

INSECT DIVERSITY OF SIKKIM, INDIA

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ABSTRACT

The present chapter gives the current information on entomofauna of Sikkim. This is the first comprehensive account on insect species diversity brought out by the Zoological Survey of India. Since, the complete list of insects so far known from Sikkim could not be given in the present publication, only the list of families of the all the known orders and their species numbers are provided. Altogether, 5892 species belonging to 2382 genera under 261 families and 22 orders of Insect are reported from the state of Sikkim.

KEYWORDS: *Insect diversity, Sikkim, India*



Trithemis aurora (Burmeister) male : Family Libellulidae, Order Odonata



Spilosoma dalbergiae (Moore): Family Arctiidae, Order Lepidoptera

INTRODUCTION

Sikkim is one of small Himalayan state of northeast India covering the area of 7,096 sq. km and lies at 27° 00' 46" and 28° 07' 48" North latitude and 88° 00' 58" and 88° 55' 25" East longitude. The topography of the state is quite varied and the elevation ranges from 200m to 8598m. The state has one National Park, six wildlife sanctuaries and one Biosphere Reserve. The protected areas are also increasingly coming under pressure for exploitation of natural resources, over tourism development and other developmental activities, thus undermining the very basis of sustainable development and bringing into conflict of conservation and development interests.

The insects are known to be the most successful and diverse animals on earth. They have adopted for almost every conceivable type of environment from the equator to the arctic and from sea level to the snowfield of highest mountains, on land, in air and water and almost everywhere. The insects are considerably estimated to comprise more than 75 percent of the known species of the animals. Approximately 0.9 million species of insects have been described throughout the world and 59353 species of insects pertaining to 27 orders are known in India (Varshney, 1998). Although new findings of the faunal explorations indicate that this number is a little proportion of the total existing species.

To assess the faunal diversity of the Sikkim under the programme of '*State Fauna Series*', publication a series of faunistic surveys of almost all the parts of Sikkim were undertaken from 1988 to 1994 by the Zoological Survey of India and the collection of various groups of animals including the insects were made, this resulted the publication of four parts of '*Fauna of Sikkim*' in 2003 & 2006. Ramakrishna and Alfred (2006) in the "*Fauna of Sikkim*" overview included the information on Insect fauna representing 3656 species under 13 orders. Subsequently, information on the insect fauna was further collated through all the sources, particularly the ZSI publications and through the National Zoological Collection of last five decades present in Zoological Survey of India as well the references from the Zoological Records. Presently, 5892 species belonging to 2382 genera under 261 families of 22 orders of insects are known from Sikkim (Table-II). The state of Sikkim with 0.21% of the geographical area of whole India, represents 9.63% of all known insect species diversity of the country, which reveals that the Sikkim possess very high species biodiversity in comparison to any other state in India. Despite the fact, that the study of insects in Sikkim is still not very exhaustive.

The composition of insect groups known from Sikkim indicates that nine orders viz. Lepidoptera, Coleoptera, Diptera, Hymenoptera, Hemiptera, Trichoptera, Orthoptera, Odonata and Dermaptera comprise bulk (95 percent) of the insect fauna, while Isoptera, Neuroptera, Thysanoptera, Mantodea, Blattaria and other eight orders are represented by a very small number (less than five percent) of species (Table-II). The list of insect orders and their number of species known in India is given in table I , while the list of recorded orders and their number of families, genera and species of Sikkim are given in table II, while the details of family wise break up is given along with the each orders individually. Of these, only onefifth of species are only dealt in several volumes of "*Fauna of British India*" and "*Fauna of India*". Although, endemic fauna of Insect has not yet been completely worked out, but the cursory analysis of data reveal that among the insects few groups like aphids, butterflies and caddis-flies show maximum endemicity even up to 50 %.

Table 1. Insect Diversity in India

GROUP	INDIA	WORLD	% IN INDIA
INSECTA	61,181	866,481	7.06
THYSANURA	38	1250	3.04
DIPLURA	16	355	4.51
PROTURA	20	260	7.69
COLLEMBOLA	314	5500	5.71
EPHEMEROPTERA	124	2200	5.64
ODONATA	470	6000	7.83
PLECOPTERA	116	2100	5.52
ORTHOPTERA	1033	17250	5.99
PHASMIDA	150	2262	6.63
DERMAPTERA	320	2000	16.00
EMBIOPTERA	31	200	15.50
BLATTARIA	156	4200	3.71
MANTODEA	162	2000	8.10
ISOPTERA	310	2000	15.50
PSOCOPTERA	90	2500	3.60
PHTHIRAPTERA	400	3000	13.33
HEMIPTERA	6556	80000	8.20
THYSANOPTERA	693	6000	11.55
NEUROPTERA	357	5000	7.14
COLEOPTERA	17431	350000	4.98
STREPSIPTERA	18	554	3.25
MECOPTERA	23	350	6.57
SIPHONAPTERA	52	2000	2.60
DIPTERA	6255	100000	6.26
LEPIDOPTERA	15000	142500	10.53
TRICHOPTERA	1046	7000	14.94
HYMENOPTERA	10000	120000	8.33

Table 2. Insect Diversity in Sikkim

S. No.	Orders	Common Name	No. of Families	No. of Genera	No of Species
1	THYSANURA	3- Pronged Bristletails	2	3	5
2	COLLEMBOLA	Springtails	4	13	20
3	EPHEMEROPTERA	May-flies	2	2	2
4	ODONATA	Dragons and Damsels	11	34	65
5	PLECOPTERA	Stone-flies	4	5	6
6	ORTHOPTERA	Grasshoppers	11	90	123
7	PHASMIDA	Leaf and Stick insects	2	3	4
8	DERMAPTERA	Ear-wigs	7	30	50
9	BLATTARIA	Cockroaches	8	13	17
10	MANTODEA	Mantids	2	9	17
11	ISOPTERA	Termites	2	8	16
12	PHTHIRAPTERA	Chewing - Lice	3	5	9
13	HEMIPTERA	True -Bugs	39	302	549
14	THYSANOPTERA	Thrips	2	11	17
15	NEUROPTERA	Antlions & Lace-wings	7	21	31
16	COLEOPTERA	Beetles	35	417	994
17	MECOPTERA	Scorpion-flies	1	1	4
18	SIPHONAPTERA	Fleas	2	3	3
19	DIPTERA	True-flies	46	230	634
20	LEPIDOPTERA	Butterflies & Moths	31	850	2528
21	TRICHOPTERA	Caddis-flies	21	44	179
22	HYMENOPTERA	Wasps & Bees	19	288	619
	Total		261	2382	5892



Orthetrum glaucaum (Brauer): Family Libellulidae, Order Odonata

INSECT DIVERSITY IN SIKKIM

APTERYGOTA:

Among the apterans, four orders are included, which are mostly wingless form and found in the soil. Although, several lots of these groups have been collected during the faunal explorations by the Zoological Survey of India, but in the present chapter, only two orders viz. Thysanura and Collembola are included and the remaining two orders are still in the process of determination.

1. Order THYSANURA :

The order Thysanura comprises of “fish-like” silvery shining body due to presence of scales and hence commonly known as 'Silverfish'. They frequently harbor in the human abode where they may cause considerable damage to books, photographs, and household articles. They are easily distinguishable from the other closely related order by long and many segmented antennae, 2 anal cerci and a single median telson projecting posteriorly from the terminal part of abdomen. The free living species are found in the forest floor, under bark of trees, under rocks, in the nests of ants and termites. The members of the family Machilidae representing “bristle tail” occur mostly in the decomposing litter of the forest floor and capable of jumping by means of their bristle tail. Through the publication of Hazra *et al* (2003a), presently 5 species belonging to 3 genera and 2 families under two suborders are reported from Sikkim.

