

**Studies on  
Odonata and Lepidoptera fauna  
of foothills of Aravalli Range,  
Rajasthan**

**Gaurav Sharma**





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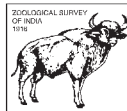
**RECORDS OF THE  
ZOOLOGICAL SURVEY OF INDIA**

**Studies on Odonata and Lepidoptera fauna of  
foothills of Aravalli Range, Rajasthan**

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## Chapter - I

### Aravalli Range of Rajasthan

#### 1.1. Introduction

Rajasthan, the largest state of India (3,42,239 sq km) situated in the north-western part of the western union (23° 30' and 30° 11' North and 69° 29' and 78° 17' East) is largely an arid state for most of its part. The Tropic of Cancer passes through south of Banswara town. Presenting an irregular rhomboid shape, the state has a maximum length of 869 km, from west to east and 826 km, from north to south. The western boundary of the state is a part of the Indo-Pak International boundary, running to an extent of 1,070 km, it touches four main districts of the region namely, Barmer, Jaisalmer, Bikaner and Ganganagar. The state is girdled by Punjab and Haryana states in the north, Uttar Pradesh in the east and Gujarat in the west. The area of Rajasthan is nearly equivalent to some of the urbanized countries of the western world like Norway (3,24,200 sq km), Poland (3,12,600 sq km) and Italy (3,01,200 sq km) (Anon., 2009).

Rajasthan has exhibited spectacular progress in several areas like agricultural production, harnessing of mineral resources, development of means of transport and communication, and the production of energy resources but the rate of progress and plans of economic development have slowed down to a large extent by a parallel growth of human population and livestock. Human resources are therefore to be geared into the channel of economic progress while taking care to arrest their future growth rate. The rich wealth of non renewable resources is yet to be explored and exploited. Their judicious exploitation can make the state economically self sufficient. At the same time renewable resources like solar power, wind and water can also be harnessed effectively to serve man's need.

The physiography of Rajasthan is the product of long years of erosional and depositional processes. The present landforms and drainage systems have been greatly influenced and determined by the geological formation and structures. Four major physiographic conditions have been identified within the state. These are The Western desert (Thar), The Aravalli ranges, The Eastern plains and The South-Eastern plateau Region. The Aravalli hill ranges, running from north-east to south-west, divides the state into western arid and eastern semi-arid regions. It is also a major water divide. The area, to its east, is well drained by several drainage systems, while the area, to the west, has only one integrated drainage system that is the Luni drainage system in the south-eastern part of the desert (Anon., 2009).

## **1.2. Aravalli Ranges**

The Aravalli ranges constitute the most dominant hilly area of Rajasthan. The ranges run diagonally across the state from north-east Delhi to south-west, upto the plains of Gujarat, covering a distance of 690 km. Within Rajasthan, the forest ranges run from Khetri in the north-Khed Brahma in the south-west for the length of about 550 km. In the north-east, the hill ranges become more prominent near Khetri and Alwar (Fig. 1 & 2). Towards the south-west, the ranges become more prominent with peaks upto 1055 m above MSL. Quartzite, being very resistant, forms most of the hills in the northern and central parts. Granite forms the high hills in the south near Abu. Apart from the hills, the other major landforms within this region are rocky uplands, shallow to moderately deep colluvial plains and narrow alluvial plains at few locations.

The Aravalli ranges are the most prominent hill feature extending from Sirohi, Udaipur and Dungarpur districts in the south-west to Jaipur and Alwar districts in the north-east. They rise to their highest summit at Mount Abu (1772m above MSL) in Sirohi district. These ranges form a labyrinth of low hills in Udaipur, Dungarpur and Banswara districts, and stretch north-eastwards in the form of undulating low hills through parts of Ajmer, Tonk, Sawai Madhopur, Jaipur and Alwar districts. Isolated outcrops of Aravallies occur in Jhunjhunun, Sikar and Nagaur districts (Anon., 2009).

## **1.3. Geology**

The characteristic feature of the geology of Rajasthan is the presence of several groups of rocks belonging to Archaean and Pre-Cambrian ages. They form the Aravalli mountain system which runs across the state from the north of Delhi in the north-east to the Gulf of Cambay in the south-west. The Central part of Aravalli ranges is occupied by a great synclinorium composed of Delhi and Aravalli rocks. Because of the thin deposits of sand in this region, the rock exposures are good but in the west and the south-west, they are often engulfed in the sandy alluvium and desert sands. The Aravallis, an enormously thick series of argillaceous rocks, came into existence at the close of the Archaean era when the sediments which were deposited in the seas of that age, underwent an upheaval by orogenic activities. These vast mountains were peneplaned in pre-Cretaceous time but were again rejuvenated in later ages. The Aravalli Super Group is a vast formation composed of basal quartzites, shales, conglomerates, composite, gneisses and slates (Anon., 2009).

## **1.4. River Valley Catchments**

The rivers of Rajasthan, except for the Chambal, are ephemeral and flow only during the rainy season. The Aravalli ranges which run across the state from south-west to the north-east direction largely influence the drainage system of the state. While a major part of western Rajasthan has an inland drainage system, the southern, south-eastern and eastern parts have a well developed drainage system. The river Chambal, the only perennial river of the state,

which forms the boundary with Madhya Pradesh, has its origin south of Mhow, near Manpur forms the northern parts of the Vindhya. It enters Rajasthan near Chaurasigarh Fort flows through the Kota district. Later, it flows to form the district boundary between Kota and Bundi and also between Kota and Sawai Madhopur. This river covers a distance of about 135 kms in Rajasthan out of its total length of about 965 kms and has therefore, a smaller share of drainage system in the state. It has a catchment of 75,680 sq. km. (including Banas river) in Rajasthan, the river collects the major part of the drainage discharge from Jaipur, Dausa, Sawai Madhopur, Karauli, Ajmer, Tonk, Bhilwara, Bundi, Kota, Barab, Jhalawar, Chittaurgarh, Udaipur and Rajsamand districts. Its main tributaries are Banas, Kali Sindh, Parvati, etc. the river Chambal joins the river Jamuna near Etawah in Uttar Pradesh.

The river Banas originating from the Khamnor hills of Aravalli ranges (about 5 km from Kumbhalgarh) is one of the major rivers of the state, which in its entire course, flows through Rajasthan. It flows from Kumbhalgarh towards the south upto the Gogunda plateau and after cutting the Aravalli ranges at right angles, it flows through Nathdwara, Rajsamand and Railmagra. The river collects the major run-off of Udaipur, Rajsamand, Chittaurgarh and Bhilwara districts by the tributary, Berach. The Banas meets the river Chambal near Khandar. This total length of the river is about 480 kms and its main tributaries are Berach, Kothari, Khari, Dai, Mashi, Dundh and Morel. The river Banganga which originates from the low hills of Bairath (Jaipur district), flows towards the east, entering Sawai Madhopur district and finally in Bharatpur district where its water spreads over a large area. The total length of this river is about 380 kms. The river joins the river Jamuna near Fatehabad of Agra district. The Gambhiri which originates from Karauli hills in Karauli and Sawai Madhopur districts, flows through these districts to a greater length and inundates several areas of Bharatpur district before joining the river Jamuna.

Luni is the only major stream on the west of the Aravalli ranges which meets the sea in the Rann of Kutch. It originates in the Nag Pahar in Ajmer and flows south-west through Jodhpur, Barmer, Jalore over a distance of about 320 kms, covering a total catchment area of 34,250 sq. km., its catchment area has a spread over some parts of Nagaur district also. It flows only during the rainy season and even at this time, the river is choked with advancing sands at many places. Even in the monsoon months when the water flow rate is high and at its peak, the flowing water is not able to cut these sand deposits on the river bed, as a result of which, the run-off spreads to the adjoining fields on both the banks of the river braiding it. This results in sand deposition on arable and non-arable lands, thus, adversely affecting their productivity. A unique characteristic of this river is that its water is good upto Balotra, but it becomes brackish thereafter till it drains into the Rann of Kutch. A number of streams and tributaries like Bandi, Sukri, Mithri, Jawai, Sagi, Jojri, Lilri, Guhiya, etc., flows on the western side of the Aravalli range and drain the run-off of some parts of Pali, Jalore, Sirohi and Barmer district areas (Roonwal, 1983; Ghosh *et al.*, 1996; Ramakrishna *et al.*, 2010).

The river Mahi which originates from the Mhow ranges of Madhya Pradesh, and after flowing for some distance towards north, enters Rajasthan state near Khandu village of Banswara district. Its catchment area in Rajasthan largely spreads over the districts of Udaipur, Banswara, Chittaurgarh, Pratapgarh and Dungarpur, covering a total geographical area of about 16,030 sq. kms. Important tributaries of this river are Som, Jakham, Anas, Chap and Moren. The west Banas originates from the western slope of the Aravalli ranges and drains some parts of Sirohi district, finally draining its run-off in the Rann of Kutch. The Sabarmati, originating from the low hills of Gogunda (Udaipur district) and called Wakal in its initial course, covers a catchment area of 4,300 sq. kms. In the state and drains part of its water from Udaipur and Sirohi districts before finally traversing Gujarat to meet the Gulf of Cambay (Anon., 2009).

### **1.5. Rainfall Pattern**

The climate of Rajasthan state varies from arid to sub-humid. To the west of the Aravalli range, the climate is characterized by low rainfall with erratic distribution, extremes of diurnal and annual temperatures, low humidity and high wind velocity. The climate is semi-arid to sub-humid in the east of Aravalli range, characterized by more or less the same extremes in temperatures but relatively low wind velocity and high humidity with better rainfall. The entire state is characterized by hyperthermic conditions. The annual rainfall in the state varies significantly. There is a very rapid and marked decrease in rainfall west of the Aravalli range, making western Rajasthan the most arid part. The average annual rainfall in this part ranges from less than 10cm in the north-west part of Jaisalmer (lowest in the state), to 20 to 30 cm in Ganganagar, Bikaner and Barmer regions, 30 to 40 cm in Nagaur, Jodhpur, Churu and Jalore regions and more than 40cm in Sikar, Jhunjhunun and Pali regions and along the western fringes of the Aravalli range. On the eastern side of the Aravalli range, the rainfall ranges from 55 cm in Ajmer to 102 cm in Jhalawar. In plains, Banswara (92.0cm) and Jhalawar (95 cm) districts receive the maximum annual rain. Mount Abu (Sirohi district) in the south-west, however, receives the highest rainfall in the state (163.8 cm) (Anon., 2009).

### **1.6. Temperature Regimes**

Marked variations in diurnal and seasonal range of temperatures occur at all places in the state, exhibiting the most characteristic phenomenon of the warm-dry continental climate. The month of March marks the beginning of summer and the temperature starts rising progressively through April, May and June. The temperature rise during this period is uniform all over the state. In the western part, mainly at Bikaner, Phalodi, Jaisalmer and Barmer, the maximum daily temperatures varies between 40°C to 45°C. Occasionally, it rises to 49°C during the summer months. The diurnal temperature variations is greater in summers. The minimum daily temperature drops down considerably at night and remains between 20 to 29°C. On the eastern side of Aravalli range, the day temperature are in a similar range but night temperatures are however around 26°C. At Udaipur and Mount Abu, temperature,

however, is lower and mean daily maximum temperature in summer reaches 38 C and 31.5 C, respectively and the daily minimum temperature is around 25 C and 22 C, respectively (Anon., 2009; Ghosh *et al.*, 1996; Ramakrishna *et al.*, 2010).

### **1.7. Vegetation (Trees and Shrubs)**

The Aravalli range of Rajasthan is endowed with a wealth of wide range of vegetation, which contains few protected and conserved forests whereas majority of the hilly zone is unprotected (Anon., 2009). The details of vegetation type are as given below:

#### **i) *Acacia leucophloea-Prosopis cineraria-Acacia nilotica* Type**

Plains east of Aravalli, mostly consisting of deep to very deep buried pediment plains, alluvial plains and exposed undulating rocky plains show a sparse tree density in the cultivated fields. *Acacia leucophloea* dominates the shallow to moderately deep, buried and exposed plains whereas plains with deep soil have *A. nilotica* as the main species in the western part of Jaipur, Tonk, Alwar and Bhilwara district together with Jaisamand and Ajmer and north-western Udaipur are also occupied by this type. Trees- *Acacia leucophloea*, *A. senegal*, *A. nilotica*, *Aegle marmelos*, *Azadirachita indica*, *Balanites aegyptica*, *Ficus bengalensis*, *F. religiosa*, *Prosopis cineraria*, *Salvadora oleoides*, *S. persica*, *Phoenix sylvestris*, *Pithecellobium dulce*, *Zyziphus mauritiana*, *Mangifera indica*, *Madhuca indica*. Shrubs- *Acacia jacquemontii*, *Calotropis procera*, *Mimosa hamata*, *Capparis decidua*, *C. zeylanica*, *C. sepiaria*, *Dichrostachys cinerea*, *Cassia auriculata*, *Lantana camera*, *Zyzyphus nummularia*.

#### **ii) *Acacia nilotica* Type**

The Eastern plains cover the north-east, east and south-east of the main Aravalli range. Here, the alluvial plains and buried pediment plains are largely under double cropped and are dominated by this species. Trees are generally limited due to cultivation. Due to good irrigation, they exhibit good growth. Trees- *Acacia cupressiformis*, *A. nilotica*, *Azadirachita indica*, *Mangifera indica*, *Madhuca indica*, *Phoenix sylvestris*, *Zyziphus mauritiana*, *Ailanthus excels*, *Ficus bengalensis*, *F. religiosa*, *Pithecellobium dulce*, *Acacia leucophloea*, *Cordia dichotoma*, *Prosopis cineraria*. Shrubs- *Zyzyphus nummularia*, *Capparis decidua*, *C. zeylanica*, *Ficus palmate*, *Kirganelia reticulata*, *Lantana camara*.

#### **iii) *Acacia nilotica-Capparis decidua* Type**

The ravine land along the Chambal Valley covering Dhaulpur, Sawai Madhopur, Karauli, Baran, and Kota districts represents a special habitat where the land is much dissected. The dissected upland represents dry situation whereas at lower level, the flat land is experiencing fast flow of water. Generally scrubs vegetation represented by *Acacia nilotica* grows at ground/low level whereas *Capparis decidua* occupies the dissected islands. Trees- *Acacia nilotica*, *Prosopis juliflora*, *Acacia tortilis*. Shrubs- *Capparis decidua*, *Zyzyphus nummularia* and *Mimosa hamata*.

**iv) *Butea monosperma-Madhuca indica-Zizyphus mauritiana* Type**

Undulating pediment plains and rocky valleys in southern Rajasthan covering Banswara, Dungarpur, south Chittaurgarh, Rajsamand and Udaipur districts represent this habitat. Here *Butea monosperma* (Dhak) dominates the terrains whereas *Madhuca indica* and *Zizyphus mauritiana* exhibit co-dominance and occur in places with deep soil deposition. Trees- *Madhuca indica*, *Azadirachita indica*, *Zizyphus mauritiana*, *Mangifera indica*, *Phoenix sylvestris*, *Aegle marmelos*, *Acacia leucophloea*, *Cassia fistula*, *Balanites aegyptica*. Shrubs- *Nyctanthes arobor-tristis*, *Holerrhena pubescens*, *Euphorbia neriifolia*, *E. nivulia*, *Dendrocalamus strictus* (Isolated patches), *Dichrostachys cinerea*.

**v) *Anogissus pendula-Boswellia serrata* Type**

This is one of the major mixed deciduous vegetation of Aravalli range. Alwar, Ajmer, Tonk, Jaipur, Karauli, Sawai Madhopur, Bhilwara, Western Chittaurgarh and eastern part of Udaipur are largely dominated with this type. The higher slopes show pure stand of *Anogissus pendula* with few trees of *Boswellia serrata* and *Sterculia urens*. Vegetation at different slope zones is- Higher slopes- *Anogissus pendula*, *Boswellia serrata* and *Sterculia urens*. Middle slopes- *Acacia senegal*, *Bauhinia racemosa*, *Cassia fistula*, *Capparis sepiaria*, *Dichrostachys cinerea*, *Diospyros melanoxylon*, *Lannea coromandelica*, *Wrightia tinctoria*, *Aegle marmelos*, *Adina cordifolia*. Lower slopes and valleys- *Butea monosperma*, *Cassia auriculata*, *Acacia leucophloea*, *Dendrocalamus strictus*, *Euphorbia caducifolia*, *Holoptelia intergrifolia*.

**vi) *Tectona grandis* Type**

This type covers south-eastern part of Udaipur, southern Chittaurgarh and Banswara district. This region is quite typical in exhibiting non-zonation in terms of species occupation on various altitudes. The tract is largely dominated by *Tectona grandis* (Teak). This species is very much exploited at lower zones. Main associated species include *Boswellia serrata* and *Dalbergia latifolia*. Portions with gentle slopes exhibit mostly good density of trees and shrubs species. Vegetation at different slope zones is Higher slopes- *Bauhinia racemosa*, *Boswellia serrata*, *Emblica officinalis*, *Dalbergia latifolia*, *Lahnea coramandelica*, *Sterculia urens*. Middle slopes- *Adina cordifolia*, *Aegle marmelos*, *Albizia odoratissima*, *Madhuca longifolia*, *Mitragyna parviflora*, *Terminalia arjuna*, *Wrightia tinctoria*, *Lagerstroemia parviflora*. Lower slopes- *Acacia chundra*, *Nyctanthes arobor-tristis*, *Butea monosperma*, *Holerrhena pubescens*, *Euphorbia caducifolia* etc. Bamboos *Dendrocalamus strictus* grows in isolated patches.

**vii) *Mangifera indica-Syzygium cumini* Type**

The vegetation of Mount Abu supports dry deciduous, semi-deciduous and evergreen species of plants, composition of which changes with the increase in altitude. Important species distribution at various heights is described as under: Base of the hill and upto 700 m- *Butea*

*monosperma*, *Anogeissus pendula*, *Acacia senegal*, *Wrightia tinctoria*, *Moringa concanensis*; 500-1000 m- *Anogeissus latifolia*, *Lannea cormendelica*, *Wrightia tinctoria*, *Mitragyna parviflora*, *Aegle marmelos*, *Dalbergia latifolia*, *D. sissoo*, *Mallotus phillipensis*, *Albizia spp.* *Bauhinia retus*, *Emblica officinalis*, *Boswellia serrata*, *Lannea cormendelica*, *Anogeissus latifolia*; 1000-1457 m- *Mangifera indica*, *Syzygium cumini*, *Ficus spp*, *Falcourtia indica*, *Anogeissus sericea*, *Mallotus phillipensis*, *Erythrina suberosa*, *Bauhinia purpurea*, *Sterculia urens*, *Dendrocalamus strictus*.

### 1.8. Forests

Rajasthan has 32,488.01 sq km of forest area, which is about 9.49 percent of the total geographical area of the state. The forests of the state can be divided into three broad forest types: Tropical Thorn Forest, Tropical Dry Deciduous Forests and Central India Sub-tropical hill Forests (Anon., 2009).

#### A. Tropical Thorn Forests

Tropical thorn forests are found in arid and semi-arid regions of western Rajasthan. These extend from western Indo-Pak border and gradually merge with the dry deciduous mixed forests of the Aravalli hills and the south-eastern plateau. The general composition of vegetation here is the desert and scrub type. These can be further classified as:

(i) **Sandy Plains:** Under this head following types of forests have been recognized. (i) Desert thorn forest, (ii) *Zizyphus* scrub forest, (iii) Tropical *Euphorbia* scrub forest, (iv) *Acacia senegal* forest, (v) Rann saline thorn scrub forest, (vi) *Salvadora* scrub, (vii) *Cassia auriculata* scrub and (viii) Desert dune scrub.

(ii) **Saline Flat-Salvadora-Tamarix scrubs:** Older alluvial plains which have developed alkalinity/salinity and are left uncultivated for a longer period of time are generally dominated by *Salvadora oleoides*-*Tamarix* community. *Acacia nilotica* is also found in the outer periphery of such lands. Species composition: Tree canopy- *Salvadora oleoides*, *S. persica*, *Tamarix articulata*, *T. aphylla*, *Prosopis cineraria*, etc. Shrub layer- *Capparis decidua*, *Tamarix dioca*, *Zizyphus nummularia*, *Calotropis procera* and *Randia spp* etc. Under Shrubs- *Suaeda fruticosa*, *Haloxylon salicornicum*, *Salsola barysoma*, *Argemone Mexicana* etc. Grasses- *Sporobolus marginatus*, *Eleusine compressa*, *Chloris virgata*, *Dactyloctenium aegyptium*, *Tragus biflorus*, *Aleuopus lagopoides* etc.

#### B. Tropical Dry Deciduous Forests

These forests are mostly found in small patches in few parts of the state. The northern and eastern slopes of Aravalli ranges, mostly in Alwar, Bharatpur and Dhaulpur districts, are covered with these types of forests. Sporadic growth of certain species of dry deciduous forests is found along the dry river beds of Jalore, Nagaur, Ganganagar, Hanumangarh and Bikaner districts. These forests are further divided into following seven sub-groups.

**(i) *Acacia nilotica* sub. *sps indica* forests**

The younger alluvial plains and depressions along the banks of the river and rivulets are dominated by *A. nilotica*. The tree assumes gregarious growth under rich soil moisture conditions. Being the most common tree species of the tract, it is mostly lopped for top-feed. The mature seeds are harvested or cut for timber and fuel purposes. Tree canopy- *Acacia leucophloea*, *Azadirachita indica*, *Balanites aegyptiaca* etc.; Shrub layer- *Capparis decidua*, *C. grandis*, *Zizyphus nummularia* etc.; Grasses- *Heteropogon contortus*, *Chrysopogon fulvus*, *Dichanthium annulatum*, *Bothriochloa pertusa* etc.

**(ii) *Butea monosperma* forests**

Rocky plateau, pediment plains, rocky out-crops valley and gravelly plains above 40 cm rainfall zone, especially in the district of Sirohi, Udaipur, part of Pali, Ajmer, Alwar and Chittaurgarh, have scattered, stunted maltreated trees of *Butea*. In many regions, it forms small thickets which are almost pure. Shallow, moderately heavy to heavy soils are generally occupied by this species. Tree canopy- *Butea monosperma*, *Acacia leucophloea*, *Balanites aegyptiaca*, *Zizyphus mauritiana* etc.; Shrub layer- *Zizyphus nummularia*, *Mimosa rubicaulis*, *Indigofera oblongifolia*, *Dichrostachys cinerea*, *Maytenus emarginatus*, *Carissa congesta* etc.; Herbaceous species- *Tephrosia purpurea*, *Indigofera cordifolia*, *Pulicaria wightiana* etc.; Grasses- *Apluda mutica*, *Heteropogon contortus*, *Iseilema laxum*, *Dichanthium annulatum*, *Bothriochloa pertusa* etc.

**(iii) *Anogeissus pendula* forests**

*Anogeissus pendula* (commonly known as 'Dhok', 'Dhokra', 'Kalia', 'Dhav') trees generally form pure stands, often quite well stocked, 6 m high and with a 70 to 80 cm girth. The branching takes place at a height of 1 to 1.5 m. they provide red hue in winters between November and February but by March, the trees become leafless. Shrubs, under shrubs and ground flora are usually abundant in these forests. The hills of Ajmer, Udaipur, Rajsamand, Chittaurgarh, Bundi, Sawai Madhopur, Karauli, Kota, Baran, Alwar, Jaipur and parts of Pali districts are dominated by these forests. The hill slopes are generally gradual and well occupied by this species. Tree canopy- *Anogeissus pendula*, *Acacia leucophloea*, *Diospyros cordifolia*, *Sapindus emarginata*, *Acacia catechu*, *Butea monosperma*, *Azadirachita indica*, *Ficus glomerata*, *Lannea coromandelca*, *Sterculia urens*, *Boswellia serrata*, *Tamarindus indica*, *Albizzia odoratissima* and *Wrightia tinctoria*, etc.; Shrub layer- *Dichrostachys cinerea*, *Euphorbia caducifolia*, *Zizyphus mauritiana*, *Grewia tenax*, *Rhus mysorensis*, *Securinega leucopyrus*, *Mimosa rubicaulis*, *Pavonia spp.* etc.; Under Shrub layer- *Adhatoda zeylanica*, *Capparis sepiaria* etc.; Herbaceous species- *Cassia tora*, *Indigofera cordifolia*, *Borreria hispida*, *Argemone mexicana*, *Leucas aspera*, *Tridax procumbens*, *Sida cordifolia*, etc.; Grasses- *Eragrostis spp.*, *Apluda mutica*, *Chrysopogon fulvus*, *Cymbopogon martini*, *Eremopogon foveolatus*, *Heteropogon contortus*, *Sehima nervosum*, *Themeda quadrivalvis*.

### C. Central Indian Sub-tropical Hill Forests

These forests which are most abundant in Central India, as in Madhya Pradesh, parts of Gujarat and Maharashtra, are found in Sirohi district of Rajasthan also, mostly on the hills girdling Mount Abu. These forests have semi-evergreen and some evergreen species of trees. The vegetation of Mt. Abu consists of many plants which are similar to the sub-tropical region of Himalayas. Around Mt. Abu, they are well represented between 700 to 800 m altitudes. The dominating species are of *Bauhinia racemosa* (Kachnar), *Mallotus philipensis*, *Mangifera indica*, *Syzigium cuminil*, *Anogeissus latifolia*, *Embllica officinalis*, *Salmalia malabarica*, *Dalbergia sissoo*, *Aegle marmelos*, *Mitragyna parvifolia*, *Ougeinia oojeinensis* and *Ixora arborea*, *Ficus glomerata* and *Dendrocalamus spp.*, *Erythrina suberosa*, *Anogeissus sericea*, etc.; Shrub layer- *Carissa spinarum*, *Rosa muashcata* etc.; Grasses- *Cymbopogon martini*, *Sehima nervosum*, *Apluda mutica*.

#### (i) *Boswellia serrata* Forests

On the high hills of Banswara, Sirohi, Pali, Ajmer, Alwar, Udaipur, Chittaurgarh, *Boswellia* dominates the forest tract. It is associated with stunted trees and shrubs of deciduous nature. At some places, pure stands can be seen showing white shining poles of 12 to 15 m height and 80 to 120 cm girth. *Sterculia urens*, though few in number, gain similar height. Both these species become leafless by February. *Boswellia* is fire resistant and is generally left alone when other trees are removed. It does not coppice well. It occupies higher zones in *Anogeissus* forests. Tree canopy- *Boswellia serrata*, *Lannea coromandelica*, *Sterculia urens*, *Anogeissus latifolia* (stunted) and *Anogeissus pendula*; Shrub layer- *Helicteris isora* (Maror phali) and *Grewia flavescens* etc.; Grasses- *Apluda mutica*, *Heteropogon contortus*, *Aristida spp.*, *Eleusine spp.*

### 1.9 National Parks and Wildlife Sanctuaries

It is the conglomeration of harsh, hostile climatic conditions and the diversity in geological formation imbedded in the Aravalli ranges and lakes that is reflected in the distinctive flora and fauna of Rajasthan. On the western side of Aravallis, there is the great Thar Desert with extreme high temperature during summer with dust, storms and erratic rainfall, while on the eastern side; a good forest cover is seen in the villages of Aravalli hill running parallel of each other from Udaipur to Gujarat state. There are moderate temperatures with rainfall ranging between 25 to 40 cms, providing suitable habitat for wildlife species like Tiger, Desert Cat, Panther, Black buck, Sloth bear, Carcal, Desert fox, Hyaena, Wild Boar, Porcupine and among the birds, Great Indian Bustard, Peacock, Sand Grouse and Indian Roller, etc. Besides these, snakes, lizards and amphibians are also found in the sanctuaries of Rajasthan (Roonwal, 1983; Ghosh *et al.*, 1996; Ramakrishna *et al.*, 2010).

To maintain the ecological balance, two National Parks and twenty-five Wildlife Sanctuaries have been established in suitable forest areas. Wildlife wing of the Forest

Department maintain these areas in scientific manner, conducive to preservation of wildlife in the state. Approximately 2.7 percent of the total geographical area of Rajasthan is maintained as National Parks and Sanctuaries in Rajasthan. The Keoladeo National Park is partially an artificial lake which gets filled up with water every year during rains and which gets dried up in summer, is a paradise for birds and bird watchers. This is one of the best known bird habitat in the world. Migratory birds like Demoiselle cranes, Pintails, Coots, Painted storks, Pelicans, etc. roost and breed in thousands. Siberian crane which is a vanishing species, visits the habitat during winter season although for last few years these birds are not been reported. The Ranthambore National Park, in the dry deciduous forest in Aravalli hills, provides a suitable and healthy habitat to the Indian Tiger and included in Project Tiger Scheme in the year 1973 by the Government of India. Among the wildlife sanctuaries, Sariska is another Tiger Reserves in the country, which included in Project Tiger Scheme in 1978. The objective is to maintain a viable population of tiger, which entails improvement of habitat on which the prey species are essentially dependent.

