, 21.x.'05, K. Rajmohana.

Distribution : India: Brahmaputra, Ganga, Mahanadi River system in Assam, Bihar, Orissa, U. :, West Bengal, and also rivers in South India; Bangladesh, Nepal, Pakistan.

Habitat : Streams and lakes.

Remarks: Sexual dimorphism reflected with colouration is common in this species. Its potential as an aquarium fish is gaining popularity.

5. *Puntius fasciatus fasciatus* (Day)

1849. *Cirrhinus fasciatus* Jerdon, *Madras J. Lit. & Sci.*, 15: 305 (type locality : Malabar).

1878. *Barbus melanampyx* Day, *Fish India*, : 570, pl. 139, fig. 1.

1991. *Puntius fasciatus* Talwar and Jhingran, *Inland Fishes of India and Adajacent Countries*, Vol. I : 269-270.

1999. *Puntius fasciatus fasciatus* Jayaram, *Freshwater Fishes of the Indian Region* : 112, 116.

Diagnostic characters : A pretty coloured small fish, body with three vertical black bands. Two pairs of barbels. Dorsal fin with last unbranched ray non-osseous, weak, articulated. Lateral line scales 18-20. Circumpeduncular scales 8-10. Varying shades of hues to the general colouration during growth phase and in the adult males.

Material examined : 8 exs, 18-30.2 mm SL., V/F.1749, Gangadikkal, 26.x.'05, K. Rajmohana; 1 ex., 42.2 mm SL., V/F. 1755, Gangamoola, 26.x.'05, K. Rajmohana.

Distribution : Peninsular India: Western Ghats: South Karnataka and Kerala hill ranges, Nilgiri hill ranges and Cauvery River at base of hills in Tamil Nadu. Also Nallamalai hills in Eastern Ghats.

Habitat : Hill streams.

Remarks : The name *fasciatus* is used on the basis of priority (Jayaram, 1999), against the name : *melamambyx* (Day) being cited as a favourite aquarium fish in certain aquarium journals. Menon (1999) considers the latter usage more desirable. An indigenous species of aquarium potential.

6. *Puntius vittatus* Day

1865. *Puntius vittatus* Day, *Proc. Zool. Soc. Lond.*, : 303 (type locality: Madras).

1878. *Barbus vittatus* Day, *Fish. India*, : 582, pl. 144, fig. 2.

1991. *Puntius vittatus* Talwar and Jhingran, *Inland Fishes of India and Adajacent Countries*, Vol. I : 293-294.

Diagnostic characters : One of the smallest barbs. No barbels. Last unbranched dorsal fin ray non-osseous, weak, non-articulated. Lateral line incomplete, only up to 3 - 6 scales. 20-22 scales in longitudinal series. Body devoid of vertical colour bands, but with a small, round, dark blotch at base of caudal fin.

Material examined : 1 ex., 28.4 mm SL., V/F. 1754, Seethabhoomi, 25.x.'05, K. Rajmohana.

Distribution : India: Goa, Karnataka, Kerala, Kutch, Orissa, Rajasthan, Tamil Nadu. Pakistan. Sri Lanka.

Habitat : Streams, ponds, lakes in the uplands and plains. Very common in paddy-field waters.

Remarks : A hardy species and a prolific breeder. A staple prey fish of piscivorous birds visiting paddy fields and other aquatic bodies in the plains.

7. *Osteochilichthys nashii* (Day)

1868. *Barbus nashii* Day, *Proc. Zool. Soc. Lond.*, : 584 (type locality: Fraserpett River, Coorg dist., Karnataka).

1877. *Scaphiodon nashii* Day, *Fish India*, : 552, pl. 133, fig. 3; Day.

1991. *Osteochilus (Osteochilichthys) nashii* Talwar and Jhingran, *Inland Fishes of India and Adajacent Countries*, Vol. I : 247-248.

Diagnostic characters : Body elongate and compressed. Abdomen rounded. Mouth inferior. No barbels. Lips simple, continuous at angles of mouth; lower lip attached to jaw at some distance from mouth, thereby tip of lower jaw is not covered by li: Dorsal fin without any osseous ray, with 11 branched rays. Lateral line with 40-43 scales. A black mid-lateral band on flanks from eye to caudal fin base.

Material examined : 2exs. 43.8-50.4 mm SL., V/F. 1757, Bhagavathi Road, 26.x.'05, K. Rajmohana.

Distribution : India : Western Ghats of Karnataka and Kerala.

Habitat : Hill streams.

Subfamily GARRINAE

8. *Garra mullya* (Sykes)

1849. *Chondrostoma mullya* Sykes, *Trans. Zool. Soc. Lond.*, 2 : 359, pl. 62 fig.3 (type locality: Bheema River at Daunde).

1878. *Discognathus lamta* Day (in part), *Fish. India*, : 527, pl. 122, fig. 4 & pl. 113, fig. 1.

1991. *Garra mullya* Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, Vol. I : 429.

Diagnostic characters : Body elongated, slightly flattened on underside. Snout rounded, its tip of marked off by a transverse groove. 2 pairs of barbels. Interorbital region slightly convex, its width about 2 times in head length. Width of suctorial disc 2 times in width of head. Vent to anal base less than 4.0 times in that between anterior origins of pelvic and anal fins. Lateral line with 32-34 scales.

Material examined : 5exs. 17.8-19.5 mm SL., V/F. 1756, Gangadikkal, 26.x.'05, K. Rajmohana.

Distribution : Throughout India except Assam and the Himalaya.

Habitat : Mountain streams

Remarks : Small specimens collected from the Park waters showed their suctorial disc apparently reduced or indistinct.

Family BALITORIDAE

Subfamily NEMACHEILINAE

9. *Schistura denisoni denisoni* (Day)

1867. *Nemacheilus denisonii* Day, *Proc. Zool. Soc. Lond.*, : 287 (type locality: Bhowany River, base of Nilgiris).

1987. *Noemacheilus denisoni denisoni* Menon, *Faun. India Pisces*, 4(1) : 93, pl. 10, figs. 3 & 4.

1999. *Schistura denisoni denisoni* Jayaram, *Freshwater Fishes of the Indian Region* : 181-188.

Diagnostic characters : Body nearly cylindrical, with uniform depth, partly covered with minute scales. Belly straight and horizontal. Barbels well developed and thread-like, all as long as eye-diameter. Dorsal fin with 8—8½ branched rays, its origin midway between snout-tip and base of caudal, or nearer snout-ti: Anal fin with two simple rays. Caudal fin deeply emarginated, with rounded lobes. Lateral line incomplete, ending in front of or behind dorsal fin. Body marked with varying number, usually 10-14, of brown bands, as wide as interspaces.

Material examined : 2exs. 19-22 mm SL., V/F. 1744, Manikyadhara Betta, 19.x.'05, K. Rajmohana; 5 exs. 22.6-26.8 mm SL., V/F. 1752, Towergudda, 22.x.'05, K. Rajmohana.

Distribution : Peninsular India: Madhya Pradesh, Maharashtra, Karnataka, Kerala, Tamil Nadu.

Habitat : Clear, fast/slow flowing streams with pebbly bottom.

Order PERCIFORMES

Family CHANNIDAE

10. *Channa orientalis* (Bloch and Schneider)

1801. *Channa orientalis* Bloch and Schneider, *Syst. Ichth.* Bloch. : 496, pl. 90, fig. 2 (type locality : India).

1991. *Channa orientalis* Talwar and Jhingran, *Inland Fishes of India and Adjacent Countries*, Vol. II : 1019-1020.

Diagnostic characters : Body elongate, almost cylindrical anteriorly and compressed posteriorly. Head large; mouth fairly large; chin marbled. Anterior nostrils tubular. Scales rows 4 or 5 between orbit and angle of preopercle; pre dorsal scales 12 or 13. Dorsal and anal fins long-based: dorsal with 32-37 rays; anal fin with 20-23 rays. Pelvic fins less than half the length of pectoral fins. Pectoral fin with distinct alternating blue and pale orange vertical bands. Young with a large ocellus on last five dorsal rays.

Material examined : 2 exs. 22.2-45.8 mm SL., V/F. 1745, Manikyadhara Betta, 19.x.'05, K. Rajmohana.

Distribution : Throughout India. Afganistan. Bangladesh. Borneo. Iran. Malaysia. Myanmar. Nepal. Pakistan. Polynesia. Sri Lanka.

Habitat : Freshwater streams, ponds and ditches, including poorly oxygenated stagnant waters, from plains to uplands of high elevations.

Remarks : The species is well known for its amphibious mode of life, which is reasoned, probably, for certain extent of variation exhibited by the individuals (Talwar and Jhingran, 1991).

Order SILURIFORMES

Family SISORIDAE

11. *Glyptothorax kudremukhensis* sp. nov.

(Figs. 1-5)

The specimen of the new species was collected from a stream (headwaters of the Thunga River) flowing through a degraded forest patch at the locality Muduba (Lat. 13° 19. 420' N and Long. 75° 8. 635' E) in the Kudremukh National Park, on 21.x.2005. Morphometric measurements of the holotype were taken with dial calipers having an accuracy of 0.02 mm,

following standard practices (Jayaram, 1999). The same data are mainly presented as per cent (hundredths) of the standard length (SL), or head length (HL) in the text, besides several other morphometric ratios. A comparison of the salient characters between the new species and the closely related species is presented in Table-1. The studied specimen is deposited in the faunal holding of the Zoological Survey of India (ZSI), Western Ghats Field Research Station (WGFRS), Calicut.

Holotype : ZSI/WGFRS, V/F. 13846, 32.66 mm TL, 24.66 mm SL; type locality: a stream (headwaters of the Thunga River) at Muduba in Kudremukh National Park, Karnataka, Western Ghats, India; Coll: K. Rajmohana; 21.x.2005.

Paratype : None.

Diagnosis : A presumably miniature species of *Glyptothorax*, the holotype 32.66 mm in total length, with prominent tubercles speckled on body apparently in horizontal lines; a poorly developed, broader than long, inverted 'V' shaped adhesive apparatus on thorax; 4 pairs of barbels, maxillaries reaching middle of pectoral base, nasals extending posteriorly to hind margin of eye; adipose dorsal fin longer, its base 2.0 times that of dorsal: caudal peduncle with least height 2.0 times in its length; grayish yellow/brownish olive colouration on dorsal and lateral sides, becoming yellow or dull white below; and caudal fin brown with white blotches.

Description : Based on the specimen, holotype.

D. I/6; : I/7; V. i/5; A. iii/7; C. 17.

Body : Body miniature in size, moderately elongate (Fig.1-3), sub-cylindrical, depth 20.3% of SL, 70.4 % of HL. Head depressed, broad, obtusely rounded anteriorly, its length 28.9 % of SL, breadth 24.4 % of SL, 84.5 % of HL, height at occiput 54.65 % of HL. Mouth inferior, transverse, narrow, gape 46.67 % of head width, 39.44 % of HL; upper jaw longer; lips fleshy, papillated. Teeth villiform in curved bands on jaws; no teeth on palate. Snout length 43.7 % of HL. Nostrils closely set, separated by a nasal barbel, nearer snout tip than to the anterior margin of eyes. Eyes very small, superior, subcutaneous, in the middle of head, not visible from below, 8.5 % of HL, 28.3 % of inter orbital width (IOW), 19.35 % of snout length, IOW 68.39 % of snout length. Barbels four pairs, pair of maxillaries broad-based, reaching middle of pectoral base, outer and inner pairs of mandibulars shorter, outer ones barely reaching pectoral base, the inner ones reaching anterior part of the adhesive disc, the pair of nasals reaching posteriorly to hind margin of eye (Figs. 2 & 5). Median longitudinal groove on head not reaching base of occipital process. Occipital process short, not reaching basal bone of dorsal fin. Thorax flattened with a poorly developed, broader than long, inverted 'V' shaped adhesive apparatus (Fig. 3 & 4); longitudinal skin folds of disc simple, not anteriorly branched (Fig. 4). Body cavity measured from gill opening at pectoral origin to anal opening 39 % of SL. Anus closer to anal fin origin, distance 40 % of that between the origins of

pelvic and anal fins. Anal papilla present. Caudal peduncle 20.3 % of SL, 70.4 % of HL, its least height 35.2 % of HL, 2.0 times in, i.e. 50 % of, its own length. Skin speckled with prominent tubercles apparently arrayed in horizontal lines on body (Fig. 5). Lateral line simple, complete.

Fins : Rayed dorsal fin higher than depth of body, 105.6 % of body depth, shorter than head, 74.4% of HL, with a fairly strong, smooth spine; inserted above last quarter of pectoral fin, much nearer to origin of adipose dorsal fin than to tip of snout; predorsal distance 40.7 % of SL, 63. 21 % of postdorsal distance. Adipose dorsal fin longer, posteriorly free, its base 2.0 times that of rayed dorsal, separated by an interdorsal space 3/4th of its base; pre-adipose dorsal distance 65 % of SL. Pectoral fin shorter than head, 73. 8% of HL, not reaching pelvic fin, spine strong, serrated along inner edge with 6 antrose teeth; prepectoral distance 27.6 % of SL. Pelvic fin 49.3 % of HL, inserted just behind the vertical from the last ray of dorsal fin, slightly nearer to caudal fin base than to snout tip, not reaching anal fin origin, extends to just beyond anus; pre-pelvic distance 52.4 % of SL. Distance between origins of pectoral and pelvic fins 58.9 % of distance between origins of pectoral and anal fins. Paired fins not plaited ventrally. Anal fin 64.8 % of HL, its base 60 % of adipose dorsal fin base, not reaching caudal fin base, nearer to pelvic origin than to caudal base; pre anal distance 69.1 % of SL. Distance between origins of pelvic and anal fins 41.0 % of distance between pelvic origin and caudal base. Caudal fin forked, lower lobe a little broader.

Colour : In life body grayish yellow/brownish olive on the dorsal and lateral sides, becoming yellow or dull white below. Caudal fin brown with vertically arrayed white blotches: two at the caudal base, four in the middle, apparently visible as a disrupted cross band, and fin-lobes distally white. Rayed dorsal, adipose dorsal and pectoral fins brownish tinged with white distal borders. Pelvic and anal fins pale white with brown shades.

Etymology : The name *kudremukhensis* refers to the Kudremukh National Park, Karnataka State, South India, wherefrom the new species was collected.

Distribution : Known so far only from the Kudremukh National Park, Western Ghats, Karnataka, South India.

Remarks : Freshwater catfishes of the genus *Glyptothorax* Blyth (Siluriformes: Sisoridae) are benthic inhabitants of torrential waters of foothill rivers and mountain streams, maintaining themselves attached to the bottom rocks and boulders against the strong currents aided by means of adhesive apparatus. Primarily Oriental, the genus comprises of about 60 species known from its range of distribution (Talwar and Jhingran, 1991). Approximately 33 species are known to occur in Indian Sub region, with about 28 species being recognized from India (Jayaram, 2006).

8 species (including one subspecies) of *Glyptothorax* are so far known from the Peninsular India, which are: *Glyptothorax anamalaiensis* Silas, *Glyptothorax annandalei* Hora,

Glyptothorax conirostre poonaensis Hora, *Glyptothorax davissinghi* Manimekalan & Das, *Glyptothorax housei* Herre, *Glyptothorax lonah* (Sykes), *Glyptothorax madraspatanum* (Day) and *Glyptothorax trewavasae* Hora.

The new species, *G. kudremukhensis*, has the striking character of its miniature body speckled with prominent tubercles, apparently in horizontal arrays on back and flanks (Fig. 5). The only other species having allied feature reported from India (Manipur Valley) is *Glyptothorax platypogonoides* (Bleeker) (type locality: Sumatra) (Jayaram, 1999; 2006). Most of the congeners have skin on body and head profusely granulated or tuberculated, and some with smooth skin. The variation of the speckled nature and prominence of tubercles on head and body of the new species was ascertained after examining and comparing *Glyptothorax annandalei* Hora, *Glyptothorax davissinghi* Manimekalan & Das, and *Glyptothorax lonah* (Sykes) for their profusely granulated/tuberculated body skin, as well as *Glyptothorax conirostre poonaensis* Hora, and *Glyptothorax madraspatanum* (Day) for their smooth-skinned nature.

Of the eight species known from the peninsular India, *G. housei* Herre from the Anamalai Hills, Western Ghats (type locality: Puthuthotam Estate, Valparai (Pollachi), Tamil Nadu, India), and *Glyptothorax conirostre poonaensis* Hora (type locality: Poona, Maharashtra) are smooth-skinned whereas the others have profusely granulated/tuberculated skin (Talwar and Jhingran, 1991; Jayaram, 2006). Another diagnostically distinct character of the new species is the length of barbels, especially nasals extending, notably, to hind margin of eye, and the maxillaries to middle of pectoral fin base. *G. trewavase* Hora (type locality: Yenna river valley, Satara District, Maharashtra) reported from Thunga River (at Shimoga) Karnataka, has nasals not reaching eye and maxillaries barely reaching pectoral fin base.

Herre (1942) described *G. housei* from the Anamalai Hills (type locality: Puthuthotam Estate, 4 miles east of Valparai, Pollachi) in Tamil Nadu, South India. Silas (1951 a & b) based on his collection of two specimens from a stream located further away from Valparai, on the eastern slopes of Anamalai hills in Tamil Nadu, described *G. anamalaiensis*. Menon, M.A.S (1954) remarked on the similarities of these two species, referring to their description from the same locality (Puthuthotam Estate, Anamalai Hills). Menon (1999) treated *G. anamalaiensis* as a synonym of *G. housei*. However, Talwar and Jhingran (1991), and Jayaram (1999, 2006) cited the characteristics of *anamalaiensis* like coarsely granulated skin, shorter maxillary and nasal barbels, and the three white transverse bands on body as being very characteristic and, therefore, indicative of its status as a valid species.

G. kudremukhensis resembles *G. anamalaiensis* in having the features like poorly developed, broader than long thoracic adhesive disc and nature of occipital process. However, *G. kudremukhensis* differs from *G. anamalaiensis* by having proportionately less elongate body (depth of body 4.9 in SL (vs. 7.1 in *G. anamalaiensis*), and broader caudal peduncle with least height 2.0 in its length (vs. 2.8); smaller eyes, diameter 11.8 in HL (vs. 7); longer nasal barbels reaching hind border of eyes (vs. not reaching eyes); paired fins ventrally non-plaited

(vs. plaited); adipose dorsal fin base longer than (vs. equal to) that of dorsal; body uniformly grayish yellow/brown, without bands (vs. with three white transverse bands) (Table 1). *G. kudremukhensis* differs from *G. trewavase* Hora, yet another species (type locality: Yenna river valley, Satara District, Maharashtra) reported from Thunga River at Shimoga, Karnataka (Menon, M. A. S. (1954), in having maxillary barbels reaching pectoral fin base (vs. barely reaching pectoral base in *G. trewavase*), nasals reaching hind margin of eye (vs. not reaching anterior eye-margin), and adipose dorsal fin base 2.0 times of rayed dorsal base (vs. equal to that of dorsal). *G. kudremukhensis* is distinguishable from *G. conirostre poonaensis* by its body skin speckled with tubercles (vs. smooth skin), and longer adipose fin base. *G. kudremukhensis* differs from *G. housei*, *G. davissinghi*, *G. annandalei*, *G. lonah* by the lesser extent of the thoracic adhesive apparatus and the paired fins ventrally non-plaited, and from *G. madraspatanum* by having the rayed dorsal fin with a smooth spine (vs. serrated along outer and inner margins).