S.N.	Family	No. of families	No. of genera	No. of Species
1	Machilidae (Bristle tails)	1	1	1
2	Lepismatidae (Silverfish)	1	2	4
		2	3	5

2. Order COLLEMBOLA:

“Collembola”, popularly known as springtails, are small and primarily wingless insects. These primitive insects measure from 0.25 mm to 6 mm in length. They also occur in the vicinity of both North and South Poles and few species even live permanently on glacier or snow fields. Presently, 20 species under 13 genera are known from the Sikkim through the work of Hazra *et al.* (2003b)

S.N.	Family	No. of families	No. of genera	No. of Species
1	Onychiuridae	1	1	1
2	Hypogastruridae	1	1	1
3	Entomobryidae	1	10	16
4	Isotomidae	1	1	2
		4	13	20

PTERYGOTA:

3. Order EPHEMEROPTERA:

These amphibiotic insects are commonly known as 'mayflies'. Hubbard and Peters (1978) and Sivaramkrishnan *et al.* (2009) published the list of Ephemeroptera of Indian sub region and the species from Sikkim were also dealt. So far, 2 species pertaining to two genera and two families are reported from Sikkim.

S.N.	Family	No. of families	No. of genera	No. of Species
1	Ephemeridae	1	1	1
2	Heptageniidae	1	1	1
		2	2	2

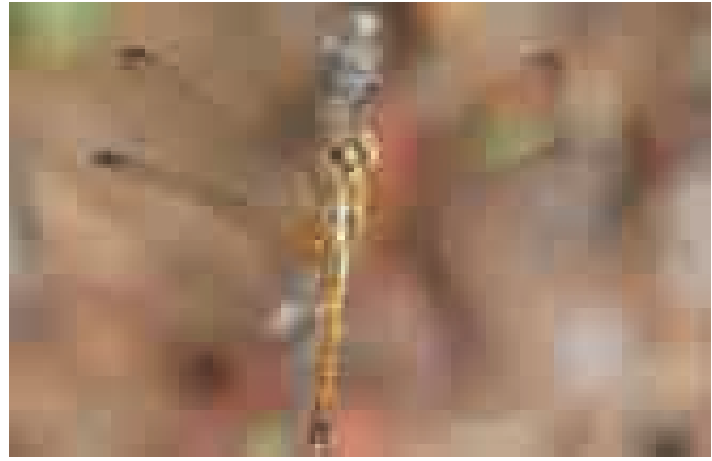
4. Order ODONATA:

The insects of order Odonata are commonly known as dragonflies and damselflies. This is relatively a small order of insects and the extant forms are being represented by three suborders viz. Zygoptera, Anisozygoptera and Anisoptera. These are cosmopolitan in distribution and are abundant in the tropics especially available in the vicinity of the aquatic bodies. “Economically they are of great important in destroying noxious flies and mosquitoes as well as the smaller moths which are regarded as pests. In India about five hundred species and sub-species occur (Prasad and Varshney, 1995). Fraser (1933, 1934, 1936) in the volumes of “*Fauna of British India*” and (1918-19), included several species from Sikkim. Prasad and Varshney (1995) studied the Odonata of different states, where in species from Sikkim were also included. Presently, 65 species pertaining to 34 genera and eleven families are known from Sikkim through the publication of Mitra (2003).

S.N.	Family	No. of families	No. of genera	No. of Species
1	Euphaeidae	1	2	5
2	Chlorocyphidae	1	1	2
3	Synlestidae	1	1	2
4	Megapodagrioniidae	1	1	1
5	Platycnemididae	1	1	5
6	Platystictidae	1	1	1
7	Coenagrionidae	1	5	9
8	Gomphidae	1	4	5
9	Aeshnidae	1	6	6
10	Cordulegasteridae	1	2	4
11	Libellulidae	1	10	25
		11	34	65



Orthetrum pruinatum neglectum (Rambur):
Family Libellulidae, Order Odonata



Trithemis aurora (Burmeister) Female:
Family Libellulidae, Order Odonata

5. Order PLECOPTERA:

The representative of the order are commonly known as stone-flies. So far, 113 species are reported from India, of which six species belonging to five genera pertaining to four families have been known from Sikkim through the work of Chandra & Sharma (2009).

S.N.	Family	No. of families	No. of genera	No. of Species
1	Capniidae	1	1	2
2	Taeniopterygidae	1	1	1
3	Perlidae	1	2	2
4	Perlodidae	1	1	1
		4	5	6

6. Order ORTHOPTERA:

The order includes common insects like grasshoppers, locusts, crickets, mole crickets and grouse locusts. Kirby (1914) and Chopard (1969) wrote the Fauna on Acrididae and Grylloidea of India, and several species were included from Sikkim. Uvarov (1927) published the distributional record of family Acrididae of India. Through the publication of Barman (2003) and Shishodia *et al.* (2003, 2010), altogether 123 species belonging to 90 genera and 11 families are presently reported from Sikkim. The family Acrididae is dominant represented by 47 species followed by Tetrigidae (26) and Gryllidae (14). *Schistocerca gregaria*, a gregarious species particularly known from arid region is also reported from Sikkim. An exotic species from South China namely *Cercaris nigricornis* has also been recently invaded the northeast India including Sikkim.

S.N.	Family	No. of families	No. of genera	No. of Species
1	Acrididae	1	35	46
2	Chorotypidae	1	1	1
3	Pyrgomorphidae	1	4	6
4	Tetrigidae	1	16	26
5	Tridactylidae	1	1	1
6	Gryllidae	1	11	14
7	Trigonididae	1	1	1
8	Gryllotalpidae	1	1	1
9	Anostomatidae	1	1	1
10	Gryllacrididae	1	1	1
11	Tettigonidae	1	18	25
		11	90	123



Catantops pinguis innotabilis (Walker): Family Acrididae, Order Orthoptera



Xenocatantops humilis humilis (Serville): Family Acrididae, Order Orthoptera



Gastrimargus africanus africanus (Saussure): Family Acrididae, Order Orthoptera

7. Order PHASMIDA:

The body usually elongate and cylindrical called as stick-insects, while depressed and leaf-like body represents leaf insects. Presently, only four species under three genera and two families namely Phasmatidae and Diapheromeridae are known from the state.

S.N.	Family	No. of families	No. of genera	No. of Species
1	Phasmatidae	1	1	1
2	Diapheromeridae	1	2	3
		2	3	4

8. Order DERMAPTERA:

These insects are known as ear-wigs. Through the literature of Burr (1910) and Srivastava (1988), few species were known from Sikkim. Presently, 50 species pertaining to 30 genera under seven families are reported in Sikkim through the publication of Srivastava (2003). Ear-wig fauna of the State is an interesting admixture of different faunal elements. In the foot hills and forested slopes tropical forms are more common, which are the derivatives of Indo-Malayan and Chinese elements.

S.N.	Family	No. of families	No. of genera	No. of Species
1	Pygicranidae	1	3	5
2	Anisolabididae	1	2	6
3	Labiduridae	1	3	6
4	Apachyidae	1	1	1
5	Spongiphoridae	1	6	6
6	Chelisoichidae	1	4	4
7	Forficulidae	1	11	22
		7	30	50

9. Order BLATTARIA:

These insects are commonly known as cock-roaches. These insects are predominantly found in tropical countries, but a few species are also found in temperate areas. Cockroaches are found in or on the ground, among low vegetation and debris, but some inhabit caves, some species live near water, where as a few species live in desert. These insects are generally omnivorous. Cockroaches are medically important, as some species mechanically transmit by food/garbage, or water borne disease. Total 17 species belonging to 13 genera and eight families presently known from Sikkim (Mandal, 2003).