Besides the National Parks and Sanctuaries, the Forest Department is trying to establish Conservation Reserves and Community Reserves for conservation and protection of wildlife as well as entire biodiversity. Apart from forest areas, there are many areas like “Orans” or “sacred groves” scattered in the entire state which are repository of rich biodiversity and such areas are religiously been protected by local people. No one dare to destroy flora and fauna of these sites for the fear of curse from reigning deities of the sites (Anon., 2009).

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## Chapter II

### Odonata (Damsel and Dragonflies)

#### 2.1. Introduction

Odonata (Damsel and Dragonflies) includes some of the most ancient and beautiful insects ever roamed the earth, as well as some of the largest flying invertebrates ever to have lived. For some 270 million years, odonates with their four long independent membranous wings and long bodies have remained unchanged in their essential form and are dominant invertebrate predators in ecosystem. They were the first creatures to truly command the air of this earth. They are amphibious hemi-metabolous insects having the aquatic egg and larval (nymph) stages, while the adults are terrestrial, both larvae and adults are predator. They are some of the best hunters in the insect world. Their powerful acrobatic flight enables them to catch many small organisms. The Odonates, thus form the integral part of aquatic as well as terrestrial ecosystems and are also the natural biological agents particularly the larvae, which are biological indicators of aquatic pollution. Now a days they are extensively used in controlling causative agents of malaria, filaria and of insect pests in different ecosystems on the global basis (Kumar, 2002).

Approximately 6,000 species and subspecies belonging to 630 genera in 28 families of Odonata are known from all over the world (Tsuda, 1991), out of which 499 species and subspecies of Odonata under 139 genera belonging to 17 families are reported from India (Prasad and Varshney, 1995). They are among the dominant invertebrate predators in ecosystems. Being predators both at larval and adult stages, they play a significant role in the food chain of forest ecosystem (Vashishth *et al.*, 2002). In addition to this, their value as indicators of quality of the biotope is being increasingly recognized (Subramanian, 2002).

Perusal of literature reveals that no consolidated account is available on the Odonata fauna of Aravalli Range of Rajasthan, though Agarwal (1957) recorded 15 species, Bose and Mitra (1976) 13 species, Tyagi and Miller (1991) 23 species from Rajasthan, Prasad (1996) 31 species from Thar Desert of Gujarat and Rajasthan and Prasad (2004) recorded 11 species from Desert National Park, Rajasthan. Therefore, the present study makes a modest attempt to explore the existing diversity of odonates from Aravalli Range of Rajasthan.

#### 2.2. Materials and Methods

The five extensive and intensive surveys of twelve to fifteen days duration were conducted on Odonata in the different selected localities of Aravalli Range of Rajasthan, in eleven districts *i.e.* Sirohi, Udaipur, Pali, Rajsamand, Ajmer, Jaipur, Sikar, Jhunjhunu, Alwar, Dausa and Bharatpur during 2008-11 (Fig. 1 & 2). The common odonata species were identified in the field and unidentified species representatives were collected by using aerial sweep net

and collected individuals in the field were transferred into insect collection paper packs and were brought to the laboratory of Desert Regional Centre, Zoological Survey of India, Jodhpur, where these were properly stretched, pinned, oven dried for 72 hours at 60°C and preserved in Insect Storage System of National Zoological Collection. In the field observations and in the laboratory, specimens were photographed prior to studies, by using a Nikon D70s and Sony-D300-SLR digital cameras with close up and tele lens attachment. Identification of adult individuals was carried out using identification keys provided by Fraser (1933, 1934 & 1936).

### 2.3. Results

**Species diversity:** The studies on Odonata fauna of Aravalli Range of Rajasthan reveals that so far 46 species belongs to 8 families under 2 suborders were recorded, in which 12 species are new records from Rajasthan state *i.e.* *Pseudagrion microcephalum* (Rambur, 1842), *Disparoneura quadrimaculata* (Rambur, 1842), *Neurobasis chinensis* (Linnaeus, 1758), *Anax immaculifrons* Rambur, 1842, *Anax parthenope* (Selys, 1839), *Neurothemis fulvia* (Drury, 1773), *Neurothemis tullia* (Drury, 1773), *Tholymis tillarga* (Fabricius, 1798), *Tramea basilaris burmeisteri* Kirby, 1889, *Tramea limbata* (Rambur, 1842), *Tramea virginia* (Rambur, 1842) and *Trithemis kirbyi* Selys, 1891 (Table-1). The study reveals that *Ceriagrion coromandelianum* (Fabricius, 1798), *Brachythemis contaminata* (Fabricius, 1793), *Bradinopyga geminata* (Rambur, 1842), *Crocothemis servilia* (Drury, 1770), *Ischnura aurora* (Brauer, 1865), *Pseudagrion rubriceps* Selys, 1876, *Orthetrum glaucum* (Brauer, 1865), *Orthetrum pruinosum neglectum* (Rambur, 1842), *Orthetrum sabina* (Drury, 1770), *Pantala flavescens* (Fabricius, 1798) and *Trithemis aurora* (Burmeister, 1839) were the dominant species of Odonates of Aravalli Range of Rajasthan. The mass emergence of *Pantala flavescens* (Fabricius, 1798), a migratory species was recorded from May to October in different localities of Aravalli Range of Rajasthan during 2008-11. Annotated checklist of Odonata of Aravalli Range of Rajasthan prepared, followed by detailed systematic account species wise (Table-1).

**Table 1.** Annotated checklist of Odonates of Aravalli Range of Rajasthan

S. No.	Suborder	Family	Species
(A).	ZYGOPTERA	<b>Coenagrionidae</b>	<i>Agriocnemis pygmaea</i> (Rambur, 1842) <i>Ceriagrion cerinorubellum</i> (Brauer, 1865) <i>Ceriagrion coromandelianum</i> (Fabricius, 1798) <i>Enallagma parvum</i> Selys, 1876 <i>Ischnura aurora</i> (Brauer, 1865) <i>Ischnura senegalensis</i> (Rambur, 1842) <i>Pseudagrion decorum</i> (Rambur, 1842) * <i>Pseudagrion microcephalum</i> (Rambur, 1842)

S. No.	Suborder	Family	Species
(B).	ANISOPTERA	<b>Platynemididae</b> <b>Protoneuridae</b> <b>Lestidae</b> <b>Calopterygidae</b> <b>Gomphidae</b>  <b>Aeshnidae</b>  <b>Libellulidae</b>	<i>Pseudagrion rubriceps</i> Selys, 1876 <i>Rhodischnura nursei</i> (Morton, 1907) <i>Copera marginipes</i> (Rambur, 1842) * <i>Disparoneura quadrimaculata</i> (Rambur, 1842) <i>Lestes viridulus</i> Rambur, 1842 * <i>Neurobasis chinensis</i> (Linnaeus, 1758) <i>Ictinogomphus rapax</i> Rambur, 1842 <i>Paragomphus lineatus</i> (Selys, 1850) * <i>Anax immaculifrons</i> Rambur, 1842 * <i>Anax parthenope</i> (Selys, 1839) <i>Hemianax ephippiger</i> (Burmeister, 1839) <i>Acisoma panorpoides</i> Rambur, 1842 <i>Brachydiplax sobrina</i> (Rambur, 1842) <i>Brachythemis contaminata</i> (Fabricius, 1793) <i>Bradinopyga geminata</i> (Rambur, 1842) <i>Crocothemis servilia</i> (Drury, 1770) <i>Diplacodes lefebvrei</i> (Rambur, 1842) <i>Diplacodes nebulosa</i> (Fabricius, 1793) <i>Diplacodes trivialis</i> (Rambur, 1842) <i>Hydrobasileus croceus</i> Brauer, 1867 * <i>Neurothemis fulvia</i> (Drury, 1773) * <i>Neurothemis tullia</i> (Drury, 1773) <i>Orthetrum glaucum</i> (Brauer, 1865) <i>Orthetrum pruinosum neglectum</i> (Rambur, 1842) <i>Orthetrum sabina</i> (Drury, 1770) <i>Orthetrum taeniolatum</i> (Schneider, 1845) <i>Orthetrum triangulare</i> (Selys, 1878) <i>Palpopleura sexmaculata</i> (Fabricius, 1787) <i>Pantala flavescens</i> (Fabricius, 1798) <i>Rhyothemis variegata</i> (Linnaeus, 1763) * <i>Tholymis tillarga</i> (Fabricius, 1798) * <i>Tramea basilaris burmeisteri</i> Kirby, 1889 * <i>Tramea limbata</i> (Desjardins, 1832) * <i>Tramea virginia</i> (Rambur, 1842)

S. No.	Suborder	Family	Species
			<i>Trithemis aurora</i> (Burmeister, 1839) <i>Trithemis festiva</i> (Rambur, 1842) * <i>Trithemis kirbyi</i> Selys, 1891 <i>Trithemis pallidinervis</i> (Kirby, 1889)
<b>Total</b>	<b>2</b>	<b>8</b>	<b>46</b>

Where \* indicates New records from state

## SYSTEMATIC ACCOUNT

Order ODONATA

Sub order ZYGOPTERA

Family COENAGRIONIDAE

### 1. *Agriocnemis pygmaea* (Rambur, 1842)

1842. *Agriocnemis pygmaea* Rambur, *Ins. Nevrop.*, p. 278.

1877. *Agriocnemis pygmaea* Selys, *Syn. Agr. 5me Legion: Agrion (Suite et fin)*, p. 52.

1983. *Agriocnemis pygmaea pygmaea* Mitra, *Ent. Mon. Mag.*, **119**: 30.

*Material examined*: 1 male, Nakki Lake, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & Party; 1 male, Rajsamand Lake, Rajsamand, 2.ii.2011, Coll. G. Sharma & party.

*Diagnostic characters*: Male- Abdomen 16-17 mm, Hind wing 9.5-10 mm. Thorax black on dorsum, marked with narrow antehumeral apple-green strips. Legs yellow, extensor surface of femora black. Wings hyaline; pterostigma pale yellow in the forewing, black in the hind; 6 to 7 postnodal nervures in forewing, 5 to 6 in the hind. Abdomen segments 1 to 6 with the ground-colour pale greenish yellow, the terminal segments brick-red, marked with bronzed black. Anal appendages brick-red, superiors longer than inferiors.

*Distribution*: *India*: Arunachal Pradesh, Assam, Bihar, Manipur, Mizoram, Nagaland, Orissa, Sikkim, West Bengal, Rajasthan, Uttarakhand, Uttar Pradesh, Tamil Nadu, Madhya Pradesh, Goa and Maharashtra. *Elsewhere*: Formosa, Singapore, Thailand, Java, Philippines, Afghanistan, Bangladesh, Indonesia, Japan, Nepal, Pakistan, Taiwan, Australia, Papua New Guinea, Sri Lanka, Myanmar, Malaysia and China.

### 2. *Ceriagrion cerinorubellum* (Brauer, 1865)

1866. *Agriocnemis cerinorubellum* Brauer, *Reise d. Novara (Neur.)*, p. 59.

1876. *Ceriagrion cerinorubellum* Selys, *Bull. Acad. Belg.*, **2**: 526.

*Material examined:* 1 male, Rajsamand Lake, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Around Sariska Tiger Reserve, Alwar, 9.iii.2009, Coll. G. Sharma & Party; 1 male, Nahargarh Biological Park, Jaipur, 13.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Male- Abdomen 31-33 mm, Hindwing 20-21 mm. Prothorax and thorax green, changing to blue on the sides, yellow beneath. Wings hyaline, pterostigma amber-tinted, paler around the circumference and framed in reddish-brown nervures, elongate, diamond-shaped, oblique, covering one cell; 11 to 12 postnodal nervures to forewing, 9-10 in the hind. Abdomen multicoloured, segment 1 and 2 and the basal half of 3 bright brick-red, segments 4 to 6 on the dorsum black, segments 7 to 10 again bright brick-red. Legs yellow with short black spines. Anal appendages reddish brown, or the inferiors ochreous, tipped with black.

*Distribution:* *India:* Andaman, Bihar, Orissa, West Bengal, Rajasthan, Tamil Nadu, Madhya Pradesh and Maharashtra. *Elsewhere:* Borneo, Indo-China, Java Singapore, Thailand, Bangladesh, Indonesia, Pakistan, Sri Lanka, Myanmar, Malaysia and Vietnam.

### 3. *Ceriagrion coromandelianum* (Fabricius, 1798)

1798. *Agrion coromandelianum* Fabricius, *Ent. Syst. (suppl.)*: 287.

1933. *Ceriagrion coromandelianum* Fraser, *Fauna Brit. India Odon.*, **1**: 315-316.

1967. *Ceriagrion coromandelianum* Asahina, *Jap. J. Zool.*, **15**: 279.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Keoladeo National Park, Bharatpur, 18.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Male- Abdomen 28-30 mm; Hindwing 18-20 mm. Prothorax and thorax uniformly olive-green; laterally citron yellow. Legs citron-yellow, with short black spines. Wings hyaline, pterostigma golden yellow, framed in brown nervures covering one cell; 11 to 12 postnodal nervures in forewings, 10 to 11 in the hind. Abdomen uniformly citron-yellow. Anal appendages citron-yellow, the inferiors tipped with black; superiors about half the length of segment 10.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Myanmar, Malaysia and China.

### 4. *Enallagma parvum* Selys, 1876

1876. *Enallagma parvum* Selys, *Bull. Acad. Belg.*, **41**: 537.

*Material examined:* 1 male, Bheel Beri, Rajsamand, 26.ix.2008, Coll. G. Sharma & party; 1 male, Puskar Lake, Ajmer, 11.ii.2010, Coll. G. Sharma & Party.

*Diagnostic characters:* Male-Abdomen 17 mm. Hindwing 11 mm. Prothorax broadly black on dorsum, the sides pale blue. Thorax black on dorsum, with very broad antehumeral azure

blue strips narrowly bordered outwardly with black. Wings hyaline; pterostigma small, covering less than one cell, very oblique distally, yellow in teneral, blackish in adults, with a fine pale frame and thick black enclosing nervures; 7 postnodal nervures in forewings, 6 in the hind. Abdomen pale sky-blue, marked with black as follows: Segment 1 with a broad quadrate dorsal spot and narrow blue apical annule; segment 2 with a broad thistle-shaped dorsal spot extending the whole length of segment; segments 3 to 7 with fine apical annules confluent with a rounded spot; segments 8 to 10 azure blue.

*Distribution:* Throughout India. *Elsewhere:* Myanmar, Malaysia, China and Formosa.

#### 5. *Ischnura aurora* (Brauer, 1865)

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

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

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

*Material examined:* 1 male, Rajsamand Lake, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Buda Puskar, Ajmer, 5.iii.2009, Coll. G. Sharma & Party; 1 male, Ghana Sagar Lake, Ajmer, 10.ii.2010, Coll. G. Sharma & party; 1 male, Kankaroli Fort, Alwar, 5.ii.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Male— Abdomen 16-20 mm; Hindwing 10-12 mm. Prothorax bronzed black on dorsum, the sides and anterior lobe blue. Thorax bronzed black on dorsum, marked with narrow grass-green antehumeral strips. Wings hyaline; pterostigma differing in the fore and hindwings, that of forewings slightly broader than long, kite-shaped, rose-red for its proximal half, hyaline for the distal, inner and posterior borders thick, black; in the hindwing much smaller, about half the size, uniform pale grey. Abdomen citron-yellow, except segments 8 to 10, which are azure blue.

*Distribution:* Throughout India. *Elsewhere:* Afghanistan, Bangladesh, Iran, Japan, Micronesia, Pakistan, Thailand, Taiwan, Sri Lanka, Myanmar, Malaysia, Indonesia (Borneo), New Guinea, Australia, Philippines and Samoa.

#### 6. *Ischnura senegalensis* (Rambur, 1842)

1842. *Agrion senegalensis* Rambur, *Ins. Nevrop.*, p. 276.

1876. *Ischnura senegalensis* Selys, *Bull. Acad. Belg.*, **2**: 273.

*Material examined:* 1 male, Rajsamand Lake, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Male— Abdomen 22 mm; Hindwing 14 mm. Prothorax black, the anterior collar pale blue, the sides pale green. Thorax bronzed black on dorsum, the sides palest green, pale yellow beneath. Legs black, the flexor surfaces of femora, extensor surfaces

of tibiae and the tarsi yellow. Wings hyaline; 8 post-nodal nervures to forewings and 6 in the hindwing. Pterostigma of fore wings oblique, diamond shaped black, but the outer angle and costal border narrowly white. Abdomen black, marked with yellow and blue.

*Distribution:* Throughout India. *Elsewhere:* Africa, China, Formosa, Afghanistan, Bangladesh, Iran, Japan, Hongkong, Vietnam, Micronesia, Pakistan, Thailand, Taiwan, Sri Lanka, Myanmar, Malaysia, Indonesia (Borneo), New Guinea, Australia, Philippines and Samoa.

### 7. *Pseudagrion decorum* (Rambur, 1842)

1842. *Agrion decorum* Rambur, *Ins. Nevrop.*, p. 258.

1876. *Pseudagrion decorum* Selys, *Bull. Acad. Belg.*, 2: 504.

*Material examined:* 1 male, Pichhola lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party.

*Diagnostic characters:* Male– Thorax a beautiful bluish-green on dorsum; laterally azure blue; mid-dorsal carina very finely black; a narrow black humeral strip and a short black point at upper part of postero-lateral suture; beneath white; tergum azure blue. Wings hyaline; pterostigma diamond-shaped, very narrow, braced, covering less than one cell; 10 postnodal nervures to forewings, 9 in the hind; ac nearly opposite level of basal antenodal nervure. Abdomen pale azure blue, except segments 8 to 10, which are deep azure blue, and segment 2, which is bluish-green on dorsum.

*Distribution:* Throughout India. *Elsewhere:* Myanmar, Malaysia, China and Formosa.

### 8. *Pseudagrion microcephalum* (Rambur, 1842)

1842. *Agrion microcephalum* Rambur, *Ins. Nevrop.*, p. 259.

1876. *Pseudagrion microcephalum* Selys, *Bull. Acad. Belg.*, 42: 504.

*Material examined:* 1 male, Nakki lake, Mount Abu, 23.ix.2009, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 10.iii.2009, Coll. G. Sharma & Party; 1 male, Ana Sagar, Ajmer, 9.ii.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Male– Abdomen 27 mm; Hindwing 17 mm. Prothorax azure blue. Thorax azure blue, paling to white below and beneath. Wings hyaline; pterostigma grayish, framed in black sutures. 10 postnodal nervures in forewings, 9 in the hind. Abdomen azure blue, marked with black. Anal appendages superiors black-Final as long as segment 10, inferiors less than half the length of superiors.

*Distribution:* *India:* Assam, West Bengal, Uttar Pradesh, Madhya Pradesh, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu. *Elsewhere:* Australia, Bangladesh, Myanmar, Malaysia, China, Sri Lanka, Java, Philippines, Taiwan, Thailand, Japan, Nepal, Singapore, Papua New Guinea and Vietnam.

### 9. *Pseudagrion rubriceps* Selys, 1876

1876. *Pseudagrion rubriceps* Selys, *Bull. Acad. Belg.*, **42**(2): 510.

1954. *Pseudagrion rubriceps* Lieftinck, *Treubia*, **22** (suppl.): 60.

1983. *Pseudagrion rubriceps* Mitra, *Ent. mon. Mag.*, **119**: 29.

*Material examined*: 1 male, Rupakhada, Rajsamand, 23.ix.2008, Coll. G. Sharma & party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Pushar Lake, Ajmer, 10.ii.2011, Coll. G. Sharma & party.

*Diagnostic characters*: Male– Abdomen 28-29 mm; Hindwing 18-20 mm. Thorax olivaceous green, with a golden tinge as far back as the first lateral suture, the sides azure blue. Wings hyaline; pterostigma strongly braced, covering less than one cell, reddish brown, diamond-shaped; 10 postnodal nervures in forewings, 9 in the hind. Abdomen marked broadly with black on dorsum; segments 1 and 2 oilivaceous green above, azure blue laterally; segment 2 with a goblet-shaped marking on dorsum; segments 3 to 7 black, bronzed green on dorsum, pale greenish laterally; segments 9 and 10 azure blue, unmarked.

*Distribution*: Throughout India. *Elsewhere*: Myanmar, Malaysia, China and Formosa.

### 10. *Rhodischnura nursei* (Morton, 1907)

1907. *Ischnura nursei* Morton, *Trans. Ent. Soc. Lond.*, : 306-307.

1919. *Rhodischnura nursei* Laidlaw, *Rec. Ind. Mus.*, **16**: 171.

*Material examined*: 1 male, Pichhola Lake, Udaipur, 26.ix.2009, Coll. G. Sharma & party; 1 male, Ghana Sagar Lake, Ajmer, 10.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters*: Male– Abdomen 14 mm; Hindwing 9.3 mm. Thorax broadly black on dorsum, marked with narrow green antehumeral stripes. Wings hyaline; pterostigma of forewing diamond-shaped, posterior borders black, costal pale yellow. Abdomen segments 1 to 4 bright crimson, segment 5 and the basal two thirds of 6 pale citron yellow, segments 7 to 10 and the apical third of 6 black, the intersegmental joints finely reddish. Anal appendages reddish or ochreous.

*Distribution*: *India*: Orissa, Uttarakhand, Rajasthan, Maharashtra, Karnataka, Kerala, West Bengal, Bihar. *Elsewhere*: Bangladesh, Pakistan.

### Family PLATYCNEMIDIDAE

### 11. *Copera marginipes* (Rambur, 1842)

1842. *Platycnemis marginipes* Rambur, *Ins. Nevrop.*, p. 240.

1890. *Copera marginipes* Kirby, *Syn. Cat. Neur. Odon.*, p. 129.

*Material examined*: 1 male, Jaisamand Lake, Udaipur, 28.ix.2009, Coll. G. Sharma & Party.

*Diagnostic characters:* Male thorax bronzed black on dorsum for rather more than half way to the humeral suture. Legs variably bright orange to dull reddish. Wings hyaline; pterostigma brown, with a fine frame of yellow and thick black nervures, 12 postnodal nervures to forewing and 9 in the hindwing. Abdomen bronzed black upto segment 8 and 9 and 10 segments pale bluish white. *Distribution: India:* Assam, Bihar, Manipur, West Bengal, Meghalaya, Madhya Pradesh, Maharashtra, Andaman, Rajasthan, Uttarakhand, Himachal Pradesh, Karnataka, Tamil Nadu, Kerala. *Elsewhere:* Myanmar, Sri Lanka, Malaysia, Nepal, Thailand, China, Taiwan, Hongkong.

#### Family PROTONEURIDAE

##### 12. *Disparoneura quadrimaculata* (Rambur, 1842)

1842. *Argia quadrimaculata* Rambur, *Ins. Nevrop.*, p. 255.

1917. *Chloroneura quadrimaculata* Laidlaw, *Rec. Ind. Mus.*, **13**: 323.

1953. *Disparoneura quadrimaculata* Lieftinck, *Treubia.*, **21**: 678.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 2.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male– Abdomen 32 mm; Hindwing 22 mm. Thorax bright brick red on dorsum, paler at the sides, marked with black. Wings hyaline, the forewing pair traversed by a broad blackish-brown fascia, which extends from near the node to half way to the pterostigma. 15 postnodal nervures to forewing and 12 to 13 in the hindwing. Abdomen brick-red, marked with white, brown and black. Anal appendages inferior very short and obtuse, apices black and curled strongly inwards.

*Distribution: India:* Bihar, West Bengal, Madhya Pradesh, Maharashtra, Rajasthan, Karnataka.

#### Family LESTIDAE

##### 13. *Lestes viridulus* Rambur, 1842

1842. *Lestes viridula* Rambur, *Hist. Nat. Ins. Nevrop.*, pp. 252-253.

1890. *Lestes viridulus* Kirby, *Cat. Odon.*, p. 163.

*Material examined:* Recorded from literature.

*Diagnostic characters:* Male thorax pale light brown, dorsum of thorax with two very narrow conspicuous metallic green strips. Wings hyaline; pterostigma light brown, very narrow covering 2 cells. Abdomen pale yellow at the sides and white beneath. Anal appendages yellow, tipped with black, superiors rather longer than segment 10.

*Distribution: India:* Bihar, Orissa, Madhya Pradesh, Maharashtra, Rajasthan, Uttarakhand, Himachal Pradesh, Karnataka, Tamil Nadu and Kerala. *Elsewhere:* Sri Lanka.

## Family CALOPTERYGIDAE

14. *Neurobasis chinensis* (Linnaeus, 1758)

1758. *Libellula chinensis* Linnaeus, *Syst. Nat.*, **10**: 545.

1776. *Agrion nobile* Fabricius, *Gen. Ins.*, p.248.

1890. *Neurobasis chinensis* Kirby, *Syn. Cat. Neur. Odon.*, p.102.

*Material examined*: Recorded from Gomukh, Mount Abu, 31.1.2011, G. Sharma.

*Diagnostic characters*: Male prothorax bronzy-green with a coppery reflex. Thorax brilliant metallic green; humeral and antero-lateral strips blackish-brown; tergum brown, with metallic spots at bases of wings and two coral-white spots. Wings moderately rounded at apices, especially hindwings; forewings considerably longer than hindwings, hyaline tinted with pale yellowish-green, especially along costa and at apex, neuration brilliant emerald-green, especially the costa and main nervures, node thickened and narrowly clouded with brown; hindwings opaque, basal two-thirds appearing brilliant metallic green or peacock-blue according to angle of view, apical third blackish-brown with violaceous reflections and green metallic nervures. Abdomen narrow and cylindrical, much longer than wings, metallic bronzy-green above and at sides, intersegmental joints brighter emerald-green, finely bordered with black; beneath black, segments 9 and 10 whitish.

*Distribution*: *India*: Arunachal Pradesh, Assam, Manipur, Mizoram, Nagaland, Orissa, Maharashtra, Uttarakhand, Uttar Pradesh, Karnataka, Tamil Nadu, Kerala. *Elsewhere*: Bangladesh, Indonesia, Myanmar, Sri Lanka, Laos, Malaysia, Nepal, Thailand, China, Taiwan, Hongkong, Philippines, Yunnan, Vietnam.

## Suborder ANISOPTERA

## Family GOMPHIDAE

15. *Ictinogomphus rapax* (Rambur, 1842)

1842. *Diastatomma rapax* Rambur, *Ins. Neurop.*: 169.

1854. *Ictinus rapax* Selys, *Bull. Acad. Belg.*, **21**(2): 90.

1983. *Ictinogomphus rapax* Mitra, *Ent. Mon. Mag.*, **119**: 30.

*Material examined*: 1 male, Nakki lake, Mount Abu, 23.ix.2009, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 10.iii.2009, Coll. G. Sharma & Party; 1 male, Ana Sagar, Ajmer, 9.ii.2011, Coll. G. Sharma & party.

*Diagnostic characters*: Male prothorax black, marked with yellow. Thorax black, marked with yellow or greenish-yellow. Wings clear or when fully mature, slightly enfumed. Pterostigma black, braced, long, covering 5 to 6 cells; discoidal cell of forewings with 4 cells, of hindwings with 3 cells; subtrigone of forewing with 2 cells, of hindwing with 1

cell; membrane whitish; 3 cubital cells in forewing, 2 in a hindwing; 5 cells in anal triangle. Abdomen black, marked with bright yellow. Anal appendages black, inferior much shorter, deeply bifid, black.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Myanmar and Malaysia.

#### 16. *Paragomphus lineatus* (Selys, 1850)

1850. *Gomphus lineatus* Selys, *Rev. Odon.*, p. 386.

1854. *Onychogomphus lineatus* Selys, *Bull. Acad. Belg.*, **21**: 36.

1934. *Mesogomphus lineatus* Fraser, *Rec. Ind. Mus.*, **26**: 427.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 31.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Male prothorax blackish-brown and a large spot on either side yellow. Thorax sandy yellow, marked with dull or dark brown. Legs yellow, marked with black. Wings hyaline, costa yellow, pterostigma pale reddish brown heavily bordered with black. Abdomen black marked with yellow. Anal appendages dull sandy yellow.

*Distribution:* *India:* Andhra Pradesh, Arunachal Pradesh, Bihar, Orissa, Sikkim, Tripura, West Bengal, Maharashtra, Meghalaya, Rajasthan, Uttarakhand, Karnataka, Tamil Nadu, Kerala, Madhya Pradesh. *Elsewhere:* Nepal, Sri Lanka, Myanmar, Malaysia and Turkey.

#### Family AESHNIDAE

#### 17. *Anax immaculifrons* Rambur, 1842

1842. *Anax immaculifrons* Rambur, *Ins. Nevrop.*, p.189.

*Material examined:* Recorded from Gyan Sarover, Mount Abu, 19.ix.2008, G. Sharma.

*Diagnostic characters:* Male prothorax dark reddish-brown, paler laterally, posterior lobe with heavy fringe of long hairs; thorax pale bluish-green on dorsum, mid-dorsal carina finely blackish-brown; turquoise-blue laterally. Wings hyaline, tinted with amber-yellow from apex to base of discoidal cell, pale at apex; pterostigma ochreous to reddish-brown, covering about 3 cells; membrane black, white at extreme base; discoidal cell of forewing with 5 or 6 cells, 4 or 5 cells in the hind; 5 or 6 cubital nervures in forewing, 4 in the hind; 12 cells in anal loop; Abdomen: Segment 1 entirely jet-black; segment 2 turquoise-blue; segment 3 with its base laterally broadly turquoise-blue; segments 4 to 8 with apical half black; segment 9 black on dorsum, reddish-brown laterally; segment 10 variable, black on dorsum or reddish-brown, with black confined to base. Anal appendages: Constant in shape, pale reddish-brown or ochreous; inferior narrowly triangular, apex notched, and with one or two small spines each side.