Table 1. Comparison of morphologic characters between *G. kudremukhensis* s: nov. and *G. anamalaiensis* Silas

Characters	<i>G. kudremukhensis</i>	<i>G. anamalaiensis</i>
Size (total length)	32.66 mm	50.25-63.25 mm
Body depth	4.9 in standard length	7.1 (6.5-7.8) in standard length
Head length	3.5 in standard length	3.9-4.3 in standard length
Eye diameter	11.8 in head length	7.0 (6.8-7.1) in head length
	3.5 in interorbital width	1.8 in interorbital width
	5.2 in snout length	3.2 in snout length
Mouth width	2.5 in head length	3.0 in head length
Nasal barbels	Reaching hind margin of orbit	Not reaching orbit
Poorly developed adhesive disc	Median longitudinal skin folds simple; broader than long	Median skin folds anteriorly branched; broader than long
Adipose dorsal fin base	Longer, 2.0 times of rayed dorsal base	Equal to rayed dorsal base
Paired fins	Not plaited ventrally	Plaited ventrally
Caudal peduncle	Least height 2.0 in its length	Least height 2.8 (2.6-3.0) in its length
Body colour	Uniformly greyish yellow/brown (with no bands on body)	Greyish, with three broad white transverse bands on body
Caudal fin	Forked, lower lobe wider; with white blotches	Deeply forked, lobes equal; with white transverse band
Skin	With prominent tubercles in rows	Profusely granulated

Sources: Silas (1951 a & b), Jayaram (2006), and original data.

DISCUSSION

It is to be mentioned at the outset that the sample-collections of fish fauna from the Park waters were not exhaustive, or even optimal, primarily because the scientific team was constrained to make systematic sampling efforts of fish collection from the Park waters due to the intervention of the field staff of Park's protection wing, interfering the ichthyofaunal collection.

The present study on the fish fauna of the Kudremukh National Park deals with only 11 species, belonging to 9 genera of 3 families under 2 orders, of primary freshwater fishes based on the available collection of fish. The survey party holds the view that Park's water bodies are likely to be represented with better fish diversity, since the Park waters, at many sites, exhibited good assemblage/population of a variety of fishes. Therefore an objective assessment or evaluation of fish faunal diversity of Kudremukh National Park based on an under-representative sample-collection is beyond the scope of this study. As a validation to this assumption, about 43 species of fishes have been reported from KMNP, as per one unauthenticated electronic version of the checklist of fishes from Kudremukh National Park, prepared by the Centre for Ecological Sciences, Indian Institute of Science, Bangalore ([http://www.wildindia.org/wiki/Kudremukh checklist fishes](http://www.wildindia.org/wiki/Kudremukh_checklist_fishes)). The list of catalogued species in the present study suggests that it is only a sublevel reflection of the actual diversity of Park's fish fauna. The present study is to be taken as only a preliminary taxonomic work on fish fauna of the Park attempted towards inventorying/monitoring fish diversity.

Hora (1937), based on the fish collections from the highland watersheds of Thunga and Bhadra Rivers, catalogued about 30 species of fish. Jayaram (1995), under a programme of Biodiversity Conservation Prioritisation Project (BCPP) – India, made an assessment of fish-diversity of the Karnataka State, recognizing about 160 species as being the common freshwater fishes of the State. According to Chandrashekhariah *et al.* (2000), the stretches of the inter-state rivers of Krishna, Cauvery and Godavary systems falling within the geographical limits of the Karnataka State, when independently considered for their respective potential for fish diversity realized from the state, have the recorded diversity levels of 101, 97 and 60 species respectively. Besides, a number of west flowing minor rivers of the state are also known to support and sustain the fish diversity of as many as 84 species. Venkateshwarlu *et al.* (2002) in their study on the fish fauna of Bhadra Reservoir documented about 27 species of fish. Since the highland streams and rivulets of Thunga and Bhadra Rivers primarily drain Kudremukh National Park, some of the species inventoried by them are likely to occur in the Park's waters.

But given the kind of degradation the park aquatic environment has suffered by the human excesses in the recent past, many stream components of the Park's aquatic environment presented a picture of impoverished fish diversity, which is strikingly noticeable at many locales in the Park, wherever soil erosion and consequent silt sedimentation has choked up

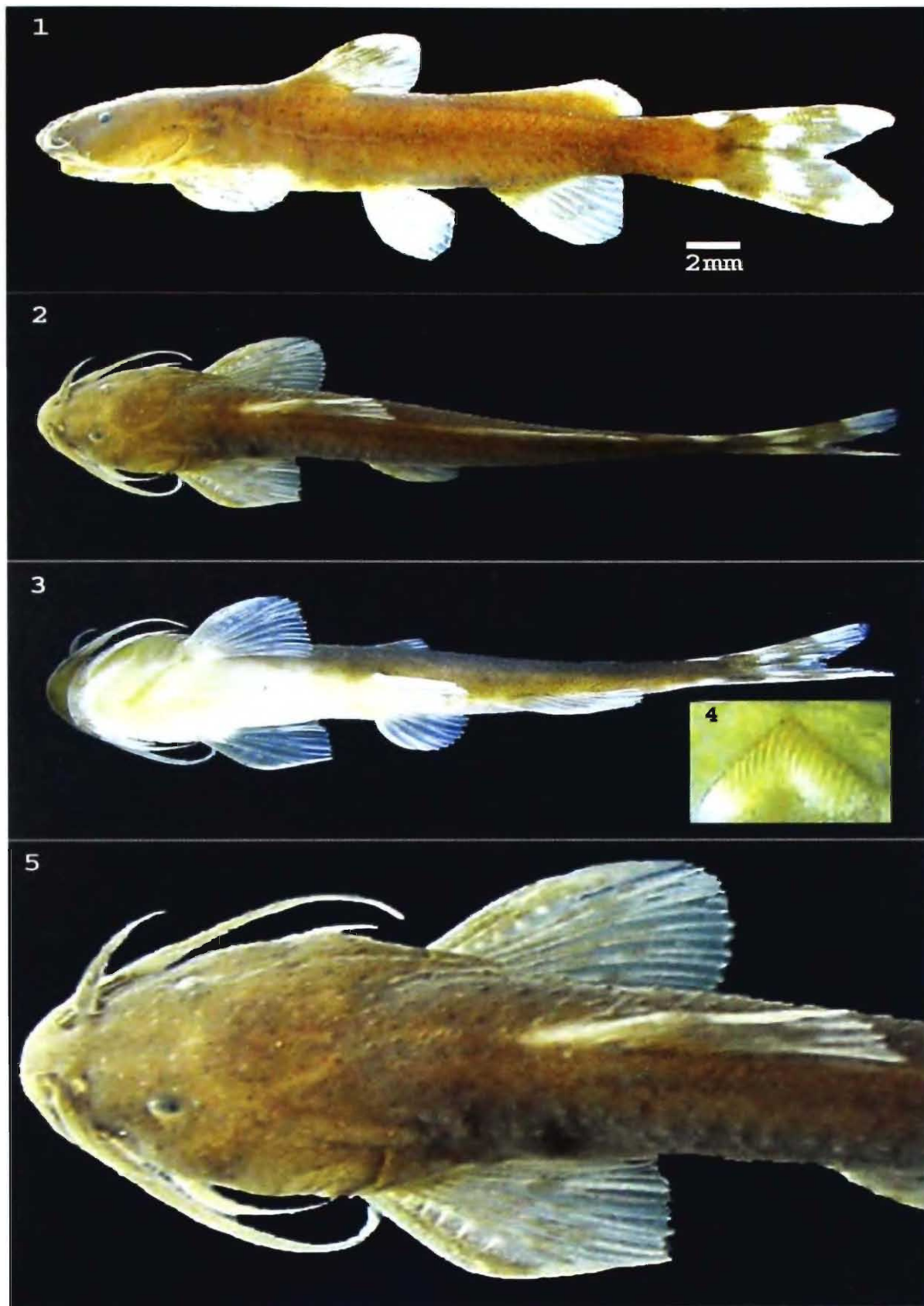
the vigor of life of the streams in the Park. Yet, the detection of a new species of fish from the Park's stream habitat is an indication of the potential of the Park's watershed to support and sustain diverse fish fauna and other life forms.

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Figs. 1-5 : *Glyptothorax kudremukhensis* sp. nov.

1. Lateral view; 2. Dorsal view; 3. Ventral view; 4. Thoracic adhesive disc;
5. Anterior half of body featuring barbels, and tuberculation (in rows).

AMPHIBIA

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INTRODUCTION

The amphibian fauna of the World comprises of about 6009 species (Frost, 2006). Of these, 250 species are known to occur in India and 104 from Western Ghats (Biju, 2001).

The Kudremukh National Park (KMNP) with substantial areas of varied vegetation types including grass lands, shola patches and evergreen rain forests with perennial water sources constitute an ideal abode for a rich and varied amphibian fauna. Available information on the Amphibia of KMNP is rather meager. However, Krishnamurthy and Hussain (2000) reported 26 species of amphibians from this National Park. Two species new to science have also been described from the KMNP (Krishnamurthy *et al.*, 2003; Kuramoto and Joshi, 2003).

The current programme of surveys and studies on the faunal groups of KMNP has further augmented our knowledge on the amphibians of the Park. A consolidated report of studies of all the collections, past and present, is provided below. The 17 species which were collected during the current KMNP survey are indicated by asterisk marks in the following account. As the amphibian taxonomy is under flux, we follow the earlier nomenclature with currently introduced names in parenthesis. The specimens studies are deposited in the faunal depository of Western Ghats Field Research Station, Zoological Survey of India, Calicut.

SYSTEMATIC ACCOUNT

Class AMPHIBIA

Order ANURA

Key to the families of AMPHIBIA from KMNP

- 1 Limbs absent; body worm like; skin without external scales 2
- Limbs present; without tail in adult..... 3
2. True tail present; vent longitudinal; eyes visible externally ICTHYOPHIIDAE

- True tail absent; vent transverse; eyes hidden under the bone CAECILIIDAE
- 3. Upper jaw toothed; tongue bifid 4
- Jaws toothless; tongue entire 5
- 4. Digits with an intercalary cartilage between penultimate phalanges Rhacophoridae
- Digits without intercalary cartilage RANIDAE
- 5. Pupil horizontal, tongue pyriform; skin warty BUFONIDAE
- Pupil circular; tongue oval; skin smooth MICROHYLIDAE

Family BUFONIDAE

Diagnosis : Tongue elliptic in shape; skin rough and tuberculated; pupil horizontal; vomerine teeth absent; jaws toothless; diapophyses of sacral vertebrae dilated; terminal phalanges of fingers and toes obtuse or T-shaped; vertebrae procoelous.

Key to the genera of BUFONIDAE from KMNP

- Tips of fingers and toes with disk; fingers webbed *Pedostibes*
- Tips of fingers and toes without disk; fingers free *Bufo*

Genus *Bufo* Laurenti

Diagnosis : Skin rough and tuberculated; tongue elliptic, entire; vomerine teeth absent; pupil horizontal; tympanum usually distinct; parotoid glands large and prominent; fingers free, toes more or less webbed.

Key to the species of *Bufo*, Laurenti from KMNP

- Head without bony ridges; tympanum very small or indistinct, toes fully webbed *beddomii*
- Head with bony ridges; parietal ridges absent; tympanum $\approx$ diameter of eye *melanostictus*

1. *Bufo beddomii* Gunther, 1875

1875. *Bufo beddomii* Gunther, *Proc. Zool. Soc. London* : 569.

Diagnosis : A small toad distinguished by its very small rather indistinct tympanum and completely webbed toes. First finger equal to or less than second in length. Skin tubercular,

brown above with indistinct black spots; limbs marbled with carmine and ventrally marbled with brown.

Distribution in India : Maharashtra, Kerala, Tamil Nadu (Dutta, 1997) & Karnataka (Krishnamurthy & Hussain, 2000).

2. *Bufo melanostictus* Schneider, 1799
[= *Duttaphrynus melanostictus* (Schneider, 1799)]

1799. *Bufo melanostictus* Schneider, *Hist. Amph. I, Jena* : 216.

Diagnosis : Dorsally yellow brown, ventrally yellowish. Skin rough with spiny warts and tubercles. Tympanum very prominent, large, more than $\frac{2}{3}$ diameter of eye. Parotoid glands large and prominent. Tibiotarsal articulation reaches eyes when the leg is held along the body. Fingers free; toes half webbed. A moderately large inner and a small outer metatarsal tubercle present.

Distribution in India : Throughout India (Dutta, 1997).

Genus *Pedostibes* Gunther

Diagnosis : Skin of dorsum tuberculated. Tongue elliptical, entire, free. Vomerine teeth absent. Pupil horizontal. Tympanum distinct or hidden. Parotoid glands present. Toes almost fully webbed. Disks present. Palate concave without any transverse ridges.

3. **Pedostibes tuberculosus* Gunther, 1875
(Plate-IX, Fig. 1)

1875. *Pedostibes tuberculosus* Gunther, *Proc. Zool. Soc. London*, 1875 : 576.

Diagnosis : A slender tree toad with the tips of fingers and toes dilated into truncated disks. Tympanum distinct, $\frac{1}{3}$ diameter of eye. Parotoids present. Fingers webbed at base; first finger half the length of the second. Toes almost fully webbed. Skin of back tubercular with the largest tubercles in two rows on the sides of back. Colour brownish grey above with darker sides. A white band from below the eye to the shoulder and another on the flank. Below whitish spotted with black.

Material examined : 1 ex., Bhagavathi forest, 24.x.2005, coll: K. Rajmohana & party.

Measurements : SVL: 18.0 mm.

Habitat : Phytotelmatic frog, collected near the bank of the river Tunga on a fallen tree.

Remarks : Endemic to Western Ghats and first report from Kudremukh National Park.

Distribution in India : Tamil Nadu : Kalakkad, (Biju, 2001); Kerala : Silent Valley National Park (Pillai, 1986), Ponmudi (Inger *et al.*, 1984), Wayanad (Personal Collection); Karnataka

: Sharavathi River basin (Gururaja & Ramachandra, 2006); Goa : Cotegao Wildlife Sanctuary (Das & Whitaker, 1998).

Family MICROHYLIDAE

Diagnosis : Vomerine teeth absent; jaws toothless; pupil vertical and circular; terminal phalanges of fingers and toes simple or T-shaped; omosternum rudimentary or absent; diapophyses of sacral vertebra dilated.

Genus *Microhyla* Tschudi

Diagnosis : Skin smooth or with small warts. Tongue narrow and elliptical, free and entire behind. Vomerine teeth absent. Pupil vertical and circular. Tympanum hidden. Paratoid glands absent. Fingers and toes free, webbed to a greater or lesser extent; tips of fingers and toes more or less dilated; outer metatarsal united. Omosternum absent; sternum cartilaginous; terminal phalanges T-shaped.

4. *Microhyla ornata* (Duméril and Bibron, 1841)

1841. *Engystoma ornatum* Duméril and Bibron, *Erp. Gen.*, 8 : 745.

Diagnosis : A small slender microhylid. The colour pattern of the back is distinctive. Interorbital width nearly twice as broad as upper eyelid. Toes with a rudiment of web. Two prominent metatarsal tubercles. Tibiotarsal articulation reaches the shoulder or slightly beyond the anterior border of eye when the leg is held along the body. The heels meet when the legs are folded at right angles to the body. Skin smooth or slightly tubercular. The characteristic pattern on the back, which may be bright pink or brown of varying shades, begins between the eyes where it extends to both eyelids, narrows on the nape, widens above the shoulder, narrows again and finally broadens out sending a stripe to the groin and the thigh. A dark streak from behind the eye to the shoulder, limbs cross barred. Body, white below, throat and chest may be stippled with brown. Throat in breeding male black.

Habitat : Semi aquatic margins of paddy fields.

Distribution in India : Throughout India (Daniel, 1963; Dutta, 1997; Chanda, 2002; Krishnamurthy & Hussain, 2000).

Family RANIDAE

Diagnosis : Upper jaw toothed, lower one nearly always toothless. In most species of this family, fingers perfectly free but the toes more or less fully webbed. One or more metatarsal tubercles may be blunt, sharp or shovel shaped and adapted for digging. Terminal phalanges of fingers and toes of various shapes and sizes.

Key to the genera of RANIDAE from KMNP

1. Vomerine teeth present 2
- Vomerine teeth absent *Micrixalus*
2. Skin smooth with or without longitudinal folds; pupil horizontal or roundish-sub triangular; digits with or without disk 3
- Skin wrinkled with fine set of folds; pupil mostly rhomboidal; toes with or without web and with disk *Nyctibatrachus*
3. Disks of toe tips with crescentic or horse shoe shaped circum marginal groove; terminal phalanges 'Y' shaped; tongue with papilla *Indirana*
- Disks of toe tips with or without crescentic or horse shoe shaped circum marginal groove; tongue without papilla *Rana*

Genus *Indirana* Laurent

Diagnosis : Pupil horizontal or roundish. Vomerine teeth present. Tips of fingers and toes with a crescentic horse shoe shaped circum marginal groove, terminal phalanges 'Y' shaped. Tongue with papilla; tadpoles terrestrial, characterized with a keratodont formula of 3–5/3–4.

Key to the species of *Indirana*, Laurent from KMNP

1. First finger shorter than the second 2
- First finger longer than the second; tympanum as large as eye and close to it *semipalmata*
2. Tympanum $\frac{2}{3}$ diameter of the eye; interorbital width a little narrower than the upper eyelid *leithii*
- Tympanum $\frac{1}{2}$ to $\frac{2}{3}$ diameter of the eye; interorbital space as broad as the upper eyelid. *beddomii*

5. **Indirana beddomii* (Gunther, 1875)

1875. *Polypedates beddomii* Günther, *Proc. Zool. Soc. London* : 571.

Diagnosis : Medium sized frogs. This species closely resembles *Indirana leithii* but can be separated from it by the following set of characters: Interorbital space as broad as the

upper eye lid; fingers moderate, first at least as long as second; the tibiotarsal articulation reaches the tip of the snout or a little beyond when the leg is held along the body; heels strongly overlap when the limbs are folded at right angles to the body; skin of back with short longitudinal glandular folds; a strong supra tympanic fold from the eye to the shoulder; colour brown above with rather indistinct darker spots, rarely uniform pinkish, sometimes with a light vertebral band; a dark cross band between eyes; a black band along the canthus rostralis and a black temporal spot; limbs more or less distinctly cross barred; lower parts uniform white.

Material examined : 3 exs., Manikyadhara Betta, 19.x.2005, coll. K. Rajmohana & party; 1 ex., Muduba, 21.x.2005.

Measurements : SVL : 18.0 mm to 23.0 mm.

Habitat : Found below the leaf litter of the forest floor.