S.N.	Family	No. of families	No. of genera	No. of Species
1	Homoeogamidae	1	2	2
2	Derocalymmidae	1	1	2
3	Pycnoscelidae	1	1	1
4	Blattidae	1	3	3
5	Ectobiidae	1	1	1
6	Epilampridae	1	1	1
7	Blattellidae	1	1	1
8	Panesthidae	1	3	6
		8	13	17

10. Order MANTODEA :

These are carnivorous insects popularly known as "praying mantis". Mukherjee *et al.* (1995) in his publication on mantid fauna of India included 17 species representing 9 genera and two families from Sikkim. Two species *Creobator elongata* Beier and *Amantis indica* Giglio-Tos are so far only known from Sikkim state.

S.N.	Family	No. of families	No. of genera	No. of Species
1	Hymenopodidae	1	4	9
2	Mantidae	1	5	8
		2	9	17

11. Order ISOPTERA :

These social and polymorphic insects are commonly known as termites. Roonwal and Chhotani (1989) and Chhotani (1997) wrote the '*Fauna of India*' on termites of India, where in the termite fauna of Sikkim was poorly known. Presently, 16 species belonging to eight genera and two families are reported from Sikkim (Maiti *et al.*, 2003).

S.N.	Family	No. of families	No. of genera	No. of Species
1	Rhinotermitidae	1	2	2
2	Termitidae	1	6	14
		2	8	16

12. Order PHTHIRAPTERA :

The biting lice are easily recognizable by their wing less body and having the simple metamorphosis. They are generally ectoparasites of birds and very occasionally on some mammals. Through the work of Lakshminarayana (1979, 1982), hitherto, nine species belonging to five genera and three families are reported from Sikkim.

S.N.	Family	No. of families	No. of genera	No. of Species
1	Menoponidae	1	1	2
2	Ricinidae	1	1	1
3	Philopteridae	1	3	6
		3	5	9

13. Order HEMIPTERA :

These are small to medium-sized insects commonly called 'true bugs', with piercing and sucking type mouth parts. A few species are also aquatic. They are generally phytophagous, but a very few species are also bloodsuckers. Distant (1912-18) in his seven volumes on Rhynchota under "*Fauna of British India*" included 45 species from Sikkim. Presently, 549 species representing 302 genera and 39 families are recorded from Sikkim.

S.N.	Family / Superfamily	No. of families	No. of genera	No. of Species
1	Aphididae	1	91	184
2	Cicadelloidea	8	22	34
3	Cicadiidae	1	18	34
4	Fulgoridae	1	18	36
5	Cercopoidea	3	10	28
6	Reduviidae	1	26	38

S.N.	Family / Superfamily	No. of families	No. of genera	No. of Species
7	Anthocoridae	1	1	1
8	Aradidae	1	2	4
9	Lygaeidae	1	12	14
10	Pyrrhocoridae	1	4	5
11	Coreoidea	2	20	38
12	Pentatomoidea	9	62	107
13	Gerromorpha	3	9	16
14	Nepomorpha	6	7	10
		39	302	549

Suborder HOMOPTERA :

Family : APHIDIDAE : The aphids are tiny insects, sucking sap from the various parts of plants. They are remarkable for polymorphism, polyphytophagism, host alternating heteroecious behavior, reproductive habits and for the ability of transmitting as crop pests. Through the publication of Ghosh and Basu (2003), altogether 184 species belonging to 91 genera under 8 subfamilies are so far reported from Sikkim. Ghosh and Mondal (2003) also highlighted the importance of aphids and the information on Aphid-Host plant association in Sikkim was also provided.

Superfamily : CICADELLOIDEA : The Cicadelloidea (Jassidae) are usually known as Leafhoppers. They constitute the largest family in Hemiptera and have been considered insects of economic importance. The Cicadellids usually cause damage to the plants by sucking plant's sap, injecting toxins while sucking, by laying eggs covering the leaf circle. Distant (1908, 1916, 1918) reported only 26 species from the State of Sikkim, but Ghosh and Ghosh (2003) provided an account of the superfamily Cicadelloidea of Sikkim, comprising 34 species belonging to 22 genera spread over 8 families.

Family CICADIDAE : The Cicadids are the homopteran insects. The Cicada's 'Song' (Buzzing sound) is usually heard in forest. The group exhibits a remarkable variety in form, coloration and habits. It reaches its highest development in tropical and warm temperate regions. Our knowledge on Cicadid fauna of Sikkim is scanty. Presently, 20 species belonging to 12 genera and 3 families of Cicadoidea from the State of Sikkim (Ghosh *et al*, 2003).

Superfamily : CERCOPOIDEA : The cercopids, commonly known as 'Frog hoppers' or 'Cuckoo spits' bugs, are one of the economically important families of the insect order Hemiptera. The cercopid fauna of Sikkim is poorly known. Altogether, 28 species belonging to 10 genera under three families *viz.*, Aphrophoridae, Cercopoidea and Machaerotidae are so far known from Sikkim (Biswas and Ghosh, 2003).

Suborder HETEROPTERA :

Superfamily COREOIDEA : Coreids are commonly known as the leaf-footed bugs. They are phytophagous in nature and include some pests of cultivated plants. This superfamily includes four families *viz.*, Alydidae, Coreidae, Rhopalidae and Stenocephalidae. Among these, members belonging to the family Coreidae are important pest of crops. In Sikkim the Coreid species mostly belong to families Alydidae and Coreidae. Record of Coreid fauna from the State of Sikkim is mainly done by the Distant (1904, 1908, 1918), who reported 29 species under 18 genera, but . presently 38 species under 20 genera are known (Basu and Mitra, 2003).

Superfamily PENTATOMOIDEA :

The Pentatomids or "Shield Bugs" are mostly phytophagous and sometimes carnivorous in habit, while few are pests on vegetable crops. A few families like Asopidae are predaceous on lepidopterous larvae. A perusal of literature reveals that altogether 107 species belonging to 62 genera in 9 families are so far known from the State of Sikkim (Distant 1902, 1908, 1918 and Chakroborty and Ghosh, 2003)

Family REDUVIDAE: Reduviids, commonly known as 'Assaisan bugs', are one of the economically important predaceous insect belonging to the series sternorhyncha under the order Hemiptera. Distant (1904, 1910) had recorded some 31 species under 22 genera from Sikkim in his monumental work in the *Fauna of British India*, Rhynchota Volumes. Presently 38 species under 26 genera are reported from Sikkim (Biswas and Bal, 2003).

AQUATIC AND SEMIAQUATIC BUGS: The aquatic and semi-aquatic bugs include two divisions viz. Nepomorpha and Gerromorpha, which includes nine families from Sikkim. Of which, six families are aquatic belonging to Belostomatidae, Gelastocoridae, Corixidae, Aphelocheiridae, Nepidae and Notonectidae while other three families are surface dwelling semi-aquatic bugs belonging to Veliidae, Hebridae and Gerridae (Thirumalai, 1999 & 2002). Through the collection available in ZSI and the publication of Bal and Basu (2003), presently 26 species under 16 genera are known from Sikkim. The species *Velia* sp. *Lethocerus patruelis* (Stal) and *Aphelocheirus pradhanae* Zettel are only reported from Sikkim.

14. Order THYSANOPTERA :

Relatively small insects, commonly known as 'thrips'. Most of them are phytophagous, some are mycophagous and few species are predaceous. Sen *et al.* (1988) worked for North Eastern parts of India and 105 species were reported. Das *et al.* (2003) studied 17 species under 10 genera and two families from Sikkim.

S.N.	Family	No. of families	No. of genera	No. of Species
1	Thripidae	1	7	9
2	Phlaeothripidae	1	4	8
		2	11	17

15. Order NEUROPTERA :

Soft bodied, small to large sized insects. The representatives of order Neuroptera are commonly known as 'Lace wings, nerve-winged insects and ant lions. The fine network of veins readily recognizes them on generally transparent wings and well-developed antennae. This is an important group of predacious insects, who feeds on various pests. Ghosh (2000) described several new genera and species of Neuroptera from North- East India, wherein 31 species belonging to 21 genera and seven families are included from Sikkim.