*Distribution:* *India:* Bihar, Chandigarh, Eastern Ghats, Maharashtra, Sikkim, West Bengal and Western Himalaya. *Elsewhere:* Sri Lanka.

18. *Anax parthenope* (Selys, 1839)

1839. *Aeshna* (*Anax*) *parthenope* Selys, *Bull. Acad. Belg.*, 6(2): 389.

1991. *Anax parthenope parthenope* Tsuda, *A distributional list of World Odonata*, p. 120.

*Material examined*: Recorded from Pichhola lake, Udaipur, 24.ix.2008, G. Sharma.

*Diagnostic characters*: Male prothorax blackish-brown, yellow laterally; thorax pale olivaceous-brown with sutures finely dark brown. Wings hyaline, enfumed with brown or yellowish brown from apices nearly to discoidal triangles; pterostigma reddish-brown, long and narrow, covering 3 cells; membrane blackish; discoidal triangle of forewing longer and narrower than that of hind, made up of 6 cells, but only 5 in the hind; 4 or 5 cubital nervures in all wings; 13 or 14 cells in anal loop. Abdomen: Segment 1 olivaceous-brown, with a small dark brown spot on each side; segment 2 turquoise-blue; segments 4 to 9 with jugal and accessory lateral sutures or ridges finely black; segment 10 black, with its sides and apical border narrowly bluish-grey.

*Distribution*: *India*: Chandigarh, Himachal Pradesh, Jammu & Kashmir, Uttarakhand, Uttar Pradesh and Western Ghats. *Elsewhere*: Afghanistan, Iraq, South Europe and North Africa.

19. *Hemianax ephippiger* (Burmeister, 1839)

1839. *Aeschna ephippigera* Burmeister, *Handb. Ent. Band.*, 2: 840.

1890. *Hemianax ephippiger* Kirby, *Cat. Odon.*, p. 85.

*Material examined*: Recorded from literature.

*Diagnostic characters*: Male prothorax and thorax palest brown. Legs black, bases of femora reddish-brown. Wings hyaline or palely enfumed, hindwing with a patch of amber yellow, pterostigma bright ochreous, covering nearly 3 cells, very long and narrow. Abdomen bright ochreous marked with azure blue and reddish or blackish brown. Anal appendages: inferior appendages yellow with black spines, superiors dark reddish brown.

*Distribution*: *India*: Assam, Orissa, West Bengal, Rajasthan, Maharashtra, Gujarat, Karnataka, Kerala and Tamil Nadu. *Elsewhere*: Baluchistan, China, Persia, Iraq, Africa, France, Germany, Spain, Switzerland, Greece.

Family LIBELLULIDAE

20. *Acisoma panorpoides* Rambur, 1842

1842. *Acisoma panorpoides* Rambur, *Ins. Neurop.*, p. 28.

1936. *Acisoma panorpoides panorpoides*: Fraser, *Fauna Brit. India Odon.*, 3: 330-331.

*Material examined*: 1 male, Rajsamand lake, Rajsamand, 24.ix.2008, Coll. G. Sharma & party; 1 male, Pandu Pole Sariska, Alwar, 15.ii.2010, Coll. G. Sharma & Party; 1 male, Gyan Sarover, Mount Abu, 31.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Male Prothorax black, with the anterior border of anterior lobe, mid-dorsum of middle lobe, and posterior border and mid-dorsum of posterior lobe pale yellow. Thorax azure-blue marbled with black; sutures all narrowly black. Legs black, femora striped with yellow. Wings hyaline; distal antenodal complete; discoidal field with 2 rows of cells; pterostigma pale yellow between black nervures, covering rather more than 1 cell; membrane brownish. Abdomen azure-blue, marked with black.

*Distribution: India:* Arunachal Pradesh, Assam, Bihar, Chandigarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Punjab, Rajasthan, South India, Uttar Pradesh and west Bengal. *Elsewhere:* Sri Lanka to Philippines and China, Indonesia (Java and Sumatra) and the Celebes.

### 21. *Brachydiplax sobrina* (Rambur, 1842)

1842. *Libellula sobrina* Rambur, *Ins. Nevrop.*, p. 114.

1893. *Brachydiplax sobrina* Kirby, *J. Linn. Soc. Zool.*, **24**: 551.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party.

*Diagnostic characters:* Male Prothorax dark brown. Thorax olivaceous-brown with black or metallic marking. Legs black, anterior femora yellow on inner side. Wings hyaline, uncoloured; pterostigma pale yellow between black nervures, covering 1 and half cells. Abdomen black, pruinose blue in adults and marked with yellow in subadults. Anal appendages black.

*Distribution: India:* Andhra Pradesh, Nagaland, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tripura, Punjab, Rajasthan, Karnataka, Kerala, Uttarakhand, Uttar Pradesh, Tamil Nadu and West Bengal. *Elsewhere:* Bangladesh, Myanmar, Sri Lanka, Thailand and Nepal.

### 22. *Brachythemis contaminata* (Fabricius, 1793)

1793. *Libellula contaminata* Fabricius, *Ent. Syst.*, **2**: 382.

1868. *Brachythemis contaminata*: Brauer, *Verh. Zool.-bot. Ges. Wien.*, **18**: 736.

1936. *Brachythemis contaminata*: Fraser, *Fauna Brit. India Odon.* **3**: 365-366.

*Material examined:* 1 male, Rajsamand lake, Rajsamand, 24.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Keoladeo National Park, Bharatpur, 18.ii.2010, Coll. G. Sharma & party; 1 male, Gyan Sarover, Mount Abu, 31.i.2011, Coll. G. Sharma & party..

*Diagnostic characters:* Male prothorax ochreous, with dark reddish-brown strips traversing anterior and posterior borders of middle lobe; thorax olivaceous-brown, ferruginous, dorsally marked with an obscure reddish-brown humeral strip and two obscure brownish strips on

each side. Wings hyaline, reticulation reddish, with a broad bright orange fascia extending from base to within 2 to 3 cells of pterostigma in forewing and as far as that organ in the hind; pterostigma rust-red, posterior border brown. Abdomen reddish-ochreous, marked with obscure dorsal and subdorsal brown strips; segments 8 and 9 often black on mid-dorsum. Anal appendages ferruginous.

*Distribution:* Throughout India. *Elsewhere:* Bangladesh, Hong Kong, Japan, Malaysia, Nepal, Singapore, Taiwan, Thailand, Sri Lanka, Myanmar, China, Philippines and Indonesia (Java and Sumatra).

### 23. *Bradinopyga geminata* (Rambur, 1842)

1842. *Libellula geminata* Rambur, *Ins. Nevrop.*, p. 90.

1936. *Bradinopyga geminata*: Fraser, *Fauna Brit. Ind. Odon.*, **3**: 349-350.

*Material examined:* 1 male, Stapolia, Rajsamand, 27.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Buda Puskar, Ajmer, 5.iii.2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Gyan Sarovar, Mount Abu, 31.i.2011, Coll. G. Sharma & Party; 1 male, Rajsamand Lake, Rajsamand, 2.ii.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Male prothorax and thorax dirty pale yellow. Legs greyish. Wings hyaline, pterostigma black at centre, pure white at distal and proximal ends. Abdomen black marbled with yellow. Anal appendages pale creamy white.

*Distribution:* India: Bihar, Central India, Haryana, Orissa, Peninsular India, Rajasthan, Uttar Pradesh and West Bengal.

### 24. *Crocothemis servilia* (Drury, 1770)

1770. *Libellula servilia* Drury, *III. Ex. Ins.*, **1**: 112.

1936. *Crocothemis servilia servilia*: Fraser, *Fauna Brit. India Odon.*, **3**: 345-347.

*Material examined:* 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Stapolia, Rajsamand, 27.ix.2008, Coll. G. Sharma & party; 1 male, Buda Puskar, Ajmer, 5.iii.2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 18.ii.2010, Coll. G. Sharma & party; 1 male, Gyan Sarovar, Mount Abu, 31.i.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male thorax bright ferruginous, often blood-red on dorsum. Wings hyaline, bases of all marked with rich amber-yellow to as far distal as the cubital nervure in forewing and to first antenodal nervure nearly to arc and including the tornal angle in hindwing; apices of wings lined narrowly with pale brown in old specimens; pterostigma

dark ochreous between blackish nervures; membrane dark reddish-brown. Abdomen blood-red, segments 8 and 9 with mid-dorsal carina blackish. Anal appendages blood-red.

*Distribution:* Throughout India. *Elsewhere:* Mesopotamia, Sri Lanka, Myanmar, South Asia to Japan, Philippines, Australia and Sundaic Archipelago.

**25. *Diplacodes lefebvrei* (Rambur, 1842)**

1842. *Libellula lefebvrei* Rambur, *Ins. Nevrop.*, p. 112.

1889. *Diplacodes tetra* Kirby, *Trans. Zool. Soc. Lond.*, 12: 308.

1890. *Diplacodes ramburi* Kirby, *Cat. Odon.*, p. 42.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party.

*Diagnostic characters:* Male Prothorax, thorax, abdomen and legs entirely black. Wings hyaline, clouded with blackish brown from node to apex, subtrigone in forewing 1 or 2 celled. Pterostigma brown above, white beneath, between thick black nervures. Anal appendages black.

*Distribution:* *India:* Chandigarh, Rajasthan, Tamil Nadu, Kerala and Karnataka. *Elsewhere:* Africa and Mesopotamia.

**26. *Diplacodes nebulosa* (Fabricius, 1793)**

1793. *Libellula nebulosa* Fabricius, *Ent. Syst.*, 2: 379.

1954. *Diplacodes nebulosa* Lieftinck, *Treubia.*, 22(suppl.): 146.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & Party; 1 male, Fateh Sagar Lake, Udaipur, 2.ii.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Male Prothorax, thorax, abdomen and legs entirely black. Wings with all apices blackish brown as far inwards as proximal end of pterostigma, pterostigma dark reddish-brown between thick black nervures. Anal appendages black.

*Distribution:* *India:* Andhra Pradesh, Assam, Orissa, West Bengal, Sikkim, Meghalaya, Uttar Pradesh, Uttarakhand, Himachal Pradesh, Rajasthan, Tamil Nadu, Kerala, Karnataka and Madhya Pradesh. *Elsewhere:* China, Java, Myanmar, Sri Lanka, Malaysia, Nepal, Philippines, Thailand, Australia, Singapore and Papuan Region.

**27. *Diplacodes trivialis* (Rambur, 1842)**

1842. *Libellula trivialis* Rambur, *Ins. Nevrop.*, p. 115.

1911. *Diplacodes trivialis*: Ris, *Cat. Coll. Selys Lib.*, 12: 462.

1936. *Diplacodes trivialis*: Fraser, *Fauna Brit. India Odon.*, 3: 336-338.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Stapolia, Rajsamand, 27.ix.2008, Coll. G. Sharma & party; 1 male, Buda Puskar, Ajmer, 5.iii.2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Gyan Sarovar, Mount Abu, 31.i.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male Prothorax pale yellow to black; thorax greenish yellow. Legs greenish yellow or black. Wings hyaline, minute yellow point in cubital space of hindwing. Abdomen with segments 1 to 3 greenish yellow. Anal appendages bright yellow.

*Distribution:* Throughout India. *Elsewhere:* Australia, China, Japan, Nepal, Taiwan, Micronesia, Sri Lanka, Myanmar, Formosa and Philippines.

#### 28. *Hydrobasileus croceus* Brauer, 1867

1867. *Tramea croceus* Brauer, *Verh. Zool.-bot. Ges. Wien.*, **17**: 813.

1904. *Hydrobasileus extraneus* Martin, *Mission Pavie, Zool.*, p. 4.

*Material examined:* Recorded from literature.

*Diagnostic characters:* Male Prothorax olivaceous with a golden tinge; thorax rich olivaceous suffused with golden reddish brown. Wings palely tinted throughout with burnt brown or golden amber, base of hindwing along posterior border marked with a moderately broad dark reddish brown fascia, which starting from tornal angle, extends into distal angle of anal loop. Abdomen olivaceous, changing to reddish or ochreous towards anal end, marked with black. Anal appendages reddish brown.

*Distribution:* India: Andhra Pradesh, Assam, Orissa, Meghalaya, Madhya Pradesh, Maharashtra, Rajasthan, Karnataka and Kerala. *Elsewhere:* Bangladesh, Hong Kong, China, Indonesia, Japan, Laos, Myanmar, Malaysia, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam and Philippines.

#### 29. *Neurothemis fulvia* (Drury, 1773)

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

1842. *Polyneura fulvia* Rambur, *Ins. Nevrop.*, p. 129.

1889. *Neurothemis fulvia* Kirby, *Trans. Zool. Soc. Lond.*, **12**: 271.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party.

*Diagnostic characters:* Male prothorax, thorax and abdomen uniform reddish-brown, sutures and borders of latter finely black. Wings opaque dark reddish-brown except for an irregular triangular area at apices of wings which is clear and uncoloured; this area meeting

border of wing posteriorly; margin of dark area beginning slightly nearer proximal end of pterostigma and running straight backwards in forewing, obliquely basalwards in hindwing, but with very irregular crenate margin the dark area presenting clear amber-tinted areas in costal and basal spaces, base of hypertrigones, space distal to arc, and at node and subnode; the whole of the dark area very finely and closely reticulated by bright yellow nervures except in the clear spaces; antenodals and postnodals adjacent the node breaking up into a network of secondary neurulation; 10 cubital nervures in forewing, 6 in the hind; pterostigma dark reddish-brown; membrane blackish-brown.

*Distribution: India:* Arunachal Pradesh, Manipur, Mizoram, Nagaland, Orissa, Tripura, Meghalaya, Madhya Pradesh, West Bengal, Assam, Maharashtra, Uttarakhand, Kerala, Karnataka, Tamil Nadu. *Elsewhere:* Bangladesh, Malaysia, Taiwan, Hong Kong, Indonesia, Myanmar, Nepal, China, Laos and Thailand.

### 30. *Neurothemis tullia* (Drury, 1773)

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

1793. *Libellula lineata* Fabricius, *Ent. Syst.*, 2: 375.

1931. *Neurothemis tullia feralis* Ris, *Cat. Coll. Selys, fasc.*, 13: 551.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Trevor point, Mount Abu, 1.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male prothorax, thorax and abdomen black, mid-dorsal carina of thorax narrowly yellow; a broad mid-dorsal interrupted creamy-white strip on segments 1 to 8. Wings hyaline for apical half, opaque steely blue-black for basal half, the border of this opaque area running in both fore and hindwings from costal border, one cell distal to node in forewing, two or three cells distal in hind, to the posterior border of wings in a convex curve; a broad opalescent white band bordering the black area in both wings; Pterostigma dull ochreous bordered with black; membrane black. Anal appendages creamy-white tipped with black.

*Distribution: India:* Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Nagaland, Orissa, Rajasthan, Tripura, Meghalaya, Madhya Pradesh, West Bengal, Maharashtra, Uttarakhand, Uttar Pradesh, Kerala, Karnataka, Tamil Nadu. *Elsewhere:* Bangladesh, Malaysia, Taiwan, Hong Kong, Indonesia, Myanmar, China, Sri Lanka and Thailand.

### 31. *Orthetrum glaucum* (Brauer, 1865)

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

1890. *Orthetrum glaucum*: Kirby, *Syn. Cat. Neur. Odon.* p. 39.

1936. *Orthetrum glaucum*: Fraser, *Fauna Brit. India Odon.* 3: 307-309.

*Material examined:* 1 male, Nakki Lake, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Kumaria,

Rajsamand, 23.ix.2008, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & Party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Nahargarh Biological Park, Jaipur, 4.ii.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Male— Abdomen 29-35 mm; Hindwing 33-40 mm. Prothorax bright yellow to dark brown marked with yellow; thorax dark dull blue or black with a very thin pruinescence. Wings hyaline, with extreme base tinted with dark amber-yellow; pterostigma dark ochreous between thick black nervures; covering 2 cells; membrane black. Abdomen ventro-dorsally dilated at segments 1 to 3, then very slim and of even width to the end, pale dirty blue from segment 1 to apical end of segment 8, black for the remainder. Anal appendages black.

*Distribution:* Throughout India. *Elsewhere:* Afghanistan, Bangladesh, Hong Kong, Indo-China, Japan, Laos, Myanmar, Malaysia, Nepal, Singapore, Sri Lanka, Taiwan, Thailand, Tibet, Vietnam, Yunnan and Philippines.

### 32. *Orthetrum pruinosum neglectum* (Rambur, 1842)

1842. *Libellula neglecta* Rambur, *Ins. Neurop.*, p.86.

1909. *Orthetrum pruinosum neglectum*: Ris, *Cat. Coll. Selys fasc.*, **9**: 181.

1936. *Orthetrum pruinosum neglectum*: Fraser, *Fauna Brit. India Odon.*, **3**: 311-312.

*Material examined:* 1 male, Nakki Lake, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1 male, Akbarpur Sariska, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Rajsamand Lake, Rajsamand, 2.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male Prothorax and thorax reddish-brown to dull purple according to amount of pruinescence present. Wings hyaline, enfumed pale brown especially towards apices in old adults, and with a reddish-brown basal marking extending distalwards in hindwing to first antenodal nervure; only a vestige of this in forewing; pterostigma reddish-brown to black, covering 2 cells; membrane black. Abdomen bright vermilion-red in subadults, purplish-red in adults, due to pruinescence. Anal appendages red.

*Distribution:* Throughout India. *Elsewhere:* Afghanistan, Bangladesh, Singapore, Thailand, Taiwan, Vietnam, Hongkong, Java, Nepal, Philippines, Yunnan, Sri Lanka and Myanmar.

### 33. *Orthetrum sabina* (Drury, 1770)

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

1889. *Orthetrum sabina*: Kirby, *Trans. Zool. Soc. Lond.* **12**: 302.

1936. *Orthetrum sabina sabina*: Fraser, *Fauna Brit. India Odon.* **3**: 300-302.

*Material examined:* 1 male, Nakki Lake, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1 male, Akbarpur Sariska, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 18.ii.2010, Coll. G. Sharma & party; 1 male, Fateh Sagar Lake, Udaipur, 2.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male Prothorax bright yellow, with anterior and middle lobes blackish brown posteriorly; thorax greenish-yellow, marked with black as follows: sutures all finely black; an antehumeral strip narrow and is outlined in black. Wings hyaline; only slightly enfumed at apices and borders of wings; pterostigma black with middle ochreous, covering 2 cells; membrane dark brown; are situated opposite the second antenodal nervure or between the first and second. Abdomen greenish-yellow, marked with black as follows: Apical borders and jugal sutures of segments 1 to 3 all finely black; segments 4 to 6 with a broad oval dorsal black spot on basal third of segments which is continued finely along mid-dorsal carina to become confluent with very broad apical black rings on 4 and 5 and a narrow one on segment 6; segments 7 to 9 black; 10 with base broadly. Anal appendages creamy-white in colour, with a row of very small black teeth or spines below superiors.

*Distribution:* Throughout India. *Elsewhere:* Myanmar, Bangladesh, China, Sri Lanka, Cyprus, Formosa, Java, Philippines, Nepal, Syria, Singapore, Indonesia, Thailand, Africa, Somaliland, Mesopotamia, Persia to Samoa and Australia.

#### 34. *Orthetrum taeniolatum* (Schneider, 1845)

1845. *Libellula taeniolata* Schneider, *Stett. Ent. Zeit.* 6: 111.

1890. *Orthetrum taeniolatum* Kirby, *Cat. Odon.* p.37.

*Material examined:* 1 male, Rupakhada, Rajsamand, 23.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Rajsamand Lake, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Puskar Forest Area, Ajmer, 4.iii.2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Gyan Sarovar, Mount Abu, 31.i.2011, Coll. G. Sharma & Party; 1 male, Pichhola Lake, Udaipur, 2.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male prothorax and thorax uniform pulverulent blue. Legs black, hinder surface yellow. Wings hyaline, rarely enfumed; pterostigma ochreous between thick black nervures, covering 2½ cells; membrane very narrow, cinereous; 2 rows of cells between IRiii and Rspl; costal nervure finely yellow, especially distal to the node. Abdomen pulverulent blue. Anal appendages black; inferiors appendages triangular, slightly shorter than superiors.

*Distribution: India:* Arunachal Pradesh, Bihar, Sikkim, West Bengal, Nagaland, Uttar Pradesh, Kashmir, Himachal Pradesh, Rajasthan, Madhya Pradesh. Karnataka, Kerala, Tamil Nadu, Madhya Pradesh, Gujarat and Maharashtra. Elsewhere: Baluchistan, Myanmar, Sri Lanka, Iran, Nepal, Greece, Turkey, Somali.

### 35. *Othertrum triangulare* (Selys, 1878)

1878. *Libellula triangularis* Selys, *Mitt. Mus. Dresden.*, p. 314.

1909. *Orthetrum triangulare triangulare*: Ris, *Cat. Coll. Selys fasc.*, **9**: 181.

1936. *Orthetrum triangulare triangulare*: Fraser, *Fauna Brit. India Odon.*, **3**: 305-307.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Gyan Sarovar, Mount Abu, 31.i.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male prothorax and thorax velvety black. Legs black. Wings hyaline, with a broad triangular blackish-brown spot at base of hindwing which extends irregularly to the third antenodal nervure; a vestige of same in forewings extending to the first antenodal nervure; pterostigma black, covering 2 cells; membrane black. 2 rows of cells between IRiii and Rspl; Cuii arising from the posterior angle of discoidal cell in hindwing; discoidal cell of forewing 3-celled, 2-celled in the hind; 4 cells in subtrigone of forewing. Abdomen broad at base, then tapered gradually to the anal end, strongly carinated from segments 3 to 9; pruinosed palest azure-blue except segment 1, sides of segment 2, and whole of segments 8 to 10. Anal appendages black.

*Distribution: India:* Arunachal Pradesh, Manipur, Mizoram, Nagaland, Sikkim, West Bengal, Assam, Kashmir, Uttarakhand, Uttar Pradesh, Kerala, Karnataka, Tamil Nadu. *Elsewhere:* Myanmar, Sri Lanka, Nepal, Afghanistan, China, Laos, Thailand, Vietnam.

### 36. *Palpopleura sexmaculata* (Fabricius, 1787)

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

1936. *Palpopleura sexmaculata sexmaculata* Fraser, *Fauna Brit. Ind. Odon.*, **3**: 318-320.

*Material examined:* 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Satpolia, Rajsamand, 27.ix.2008, Coll. G. Sharma & party; 1 male, Buda Puskar, Ajmer, 5.iii.2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 18.ii.2010, Coll. G. Sharma & party; 1 male, Gyan Sarovar, Mount Abu, 31.i.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male prothorax dark brown, with posterior collar and a geminate spot on dorsum of middle lobe bright yellow; thorax pale greenish-yellow, marked with dark brown and black. Wings hyaline marked with black; hindwings usually tinted with yellow from base to proximal end of pterostigma. A black spot at node in forewing covering from  $\frac{1}{2}$  to  $1\frac{1}{2}$  cells proximal to node; a black streak in subcostal space extending from base for two thirds its length to node and overlapping costal space for a few cells near its middle, another streak between sectors of arc occupying from 2 to 5 cells, a third strip in cubital space extending from base nearly to or right up to discoidal cell. Similar streaks in the hindwing, but the subcostal strip not extending into costal space, the intersector strip absent. Pterostigma black. Abdomen pruinose light blue, sides of segments 1, 2, and base of 3 yellow, beneath yellow, with a median strip of black. Anal appendages black.

*Distribution:* India: Arunachal Pradesh, Assam, Bihar, Manipur, Mizoram, Nagaland, Sikkim, Tripura, Orissa, Himachal Pradesh, Uttarakhand, Uttar Pradesh, Madhya Pradesh, West Bengal, Kerala, Karnataka and Tamil Nadu. *Elsewhere:* Afghanistan, Hong Kong, Laos, Sri Lanka, Nepal, Myanmar, China, Malaysia, Thailand, Yunnan and Vietnam.

### 37. *Pantala flavescens* (Fabricius, 1798)

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

1861. *Pantala flavescens* Hagen, *Syn. Neur. N. Amer.* 142.

1936. *Pantala flavescens* Fraser, *Fauna Brit. India Odon.* 3: 414-416

*Material examined:* 1 male, Nakki Lake, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Rajsamand Lake, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1 male, Kalighati, Sariska Forest Area, Alwar, 16.ii.2010, Coll. G. Sharma & party; 1 male, Rajsamand Lake, Rajsamand, 2.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male prothorax rich ochreous, with a transverse belt of dark reddish-brown between anterior and middle lobes; thorax olivaceous or ferruginous, coated thickly with yellowish hairs, paler laterally. Wings hyaline, with base of hindwing pale golden-yellow as far distal as anal loop and with a narrow apical brown spot limited to posterior border of wing; pterostigma bright ochreous or reddish-brown. Abdomen bright ochreous, dorsum tinted with bright brick red, sides of segments 1 to 4 pale yellow; segments 8 to 10 with sharply-defined black mid-dorsal pyriform spots. Anal appendages ochreous, changing to black towards apex; superiors about as long as segments 9 and 10 taken together, slim, but dilated at apical half and acuminate at apex.

*Distribution:* Throughout India. *Elsewhere:* Cosmopolitan.

### 38. *Rhyothemis variegata* (Linnaeus, 1763)

1763. *Libellula variegata* Linnaeus, *Amoenitates Acad.*, 6: 412.

1913. *Rhyothemis variegata* Ris, *Cat. Coll. Selys Lib. Fasc.*, 15: 931.

*Material examined*: 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party.

*Diagnostic characters*: Male prothorax black; thorax dark metallic green. Legs and abdomen entirely black. Wing markings as follows: Forewing, apical marking usually slightly less extensive, nodal spot more extensive, often extending posteriorly to as far as Riv+v, occasionally small spots at proximal end of subcostal space and another at origin of sectors of arc; hindwing with basal fasciae more extensive, extending distally to slightly beyond discoidal cell and well beyond anal loop to the level of Cuii; the posterior border of posterior fascia with a small rounded notch; in addition, a large spot at middle of IRiii, another similar spot at middle of MA. Anal appendages rather long slim, slightly sinuous.

*Distribution*: *India*: Arunachal Pradesh, Manipur, Orissa, Himachal Pradesh, Uttar Pradesh, Meghalaya, Maharashtra, Madhya Pradesh, Little Andaman, West Bengal, Kerala, Karnataka and Tamil Nadu. *Elsewhere*: Bangladesh, Sri Lanka, Nepal, Myanmar, Malacca, Indonesia, China, Malaysia, Yunnan and Vietnam.

### 39. *Tholymis tillarga* (Fabricius, 1798)

1798. *Libellula tillarga* Fabricius, *Ent. Syst. Suppl.*, p. 285.

1867. *Tholymis tillarga* Lieftinck, *Treubia.*, 22 (suppl.): 161.

*Material examined*: 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Trevor Point, Mount Abu, 24.ix.2009, Coll. G. Sharma & party.

*Diagnostic characters*: Male prothorax and thorax golden-yellow or olivaceous. Legs ochreous. Wings hyaline, with a broad fan-shaped, smoky, golden-brown fascia extending from node to base of hindwing, very deep in colour at node and somewhat longitudinally striated, paling towards base and posterior border of wing; this fascia bordered distally by a broad oval opalescent white spot about 4 cells deep; pterostigma reddish-brown between dark nervures; membrane blackish-brown, paler along attachment. Abdomen bright rust-red, especially on dorsum, paler at sides of basal segments. Anal appendages ochreous or reddish; superiors as long as segments 9 and 10 taken together, long, slim, acuminate at apex.

*Distribution*: *India*: Assam, Bihar, Manipur, Mizoram, Nagaland, Orissa, Arunachal Pradesh, Meghalaya, Maharashtra, Madhya Pradesh, Goa, West Bengal, Kerala, Karnataka and Tamil Nadu. *Elsewhere*: Africa, America, Australia, Bangladesh, Sri Lanka, Nepal, Micronesia, Tibet, Japan, Laos, Vietnam, Myanmar, Malacca, Indonesia, China and Malaysia.

### 40. *Tramea basilaris burmeisteri* Kirby, 1889

1862. *Libellula basilaris* Hagen, *Peters, Reise n. Mossambique, Zool.* 5: 105.

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

*Material examined:* 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Fateh Sagar Lake, Udaipur, 2.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male prothorax yellowish; thorax olivaceous, with a reddish tinge on dorsum. Wings hyaline, hindwing with a rather variable dark reddish brown marking at base, usually limited to cubital space, base of discoidal cell and hypertrigone, extreme base of anal loop and anal area adjoining cubital space, this marking narrowly confluent with a larger, broader and curved stripe running from midrib of anal loop to tornal angle, venation in this dark area bright yellow. Pterostigma bright ochreous. Abdomen bright brick-red, marked with black. Anal appendages dark reddish brown to black.