Distribution in India : Maharashtra, Karnataka, Kerala & Tamil Nadu (Daniel, 1975; Dutta, 1997; Chanda, 2002; Krishnamurthy & Hussain, 2000).

Remarks : Endemic to Western Ghats.

6. **Indirana leithii* (Boulenger, 1888)

1888. *Rana leithii* Boulenger, *Ann. Mag. Nat. Hist., Ser.*, 6, 2 : 506.

Diagnosis : Small sized frogs. Tongue bifid with a distinct papilla. Head moderate; snout obtuse. Interorbital width a little narrower than the upper eyelid; tympanum $\frac{2}{3}$ diameter of the eye. First finger not exceeding quite as far as second; toes $\frac{2}{3}$ webbed. Tips of fingers and toes dilated into small disks with circum-marginal groove. Tibiotarsal articulation reaching between the eye and the tip of the snout when leg is held along the body; inner metatarsal tubercle oval; no tarsal fold. Heels overlap when the limbs are folded at right angles to the body. Skin of back with small scattered longitudinal warts; supratympanic fold strong. Brown above with small dark spots; limbs with dark transverse bands, lower parts white; throat mottled with brown.

Material examined : 1 ex., Hanumangundi falls, 20.x.2005, coll: K. Rajmohana & party.

Measurement : SVL : 16.0 mm.

Habitat : Found along the water body down the small rocks.

Distribution in India : Gujarat, Maharashtra, Karnataka, Kerala & Tamil Nadu (Daniel, 1975; Dutta, 1997; Chanda, 2002).

Remarks : Endemic to Western Ghats.

7. **Indirana semipalmata* (Boulenger, 1882)

1882. *Rana semipalmata* Boulenger, *Cat. Batr. Sal. Coll. Brit. Mus., Ed., 2* : 56.

Diagnosis : Small sized frogs. Tongue bifid with a papilla in the middle. Head moderate; snout blunt. Interorbital width as broad as the upper eyelid or a little narrower. Tympanum equal to the diameter of the eye. First finger a little longer than the second; toes half webbed; tips of fingers and toes dilated into disks with circummarginal groove. Subarticular tubercles well developed; a single small oval inner metatarsal tubercle; no tarsal fold. Tibiotarsal articulation reaching tip of the snout or between the eye and snout when the leg is held along the body. The heels overlap when the limbs are folded at right angles to the body. Skin of back with short longitudinal glandular folds; sides granulate with small warts; a strong glandular fold from eye to the shoulder; lower parts smooth. Mature males have nuptial pads on the first finger and enlarged glands covering the ventral surface of the thighs. Brown above, sides of body darker, loreal and temporal regions blackish, limbs with dark crossbars, lower parts white, throat and breast mottled with brown.

Material examined : 3 exs., Gangamoola, 27.x.2005, coll: K. Rajmohana & party.

Measurement : SVL : 17.0 mm to 21.0 mm.

Habitat : Found in the leaf litter of forest floor.

Distribution in India : Kerala (Daniel, 1975; Dutta, 1997; Chanda, 2002); Karnataka (Krishnamurthy & Hussain, 2000).

Remarks : Endemic to Western Ghats.

Genus *Micrixalus*, Boulenger

Diagnosis : Pupil horizontal or roundish, vomerine teeth absent, papilla on tongue some times present; finger and toe tips with a crescentic horse shoe shaped circum marginal groove.

Key to the species of *Micrixalus*, Boulenger from KMNP

- Dorsolateral glandular folds absent; tongue with a papilla *saxicola*
- Dorsolateral glandular fold present and complete; papilla on the tongue absent; stripe on hinder side of thigh horizontal; toes $\frac{3}{4}$ webbed *fuscus*

8. **Micrixalus fuscus* (Boulenger, 1882)

1882. *Ixalus fuscus* Boulenger, *Cat. Batr. Sal. Coll. Brit. Mus., Ed., 2* : 96.

Diagnosis : Snout pointed, prominent, generally longer than the orbital diameter; canthus rostralis angular; loreal region flat, vertical; nostril halfway between the eye and the tip of the snout; interorbital space as broad as the upper eye lid; tympanum small, indistinct. Toes

nearly entirely webbed; disks moderate; subarticular tubercles small; a small inner metatarsal tubercle present. The tibiotarsal articulation reaches between the eye and the tip of snout when the leg is held along the body. Skin smooth above and beneath; a narrow glandular lateral fold and a fold from the eye to the shoulder present. Brown or pinkish above; sides of head and body generally darker; limbs with dark cross bands; hinder side of thighs dark brown, with a more or less accentuated light median stripe; whitish beneath, marbled with brown. Male with two internal vocal sacs, the opening of which are very small.

Materials examined : 3 exs., Manikyadhara Betta, 19.x.2005, coll: K. Rajmohana & party; 1 ex., Muduba, 21.x.2005, coll: K. Rajmohana & party; 1 ex., Bhagavathi Nature Camp, 24.x.2005.

Measurements : SVL : 13.0 to 27.0 mm.

Habitat : Found on the forest floor near the water body.

Distribution in India : Tamil Nadu, Karnataka & Kerala (Dutta, 1997; Radhakrishnan, 1997; Chanda, 2002).

Remarks : Endemic to Western Ghats and first report from Kudremukh National Park.

9. **Micrixalus saxicola* (Jerdon, 1854)

1845. *Polypedates saxicola* Jerdon, *J. Asiat. Soc. Bengal*, **22** : 533.

Diagnosis : Tongue with a free pointed papilla in the anterior part of the median line. Snout sub acuminate, as long as the diameter of the orbit; canthus rostralis angular; loreal region flat, vertical; nostrils midway between eye and the tip of the snout; interorbital space as broad as the upper eyelid; tympanum small, hidden. Toes very broadly webbed, the web reaching the disks, disks very large; subarticular tubercles small; inner metatarsal tubercle small. Tibiotarsal articulation reaches the tip of the snout or somewhat beyond when the leg is held along the body. Skin smooth above, with more or less distinct darker reticulations; limbs with dark cross bands; throat and breast often marbled with brown. Males with internal vocal sacs, the opening of which are very small.

Materials examined : 12 exs., Hanumangundi falls, 20.x.2005, coll: K. Rajmohana & party; 3 exs., Muduba, 21.x.2005, coll: K. Rajmohana & party, 2 exs., Bhagavathi Nature Camp, 24.x.2005, coll: K. Rajmohana & party.

Measurements : SVL : 20.0 mm to 30.0 mm.

Habitat : Found on the big boulders and fallen tree logs of the water body.

Distribution in India : Karnataka & Kerala (Dutta, 1997, Radhakrishnan, 1997; Krishnamurthy and Hussain, 2000; Chanda, 2002).

Remarks : Endemic to Western Ghats.

Genus *Nyctibatrachus*, Boulenger

Diagnosis : Pupil vertical; Tongue free and deeply notched. Vomerine teeth present. Tympanum hidden. Fingers free, toes webbed. Tips of fingers and toes dilated into small disks. Outer metatarsals separated by web. Omosternum and sternum with bony style. Distal phalanges bifurcate.

Key to the species of *Nyctibatrachus*, Boulenger from KMNP

1. Adult size medium to large; outer metatarsal tubercle absent 2
- Adult size small; outer metatarsal tubercle present *aliciae*
2. Adult size medium to large; subarticular tubercles indistinct; finger tips dilated into rounded disks without circummarginal grooves; no distinct colour pattern *major*
- Adult size large; subarticular tubercles distinct and oval; fingers and toe disks with circummarginal groove; dorsum black, mottled with yellow *hussaini*

10. **Nyctibatrachus aliciae* Inger, Shaffer, Koshy, and Bakde, 1984

1984. *Nyctibatrachus aliciae* Inger, Shaffer, Koshy and Bakde, *J. Bombay nat. Hist. Soc.*, **81** : 414.

Diagnosis : A small sized frog, dorsal surface of the body generally dark brown with light cream colored blotches. A mid-dorsal diffused band present and is interrupted with dark brown. A light cream spot present between the eyes. A number of light brown and cream bars present on both the limbs. Throat white with dark brown. Body covered with loose skin and with irregular series of short ridges covering the entire back including the limbs. A strong well developed ridge extending from the lip and running over the tip of the snout between the nostrils present. A number of strong tubercles present on the upper eyelid; with numerous tiny, white-tipped tubercles on the upper surface of the calves, tarsus as well as above the vent. Snout rounded in shape. Nostrils closer to the tip of the snout than to eyes. Upper eyelids very small, covering less than one-fourth of the eye ball. A well developed supratympanic fold extending from the posterior region of the eye up to the shoulder present. Tympanum completely hidden. Forelimbs stout. Fingers long, slender and free. Tips of fingers dilated into small rounded disks with a prominent circum marginal groove, separating the dorsal and ventral portions of the disks. Hind limbs robust and short. Toes three-fourth webbed. Tips of toes dilated into prominent disks which are much larger than finger disks. Subarticular tubercles well developed and oval in shape. A long, slender inner and a nearly rounded outer metatarsal tubercle present.

Materials examined : 1 ex., Bhagavathi Nature Camp, 24.x.2005, coll: K. Rajmohana & party.

Measurement : SVL : 25.0 mm.

Habitat : Found in slow moving stream.

Distribution in India : Kerala (Dutta, 1997, Inger *et al.*, 1984; Krishnamurthy & Hussain, 2000; Chanda, 2002).

Remarks : Endemic to Western Ghats.

11. **Nyctibatrachus hussaini*[#] Krishnamurthy, Reddy, and Gururaja, 2001
(Plate-IX, Fig. 2)

2001. *Nyctibatrachus hussaini* Krishnamurthy, Reddy and Gururaja, *Curr. Sci.*, **80** : 887.

Diagnosis : A very large and colored species of *Nyctibatrachus*; body squat and not constricted at waist; head wider than long, snout blunt, canthus rostralis and tympanum indistinct, a distinct supra tympanic fold, a small fold from base of posterior end of eye lid to angle of jaw, a distinct Y shaped fold commencing from anterior corner of the eyes to the tip of snout and a small transverse fold between the inter-orbital space present. Webbing on toes reaching base of disks except on toe IV, where it reaches distal subarticular tubercle; tips of both fingers and toes flattened to form disks with distinct grooves separating dorsum of disks from venter; prominent subarticular tubercles on fingers and toes; toe tips rounded with circummarginal grooves. Subarticular tubercles well developed, oval, numbering one on first and second toes; two on third and fifth toes; and three on fourth toe. Inner metatarsal tubercle thick and elongated; outer metatarsal tubercle absent; toe disks wider than finger disks; a slightly crescentic tarsal fold extending from posterior edge of inner metatarsal tubercle up to just beginning of tarsus present. Dorsum blackish brown mottled with yellow spots, the mottling extending to tip of toes and fingers including upper eye lids; a dotted small white band from posterior end of eye to angle of joining of forearm present; small white band present on both fingers and toes; no dorsolateral fold present; throat granular with fine longitudinal folds; rest of venter glandular, coloured light creamish brown and with fine folds; fore and hind limbs brownish with granular folds; hind limbs barred with unclear dotted white bands; tongue unpigmented creamish.

Material examined : 1 ex., Manikyadhara Betta, 19.x.2005, coll: K. Rajmohana & party.

Measurements : SVL: 63.3 mm.

Habitat : Rocky boulder stream.

Distribution in India : Endemic to KMNP (Krishnamurthy *et al.*, 2001)

[#] *Remarks* : According to the ICZN Code, for a new species described after 1999, it must have a holotype designated and deposited in a museum. Since, description of *N. hussaini*

did not meet these criteria, Das and Kunte (2005), citing the Article 16.4 and 72.3 of *the code* proposed to consider *N. hussaini* as an invalid name; accordingly, a new name *N. karnatakaensis* has been proposed with the designation of a holotype [Dinesh *et al.*, 2007-in press].

12. **Nyctibatrachus major* Boulenger, 1882

1882. *Nyctibatrachus major* Boulenger, *Cat. Batr. Sal. Coll. Brit. Mus., Ed., 2* : 114.

Diagnosis : Habitus stout. Vomerine teeth in two straight series, oblique in the young, much behind the level of the choanae; snout very short, without canthus rostralis; eyes very prominent, obliquely directed forwards and upwards; upper eyelid very narrow; interorbital space twice as broad as the upper eyelid. Fingers moderate, first much shorter than second; toes moderate, $\frac{3}{4}$ webbed; tips of fingers and toes with disks, only toes with circum marginal grooves; subarticular tubercles not much developed and rather indistinct; inner metatarsal tubercle small, elongate and scarcely prominent. The tibiotarsal articulation reaching the eye, or somewhat beyond when the leg is held along the body. Dorsum with very thin, closely set vermiculated folds; upper eyelids covered with strong tubercles and with a rather indistinct oblique fold beneath the eye; throat with slight longitudinal folds. Brown above, with rather indistinct darker and lighter markings; brownish beneath, more or less speckled with brown. Male with two internal vocal sacs.

Materials examined : 1 ex., Manikyadhara Betta, 19.x.2005, coll: K. Rajmohana & party.

Measurement : SVL : 44.0 mm.

Habitat : Found in a moving creek along the sides of boulders.

Distribution in India : Kerala & Tamil Nadu (Dutta, 1997); Karnataka (Krishnamurthy & Hussain, 2000).

Remarks : Endemic to Western Ghats.

Genus *Rana* Linnaeus

Diagnosis : Skin smooth or with tubercles and warts. Tongue free, deeply notched and bifid behind. Vomerine teeth present (rarely absent). Pupil horizontal. Tympanum distinct, sometimes hidden. Parotoid glands absent. Fingers free; toes webbed (rarely nearly free). Tips of fingers and toes simple or dilated; disks without transverse grooves. Outer metatarsals separated by web. Omosternum and sternum with a bony style.

Key to the species of *Rana*, Linnaeus from KMNP

1. Dorsolateral glandular fold present 2
- Dorsolateral glandular fold absent 5

2. Toes without disks; toes incompletely webbed; tibiotarsal articulation reaches tympanum or eye when leg is held along the body *malabarica*
- Toes with disks 3
3. Disks of toe tips without a crescentic or horse shoe shaped circum marginal groove; heels meet when folded right angles to the body *curtipes*
- Disks of toe tips with a crescentic or horse shoe shaped circum marginal groove; heels strongly overlap when folded at right angles to the body 4
4. Tibiotarsal articulation reaches between eye and the nostril *aurantiaca*
- Tibiotarsal articulation reaches nostril or tip of snout or little beyond *temporalis*
5. Outer metatarsals united completely or feebly separated at the distal end, inner metatarsal tubercle large nearly $\frac{1}{3}$ the length of inner toe *rufescens*
- Outer metatarsals separated by web nearly to the basal half or to the base 6
6. Toes completely webbed *cyanophlyctis*
- Toes incompletely webbed 7
7. Skin of back with longitudinal folds, heels over lap when legs are folded at right angles to the body *tigerina*
- Skin of back smooth or with tubercles and warts 8
8. Toes $\frac{1}{2}$ webbed, 3 phalanges of 4th toe free; outer metatarsals united in the basal half; tibiotarsal articulation reaches nostril *limnocharis*
- Toes $\frac{3}{4}$ webbed, 2 phalanges of 4th toe free; outer metatarsals separated by web nearly to the base, tibiotarsal articulation reaches nostril or tip of snout *keralensis*

13. **Rana aurantiaca* Boulenger, 1904
[= *Sylvirana aurantiaca* (Boulenger, 1904)]

1904. *Rana aurantiaca* Boulenger, *J. Bombay nat. Hist. Soc.* 15: 430.

Diagnosis : Small to medium sized slender frogs; snout long and narrow, canthus rostralis distinct; loreal region vertical. Interorbital width very slightly broader than the upper eyelid. Tympanum distinct; $\frac{1}{2}$ or $\frac{2}{3}$ the diameter of the eye. Tips of fingers and toes dilated into disks with circummarginal groove. Toes $\frac{2}{3}$ webbed; subarticular tubercles moderate; the outer metatarsal tubercle small and round whereas the inner elongated. Tibiotarsal articulation reaches between eye and the nostril when leg is held along the body. Males have a darkly

pigmented humeral gland close to the axilla and an internal vocal sac. A nuptial pad is present on the first finger. Skin smooth or coarsely shagreened with an irregular scattering of conical tubercles. A distinct but narrow dorsolateral glandular fold extends from behind the eye to the region of the vent. Below this fold is a broad chocolate brown band which runs from the tip of the snout through the nostril, eye and tympanum fading on the flanks. Throat speckled and the vent is immaculate. Dorsum orange in colour without spots; limbs with out bars; a black band along each side of the head and body; upper lip, canthus rostralis and dorsolateral folds white; terminal disks of toes black, lower parts white.

Materials examined : 1 ex., Gangamoola, 27.x.2005, coll: K. Rajmohana & party; 5 exs., Hanumangundi falls, 20.x.2005, coll: K. Rajmohana & party.

Measurements : SVL : 35.0 mm to 45.0 mm.

Habitat : Found along the streams.

Distribution in India : Kerala & Karnataka (Dutta, 1997; Biju, 2001).

14. **Rana curtipes* Jerdon, 1853
[= *Clinotarsus curtipes* (Jerdon, 1853)]

1853. *Rana curtipes* Jerdon, *J. Asiat. Soc. Bengal*, 22: 532.

Diagnosis : Medium sized frogs; head depressed, snout obtusely pointed, canthus rostralis distinct. Loreal region concave. Interorbital width broader than upper eyelid. Tips of fingers and toes swollen or dilated into disks with indistinct circummarginal groove. First finger longer than second. Tibiotarsal articulation reaches the tympanum or eye. Heels meet when the limbs are folded at right angles to the body; toes $\frac{3}{4}$ or entirely webbed; inner metatarsal tubercle small; no tarsal fold. Males with internal vocal sacs. Forelimbs robust. Inner metacarpal tubercle on the inner side of the first finger with a small, grey, velvety, rugous patch. Skin smooth. Dorsolateral glandular fold narrow and moderately prominent. Supratympanic fold present. Coloration distinctive with grey above and with or without black dots; black below. Both colors are sharply separated.

Material examined : 1 ex., Seethabhumi, 25.x.2005, coll: K. Rajmohana & party.

Measurements : SVL : 52.0 mm.

Habitat : Found on the forest floor.

Distribution in India : Karnataka & Kerala (Dutta, 1997 and Biju, 2001).

Remarks : Endemic to Western Ghats.

15. **Rana cyanophlyctis* (Schneider, 1799)
 [= *Euphlyctis cyanophlyctis* (Schneider, 1799)]

1799. *Rana cyanophlyctis* Schneider, *Hist. Amph. Nat.*, : 137.

Diagnosis : Medium sized frogs. Snout rounded. First and second fingers more or less equal in length. Tibiotarsal articulation reaches up to either between the tympanum and eye or eye and nostril when the leg is held along the side of the body. Toe tips swollen and rounded, but without disks. A single line of porous warts on flanks, from behind the shoulder to the groin. Inner metatarsal tubercle fingerlike. Skin on dorsum warty. A strong fold from behind the eye to the shoulder. A U-shaped line of warts above the anus. Ventrally smooth. Dorsum grey olive, brown with darker spots or marblings. Back of the thighs with a dark-edged white band. Ventrally white, often spotted, vermiculated or marbled with black. The black colouration on the belly is commoner and more widespread in the larger females.