S.N.	Family	No. of families	No. of genera	No. of Species
1	Corydalidae	1	1	1
2	Mantispidae	1	1	2
3	Hemerobiidae	1	2	3
4	Berothidae	1	4	9
5	Osmylidae	1	5	8
6	Myrmeleontidae	1	7	7
7	Ascalaphidae	1	1	1
		7	21	31

16. Order COLEOPTERA :

They are known as beetles characterized by the forewings much thickened, veinless and meeting in a mid-dorsal straight line. Gahan (1906), Jacoby (1908), Arrow (1910,1917,1925,1931,1943,1949), Fowler (1912), Marshall (1916), Maulik (1919,1926,1936), Andrews (1929,1935), Cameron (1930,1931,1932,1937), Balthasar (1963a, b, & 1964), Vazirani (1977 & 1984), Ghosh *et al.* (2000), Gerstmeier (2003), Telnov (2003), in their fauna volumes, monographs and other scattered publications included many species of beetles from Sikkim. Altogether, 995 species under 420 genera and

35 families of beetles are reported from Sikkim, dominated by the families Staphlinidae, Scarabaeidae, Anthicidae, Coccinellidae, Elateridae, Cerambycidae, Carabidae and Chrysomelidae.

S.N.	Family	No. of families	No. of genera	No. of Species
1	Cicindelidae	1	4	24
2	Carabidae	1	31	67
3	Gyrinidae	1	1	8
4	Dytiscidae	1	13	32
5	Hydrophilidae	1	13	22
6	Histeridae	1	14	22
7	Silphidae	1	1	1
8	Staphylinidae	1	59	143
9	Lucanidae	1	9	24
10	Scarabaeidae	1	24	112
11	Buprestidae	1	1	1
12	Elateridae	1	23	77
13	Cantharidae	1	11	20
14	Cleridae	1	6	9
15	Melyridae	1	2	2
16	Rhizophagidae	1	4	4
17	Sphindidae	1	1	1
18	Silvanidae	1	7	15
19	Languriidae	1	8	18
20	Erotylidae	1	6	10
21	Endomychidae	1	8	9
22	Coccinellidae	1	32	87
23	Discolomidae	1	1	3
24	Colydidae	1	12	12
25	Anthicidae	1	16	103
26	Inoepidae	1	1	3
27	Lagriidae	1	1	1
28	Tenebrionidae	1	6	6
29	Cerambycidae	1	49	75
30	Chrysomelidae	1	29	42
31	Anthribidae	1	1	5
32	Curculionidae	1	19	28
33	Scolytidae	1	1	1
34	Platypodidae	1	2	5
35	Rhipiceridae	1	1	2
		35	417	994

Suborder ADEPHAGA:

Family CICINDELIDAE : The members of this family are commonly known as tiger beetles. They are predacious because of their hunting and feeding on other insects particularly ants, small beetles, bugs, caterpillars and nymphs. They are usually found in open sunny places where the soil is sandy or dusty and also in moist ground near streams, ponds and sea shore (e.g. *Cicindela* L.) while the others are predominantly arboreal and found in foliage and bark (*Neocollyris* Horn, *Tricondyla* Latreille). Altogether 24 species of tiger beetles under four genera and two subfamilies are recorded from Sikkim (Mukhopadhyay and Halder, 2003a).

Family GYRINIDAE : The members of the family Gyrinidae are commonly known as 'whirligig beetles' because of their habit of swimming in groups on the surface of ponds and quiet streams. They are aquatic both in adult and larval stages. Vazirani (1984) has recorded 46 species under the family Gyrinidae from India. Of which, eight species under the genus *Orectochilus* Eschscholtz were recorded from Sikkim in "*Fauna of India*". So far eight species belonging to the genus *Orectochilus* are known from Sikkim (Mukhopadhyay and Ghosh, 2003).

Family DYTISCIDAE : The members of the other family Dytiscidae are commonly known as 'Predaceous diving beetles' and are most perfectly adapted to aquatic life. They are very active swimmers and preying on all other small water life. They are in habit in both fresh and brackish water. Presently, 32 species under 13 genera belonging to the five subfamilies of the family Dytiscidae are reported from Sikkim (Mukhopadhyay and Ghosh, 2003).

Suborder POLYPHAGA:

Family HYDROPHILIDAE: The members of this family are commonly known as 'water scavenger beetle' and majority of which are truly aquatic. Some of them are terrestrial and found in moist places like dung, decaying vegetable garbage. This insect varies from small to large in size and can be easily distinguished by its maxillary palpi which may be mistaken as antennae. Present study includes a total of twenty two species under thirteen genera belonging to three subfamilies viz. Hydraeninae, Sphaeridiinae and Hydrophilinae from Sikkim (Mukhopadhyay and Sengupta, 2003).

Family HISTERIDAE: These beetles are very small to median size, very hard and of various shapes. They are predaceous in larval as well as in adult stages and occur in various habitats namely in soil, termite and ants nests, dung of various animals and carcasses. About 175 species under 34 genera are known from India and 22 species under 14 genera and five subfamilies are reported from Sikkim (Chakraborty and Biswas, 2003).

Family SCARABAEIDAE: The Scarabaeidae is one of the largest family of the class Insecta. They are popularly known as "Dung beetles". They are generally phytophagous and coprophagous in nature. They are recognized by their characteristic form of lamellate antennae. Information on the Indian Scarabaeidae is mainly based on the works of Arrow (1910, 1917, 1931) "*Fauna of British India*" series, and Dalla Torre (1912-1913) and Frey (1971a, 1971b, 1972), where in several species are included from Sikkim. Chatterjee and Biswas (2003) also studied the family Scarabaeidae from Sikkim and dealt only 25 species under 13 genera under five subfamilies. Hitherto, 112 species of family Scarabaeidae under 24 genera are recorded from the state.

Family RHIZOPHAGIDAE: The Rhizophagidae with about 250 species are a moderately large family and are represented in all major biogeographic regions. They occur under bark of old logs, ascomycetes fungi, haystacks, decaying vegetation and are sometime called 'root-eating beetles'. Hitherto, four species under four genera are known from Sikkim (Pal, 2003a).

Family SILVANIDAE: The Silvanidae are a moderately large family of the section Clavicornia of the superfamily Cucujoidea. The silvanids are usually small (1.3-4.5 mm.), reddish-brown and occasionally with dorsal spot. They are largely associated with litter or vegetable debris and a good number of species are subcorticolous by habit. A few species cause considerable damage to stored food products of vegetable origin. Through the work of Pal (2003b), 15 species under 7 genera are reported from Sikkim.

Family LANGURIDAE: The languriids are small to large, elongate-oval to narrow-elongate, subcylindrical to slightly flattened, and often glabrous. They are usually bicoloured or metallic and are commonly called as 'lizard beetles.' Many a forms are found in rotting vegetation and some others remain associated with stored agricultural products. Following the publication of Arrow's '*Fauna of British India*' in 1925 not much works on this family have come out from the Indian subregion. Pal (2003c) reported 18 species pertaining to 8 genera from Sikkim.

Family EROTYLIDAE: The Erotylidae is a well defined large family of the section Clavicornia under the superfamily Cucujoidea. The representatives of Erotylidae are small to large, elongate-ovoid, generally brightly coloured

and commonly called as “pleasing fungus beetles”. They are often found in moist woodland areas and adult beetles are generally gregarious, whether on the host plant or in hiding. Following the publication of Arrow's “*Fauna of British India*” in 1925, not much information was available from the Indian subregion. Through the work of Pal (2003d), 10 species under 7 genera are reported from Sikkim.