*Distribution: India:* Bihar, Madhya Pradesh, Orissa, West Bengal, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Tamil Nadu, Kerala, Karnataka, Maharashtra and Uttar Pradesh. *Elsewhere:* Myanmar, Sri Lanka, Nepal, Indonesia, Tibet, Indo-Malaya, Japan, Thailand and Vietnam.

#### 41. *Tramea limbata* (Desjardins, 1832)

1832. *Libellula limbata* Desjardins, *Rapport Soc. Maurice.*, p.1.

1889. *Tramea limbata* Kirby, *Trans. Zool. Soc. Lond.*, **12**: 318.

*Material examined:* Recorded 1 male, Jal Mahal, Jaipur, 5.iii.2009, G. Sharma.

*Diagnostic characters:* Male prothorax dark brown; thorax olivaceous with a reddish suffusion. Wings hyaline, reticulation red towards base of wings; base of hindwing with an extremely variable blackish-brown marking in which the nervures are reddish. Abdomen blood-red marked with black.

*Distribution: India:* Assam, Peninsular India, Southern India. *Elsewhere:* Sri Lanka, Africa, Madagascar, South Asia, Sundaic Archipelago, Australia.

#### 42. *Tramea virginia* (Rambur, 1842)

1773. *Libellula chinensis* De Geer, *Mem. Ins.*, **3**: 556.

1890. *Tramea virginia* Kirby, *Cat. Odon.*, p. 3.

*Material examined:* 1 male, Pichhola Lake, Udaipur, 2.ii.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Male prothorax dark ochreous, with a black strip between anterior and middle lobes; thorax dark olivaceous-green. Wings hyaline, with reddish reticulation at basal half, tinted with amber-yellow and enfolded more or less, especially towards apices and along posterior border of wings; base of forewings tinted with golden-amber to as far as basal antenodal nervure and cubital nervure; base of hindwing with a very broad, very dark burnt-brown or reddish-brown mark extending distally to one cell; venation within this mark a very close bright red network of cells. Membrane blackish-brown, paler along free border;

pterostigma dark ochreous. Abdomen bright brick-red, marked with black on last three segments. Anal appendages black, red at extreme base.

*Distribution: India:* Bihar, Mizoram, Orissa, West Bengal, Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Great Nicobar Island, Andaman, Tamil Nadu and Uttar Pradesh. *Elsewhere:* Myanmar, Indonesia, China, Japan, Micronesia, Siam, Bangladesh, Hongkong, Malaysia, Thailand, Taiwan and Vietnam.

#### 43. *Trithemis aurora* (Burmeister, 1839)

1839. *Libellula aurora* Burmeister, *II & b, Ent.* **2**: 859.

1868. *Trithemis aurora*: Brauer, *Verh. zool. bot. Ges. Wien.* **18**: 177.

1936. *Trithemis aurora*: Fraser, *Fauna Brit. India Odon.* **3**: 383-385.

*Material examined:* 1 male, Nakki Lake, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Puskar forest area, Ajmer, 4.iii.2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 7.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male Prothorax reddish-brown, anterior lobe pale brown, anterior half of middle lobe and base of posterior lobe black. Thorax dull purple due to a thin pruinescence overlaying a reddish ground-colour; an obscure superior humeral brown strip and a narrow black strip on postero-lateral suture with an angular black line crossing it. Wings hyaline, with crimson reticulation and a broad amber-yellow fascia at base of wings, with darker brown rays in subcostal and cubital spaces. Abdomen swollen dorso-ventrally at base, then slightly constricted at segment 3 and again dilated fusiformly, depressed and rather broad; violaceous throughout, segment 9 laterally at ventral border and segment 10 at base marked with black. Anal appendages red.

*Distribution:* Throughout India. *Elsewhere:* China, Formosa, Nepal, Malaysia, Pakistan, Philippines, Thailand, Singapore, Taiwan, Indonesia, Japan, Laos, Vietnam.

#### 44. *Trithemis festiva* (Rambur, 1842)

1842. *Libellula festiva* Rambur, *Ins. Neurop.* p. 92.

1868. *Trithemis festiva* Brauer, *Verh. zool. bot. Ges. Wien.* **18**: 736.

1936. *Trithemis festiva* Fraser, *Fauna Brit. India Odon.* **3**: 387-389.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1 male, Buda Puskar, Ajmer, 5.iii.2009, Coll. G. Sharma & party; 1 male, Sikar Forest Area, Sikar, 7.iii.2009, Coll. G. Sharma &

Party; 1 male, Forest around Amber Fort, Jaipur, 14.ii.2010, Coll. G. Sharma & party; 1 male, Trevor point, Mount Abu, 1.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male prothorax dark blue; thorax black, coated with a thin purplish pruinescence. Wings hyaline, with a dark opaque brown mark at base of hindwing, dark rays in subcostal and cubital spaces as far as cubital nervure and extending in a curve posteriorly as far as the limit of membrane, which is dark with paler attached border; pterostigma black. Abdomen black, segments 1 to 3 with a thin bluish pruinescence. Anal appendages black.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Myanmar, Bhamo, Celebes, China, Hong Kong, Indonesia, Japan, Kampuchea, Laos, Malaysia, Nepal, Pakistan, Philippines, Singapore, Taiwan, Thailand, Tibet, Timor and Vietnam.

#### 45. *Trithemis kirbyi* Selys, 1891

1891. *Trithemis kirbyi* Selys, *Ann. Mus. civ. Genova.*, **30**: 465.

1912. *Trithemis kirbyi kirbyi* Ris, *Cat. Coll. Selys. fasc.*, **14**: 760.

*Material examined:* 1 male, Puskar forest area, Ajmer, 4.iii.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Male prothorax ochreous, with a black collar. Thorax olivaceous to golden-brown, tinted with rose-red. Wings hyaline, neuration including costa, bright red; a broad basal bright reddish-yellow marking to all wings, rather variable and extent in subcostal and cubital spaces, discoidal cell and central portion of anal area of hindwing. Pterostigma black, with a narrow red stripe at its middle. Abdomen brilliant vermilion red. Anal appendages bright red.

*Distribution:* India: Maharashtra, Karnataka, Tamil Nadu. *Elsewhere:* Sri Lanka.

#### 46. *Trithemis pallidinervis* (Kirby, 1889)

1889. *Sympetrum pallidinervis* Kirby, *Trans. Zool. Soc. Lond.*, **12**: 327.

1954. *Trithemis pallidinervis* Lieftinck, *Treubia.*, 22 (suppl.). p. 156.

*Material examined:* 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Buda Puskar, Ajmer, 5.iii.2009, Coll. G. Sharma & party; 1 male, Gyan Sarovar, Mount Abu, 31.i.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Male prothorax dull brown or black with the anterior border of anterior lobe narrowly yellow and a large medial and a lateral spot on middle lobe. Thorax olivaceous-brown on dorsum and upper part of sides, brighter olivaceous on lower part of sides, dorsum thickly coated with grayish hairs; a dark brown triangle on mid-dorsum and three black strips on each side. Wings hyaline, with reddish reticulation, and a bright amber-

yellow basal marking at extreme base in forewing, but extending distally to first antenodal nervure and slightly over cubital nervure in the hindwing; pterostigma black with creamy-white ends; membrane brown. Abdomen long and slender, of nearly even width throughout; black, marked with bright yellow.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Myanmar, Bhama, China, Formosa, Nepal, Philippines, Singapore, Taiwan and Thailand.

#### 2.4 Discussion

On the basis of total number of species, family Libellulidae was the most dominant family of order Odonata, represented by 27 species, followed by Coenagrionidae (10 species), Aeshnidae (3 species), Gomphidae (2 species), Calopterygidae, Lestidae, Platycnemididae

and Protoneuridae each having 1 species. The dominance of family Libellulidae was reported by many earlier workers as Kumar and Mitra (1998) recorded 42 species from Sahstradhara, Dehradun, out of which 18 species represented family Libellulidae; Prasad (2002) recorded 162 species from Western Himalaya, out of which 42 species represented family Libellulidae; Kumar (2002) recorded 109 species in Jharkhand state, out of which 40 species represented family Libellulidae; Vashishth *et al.* (2002) recorded 17 species in Rajaji National Park, out of which 9 species represented family Libellulidae; Kandibane *et al.* (2005) recorded 12 species of odonates in an irrigated rice field of Madurai, out of which 7 species represented family Libellulidae; Emiliyamma (2005) recorded 31 species of odonates in the Kottayam district, out of which 18 species represented family Libellulidae, Emiliyamma *et al.* (2005) recorded 137 species of odonates from Kerala, out of which 56 species represented family Libellulidae and Sharma and Joshi (2007) recorded 30 species of odonates in Dholbaha Dam, Punjab, out of which 18 species represented family Libellulidae.

Hurd *et al.* (1971) stated that the abundance of one group of insects is to have little effect on the other species in a stable ecosystem. The adults of dragonfly and damselfly preferred tillering stage of the diversified ecosystem as they create a favourable microclimate for the abundance of dragonfly and damselfly species. This is in consonance with the view of MacArthur (1965) who stated that the adjustment in species abundance is more in diversified ecosystem. Therefore, the present study reveals that Rajasthan state is rich in Odonata fauna and provided a suitable natural habitat for their existence and alternatively acts as natural biological control agent against pests and noxious insects.

**Role as Biological Control Agent:** Odonates found near any inland wetlands. They lead a bimodal life: adults are aerial whereas larvae are purely aquatic. Larval odonates form a high proportion of biomass in freshwaters, and thus, occupy an important position in the energy flow pathway of the freshwater ecosystems. As dominant members of the benthic and littoral fauna, they are considered as promising organisms for bio-monitoring the organic pollution. Larval odonates devour mosquito larvae as well as other harmful organisms and

prove themselves a friend of mankind. Their mere presence in any habitat shows the conditions are varied, congenial and healthy, supporting diversified faunal components, which in turn are supported by complex flora. The complex flora allows for a greater diversity of faunal components and more complex food webs (Boyd, 1971). The Odonate population is steadily on decline due to rapid industrialization, urbanization as well as the related disappearance of natural habitats. So, it is high time to take effective measures to stop the disappearance of Odonata habitat, to increase their population and conservation of these elegant flies. Needless to say, the dragonflies and damselflies have their own role in ecobalance. Thakur (1985) studied feeding behaviour of odonates at Kailana lake, Jodhpur, Rajasthan.

Bohra (2002) studied on the food and feeding habits of trophically distinct aquatic odonate larvae of Udhuwa lake in Santal Pargana, Jharkhand and recorded food preference of damselflies larvae on rhizophora, cladocera, aquatic insects, rotifers, copepoda and algae and for dragonflies larvae utterly different as cladocera, rotifers, aquatic insects, copepoda, algae and lastly rhizophora. Roy (2002) studied on seasonal variations in the energy contents, productivity in terms of  $g/m^2/month/year$ , food and feeding biology and foraging ratio of three species *Mesogomphus lineatus* Selys, *Cordulegaster* sp. and *Ischnura* sp. at Bhagalpur, Bihar. Khaliq (2002) carried out studies in Poonch and Bagh districts of Pakistan Occupied Kashmir on potential of 11 species of dragonflies as bio-control agents of insect pests of rice, feeding on yellow and white stem borers, hairy caterpillar, rice skippers, white-backed plant hoppers, white and green leafhoppers, rice bugs, cicadellid leafhoppers and grasshoppers respectively and got excellent results of natural pest control as compared to other agricultural fields. Lawton, 1970, Benke, 1976, Roy, 1984, Kumar, 1996 reveals that odonates larvae are top carnivores and play a significant role in limiting the numbers of organisms present at the lower trophic levels of the food chain. These larvae are feeding on various zooplanktons, aquatic insects, fish spawns, fish fry and fingerlings and are secondary and tertiary consumers. In the absence of these top carnivores, no balanced ecosystems could continue to persist. Therefore, the ecosystems can be manipulated and monitored with the help of organisms occupying at the apex of the food chain. According to Lotka (1924) and Volterra (1925) a predator population is prerequisite in keeping the ecosystem in a state of balance.

**Need for Conservation:** Odonates are part of biodiversity, so it should be conserved. They have its own cultural value *i.e.* owing to the size, these diurnal flying insects has brought the attention of people, so that they are included in the folklore of many countries and they are the subject of poetry and painting. They are considered as potential bio-indicator, used to assess the water quality as they are less sensitive compared to other aquatic organisms. Some species are endemic or habitat specific and so can be used for mapping of the habitats which they represent. They are used as bio-control agents of certain vectors like mosquitoes. The advancement in the aeronautic science is mainly due to the knowledge obtained from the flight principles of the dragonflies. Odonates being large and conspicuous draw attention to invertebrates and therefore there is need for conservation.

Around 499 species and subspecies of odonates recorded from India that forms about 10% of the world odonate fauna. This rich diversity is fast disappearing due to destruction of their breeding and resting habitats. *Epiophlebia laidlawi* Tillyard was reported from Darjeeling, India, the only representative of suborder Anisozygoptera, having only two species worldwide *i.e.* *Epiophlebia laidlawi* Tillyard from Himalayas and *Epiophlebia superstes* Selys from Japan, these species having mixed characters of damselflies and dragonflies. These endemic species are more important to science, which need proper protection. Identifying the priority species that require immediate attention is the first step in conservation action. Species prioritization of the dragonflies and damselflies of India is a prerequisite for Odonata conservation. In India only *Epiophlebia laidlawi* Tillyard is protected in Schedule I, Part IV under Indian Wildlife (Protection) Act, 1972 and worldwide four species of Odonates *i.e.* *Cephalaeschna acutifrons* (Vulnerable) *Acanthaeschna victoria* (Vulnerable), *Burmagomphus sivalikensis* (Critically endangered) and *Epiophlebia laidlawi* (Vulnerable) are listed in the IUCN Red List of Threatened Species, 2011. In Aravalli Range of Rajasthan habitats of odonates species such as *Anax immaculifrons* Rambur, *Disparoneura quadrimaculata* (Rambur), *Neurobasis chinensis* (Linnaeus), *Neurothemis fulvia* (Drury), *Neurothemis tullia* (Drury), *Orthetrum triangulare* (Selys), *Rhyothemis variegata* Linnaeus, *Trithemis kirbyi* Selys and *Tramea virginia* (Rambur) etc. needs conservation. Odonates conservation cannot be treated separately since the national programmes such as formation of National Parks take care of invertebrates also. But many of the odonates extent range area that does not come under any of the national programmes have to be focused. Many locally endemic odonates species will be lost because of their susceptibility to habitat loss.

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## Chapter III

### Lepidoptera (Butterflies and Moths)

#### 3.1 Introduction

The order Lepidoptera belongs to holometabolous endopterygotes, scale-winged insects, divided mainly into two suborders, *viz.*, Rhopalocera (Butterflies) and Heterocera (Moths). A recent estimate shows the occurrence of about 17,200 species of butterfly throughout the world, of which 1,501 species of butterfly are known from India and around 1,27,000 species of Moths recorded from the world, of which 12,000 species are recorded from India (Alfred *et al.*, 1998; Gupta and Mondal, 2005; Kehimkar, 2008). Butterflies are the most beautiful and attractive than most other insects and have fascinated human imagination and creativity. They are valuable pollinators when they move from plant to plant, gathering nectar and are the one of the important food chain components of the birds, reptiles, spiders and predatory insects. They are also good indicators of environmental quality as they are sensitive to changes in the environment. Some species of Lepidoptera are recorded as serious pest on vegetables, crops, stored grains, medicinal plants, herbal plantations *etc.*, by the various workers.

Perusal of literature reveals that no consolidated account is available on the Lepidoptera fauna of Aravalli Range of Rajasthan, though Cotes and Swinhoe (1886-89), Hampson (1892, 1894, 1895-96), Bell and Scott (1937), de Niceville (1886, 1890), Moore (1890-1903), Marshall & de Niceville (1882), Swinhoe (1893, 1905-1912), Bingham (1905, 1907), Evans (1932), Talbot (1939, 1947) and Wynter-Blyth (1957) provided information on Lepidoptera of Rajasthan. Therefore, the present study makes a modest attempt to explore the existing diversity of Lepidoptera from Aravalli Range of Rajasthan.

#### 3.2 Materials and Methods

The five extensive and intensive surveys of twelve to fifteen days duration were conducted on Lepidoptera in the different selected localities of Aravalli Range of Rajasthan, in eleven districts *i.e.* Sirohi, Udaipur, Pali, Rajsamand, Ajmer, Jaipur, Sikar, Jhunjhunu, Alwar, Dausa and Bharatpur during 2008-11 (Fig. 1 & 2). The common Lepidoptera species were identified in the field and unidentified species representatives were collected with butterfly net and at night with the help of light traps of different light sources *i.e.* ultra violet and mercury vapour light. The collected insects were killed by using benzene and in the laboratory specimens were stretched, pinned, labeled and preserved in collection boxes using standard entomological techniques and deposited in the National Zoological Collection of Desert Regional Centre, Zoological Survey of India, Jodhpur. Also the reference collection of Lepidoptera were studied kept in National Pusa Collection, Entomology Division, Indian Agricultural Research Institute, New Delhi. The butterfly species were identified by using keys prepared by de Niceville

(1886, 1890), Moore (1890-1903), Marshall & de Niceville (1882), Swinhoe (1893, 1905-1912), Bingham (1905, 1907), Evans (1932), Talbot (1939, 1947), Wynter-Blyth (1957), Cantlie (1962), Lewis (1985), Haribal (1992), Gunathilagaraj *et al.* (1998), Heppner (1998), Kunte (2000) and Beccaloni *et al.* (2003). The specimens collected from various localities were processed as per methodology discussed by workers such as Lindquist (1956), Tagestad (1974), Zimmerman (1978) and Landry and Landry (1994). For the taxonomic descriptions of various morphological characters, wing venation and genitalia, Klots (1970), Zimmerman (1978) and Robinson (1994) were followed. The scientific names of lepidoptera updated by consulting database listed in Lepindex of Natural History Museum, London. In the field observations and in the laboratory specimens were photographed prior to studies, using a Nikon D70 and D90 SLR Cameras with close up and telelens attachments.

### 3.3 Results

**Species Diversity:** Altogether 146 species belonging to 17 families of 2 suborders of order Lepidoptera are recorded from Aravalli Range of Rajasthan. The family Nymphalidae was the dominant family represented by 35 species followed by Noctuidae having 24 species; Lycaenidae 22 species; Pieridae 21 species; Papilionidae and Crambidae each having 8 species; Arctiidae 5 species; Hesperidae and Nolidae each having 4 species; Gelechiidae, Lymantriidae, Sphingidae each having 3 species; Pterophoridae 2 species and least by Geometridae, Plutellidae, Pyralidae and Saturniidae each having 1 species. Annotated checklist of Lepidoptera of Aravalli Range of Rajasthan prepared, followed by detailed systematic account species wise (**Table 2**).

**Table 2.** Annotated checklist of Lepidoptera of Aravalli Range of Rajasthan

S. No.	Suborder	Family	Species
(A).	RHOPALOCERA	<b>Hesperidae</b>	<i>Borbo cinnara</i> (Wallace, 1866) <i>Parnara guttatus</i> (Bremer and Grey, 1852) <i>Pelopidas mathias</i> (Fabricius, 1798) <i>Spialia galba</i> (Fabricius, 1793)
		<b>Lycaenidae</b>	<i>Acytolepis puspa</i> (Horsfield, 1828) <i>Apharitis acamas</i> (Klug, 1834) <i>Azanus jesous</i> (Guerin-Meneville, 1847) <i>Castalius rosimon</i> (Fabricius, 1775) <i>Catochrysops strabo</i> (Fabricius, 1793) <i>Celastrina huegelii</i> (Moore, 1882) <i>Chilades lajus</i> Stoll, 1780 <i>Dodona durga</i> (Kollar, 1844) <i>Euchrysops cnejus</i> (Fabricius, 1798)

S. No.	Suborder	Family	Species
		<b>Nymphalidae</b>	<i>Jamides celeno</i> (Cramer, 1775) <i>Lampides boeticus</i> (Linnaeus, 1767) <i>Leptotes plinius</i> (Fabricius, 1793) <i>Pratapa deva</i> (Moore, 1857) <i>Prosotas nora</i> (C. Felder, 1860) <i>Pseudozizeeria maha</i> (Kollar, 1848) <i>Spalgis epius</i> (Westwood, 1851) <i>Talicauda nyseus</i> (Guerin-Meneville, 1843) <i>Tarucus nara</i> Kollar, 1848 <i>Zesius chrysomallus</i> Hubner, 1819 <i>Zizeeria karsandra</i> Moore, 1865 <i>Zizula hylax</i> (Fabricius, 1775) <i>Zizina otis</i> (Fabricius, 1787) <i>Acraea violae</i> (Fabricius, 1758) <i>Argyreus hyperbius</i> (Linnaeus, 1763) <i>Ariadne ariadne</i> (Linnaeus, 1763) <i>Ariadne merione</i> (Cramer, 1777) <i>Athyma perius</i> (Linnaeus, 1758) <i>Cynthia cardui</i> (Linnaeus, 1758) <i>Cupha erymanthis</i> (Drury, 1773) <i>Danaus chrysippus</i> (Linnaeus, 1758) <i>Danaus genutia</i> (Cramer, 1779) <i>Euploea core</i> (Cramer, 1780) <i>Euthalia aconthea</i> (Cramer, 1777) <i>Euthalia nais</i> (Forster, 1771) <i>Hypolimnias bolina</i> (Linnaeus, 1758) <i>Hypolimnias misippus</i> (Linnaeus, 1764) <i>Junonia almana</i> (Linnaeus, 1758) <i>Junonia atlites</i> (Linnaeus, 1763) <i>Junonia hierta</i> (Fabricius, 1798) <i>Junonia iphita</i> (Cramer, 1779) <i>Junonia lemonias</i> (Linnaeus, 1758) <i>Junonia orithiya</i> (Linnaeus, 1758) <i>Lethe rohria</i> Fabricius, 1787

S. No.	Suborder	Family	Species
		<p data-bbox="580 1025 735 1059"><b>Papilionidae</b></p> <p data-bbox="580 1346 683 1379"><b>Pieridae</b></p>	<p data-bbox="818 477 1166 510"><i>Melanitis leda</i> Linnaeus, 1758</p> <p data-bbox="818 517 1190 551"><i>Melanitis phedima</i> Cramer, 1780</p> <p data-bbox="818 557 1214 591"><i>Mycalesis mineus</i> (Linnaeus, 1758)</p> <p data-bbox="818 598 1203 631"><i>Mycalesis perseus</i> Fabricius, 1775</p> <p data-bbox="818 638 1158 672"><i>Neptis hylas</i> (Linnaeus, 1758)</p> <p data-bbox="818 678 1153 712"><i>Parantica aglea</i> (Stoll, 1782)</p> <p data-bbox="818 719 1209 752"><i>Phalanta phalantha</i> (Drury, 1773)</p> <p data-bbox="818 759 1171 792"><i>Polyura athamas</i> (Drury, 1773)</p> <p data-bbox="818 799 1201 833"><i>Tirumala limniace</i> (Cramer, 1775)</p> <p data-bbox="818 840 1241 873"><i>Tirumala septentrionis</i> (Butler, 1874)</p> <p data-bbox="818 880 1158 913"><i>Vanessa indica</i> (Herbst, 1794)</p> <p data-bbox="818 920 1166 954"><i>Ypthima asterope</i> (Klug, 1832)</p> <p data-bbox="818 960 1193 994"><i>Ypthima baldus</i> (Fabricius, 1775)</p> <p data-bbox="818 1001 1161 1034"><i>Ypthima huebneri</i> Kirby, 1871</p> <p data-bbox="818 1041 1321 1075"><i>Atrophaneura aristolochiae</i> (Fabricius, 1775)</p> <p data-bbox="818 1081 1254 1115"><i>Atrophaneura hector</i> (Linnaeus, 1758)</p> <p data-bbox="818 1122 1273 1155"><i>Graphium agamemnon</i> (Linnaeus, 1758)</p> <p data-bbox="818 1162 1273 1196"><i>Graphium doson</i> (C. &amp; R. Felder, 1864)</p> <p data-bbox="818 1202 1241 1236"><i>Graphium sarpedon</i> (Linnaeus, 1758)</p> <p data-bbox="818 1243 1198 1276"><i>Papilio demoleus</i> Linnaeus, 1758</p> <p data-bbox="818 1283 1217 1317"><i>Papilio polyctor</i> (Boisduval, 1836)</p> <p data-bbox="818 1323 1190 1357"><i>Papilio polytes</i> (Linnaeus, 1758)</p> <p data-bbox="818 1364 1222 1397"><i>Anaphaeis aurota</i> (Fabricius, 1793)</p> <p data-bbox="818 1404 1217 1438"><i>Catopsilia pomona</i> Fabricius, 1775</p> <p data-bbox="818 1444 1241 1478"><i>Catopsilia pyranthe</i> (Linnaeus, 1758)</p> <p data-bbox="818 1485 1174 1518"><i>Cepora nerissa</i> Fabricius, 1775</p> <p data-bbox="818 1525 1161 1559"><i>Colotis amata</i> Fabricius, 1775</p> <p data-bbox="818 1565 1174 1599"><i>Colotis etrida</i> Boisduval, 1836</p> <p data-bbox="818 1606 1187 1639"><i>Colotis eucharis</i> Fabricius, 1775</p> <p data-bbox="818 1646 1145 1680"><i>Colotis fausta</i> (Oliver, 1804)</p> <p data-bbox="818 1686 1158 1720"><i>Colias fieldii</i> Menetries, 1855</p> <p data-bbox="818 1727 1158 1760"><i>Colotis vestalis</i> (Butler, 1876)</p> <p data-bbox="818 1767 1139 1800"><i>Delias eucharis</i> Drury, 1773</p> <p data-bbox="818 1807 1187 1841"><i>Eurema blanda</i> Boisduval, 1836</p>

S. No.	Suborder	Family	Species
(B).	HETEROCERA	<b>Arctiidae</b>	<i>Eurema hecabe</i> Linnaeus, 1758 <i>Eurema laeta</i> Boisduval, 1836 <i>Hebomoia glaucippe</i> Linnaeus, 1758 <i>Ixias marianne</i> (Cramer, 1779) <i>Ixias pyrene</i> (Linnaeus, 1764) <i>Leptosia nina</i> Fabricius, 1793 <i>Pareronia valeria</i> (Cramer, 1776) <i>Pieris brassicae</i> Linnaeus, 1758 <i>Pieris canidia</i> (Sparman, 1768) <i>Amsacta moorei</i> Butler, 1876 <i>Cretonotos gangis</i> (Linnaeus, 1763) <i>Pericallia ricini</i> (Fabricius, 1775) <i>Spilosoma obliqua</i> (Walker, 1862) <i>Utetheisa pulchella</i> (Linnaeus, 1758)
		<b>Crambidae</b>	<i>Crocidolomia binotalis</i> Zeller, 1852 <i>Dichocrocis punctiferalis</i> (Guenee, 1896) <i>Hellula undalis</i> (Fabricius, 1781) <i>Leucinodes orbonalis</i> Guenee, 1854 <i>Noorda blitealis</i> Walker, 1859 <i>Maruca testulalis</i> (Geyer, 1832) <i>Spoladea recurvalis</i> (Fabricius, 1775) <i>Syllepte derogata</i> (Fabricius, 1775)
		<b>Gelechiidae</b>	<i>Helcystogramma hibisci</i> (Stainton, 1859) <i>Pectinophora gossypiella</i> (Saunders, 1844) <i>Phthorimaea operculella</i> Zeller, 1873
		<b>Geometridae</b>	<i>Hyposidra successaria</i> Walker, 1860
		<b>Lymantriidae</b>	<i>Euproctis fraterna</i> (Moore, 1883) <i>Olene mendosa</i> Hübner, 1823 <i>Somena scintillans</i> Walker, 1856
		<b>Noctuidae</b>	<i>Acantholeucania loreyi</i> (Duponchel, 1827) <i>Acontia malvae</i> Esper, 1808 <i>Acontia nitidula</i> (Fabricius, 1787) <i>Acontia transversa</i> (Guenee, 1841) <i>Adisura atkinsoni</i> Moore, 1881