Materials examined : 2 exs., Bhagavathi forest road, 26.x.2005, coll: K. Rajmohana & party; 3 exs., Kerekatte, 18.x.2005, coll: K. Rajmohana & party.

Measurements : SVL : 26.0 mm to 32.0 mm.

Habitat : Found in mud puddles in the forest.

Distribution in India : Throughout India (Dutta, 1997).

16. **Rana keralensis* (Gunther, 1875)
 [= *Fejervarya keralensis* (Gunther, 1875)]

1875. *Rana verrucosa* Günther, *Proc. Zool. Soc. London* : 567.

Diagnosis : Medium sized frogs. Snout obtuse, tympanum distinct, nearly the size of the eye. First finger longer than the second. Tibiotarsal articulation reaches nostril or tip of snout; heels strongly overlap when folded at right angle to the body. Toes fully webbed except the fourth which has two phalanges free. A dermal fringe to the fifth toe. Outer metatarsals separated nearly to the base. Two metatarsal tubercles, the inner larger. A short tarsal fold. The skin of the back is extremely warty. A fold from eye to shoulder. Ventrally smooth. Dark grey or brown above with dark markings. A light vertebral streak if present, interrupted by the markings on the back. Limbs and lips barred. Sides of the thigh patterned in black and yellow. Ventrally white.

Materials examined : 2 exs., Manikyadhara Betta, 19.x.2005, coll: K. Rajmohana & party.

Measurements : SVL : 40.0 mm to 52.0 mm.

Habitat : Found along the sides of streams.

Distribution in India : Gujarat (doubtful) (Biju, 2001), Goa, Karnataka, Kerala & Tamil Nadu (Dutta, 1997).

17. **Rana limnocharis* Gravenhorst, 1829
[=*Fejervarya limnocharis* (Gravenhorst, 1829)]

1829. *Rana limnocharis* Gravenhorst, *Delic. Mus. Zool. Vratislav.*, 1 : 42.

Diagnosis : Small sized frogs with brief webbing on the toes, usually half webbed with three phalanges of the fourth toe free. The tibiotarsal articulation reaches the nostril when the leg is held along the body. Outer metatarsal united in the basal half or third. An inner and an outer metatarsal tubercle present. First finger longer than the second. Skin warty above, often with short and interrupted longitudinal glandular folds. A strong fold from eye to above shoulder. Body, smooth below. Male with a median subgular external vocal sac, the vocal sac area becoming black in the breeding season. Breeding male with a strong pad on the inner aspect of the first finger. Dorsum usually grey or brown with darker markings. Lips and legs often with darker bars. A vertebral band of varying width often present. Ventrally white.

Materials examined : 1 ex., Bhagavathi forest road, 26.x.2005, coll: K. Rajmohana & party.

Measurement : SVL : 28.0 mm.

Habitat : Found in a mud puddle.

Distribution in India : Throughout India (Dutta, 1997; Biju, 2001).

18. *Rana malabarica* Tschudi, 1838
[= *Hydrophylax malabarica* (Tschudi, 1838)]

1838. *Rana malabarica* Tschudi, *Classif. Batr.*, : 40, 80.

Diagnosis : Medium sized frogs. Adults can be easily identified by distinctive coloration. Snout obtuse, projecting slightly beyond the mouth. Tympanum very distinct, slightly less or equal to the diameter of the eye. Tips of fingers and toes swollen. First finger longer than second. Tibiotarsal articulation reaches the tympanum or the eye when the leg is held along the body. Heels overlap feebly when the legs are folded at right angles to the body. Toes feebly webbed; two or three phalanges of the fourth toe free. Subarticular tubercles on fingers and toes and the inner metatarsal tubercles large and prominent. Skin smooth or granular above with a distinct dorsolateral glandular fold from above the tympanum to the groin. A shorter fold terminating in a large gland below the tympanum or is continued as a line of glands along the flanks, present. Ventrally granulate on belly and the underside of the thighs. Back bright orange red, yellowish red or crimson, from the tip of the snout to vent, distinctly separated from the black colouration on the flanks starting canthus rostralis; upper lip white and the colour may extend along the line of glands on one sides. Ventrally white, uniform or spotted or marbled with black. Throat and chest often wholly brownish black or black barred or marbled with yellowish white. The barring in some of the young specimens resembles stripes.

Distribution in India : Maharashtra, Kerala, Goa, Madhya Pradesh & Orissa (Dutta, 1997 and Biju, 2001), Karnataka (Krishnamurthy and Hussain, 2000).

19. *Rana rufescens* (Jerdon, 1854)
[=*Fejervarya rufescens* (Jerdon, 1854)]

1854. *Pyxicephalus rufescens* Jerdon, *J. Asiat. Soc. Bengal*, **22** : 534.

Diagnosis : Medium sized frogs. Head broader than long with rounded snout. Tympanum distinct, about half or slightly over half the diameter of the eye. First finger much longer than second, third equal to or slightly longer than the first. Tibiotarsal articulation reaches tympanum or posterior border of the eye. Heels overlap when legs are folded at right angles to the body. Toes feebly webbed. One phalange of 1st and 2nd toes free; 2 phalanges of 3rd and 5th toes and 3 phalanges of 4th toe free. Subarticular tubercles of fingers and toes prominent. Inner metatarsal tubercle large, nearly one third the length of the inner toe and is compressed and crescentic in shape. Outer metatarsal tubercle small. Skin with numerous warts above and two glandular ridges forming an inverted open V between the shoulders. A glandular fold from the eye to shoulder, present. Ventrally smooth except on the back of the thighs where it is granular. Brown above with darker spots and marblings. Occasionally a crossbar between eyes. Lips and limbs barred. Most specimens with patches of varying shades of red and some with whole dorsal surface brick red.

Distribution in India : Maharashtra & Kerala (Biju, 2001), Karnataka (Krishnamurthy and Hussain, 2000).

Remarks : Endemic to Western Ghats.

20. **Rana temporalis* (Gunther, 1864)
[=*Sylvirana temporalis* (Gunther, 1864)]
(Plate- IX, Fig. 3)

1864. *Hylorana temporalis* Günther, *Rept. Brit. India* : 427.

Diagnosis : Medium sized frogs. Head depressed; snout acute, projecting beyond the mouth; canthus rostralis angular; loreal region strongly concave. Interorbital width broader than upper eyelid. Tympanum very distinct, $\frac{3}{4}$ the diameter of the eye. Tips of fingers and toes dilated into well developed disks with a distinct circummarginal groove. First finger longer than second. Toes nearly entirely webbed; inner metatarsal tubercle small; no tarsal fold. Tibiotarsal articulation reaches nostril or tip of snout or a little beyond. The heels strongly overlap when the limbs are folded at right angles to the body. Males with internal vocals sacs. Fore limb strong with a pad on the inner side of the first finger, covered during the breeding season with grayish brown velvet like horny layer. Skin smooth; a prominent glandular dorsolateral fold from above the tympanum to the hip. Lower parts smooth.

Materials examined : 2 exs., Hanumangundi falls, 20.x.2005, coll: K. Rajmohana & party; 1 ex., Kerekatte, 18.x.2005, coll: K. Rajmohana & party.

Measurements : SVL : 60.0 mm to 77.0 mm.

Habitat : Found along the streams.

Distribution in India : Kerala, Maharashtra, Tamil Nadu & Karnataka (Dutta, 1997 and Biju, 2001).

21. **Rana tigerinus* (Daudin, 1802)
[=*Hoplobatrachus tigerinus* (Daudin, 1802)]

1802. *Rana tigerina* Daudin (*An. XI*), *Hist. Nat. Rain. Gren. Crap.*, Quarto: 62.

Diagnosis : Large sized frogs, males smaller compared to females. Snout projecting beyond mouth. Tympanum distinct, equal to or slightly smaller than the diameter of the eye. First finger longer than second. Toes fully webbed but the web not reaching the tip of the fourth toe. Fifth toe with an outer fringe of web. Outer metatarsals separated by web nearly to the base. An obtuse inner metatarsal tubercle. Tibiotarsal articulation reaches the eye or between the eye and the nostril. Heels overlap when folded at right angles to the body. Skin smooth or granulate above with distinct longitudinal glandular folds. A fold from behind the eye to the shoulder. Ventral skin smooth. Dorsum olive green or brown with darker markings. A light colored vertebral streak from snout to vent often present.

Materials examined : 1 ex., Manikyadhara Betta, 19.x.2005, coll: K. Rajmohana & party; 1 ex., Kerekatte, 20.x.2005, coll: K. Rajmohana & party.

Measurements : SVL : 55.0 mm to 102.0 mm.

Habitat : Found in a pond inside the forest and in paddy fields.

Distribution in India : Throughout India (Dutta, 1997).

Family RHACOPHORIDAE

Diagnosis : Pupil horizontal. Tongue free and deeply notched. Tips of digits distinctly dilated into disks, with the digital pads having a circummarginal groove. Webbing of fingers variable but generally extensive. Vocal sacs present. An intercalary ossification between the penultimate and distal phalanges. Elaborate dermal ornamentations such as flap on forearms and heels present in some members.

Genus *Rhacophorus* Kuhl and Van Hasselt

Diagnosis : Medium to very large frogs with usually rounded snout; body usually slender with narrow waist; skin of head never co-ossified to skull; dermal ornamentations such as

flaps on fore arm, tarsus, heel or above anus usually present in most species; digital pad with complete circummarginal groove. Fingers and toes fully webbed in most species. Vomerine teeth usually present. Terminal phalanges 'Y' shaped.

22. *Rhacophorus malabaricus* Jerdon, 1870

1870. *Rhacophorus malabaricus* Jerdon, *Proc. Asiat. Soc. Bengal*, 1870 : 84.

Diagnosis : Medium sized frogs with vomerine teeth in two straight series; snout sub acuminate; canthus rostralis obtuse; loreal region concave; nostril nearer the end of the snout than eye; inter orbital width broader than upper eyelid; tympanum $\frac{2}{3}$ the diameter of the eye. Fingers and toes webbed to the disk; disk as large as the tympanum. Subarticular tubercles well developed. Tibiotarsal articulation reaches the eye or nostril. Heels overlap when the legs are folded at right angle to the body. Skin finely granular above, more coarsely beneath; granules under the thigh intermixed with larger ones; outer border of forearm and tarsus with a dermal fold; heel with a triangular dermal process. Green above often speckled all over with black and white. Lower parts whitish. Web between fingers and toes reddish.

Distribution in India : Kerala & Karnataka (Dutta, 1997; Krishnamurthy and Hussain, 2000).

Remarks : Endemic to Western Ghats.

Genus *Philautus* Gistel

Diagnosis : Skin smooth, sometimes granulated. Tongue free and deeply notched behind. Vomerine teeth present. Pupil horizontal. Tympanum distinct or hidden. Fingers free or minutely webbed at base. Toes webbed. Tips of fingers and toes dilated into swollen disks or rounded tips. Omosternum and sternum with a bony style. Outer metatarsal separated by a groove or a narrow web. Intercalary ossicle present between the penultimate and terminal phalanges. Terminal phalanges obtuse or bifurcate.

Key to the species of *Philautus*, Gistel from KMNP

1. Tongue with a free pointed papilla in anterior part of the median line; snout rounded; colour brown to green; dorsum glandular; toes webbed at the base *glandulosus*
- Tongue without a free pointed papilla 2
2. Tympanum indistinct or hidden; throat granular; thigh with a green longitudinal band; tibiotarsal articulation reaching tip of snout; upper arm not colored *femoralis*
- Tympanum perfectly distinct 3
3. Toes $\frac{1}{3}$ or $\frac{1}{2}$ webbed; disks well developed; heel without dermal appendages; tibiotarsal articulation reaches tip of snout or slightly beyond the snout *leucorhinus*

- Toe webbing rudimentary; snout slightly pointed; tibiotarsal articulation reaches up to eye; a bony projection on the underside of the humerus bone *tuberohumerus*

23. *Philautus femoralis* (Gunther, 1864)

1864. *Ixalus femoralis* Günther, *Rept. Brit. India* : 434.

Diagnosis : A small sized frog. Dorsal surface green, immaculate or with black spots. Skin smooth but sometimes granular dorsally. Upper surface of the thighs with prominent green stripes. An indistinct cutaneous fold extending from the posterior corner of eyes up to the shoulder. Throat, belly as well as the lower surface of the thighs granular, the granules being larger on the belly in comparison to other regions. Head moderately large. Snout rounded and nearly as long as the diameter of the eye. Canthus rostralis moderately prominent. Loreal region oblique and concave. Nostrils much closer to tip of the snout than to eye. Interorbital width broader than the diameter of the eye. Tympanum small and hidden. Forelimbs moderate in size. Fingers free with well developed disks. Hind limbs moderately long. Tibiotarsal articulation reaches the tip of snout. Toes $\frac{2}{3}$ webbed. A small inner metatarsal tubercle present.

Distribution in India : Kerala (Dutta, 1997); Karnataka (Krishnamurthy and Hussain, 2000).

24. *Philautus glandulosus* (Jerdon, 1853)

1853. *Ixalis? glandulosa* Jerdon, *J. Asiat. Soc. Bengal*, **22** : 532.

Diagnosis : A small frog with color varying from green to dark purple with uniform or distinct markings dorsally. Ventral surface immaculate more or less spotted. Dorsal skin generally smooth, sometimes with a number of small indistinct tubercles. Lateral sides of the body generally granular. A cutaneous fold extending from the eye to shoulder. Head moderately large. Snout rounded and as long as the diameter of the eye. Canthus rostralis distinct. Nostrils equidistant from the eye and tip of snout. Interorbital width broader than the diameter of the eye. Tympanum hidden. Forelimbs moderately long. Fingers free. Hind limbs long. Tibiotarsal articulation reaching eye or slightly beyond. Toes webbed at base. Tips of toes dilated into small rounded disks. A small inner metatarsal tubercle present. Outer metatarsal tubercle absent.

Distribution in India : Maharashtra, Karnataka, Kerala & Tamil Nadu (Dutta, 1997).

Remarks : Endemic to Western Ghats.

25. *Philautus leucorhinus* (Lichtenstein & Martens, 1856)

1856. *Ixalus leucorhinus* Lichtenstein and Martens, *Nomencl. Rept. Amph. Mus. Zool. Berol.*, : 36.

Diagnosis : A small frog. Colour varying from light brown to chocolate brown, olive, green or grey. A dark cross band between the eyes and a dark dorsolateral band with two transverse connections on each side near the shoulder region, present. A prominent mid-

dorsal vertical band present with two transverse connections on each side near the shoulder region. A median white line also present ventrally from snout to vent. Lips spotted with white or almost completely dark brown with few light patches. A hexagonal light patch is often present on the snout. Limbs brown with few light patches. Limbs covered with dark cross-bars. Thighs and back uniformly brown. Skin smooth, occasionally with small scattered tubercles. A supratympanic fold present. Sometimes a raised median line present from the tip of snout to vent. Belly, underside of thighs and around the vent granulated. Head nearly as long as broad. Snout pointed or blunt. Nostrils closer to tip of snout than to eyes. Forelimbs moderately long. Fingers free and with rudiment of webs. First finger shorter than second. Hind limbs fairly long. Tibiotarsal articulation reaching tip of snout or slightly beyond the snout. Toes $1/3$ to $1/2$ webbed. Subarticular tubercles of toes moderately developed.

Distribution in India : Goa, Karnataka & Kerala (Dutta, 1997).

Remarks : This species was described from Sri Lanka and later reported from India; but Bossuyt and Dubois, 2001 referred the Indian specimens of this nomen to *Philautus wynaadensis* (Jerdon).

26. *Philautus tuberochumerus* Kuramoto and Joshy, 2003

2003. *Philautus tuberochumerus* Kuramoto and Joshy, *Curr. Herpetol.*, **22** : 55.

Diagnosis : A small frog with brown to dark dorsal color and conspicuous yellow spots on the anterior surface of the thigh and with large yellow or reddish yellow markings near groin. Snout slightly pointed, canthus rostralis rounded. Loreal region slightly concave or flat; nostril nearer to tip of snout than to eye, and protruding beyond the line between tip of snout and anterior corner of eye when viewed from above. Interorbital width much wider than the upper eyelid. Tympanum small and indistinct, less than the diameter of the eye. Supratympanic fold distinct. No papilla on the tongue. Palm longer than forearm and with a bony projection on the underside of the humerus bone, which is unique to this species. Fingers with large disks with circummarginal groove, no web between fingers. Subarticular and palmar tubercles well developed. Rudimentary web between toes. Inner metatarsal tubercle moderate; no outer metatarsal tubercle; no tarsal fold. Heels overlap when folded at right angles to the body. Dorsal surface coarsely granulated but, lower surface finely granulated.

Distribution in India : Endemic to the Kudremukh National Park.

Source : Kuramoto and Joshy, 2003.

Order GYMNOPTERA
Family CAECILIIDAE

Diagnosis : Gymnophiona with no tail, a pseudo tail may be present; eyes not well developed; three or four dental series present. Some, none or all primary annuli with secondary folds.

Genus *Gegeneophis* Peters

Diagnosis : Caeciliids with eyes under bone; no temporal fossae; mesethmoid not exposed dorsally; splenial teeth present; tentacular opening midway between eye and external naris; small narial plugs present; no diastemata between vomerine and palatal teeth; terminal keel absent (Ravichandran *et al.*, 2003).

27. *Gegeneophis carnosus* (Beddome, 1870)

1870. *Epicrium carnosum* Beddome, *Madras Month. J. Med. Sci.*, 2 : 176.

Diagnosis : Body light pink coloured throughout. Head oval and slender. Snout projecting beyond mouth. Eyes invisible, if present buried under the skull bones. Tentacular area somewhat swollen, the foramen not visible from above but small lateral elevations marks its position. Nostrils nearly terminal and not visible directly from above the head. Two collars, the first moderately distinct, delineated by the first and second nuchal grooves. The posterior terminus of the body with an un-segmented 'shield', on the underside of which is the transverse vent. Dental series in four rows. The tongue bears two narial plugs. The choanae directed outward and forward.

Distribution in India : Karnataka & Kerala (Pillai & Ravichandran, 2005).

Remarks : Endemic to Western Ghats.

Family ICTHYOPHIIDAE

Diagnosis : Gymnophiona with true tails; mouth nearly terminal; tentacular opening between the eye and the nostril, usually closer to the eye; four rows of dental series; all primary annuli subdivided into secondary grooves.

Genus *Icthyophis* Fitzinger

Diagnosis : Medium to large species, with or without a lateral cream or yellow stripe. Four series of teeth; tentacular opening between an below the eye-nostril line, usually closer to eye than to nostril; primary and secondary folds not separable, folds angular in the mid-ventral line; sub dermal scales always present; eyes visible externally; tail present, short and pointed.