Family ENDOMYCHIDAE: The Endomychidae is a distinct family of the section Clavicornia under the superfamily Cuculoidea. The endomychids are small to large, broadly ovoid to elongate and narrow, strongly convex to moderately flattened, often brightly coloured and are commonly called as 'handsome fungus beetles'. Endomychids are mostly saprophagous or consume softer tissues of various fungi. They are often seen beneath bark or in rotten wood, decayed fruit refuse or may be collected in leaf litter. In moist woodland areas they are frequently seen. In the publication of Arrow's '*Fauna of British India*' in 1925, very few species have been worked out from the Indian subregion. Pal (2003e) reported 9 species pertaining to 8 genera from Sikkim.

Family COCCINELLIDAE: The Coccinellidae beetles, popularly known as lady bird beetles are very common in forested and agricultural area. These beetles are of profound economic importance as many of them predate on crop or plant pests like Aphids, Mealy bugs, Scale insects and other soft bodied pests of plants. Members of the subfamily Epilachninae are phytophagous, causing injury to the crops. Chakroborty and Biswas (2003) contributed on the Coccinellidae of Sikkim and presently 87 species under 32 genera are known from Sikkim.

Family DISCOLOMIDAE: More than 400 species are known from India. This is a sharply defined family of the section Clavicornia under the superfamily Cucujoidea. Species of Discolomidae have been found under bark and on fungi grown upon log. Pal (2003f) reported three species from Sikkim.

Family COLYDIIDAE : The Colydiidae are a moderately large family of the superfamily Cuculoidea. These are small to moderately large beetles, those occur in both adult and larval stages in dead wood, under bark, leaf litter etc. Several species are predators on insect's larvae inhabiting the wood. Through the publication of Pal (2003g), 12 species under 12 genera are known from Sikkim.

Family INOPEPLIDAE: The Inopeplidae is a small family under the superfamily Cucujoidea. These beetles are often broadly elongate, flattened with abbreviated elytra, and are seen under bark or in decaying wood. Presently only 3 species under one genus are recorded from Sikkim (Pal,2003h).

Family CERAMBYCIDAE: The members of the family are commonly known as 'longicorn beetles'. These beetles are phytophagous insects of great economic importance as pests of agricultural, horticultural, forest trees and valuable timbers. This is one of the largest families of the order coleopteran containing 35,000 species under 4,000 genera in 11-subfamilies from the world (Lawrence, 1982) and presently about 1500 species are known from India. The cerambycid fauna of Sikkim is not extensively surveyed and there is only record of 75 species under 49 genera belonging to four subfamilies through the publication of Mukhopadhyay and Halder (2003b).

Family CURCULIONIDAE: The members of the family Curculionidae are commonly known as weevils and is one of the largest family of the order Coleoptera. They can be easily distinguished by its pronounced rostrum and geniculate antennae. The “*Fauna of British India*” by Marshal (1916) and Pajni (1990) has published “*Fauna of India*” volume on the subfamily Eremninae. Mukhopadhyay and Halder (2003c) published the information on Curculionidae of Sikkim and 28 species belonging to 19 genera are recorded.

Family PLATYPODIDAE: The members of the family Platypodidae are commonly known as 'Pin hole borer of shoot hole borer or ambrosia beetle' because of its dark brown or black in colour caused due to presence of the peculiar fungus known as ambrosia growing in the tunnel made by themselves. They mostly live in or favoured the injured tissues that are in the process of dying. So far only 85 species under 6-genera belonging to three subfamilies viz. Diaporinae, Crossotarsinae and Platypodenae are known from India. This includes five species under two genera belonging to two subfamilies from Sikkim (Nandi and Mukhopadhyaya, 2003).

Superfamily ELATEROIDEA : ELATERIDAE: The members of family Elateridae are commonly known as click beetles. They can be easily distinguished by its body being mostly elongated, heavily sclerotized and its head being sunk in the large prothorax; pointed posterior angle of prothorax; a pointed process on the undersurface of prothorax which fits into a cavity on the mesosternum; short and serrated antennae, the serration may be much prolonged; elytra hard and cover the abdomen and their size varied from few millimeters to 5-6 cm. the larvae of the these beetles are commonly known as 'wire worms' and are mainly root feeders. They usually damage the roots of maize, wheat, small grasses, deodar seedlings etc. and are widely distributed throughout the world. More than 9,000 species under 4000 genera were recorded from the world. Altogether 77 species under 23 genera belonging to the 12 sub-family are recorded from Sikkim (Mukhopadhyay and Chakraborty, 2003).

Family STAPHYLINIDAE: The Staphylinidae is one of the largest families of the superfamily Staphylinoidea. More than 2,000 species have been recorded so far from India. Cameron's work on "*Fauna of British India*" series (1930, 1931, 1932, 1939) recorded 51 species from Sikkim. Subsequently, Biswas (2003) added several species and thus the total number of species known from Sikkim is increased to 143.

17. Order MECOPTERA:

These insects are commonly known as scorpion flies and hanging flies. They have beak like prolongations of head and often maculated wings. In total, 23 species belonging to two genera under two families viz., Bittacidae and Panorpidae are recorded from India. Of these, four species belonging to one genus under family Panorpidae are known from Sikkim (Chandra, 2004).

S.N.	Family	No. of families	No. of genera	No. of Species
1	Panorpidae	1	1	4

18. Order SIPHONAPTERA:

Small, wingless insects with piercing and sucking type of mouthparts. These insect are also known as fleas. Adults are ectoparasite on warm-blooded animals. Three species belonging to three genera and two families are known from Sikkim.

S.N.	Family	No. of families	No. of genera	No. of Species
1	Hystrichopsyllidae	1	2	2
2	Ceratophyllidae	1	1	1
		2	3	3

19. Order DIPTERA:

This order comprises mosquitoes, midges and flies, which are generally two-winged, with two halteres, but there are some that have partially or entirely lost their wings, usually leaving their halteres intact behind. Through the works of Brunetti (1912, 1920, 1923), Christophers (1933), Baraud (1934), SeniorWhite *et al* (1940), Emden (1965), Delfinado and Hardy (1973,1975,1977), Joseph and Pauri (1980,1983,1990,1998), Datta (1983),Nandi (2002) and Cherian (2002) in their faunal and monographical work included number of species from Sikkim. Till 1998, 624 species belonging to 230 genera and 45 families were known from Sikkim and subsequently 10 more species and a family Sciomyzidae are added to the Diptera fauna of Sikkim through the work of Datta and Parui (2003) and Parui (2003), which raised the number to 634 species under 46 families.