S. No.	Suborder	Family	Species
		<p data-bbox="580 1227 675 1256"><b>Nolidae</b></p> <p data-bbox="580 1391 711 1420"><b>Plutellidae</b></p> <p data-bbox="580 1429 754 1458"><b>Pterophoridae</b></p> <p data-bbox="580 1507 703 1536"><b>Pyralidae</b></p> <p data-bbox="580 1545 722 1574"><b>Saturniidae</b></p> <p data-bbox="580 1583 715 1612"><b>Sphingidae</b></p>	<p data-bbox="818 483 1206 512"><i>Agrotis c-nigrum</i> (Linnaeus, 1758)</p> <p data-bbox="818 521 1161 551"><i>Agrotis segetis</i> (Hübner, 1803)</p> <p data-bbox="818 560 1217 589"><i>Agrotis ypsilon</i> (Rottemburg, 1766)</p> <p data-bbox="818 598 1241 627"><i>Anadevidia peponis</i> (Fabricius, 1775)</p> <p data-bbox="818 636 1161 665"><i>Anomis flava</i> (Fabricius, 1775)</p> <p data-bbox="818 674 1177 703"><i>Antoba olivacea</i> (Walker, 1858)</p> <p data-bbox="818 712 1185 741"><i>Anua coronata</i> (Fabricius, 1775)</p> <p data-bbox="818 750 1193 779"><i>Elygea materna</i> (Linnaeus, 1767)</p> <p data-bbox="818 788 1241 817"><i>Helicoverpa armigera</i> (Hübner, 1805)</p> <p data-bbox="818 826 1217 855"><i>Helicoverpa assulta</i> (Guenee, 1852)</p> <p data-bbox="818 864 1106 893"><i>Ilattia octo</i> Guenee, 1852</p> <p data-bbox="818 902 1209 931"><i>Mythimna separata</i> (Walker, 1865)</p> <p data-bbox="818 940 1201 969"><i>Othreis fullonica</i> (Linnaeus, 1763)</p> <p data-bbox="818 978 1209 1008"><i>Spodoptera exigua</i> (Hübner, 1808)</p> <p data-bbox="818 1016 1217 1046"><i>Spodoptera litura</i> (Fabricius, 1775)</p> <p data-bbox="818 1055 1265 1084"><i>Spodoptera mauritia</i> (Boisduval, 1833)</p> <p data-bbox="818 1093 1169 1122"><i>Trichoplusia ni</i> (Hübner, 1803)</p> <p data-bbox="818 1131 1281 1160"><i>Thysanoplusia nigrisigna</i> (Walker, 1857)</p> <p data-bbox="818 1169 1313 1198"><i>Thysanoplusia orichalcea</i> (Fabricius, 1775)</p> <p data-bbox="818 1207 1209 1236"><i>Earias insulana</i> (Boisduval, 1833)</p> <p data-bbox="818 1245 1161 1274"><i>Earias vittella</i> Fabricius, 1794</p> <p data-bbox="818 1283 1114 1312"><i>Selepa celtis</i> Moore, 1860</p> <p data-bbox="818 1321 1121 1350"><i>Selepa docilis</i> Butler, 1881</p> <p data-bbox="818 1359 1225 1388"><i>Plutella xylostella</i> (Linnaeus, 1758)</p> <p data-bbox="818 1397 1257 1426"><i>Exelastis atomosa</i> (Walsingham, 1885)</p> <p data-bbox="818 1435 1201 1464"><i>Sphenarches caffer</i> (Zeller, 1852)</p> <p data-bbox="818 1473 1241 1503"><i>Etiella zinckenella</i> (Treitschke, 1832)</p> <p data-bbox="818 1512 1145 1541"><i>Actias selene</i> (Hübner, 1807)</p> <p data-bbox="818 1550 1209 1579"><i>Acherontia styx</i> (Westwood, 1847)</p> <p data-bbox="818 1588 1217 1617"><i>Agrius convolvuli</i> (Linnaeus, 1758)</p> <p data-bbox="818 1626 1217 1655"><i>Hippotion celerio</i> (Linnaeus, 1758)</p>
<b>Total</b>	<b>2</b>	<b>17</b>	<b>146</b>

**SYSTEMATIC ACCOUNT**

Order LEPIDOPTERA

(A). Suborder RHOPALOCERA

(1). Family HESPERIIDAE

1. ***Borbo cinnara*** (Wallace, 1866), Rice Swift1866. *Hesperia cinnara* Wallace, *Proc. zool. Soc. Lond.*, p. 361.2006. *Parnara kuyaniana* Matsumura, *Zoological Studies*, **45**(3): 322-338.*Material examined*: 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party.*Diagnostic characters*: Adult grey brown skipper with a small white spot in cell, a row of three white spots, which decrease in size from dorsum of wing towards apex, a creamy spot in space 1b at mid-dorsum and three apical spots on upper forewing. Upper hindwing has one or two white discal spots or unmarked. Under hindwing with olive-ochreous scaling, has spots in spaces 2, 3 and 6. Under paler.*Distribution*: Throughout India. *Elsewhere*: Sri Lanka, Bangladesh, Myanmar, Bhutan and Nepal.2. ***Parnara guttatus*** (Bremer and Grey, 1852), Straight Swift1853. *Eudomus guttatus* Bremer & Grey, *Schmett. N. China*. p. 10.1949. *Parnara guttatus* (Bremer & Grey): Evans. *A Cat. of Herperiidae from Europe, Asia and Australia in Brit. Museum (Nat. Hist.)*, London, p. 433.*Material examined*: 1 male, Sariska Forest Area, Alwar, 16.ii.2010, Coll. G. Sharma & party.*Diagnostic characters*: Antennae very short; not equal to half costa. Upper side of Forewing decreasing spots in 2-4, apical 6-8, very rarely faint spot in cell. Upper and under side of Hindwing a straight decreasing row of spots in 2-5. Cuiller projection ventrally beyond the valve, then ventral edge of the latter straight.*Distribution*: India: Uttarakhand, Kashmir to Kumaon, Nagaland, Assam and Sikkim. *Elsewhere*: Hainan, North Myanmar, South and West China and Thailand.3. ***Pelopidas mathias*** (Fabricius, 1798), Small Branded Swift1798. *Hesperia mathias* Fabricius, *Ent. Syst. Suppl.* p. 433.1997. *Pelopidas mathias*, Ghosh and Chaudhary. *State Fauna Series, Fauna of West Bengal, Zool. Surv. India*, **3**(7): 313-314.*Material examined*: 1 male, Puskar Forest Area, Ajmer, 11.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Forewing dorsally with discal stigma in male, lower end of stigma nearer to base than termen and situated well before origin of vein CU 1b, a line joining the cell spot centres.

*Distribution:* India: Assam, Uttarakhand, Himachal Pradesh, Sikkim, West Bengal, South India, Central India, Rajasthan, Punjab and Jammu & Kashmir.

#### 4. *Spialia galba* (Fabricius, 1793), Indian Skipper

1793. *Hesperia galba* Fabricius. *Syst. Ent.*, **3**(1): 352.

1932. *Syrichthus galba* Evans, *The Identification of Indian Butterflies*. *Bombay nat. Hist. Soc.*, p. 347.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party.

*Diagnostic characters:* Upper side of forewing with three cell spots. Under side of Hindwing with discal band ending to mid dorsum.

*Distribution:* India: Uttarakhand, Kashmir to Kumaon, Sikkim, South India, West Bengal, Assam and Andhra Pradesh. *Elsewhere:* Myanmar to South Shan states, Sind and Sri Lanka.

### (2). Family LYCAENIDAE (Blues)

#### 5. *Acytolepis puspa* (Horsfield, 1828), Common Hedge Blue

1992. *Acytolepis puspa gisca* Fruhstorfer: Haribal, *The Butterflies of Sikkim Himalaya*, Sikkim Nature Conservation Foundation. p.123.

*Material examined:* Recorded from literature.

*Diagnostic characters:* Adult hindwing tailless. Glossy pale blue on upper. Coarse black markings on white under. Under forewing spot in space 2 oblique, directed towards the bar at end cell. Spot in space 3 vertical, directed towards centre of spot in space 4. Inner edges of spots in spaces 2 and 5 irregular. Male upper is iridescent violet-blue with variable black margins.

*Distribution:* India: Peninsular India, Madhya Pradesh, Jharkhand, Rajasthan, Jammu & Kashmir to Arunachal Pradesh, Northeast. *Elsewhere:* Afghanistan, Pakistan, Sri Lanka, Bangladesh, Bhutan, Myanmar.

#### 6. *Apharitis acamas* (Klug, 1834), Tawny Silverline

1957. *Apharitis acamas* (Klug), *Butterflies of the Indian Region*, BNHS. p.330.

*Material examined:* 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult hindwing has two tails, upper tail shorter than lower tail. Hindwing lobe not prominent. Under pale creamy white, discal silver bar turned outwards at

lower end to meet submarginal bar at vein 4 on under hindwing. Three basal silver spots on under hindwing, lowest one elongated, not round. Upper tawny orange with black bars and spots.

*Distribution:* India: Western Gujarat, Rajasthan, Punjab. *Elsewhere:* Pakistan.

7. *Azonus jesous* (Guerin-Meneville, 1847), African Babul Blue

2008. *Azonus jesous* (Guerin-Meneville): Kehimkar, *The book of Indian Butterflies*, BNHS. p. 264.

*Material examined:* Recorded from literature.

*Diagnostic characters:* Adult Hindwing tailless. Male upper violet-blue with narrow borders. No black spot at end-cell on upper forewing. Two black tornal spots on upper hindwing, two black costal spots, a prominent black basal streak and two black tornal spots on under hindwing.

*Distribution:* Throughout India. *Elsewhere:* Pakistan, Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

8. *Castalius rosimon* (Fabricius, 1775), Common Pierrot

1775. *Papilio rosimon* Fabricius, *Syst. Ent.* p. 523.

1907. *Castalius rosimon* (Fabricius): Bingham. *The fauna of Brit. India*, Butterflies, 2: 424.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult hindwing has white-tipped black tails. Under conspicuously marked with black spots and streaks on white. Square black spots are more on under forewing. Under hindwing has a metallic green spot at tornus. Upper white with dark borders and black spots; basal area powdered with metallic blue scales.

*Distribution:* Throughout India except Northwest. *Elsewhere:* Pakistan, Nepal, Bhutan, Bangladesh, Myanmar, Sri Lanka.

9. *Catochrysops strabo* (Fabricius, 1793), Forget-me-Not

1793. *Hesperia Strabo* Fabricius, *Syst. Ent.*, 3: 287.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party; 1 male, Kalighati, Sariska Forest Area, Alwar, 16.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult hindwing tailed, wings narrow. Under pale grey with white-edged fawn discal bars. Under forewing with small pale costal spot just near discal bar. Two white-ringed black spots along costa and two black tornal spots; larger, yellow-crowned, tornal

spot between veins 1c and 2 above tail on under hindwing. Male pale blue on upper, with black line borders. Upper hindwing with one prominent black tornal spot between veins 1c and 2 above tail.

*Distribution:* Throughout India. *Elsewhere:* Pakistan, Sri Lanka, Nepal, Bhutan, Bangladesh.

#### 10. *Celastrina huegelii* (Moore, 1882), Large Hedge Blue

1882. *Cyaniris huegelii* Moore, *Proc. zool. Soc. Lond.* p.204.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 24.ix.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult hindwing tailless. Upper shining blue without white patches with narrow border not increasing towards the apex of forewing. Under light grey with faint marginal markings. Small black discal spots are distinct on under hindwing.

*Distribution:* India: Jammu & Kashmir to Arunachal Pradesh. *Elsewhere:* Nepal, Bhutan.

#### 11. *Chilades lajus* Stoll, 1780, Lime Blue

1992. *Chilades lajus* (Cramer): Haribal, *The Butterflies of Sikkim Himalaya*, Sikkim Nature Conservation Foundation, p. 266.

*Material examined:* Recorded from literature.

*Diagnostic characters:* Adult hindwing tailless. Under light with several dark spots. Among those spots, there is one pair of spots on each wing, joined at right angles. Male upper dull purplish blue with thin black border.

*Distribution:* Throughout India. *Elsewhere:* Pakistan, Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

#### 12. *Dodona durga* (Kollar, 1844), Common Punch

1844. *Melitaea durga* Kollar, In: Hugel's *Kaschmir und das Reich der Siek*, 4(2): 441.

1932. *Dodona durga* (Kollar): Evans. *Identification of Indian Butterflies*, p. 194.

*Material examined:* 1 male, Nakki Lake, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Puskar Forest Area, 11.ii.2010, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult on under hindwing, two small black spots near apex. Upper dark brown. Upper forewing with two ochreous yellow bars, one bar at end-cell and the other in mid-cell. Upper hindwing bars tawny orange. On hindwing, there is a tornal lobe, but no tail.

*Distribution:* India: Jammu & Kashmir to Uttarakhand. *Elsewhere:* Pakistan, Nepal.

**13. *Euchrysops cnejus* (Fabricius, 1798), Gram Blue**

1798. *Hesperia cnejus* Fabricius, *Syst. Ent.*, 430.

*Material examined*: 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party.

*Diagnostic characters*: Adult hindwing tailed. Two prominent orange-crowned, black tornal spots with metallic silver centres on under hindwing, one on either side of tail. Male pale violet-blue on upper, with dark thin line border that broadens at apex of upper forewing. Upper hindwing has two orange-ringed black tornal spots.

*Distribution*: Throughout India. *Elsewhere*: Pakistan, Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

**14. *Jamides celeno* (Cramer, 1775), Common Cerulean**

1992. *Jamides celeno celeno* (Cramer): Haribal, *The Butterflies of Sikkim Himalaya*, Sikkim Nature Conservation Foundation, p. 116.

*Material examined*: 1 male, Rajsamand Lake, Rajsamand, 2.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters*: Adult hindwing tailed. Under grayish white, the three narrow white marginal lines, four more vertical white discal lines on under forewing, while under hindwing has six more white lines. Male upper pale bluish white with thin black border which on upper forewing broadens at apex. Traces of small black spots on upper hindwing termen and under hindwing pattern shows through on upper hindwing as faint bars.

*Distribution*: Throughout India except arid Northwest. *Elsewhere*: Afghanistan, Sri Lanka, Nepal, Bhutan, Bangladesh, Myanmar.

**15. *Lampides boeticus* (Linnaeus, 1767), Pea Blue**

1767. *Papilio boeticus* Linnaeus, *Syst. Nat.* (12<sup>th</sup> ed.), 1(2): 789.

1932. *Lampides boeticus*: Evans, *The Identification of Indian Butterflies*. p. 69.

*Material examined*: 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Keoladeo National Park, Bharatpur, 7.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters*: Adult hindwing tailed. Under very pale brown with darker brown bands rimmed with white on both wings. No spots on under forewing. Distinct lighter band within outer margin on under hindwing, where the dark brown bands are absent. Two orange-ringed black tornal spots, often with metallic silver crown on under hindwing. Male on upper dark violet-blue, two black tornal spots on upper hindwing.

*Distribution:* Throughout India. *Elsewhere:* Afghanistan, Pakistan, Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

16. *Leptotes plinius* (Fabricius, 1793), Zebra Blue

1992. *Syntarucus plinius* (Fabricius): Haribal, *The Butterflies of Sikkim Himalaya*, Sikkim Nature Conservation Foundation, p.118.

*Material examined:* Recorded from literature.

*Diagnostic characters:* Adult hindwing tailed and typical zebra-like markings on under unmistakable. Whitish under with alternately broad and narrow, irregular, brown bands at right angles to costa, the bands being broken up into spots on under hindwing.

*Distribution:* Throughout India. *Elsewhere:* Pakistan, Sri Lanka, Nepal, Bhutan, Myanmar.

17. *Pratapa deva* (Moore, 1857), White Royal

1957. *Pratapa deva* (Moore), *Butterflies of the Indian Region*, BNHS, p. 339.

*Material examined:* Recorded from literature.

*Diagnostic characters:* Adult hindwing has two tails, creamy white on under; outer discal line not continuous and bars at end cells faint. Two orange bordered black spots on under hindwing and upper bar of discal line in space 7 shifted out. The outer discal line faint on under forewing. Male shining blue on upper, with very broad black apex on upper forewing.

*Distribution:* India: South India upto Madhya Pradesh, Rajasthan, Punjab, Himachal Pradesh to Arunachal Pradesh, West Bengal. *Elsewhere:* Nepal, Bhutan, Bangladesh, Myanmar, Sri Lanka.

18. *Prosotas nora* (C. Felder, 1860), Common Lineblue

2008. *Prosotas nora* (C. Felder): Kehimkar, *The book of Indian Butterflies*, BNHS, pp. 255-256.

*Material examined:* Recorded from literature.

*Diagnostic characters:* Adult hindwing tailed; under may vary from grey to dark or pale brown with basal and discal bands consisting of two darker thin brown lines within a pair of whitish outer lines. Small black tornal spot conspicuous, often along with metallic spots on dorsum of under hindwing.

*Distribution:* Throughout India. *Elsewhere:* Pakistan, Sri Lanka, Nepal, Bhutan, Bangladesh, Myanmar.

19. *Pseudozizeeria maha* (Kollar, 1848), Pale Grass Blue

1848. *Lycaena maha* Kollar, *In Hugel's Kaschmir und das Reich der Siek*, 4(2): 422.

1907. *Pseudozizeeria maha* (Kollar): Bingham, *The Fauna of Brit. India*, Butterflies, 2: 355.

*Material examined:* 1 male, Anadara Point, Mount Abu, 21.ix.2008, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 4.iii.2009, Coll. G. Sharma & party; 1 male, Nahargarh Biological Park, Jaipur, 13.ii.2010, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult hindwing tailless. Under grayish white to pale grayish brown. Under forewing with faint rounded black spots in a discal band, an end-cell spot, a tiny spot mid-cell, and a tiny spot on costa in discal region. On under hindwing, all the spots faint. Male pale milky blue on upper, with broad, pale brown border along termen of upper forewing, narrow border on upper hindwing. Sky blue dusting on upper hindwing bases and distinct narrow pale brown border.

*Distribution:* Throughout India. *Elsewhere:* Pakistan, Nepal, Bangladesh, Bhutan, Myanmar.

#### 20. *Spalgis epius* (Westwood, 1851), Apefly

1957. *Spalgis epius* (Westwood), *Butterflies of the Indian Region*, BNHS : 256-257.

*Material examined:* 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult hindwing tailless. Dainty little butterfly which has grey under with several fine wavy vertical lines. Brown on upper with diffuse or well defined discal white patch at end cell on upper forewing. Male forewing has acute apex and straight termen.

*Distribution:* India: Peninsular India upto Gujarat, West Bengal, Uttaranchal to Arunachal Pradesh, Northeast. *Elsewhere:* Sri Lanka, Nepal, Bhutan, Bangladesh, Myanmar.

#### 21. *Talicauda nyseus* (Guerin-Meneville, 1843), Red Pierrot

2008. *Talicauda nyseus* (Guerin-Meneville): Kehimkar, *The book of Indian Butterflies*, BNHS : 266-267.

*Material examined:* Recorded from Gomukh, Mount Abu, 31.i.2011, G. Sharma.

*Diagnostic characters:* Adult hindwing tailed, blackish brown on upper with broad orange-red area on lower half of upper hindwing. Under mainly white with black spots. Outer half of under forewing black with white spots. Under hindwing has orange-red marginal band followed by black upto costa, both with white spots.

*Distribution:* India: Peninsular India, Orissa, Northeast. *Elsewhere:* Sri Lanka, Myanmar.

#### 22. *Tarucus nara* Kollar, 1848, Striped Pierrot

1992. *Tarucus nara* Kollar: Haribal, *The Butterflies of Sikkim Himalaya*, Sikkim Nature Conservation Foundation, p. 119.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 24.ix.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult hindwing tailed. Upper violet-blue with narrow black border. Under with basal streaks and marginal spots. Under hindwing streaks broken into numerous spots.

*Distribution:* India: South India upto Maharashtra, Madhya Pradesh, Himachal Pradesh to Sikkim, West Bengal. *Elsewhere:* Nepal, Sri Lanka, Pakistan.

### 23. *Zesius chrysomallus* Hubner, 1819, Redspot

1957. *Zesius chrysomallus* Hubner, *Butterflies of the Indian Region*, BNHS : 335-336.

*Material examined:* Recorded from Trevor Point, Mount Abu, 24.ix.2009, G. Sharma & party.

*Diagnostic characters:* Adult male has two tails on hindwing. Pale grey on under with discal band of loosely linked orange-bordered spots; similar cell and basal spots on forewing and hindwing. Red-crowned black spots in space 2. Male on the upper is copper red with narrow dark border. Upper hindwing has two red-crowned black tornal spots.

*Distribution:* India: Peninsular India upto Maharashtra, Orissa, Jharkhand, West Bengal. *Elsewhere:* Sri Lanka.

### 24. *Zizeeria karsandra* Moore, 1865, Dark Grass Blue

1865. *Polyommatus karsandra* Moore, *Proc. zool. Soc. Lond.*, p. 505.

*Material examined:* 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult hindwing tailless. Under grayish brown with small, distinct rounded black spots. Male upper dark blue, with dark brown broad border along costa and termen of upper forewing and broad border on costa, narrow along termen of upper hindwing.

*Distribution:* Throughout India. *Elsewhere:* Pakistan, Sri Lanka, Nepal, Bhutan, Myanmar.

### 25. *Zizula hylax* (Fabricius, 1775), Tiny Grass Blue

2008. *Zizula hylax* (Fabricius): Kehimkar, *The book of Indian Butterflies*, BNHS, p. 263.

*Material examined:* Recorded from literature.

*Diagnostic characters:* Adult hindwing tailless. Under pale grayish brown with fine, small, distinct, dark brown or black spots. Under forewing has row of discal spots, all well separated and angled inwards, and a bar at end-cell, but no spot in mid-cell. On under hindwing, two small costal spots and a spot near the end cell bar, also a spot in the cell next to two more spots near base. Male pale blue on upper, with narrow black border on upper hindwing, and broad, diffused black border covering most of the apex on upper forewing.

*Distribution:* Throughout India. *Elsewhere:* Pakistan, Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

26. *Zizina otis* (Fabricius, 1787), Lesser Grass Blue

2008. *Zizina otis* (Fabricius): Kehimkar, *The book of Indian Butterflies*, BNHS, p. 263.

*Material examined*: 1 male, Mount Abu Forest Area, 31.i.2011, Coll. G. Sharma & party.

*Diagnostic characters*: Adult hindwing tailless. Under pale grayish brown with rounded, not very dark spots. Under forewing has no costal spots or any spot inside the cell. On under hindwing, first two spots from costa are separate, a curve is formed by only the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> spots, the 7<sup>th</sup> is again separate towards the termen. Male upper dark blue with fairly distinct black border along termen, broadening towards apex.

*Distribution*: Throughout India. *Elsewhere*: Pakistan, Sri Lanka, Nepal, Bhutan, Myanmar.

## (3). Family NYMPHALIDAE (Brush-footed Butterflies)

27. *Acraea violae* (Fabricius, 1758), Tawny Coster

1775. *Papilio violae* Fabricius, *Syst. Ent.*, 1(3): 460.

1947. *Acraea violae*: Talbot, *The fauna of Brit. India*, Butterflies, 2: 466-469.

*Material examined*: 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party.

*Diagnostic characters*: Adult upper brick red with narrow black border along termen on forewing. On hindwing black border is broader with white spots. Black spots on cell and disc of both wings.

*Distribution*: Throughout India. *Elsewhere*: Pakistan, Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

28. *Argyreus hyperbius* (Linnaeus, 1763), Indian Fritillary

1764. *Papilio hyperbius* Linnaeus, *Amoen Acad.*, 6: 408.

1932. *Argynnis hyperbius hyperbius* (Linnaeus): Evans, *Identification of Indian Butterflies*, p. 182.

*Material examined*: 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party.

*Diagnostic characters*: Adult male upper bright tawny, covered with black spots. Upper hindwing light brown or greenish brown outwardly, dark green inwardly. Silver stripes on under hindwing irregular and broken into separate spots. Silver markings on inner area are black-edged.

*Distribution*: India: Jammu & Kashmir to Arunachal Pradesh, Northeast, Rajasthan, Gujarat, Madhya Pradesh, South India. *Elsewhere*: Afghanistan, Pakistan, Nepal, Bangladesh, Bhutan, Myanmar, Sri Lanka.

29. *Ariadne ariadne* (Linnaeus, 1763), Angled Castor

1911. *Ergolis palliditor* Fruhstofer, *Berl. Ent. Zschr.*, **44**: 90.

1990. *Ariadne ariadne* (Linnaeus): Varshney, Revised Nomenclature for Butterfly taxa. *J. Bom. Nat. Hist. Soc.*, **87**: 60.

*Material examined*: 1 male, Guru Shikhar, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; also recorded from Pichhola Lake, Udaipur, Sariska Tiger Reserve and Keoladeo National Park.

*Diagnostic characters*: Adult very similar to common castor, but darker with black lines regular, slender and much apart. Forewing termen deeply concave between veins 3 and 5. Upper forewing discal line beyond cell, single and regular, angled at vein 5. Under darker brown with purplish brown markings.

*Distribution*: Throughout India except arid North and Northwest. *Elsewhere*: Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

30. *Ariadne merione* (Cramer, 1777), Common Castor

1777. *Papilio merione* Cramer, *Pap. Exot.*, **2**: 76.

1994. *Ariadne merione*: Varshney, *Oriental Ins.*, **28**: 167.

*Material examined*: Recorded from Mount Abu, Udaipur, Jaipur, Sariska and Bharatpur.

*Diagnostic characters*: Adult upperside reddish brown with transverse black wavy lines. Wavy lines broader in the form of distinct bands in female. Forewing with small, white subapical costal spot and a series of obscure spots within the submarginal markings. Underside often pale and duller in colour, black wavy lines replaced by denser and diffuse brown bands. Wingspan 52-62 mm.

*Distribution*: Throughout India. *Elsewhere*: Sri Lanka, Pakistan, Bhutan, Bangladesh, Myanmar, Malaysia, and Indonesia.

31. *Athyma perius* (Linnaeus, 1758), Common Sergeant

1758. *Papilio perius* Linnaeus, *Syst. Nat.*, **10**: 471.

1911. *Athyma perius*: Tytler, *J. Bom. nat. Hist. Soc.*, **21**(1): 60.

*Material examined*: Recorded from Guru Shikhar, Mount Abu, 23.ix.2009, G. Sharma.

*Diagnostic characters*: Adult prominent row of black spots strictly towards the inner edge of white postdiscal band on the yellow under hindwing. Upper forewing white cell streak divided into four parts.

*Distribution*: India: Himachal Pradesh to Arunachal Pradesh, Northeast, Peninsular India upto Madhya Pradesh. *Elsewhere*: Myanmar.

32. *Cynthia cardui* (Linnaeus, 1758), Painted Lady

1758. *Papilio cardui* Linnaeus, *Syst. Nat.* ed. 10, 1: 475.

1987. *Cynthia cardui* Gupta & Shukla, *Rec. zool. Surv. India, Occ. Pap.*, 106: 27.

*Material examined*: 1 male, Gyan Sarover, Mount Abu, 24.ix.2009, Coll. G. Sharma & party.

*Diagnostic characters*: Upperside, both wings ochreous red. Forewing with the basal area ochreous brown; an oblique irregular shaped angular band, the apical area and exterior border black, before the apex is a short white oblique band and a curved series of four spots, a pale marginal line. Hindwing with ochreous brown basal area, a transverse discal row of five black spots, each spot with slightly paler outer ring, a submarginal row of lunular spots and marginal row of larger spots.

*Distribution*: Throughout India. *Elsewhere*: Afghanistan, Bangladesh, Bhutan, Nepal, Myanmar, Pakistan.

33. *Cupha erymanthis* (Drury, 1773), Rustic

1770. *Papilio erymanthis* Drury, *Exot. Ent.*, 1: 3-4.

1911. *Cupha erymanthis* (Drury) Tytler, *J. Bombay nat. Hist. Soc.*, 21(1): 64.

*Material examined*: 1 male, Guru Shikhar, Mount Abu, 23.ix.2009, Coll. G. Sharma & party.

*Diagnostic characters*: Adult upper mainly ochre. Upper forewing has basal area reddish brown, a broad yellow or white central band and broad black apex. Upper hindwing with two darker marginal lines of crescents and a row of small black discal spots. Under yellowish brown, with small white and dark brown markings.

*Distribution*: India: South India upto Maharashtra, Uttarakhand to Arunachal Pradesh, Northeast, Andaman and Nicobar Islands. *Elsewhere*: Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

34. *Danaus chrysippus* Linnaeus, 1758, Plain Tiger

1758. *Papilio chrysippus* Linnaeus, *Syst. Nat.*, (ed.x), p. 471.

1947. *Danaus chrysippus chrysippus*: Talbot, *The Fauna of British India, Butterflies*, 2: 20.

*Material examined*: 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Rajsamand Lake, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1

male, Kalighati, Sariska Forest Area, Alwar, 16.ii.2010, Coll. G. Sharma & party; 1 male, Rajsamand Lake, Rajsamand, 2.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult upperside reddish brown with black borders in both wings and black apex in Forewing. Forewing with variable number of white spots in the costa and apex. Hindwing with four small black spots around the cell in male and three in female and a pouch in male. Underside dull orange. Forewing dark brown in the upper half with white spots in the black area and Hindwing with six black spots. Wingspan 70-80 mm.

*Distribution:* Throughout India. *Elsewhere:* Afghanistan, Africa, Australia, Iran, Turkey, Syria, South-eastern Europe, Sri Lanka, Pakistan, Bangladesh, Myanmar, Malaysia, Singapore, Indonesia, Madagascar, Mauritius, Fiji, Japan, New Guinea and China.

### 35. *Danaus genutia* (Cramer, 1779), Striped Tiger

1779. *Papilio genutia* Cramer, *Pap. Exot.*, **3**: 23.

1987. *Danaus genutia*: Gupta & Shukla, *Rec. zool. Surv. India, Occ. Pap.*, **106**: 17.