Key to the species of *Icthyophis*, Fitzinger from KMNP

- A lateral cream or yellow stripe present widening on first collar, tentacular aperture nearly equidistant between eye and nostril *beddomei*
- A lateral stripe absent, with uniform brown colour; tail relatively longer with 12 or more caudal folds; body folds 386 to 402; size smaller *bombayensis*

28. **Ichthyophis beddomei* Peters, 1879
(Plate- IX, Fig. 4)

1879. *Ichthyophis beddomei* Peters, *Monatsber. Preuss. Akad. Wiss. Berlin* : 932.

Diagnosis : Dark brown above; a creamy or canary yellow stripe extends from the tip of tail to the snout, which bifurcates at the angle of the mouth. Ventral surface somewhat lighter than the dorsum. Each annulus is darker on its anterior half, lighter posteriorly so that ventral surface and to a lesser extent the dorsum, shows as many rings as there are annuli. A cream spot present at the vent. Teeth in four series. The outer maxillaries are as large or larger than the largest dentaries. Tongue rather narrow anteriorly and does not cover the splenials. Choanae lateral, somewhat elongate and slightly angular. Tail very short and terminates to a point.

Materials examined : 1 ex., Kerekatte, 18.x.2005, coll: K. Rajmohana & party; 1 ex., Gangamoola, 27.x.2005, coll: K. Rajmohana & party.

Measurements : Head to tail length: 210.0 to 215.0 mm.

Habitat : Found below the boulders in the grasslands.

Distribution in India : Karnataka, Kerala & Tamil Nadu (Pillai & Ravichandran, 2005).

Remarks : Endemic to Western Ghats.

29. *Ichthyophis bombayensis* Taylor, 1960

1960. *Ichthyophis bombayensis* Taylor, *Univ. Kansas Sci. Bull.*, 40 : 67.

Diagnosis : A large sized species of *Ichthyophis*. Dorsally dark brown; posterior part of each annulus slightly lighter than the anterior region. Top of the head mottled with darker brown. Ventral surface lighter brown. Creamy spots present at the vent, eye, tentacle and nostril. Lips as well as the angle of mouth cream colored. Head long, depressed, roughly oval and narrower than the body. Eyes distinct, large, placed in a circular socket and surrounded by a whitish ring. Tentacular aperture, situated close to lip and closer to the eye than to nostril. Tail rather strongly compressed.

Distribution in India : Gujarat (Pillai & Ravichandran, 2005); Karnataka (Krishnamurthy and Hussain, 2000).

Remarks : Endemic to Western Ghats.

DISCUSSION

An analysis of the earlier published literature and the present survey collection reveals the presence of at least 29 species of amphibians in the Kudremukh National Park. Here we list 3 species of family Bufonidae, 1 species of Microhylidae, 17 species of Ranidae, 5 species

Rhacophoridae, 1 species of Caeciliidae and 2 species of Ichthyophiidae. *Pedostibes tuberculosus* and *Micrixalus fuscus* are reported here for the first time from this National Park. The amphibian diversity of this conservation area can further be revealed if a few more seasonal systematic surveys are conducted in the Park.

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REPTILIA

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INTRODUCTION

The state of Karnataka is known to harbour 93 species of reptiles (Daniels, 2000). The present account pertaining to the Kudremukh National Park (KNP), a part of Karnataka state and a part of the Western Ghats (WG), is based on the reptiles collected and sighted during the survey period and also on the bibliographic records (Murthy, 1985; Das, 1995; Daniels, 2000; Daniel, 2002; Hussain, 2003) including trip reports in the website, http://www.wildindia.org/wiki/kudremukh_checklist_reptiles -accessed on 27.09.2005.

Altogether 52 species of reptiles (Table-1) under 13 families are recorded from the Kudremukh National Park. They belong to 4 species of Chelonians (Turtles and tortoises), 17 species of Lizards and 31 species of snakes. Out of these, 18 are endemic to the Western Ghats viz. Cochin Forest Cane Turtle (*Geoemyda silvatica*), Travancore Tortoise (*Indotestudo forstenii*), Nilgiri Palli (*Cnemaspis indica*), North Indian Hill Palli (*Cnemaspis kandiana*), Mysore Hill Palli (*Cnemaspis mysoriensis*), Roux's Forest Calotes (*Calotes rouxii*), Draco (*Draco dussumieri*), Anaimalai Spiny Lizard, (*Salea anamalayana*), Horsfield's Spiny Lizard (*Salea horsfieldi*) Kanara Shieldtail (*Plectrurus canarius*), Nilgiri Shieldtail (*Uropeltis ocellatus*), Phipson's Shieldtail (*Uropeltis phipsonii*), Whitakers's Sand Boa (*Eryx whitakeri*), Beddome's Keelback (*Amphiesma beddomei*), Large-eyed Bronzeback (*Dendrelaphis grandoculis*), Bamboo Pit Viper (*Trimeresurus gramineus*), Large-scaled Pit Viper (*Trimeresurus macrolepis*) and the Malabar Pit Viper (*Trimeresurus malabaricus*).

Venomous snakes known from the Park include the King Cobra (*Ophiophagus hannah*), Indian Cobra (*Naja naja*), Common Krait (*Bungarus caeruleus*), Russell's Viper (*Vipera russelli*) and Pit vipers in the genera *Trimeresurus* and *Hypnale*. The specimens collected are deposited in the faunal depository of the Western Ghats Field Research Station, Zoological Survey of India, Calicut.

Table-1 : Checklist of Reptiles reported from Kudremukh National Park.

Sl. No.	Scientific Name	Common Name	Remarks
	Order Testudines		
	Family Emydidae		
1.	<i>Geoemyda silvatica</i> Henderson	Cochin Forest Cane Turtle	Endemic to WG
2.	<i>Melanochelys trijuga</i> (Schweigger)	Indian Pond Terrapin	
	Family Testudinidae		
3.	<i>Indotestudo forstenii</i> (Boulenger)	Travancore Tortoise	Endemic to WG
4.	<i>Lissemys punctata</i> (Lacepede)	Southern Flap-shelled Turtle	
	Order Squamata		
	Suborder Sauria		
	Family Gekkonidae		
5.	<i>Cnemaspis indica</i> (Gray)	Nilgiri Palli	Endemic to WG
6.	<i>Cnemaspis kandiana</i> (Kelaart)	North Indian Hill Palli	Endemic to WG
7.	<i>Cnemaspis mysoriensis</i> (Jerdon)	Mysore Hill Palli	Endemic to WG
8.	<i>Hemidactylus brookii</i> Gray	Spotted House Gecko*	
9.	<i>Hemidactylus frenatus</i> Schlegel	Ticticky House Gecko*	
10.	<i>Hemidactylus leschenaultii</i> Dumeril & Bibron	Common Bark Gecko	
11.	<i>Hemidactylus maculatus</i> (Dumeril & Bibron)	Dark Spotted Giant Gecko	
	Family Agamidae		
12.	<i>Calotes rouxii</i> (Dumeril & Bibron)	Roux's Forest Lizard*	Endemic to WG
13.	<i>Calotes versicolor</i> (Daudin)	Indian Garden Lizard*	
14.	<i>Draco dussumieri</i> Dumeril & Bibron	Draco*	Endemic to WG
15.	<i>Salea anamallayana</i> (Beddome)	Anaimalai Spiny Lizard	Endemic to WG
16.	<i>Salea horsfieldii</i> Annandale	Horsfield's Spiny Lizard	Endemic to WG
	Family Chamaeleonidae		
17.	<i>Chamaeleo zeylanicus</i> Laurenti	Indian Chamaeleon	
	Family Scincidae		
18.	<i>Mabuya carinata</i> (Schneider)	Common Indian Skink*	
19.	<i>Mabuya macularia</i> (Blyth)	Bronze Grass Skink*	
20.	<i>Ristella</i> sp	Four fingered Skink	
	Family Varanidae		
21.	<i>Varanus bengalensis</i> (Daudin)	Indian Monitor Lizard*	
	Suborder Serpentes		
	Family Typhlopidae		
22.	<i>Ramphotyphlops braminus</i> (Daudin)	Common Blind Snake*	

Sl. No.	Scientific Name	Common Name	Remarks
	Family Uropeltidae		
23.	<i>Plectrurus canaricus</i> (Beddome)	Kanara Shieldtail	Endemic to WG
24.	<i>Uropeltis ocellatus</i> (Beddome)	Nilgiri Shieldtail	Endemic to WG
25.	<i>Uropeltis phipsonii</i> (Mason)	Phipson's Shieldtail	Endemic to WG
	Family Boidae		
26.	<i>Eryx whitakeri</i> I.Das	Whitakers's Sand Boa	Endemic to WG
27.	<i>Python molurus</i> (Linnaeus)	Indian Rock Python	
	Family Colubridae		
28.	<i>Amphiesma stolata</i> (Linnaeus)	Striped Keelback	
29.	<i>Amphiesma beddomei</i> (Gunther)	Beddome's Keelback	Endemic to WG
30.	<i>Ahaetulla nasuta</i> (Lacepede) (Plate-IX, Fig. 6)	Green Whip Snake*	
31.	<i>Atretium schistosum</i> (Daudin)	Olivaceous Keelback	
32.	<i>Boiga forsteni</i> (Dumeril & Bibron)	Forsten's Cat Snake	
33.	<i>Boiga trigonata</i> (Schneider)	Common Cat Snake	
34.	<i>Chrysopelia ornata</i> (Shaw)	Ornate Flying Snake	
35.	<i>Dendrelaphis grandoculis</i> (Boulenger)	Large-eyed Bronzeback	Endemic to WG
36.	<i>Dendrelaphis tristis</i> (Daudin)	Common Indian Bronzeback	
37.	<i>Elaphe helena</i> (Daudin)	Common Trinket Snake	
38.	<i>Lycodon aulicus</i> (Linnaeus)	Common Wolf Snake	
39.	<i>Lycodon striatus</i> (Shaw)	Barred Wolf Snake	
40.	<i>Macropisthodon plumbicolor</i> (Cantor)	Green Keelback	
41.	<i>Oligodon arnensis</i> (Shaw)	Common Kukri Snake*	
42.	<i>Ptyas mucosus</i> (Linnaeus)	Rat Snake*	
43.	<i>Xenochrophis piscator</i> (Schneider)	Checkered Keelback*	
	Family Elapidae		
44.	<i>Bungarus caeruleus</i> (Schneider)	Common Krait	
45.	<i>Calliophis melanurus</i> (Shaw)	Slender Coral Snake	
46.	<i>Naja naja</i> (Linnaeus)	Indian Cobra	
47.	<i>Ophiophagus hannah</i> (Cantor)	King Cobra	
	Family Viperidae		
48.	<i>Vipera russelli</i> (Shaw)	Russel's Viper	
49.	<i>Hypnale hypnale</i> (Merrem)	Hump-nosed Pit Viper*	
50.	<i>Trimeresurus gramineus</i> (Shaw)	Bamboo Pit Viper	Endemic to WG
51.	<i>Trimeresurus macrolepis</i> Beddome	Large-scaled Pit Viper	Endemic to WG
52.	<i>Trimeresurus malabaricus</i> (Jerdon) (Plate-IX, Fig. 5)	Malabar Pit Viper*	Endemic to WG

*Sighted/collected during the survey.

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AVES

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INTRODUCTION

Karnataka is known to harbour a rich bird fauna (Ali and Whistler, 1942-43; Ali and Ripley, 1989 and Hussain, 2003). The present account on the avian fauna of the Kudremukh National Park (KMNP) is based on the observations made during the survey and also on the information available from the past records (Hussain, 2003, <http://www.wildindia.org/wiki/kudremukh_checklist_birds accessed> on 27.09.2005).

Altogether 149 species under 116 genera of 44 families belonging to 14 orders were recorded from the Kudremukh National Park. Of these, 21 species are winter migrants, which include a good number of Leaf Warblers and Flycatchers.

A number of Western Ghats endemics like the Blue winged Parakeet, Malabar Grey Hornbill, Grey headed Bulbul, Rufous Babbler, Small Sunbird and the White-bellied Tree-pie were observed here. The Malabar Trogon, Woodpeckers of the genus *Dinopium*, Fairy Blue Bird, Rufousbellied Munia *etc.*, which enjoy a disjunct distribution in Western Ghats, Sri Lanka and Eastern Himalaya, also occur here. The lesser number of water birds in the Lakhya Dam area is probably due to the silty nature of the reservoir.

A systematic account of the birds recorded from KMNP and information on their *Occurrence during the survey* is given below. The classification and nomenclature followed here is after Manakadan and Pittie (2001).

SYSTEMATIC ACCOUNT

Order PELECANIFORMES

Family PHALACROCORACIDAE

Cormorants/Shags

1. *Phalacrocorax niger* (Vieillot)

Little Cormorant

Habitat and status : A resident bird found in and around all wetlands and water bodies throughout Karnataka.

Occurrence during the survey : Uncommon. A small flock of 5-6 birds were sighted at Bhadra River.

Order CICONIIFORMES

Family ARDEIDAE

Herons, Egrets & Bitterns

2. *Egretta garzetta garzetta* (Linnaeus)

Little Egret

Habitat and status : Brackish and freshwater wetlands, paddy fields and edges of tanks. Common.

Occurrence during the survey : Uncommon. Seen near paddy fields at Kerekatte.

3. *Bubulcus ibis coromandus* (Boddaert)

Cattle Egret

Habitat and status : Widespread and the most abundant of our egrets. Fallow land, grassland, cultivation lands and house compounds wherever there are cattle.

Occurrence during the survey : Commonly sighted at inhabited areas of the Park.

4. *Ardeola grayii grayii* (Sykes)

Indian Pond Heron

Habitat and status : Resident with extensive range. Seen around paddy fields, wetlands and tanks.

Occurrence during the survey : Common at the paddy fields near Kerekatte.

5. *Nycticorax nycticorax*

Night Heron/ Black-crowned Night Heron

Habitat and status : Wide-ranging; breeding colonies reported at various parts of the state. Seen around large wetlands.

Occurrence during the survey : Heard calls at night near Kerekatte.

6. *Ardeola striatus chloriceps* (Bonnaparte)

Little Green Heron

Habitat and status : Present at almost all wetlands in low numbers. Edges of water bodies.

Occurrence during the survey : None; only earlier records.

7. *Ixobrychus cinnamomeus* (Gmelin)

Chestnut Bittern

Habitat and status : Resident, small numbers; paddy fields, mangroves, reedbeds. Uncommon.

Occurrence during the survey : Observed once at Kerekatte paddy fields.

Order FALCONIFORMES

Family ACCIPITRIDAE

Hawks, Eagles, Buzzards, Old World Vultures, Kites & Harriers

8. *Elanus caeruleus vociferus* (Latham)

Black-shouldered Kite

Habitat and status : Found in open areas from coastal wetlands and fallow fields to grasslands in the hills. Resident. Locally common.

Occurrence during the survey : A few observations from the Park, mostly in the open grasslands at Manikyadhara and Gangadikal.

9. *Milvus migrans govinda* Sykes

Black Kite

Habitat and status : The most abundant raptor; apparently inseparable from human habitations. Resident.

Occurrence during the survey : A few observations from the Park.

10. *Haliastur indus indus* (Boddaert)

Brahminy Kite

Habitat and status : Resident in the coastal and inland areas near water. Resident.

Occurrence during the survey : Observed in small numbers at Lakhya dam area.

11. *Accipiter trivirgatus peninsulae* Koelz

Crested Goshawk

Habitat and status : Evergreen and moist deciduous forests from the foothills to about 1600m. Resident. Uncommon.

Occurrence during the survey : A single bird was sighted at Muduba area of the Park.

12. *Spilornis cheela melanotis* (Jerdon)

Crested Serpent-Eagle

Habitat and status : The most widespread of our eagles, found in evergreen and moist deciduous forests as well as well wooded villages. Resident.

Occurrence during the survey : Noisy display flights were noted in many localities within the park.

13. *Ictinaetus malayensis perniger* (Hodgson)

Black Eagle

Habitat and status : Evergreen and moist deciduous forests, neighbouring coffee and cardamom plantations. Resident. Fairly common.

Occurrence during the survey : Observed at Muduba, Bhagavathi and Seethabhumi areas of the Park.

14. *Accipiter badius badius* (Gmelin)

Shikra

Habitat and status : A widespread resident, found in open forests, well-wooded villages and towns.

Occurrence during the survey : A common raptor of the Kerekatte area. Many noisy calls were recorded during the survey.

Family FALCONIDAE

Falcons

15. *Falco tinnunculus tinnunculus* Linnaeus

Common Kestrel

Habitat and status : The race *tinnunculus* is a winter visitor affecting cultivable lands in the coastal areas and grass and scrub lateritic plains and the midlands, ascending to grassy hills also. The race *objurgatus* is resident, mainly in the grasslands of the hills. Fairly common, locally.

Occurrence during the survey : Hovering flight of these small raptors were sighted at the montane grasslands of Manikyadhara Betta and Seethabhumi area of the Park.

Order GALLIFORMES
Family PHASIANIDAE
Pheasants, Partridges, Quails

16. *Perdica* sp.

Bush-Quail

Habitat and status : Frequents grasslands and bushes.

Occurrence during the survey : A small flock was noted on the way to Seethabhumi. We could not ascertain the identity of the species due to its cryptic colouration and quick flight.

17. *Galloperdix spadicea spadicea* (Gmelin)

Red Spurfowl

Habitat and status : Found in edges of forests and secondary jungles. Resident.

Occurrence during the survey : Many sightings from the Park during the survey.

18. *Gallus sonneratii* Temminck

Grey Junglefowl

Habitat and status : Frequents edges and clearings of evergreen forests, moist deciduous forests and adjacent plantations and cashew groves in the lateritic midlands. Resident.

Occurrence during the survey : Rare. Many males and small parties were observed.

19. *Pavo cristatus* Linnaeus

Common Peafowl

Habitat and status : Moist and dry deciduous forests as well as cultivations. Resident.

Occurrence during the survey : Commonly sighted near Bhagavathi nature camp area of the Park.

Order GRUIFORMES
Family RALLIDAE
Rails, Crakes, Moorhens, Coots

20. *Amaurornis phoenicurus phoenicurus* (Pennant)

White-breasted Waterhen

Habitat and status : A widespread resident of the wetlands, paddy fields, mangrove swamps, edges of tanks and river banks.

Occurrence during the survey : Sighted at the edges of paddy fields at Kerekatte.

Order CHARADRIIFORMES

Family CHARADRIIDAE

Plovers, Dotterels, Lapwings

21. *Vanellus indicus indicus* (Boddaert)

Red-wattled Lapwing

Habitat and status : Seen in the neighbourhood of water logged paddy fields, riverbanks and lateritic plains. A widespread resident.

Occurrence during the survey : Common. Many observations from waterlogged areas of the Park.

Family SCOLOPACIDAE

Sandpipers, Stints, Snipes, Godwits & Curlews

22. *Tringa ochropus* Linnaeus

Green Sandpiper

Habitat and status : Found mainly inland fresh water habitats like Lakes, tanks, paddy fields and marshes. A fairly common winter visitor.

Occurrence during the survey : A single observation from the Gangamoola area of the Park.