Diptera fauna known from Sikkim up to 1998 (Datta and Parui, 2003)

S.N.	SUBORDER	Family	No. of families	No. of genera	No. of Species
	NEMATOCERA			(81)	(366)
1		Trichoceridae	1	2	6
2		Tipulidae	1	39	261
3		Tanyderidae	1	1	2
4		Psychodidae	1	2	3
5		Nymphomyiidae	1	1	1
6		Deuterophlebiidae	1	1	1
7		Culicidae	1	5	15
8		Thaumaleidae	1	1	2
9		Ceratopogonidae	1	5	21
10		Chironomidae	1	4	12
11		Simuliidae	1	1	7
12		Anisopodidae	1	1	2
13		Bibionidae	1	2	4
14		Mycetophilidae	1	6	11
15		Sciaridae	1	3	9
16		Scatopsidae	1	1	1
17		Cecidomyiidae	1	6	7
	BRACHYCERA			(36)	(75)
18		Coenomyiidae	1	1	1
19		Solvidae	1	1	5
20		Stratiomyidae	1	6	7
21		Tabanidae	1	6	19
22		Asilidae	1	15	28
23		Bombyliidae	1	4	6
24		Systropodidae	1	1	7
25		Dolichopodidae	1	2	2
	CYCLORRHAPHA			(113)	(184)
26		Pipunculidae	1	1	2
27		Syrphidae	1	34	60
28		Conopidae	1	4	10
29		Micropezidae	1	2	2
30		Megamerinidae	1	1	1
31		Pyrgotidae	1	2	5
32		Tephritidae	1	10	11
33		Platistomatidae	1	6	12
34		Sciomyzidae	1	1	1
35		Sepsidae	1	3	6
36		Agromyzidae	1	2	2
37		Chloropidae	1	4	7
38		Heleomyzidae	1	1	1
39		Sphaeroceridae	1	2	2
40		Scathophagidae	1	1	2
41		Anthomyiidae	1	1	1
42		Muscidae	1	11	22
43		Calliphoridae	1	7	9
44		Sarcophagidae	1	6	10
45		Tachinidae	1	12	16
46		Oestridae	1	2	2
			46	230	624
	Extra record				10
					634

Family ASILIDAE: Sikkim contained mountain ranges, rivers and streams, and deep forests and bushes with wet atmosphere. These situations favors the populations of robber-flies. The asilid fauna of the state comprises a total of 28 species spread over 15 genera through the works of Joseph and Parui (1980, 1998) and Parui (2003). However, it appears that many more species can be discovered from the state if intensive surveys are undertaken in future.

Family SYRPHIDAE: Through the publication of Datta (2003) and Lahiri (2003), altogether 60 species under 34 genera are hitherto known from the state *vis-à-vis* 264 species and 5 subspecies under 62 genera belonging to 2 subfamilies in India.

Family MUSCIDAE: The Muscidae is one of the most diversified and economically important group of flies under suborder Cyclorrhapha. Adult Muscidae are generally small to medium sized flies and seldom exhibit any striking developments of colour or form. Adults may be predaceous (subfamilies Coenosiinae and Limnophorinae), saprophagous (subfamily Muscinae), pollenophagous (most of the subfamilies) or haematophagous (subfamily Stomoxyinae). Larvae have varied habits being saprophagous, parasitic and phytophagous. Muscid fauna from Sikkim has not been studied in detail. Presently twenty two species belonging to 11 genera under 6 subfamilies are known from Sikkim (Mitra, B. , 2003)

20. Order LEPIDOPTERA :

Small to very large size insects commonly known as 'butterflies' and 'moths'. Two pairs of well-developed wings with colored scales on them. Wings are brilliantly coloured in many species. The various publications on Butterflies of India have been published by Marshall and De Niceville (1882), De Niceville (1886, 1890), Betham (1890, 1891a, 1891b, 1892), Evans (1932), Talbot (1939, 1947) and Wynter-Blyth (1957). Haribal (1992) published the book on butterfly fauna of Sikkim and 689 species pertaining to five families were enumerated, which accounts to almost 50 % of the known butterflies from India. The butterfly diversity of the Sikkim is highest and unique in the global level on the context of geographical area, position and the admixture of the Indo-Malayan and Indo-Chinese elements. Presently, the number of species has increased to 711 under 243 genera from Sikkim. While undertaking the survey of Sikkim by the Zoological Survey of India, several species already known from the state were neither collected nor observed, shows that the population of several butterfly species has declined. Accordingly, Wildlife (Protection) Act 1972, was amended from time to time and more than 55 species known from Sikkim are listed in Schedule species.

Recent estimates reveal the report of over 12,000 species of moths from India. Cotes and Swinhoe (1887- 1889) in six volumes of “*A Catalogue of Moths of India*” included 122 species and Hampson (1892, 1894, 1895 and 1896) and Bell and Scott (1937) in five volumes of “*Fauna of British India*” included 76 species from Sikkim. Several other important papers on various families of moths were also published by Arora (1976) and Arora and Gupta (1979), Bhattacharya (2003), Buchsbaum (2003, 2006). But during the last decade survey of Sikkim undertaken by the Zoological Survey of India and other organizations have yielded hundreds of new records and new species from the state and presently there is record of 1817 species of moths pertaining to 607 genera and 26 families.

Family PAPILIONIDAE: The family Papilionidae includes two subfamilies, viz., Papilioninae and Parnassiinae. The family includes 59 species under 9 genera from Sikkim, of which 40 species / subspecies are studied during the recent survey (Maulik, 2003). Four species are endemic to the state of Sikkim.

Family NYMPHALIDAE: Altogether, 263 species/subspecies spread over 66 genera and six subfamilies have been dealt with from Sikkim (Gupta, 2003 a). The maximum records of species of butterflies were recorded from South Sikkim (48 spp.), followed by the North Sikkim (39 spp.), East Sikkim (31 spp.) and West Sikkim (19 spp.). Seven species are endemic to Sikkim.

Family PIERIDAE AND HESPERIIDAE: The important works on butterflies of India, including Sikkim are by Seitz (1927), Evans (1932) and Wynter Blyth (1957), on Pieridae by de Niceville (1902), Talbot (1939) and on Hesperidae by Watson (1891) and Evans (1949), Haribal (1992) dealt with all species known from Sikkim. Altogether 227 species of butterflies of families Pieridae and Hesperidae have been dealt with. The family Hesperidae constitutes

S.N.	Family	No. of families	No. of genera	No. of Species
1	Papilionidae	1	9	59
2	Nymphalidae	1	66	263
3	Pieridae	1	18	51
4	Hesperidae	1	68	176
5	Lycaenidae	1	82	162
6	Ctenuchidae	1	5	22
7	Limacodidae	1	18	44
8	Hepialidae	1	4	7
9	Tineidae	1	16	22
10	Sessidae	1	6	11
11	Zygaenidae	1	29	66
12	Cossidae	1	4	10
13	Totricidae	1	6	12
14	Callidulidae	1	3	4
15	Saturniidae	1	14	26
16	Bombycidae	1	16	23
17	Pyralidae & Crambidae	2	116	303
18	Thyrididae	1	8	24
19	Eupterotidae	1	8	14
20	Lasiocampidae	1	14	32
21	Sphingidae	1	24	41
22	Arctiidae	1	49	182
23	Lymantridae	1	23	95
24	Drepanidae	1	17	43
25	Uranidae	1	6	8
26	Geometridae	1	82	525
27	Epicothidae	1	1	1
28	Notodontidae	1	20	45
29	Agaristidae	1	7	15
30	Noctuidae	1	111	242
		31	850	2528



Trabala vishnou Lefebvre - Family Lasiocampidae - Lepidoptera



Hyposidra talaca (Walker): Family Geometridae, Order Lepidoptera



Xandrames albofasciata Moore: Family Geometridae, Order Lepidoptera

major share of 176 species belonging to 68 genera and three subfamilies where as Pieridae has 51 species representing 18 genera and two subfamilies, viz., Pierinae and Coliadinae (Majumdar, 2003b). Two species are endemic to Sikkim.

Family CTENUCHIDAE AND LIMACODIDAE: The faunistic account deals with the moths of families Ctenuchidae and Limacodidae from Sikkim. Cotes and Swinhoe (1887-89) catalogued species of moths of India and neighboring countries. Subsequently Hampson (1982) provided description of species of these families in his first volume of *Fauna of British India* (Moths) Series. Hampson (1898) included comprehensive account of species' of Ctenuchidae. Altogether 64 species of moths of both the families have been dealt including the earlier record of 13 species. The family Ctenuchidae includes 20 species in 5 genera whereas family Limacodidae covers 44 species under 17 genera. Eight species are endemic to Sikkim (Majumdar, 2003a).