*Material examined:* 1 male, Nakki Lake, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Bheel Beri, Rajsamand, 26.ix.2008, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 4.iii.2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 15.ii.2010, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 6.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult orange-brown with bold black veins, black and white apical and marginal bands. Underside pale with more prominent black lines along the veins. Wingspan 75-95 mm.

*Distribution:* Throughout India. *Elsewhere:* Entire Oriental region, the Americas, Australia, the Canary Islands and the Mediterranean countries.

### 36. *Euploea core* (Cramer, 1780), Common Crow

1780. *Papilio core* Cramer, *Pap. Exot.*, **3**: 133.

*Material examined:* 1 male, Nakki Lake, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1 male, Todgarh Ravali, Rajsamand, 3.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult dark velvety brown on upper and paler on under, with all wings bordered by two rows of small white spots. The inner spots are larger on both wings and elongate on hindwing. Paler under has white discal spots and two rows of marginal spots. White spot at end-cell on under forewing. Thorax black with white spots. Male upper forewing

has a dark velvety, short narrow brand between veins 1a and 1b, and a white streak at the same place on under forewing.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

37. *Euthalia aconthea* (Cramer, 1777), Common Baron

1992. *Euthalia aconthea suddhodana* Frusthorfer: Haribal, *The Butterflies of Sikkim Himalaya*, Sikkim Nature Conservation Foundation, p. 182.

*Material examined:* Recorded from Jaisamand Lake, Udaipur, 28.ix.2009, G. Sharma.

*Diagnostic characters:* Adult similar to chocolate pansy. Outer discal band of small black dots on upper hindwing. Upper with deep olive green sheen over brown. Under white with sparse black markings. Male darker, with a row of small white spots beyond cell at bases of spaces 2 to 6.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Pakistan, Nepal, Bangladesh, Bhutan, Myanmar.

38. *Euthalia nais* Forster, 1771, Baronet

1771. *Papilio nais* Forster, *Nov. Spec. Ins. Cent.*, **1**: 73.

1987. *Euthalia nais*: Gupta & Shukla, *Rec. zool. Surv. India, Occ. Pap.*, **106**: 38.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party.

*Diagnostic characters:* Adult upper tawny orange with black termen on both wings and narrow black outer discal line, the discal line broken into small spots on upper hindwing. Upper forewing has black band beyond cell, black bar at end cell and a large black spot at base of space 3 and in space 2. Upper hindwing has large black spot at mid-costa.

*Distribution:* India: Madhya Pradesh, Saurashtra southwards to peninsular India, Uttarakhand to Sikkim. *Elsewhere:* Nepal, Sri Lanka.

39. *Hypolimnas bolina* (Linnaeus, 1758), Great Eggfly

1758. *Papilio bolina* Linnaeus, *Syst. Nat.* (ed. 10), **1**: 479.

1987. *Hypolimnas bolina* Gupta & Shukla, *Rec. zool. Surv. India, Occ. Pap.*, **106**: 29.

*Material examined:* 1 male, Trevor Point, Mount Abu, 24.ix.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Male upperside very dark indigo-blue. Forewing with a large elongate and macular white spot at end of cell, two or three small subapical white spots.

Hindwing with a large medial white spot, a series of minute and frequently subobsolete submarginal white spots placed between the nervules.

*Distribution:* India: Andaman and Nicobar, Arunachal Pradesh, Bihar, Delhi, Meghalaya, Orissa, Uttar Pradesh and West Bengal. *Elsewhere:* Myanmar, Pakistan and Sri Lanka.

40. *Hypolimnas misippus* (Linnaeus, 1764), Danaid Eggfly

1764. *Papilio misippus* Linnaeus, *Mus. Utr.* p. 264.

1987. *Hypolimnas misippus*: Gupta & Shukla, *Rec. zool. Surv. India, Occ. Pap.*, **106**: 28.

*Material examined:* Recorded from Mount Abu, Udaipur, Puskar and Bharatpur.

*Diagnostic characters:* Adult male upperside black with dark iridescent blue or violet-ringed white, oval discal patch on both wings. Forewing with a small oval spot in the apex. Underside oval spot prominent which in the hindwing occupy the entire discal area and a prominent black costal spot. Adult female upperside orange or orange-brown, mimics the *Danaus chrysippus*. Forewing with white-spotted, black apex and costa. Hindwing with a prominent black costal spot and more wavy margin. Wingspan 70-85 mm.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Pakistan, Bangladesh, Myanmar, Malaysia, Indonesia, Africa, Japan, Australia, Thailand, Taiwan, Hongkong, the Carribean Islands, parts of Latin America and China.

41. *Junonia almana* (Linnaeus, 1758), Peacock Pansy

1758. *Papilio almana* Linnaeus, *Syst. Nat.*, (ed.x) **1**: 472.

1994. *Junonia almana*: Varshney, *Oriental Ins.*, **28**: 176.

*Material examined:* Recorded from Mount Abu, Udaipur, Puskar, Ajmer, Jaipur, Sariska and Bharatpur.

*Diagnostic characters:* Adult upperside light yellowish brown with two ocelli each in both wings; that near apex of Hindwing large, having two whit spots in peacock back-ground and surrounded by yellow and black rings. Forewing with dark costal bars and both wings with brown wavy margins. Underside leaflike, brownish in male and yellowish in female. Wingspan 60-65 mm.

*Distribution:* Throughout India. *Elsewhere:* Afghanistan, Iran, Turkey, Syria, south-eastern Europe, Sri Lanka, Pakistan, Bangladesh, Myanmar, Malaysia, Singapore, Indonesia, Thailand, Philippines, Hongkong, Taiwan, the lesser Sunda Islands and China.

42. *Junonia atlites* (Linnaeus, 1763), Grey Pansy

1763. *Papilio atlites* Linnaeus, *Cent. Ins.* p.24.

1911. *Junonia atlites* (Linnaeus): Tytler, *J. Bom. Nat. Hist. Soc.*, **21**(1): 61.

*Material examined:* Recorded from Mount Abu, Udaipur, Puskar, Ajmer, Jaipur, Sariska and Bharatpur.

*Diagnostic characters:* Adult upper creamy grey with dark brown lines and with complete row of discal eyespots on both wings.

*Distribution:* Throughout India except drier areas. *Elsewhere:* Sri Lanka, Bangladesh, Myanmar, Bhutan and Nepal.

#### 43. *Junonia hierta* (Fabricius, 1798), Yellow Pansy

1798. *Papilio hierta* Fabricius, *Ent. Syst.*, (suppl.) 4: 424.

1994. *Junonia hierta*: Varshney, *Oriental Ins.*, 28: 176.

*Material examined:* Recorded from Mount Abu, Udaipur, Puskar, Ajmer, Jaipur, Sariska and Bharatpur.

*Diagnostic characters:* Adult male upperside forewing bright yellow. Forewing black bordered with two yellowish white elongated markings in the apex and two ocelli in the discal area. Hindwing with broad black costa and base, the latter with a brilliant blue oval patch and no spots in the yellow area. Female larger but pale. Forewing with narrow costal border having four bands extending inwards. Hindwing with costal and basal areas more black or brownish; oval blue patch small and two spots in the yellow border. Underside straw yellow. Forewing more yellowish with distinct ocelli. Hindwing greyish basally with brown wavy lines. Spots and lines more pronounced in female. Wingspan 45-60 mm.

*Distribution:* India: Himalayas as far as west of Kashmir, Assam, Bengal, South and Central India, Saurashtra. *Elsewhere:* Sri Lanka, Pakistan, Afghanistan, Arabia, Bangladesh, Myanmar, Thailand, China and Hongkong.

#### 44. *Junonia iphita* (Cramer, 1779), Chocolate Pansy

1779. *Papilio iphita* Cramer, *Pap. Exot.*, 3: 209.

1911. *Junonia iphita* (Cramer): Tytler, *J. Bom. Nat. Hist. Soc.*, 21(1): 61.

*Material examined:* Recorded from Mount Abu, Udaipur, Puskar, Ajmer, Jaipur, Sariska and Bharatpur.

*Diagnostic characters:* Adult upper pale to dark brown with darker brown bands. Upper hindwing with row of small eyespots. Upper forewing with or without small eyespots. Forewing apex and hindwing tornus slightly produced. Forewing apex square-cut and termen concave.

*Distribution:* Throughout India except drier areas. *Elsewhere:* Sri Lanka, Pakistan, Bangladesh, Myanmar, Bhutan and Nepal.

#### 45. *Junonia lemonias* (Linnaeus, 1758), Lemon Pansy

1912. *Precis vaisya* Fruhstorfer, In Seitz, *The Macrolepidoptera of the World*, 9: 424.

1994. *Junonia lemonias*: Varshney, *Oriental Ins.*, 28: 176.

*Material examined:* Recorded from Mount Abu, Udaipur, Puskar, Ajmer, Jaipur, Sariska and Bharatpur.

*Diagnostic characters:* Adult upperside dark brown or greyish brown. Forewing with black lines, yellowish brown spots and 2 red ocelli, the lower one larger and prominent. Hindwing with a large apical red ocellus enclosing two minute white spots and smaller lower black spot. Underside yellowish brown in male, pinkish brown in female with several wavy lines and the lower ocellus in the forewing alone visible mostly. Wingspan 45-60 mm.

*Distribution:* India: Himalayas as far west as Kashmir, Assam, West Bengal, South and Central India. *Elsewhere:* Sri Lanka, Pakistan, Bangladesh, Myanmar, Malaysia, Indonesia, China, Hongkong, Taiwan and Philippines.

#### 46. *Junonia orithiya* (Linnaeus, 1758), Blue Pansy

1885. *Junonia swinhoi* Butler, *Ann. Mag. Nat. Hist.*, **16**(5): 309.

1994. *Junonia orithya*: Varshney, *Oriental Ins.*, **28**: 176.

*Material examined:* Recorded from Mount Abu, Udaipur, Puskar, Ajmer, Jaipur, Sariska and Bharatpur.

*Diagnostic characters:* Adult male upperside forewing basal two-thirds black and apex pale brown with white transverse bands. Hindwing predominantly bright blue. Both wings with two orange-ringed ocelli each. Female larger, pale almost light brown. Blue markings in the hindwing slight and orange-ringed spots bigger than in female. Underside greyish brown with white markings and wavy lines. Ocelli visible in forewing only. Wingspan 40-60 mm.

*Distribution:* Throughout India. *Elsewhere:* Arabia, Africa, Sri Lanka, Pakistan, Bangladesh, Myanmar, Malaysia, China, Hongkong, Taiwan, Japan and Australia.

#### 47. *Lethe rohria* Fabricius, 1787, Common Treebrown

1787. *Papilio rohria* Fabricius, *Mant. Ins.*, **2**: 45.

1947. *Lethe rohria rohria* Talbot, *The Fauna of Brit. India, Butterflies*, **2**: 200-201.

*Material examined:* 1 male, Guru Shikhar, Mount Abu, 23.ix.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult pale brown, with whitish bands and series of black eyespots on under. Under forewing has a V-shaped white band in discal area and another broader one in postdiscal area. Under hindwing has pale irregular discal band with dark border and irregular whitish basal line with inward dark border. On under hindwing, elongated and distorted eyespots in spaces 3, 4, sometimes 5; undistorted apical eyespot has white pupil and is much larger than eyespot in space 2. Hindwing toothed along border, prominently at vein 4. Male has apical and costal pale spots on upper forewing.

*Distribution*: India: South India to Madhya Pradesh, Jharkhand, Jammu & Kashmir to Arunachal Pradesh, Northeast. *Elsewhere*: Pakistan, Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

48. *Melanitis leda* Linnaeus), 1758, Common Evening Brown

1775. *Papilio leda ismene* Cramer, *Pap. Exot.* 1: 40.

1947. *Melanitis leda ismene* Talbot, *The fauna of Brit. India, Butterflies.* 2: 366-369.

*Material examined*: 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 15.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters*: Adult large brown. Forewing produced and slightly angled below vein 5 in male. Hindwing slightly tailed at veins 1 and 3. Under grey with prominent dark brown striations and a series of prominent white-pupilled eyespots of varying sizes. Forewing produced and angled at vein 5 in male. Under pale grey or brown, never with fine brown streaks. Eyespots on under reduced and obscure.

*Distribution*: Throughout India except extreme Northwest. *Elsewhere*: Pakistan, Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

49. *Melanitis phedima* Cramer, 1780, Dark Evening Brown

1732. *Papilio phedima* Stoll, *Pap. Exot.* 4: 165-252.

1932. *Melanitis phedima galkissa* Evans, *The Ident. Indian Butterflies* (2<sup>nd</sup> ed.), p.126.

*Material examined*: 1 male, Arna, Mount Abu, 31.i.2011, Coll. G. Sharma & party.

*Diagnostic characters*: Adult similar to common evening brown, but differs in being much darker and the apical eyespots on upper forewing lack the orange and are much reduced. Both wings have grey border on upper. Forewing not produced and termen straight. Under dark brown, finely striated with pale purplish lines and small but distinct eyespots. Hindwing toothed at vein 3.

*Distribution*: India: Western Ghats, Madhya Pradesh, Jammu & Kashmir to Arunachal Pradesh, Northeast. *Elsewhere*: Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

50. *Mycalesis mineus* (Linnaeus, 1758), Dark-Brand Bushbrown

1767. *Papilio mineus* Linnaeus, *Syst. Nat.* (12<sup>th</sup> ed.). 1(2): 768.

1947. *Mycalesis mineus mineus* (Linnaeus): Talbot, *The fauna of Brit. India, Butterflies.* 2: 134-136.

*Material examined*: 1 male, Sariska Forest Area, Alwar, 16.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters*: Adults similar to Common Bushbrown, but all eyespots on under hindwing are in line. Two dark lines mark a pale area on upper forewing in which the eyespot

is situated. The eyespot has a dark yellow ring often diffused into pale area. Male has a salmon pink oval or rarely brown brand on upper hindwing and another small brown brand on under forewing.

*Distribution:* India: Peninsular India upto Mumbai, Madhya Pradesh to West Bengal, Himachal Pradesh to Arunachal Pradesh, Northeast. *Elsewhere:* Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

#### 51. *Mycalesis perseus* Fabricius, 1775, Common Bushbrown

1798. *Papilio blasius* Fabricius, *Ent. Syst. (Suppl.)*, p. 426.

1947. *Mycalesis perseus blasius* (Fabricius): Talbot, *The fauna of Brit. India, Butterflies*, 2: 132-133.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 24.ix.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult dark brown, with upper uniformly dull brown. Eyespot not ringed, in space 2 on upper forewing outer margin. Markings on under vary in seasonal forms. On under hindwing, the central eyespot in this series is shifted out towards termen, while other spots are in line. Male has a small black brand on upper hindwing and another on under forewing.

*Distribution:* India: Peninsular India upto Gujarat, Northeast, Central and Eastern India, Himachal Pradesh to Arunachal Pradesh. *Elsewhere:* Pakistan, Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

#### 52. *Neptis hylas* (Linnaeus, 1758), Common Sailer

1872. *Neptis astola* Moore, *Proc. Zool. Soc. Lond.* p.560.

1987. *Neptis hylas astola*: Gupta & Shukla, *Rec. zool. Surv. India, Occ. Pap.* **106**: 36.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix.2008, Coll. G. Sharma & party; 1 male, Buda Puskar, Ajmer, 5.iii.2009, Coll. G. Sharma & party; 1 male, Forest Around Amber Fort, Jaipur, 14.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult upperside black with white markings. Forewing with white streaks, triangular spot and a series of spots. Hindwing with a basal broad white band and an outer series of squarish white spots. Underside golden brown with white markings as above, but sharply edged with black lines. Wingspan 50-60 mm.

*Distribution:* Throughout India. *Elsewhere:* Most of the Oriental region except the Philippines and Sulawesi.

#### 53. *Parantica aglea* (Stoll, 1782), Glassy Tiger

1992. *Parantica aglea melanooides* (Moore): Haribal, *The Butterflies of Sikkim Himalaya*, Sikkim Nature Conservation Foundation. p.188.

*Material examined:* Recorded from Arna, Mount Abu, 31.i.2011, G. Sharma.

*Diagnostic characters:* Adult with bluish white transparent markings on dark brown upper. Transparent markings more extensive than in blue tiger. Two fine dark lines divide the pale streak in forewing cell. Under paler.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

#### 54. *Phalanta phalantha* (Drury, 1773), Common Leopard

1770. *Papilio phalantha* Drury, *Exot. Inst.*, 1: 41.

1987. *Phalanta phalantha phalantha*: Gupta & Shukla, *Rec. zool. Surv. India, Occ. Pap.*, 106: 30.

*Material examined:* 1 male, Gomukh, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Fateh Sagar Lake, Udaipur, 30.ix.2009, Coll. G. Sharma & party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 15.ii.2010, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 6.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult upperside bright yellowish brown with rows of black spots and wavy lines. Markings slightly larger in female. Underside very pale brownish. Markings as above but indistinct. Hindwing with a pinkish tinge. Wingspan 50-60 mm.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Pakistan, South-Western Arabia, Africa, Bangladesh, Myanmar.

#### 55. *Polyura athamas* (Drury, 1773), Common Nawab

1770. *Papilio athamas* Drury, *Ill.exot. Ent.*, 1: 5.

1932. *Eriboea athamas athamas*: Evans, *Identification of Indian Butterflies*, p. 143.

*Material examined:* Recorded from Mount Abu Forest Area, 24.ix.2009, G. Sharma.

*Diagnostic characters:* Adult with pale greenish yellow, very wide, discal band of variable width and large pale green spot near apex on both wings and on both sides. Hindwing has two sharp tails.

*Distribution:* India: Peninsular India, Uttarakhand to Arunachal Pradesh, Northeast, Andamans. *Elsewhere:* Pakistan, Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

#### 56. *Tirumala limniace* (Cramer, 1775), Blue Tiger

1866. *Danais limniace* ver. *leopardus* Butler, *Proc. zool. Soc. London*. p.52.

1911. *Danais limniace* Cramer: Tytler, *J. Bom. nat. Hist. Soc.* 21: 49.

*Material examined:* 1 male, Mount Abu Forest Area, 22.ix.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult strikingly marked with pale blue streaks and spots against a black or dark brown background. Pale or almost white cell on under hindwing has a thin black, narrowly forked streak in the middle.

*Distribution:* Throughout India. *Elsewhere:* Afghanistan, Pakistan, Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

57. *Tirumala septentrionis* (Butler, 1874), Dark Blue Tiger

1874. *Danais septentrionis* Butler, *Ent. Mon. Mag.*, **11**: 163.

1984. *Tirumala septentrionis* (Butler): Ackery & Van-Wright, *Milikweed Butterflies*, p.199.

*Material examined:* 1 male, Trevor Point, Mount Abu, 24.ix.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult similar to blue tiger, but with narrower and darker markings. Upper overall black with pale blue markings. Hindwing has a long Y-shaped marking in the cell formed by two streaks joined at the base.

*Distribution:* India: Peninsular India, Orissa, Himachal Pradesh eastward upto Arunachal Pradesh. *Elsewhere:* Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

58. *Vanessa indica* (Herbst, 1794), Indian Red Admiral

1794. *Papilio atlanta indica* Herbst, *Nat. Schmetz.*, **7**: 171.

1911. *Vanessa indica* (Herbst): Tytler, *J. Bom. nat. Hist. Soc.*, **21**(1): 62.

*Material examined:* 1 male, Gomukh, Mount Abu, 19.ix.2008, Coll. G. Sharma & party.

*Diagnostic characters:* Adult upperside dark brown, forewing with central red band divided on the innerside by large black spots. Two rows of disjoint white apical spots, outer row very small. Hindwing red marginal band with black spots in the centre.

*Distribution:* India: Hills of South India, Jammu & Kashmir to Arunachal Pradesh, hills of Northeast. *Elsewhere:* Afghanistan, Nepal, Sri Lanka, Pakistan, Bhutan, Myanmar.

59. *Ypthima asterope* (Klug, 1832), Common Threering

1832. *Hipparchia asterope* Klug, *Symb. Phys.*, : 11-14.

1884. *Ypthima asterope mahratta* Moore, *J. asiat. Soc. Bengal*, **53**(2): 16.

*Material examined:* 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult very small and fine brown striations on under, with under forewing having discal and marginal bands meeting to form a prominent loop or a pale patch below apical eyespot. The eyespot is surrounded by a pale ring of white scales. Under

hindwing has two very small eyespots in tornal region and another indistinct eyespot in apical region. Upper forewing has a large eyespot with two pupils ringed with yellow. Upper hindwing has a small eyespot.

*Distribution:* Throughout India. *Elsewhere:* Afghanistan, Pakistan, Nepal, Bangladesh, Bhutan, Myanmar.

60. *Ypthima baldus* (Fabricius, 1775), Common Fivering

1775. *Papilio baldus* Fabricius, *Syst. Ent.*, 1(3): 829.

1994. *Ypthima baldus*: Varshney, *Oriental Insects.*, 28: 159.

*Material examined:* 1 male, Puskar Forest Area, Ajmer, 11.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult under pale brown or whitish with coarse brown striations and discal and inner bands prominent. Large, double-pupilled apical eyespot, with golden yellow ring, on both sides of forewing, ring broad on under forewing. Upper hindwing with two eyespots. Under hindwing with six eyespots in three pairs.

*Distribution:* India: Peninsular India upto Gujarat, Madhya Pradesh, Himachal Pradesh to Arunachal Pradesh, Northeast. *Elsewhere:* Nepal, Bangladesh, Bhutan, Myanmar.

61. *Ypthima huebneri* Kirby, 1871, Common Fourring

1871. *Ypthima huebneri* Kirby, *Syn. Cat. Diurn. Lep.*, p. 95.

1994. *Ypthima huebneri*: Varshney, *Oriental Insects.*, 28: 159.

*Material examined:* 1 male, Trevor Point, Mount Abu, 24.ix.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult under greyish white. Under forewing with a large yellow-ringed eyespot near apex and indistinct dull brown bands. Under hindwing has four yellow-ringed black eyespots, not on a dark band. Upper greyish brown. Upper forewing with large yellow-ringed eyespot near apex. Upper hindwing has two or three unpupilled eyespots near margin.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Nepal, Bangladesh, Bhutan, Myanmar.

(4). Family PAPILIONIDAE (Swallowtails)

62. *Atrophaneura aristolochiae* (Fabricius, 1775), Common Rose

1775. *Papilio aristolochiae* Fabricius, *Syst. Ent.* 1(3): 443.

1939. *Pachliopta aristolochiae*: Talbot, *Fauna of Brit. India*, Butterflies. 1: 86.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Jal

Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1 male, Kalighati, Sariska Forest Area, Alwar, 16.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult upperside black. Forewing discal area paler with black fold stripes and well marked pale vein-stripes. Hindwing with a prominent tail, five elongate white discal spots and red submarginal spots. Female paler with broader wings. Underside discal spot in the anal area red. Wingspan 80-100 mm.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Bangladesh, Malaysia, Singapore, Thailand, Indonesia, Philippines, Sunda Islands and China.

### 63. *Atrophaneura Hector* (Linnaeus, 1758), Crimson Rose

1758. *Papilio Hector* Linnaeus, *Sys. Nat.* ed. x. p. 459.

1983. *Atrophaneura (Atrophaneura) Hector*: Hancock, *Smithersia*, **2**: 46.

*Material examined:* 1 male, Trevor point, Mount Abu, 22.ix.2008, Coll. G. Sharma & party.

*Diagnostic Characters:* Large, glossy, bluish black, with bright crimson spots on tailed hindwing. Prominent but interrupted discal and apical white bands on forewing. Markings on both sides similar. Body bright crimson.

*Distribution:* India: South India, Orissa, Jharkhand, West Bengal and Andamans. *Elsewhere:* Sri Lanka, Bangladesh and Myanmar.

### 64. *Graphium agamemnon* (Linnaeus, 1758), Tailed Jay

1758. *Papilio agamemnon* Linnaeus, *Syst. Nat.* ed. x. p. 462.

1939. *Graphium agamemnon agamemnon*: Talbot, *Fauna of Brit. Ind.*, Butterflies, **1**: 229.

*Material examined:* 1 male, Gomukh, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Jaisamand Lake, Udaipur, 28.ix.2009, Coll. G. Sharma & party.

*Diagnostic Characters:* Adult: Both sexes black with bright green spots and streaks on wings. Hindwing tails short and stumpy. Under pale brown with black, suffused with lilac or violet-grey. Green spots and markings less distinct. Two red spots near base, each edged with a black crecent and a small red tornal spot on under hindwing.

*Distribution:* India: South India upto Gujarat, Uttarakhand to Arunachal Pradesh, Northeast, Andaman and Nicobar Islands. *Elsewhere:* Sri Lanka, Nepal, Bhutan, Bangladesh and Myanmar.

### 65. *Graphium doson* (C. & R. Felder, 1864), Common Jay

1864. *Papilio axion* C. & R. Felder, *Ver. Zool. Bot. Ges. Wien.* **14**: 305.

1939. *Graphium doson axion*: Talbot, *Fauna of Brit. Ind.*, Butterflies. **1**: 223.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 27.ix.2009, Coll. G. Sharma & party.

*Diagnostic Characters:* Adult: Both sexes have hindwing ends pronounced to form short tails. Overall black, with pale blue, partially transparent central band consisting of large spots, and a marginal row of smaller spots along the band. Under brown with similar but whitish markings. Under hindwing bar from costa red-centred, not joining dark basal band.

*Distribution:* India: South India upto Maharashtra, Orissa, West Bengal, Uttarakhand to Arunachal Pradesh, Northeast. *Elsewhere:* Sri Lanka, Nepal, Bhutan and Myanmar.

**66. *Graphium sarpedon* (Linnaeus, 1758), Common Bluebottle**

1758. *Papilio sarpedon* Linnaeus, *Sys. Nat.*, **10**: 461.

1983. *Graphium sarpedon* (Linnaeus): Hancock, *Smithersia*, **2**: 46.

*Material examined:* 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party.

*Diagnostic Characters:* Adult: Upper black with greenish blue central band running from inside Forewing apex across both wings through Hindwing cell, almost to the dorsum. The band is broken into spots towards Forewing apex, and narrows at both ends. Upper Hindwing has green crescents on outer margin. Under brown, with the blue band paler and a few red spots. Female paler with marginally broader wings. Both sexes have hindwing ends pronounced to form short tails.

*Distribution:* India: Jammu & Kashmir to Arunachal Pradesh, Northeast, South India. *Elsewhere:* Sri Lanka, Nepal, Bhutan, Bangladesh and Myanmar.

**67. *Papilio demoleus* Linnaeus, 1758, Lime Butterfly**

1758. *Papilio demoleus* Linnaeus, *Syst. Nat.*, (ed.x): 464.

1939. *Papilio demoleus demoleus* Talbot, *The Fauna of British India*, Butterflies, **1**: 189.

*Material examined:* 1 male, Nakki Lake, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Rajsamand Lake, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 4.iii.2009, Coll. G. Sharma & Party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Trevor point, Mount Abu, 1.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult upperside black with yellow spots. Hindwing without a tail and with a brick red oval spot anteriorly bordered with blue lunule at the inner margin and a bluish spot near the costal margin. Yellow wavy markings at the base of both wings. Underside forewing almost black with seven yellow streaks at the base and a few orange spots. Hindwing with blue-bordered orange spots in the middle. Wingspan 80-100 mm.

*Distribution:* Throughout India. *Elsewhere:* Afghanistan, Iran, Iraq, Arabia, Sri Lanka, Pakistan, Bangladesh, Myanmar, Malaysia, Indonesia, Thailand, Philippines, Taiwan, Papua New Guinea, Northern Australia and South China.

**68. *Papilio polyctor*** (Boisduval, 1836), Common Peacock

1836. *Papilio polyctor* Boisduval, *Spec. Gen. Lep.*, **1**: 205.

1895. *Papilio polyctor polyctor*: Rothschild, A revision of the Papilios of the Eastern Hemisphere. *Nov. Zool.*, **2**: 381.

*Material examined:* 1 male, Gomukh, Mount Abu, 19.ix.2008, Coll. G. Sharma & party.

*Diagnostic Characters:* Large-tailed butterfly with black wings dusted with golden green scales and Hindwing with iridescent blue patch. Upper Hindwing discal blue patch does not enter cell and inner edge of blue patch straight but diffused. Forewing costa arched and outer margin slightly concave in both sexes. Upper forewing with diffuse, golden green, outer discal band. Three or four red crescents along upper hindwing margin.

*Distribution:* India: Jammu & Kashmir to Arunachal Pradesh. *Elsewhere:* Nepal, Bhutan, Myanmar, Pakistan and Afghanistan.

**69. *Papilio polytes*** (Linnaeus, 1758), Common Mormon

1775. *Papilio romulus* Cramer, *Pap. Exot.*, **1**: 67.

1939. *Papilio polytes* Talbot, *The Fauna of British India, Butterflies*, **1**: 178.

*Material examined:* 1 male, Guru Shikhar, Mount Abu, 20.ix.2008, Coll. G. Sharma & party.