23. *Actitis hypoleucos hypoleucos* Linnaeus

Common Sandpiper

Habitat and status : Frequents inland tanks, streams, ditches, riverbanks, paddy fields, as well as seashore, tidal mudflats and estuaries. A widespread common wader and a winter visitor.

Occurrence during the survey : Many sightings from the water edges of Lakhya Dam and Bhadra River.

Order COLUMBIFORMES

Family COLUMBIDAE

Pigeons & Doves

24. *Columba livia intermedia* Strickland

Blue Rock Pigeon

Habitat and status : Seen around cultivable fields and human habitations. A common widespread resident.

Occurrence during the survey : Fairly common in suitable habitats of the park.

25. *Streptopelia chinensis suratensis* (Gmelin)

Spotted Dove

Habitat and status : A widespread resident found in open forests and amidst cultivation. Common.

Occurrence during the survey : A few observations from the Park.

26. *Chalcophaps indica indica* (Linnaeus) (Plate-X, Fig. 3)

Emerald Dove

Habitat and status : Moist forests, well-wooded groves and sacred groves of the midlands. A common resident but found in low numbers.

Occurrence during the survey : A few observations from the Park.

27. *Treron pompadora affinis* (Jerdon)

Pompadour Green-Pigeon

Habitat and status : A resident of the forests and well-wooded areas. Common.

Occurrence during the survey : Many flocks were observed on Fig trees bearing fruits.

28. *Ducula badia cuprea* (Jerdon)

Mountain Imperial-Pigeon

Habitat and status : Found in evergreen forests. Uncommon.

Occurrence during the survey : Fairly common in the surveyed localities.

Order PSITTACIFORMES

Family PSITTACIDAE

Parakeets & Hanging Parrots

29. *Loriculus vernalis vernalis* (Sparrman)

Indian Hanging Parrot

Habitat and status : Found in well-wooded areas and forests. Resident; fairly common.

Occurrence during the survey : Many small parties were observed.

30. *Psittacula cyanocephala cyanocephala* (Linnaeus)

Plum-headed Parakeet

Habitat and status : Frequents deciduous and evergreen forests and well-wooded midland regions. Resident; fairly common.

Occurrence during the survey : Rarely sighted in the surveyed localities.

31. *Psittacula cloumboides* (Vigors)

Blue-winged Parakeet

Habitat and status : Frequents evergreen and moist deciduous forests. Resident. Endemic to Western Ghats.

Occurrence during the survey : Fairly common.

Order CUCULIFORMES

Family CUCULIDAE

Cuckoos, Malkohas & Coucals

32. *Clamator jacobinus jacobinus* (Boddaert)

Pied Crested Cuckoo

Habitat and status : Seen in the drier areas. Apparently a summer (breeding) visitor.

Occurrence during the survey : None; only earlier records.

33. *Hierococcyx varius varius* Vahl

Brainfever Bird

Habitat and status : A widespread resident; found in light forests, cashew groves and homesteads. Resident.

Occurrence during the survey : Common.

34. *Cuculus micropterus micropterus* Gould

Indian Cuckoo

Habitat and status : Frequents well-wooded villages and forests. Apparently a summer (breeding) visitor.

Occurrence during the survey : None; only earlier records.

35. *Cacomantis sonneratii sonneratii* (Latham)

Banded Bay Cuckoo

Habitat and status : Resident; found in deciduous and semi-evergreen forests, cashew groves and well-wooded homesteads of villages.

Occurrence during the survey : A few records from the Park. Mostly, calls heard during the survey.

36. *Eudynamys scolopacea scolopacea* (Linnaeus)

Asian Koel

Habitat and status : A widespread resident; more abundant in towns and cities than in villages.

Occurrence during the survey : Fairly well distributed in the areas surveyed.

37. *Centropus sinensis parroti* Stresemann

Greater Coucal

Habitat and status : Found in open forests, cultivation lands, plantations and homesteads. A widespread resident.

Occurrence during the survey : Common.

Order STRIGIFORMES

Family STRIGIDAE

38. *Glaucidium radiatum malabaricum* (Blyth)

Jungle Owlet

Habitat and status : Found in forests and well-wooded villages. Resident.

Occurrence during the survey : A single observation during the survey.

39. *Ketupa zeylonensis leschenaulti* (Temminck)

Brown Fish-Owl

Habitat and status : Found near water in low forests and villages. Fairly common.

Occurrence during the survey : A bird was sighted on a tree near the Bhagavathi nature camp area.

Family CAPRIMULGIDAE

Nightjars

40. *Caprimulgus indicus indicus* Latham

Indian Jungle Nightjar (Grey Nightjar)

Habitat and status : Found around scrub jungles and fallow lands in the villages. Resident.

Occurrence during the survey : None; only earlier records.

41. *Caprimulgus atripennis* Jerdon

Jerdon's Nightjar

Habitat and status : Forest clearings, open forests and cashew groves. Resident. Fairly common locally.

Occurrence during the survey : None; only earlier records.

Family PODARGIDAE

Frogmouths

42. *Batrachostomus moniliger* Blyth (Plate-X, Fig.1)

Ceylon Frogmouth

Habitat and status : Found in evergreen, semi-evergreen and adjacent degraded forests. Resident. Fairly common.

Occurrence during the survey : Fairly common. Calls regularly heard at Kerekatte area during the survey.

Order APODIFORMES

Family APODIDAE

Swifts

43. *Collocalia unicolor* (Jerdon)

Indian Edible-nest Swiftlet

Habitat and status : Inhabits forests and cultivated lands near breeding colonies. Resident.

Occurrence during the survey : Uncommon. A small flock was sighted at Lakhya dam area.

44. *Zoonavena sylvatica* (Tickell)

White-rumped Needletail-Swift

Habitat and status : Frequents evergreen and moist deciduous forests. Resident. Locally common.

Occurrence during the survey : A single observation of 4 individuals from Gangadikal area of the Park.

45. *Cypsiurus balasiensis* (J.E. Gray)

Asian Palm Swift

Habitat and status : Met with in villages and cultivated lands with palms. Resident.*Occurrence during the survey* : Uncommon. Observed at Kerekatte area.46. *Tachymarptis melba nubifuga* Koelz

Alpine Swift

Habitat and status : Found on hills and coastal areas. Apparently a resident bird. Uncommon.*Occurrence during the survey* : A single record from the park.47. *Apus affinis affinis* (J.E.Gray)

House Swift

Habitat and status : The most common and widespread swift of the region. Resident.*Occurrence during the survey* : A small flock frequents the Lakhya dam area.

Family HEMIPROCNIDAE

Tree-Swifts

48. *Hemiprocne coronata* (Tickell)

Crested Tree-Swift

Habitat and status : Generally frequents open and light forests, cultivated lands at forest's edge. Resident, uncommon.*Occurrence during the survey* : A pair was sighted at Heggon estate (Muduba).

Order CORACIIFORMES

Family ALCEDINIDAE

Kingfishers

49. *Alcedo atthis taporbana* Kleinschmidt

Small Blue Kingfisher

Habitat and status : A widespread resident. Met with around coastal backwaters, canals in paddy fields and tanks.*Occurrence during the survey* : A few sightings from a riverine area.

50. *Halcyon capensis capensis* (Linnaeus)

Stork-billed Kingfisher

Habitat and status : Seen near forest streams, inland wetlands and backwaters. Resident.

Occurrence during the survey : Sighted near Lakhya Dam.

51. *Halcyon smyrnensis fusca* (Boddaert)

White-breasted Kingfisher

Habitat and status : A widespread resident of varied habitats.

Occurrence during the survey : Commonly seen in the sites surveyed.

52. *Ceryle rudis travancoreensis* Whistler & Kinnear

Lesser Pied Kingfisher

Habitat and status : Found around coastal backwaters, tanks and rivers. A widespread resident.

Occurrence during the survey : A pair was sighted near Bhadra River.

Family MEROPIDAE

Bee-Eaters

53. *Merops orientalis orientalis* Latham

Small Bee-eater

Habitat and status : A widespread resident seen mostly in the plains.

Occurrence during the survey : Common. Fairly well distributed in the sites surveyed.

54. *Merops philippinus philippinus* Linnaeus

Blue-tailed Bee-eater

Habitat and status : Mostly seen in the neighborhood of waterbodies in the midlands and the coastal areas. Locally migratory.

Occurrence during the survey : Uncommon. Sighted at Lakhya dam area.

55. *Merops leschenaulti leschenaulti* Vieillot

Chestnut-headed Bee-eater

Habitat and status : Frequents forests and well-wooded villages. An uncommon resident bird.

Occurrence during the survey : Found fairly common in the areas surveyed.

Family CORACIIDAE

Rollers**56. *Coracias benghalensis indica* Linnaeus**

Indian Roller

Habitat and status : A widespread resident bird of the open areas in the midlands and coastal plains.

Occurrence during the survey : Uncommon in the park.

Family UPUPIDAE

Hoopoes**57. *Upupa epops ceylonensis* Reichenbach**

Common Hoopoe

Habitat and status : Frequents thinly wooded areas and cultivated fields. Patchy and local in distribution.

Occurrence during the survey : Met with only once during the survey.

Family BUCEROTIDAE

Hornbills**58. *Ocyrceros griseus griseus* (Latham)**

Malabar Grey Hornbill

Habitat and status : The most widespread hornbill of the area. Inhabits evergreen and moist deciduous forests and large sacred groves of southern Karnataka. Resident. Endemic to Western Ghats.

Occurrence during the survey : Fairly well distributed in the Park.

Order PICIFORMES

Family CAPITONIDAE

Barbets**59. *Megalaima viridis* (Boddaert)**

White-cheeked Barbet

Habitat and status : A widespread resident; found in forests and villages.

Occurrence during the survey : Common in the Park.

60. *Megalaima rubricapilla malabarica* (Blyth)

Crimson-throated Barbet

Habitat and status : Met with in evergreen and moist deciduous forests. Resident.

Occurrence during the survey : A small flock of about 9 birds were sighted at a fig tree near Kerekatte range office.

61. *Megalaima haemacephala indica* (Latham)

Coppersmith Barbet

Habitat and status : Can be seen in open wooded areas and villages. Resident.

Occurrence during the survey : Rare in the park.

Family PICIDAE

Woodpeckers

62. *Dendrocopus nanus cinericula* (Malherbe)

Brown-capped Pigmy Woodpecker

Habitat and status : Inhabits evergreen and moist deciduous forests, and well-wooded villages. Resident.

Occurrence during the survey : A single observation from Towergudda area of the park.

63. *Celius brachyurus jerdonii* (Malherbe)

Rufous Woodpecker

Habitat and status : Inhabits evergreen, semi-evergreen and moist deciduous forests; sacred groves and the surrounding areas in midlands. Resident, uncommon.

Occurrence during the survey : A few observations from the Park.

64. *Dinopium benghalense tehminae* (Whistler & Kinnear)

Lesser Golden-backed Woodpecker

Habitat and status : Can be seen in thin forests, well-wooded villages and homesteads. Resident.

Occurrence during the survey : None; only earlier records.

65. *Dinopium javanense malabaricum* Whistler & Kinnear

Common Golden-backed Woodpecker (Malabar Goldenbacked Threetoed Woodpecker)

Habitat and status : Frequents evergreen forests. Resident.

Occurrence during the survey : Fairly common in the Park.

66. *Chrysocolaptes lucidus chersonesus* Kloss

Greater Golden-backed Woodpecker (Malherbe's Goldenbacked Woodpecker)

Habitat and status : Inhabits evergreen and moist deciduous forests and well wooded country. Resident; fairly common.

Occurrence during the survey : A few sightings from the Park.

67. *Hemicircus canente canente* (Lesson)

Heart-spotted Woodpecker

Habitat and status : Seen in evergreen and moist deciduous forests and well-wooded villages. Resident; fairly common.

Occurrence during the survey : A pair was sighted at Muduba area of the Park.

Order PASSERIFORMES

Family PITTIDAE

Pittas

68. *Pitta brachyura brachyura* (Linnaeus)

Indian Pitta

Habitat and status : Inhabits evergreen and deciduous forests and well-wooded countryside. A winter visitor.

Occurrence during the survey : None; only earlier records.

Family ALAUDIDAE

Larks

69. *Galerida malabarica* (Scopoli)

Malabar Crested Lark

Habitat and status : Seen around fallow paddy fields, grass and scrubby lateritic plains and grassy hillsides. Resident.

Occurrence during the survey : None; only earlier records.

Family HIRUNDINIDAE

Swallows & Martins

70. *Hirundo rustica gutturalis* Scopoli

Common Swallow

Habitat and status : A widespread winter visitor to open country and wetlands. A winter Migrant.

Occurrence during the survey : Large flocks were sighted at Lakhya dam area.

71. *Hirundo smithii filfera* Stephens

Wire-tailed Swallow

Habitat and status : Frequents water logged areas. Resident.

Occurrence during the survey : None; only earlier records.

72. *Hirundo daurica nipalensis* Hodgson

Red-rumped Swallow

Habitat and status : Affects most of the areas in the coastal plains and the midlands, and occasionally the hills too.

Occurrence during the survey : A large flock of about 20 individuals were sighted at Lakhya dam area.

73. *Hirundo concolor concolor* Sykes Dusky Crag-Martin

Habitat and status : Seen in the neighbourhood of large dams, grassy hillside with rocks and cliffs; patchy in distribution. Resident; fairly common locally.

Occurrence during the survey : Observed near Lakhya dam.

Family MOTACILLIDAE

Wagtails & Pipits

74. *Motacilla maderaspatensis* Gmelin

Large Pied Wagtail

Habitat and status : A fairly common widespread resident that can be seen in the neighbourhood of water logged areas.

Occurrence during the survey : Sighted near Lakhya dam.

75. *Motacilla cinerea cinerea* (Tunstall)

Grey Wagtail

Habitat and status : Frequents areas from the coastal plains to the hills. A winter visitor.

Occurrence during the survey : Fairly well distributed in the Park.

76. *Anthus rufulus* Vieillot (*Anthus novaeseelandiae malayensis* Eyton)

Paddy field Pipit/ Malay Pipit

Habitat and status : A widespread resident seen in areas from the coastal plains to the hills; also can be seen around wet and fallow paddy fields and grasslands.

Occurrence during the survey : Common near paddy fields and the open areas.

Family CAMPEPHAGIDAE

Cuckoo-Shrikes, Flycatcher-Shrikes, Minivets & Woodshrikes

77. *Coracina macei* (Lesson)

Large Cuckoo-Shrike

Habitat and status : Inhabits well-wooded villages and forests. Resident.

Occurrence during the survey : Uncommon in the Park.

78. *Pericrocotus cinnamomeus malabaricus* (Gmelin)

Small Minivet

Habitat and status : Seen at well-wooded homesteads, plantations, semi evergreen and moist deciduous forests. Resident.

Occurrence during the survey : Rare in the Park.

79. *Pericrocotus flammeus flammeus* (Forster)

Scarlet Minivet

Habitat and status : Inhabits evergreen and moist deciduous forests, well-wooded villages and sacred groves. Resident.

Occurrence during the survey : Fairly well distributed in the surveyed sites.

80. *Hemipus picatus picatus* (Sykes)

Pied Flycatcher-Shrike

Habitat and status : Inhabits evergreen and moist deciduous forests, well wooded compounds around sacred groves in midland hills. A fairly common resident bird. *Occurrence during the survey* : A single sighting from the Park.

81. *Tephrodornis gularis* (Raffles)

Large Woodshrike

Habitat and status : Frequents evergreen and moist deciduous forests as well as the neighbouring coffee and cardamom plantations. Resident.

Occurrence during the survey : Fairly common in sites surveyed.

Family PYCNONOTIDAE

Bulbuls & Finchbills

82. *Pycnonotus priocephalus* (Jerdon)

Grey-headed Bulbul

Habitat and status : Inhabits evergreen and moist deciduous forests, secondary jungles, lantana bushes. Resident. Endemic to Western Ghats.

Occurrence during the survey : Rarely seen in the areas surveyed.

83. *Pycnonotus melanicterus gularis* (Gould)

Ruby-throated Bulbul

Habitat and status : Seen in evergreen and moist deciduous forests and secondary growths. Resident; fairly common.

Occurrence during the survey : Mostly sighted near Kerekatte.

84. *Pycnonotus jocosus fuscicaudatus* (Gould) (Plate-X, Fig. 2)

Red-whiskered Bulbul

Habitat and status : Seen in the villages and forests alike, at almost all altitudes. Resident.

Occurrence during the survey : Common.

85. *Hypsipetes indicus indicus* (Jerdon)

Yellow-browed Bulbul

Habitat and status : Inhabits evergreen and moist deciduous forests, nearby plantations, secondary jungles and sacred groves. Resident.

Occurrence during the survey : Fairly well distributed in the Park.

86. *Hypsipetes leucocephalus ganeesa* (Sykes)

Black Bulbul

Habitat and status : Found in evergreen forests from 600m; descends to lower altitudes of less rainfall during SW monsoon. Resident, locally common.

Occurrence during the survey : Common at the higher reaches of the Park.

Family IRENIDAE
Ioras, Chloropsis, Fairy Bluebird

87. *Aegithia tiphia multioclor* (Gmelin)

Common Iora

Habitat and status : Affects well-wooded villages, semi evergreen, moist deciduous and deciduous forests as well as secondary jungles. Resident.

Occurrence during the survey : Common.

88. *Chloropsis cochinchinensis jerdoni* (Blyth)

Jerdon's Chloropsis

Habitat and status : Seen around well-wooded homesteads and groves in villages. Also seen in secondary jungles. Resident.

Occurrence during the survey : Uncommon in the Park.

89. *Chloropsis aurifrons frontalis* (Pelzeln)

Gold-fronted Chloropsis

Habitat and status : Found in moist deciduous to evergreen forests, well-wooded villages. Resident.

Occurrence during the survey : Fairly common in the sites surveyed.

90. *Irena puella puella* (Latham)

Asian Fairy Blue Bird

Habitat and status : Inhabits evergreen forests. Resident; fairly common.

Resident: Fairly well distributed in the Park.

Family LANIIDAE
Shrikes

91. *Lanius cristatus cristatus* Linnaeus

Brown Shrike

Habitat and status : Met with at forest edges, grassy hillsides, open areas in villages and towns in the midlands and the coastal area. A winter visitor.

Occurrence during the survey : Rare in the Park.

92. *Lanius schach caniceps* Blyth

Rufous-backed Shrike (Southern Greybacked Shrike)

Habitat and status : Seen around forest clearings, grasslands with bushes and also around the backwaters, mangroves, cultivated lands. A resident bird.

Occurrence during the survey : A single individual was sighted near Thunga Bridge.

Family MUSCICAPIDAE

Subfamily TURDINAE

Thrushes, Shortwings, Robins, Forktails, Wheatears

93. *Zoothera citrina cyanotes* (Jardine & Selby)

White-throated Ground Thrush

Habitat and status : Affects evergreen and moist deciduous forests, cardamom and coffee plantations and sacred groves. Resident.

Occurrence during the survey : Uncommon in the Park.