Family SATURNIIDAE: They are usually of large size and beautifully coloured moths. Females of 'Atlas Moth' *Attacus atlas* (Linnaeus) and 'Edward Moth' *Archaeoattacus edwardsii* (White) are well known for their wing expanse of more than 270 mm and also for the largest wing area of all the Lepidoptera. Saturniids moths are of great economic importance as some of their species are exploited for obtaining silk of commercial value. India occupies unique position

in the world regarding production of all the three varieties of non mulberry silks, viz., tasar, eri and muga on large scale. Three species yielding these silks are: *Antheraea paphia* (Linnaeus) Tasar silkmoth providing tasar, *Samia cynthia* (Drury) Eri silk-moth producing eri and *Antheraea assamensis* (Helfer) Muga silkmoth yielding muga. India ranks first and second in the world in the production of eri and tasar silk, respectively, but it has monopoly in the yield of muga silk. Altogether 26 species under 14 genera are reported from Sikkim (Gupta, 2003b).

Family ZYGAENIDAE : The family Zygaenidae includes four subfamilies, of which Zygaeninae, Chalcosiinae and Phaudinae are well represented in Sikkim. Butler (1881-1886) in *Illustrations of Heterocera in the British Museum*, dealt with the moths of Sikkim including Zygaenidae. Hampson (1892, 1896) in *Fauna of British India, Moths*, reported 53 species of Zygaenids from Sikkim. Dudgeon (1899) noted 23 species and subspecies of Zygaenidae from Darjeeling and Sikkim. Jordan (1908) and Fletcher (1925) reported nearly 60 species and subspecies of Zygaenidae from this area. Presently 66 species / subspecies under 29 genera are known from Sikkim (Bhattachaya, 2003), of which six species are endemic.

Family ARCTIIDAE: Altogether, 182 species have been reported from Sikkim, of which 42 are endemic to the state (Majumdar, 2003c). The species represented in eight subfamilies are Nolinae (27 spp.), Arctiinae (15 spp), Rhodogastrinae (1 sp), Nyctemerrinae (4 spp), Callimorphinae (4 spp), Spilosominae (14 spp), Lithosiinae (113 spp) and Micrarctiinae (4 spp).

Family GEOMETRIDAE: The Geometridae is one of the largest families of the order Lepidoptera. It includes 21,144 species in the world fauna (Holloway, 1997) and about 2000 species from India. The Geometridae comprises of 525 species under 182 genera belonging to five subfamilies from Sikkim, of which 43 are endemic to the state (Ghosh, S., 2003).

21. Order TRICHOPTERA:

These are moth like insects commonly called as 'caddis-flies'. Heigler (1992) published the checklist of Trichoptera of India. About 1,000 species of caddis-flies occur in India. Majumdar (2003d) reported 179 species of caddis-flies under 44 genera and 21 families from Sikkim, constituting 17.9% of the known caddisflies from India including 98 endemic species.

S.N.	Family	No. of families	No. of genera	No. of Species
1	Rhyacophilidae	1	2	66
2	Hydrobiosidae	1	1	3
3	Hydroptilidae	1	1	6
4	Glossosomatidae	1	1	7
5	Stenopsychidae	1	1	6
6	Philopotamidae	1	2	3
7	Xiphocentronidae	1	4	8
8	Psychomyiidae	1	1	8
9	Polycentropidae	1	1	3
10	Hydropsychidae	1	4	9
11	Phryganopsychidae	1	1	1
12	Phrygaenidae	1	2	3
13	Lepidostomatidae	1	4	8
14	Brachycentridae	1	2	4
15	Uenoidae	1	1	1
16	Limnephilidae	1	8	17
17	Goeridae	1	1	3
18	Leptoceridae	1	4	15
19	Limnacentropidae	1	1	4
20	Odontoceridae	1	1	2
21	Helicopsychidae	1	1	2
		21	44	179



Paragomphus lineatus (Selys):
Family Gomphidae, Order Odonata



Anoplocnemis phasiana Fabricius: Family
Coreidae, Order Hemiptera



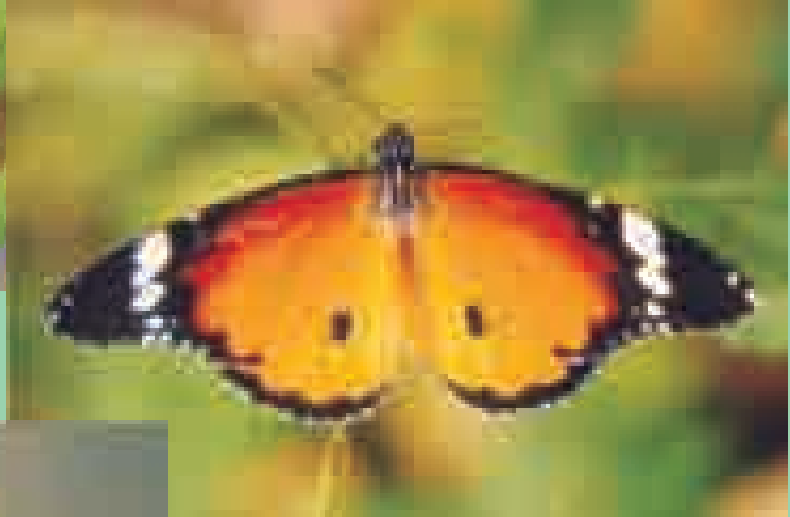
Homoeocerus signatus (Walker):
Family Coreidae, Order Hemiptera



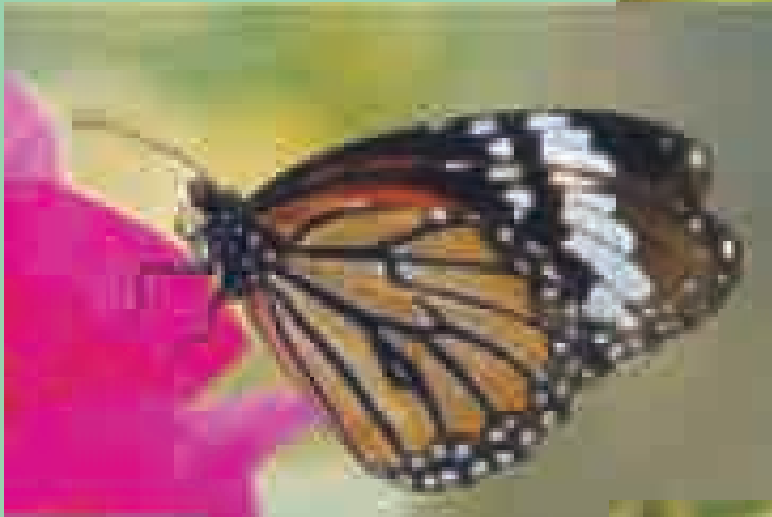
Labidura riparia (Pallas): Family Labiduridae, Order Dermaptera



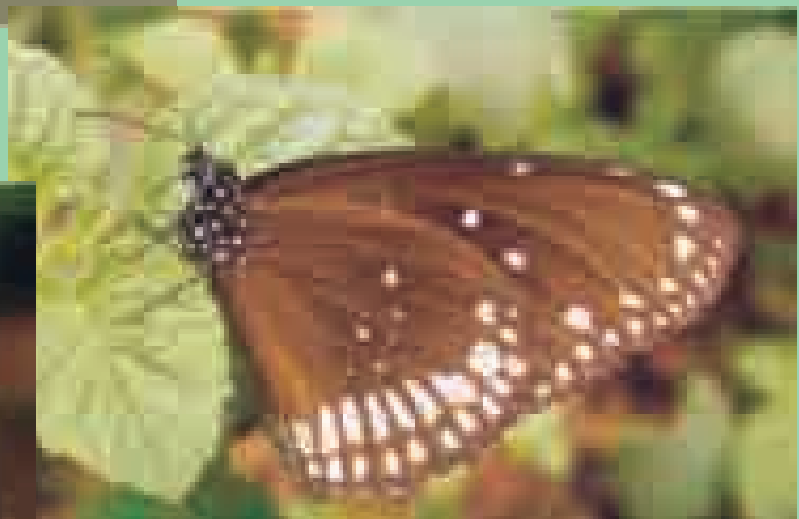
Palpares pardus Rambur:
Order Neuroptera