*Diagnostic characters:* Adult upperside black. Forewing with terminal series of white or yellow spots, decreasing in size towards the apex. Hindwing with complete discal band of elongate white spots, more prominent in female, ending in a red lunule in the tornal region and submarginal series of crimson lunules in female. Wingspan 90-100 mm.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Nepal, Bhutan, Bangladesh, Myanmar, Malaysia, Japan, Philippines, the Moluccas and China.

(5). Family: Pieridae (Whites and Yellows)

**70. *Anaphaeis aurota*** (Fabricius, 1793), Pioneer

1793. *Papilio aurota* Fabricius, *Syst. Ent.*, **3**(1): 197.

1939. *Anaphaeis aurota aurota*: Talbot, *The Fauna of British India, Butterflies*, **1**: 380.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix.2008, Coll. G. Sharma & party; 1 male, Dewair, Rajsamand, 26.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Puskar Forest Area, Alwar, 11.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult upperside male pure white with black apex in the forewing and black outer margins in both wings. Black area with white spots, elongated in the forewing and rounded in the hindwing. Female similar to male, but with thicker and broader veins, apex and outer margins. A characteristic hockey stick like spot in the middle of forewing. Underside male spots in the apex, yellowish in the forewing and yellow with black veins in hindwing. Wingspan 50-60 mm.

*Distribution:* Throughout India except Assam. *Elsewhere:* Afghanistan, Africa, a few Mediterranean countries, Bhutan, Pakistan, Saudi Arabia, Iran, Asia Minor, Madagascar, Myanmar and Australia.

#### 71. *Catopsilia pomona* Fabricius, 1775, Common Emigrant

1775. *Pipilio pomona* Fabricius, *Syst. Ent.*, p. 479.

1939. *Catopsilia pomona*: Talbot, *The fauna of Brit. India*, Butterflies, **1**: 493.

1993. *Catopsilia pomona*: Varshney, *Oriental Ins.*, **27**: 362.

*Material examined:* 1 male, Anadara Point, Mount Abu, 21.ix.2008, Coll. G. Sharma & party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 11.ii.2010, Coll. G. Sharma & party; 1 male, Todgarh Ravali, Ajmer, 3.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Costal margin only black at apex on upper side of forewing and outer marginal narrow border muscular. Ground colour of both wings white. Under side of both wings with silvery red-ringed spots at ends of cells. Antenna Red.

*Distribution:* India: Assam, Andaman and Nicobar Island, Bihar, Delhi, Gujarat, Tamil Nadu, Uttar Pradesh, Maharashtra, West Bengal and North-West Himalayas. Madhya Pradesh. *Elsewhere:* Sri Lanka, Myanmar and Pakistan.

#### 72. *Catopsilia pyranthe* (Linnaeus, 1758), Mottled Emigrant

1758. *Papilio pyranthe* Linnaeus, *Syst. Nat.*, (ed.x), **1**: 469.

1939. *Catopsilia pyranthe pyranthe*: Talbot, *The Fauna of British India*, Butterflies, **1**: 497.

*Material examined:* 1 male, Nakki Lake, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Rajsamand Lake, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 11.ii.2010, Coll. G. Sharma & party; 1 male, Anadara Point, Mount Abu, 1.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult upperside dull white or greenish. Male forewing with a narrow black border at the apex and termen and a small cell spots. Hindwing mostly without markings. Female similar to male but forewing with larger cell spots, broader black border

and black costal border. Underside closely mottled with fine brown or green lines in both sexes and with or without red-ringed silver spots in female. Wingspan 50-70 mm.

*Distribution:* India: Andamans, Assam, Gujarat, Tamil Nadu, Uttar Pradesh, West Bengal, Madhya Pradesh and N. W. Himalayas. *Elsewhere:* The entire Oriental region, tropical Africa, Southern Arabia, New Guinea and parts of Australia.

73. *Cepora nerissa* Fabricius, 1775, Common Gull

1775. *Papilio nerissa* Fabricius, *Syst. Ent.*, p. 471.

1939. *Cepora nerissa nerissa*: Talbot, *The fauna of Brit. India*, Butterflies, **1**: 365.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Sariska Tiger Reserve, Alwar, 8.iii.2009, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 18.ii.2010, Coll. G. Sharma & party; 1 male, Guru Shikhar, Mount Abu, 1.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Upperside of forewing with apical black area bearing prominent white spots. Hindwing with marginal black border dentate on the inner edge.

*Distribution:* India: Assam, Bihar, Maharashtra, Madhya Pradesh, Sikkim, Tamil Nadu, Uttar Pradesh, North West Himalayas. *Elsewhere:* Nepal and Sri Lanka.

74. *Colotis amata* Fabricius, 1775, Small Salmon Arab

1775. *Papilio amata* Fabricius, *Syst. Ent.*, p. 476.

1939. *Colotis calais amata*: Talbot, *The fauna of Brit. India*, Butterflies, **1**: 454.

*Material examined:* Recorded from literature.

*Diagnostic Characters:* Adult salmon pink upper in both sexes. Upper forewing with black costal border touching black spot at end-cell; apical half bearing spots of ground colour. Similar spotting on dark outer border on upper hindwing. Male upper hindwing with black band of specialized scales on costal margin.

*Distribution:* Throughout India except Northeast. *Elsewhere:* Pakistan, Sri Lanka.

75. *Colotis etrida* Boisduval, 1836, Small Orange Tip

1836. *Anthocharis etrida* Boisduval, *Spec. Gen. Lep.* **1**: 576.

1939. *Colotis etrida etrida*: Talbot, *The fauna of Brit. India*, Butterflies. **1**: 465.

*Material examined:* 1 male, Puskar Forest Area, Ajmer, 11.ii.2010, Coll. G. Sharma & party. *Diagnostic Characters:* Adult Male upper white, with broad, black-edged, orange apical patch and very small black cell spot on upper forewing. Sparse black dusting at base of both wings. Upper hindwing usually with costal black spot and a series of large black marginal spots.

*Distribution:* Throughout India except Northeast. *Elsewhere:* Pakistan, Sri Lanka.

76. *Colotis eucharis* Fabricius, 1775, Plain Orange Tip

1775. *Papilio eucharis* Fabricius, *Syst. Ent.*, p. 472.

1939. *Colotis eucharis*: Talbot, *The fauna of Brit. India*, Butterflies, 1: 467.

*Material examined:* 1 male, Pichhola Lake, Udaipur, 27.ix.2009, Coll. G. Sharma & party; 1 male, Todgarh Ravali, Rajsamand, 3.ii.2011, Coll. G. Sharma & Party.

*Diagnostic Characters:* Adult male upper white. Upper forewing has broad orange-yellow apical patch with black outer margin. Orange-yellow apical patch not completely enclosed by black border. Upper hindwing usually with marginal black vein spots. Under forewing white with sulphur yellow base.

*Distribution:* India: Peninsular India to Central India. *Elsewhere:* Sri Lanka.

77. *Colotis fausta* (Oliver, 1804), Large Salmon Arab

1801. *Papilio fausta* Oliver, *Voy. L'Emp. Oth. Atlas*. pl. 33, figs. 4a, 4b.

1939. *Colotis fausta fausta*: Talbot, *The fauna of Brit. India*, Butterflies, 1: 461.

*Material examined:* Recorded from literature.

*Diagnostic Characters:* Adult male upper pale to deep salmon pink with upper forewing having black cell spot, broad black apex bearing spots of ground colour, and terminal bordering narrow to a point at or near tornus. Upper hindwing with marginal black spots.

*Distribution:* India: Peninsular India, Central India, Rajasthan, Punjab. *Elsewhere:* Afghanistan, Pakistan.

78. *Colias fieldii* Menetries, 1855, Dark Clouded Yellow

1855. *Colias fieldii* Menetries, *Enum. Corp. Anim. Mus.*, p.79.

1912. *Colias fieldii*: Talbot, *J. Bom. nat. Hist. Soc.*, 21: 593.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party.

*Diagnostic Characters:* Adult very variable. Male upper orange with broad black outer borders without small orange spots. Female with broader black borders having a series of small orange-yellow spots of unequal size; large black spot at upper forewing end-cell. In both sexes, upper hindwing with bright orange discocellular spot; dusted with blackish orange at base and under dark greenish yellow with pink fringe. Under forewing basal part more orange, bearing a white-centred large black discocellular spot and a series of small black postdiscal spots which increase in size towards dorsum.

*Distribution:* India: Jammu & Kashmir to Arunachal Pradesh. *Elsewhere:* Afghanistan, Nepal, Bhutan, Myanmar, Pakistan.

79. *Colotis vestalis* (Butler, 1876), White Arab

1876. *Teracolus vestalis* Butler, *Proc. zool. Soc. Lond.* p.135.

1939. *Colotis vestalis vestalis*: Talbot, *The fauna of Brit. India*, Butterflies. 1: 457.

*Material examined:* 1 male, Kalighati, Sariska Forest Area, Alwar, 16.ii.2010, Coll. G. Sharma & party.

*Diagnostic Characters:* Adult white upper with broad black terminal borders in both sexes. On upper forewing, prominent white spot on black terminal border and two or three white spots on black apex. No white spots on terminal border on upper hindwing. Upper forewing with dark cell spot and streak above cell; costal and basal area dusted with blackish grey scales.

*Distribution:* India: Madhya Pradesh, Gujarat, Rajasthan, Punjab, Uttar Pradesh. *Elsewhere:* Pakistan.

80. *Delias eucharis* Drury, 1773, Common Jezebel

1773. *Papilio eucharis* Drury, *Illustr. Nat. Hist.*, 2: pl. x, figs. 5, 6.

1939. *Delias eucharis*: Talbot, *The Fauna of British India*, Butterflies. 1: 352.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1 male, Kalighati, Sariska Forest Area, Alwar, 16.ii.2010, Coll. G. Sharma & party; 1 male, Rajsamand Lake, Rajsamand, 2.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult upperside male white or bluish white with prominent black veins and black outer discal band in both wings. Marginal black band with a row of white spots in forewing and light pink spots in the hindwing. Veins and spots heavily marked in the forewing. Underside hindwing pale yellow (rarely dark) with black veins and a row of white-ringed red or pink marginal spots, bordered black on both sides in both the sexes.

*Distribution:* Throughout India except the desert tracts. *Elsewhere:* Sri Lanka and Nepal.

81. *Eurema blanda* Boisduval, 1836, Three Spot Grass Yellow

1957. *Terias blanda* Boisduval, *Butterflies of the Indian Region*, BNHS. p.453.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party.

*Diagnostic Characters:* Adult: Marking very variable. Three unmistakable black spots in cell always on under forewing. Upper forewing apex and termen broadly black. Upper hindwing with narrow black terminal border.

*Distribution:* India: Peninsular India, Sikkim to Arunachal Pradesh. *Elsewhere:* Bangladesh and Nepal.

#### 82. *Eurema hecabe* Linnaeus, 1758, Common Grass Yellow

1758. *Papilio hecabe* Linnaeus, *Syst. Nat. ed. X.* p. 119.

1939. *Eurema hecabe simulata*: Talbot, *The Fauna of British India, Butterflies*, 1: 530-531.

*Material examined:* 1 male, Nakki Lake, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Bheel Beri, Rajsamand, 26.ix.2008, Coll. G. Sharma & party; 1 male, Buda Puskar, Ajmer, 5.iii.2009, Coll. G. Sharma & Party; 1 male, Keoladeo National Park, Bharatpur, 18.ii.2010, Coll. G. Sharma & party; 1 male, Nahargarh Biological Park, Jaipur, 4.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult upperside bright yellow. Forewing with broadly black excavated border in the apex and termen. Hindwing with narrow irregular border. The borders broader in female. Underside both wings yellow. Forewing with two cell black spots and the border not or less excavated in dry season form. Irregular ring spots outside the cell in both wings. Wingspan 40-50 mm.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, Pakistan, Bangladesh, Myanmar, Malaysia, Thailand, Indonesia, Africa, Madagascar, Mauritius, Fiji, Japan, Tonga, New Guinea, Korea, Australia and South Eastern China.

#### 83. *Eurema laeta* Boisduval, 1836, Spotless Grass Yellow

1836. *Terias laeta* Boisduval, *Spec. Gen. Lep.*, 1: 674.

1936. *Eurema laeta laeta*: Sander, *J. Bombat nat. Hist. Soc.*, 38(4): 801.

*Material examined:* 1 male, Jaisamand lake, Udaipur, 28.ix.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Male and female upper side wings yellowish. Forewing apex and termen rounded and broadly black, but is not excavated between vein 3 and does not run on the inner edge being unevenly rounded. Hindwing with narrow terminal black border.

*Distribution:* India: Andhra Pradesh, Manipur, Meghalaya, West Bengal, Peninsular India to Western Himalayas. *Elsewhere:* Sri Lanka.

#### 84. *Hebomoia glaucippe* Linnaeus, 1758, Great Orange Tip

1758. *Papilio glaucippe* Linnaeus, *Syst. Nat. ed. x.* p. 469.

1992. *Hebomoia glaucippe glaucippe*: Haribal, *Sikkim Nature Conservation Foundation*. p.83.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party.

*Diagnostic Characters:* Adult both sexes white on upper with apical half of upper forewing having large black-edged orange patch, upper hindwing with a few marginal spots, under forewing with white base and mottled red or brown apex.

*Distribution:* India: Peninsular India, Sikkim to Arunachal Pradesh, Northeast, Andamans. *Elsewhere:* Nepal, Bhutan, Myanmar, Bangladesh, Sri Lanka.

#### 85. *Ixias marianne* (Cramer, 1779), White Orange Tip

1779. *Papilio marianne* Cramer, *Pap. Exot.*, 3: 41.

1939. *Ixias marianne*: Talbot, *The Fauna of British India, Butterflies*, 1: 440.

*Material examined:* 1 male, Gyan Sarover, Mount Abu, 19.ix.2008, Coll. G. Sharma & party; 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Rajsamand Lake, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Sikar Forest Area, Sikar, 7.iii.2009, Coll. G. Sharma & Party; 1 male, Guru Shikhar, Mount Abu, 23.ix.2009, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Alwar, 11.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult upperside white. Male forewing with grey base and black apical half enclosing a large, broad orange patch. Hindwing with a broad black terminal border. Female forewing with black base and narrow orange patch containing four black spots. Underside rich sulphur-yellow with minute spots. Orange patch of upperside slightly visible in the disc. Both wings with a large black-white centered disco-cellular spot and a broad purple-brown band composed of conical, white pointed spots. Wingspan 50-55 mm.

*Distribution:* India: Peninsular India to Saurashtra, Punjab and West Bengal. *Elsewhere:* Entire Oriental region and Papua New Guinea.

#### 86. *Ixias pyrene* (Linnaeus, 1764), Yellow Orange Tip

1777. *Papilio sesia* Fabricius, *Gen. Ins.*, 41.

1939. *Ixias pyrene sesia*: Talbot, *The Fauna of British India, Butterflies*, 1: 445.

*Material examined:* 1 male, Guru Shikhar, Mount Abu, 20.ix.2008, Coll. G. Sharma & party; 1 male, Anadra Point, Mount Abu, 21.ix.2008, Coll. G. Sharma & party; 1 male, Ghana Sagar Lake, Ajmer, 10.ii.2010, Coll. G. Sharma & party; 1 male, Pandu Pole, Sariska Tiger Reserve, Alwar, 15.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult upperside yellow. Forewing with costal area and apex black having a large orange band. Hindwing with black outer border. Underside pale yellow with brown blotches and ocellus like blackish brown spots in both sexes. Wingspan 50-70 mm.

*Distribution:* India: Peninsular India to Saurashtra, North-West Himalayas to Assam and West Bengal. *Elsewhere:* Sri Lanka, Pakistan, Bangladesh, Myanmar, Malaysia, Taiwan, Japan and China.

87. ***Leptosia nina*** Fabricius, 1793, Psyche

1793. *Papilio nina* Fabricius, *Ent. Syst.*, 3(1): 194.

1939. *Leptosia nina nina*: Talbot, *Fauna Brit. India*, Butterflies, 1: 305-307.

*Material examined:* 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Rajsamand Lake, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party; 1 male, Puskar Lake, Ajmer, 2.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult white on upper, Upper forewing with black apex and large black discal spot. Under hindwing streaked with fine greenish line.

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

88. ***Pareronia valeria*** (Cramer, 1776), Common Wanderer

1787. *Papilio hippia* Fabricius, *Montissa Ins.*, 2: 55.

1939. *Valeria valeria hippia*: Talbot, *The fauna of Brit. India*, Butterflies, 1: 486.

*Material examined:* 1 male, Anadra Point, Mount Abu, 21.ix.2008, Coll. G. Sharma & party; 1 male, Buda Puskar, Ajmer, 5.iii.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult Male pale blue or bluish white on Upper, with black margin not broad, bearing on upper forewing, prominent marginal spots that increase in size towards apex. Under less bluish.

*Distribution:* Throughout India. *Elsewhere:* Pakistan, Nepal, Bhutan, Myanmar, Bangladesh.

89. ***Pieris brassicae*** Linnaeus, 1758, Large Cabbage White

1758. *Pieris brassicae*, Linn., *Syst. Nat. ed. X*. p. 467.

1864. *Pieris brassicae* var. *nepalensis* Doubleday, *Genera of Diurnal Lepidoptera*, 1: 9.

*Material examined:* 1 male, Pichhola Lake, Udaipur, 24.ix.2008, Coll. G. Sharma & party; 1 male, Ana Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & Party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party; 1 male, Rajsamand Lake, Rajsamand, 2.ii.2011, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult: Wingspan 55-70 mm, with females being larger than the males. The wing uppersides of both sexes are usually gleaming white, with a pronounced black tip to the forewing. This is augmented in the female, which has a larger black tip by a pair of post-discal black spots, with a black smear along the inner margin below the lower spot. The undersides of both sets of wings are pale yellow dusted with grey, except for the centre and base of the forewings, which are white. In females, the black dots of the forewings also appear on the undersides.

*Distribution:* Throughout India. *Elsewhere:* Baluchistan, Pakistan, Tibet, Yunnan.

90. *Pieris canidia* (Sparrman, 1768), Indian Cabbage White

1768. *Pieris canidia*, Sparrman, *Amaen Acad.* vii. p. 504.

1926. *Pieris canidia indica* Evans, *J. Bom. nat. Hist. Soc.*, **31**: 712.

*Material examined:* 1 male, Rajsamand Lake, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Foy Sagar Lake, Ajmer, 3.iii.2009, Coll. G. Sharma & party; 1 male, Jal Mahal, Jaipur, 5.iii.2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult: Wing expanse: 60-70mm. Adult butterflies are snow white forewings with black distal margins more developed in females than in males, hindwings are also pure white with black apical spots.

*Distribution:* India: Jammu & Kashmir to Arunachal Pradesh, hills of Northeast, South India. *Elsewhere:* Afghanistan, Bangladesh, Bhutan, Myanmar, Nepal, Pakistan.

(6). Family ARCTIIDAE

91. *Amsacta moorei* Butler, 1876

1876. *Areas moorei* Butler. *Cist. Entom.* **2**: 23.

1901. *Amsacta moorei* Hampson. *Cat. Lep. Phal. Brit. Mus.* **3**: 329.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix.2008, Coll. G. Sharma & party; 1 male, Trevor Point, Mount Abu, 24.ix.2009, Coll. G. Sharma & Party.

*Diagnostic characters:* Antennae black, with basal joint scarlet. Head white with crimson line behind it; abdomen scarlet above with dorsal and lateral black spots. Wings white, forewing with scarlet fascia along the costa, a black speck at each angle of cell. Hindwing with a black spot at end of cell.

*Distribution:* India: Uttarakhand, Maharashtra, N.W. Himalayas. *Elsewhere:* Karachi and Sind.

92. *Cretonotos gangis* (Linnaeus, 1763)

1764. *Phalaena gangis* Linnaeus, *Amoen. Acad.* **6**: 410.

1991. *Cretonotus gangis*, Mandal & Ghosh, *Fauna of Tripura, Rec. Zool. Surv. India* **88** (3&4): 313-314.

*Material examined:* 1 male, Mount Abu Forest Area, 18.ix.2008, Coll. G. Sharma & party; 1 male, Puskar Forest Area, 11.ii.2010, Coll. G. Sharma & Party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Head and thorax pinkish grey; abdomen crimson above, with dorsal and lateral series of black spots, the ventral surface black; fore wing pinkish grey, black points at each angle of cell, a fascia narrow at base, broad at extremity below the cell from near base to middle of vein 3, and a wedge-shaped patch from lower angle of cell to vein 6 near termen; hind wing whitish to fuscous brown, darker at termen, a dark subterminal spot above vein 5.

*Distribution:* India: Rajasthan, Madhya Pradesh, West Bengal, Maharashtra, Gujrat, Andhra Pradesh, Kerala, Tamil Nadu, Assam, Meghalaya, Arunachal Pradesh and Tripura. *Elsewhere:* Myanmar, Sri Lanka, Western Malaysia, Java, Australia, China, Pakistan and Nepal.

### 93. *Pericallia ricini* (Fabricius, 1775)

1775. *Bombay ricini* Fabricius, *Syst. Entom.*, p. 583.

*Material examined:* 1 male, Dewair, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Mount Abu Forest Area, Alwar, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Head and thorax dark grey brown, collar tinged with crimson. Forewing fuscous brown with numerous pale ringed black spots in the interspaces. Hindwing crimson with antemedial, medial, postmedial and marginal bands. Abdomen crimson with black bands.

*Distribution:* India: Andhra Pradesh, Arunachal Pradesh, Assam, Karnataka, Madhya Pradesh, Punjab and Tamil Nadu. *Elsewhere:* Bangladesh and Sri Lanka.

### 94. *Spilosoma obliqua* (Walker, 1862)

1855. *Spilosoma obliqua* Walker, *List Lep. Insects Brit. Mus.*, **3**: 679.

*Material examined:* 1 male, Ajmer Forest Area, 2-iii-2009, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 10-ii-2010; 1 male, Mount Abu Forest Area, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Antennae black, with basal joint scarlet. Head white with crimson line behind it; abdomen scarlet above with dorsal and lateral black spots. Wings white, forewing with scarlet fascia along the costa, a black speck at each angle of cell. Hindwing with a black spot at end of cell.

*Distribution:* Throughout India. *Elsewhere:* Bhutan, China, Eastern Asia and Nepal.

95. *Utetheisa pulchella* (Linnaeus, 1758)

1758. *Tinea pulchella* Linnaeus. *Syst. Nat.* 1: 534.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix. 2008, Coll. G. Sharma & party; 1 male, Forest near Fateh Sagar Lake, 26-ix-2009, Coll. G. Sharma & party; 1 male, Dewair, Rajsamand, 1-x-2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Sariska Tiger Reserve, Alwar, 4-ii-2011, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 9-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters:* Forewing white with five interrupted scarlet bands and with series of black spots between them and marginal series of black spots. Hindwing semidiaphanous white, a very irregular black submarginal band at apical area and between veins Cu 1a and 2a.

*Distribution:* Throughout India. *Elsewhere:* Africa, Australia, Europe, Malaya Archipelago, New Guinea, Phillipines and Sri Lanka.

## (7). Family CRAMBIDAE

96. *Crocidolomia binotalis* Zeller, 1852

1852. *Crocidolomia binotalis* Zeller. *Lepid. Microptera:* 66.

*Material examined:* 1 male, Dewair, Rajsamand, 1-x-2009, Coll. G. Sharma & party; 1 male, Mount Abu Forest Area, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult thorax marked with ferruginous or fuscous. Forewing more or less suffused in parts with ferruginous and fuscous; male with the costal tuft ochreous and black; a double antemedial line highly dentate in and below cell; prominent dark-edged white spots at the angles of cell. Hindwing semihyaline ochreous white; the apical area often more or less suffused with fuscous.

*Distribution:* Throughout India. *Elsewhere:* South Africa, Formosa, Sri Lanka, Myanmar, Java, Australia and Africa.

97. *Dichocrocis punctiferalis* (Guenee, 1896)

1854. *Astura punctiferalis* Guen. *Delt. & Pyr.* p. 320.

1896. *Dichocrocis punctiferalis:* Hampson, *The fauna of Brit. India, Moths,* 4: 307.

*Material examined:* 1 male, Forest near Fateh Sagar Lake, 26-ix-2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party.

Wing expanse: 24-32 mm.

*Distribution:* Throughout India. *Elsewhere:* Australian region, China, Japan, Malayan subregion, Sri Lanka and Myanmar.

98. *Hellula undalis* (Fabricius, 1781)

1781. *Hellula undalis* Fab., *Ent. Syst.* iii, 2, p. 226.

*Material examined:* 1 male, Dewair, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Forest near Fateh Sagar Lake, 26-ix-2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult Grey and brown suffused with fuscous; fore wing with pale dentate sub basal line, a dark antemedial line on a pale band excurved between sub costal and median nervures, a pale edged dark discocellular lunule, a pale post medial line excurved from vein 7 to 2, a pale apical spot and series of pale and dark marginal specks; hind wing pale, with slight fuscous suffusion on apical area.

*Distribution:* Throughout India. *Elsewhere:* Bangladesh, Myanmar, Indonesia, Malaysia, Pakistan, Philippines, Saudi Arabia, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam, Africa.

99. *Leucinodes orbonalis* Guenee, 1854

1854. *Leucinodes orbonalis* Guenee, *Delt. & Pyr.*, p. 223.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix. 2008, Coll. G. Sharma & party; 1 male, Ajmer Forest Area, 2-03-2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult head and thorax variegated with black and brown. Forewing with the base fulvous, ferruginous, and black, followed by an incomplete sinuous black line; large fulvous orbicular and reniform patches with some black on their edges and almost extending to costa; a black-edged ferruginous triangular patch from lower angle of cell to inner margin with a sinuous line beyond it; a pale fulvous sinuous postmeidal band not reaching costa; a sinuous black subarmginal line obsolescent towards outer angle and with a ferruginous and fuscous band beyond it, from below costa. Hindwing opalescent, with black speck at upper angle of cell and spot at lower angle; an postmedial black line nearly straight from costa, then recurved and sinuous; some pale fulvous submarginal patches and some black specks on margin. Thorax marked with ferruginous or fuscous.

*Distribution:* Throughout India. *Elsewhere:* Sri Lanka, S. Africa, Myanmar, Java, South Africa, Congo and Malaysia.

100. *Noorda blitealis* Walker, 1859

1859. *Noorda blitealis* Wlk., *Cat. xix*, p. 979.

*Material examined:* 1 male, Forest near Fateh Sagar Lake, 26-ix-2009, Coll. G. Sharma & party; 1 male, Mount Abu Forest Area, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult abdomen with lateral metallic-blue and black patches on segments 3 and 8; fore wing with white patch on base on inner area, a curved black antemedial line, two leaden grey discocellular spots on a pale discal patch, a black post medial line

outwardly oblique from costa to vein 4; hind wing hyaline, with broad black marginal band narrowing to anal angle; fore wing with broad marginal black band.

*Distribution:* Throughout the plains of India. *Elsewhere:* Sri Lanka.

101. *Maruca testulalis* (Geyer, 1832)

1832. *Crochiphora testulalis* Geyer. *Samml. Exot. Schmett.*, **4**(12): 629-630.

*Material examined:* 1 male, Dewair, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 4.iii.2009, Coll. G. Sharma & Party; 1 male, Jaipur Forest Area, 12-ii-2010, Coll. G. Sharma & party; 1 male, Mount Abu Forest Area, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult Head, thorax and abdomen fuscous brown; palpi white below forewing fuscous brown; the costal area tinged with fulvous; indistinct subbasal and antemedial lines across the cell and white spots below the cell; a lunulate black edged white spot in end of cell; a maculae black edged semihyaline band beyond the cell from below the costa to vein  $Cu_{1b}$ , hindwing semi hyaline white; the basal costal area fuscous and a spot at upper angle of cell; two upper angle of cell; two indistinct sinuous postmedial lines; a marginal fulvous brown and fuscous band from costa to vein Sc, its inner ledge very irregular.

*Distribution:* Throughout India. *Elsewhere:* widespread in tropical and subtropical regions of the world.

102. *Spoladea recurvalis* (Fabricius, 1775)

1782. *Phalaena recurvalis* Fabricius, *Ent. Syst.*, **2**: 237.

1939. *Hymenia recurvalis*: Klima, *Lep. Cat.*, **89**: 31.

*Material examined:* 1 male, Mount Abu Forest Area, 18.ix.2008, Coll. G. Sharma & party; 1 male, Forest near Fateh Sagar Lake, 26-ix-2009, Coll. G. Sharma & party; 1 male, Dewair, Rajsamand, 2.ii-2011, Coll. G. Sharma & party; 1 male, Sariska Tiger Reserve, Alwar, 4-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adults head and thorax are small sized black colour ochreous suffused with rufous and abdomen is suffused with ruscou; fore wing with no antemedial line, a medial black edged white band developed, not reaching the costa, its outer edge irregular and toothed on vein 2; hind wing with the band wider, more regular, less oblique, and only slightly narrowing to inner margin, Wing expanse: 24mm.

*Distribution:* Throughout India. *Elsewhere:* Australia, Japan, Syria, Oriental region.