94. *Copsychus saularis ceylonensis* Sclater

Oriental Magpie-Robin

Habitat and status : A widespread resident seen around human habitations and light forests.

Occurrence during the survey : A common bird of the Park.

95. *Saxicola caprata nilgiriensis* Whistler.

Pied Bushchat

Habitat and status : Affects coastal wetlands, lateritic grassy scrub in the midlands and grassy hillsides up to an elevation of 2000m. Resident. Common in the hills and fairly common elsewhere.

Occurrence during the survey : Sighted at the many open grassland areas of the Park.

96. *Monticola cinclorhynchus* (Vigors)

Blue-headed Rock-Thrush

Habitat and status : Frequents moist deciduous forests, semi-evergreen forests, edges of evergreen forests, cardamom and tea plantations, well-wooded villages and sacred groves. A fairly common winter visitor.

Occurrence during the survey : None; only earlier records.

97. ***Myiophonus horsfieldii horsfieldii*** (Vigors)

Malabar Whistling-Thrush

Habitat and status : Seen in the neighbourhood of streams in the forests, even close to human habitations. Resident.

Occurrence during the survey : Fairly common in the Park.

98. ***Turdus merula nigropileus*** (Lafresnaye)

Eurasian Blackbird (Blackcapped Blackbird)

Habitat and status : frequents evergreen and moist deciduous forests as well as cardamom and coffee plantations. A fairly common winter visitor.

Occurrence during the survey : None; only earlier records.

99. ***Erithacus brunnea brunnea*** (Hodgson)

Indian Blue Robin (Indian Blue Chat)

Habitat and status : Inhabits evergreen forests, mainly above 600m, but several sightings at lower altitudes also. An uncommon winter visitor.

Occurrence during the survey : A single observation from Bhagavathi area.

Subfamily TIMALIINAE

Babblers, Laughingthrushes, Babaxes, Barwings & Yuhinas

100. ***Pellorneum ruficeps ruficeps*** Swainson

Spotted Babbler

Habitat and status : Frequents evergreen and moist deciduous forests and sacred groves and surrounding well-wooded areas in villages. Resident.

Occurrence during the survey : Fairly common in the Park.

101. ***Pomatorhinus horsfieldii*** Harington

Indian Scimitar Babbler

Habitat and status : Seen in evergreen and moist deciduous forests at all altitudes. Resident.

Occurrence during the survey : Commonly found in the Park.

102. ***Rhopocichla atriceps atriceps*** (Jerdon)

Black-headed Babbler (Dark-fronted Babbler)

Habitat and status : A resident of the evergreen and moist deciduous forests, adjoining secondary growth and thick scrub.

Occurrence during the survey : Fairly common in the Park.

103. *Turdoides subrufus subrufus* (Jerdon)

Indian Rufous Babbler

Habitat and status : Frequents undergrowth in evergreen and moist deciduous forests and secondary vegetation; scrub jungle and the cashew groves of the lateritic midlands. Resident. Endemic to Western Ghats.

Occurrence during the survey : Fairly common in the Park.

104. *Alcippe poioicephala poioicephala* (Jerdon)

Quaker Tit-Babbler

Habitat and status : Inhabits evergreen and moist deciduous forests at all elevations. Resident.

Occurrence during the survey : Commonly seen in the Park.

105. *Turdoides striatus malabaricus* (Jerdon)

Jungle Babbler

Habitat and status : Seen around well-wooded areas and forest edges. Resident.

Occurrence during the survey : Common. Fairly well distributed in the Park.

Subfamily SYLVINAE

Goldcrest, Prinias, Warblers

106. *Cisticola juncidis salimalii* Whistler

Streaked Fantail-Warbler (Zitting Cisticola)

Habitat and status : Affects wet paddy fields in the coastal plains and swamps in the hills around 1500m elevations. Resident.

Occurrence during the survey : Fairly common around water-logged areas of the Park.

107. *Prinia hodgsonii albogularis* Walden

Franklin's Prinia

Habitat and status : Frequents moist deciduous and deciduous forests, grass and scrub jungles as well as cashew groves. A resident bird.

Occurrence during the survey : A common bird of the Park.

108. ***Prinia inornata*** Blyth

Plain Prinia (*Prinia subflava franklinii* Blyth Plain Wren-Warbler)

Habitat and status : frequents wet paddy fields, grassy shores of back waters and grassy hillsides up to about 1200m. Patchy and parochial. Resident.

Occurrence during the survey : Fairly common in the Park.

109. ***Acrocephalus dumetorum*** Blyth

Blyth's Reed-Warbler

Habitat and status : Affects reeds and grasses in the wetlands of the coastal areas and also found in undergrowths and scrubs in the forests and plantations, up to an altitude of 2150m. A winter visitor.

Occurrence during the survey : a common bird of the Park.

110. ***Orthotomus sutorius guzuratus*** (Latham)

Common Tailorbird

Habitat and status : Seen in gardens in villages and towns, plantations as well as thin and open forests up to an altitude of 1050m. Resident.

Occurrence during the survey : Fairly common in the Park.

111. ***Phylloscopus magnirostris*** Blyth

Large-billed Leaf-Warbler

Habitat and status : Inhabits evergreen forests and sholas. A locally common winter visitor.

Occurrence during the survey : Fairly well distributed in the Park.

112. ***Phylloscopus occipitalis*** (Blyth)

Western Crowned Leaf-Warbler

Habitat and status : Seen in evergreen and moist deciduous forests, and plantations. A fairly common winter visitor.

Occurrence during the survey : A few observations from the Park.

113. *Phylloscopus trochiloides viridanus* Blyth

Greenish Leaf-Warbler

Habitat and status : Affects well-wooded homesteads and plantations from the coastal areas through the midlands and forests up to about 1500m in the hills. A winter visitor.

Occurrence during the survey : A common bird of the Park.

Subfamily MUSCICAPINAE

Flycatchers

114. *Muscicapa latirostris* Raffles

Asian Brown Flycatcher

Habitat and status : frequents moist deciduous and deciduous forests, forest edges up to about 1050m, well-wooded areas in the midlands, and the coastal plains. A winter visitor with small breeding populations.

Occurrence during the survey : Fairly common in the Park.

115. *Muscicapa ruficauda* Swainson

Rusty-tailed Flycatcher (Rufoustailed Flycatcher)

Habitat and status : Inhabits mainly the edges of evergreen and moist deciduous forests, preferring the canopy. Winter visitor. Uncommon.

Occurrence during the survey : A single observation from the Kudremukh area.

116. *Muscicapa muttui muttui* (Layard)

Brown-breasted Flycatcher

Habitat and status : frequents evergreen and moist deciduous forests, well-wooded villages, sacred groves and shady perches in the undergrowth and bushes. A winter visitor.

Occurrence during the survey : Fairly common in the Park.

117. *Eumyias thalassina thalassina* Swainson

Verditer Flycatcher

Habitat and status : Seen in forest edges, open forests and well-wooded areas in villages as well as sacred groves, from plains to about 1050m. A fairly common winter visitor.

Occurrence during the survey : None; only earlier records.

Subfamily MONARCHINAE
Monarch-Flycatchers & Paradise-Flycatchers

118. *Terpsiphone paradisi leucogaster* (Swainson)

Asian Paradise-Flycatcher

Habitat and status : Affects forests, well-wooded areas, plantations and gardens in the plains as well as the hills. A winter visitor.

Occurrence during the survey : Fairly common in the Park.

119. *Hypothymis azurea styani* (Hartlaub)

Black-naped Monarch-Flycatcher

Habitat and status : Seen in evergreen and moist deciduous forests, Cardamom and coffee plantations, homesteads near forests and sacred groves. Resident.

Occurrence during the survey : Fairly common in the Park.

Family PARIDAE
Tits

120. *Parus xanthogenys travancoreensis* (Whistler & Kinnear)

Black-lored Yellow Tit

Habitat and status : frequents evergreen and moist deciduous forests, and plantations between 900m to 1500m. Resident; fairly common.

Occurrence during the survey : None; only earlier records.

Family SITTIDAE
Nuthatches

121. *Sitta frontalis frontalis* Swainson

Velvet-fronted Nuthatch

Habitat and status : Inhabits evergreen and moist deciduous forests of all altitudes. Resident; fairly common.

Occurrence during the survey : A few observations from the Park.

Family DICAEDAE
Flowerpeckers

122. *Dicaeum agile agile* (Tickell)

Thickbilled Flowerpecker

Habitat and status : Frequents evergreen and moist deciduous forests, adjoining plantations and well-wooded areas at all altitudes. Resident.

Occurrence during the survey : Uncommon in the Park.

123. *Dicaeum erythrorhynchos erythrorhynchos* (Latham)

Tickell's Flowerpecker

Habitat and status : Seen around moist deciduous forests, forest edges, plantations, groves, and homesteads. Resident.

Occurrence during the survey : Uncommon in the Park.

124. *Dicaeum concolor concolor* Jerdon

Plain Flowerpecker (Nilgiri Flowerpecker)

Habitat and status : Seen in forests of the low country and hills up to about 1200m. Resident.

Occurrence during the survey : Fairly common in the Park.

Family NECTARINIIDAE

Sunbirds & Spiderhunters

125. *Nectarinia zeylonica flaviventris* (Hermann)

Purple-rumped Sunbird

Habitat and status : Affects homesteads, gardens, plantations and forests. A widespread resident.

Occurrence during the survey : Fairly common in the areas surveyed.

126. *Nectarinia asiatica asiatica* (Latham)

Purple Sunbird

Habitat and status : Frequents thin forests, gardens, villages, and cashew and rubber plantations. Seen generally in drier areas compared to other sunbirds, but may co-exist at many places. Resident.

Occurrence during the survey : Uncommon in the Park.

127. *Nectarinia lotenia hindustanica* (Whistler)

Loten's Sunbird

Habitat and status : Affects edges of evergreen forests, moist deciduous forests, plantations, well-wooded villages and gardens. Resident.

Occurrence during the survey : None; only earlier records.

128. *Nectarinia minima* (Sykes)

Small Sunbird (Crimson-backed Sunbird)

Habitat and status : Frequents evergreen and moist deciduous forests, adjacent plantations, gardens and homesteads. A common resident bird, endemic to Western Ghats.

Occurrence during the survey : Fairly common in the Park.

129. *Arachnothera longirostris longirostris* (Latham)

Little Spiderhunter

Habitat and status : Inhabits evergreen and moist deciduous forests and adjacent plantations, up to about 1500m. Present at almost all sacred groves. Resident; common.

Occurrence during the survey : Fairly common in the Park.

Family ZOSTEROPIDAE

White-eyes

130. *Zosterops palpebrosa nilgiriensis* Ticehurst

Oriental White-eye

Habitat and status : Seen in evergreen and moist deciduous forests, mainly above 450m, but could be encountered at lower altitudes also in plantations, scrub jungles and gardens. Resident. Fairly common, locally.

Occurrence during the survey : Fairly common. Up to 24 birds were counted at Bhagavathi area.

Family ESTRILDIDAE

Munias (Estrildid Finches)

131. *Lonchura kelaarti jerdoni* (Hume)

Black-throated Munia (Rufousbellied Munia)

Habitat and status : Frequents grass and scrub in forest clearings, cultivated patches and human settlements near forests, from 200m to 2100 m.

Resident. Uncommon.

Occurrence during the survey : Many flocks were observed at the edges of paddy fields near Kerekatte.

132. *Lonchura striata striata* (Linnaeus)

White-rumped Munia (Whitebacked Munia)

Habitat and status : Met with in open forests, forest clearings and edges, homesteads, gardens and cultivation. Resident.

Occurrence during the survey : Fairly common at Kerekatte.

Family PASSERIDAE
Subfamily PASSERINAE
Sparrows & Snowfinches

133. *Passer domesticus indicus* Jardine & Selby

House Sparrow

Habitat and status : A widespread resident in villages and towns of all the three physiographical zones of the country.

Occurrence during the survey : Uncommon in the Park.

Subfamily PLOCEINAE
Weavers

134. *Ploceus philippinus travancoreensis* Whistler

Baya Weaver

Habitat and status : Seen around the paddy fields in the coastal plains and midlands. Resident with local movements.

Occurrence during the survey : Small flocks were seen frequenting the paddy fields near Kerekatte.

Family STURNIDAE
Starlings & Mynas

135. *Sturnus malabaricus blythii* (Jerdon)

Blyth's Starling (Chestnut-tailed Starling)

Habitat and status : Affects forests, well-wooded villages and towns, and areas of cultivation. The race *malabaricus* is a winter visitor seen from November to April while *blythii* is resident.

Occurrence during the survey : Uncommon in the Park.

136. *Acridotheres tristis tristis* (Linnaeus)

Common Myna

Habitat and status : A widespread resident of the coastal plains, midlands and occasionally in higher altitudes also.

Occurrence during the survey : Rarely observed in the Park.

137. *Acridotheres fuscus mahrattensis* (Sykes)

Jungle Myna

Habitat and status : Affects grasslands, paddy fields and open forests. Scarce and patchy in distribution at the coastal plains and midlands; replaces the Common Myna at higher elevations. Resident.

Occurrence during the survey : Fairly common in the Park.

138. *Gracula indica* (Cuvier)

Southern Hill-Myna (*Gracula religiosa indica* (Cuvier) Southern Grackle)

Habitat and status : Inhabits evergreen and moist deciduous forests and adjacent plantations. Resident.

Occurrence during the survey : Fairly common in the Park.

Family ORIOLIDAE

Orioles

139. *Oriolus oriolus kundoo* Sykes Eurasian

Golden Oriole

Habitat and status : Frequents evergreen and moist deciduous forests, well-wooded areas in all physiographical zones of the country. A winter visitor.

Occurrence during the survey : A common bird of the Park.

140. *Oriolus xanthornus xanthornus* (Linnaeus)

Black-headed Oriole

Habitat and status : Seen around edges of evergreen forests, moist deciduous forests, house compounds and plantations. Resident.

Occurrence during the survey : Common in the Park.

Family DICRURIDAE

Drongos141. *Dicrurus macrocercus* Vieillot

Black Drongo

Habitat and status : Affects open lightly wooded country, fallow lands, cultivation lands and homesteads. Resident.

Occurrence during the survey : Rarely seen in the Park.

142. *Dicrurus leucophaeus longicaudatus* Hay

Ashy Drongo

Habitat and status : Frequents edges of evergreen forests, moist deciduous forests and well wooded house compounds in towns and villages. A winter visitor.

Occurrence during the survey : A fairly common bird of the Park.

143. *Dicrurus aeneus aeneus* Vieillot

Bronzed Drongo

Habitat and status : Affects evergreen and moist deciduous forests, cardamom and coffee plantations, well-wooded areas and sacred groves. Resident.

Occurrence during the survey : Common in the areas surveyed.

144. *Dicrurus paradiseus paradiseus* (Linnaeus)

Greater Racket-tailed Drongo

Habitat and status : Seen around evergreen and moist deciduous forests, adjacent plantations and well-wooded areas in the coastal plains and midlands.

Occurrence during the survey : Commonly seen in the Park.

Family ARTAMIDAE

Wood swallows145. *Artamus fuscus* Vieillot

Ashy Wood swallow (Ashy Swallow-Shrike)

Habitat and status : Frequents open lands in the coastal areas and midlands and also in the highlands up to 1200 m altitudes. Resident.

Occurrence during the survey : A common bird of the Park.

Family CORVIDAE
Crows, Jays, Treepies, Magpies

146. *Dendrocitta vagabunda parvula* Whistler & Kinnear

Indian Treepie

Habitat and status : Frequents semi-evergreen, moist deciduous and deciduous forests, secondary forests, house compounds and coconut groves from low country to hills (up to 1050m). Resident.

Occurrence during the survey : Common in the Park.

147. *Dendrocitta leucogastra* Gould

White-bellied Treepie

Habitat, distribution and status: Evergreen forest, adjacent plantations with large trees. Local and patchy in distribution. Resident. Endemic to Western Ghats.

Occurrence during the survey : Uncommon in the Park.

148. *Corvus splendens protegutus* Madarasz

House Crow

Habitat and status : A widespread resident, inseparable from human habitations. Abundant.

Occurrence during the survey : Uncommon in the Park.

149. *Corvus macrorhynchos culminatus* Sykes

Jungle Crow

Habitat and status : Prefers villages and well-wooded areas, compared to the preceding species; seen in the hills also. Resident; abundant.

Occurrence during the survey : Fairly common in the Park.

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MAMMALIA

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INTRODUCTION

Mammals, the most advanced group of animals are seen throughout the world. They live in diverse habitats like water bodies, glaciers, forests and deserts. 4629 species of mammals are reported, the world over. In India 397 species are recorded, of which 41 are endemic to the country (Alfred *et al.*, 2002). In proportion to the land area, the abundance and endemism of mammalian species in the country are very high. As Kudremukh National Park (KMNP) forms a part of biodiversity rich Western Ghats, it is also rich in the diversity of mammalian species.

Altogether 49 species of mammals have been reported from KMNP. The mammalian composition of the Park comprises of 49 species under 39 genera belonging to 22 families of 9 orders. 12 species of mammals recorded from the study area are found only in the Western Ghats and Sri Lanka.

A systematic account of the species, incorporating information on Distribution, status, and habitat, is provided. Out of 49 species, 22 have been directly sighted and /or collected (dead specimens) during the study period. Rests of the species are included on the basis of indirect evidences or data available in literature supplemented by field records/trip reports by various parties who visited the area ([http:// www.wildindia.org /wiki/kudremukh_ checklist_ mammals](http://www.wildindia.org/wiki/kudremukh_checklist_mammals) – accessed on 27-09-2005). The classification followed here is based on Wilson and Reeder (1993). Status of species wherever mentioned is based on the schedules of Indian Wildlife (Protection) Act, 1972, Appendices of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) and the revised Red Data book (Alfred *et al.*, 2006).

SYSTEMATIC ACCOUNT

Class	MAMMALIA
Order	INSECTIVORA
Family	SORICIDAE

1. *Suncus murinus* (Linnaeus)

Grey Musk Shrew

Distribution : Indian Subcontinent, China, S.E. Asia, Indonesia.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix- II and vulnerable under IUCN category.

Occurrence during the survey : One dead specimen collected from grassland area of Manikyadhara betta in the Park on 19.10.2005.

Order CHIROPTERA

Family PTEROPODIDAE

2. *Cynopterus sphinx* (Vahl)

Short-nosed Fruit Bat

Distribution : Indian subcontinent, Sri Lanka, S.E. Asia, Indonesia.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix- II and vulnerable under IUCN category.

Occurrence during the survey : Sightings from Kerekatte region, frequenting banana plantations.

3. *Pteropus giganteus* (Brunnich)

Indian Flying Fox/ Great Indian Fruit Bat

Distribution : Indian subcontinent.

Occurrence during the survey : Roost flights were noted at Kerekatte area.

Family MEGADERMATIDAE

4. *Megaderma lyra* E. Geoffroy

Large-eared Vampire Bat/Indian False Vampire

Distribution : India, Afghanistan, Pakistan, Sri Lanka, Myanmar, South China, S.E. Asia.
Occurrence during the survey : None; only earlier records.