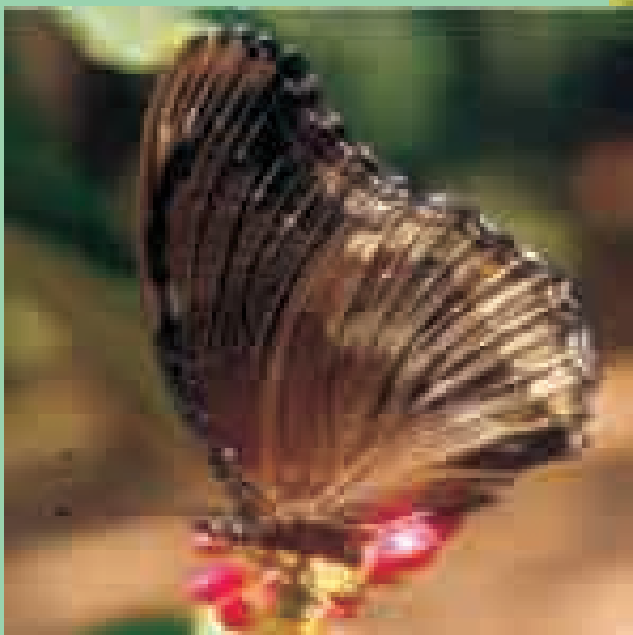
Danaus chrysippus chrysippus (Linnaeus):
Family Nymphalidae, Lepidoptera from
East & South Districts



Danaus genutia (Cramer):
Family Nymphalidae, Order Lepidoptera
from East District



Euploea core core (Cramer):
Family Nymphalidae, Order Lepidoptera



Hypolimnna bolina (Linnaeus):
Great Eggfly, Family Nymphalidae Lepidoptera

22. Order HYMENOPTERA:

Small to large sized insects with two pairs of veined or almost vein less wings or may be wingless, as in some worker ants. In most hymenopterans, a constriction lies between thorax and abdomen. Females of many species furnished with ovipositors having stings or saws. Bingham (1897, 1903), and Morley (1913) published the '*Fauna of British India*' on different families of Hymenoptera. Mani (1989a, 1989b) published '*Fauna of India*' on Chalcidoidea. Cushman (1927), Hammer (1960), Gupta (1974), Hayat (1974), Boucek and Subbarao (1978) and Jonathan (2003) worked on different families of Hymenoptera from India. As per available records, 558 species pertaining 224 genera under 16 families are included hereunder. However, Ramakrishna and Alfred (2006*) reported the occurrence of 19 families, 288 genera and 619 species of Hymenoptera from Sikkim.

S.N.	Family/ Superfamily	No. of families	No. of genera	No. of Species
1	Vespidae	1	9	32
2	Scoliidae	1	9	27
3	Ichneumonidae	1	103	204
4	Formicidae	1	39	114
5	Apoidea	4	16	55
6	Colletidae	1	1	1
7	Sphecidae	1	25	60
8	Chrysididae	1	2	5
9	Mutillidae	1	4	4
10	Pompilidae	1	8	35
11	Eumenidae	1	6	19
12	Chalcidoidea	2	2	2
		14 (19*)	224(288*)	558(619*)

*The number of families, genera and species as mentioned by Ramakrishna and Alfred (2006).

Family VESPIDAE: The family Vespidae belongs to superfamily Vespoidea which includes true wasp. In India, the family is represented by about 135 species/subspecies, 11 genera/subgenera under three subfamilies. In Sikkim, the Vespidae is represented by three subfamilies, viz., Stenogastrinae, Vespinae and Polistinae. Jonathan and Kundu (2003a) recorded 32 species/subspecies under 9 genera and 7 subgenera from this state.

Family SCOLIIDAE: The family Scoliidae belongs to superfamily Scolioidea, which includes four families, viz. Scoliidae, Tiphidae, Mutillidae and Sapygidae in India. The members of this family Scoliidae are commonly known as hairy wasp, usually black in colour, marked with spots or bands of yellow, white or red. Their wings are usually dark with a metallic iridescence. The members of this family are world-wide in distribution and their larvae are ectoparasitic on the larvae of Scarabaeidae. The subfamily Scoliinae is subdivided into two tribes, viz., Campsomerini and Scoliini. In the state of Sikkim this subfamily is represented by 27 species/subspecies under nine genera (Jonathan and Gupta, 2003).

Family SPHECIDAE: The family Sphecidae belongs to superfamily Sphecoidea which includes blue mud-dauber, black and yellow mud-dauber, digger or sand wasps. These sphecid wasps followed men from their forested habitats to mud houses to build mud nests in their houses. These sphecid wasps are mainly beneficial to man. This is a moderately large family having more than 450 species in India. Altogether, 60 species/subspecies under 25 genera have been recorded from the state (Jonathan and Kundu, 2003b).

Family ICHNEUMONIDAE: They are parasitic in cocoons usually of Lepidoptera, but also of Symphyta, Braconidae, Ichneumonidae, Neuroptera, Diptera and spiders. In India, family is represented by about 1,200 species and subspecies under 23 subfamilies. Presently, 204 species and subspecies under 103 general and 16 subfamilies are known from Sikkim including 46 endemic species (Jonathan, 2003).

Family FORMICIDAE: Ants are cosmopolitan in distribution and abundance in our environment. Its social behavior is highly developed and certain inborn instinct, keeps this creature in colonial form, exhibiting highest degree of distribution of labour, specialized caste oriented nature of work and cohesiveness amongst the said colony. Altogether 114 species, including previously reported species under 39 genera and 7 subfamilies have been reported from Sikkim (Tiwari *et al*, 2003).

Suborder ACULEATA: There are 250 species known in India of the family Apidae. 35 species are recorded from India for family Anthophoridae, while 800 are reported from the world; 55 species are recognized from India, while 1,000 are known from the world for family Megachilidae; 33 species are recorded from India, while 400 species are known from the world for family Xylocopidae; 100 species are described from the world for family Eumenidae. The superfamily Apoidea includes 55 species under 16 genera and four families from Sikkim.

SUMMARY

For the first time, a comprehensive account of insect diversity of Sikkim has been provided, which is mainly based on the collection and the faunistic surveys undertaken by the Zoological Survey of India. Altogether, 5892 species belonging to 2382 genera under 261 families of 22 orders have been recorded known from Sikkim. The state with 0.21 % of the geographical area of India represents 9.63% of all the known species of insects in the country. The insect diversity of the state is estimated about 15% (More than 9,000) of all the known species from India. The above study indicates that the study of insects in Sikkim is still not very exhaustive, as many orders / families are not yet represented, indicating the scope of discovery of a large number of known and unknown species if the systematic surveys of unexplored and under explored areas are undertaken with the help of State Government agencies.

ACKNOWLEDGMENTS

The author is grateful to Dr. K. Venkataraman, Director, Zoological Survey of India, Kolkata, for providing the necessary facilities and to Dr A. K. Sanyal, Scientist 'F' for assigning the present task and encouragement. Thanks are also due to all the authors, who have contributed the chapters on various groups of Insects to the State Fauna Series, Fauna of Sikkim, without which present contribution could not have been possible. Author is also thankful to the PCCF (Wildlife) and other authorities of Forest department for their cooperation during the survey of Sikkim by the scientists of the department.

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Several insects live only by drinking sap from trees

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