Family RHINOLOPHIDAE

5. *Rhinolophus pusillus* Temminck (Plate-XI, Fig. 3)

Least Horse-shoe Bat

Distribution : Ranges from India, Thailand and Malaysia to Mentawai island and Java.

Occurrence during the survey : Collected a dead specimen from the main road leading to Sringeri near Kerekatte.

Family VESPERTILIONIDAE

6. *Pipistrellus ceylonicus* (Kelaart)

Kelaart's Pipistrelle

Distribution : Ranges from Pakistan, India and Sri Lanka to Myanmar, China, Vietnam and northern Borneo.

Occurrence during the survey : Roost flights were observed at Kerekatte.

Order PRIMATES

Family LORISIDAE

7. *Loris tardigradus* (Linnaeus)

Slender Loris

Distribution : South India, Sri Lanka.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- II and vulnerable under IUCN category (2002).

Occurrence during the survey : None; only earlier records.

Family CERCOPITHECIDAE

8. *Macaca radiata* (Geoffroy)

Bonnet Macaque

Distribution : South India

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- I and under Lower risk / least concerned category of IUCN (2002).

Occurrence during the survey : Good populations of these Macaques were sighted at S.K. Border Junction and the forest edges along the road leading to Seethabhum.

9. *Macaca silenus* (Linnaeus) (Plate-XI, Fig. 1)

Lion-tailed Macaque

Distribution : South India (Southern Western Ghats)

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- I and endangered under IUCN category (2002).

Occurrence during the survey : Common near Kerekatte area. A maximum troop size of about 10 animals was sighted during the survey period.

10. *Semnopithecus entellus* (Dufresne)

Common Langur/ Hanuman Monkey.

Distribution : India, Sri Lanka, Nepal, southern Tibet.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- I and under Lower risk / least concern category of IUCN (2002).

Occurrence during the survey : Fairly common at Kerekatte and Hanumangundi area of the park.

Order CARNIVORA
Family CANIDAE

11. *Canis aureus* Linnaeus

Jackal

Distribution : S. E. Europe, N. & E. Africa, Middle East, C. Asia to Indian subcontinent, Myanmar and Thailand.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix- III and under Lower risk least concern category of IUCN (2002).

Occurrence during the survey : A single animal was sighted at Kerekatte region on 18.10.2006.

12. *Cuon alpinus* (Pallas)

Indian Wild Dog/Dhole.

Distribution : India, Pakistan, Bangladesh, Myanmar, China, Russia, Korea, Mongolia and S.E. Asia.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix- II and vulnerable under IUCN category (2002).

Occurrence during the survey : One pack was reported near S.K. border region on 27.10.2005.

Family URSIDAE

13. *Melursus ursinus* (Shaw)

Sloth Bear

Distribution : India, Sri Lanka, Bangladesh and Nepal.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- I and Lower risk near threatened under IUCN category (2002).

Occurrence during the survey : A pair of adult bears was sighted at the grasslands of Manikyadhara Betta area on 19.10.2005.

Family MUSTELLIDAE

14. *Lutra lutra* (Linnaeus)

Common/Eurasian Otter

Distribution : Eurasia, N.W. Africa to India, S.E. Asia and Sri Lanka.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- I and vulnerable under IUCN category (2002).

Occurrence during the survey : Many regurgitation sites observed near the stream at Seethabhumi and Bhagavathi area of the Park.

15. *Martes gwatkinsii* (Horsfield)

Nilgiri Marten

Distribution : Western Ghats.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix- III and vulnerable under IUCN category (2002).

Occurrence during the survey : Sighting reports by forest officials.

Family VIVERRIDAE

16. *Paradoxurus hermaphroditus* (Pallas)

Palm civet/Toddy Cat

Distribution : India, Sri Lanka, Bangladesh, Bhutan, Myanmar, S .E. Asia, Indonesia and Philippines.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix-Not listed and under Lower risk / Least concern category of IUCN (2002).

Occurrence during the survey : None; only earlier records.

17. *P. jerdoni* Blanford

Brown Palm Civet/ Jerdon's Palm Civet

Distribution : Western India.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix- III and vulnerable under IUCN category (2002).

Occurrence during the survey : None; only earlier records.

18. *Viverra civettina* (Blyth)

Malabar Civet

Distribution : South India (Southern Western Ghats)

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- III and critically endangered under IUCN category (2002).

Occurrence during the survey : None. A single record from the foothills of Kudremukh National Park (Karanth, 1986).

19. *Viverricula indica* (Desmarest)

Small Indian Civet

Distribution : India, Pakistan, Bangladesh, Bhutan, Sri Lanka, Myanmar, S. China and Indonesia.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix- III and Lower risk near threatened category under IUCN (2002).

Occurrence during the survey : None; only earlier records.

Family HERPESTIDAE

20. *Herpestes edwardsii* (Geoffroy)

Common Mongoose/ Indian Grey Mongoose

Distribution : E & C. Arabia to Indian subcontinent.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix- III and least concern category under IUCN (2002).

Occurrence during the survey : A single sighting from Gangadikal area of the Park.

21. *H. fuscus* Waterhouse

Nilgiri Brown Mongoose/ Indian Brown Mongoose

Distribution : South India, Sri Lanka.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix- III and vulnerable under IUCN category (2002).

Occurrence during the survey : None; only earlier records.

22. *H. smithii* Gray

Ruddy Mongoose

Distribution : India, Sri Lanka.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix- III and the least concern category of IUCN (2002).

Occurrence during the survey : None; only earlier records.

23. *H. vitticollis* Bennett

Stripe-necked Mongoose

Distribution : South India, Sri Lanka.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix- III and the Lower risk near threatened category of IUCN (2002).

Occurrence during the survey : A pair was seen crossing the road near S.K. border on 21.10.2005.

Family FELIDAE

24. *Panthera tigris* (Linnaeus)

Tiger

Distribution : Oriental region (except Borneo and Philippines), Siberia, Turkey, Iran and Afghanistan.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- I and endangered under IUCN category (2002).

Occurrence during the survey : Droppings collected from Manikyadhara area of the Park.

25. *P. pardus* (Linnaeus)

Leopard/Panther

Distribution : N. Africa, Middle East, N. Caucasia, Oriental region, Korea and N. China.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- I and data deficient under IUCN category (2002).

Occurrence during the survey : Droppings collected from Towergudda and Seethabhumi area of the National Park.

26. *Felis bengalensis* Kerr

Leopard Cat

Distribution : Siberia, Korea, N.E. China, Oriental region.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- I and data deficient under IUCN category (2002).

Occurrence during the survey : None; only earlier records.

27. *F. chaus* Guldenstaedt

Jungle Cat

Distribution : N. Africa, Middle East, India, Sri Lanka, Myanmar, Thailand, Vietnam.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; CITES: Appendix- II and data deficient under IUCN category (2002).

Occurrence during the survey : Sighted at Seethabhumi area on 24.10.2005.

Order PROBOSCIDEA

Family ELEPHANTIDAE

28. *Elephas maximus* Linnaeus

Asian Elephant

Distribution : India, Bangladesh, Sri Lanka, Bhutan, Myanmar, S. China, S. E. Asia and Indonesia.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- I and endangered under IUCN category (2002).

Occurrence during the survey : An adult tusker was sighted at Seethabhumi area on 24.10.2006.

Order ARTIODACTYLA

Family SUIDAE

29. *Sus scrofa* Linnaeus

Wild Boar

Distribution : S. & C. Europe, N. W. Africa through Asia to Siberia, south to Sri Lanka, S. E. Asia, Indonesia.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-III.

Occurrence during the survey : Fairly common along the edges of the Estates and human inhabitations.

Family TRAGULIDAE

30. *Moschiola meminna* (Erxleben)

Mouse Deer/ Indian Chevrotain

Distribution : India, Sri Lanka and Nepal.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I, but data deficient under IUCN category (2002).

Occurrence during the survey : Many hoof marks were observed within the evergreen forests.

Family CERVIDAE

31. *Cervus unicolor* Kerr (Plate-XI, Fig. 2)

Sambar

Distribution : India, Bangladesh, Nepal, Sri Lanka, Myanmar, China, S.E. Asia to Philippines.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-III, but data deficient under IUCN category (2002).

Occurrence during the survey : A common deer species of the Park. Many direct sightings during the survey. A herd of 12 deers including 2 young ones were sighted at Bhagavathi area of the Park.

32. *Muntiacus muntjak* (Zimmermann)

Barking Deer/Muntjac

Distribution : India, Bangladesh, Nepal, Sri Lanka. Myanmar, S. China, Taiwan, Japan and Indonesia

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-III, but data deficient under IUCN category (2002).

Occurrence during the survey : A few sightings during the survey.

Family BOVIDAE

33. *Bos gaurus* H. Smith

Gaur/Indian Bison

Distribution : India, Bangladesh, Nepal, Sri Lanka, Myanmar and S. E. Asia*Conservation status* : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- I and vulnerable under IUCN category (2002).*Occurrence during the survey* : Most common bovine species of the Park. Many large herds were sighted during the survey. One large bull was seen regularly resting near the Bhagavathi Rest House area.

Order PHOLIDOTA

Family MANTIDAE

34. *Manis crassicaudata* Gray

Indian Pangolin

Distribution : India, Sri Lanka, Myanmar and S. China.*Conservation status* : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I; CITES: Appendix- II and vulnerable under IUCN category (2002).*Occurrence during the survey* : None; only earlier records.

Order LAGOMORPHA

Family LEPORIDAE

35. *Lepus nigricollis* F. Cuvier

Indian Hare/Blacknaped Hare

Distribution : India, Pakistan, Bangladesh, Nepal and Sri Lanka.*Conservation status* : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-IV; and data deficient under IUCN category (2002).*Occurrence during the survey* : Direct sightings from Manikyadhara Betta and Gangadikal areas of the Park.

Order RODENTIA

Family SCIURIDAE

36. *Funnambulus pennantii* (Linnaeus)

Five striped Palm Squirrel

Distribution : C. & S. India and Sri Lanka.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-IV, but data deficient under IUCN category (2002).

Occurrence during the survey : Fairly common.

37. *F. sublineatus* (Waterhouse)

Dusky Striped Squirrel

Distribution : South India and Sri Lanka.

Occurrence during the survey : None; only earlier records.

38. *F. tristriatus* (Waterhouse)

Jungle Striped Squirrel

Distribution : Peninsular India (Western Ghats).

Occurrence during the survey : None; only earlier records.

39. *Petaurista petaurista* (Pallas)

Large Brown Flying Squirrel

Distribution : India, Sri Lanka. China, Taiwan and Java.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II, but data deficient under IUCN category (2002).

Occurrence during the survey : None; only earlier records.

40. *Petinomys fuscocapillus* (Jerdon)

Small Travancore Flying Squirrel.

Distribution : South India, Sri Lanka.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-I and vulnerable under IUCN category (2002).

Occurrence during the survey : None; only earlier records.

41. *Ratufa indica* (Erxleben)

Indian Giant Squirrel

Distribution : Central and South India.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-II; Appendix-II of CITES and under data deficient category of IUCN (2002).

Occurrence during the survey : Many sightings from the Park. Up to 5 squirrels were sighted on a *Symplocos* tree voraciously feeding on its flowers. The Coorg race *bengalensis* is represented in the area characterized by its paler tail and coat colour.

Family MURIDAE

42. *Platacanthomys lasiurus* Blyth

Malabar Spiny Dormouse

Distribution : South India (Western Ghats).

Occurrence during the survey : None; only earlier records.

43. *Bandicota bengalensis* (Gray)

Indian Mole Rat/ Lesser Bandicoot Rat.

Distribution : India, Pakistan, Bangladesh, Sri Lanka, Myanmar and Indonesia.

Occurrence during the survey : None; only earlier records.

44. *B. indica* (Bechstein)

Bandicoot Rat/ Large Bandicoot Rat/ Pig Rat

Distribution : India, Nepal, Bangladesh, Sri Lanka, China, Vietnam and Indonesia.

Occurrence during the survey : None; only earlier records.

45. *Rattus rattus* (Linnaeus)

Common House Rat

Distribution : India, Bangladesh, Nepal, S.E. Asia.

Occurrence during the survey : None; only earlier records.

46. *R. blanfordi* (Thomas)

Blanford's Rat/ White-tailed Wood Rat

Distribution : C. & S. India.

Occurrence during the survey : None; only earlier records.

47. *Mus musculus* Linnaeus

House Mouse

Distribution : Worldwide.

Occurrence during the survey : None; only earlier records.

48. *M. famulus* Bonhote

Bonhote's Mouse

Distribution : South India.

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-V and endangered under IUCN category (2002).

Occurrence during the survey : None; only earlier records.

Family HYSTRICIDAE

49. *Hystrix indica* Kerr

Indian Porcupine

Distribution : Syria, Iraq, S. Arabia, Iran, Turkey, Tibet, Kazakhstan, India, Pakistan and Sri Lanka

Conservation status : Indian Wildlife (Protection) Act (1972 as amended up to 2002): Schedule-IV and under Lower risk Least concern category of IUCN (2002).

Occurrence during the survey : Many droppings and quills were sighted at Manikyadhara area of the Park.

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Plate-I : Major Habitats of KMNP



Fig. 1. A shola grassland ecosystem at Gangadikal.



Fig. 2. A Montane grassland ecosystem at Manikyadhara Betta.



Fig. 3. Lakhya Dam reservoir filled with silt.



Fig. 4. A Wet evergreen forest at Hanumangundi falls area

Plate-II : Mantodea (Insecta)



Figs. 1a.



Figs. 1b.



Figs. 2a.



Figs. 2b.



Figs. 2c.

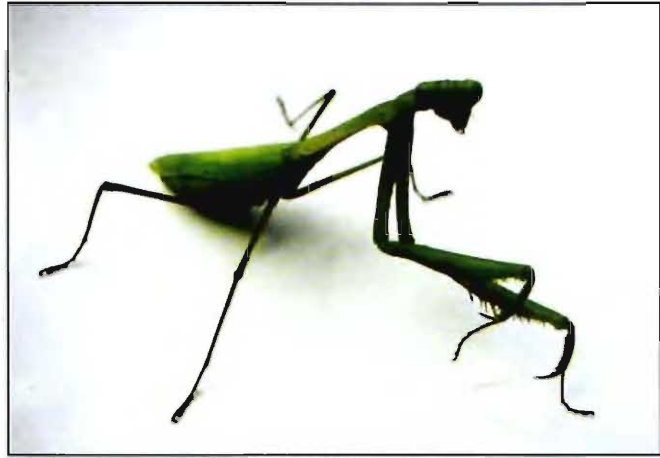
Figs. 1a, 1b : *Epestiasula intermedia*

Figs. 2a, 2b, 2c : *Tropidomantis (Eomantis) guttatipennis*

Plate-III : Mantodea (Insecta)



Figs. 3.



Figs. 4a.



Figs. 4b.



Figs. 5a.



Figs. 5b.

Figs. 3 : *Hapalopeza (Hapalopeza) nilgirica*

Figs. 4a, 4b : *Statilia nemoralis*

Figs. 5a, 5b : *Statilia maculata*

Plate-IV : Some entomofauna of KMNP



Fig. 1. *Tamea basilaris*



Fig. 2. *Epithemis mariae*



Fig. 3. *Macromia indica*

Plate-V : Some entomofauna of KMNP



Fig. 1. *Triodes minos*



Fig. 2. *Papilio dravidarum*



Fig. 3. *Cyrestis thyodamas*

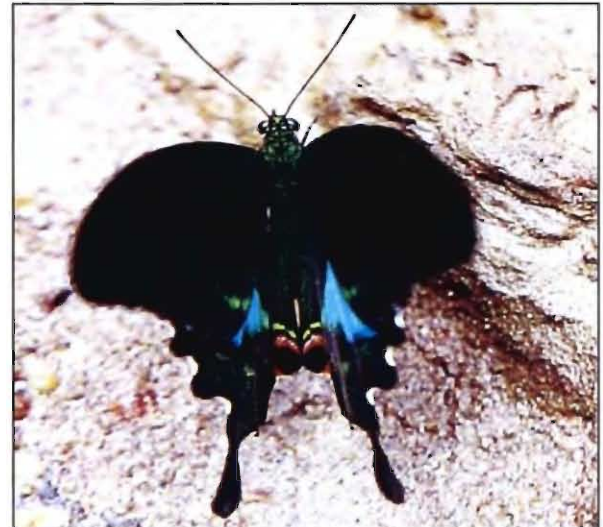


Fig. 4. *Papilio paris*



Fig. 5. *Idea malabrica*

Plate-VI : Stream Insects - Representative taxa from Cascades.



Thalerosphyrus (Heptageniidae)



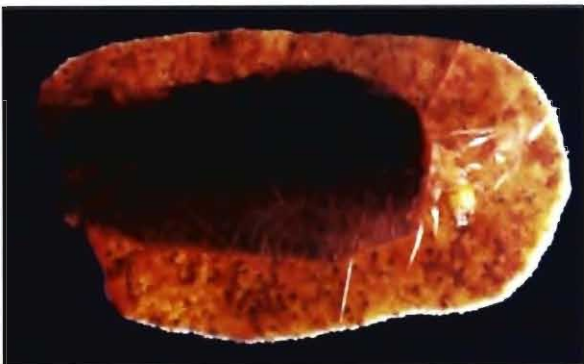
Euphaea (Euphaeidae)



Cybister (Dytiscidae)



Leptonea (Hydropsychidae)



Anisocentropus (Calamoceratidae)



Glossosoma (Glossosomatidae)



Aulocodes (Pyralidae)



Philorus (Blephariceridae)

Photos : K.A. Subramanian

Plate-VII : Stream Insects - Representative taxa from Riffles.



Baetis (Baetidae)



Tenagogonus (Gerridae)



Metrocoris (Gerridae)



Rhagovelia (Veliidae)



Dineutus (Gyrinidae)



Sandracottus (Dytiscidae)



Goerodes (Lepidostomatidae)



Helicopsyche (Helicopsychidae)

Plate-VIII : Stream Insects - Representative taxa from Pools.



Isonychia (Oligoneuridae)



Caenis (Caenidae)



Neoperla (Perlidae)



Eubrianax (Psephenidae)



Macronema (Hydropsychidae)



Hydropsyche (Hydropsychidae)



Simulium (Simuliidae)



Ephydriidae

Photos : K.A. Subramanian

Plate-IX : Some Herpetofauna of KMNP



Fig. 1. *Pedostibes tuberculosus*



Fig. 2. *Nyctibatrachus hussaini*



Fig. 3. *Rana temporalis*



Fig. 4. *Ichthyophis beddomei*



Fig. 5. *Trimeresurus malabaricus*



Fig. 6. *Ahaetulla nasuta*

Plate-X : Some Birds of KMNP



Fig. 1. *Batrachostomus moniliger*



Fig. 2. *Pycnonotus jocosus*



Fig. 3. *Chalcophaps indica*

Plate-XI : Some Mammals of KMNP



Fig. 1. *Macaca silenus*



Fig. 2. *Cervus unicolor*



Fig. 3. *Rhinolophus pusillus*