103. *Syllepte derogata* (Fabricius, 1775)

1990. *Syllepte derogata* (Fabricius). *Coton et Fibres Tropicales*, **45**(3): 199-227.

*Material examined:* 1 male, Jaipur Forest Area, 12-ii-2010, Coll. G. Sharma & party; 1 male, Sariska Tiger Reserve, Alwar, 4-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult Yellowish white; the head and thorax spotted with black and brown; abdomen with segmental brown rings; a pair of black spots or dorsal band on 2<sup>nd</sup> segment and one or two black spots towards extremity. Forewing with two subbasal series of black-brown spots often developed into lines; an oblique antemedial line; an annulus in cell and smaller one below it. Hindwing with discocellular annulus touching an oblique minutely dentate antemedial line; a sinuous postmedial line, highly excurved and dentate between veins  $M_2$  and  $Cu_1$ , its sinus crossed by a dentate line; a minutely dentate submarginal line bent outwards to anal angle.

*Distribution:* India: Andhra Pradesh, Assam, Bihar, Delhi, Gujarat, Haryana, Karnataka, Madhya Pradesh, Rajasthan, Orissa, Punjab, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal. *Elsewhere:* Africa, Australia, Myanmar, Sri Lanka, China, East Siberia, Japan, Java.

(8). Family: Gelechiidae

104. *Helcystogramma hibisci* (Stainton, 1859)

1859. *Gelechia hibisci* Stainton, *Trans. ent. Soc. Lond.*, **5**(2): 117.

1877. *Gelechia (Helcystogramma) obseratella* zeller, *Horae Soc. ent. Ross.*, **13**: 371.

*Material examined:* 1 male, Jaipur Forest Area, 12-ii-2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult thorax dark fuscous; forewing elongate, costa slightly arched at base then straight, apex rounded, termen almost straight, tornus oblique, anal margin arched at base then slightly concave; hindwing grey scaled, somewhat quadrate, costa arched at middle, apex subacute, termen trapezoidal in shape, tornus oblique, anal margin basally arched then straight, termen and anal margin with cilia grey in colour.

*Distribution:* Throughout India. *Elsewhere:* S. China, Taiwan, Sri Lanka, Java and Australia.

105. *Pectinophora gossypiella* (Saunders, 1844)

1844. *Depressaria gossypiella* Saunders. *Trans. ent. Soc Lond.*, **3**: 285.

*Material examined:* 1 male, Forest near Fateh Sagar Lake, 26-ix-2009, Coll. G. Sharma & party; 1 male, Mount Abu Forest Area, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult blackish brown, black spots on fore wings, margin of hind wing deeply fringed, wingspan 15-20mm, small dark brown, wings are narrow with a wide fringe and are peculiarly pointed at the tips.

*Distribution:* India: Arunachal Pradesh, Assam, Bihar, Delhi, Gujarat, Haryana, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Tamil Nadu, Tripura, Uttar Pradesh, West Bengal. *Elsewhere:* Africa, Australia, West Indies, Mexico, Pakistan, America, Sri Lanka, Myanmar.

106. *Phthorimaea operculella* Zeller, 1873

1873. *Phthorimaea operculella* Zeller. *Verhandlg. Zool.-bot. Ges. Wien.*, 23: 262.

*Material examined*: 1 male, Puskar Forest Area, Ajmer, 10-ii-2010, Coll. G. Sharma & party.

*Diagnostic characters*: Adult brownish gray with minute dark markings on the forewings, head and thorax pale brown, forewing gray-brown with minute dark spots and have a narrow fringe of hairs; hind wings dirty white.

*Distribution*: Throughout India. *Elsewhere*: Bangladesh, Sri Lanka.

## (9). Family GEOMETRIDAE

107. *Hyposidra successaria* Walker, 1860

1860. *Hyposidra successaria* Walker, *Cat. Lip. Het. B. M.*, 20: 60.

1895. *Hyposidra successaria*: Hampson, *The fauna of Brit. India*, Moths, 3: 214.

*Material examined*: 1 male, Mount Abu Forest Area, 19.ix. 2008, Coll. G. Sharma & party; 1 male, Jaipur Forest Area, 6.iii.2009, Coll. G. Sharma & Party; 1 male, Forest near Fateh Sagar Lake, 26-ix-2009, Coll. G. Sharma & party; 1 male, Sariska Tiger Reserve, Alwar, 4-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters*: Wing expanse: Male: 42mm. Pale brick red, both wings with faint traces of medial and crenulate post medial lines; cilia dark; the post medial line and more or less distinct sub apical patch in male.

*Distribution*: Throughout India. *Elsewhere*: Sri Lanka, Myanmar and Java.

## (10). Family LYMANTRIIDAE

108. *Euproctis fraterna* (Moore, 1883)

1883. *Artaxa fraterna* Moore. *Lepid. Ceylon*, 2: 85.

*Material examined*: 1 male, Dewair, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 9-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters*: Adult Stout and yellowish moth with light wavy markings.

*Distribution*: India: Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Andhra Pradesh, Haryana, Bihar, Manipur. *Elsewhere*: Bangladesh, Myanmar, Thailand.

109. *Olene mendosa* Hübner, 1823

1818. *Dasychira mendosa* Hubner, *Zutr.* 2: 19.

1887. *Olene fusiformis*, Cotes & Swinhoe, *Cat. Moths of India*. p. 157.

*Material examined:* 1 male, Puskar Forest Area, Ajmer, 10-ii-2010, Coll. G. Sharma & party.

*Diagnostic characters:* Wing expanse male 34-42mm. Head, thorax and abdomen pale brown, the abdominal tuft dark; fore wing with a sub basal incurved dark line, waved ante and post medial lines; hind wing pale, the outer area slightly suffused with brown.

*Distribution:* India: Madhya Pradesh, Himachal Pradesh, Maharashtra, Uttar Pradesh. *Elsewhere:* Sri Lanka and Pakistan.

#### 110. *Somena scintillans* Walker, 1856

1855. *Somena scintillans* Walker, *Cat. Lep. Het. Brit. Mus.*, 7: 1734.

*Material examined:* 1 male, Mount Abu Forest Area, 18.ix.2008, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 11-iii-2009, Coll. G. Sharma & party; 1 male, Forest near Fateh Sagar Lake, 26-ix-2009, Coll. G. Sharma & party; 1 male, Dewair, Rajsamand, 2.ii-2011, Coll. G. Sharma & party; 1 male, Sariska Tiger Reserve, Alwar, 4-ii-2011, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 9-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters:* Head yellow, thorax brown, abdomen blackish, anal tuft orange. Forewing vinous brown, irrorated with dark scales, which colour extends as two spurs across the yellow marginal area below the apex and to centre of margin, costa often yellow. Hindwing yellowish with a broad yellow margin.

*Distribution:* Throughout India. *Elsewhere:* Pakistan, Myanmar, Sri Lanka.

#### (11). Family NOCTUIDAE

#### 111. *Acantholeucania loreyi* (Duponchel, 1827)

1827. *Noctua loreyi* Duponchel. *Lep. Fr.*, 7: 81.

*Material examined:* 1 male, Jaipur Forest Area, 12-ii-2010, Coll. G. Sharma & party.

**Adult:** Adult moths were grey with six minute black dots and a white spot on each forewing. Wing expansion varied from 31 to 34 mm.

*Distribution:* India: Delhi, Madhya Pradesh, Rajasthan, Haryana, Orissa, Punjab, West Bengal.

*Elsewhere:* Egypt, Pakistan, Solomon Islands, Japan, Indonesia, Algeria, China, Turkey, Mauritius, Australia, Iran.

#### 112. *Acontia malvae* Esper, 1808

1808. *Acontia malvae* Esper, *Schmett. iv*, 2, p. 63, pl. 195, fig. 4.

*Material examined:* 1 male, Dewair, Rajsamand, 1-x-2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult Head yellow; thorax bright canary-yellow; abdomen ochreous; fore wing bright canary-yellow, with an oblique waved antemedial line, reniform oval, with a brown outline or often obsolete, a post medial line highly excurved beyond the cell and angled towards inner margin, two sub marginal lines, the inner line angled below the costa, a large diffused triangular patch extending over the whole of the outer area, its apex running upto the costa at the post medial line; hind wing iridescent white, sometimes suffused with brownish or ochreous, or with the apical area only brownish or ochreous.

*Distribution:* Throughout India. *Elsewhere:* Europe, Formosa.

113. *Acontia nitidula* (Fabricius, 1787)

1787. *Noctua nitidula* Fabricius *Mant. Ins.*, 2: 126.

*Material examined:* 1 male, Mount Abu Forest Area, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult white, prominent gray and brown spots on the wings; wings expanse 30-32 mm.

*Distribution:* Throughout plains of India. *Elsewhere:* Pakistan.

114. *Acontia transversa* (Guenee, 1841)

1852. *Acontia transversa* Guenee, *Noct.*, 2: 211.

1894. *Acontia transversa*, Hampson, *The fauna of Brit. India*, Moths, 2: 323.

*Material examined:* 1 male, Ajmer Forest Area, 2-iii-2009, Coll. G. Sharma & party; 1 male, Jaipur Forest Area, 12-ii-2010, Coll. G. Sharma & party; 1 male, Mount Abu Forest Area, Alwar, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult Vertex and frons decorated rufous scales; thorax bright canary-yellow; abdomen ochreous; hind wing iridescent white, sometimes suffused with brownish or ochreous, or with the apical area only brownish or ochreous.

*Distribution:* Throughout India. *Elsewhere:* China, Sri Lanka, Myanmar, Java and Duke of York Isle.

115. *Adisura atkinsoni* Moore, 1881

1879. *Adisura atkinsoni* Moore, *P. Z. S.* p. 36.

1991. *Adisura atkinsoni*: Singh *et al.*, *Indian J. Agr. Sci.*, 61(1): 65-69.

*Material examined:* 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 9-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult pale yellowish brown and two V- shaped pecks on fore wings and hind wings white with pale brown markings.

*Distribution:* India: Andhra Pradesh, Assam, Bihar, Orissa, Punjab, Tamil Nadu, Uttar Pradesh, Karnataka, Madhya Pradesh. *Elsewhere:* Pakistan and Sri Lanka.

116. *Agrotis c-nigrum* Linnaeus, 1758

1924. *Agrotis c-nigrum* Linnaeus. *Franklin and Lacroix*: 408.

*Material examined:* 1 male, Mount Abu Forest Area, 18.ix.2008, Coll. G. Sharma & party; 1 male, Jaipur Forest Area, 12-ii-2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult forewing ground colour is orange-brown. The most prominent mark on the forewing is the pale, triangular orbicular spot which is cream coloured to pale yellowish-orange, sharply defined by black below, but above 'bleeding' into the shading on the costa on the leading edge of the wing. Other markings are diffuse light and dark spots that make up the antemedial and postmedial lines; hindwing is pale, with dark blackish-grey shading on the wing margin.

*Distribution:* India: Central India, Peninsular India, Tamil Nadu. *Elsewhere:* Austria, Bulgaria, Ontario, Romania, Japan, Russia, Hungary, USA, France, Italy, Denmark.

117. *Agrotis segetis* Hübner, 1803

1776. *Noctua segetum* Schiffermuller, *Wien. Verz.*, p. 252.

1894. *Agrotis segetis*: Hampson, *The fauna of Brit. India, Moths*, 2: 181.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix. 2008, Coll. G. Sharma & party; 1 male, Dewair, Rajsamand, 1-x-2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult are medium sized, stout, dark greenish-brown with reddish tinges and have grayish-brown wavy lines and spots on fore wings; hind wings are hyaline having dark terminal fringe. Wing expanse 45-55 mm.

*Distribution:* Throughout India. *Elsewhere:* Europe and Sri Lanka.

118. *Agrotis ypsilon* (Rottemburg, 1766)

1766. *Agrotis ypsilon*, Rott., *Naturf.xi.* p.141.

*Material examined:* 1 male, Puskar Forest Area, Ajmer, 4.iii.2009, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult forewing more suffused with brown, and with a black streak beyond the reniform, the sub marginal line dentate, with two black streaks on it below the apex; hind wing more or less suffused with fuscous brown.

*Distribution:* Universally distributed, except South America.

119. *Anadevidia peponis* (Fabricius, 1775)

1987. *Anadevidia peponis* Fabricius. *Bull. Fac. Agric. Tamagawa Univ.*, 27: 81-92

*Material examined*: 1 male, Mount Abu Forest Area, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters*: Adults are stout dark brown moths with wing expanse of 30-35mm.

*Distribution*: Throughout India.

120. *Anomis flava* (Fabricius, 1775)

1775. *Xanthodes flava*, Moore, *Lep. Ceyl. iii*, pl.149, figs. 2, 2a (larva).

*Material examined*: 1 male, Jaipur Forest Area, 6.iii.2009, Coll. G. Sharma & Party; 1 male, Puskar Forest Area, Ajmer, 10-ii-2010, Coll. G. Sharma & party.

*Diagnostic characters*: Adult bright canary yellow; fore wing with ante and post medial highly angulated rufous line, which are sometimes waved, the latter touching a submarginal angled line, a large bright rufous triangular patch occupying backwards along median nervure to the base, or occasionally almost obsolete a black subapical speck; cilia rufous; hind wing slightly suffused with red-brown, the outer margin rufous.

*Distribution*: India: Gujarat, Rajasthan. *Elsewhere*: Africa, Asia, Australia Korea, Taiwan, Philippines, Queensland, China, Japan.

121. *Antoba olivacea* (Walker, 1858)

1858. *Eublemma olivacea* Wlk., *Cat. xii*, p.795.

*Material examined*: 1 male, Puskar Forest Area, Ajmer, 4.iii.2009, Coll. G. Sharma & Party; 1 male, Mount Abu Forest Area, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters*: Adult medium sized and ochreous-white in colour; fore wings are slightly suffused with brown tinge and have a large triangular olive-green patch on the outer area; hind wings are white suffused with fuscous towards outer margin. Wing expanse, 22-26 mm. Vertex and frons ochreous white scaled.

*Distribution*: India: Punjab, Meghalaya, Madhya Pradesh, Assam, Manipur, throughout Southern India. *Elsewhere*: Sri Lanka.

122. *Anua coronata* (Fabricius, 1775)

1792. *Ophiusa coronata* Fabricius, *Syst. Ent.*, 1: 596.

1894. *Ophiusa coronata*, Hampson, *The fauna of Brit. India*, Moths, 2: 502

*Material examined*: 1 male, Forest near Fateh Sagar Lake, 26-ix-2009, Coll. G. Sharma & party.

*Diagnostic characters:* Head and thorax of adult pale reddish-brown and abdomen orange. Forewings are irrorated with dark specks and having a black patch near outer angle. Hind wings are orange coloured with broad medial and submarginal fuscous black bands not reaching inner margins. Wing expanse is 82-96mm.

*Distribution:* Throughout India. *Elsewhere:* Australia, Java, Myanmar, Sri Lanka.

### 123. *Elygea materna* (Linnaeus, 1767)

1767. *Ophideres materna* Linn., *Syst. Nat. I*, 2: 840.

1894. *Ophideres materna*, Hampson, *The fauna of Brit. India*, Moths, 2: 561.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix.2008, Coll. G. Sharma & party; 1 male, Jaipur Forest Area, 6.iii.2009, Coll. G. Sharma & Party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 18-ii-2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult are large in size and stout, having pale orange body with greenish tinge. Fore wings are greenish-grey, hind wings are orange in colour and have a round black spot in the centre and a marginal black band.

*Distribution:* India: Madhya Pradesh, Himachal Pradesh, Karnataka, Maharashtra, Uttar Pradesh, West Bengal. *Elsewhere:* New Zealand, Australia, Java, Pakistan, Sri Lanka.

### 124. *Helicoverpa armigera* (Hübner, 1805)

1804. *Noctua armigera* Hubner, *Noct.*, 2: 180.

1896. *Heliothis armigera*: Hampson, *The fauna of Brit. India*, Moths, 2: 174-175.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix. 2008, Coll. G. Sharma & party; 1 male, Ajmer Forest Area, 2-03-2009, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 11-iii-2009, Coll. G. Sharma & party; 1 male, Forest near Fateh Sagar Lake, Udaipur, 26-ix-2009, Coll. G. Sharma & party; 1 male, Jaipur Forest Area, 12-ii-2010, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 18-ii-2010, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 9-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult vertex and frons ochreous with a pale brown; forewing with indistinct double waved antemedial lines, a dark speck representing the orbicular, an indistinct curved medial line, the reniform indistinct, post medial and sub marginal waved lines, the space between them somewhat darker and with a series of pale or dark specks on the nervules; hind wing white, the veins fuscous, a broad blackish outer border usually with a pale sub marginal central patch.

*Distribution:* India: Gujarat, Bihar, Tamil Nadu, Karnataka, Uttar Pradesh, Rajasthan, Punjab, Maharashtra, Haryana, Assam, Himachal Pradesh, Madhya Pradesh, Andhra Pradesh,

Delhi, West Bengal, Orissa, Chhattisgarh, Andaman Islands. *Elsewhere*: Africa, Madagascar, Turkey, Bulgaria, Ivory Coast, Uganda, South Africa, Sudan, Ethiopia, Russia, Philippines, Iran, Pakistan, Mauritius, Thailand, China, Iraq, Queensland, Indonesia, Yemen, Nigeria, Egypt, Syria, Kenya, France, Saudi Arabia, Sri Lanka, Somalia, Hungary, Israel, Australia, Tibet, Bangladesh, Norway, Taiwan, Vietnam, Nepal, Germany.

125. *Helicoverpa assulta* (Guenee, 1852)

1965. *Helicoverpa assulta* Guenee; Hardwick. p. 120.

1852. *Heliothis assulta* Guenee, *Hist. nat. Insectes, Spec. gen. Lepid.*, 6: 178.

*Material examined*: 1 male, Mount Abu Forest Area, 19.ix. 2008, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 4.iii.2009, Coll. G. Sharma & Party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Dewair, Rajsamand, 2.ii-2011, Coll. G. Sharma & party.

*Diagnostic characters*: Adult stout bodied moth with a forewing span of 13-17 mm. It is yellow or red-yellow or green-yellow in colour. The hind wing is pale yellow with a broad dark border

*Distribution*: India: Coimbatore, Uttar Pradesh, Andhra Pradesh, Haryana, Assam, Bihar, Gujarat, Himachal Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Meghalaya, Orissa, Sikkim, Tamil Nadu. *Elsewhere*: South Africa, South Korea, Philippines, Indonesia, Australia, Bangladesh, Bhutan, China, Japan, Malaysia, Myanmar, Pakistan, Singapore, Sri Lanka, Thailand, Vietnam.

126. *Ilattia octo* Guenee, 1852

1852. *Amyna octo* Guenee, *Noct.*, 1: 233.

1894. *Amyna octo*: Hampson, *The fauna of Brit. India, Moths*, 2: 251.

*Material examined*: 1 male, Mount Abu Forest Area, Alwar, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters*: Adult Wing expanse 20-30mm; head, thorax and forewing cupreous red-brown.

*Distribution*: Throughout India. *Elsewhere*: Africa, Arabia, China, Japan, Myanmar, Sri Lanka, South America.

127. *Mythimna separata* (Walker, 1865)

1865. *Leucania separata* Walker. *Lepid. Insects Colln Br. Mus.*, 32: 626.

*Material examined*: 1 male, Ajmer Forest Area, 2-iii-2009, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 10-ii-2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult wing expanse 40 mm, forewings have two pale round spots. The forewing has the typical 'dead grass' appearance. It is pinkish buff, with a straight, brownish streak running from the apex obliquely to the postmedial row of dots. The hindwings are dull cream in colour, lightly suffused with grayish brown, the veins picked out darker in the same colour. The thorax and abdomen are grayish.

*Distribution:* India: Delhi, Rajasthan, Madhya Pradesh, Punjab, Haryana, Tamil Nadu, Andhra Pradesh, Orissa, West Bengal, Assam, Uttar Pradesh. *Elsewhere:* Asia, Pacific Islands, Australia, Fiji, and Afghanistan, Australia, Bangladesh, Bhutan, Burma, China, Indonesia, Japan, Korea, Laos, Malaysia, Nepal, New Zealand, Pakistan, Papua New Guinea, Philippines, Sri Lanka, Taiwan, Thailand and Vietnam,

#### 128. *Othreis fullonica* (Linnaeus, 1763)

1767. *Ophideres fullonica* Linn., *Syst. Nat.* I, 2: 812

1888. *Othreis fullonica*, Cotes & Swinhoe, *Cat. Moths of India*, p. 377.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix. 2008, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult large in size, stout having pale orange body with greenish tinge. Fore wings are reddish-brown, hind wings are orange in colour having marginal black patch towards the apex and a kidney shaped black spot in centre, wing expanse 80-110 mm.

*Distribution:* India: Madhya Pradesh, Himachal Pradesh, Meghalaya, Maharashtra, Sikkim. *Elsewhere:* Africa, Australia and Pakistan.

#### 129. *Spodoptera exigua* (Hübner, 1808)

1808. *Noctua exigua* Hubner, *Ent. Schmett. Noct.*, p. 362.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix. 2008, Coll. G. Sharma & party; 1 male, Dewair, Rajsamand, 1-x-2009, Coll. G. Sharma & party.

*Diagnostic characters:* Adult smaller in size with wing expanse of 25-35 mm and lighter in colour. Forewing with the subbasal, ante and postmedial double lines indistinct; the orbicular small and round, pale or ochreous; hindwing semihyaline opalescent white, the vein and outer margin tinged with fuscous.

*Distribution:* India: Punjab, Sikkim, Madras, Rajasthan, Uttar Pradesh, Assam, Tripura, Orissa, Gujarat, Madhya Pradesh, Maharashtra, Karnataka, Haryana, Andhra Pradesh, Tamil Nadu. *Elsewhere:* Sri Lanka, South Africa, Egypt, Iran, Bangladesh, Norway, Pakistan, Italy, Iraq, Indonesia, Japan, Australia, South China.

#### 130. *Spodoptera litura* (Fabricius, 1775)

1775. *Noctua litura* Fabricius, *Syst. Ent.* : 601.

1991. *Prodenia litura*, Mandal and Maulik, *Fauna of Orissa, Zool. Surv. India* 3: 212.

1989. *Spodoptera litura*, Holloway, *The Malayan Nature journal, Malayan Nature Society, Malaysia*, 42 (2&3): 136.

*Material examined:* 1 male, Forest near Fateh Sagar Lake, 26-ix-2009, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 9-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult vertex and frons dark brown; thorax light brown; abdomen brown; forewings with the subbasal, antemedial, and postmedial double waved lines indistinct; the orbicular small and ochreous; the reniform blackish, the submarginal line whitish and irregularly waved; hindwings with opalescent and semihyaline white, with a dark marginal line.

*Distribution:* India: Rajasthan, Madhya Pradesh, West Bengal, Sikkim, Orissa, Tripura, Himachal Pradesh, Uttar Pradesh, Punjab, Maharashtra, Karnataka, Tamil Nadu and Kerala. *Elsewhere:* Nepal, Southern Myanmar, Sri Lanka, Singapore, Borneo Java and Taiwan of oriental and also Australo- Papuan, Ethiopian, Palaeartic and Hawaiian Regions.

### 131. *Spodoptera mauritia* (Boisduval, 1833)

1833. *Spodoptera mauritia*, Boisd. *Fauna Ent. Madag. Lep.*, p. 92.

*Material examined:* 1 male, Puskar Forest Area, Ajmer, 4.iii.2009, Coll. G. Sharma & Party.

*Diagnostic characters:* Adult 15 mm in length, 35mm wing expanse, dark brown with a conspicuous black spot on each of the fore wings.

*Distribution:* India: Himachal Pradesh, Arunachal Pradesh, West Bengal, Manipur, Uttar Pradesh, throughout Southern India. *Elsewhere:* Malaysia, Pakistan, Solomon Islands, New South Wales, Indonesia, Sri Lanka, China, Vietnam.

### 132. *Trichoplusia ni* (Hübner, 1803)

1803. *Plusia ni*, Hubner, *Noct. Pl.* 58, fig. 284.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix. 2008, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 9-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult head and thorax is ferruginous-grey in colour while abdomen is ochreous-white with basal tufts ferruginous and more wavy and a slender Y-mark is present. Hind wings are more wavy and a slender Y-mark is present. Hind wings are pale fuscous. Wing expanse 35-40 mm.

*Distribution:* India: Rajasthan, Maharashtra, Karnataka, Tamil Nadu, West Bengal, Punjab. *Elsewhere:* USA, Colombia, Trinidad, Thailand, Canada, Egypt, Brazil, Finland, Cuba, Taiwan, West Indian islands, Sri Lanka.

### 133. *Thysanoplusia nigrisigna* (Walker, 1857)

1857. *Plusia nigrisigna* Walker, *Cat. Xii*, p.928

*Material examined:* 1 male, Ajmer Forest Area, 2-03-2009, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 10-ii-2010.

*Diagnostic characters:* Adult Vertex, frons and thorax light grey; abdomen grayish, with small dorsal tufts; fore wing elongated, pale greenish-white, with a chalk colour weavy line extended from base and join near apex on costa, transverse deep grey, weavy lines from tornus and join near apex.

*Distribution:* India: Rajasthan, Uttar Pradesh, Haryana, Himachal Pradesh. *Elsewhere:* Japan, Pakistan, Tibet.

#### 134. *Thysanoplusia orichalcea* (Fabricius, 1775)

1781. *Plusia orichalcea* Fabr., *Sp. Ins.*, **2**: 227.

1894. *Plusia orichalcea*, Hampson, *Fauna Brit. India*, Moths, **2**: 573-574.

*Material examined:* 1 male, Puskar Forest Area, Ajmer, 10-ii-2010, Coll. G. Sharma & party; 1 male, Mount Abu Forest Area, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult vertex, frons and thorax reddish orange; abdomen paler, with the dorsal tufts small; fore wing pale red-brown, the last with the sub basal, ante and post medial waved lines very indistinct, fine and white, the sub marginal line irregularly lunulate, the orbicular and reniform with fine white out lines, the whole of the outer area, except the inner margin, occupied by a brassy golden patch which extends towards the base below median nervure.

*Distribution:* Throughout India. *Elsewhere:* China, Japan, South Africa and Sri Lanka.

### (12). Family NOLIDAE

#### 135. *Earias insulana* (Boisduval, 1833)

1833. *Earias insulana* Boisd., *Faun. Madag.*, p. 121, pl. 16, fig. 9.

*Material examined:* 1 male, Dewair, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 11-iii-2009, Coll. G. Sharma & party; 1 male, Jaipur Forest Area, 12-ii-2010, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Mount Abu Forest Area, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult head, thorax and forewing peagreen, the last with three angled indistinct lines medial, post medial and sub marginal; hind wing semidiaphanous white, the outer margin slightly fuscous below the apex; wing expanse 20-24 mm.

*Distribution:* Throughout India. *Elsewhere:* Mauritius, Baluchistan, Myanmar, Siam, Africa, Sri Lanka, Bangladesh, Japan, Taiwan, Egypt, Turkey, Pakistan.

#### 136. *Earias vittella* Fabricius, 1794

1794. *Earias fabia* Stoll, *Cram. Pap. Exot.* iv, pl.355, fig.H.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix. 2008, Coll. G. Sharma & party; 1 male, Jaipur Forest Area, 6.iii.2009, Coll. G. Sharma & Party; 1 male, Puskar Forest

Area, Ajmer, 10-ii-2010, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party; 1 male, Keoladeo National Park, Bharatpur, 18-ii-2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult 13-15 mm long, head and thorax ochreous-white; forewings pale white with a broad wedge-shaped horizontal green patch in the middle and hindwings silvery-creamy-white in colour. Wing expanse 30-34 mm.

*Distribution:* India: Bihar, Tamil Nadu, Karnataka, Haryana, Rajasthan, Madhya Pradesh, Punjab, Assam, Andhra Pradesh, Delhi, Orissa, Manipur, Uttar Pradesh. *Elsewhere:* Fiji, Thailand, Saudi Arabia, Sri Lanka, East Africa, Pakistan, Bangladesh, Myanmar, Indonesia, New Guinea.

### 137. *Selepa celtis* Moore, 1860

1887. *Plotheia celtis* Moore, *Lep. Ceyl.*, **3**: 158.

1894. *Plotheia celtis*, Hampson, *Fauna Brit. India*, Moths, **2**: 370.

*Material examined:* 1 male, Puskar Forest Area, Ajmer, 4.iii.2009, Coll. G. Sharma & Party; 1 male, Sariska Forest Area, Alwar, 4-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult vertex, frons and thorax pale brown; forewing long and narrow, pale brown with a purplish-grey tinge, traces of sub basal and medial waved black lines, a double post medial line excurved round end of cell and enclosing a blackish circular path; hindwing small and broad, whitish, suffused with fuscous towards outer margin.

*Distribution:* Throughout Peninsular India, Madhya Pradesh, Tamil Nadu, West Bengal. *Elsewhere:* Sri Lanka, Java, China.

### 138. *Selepa docilis* Butler, 1881

1881. *Selepa docilis*, Butl., *P.Z.S.* p. 619.

*Material examined:* 1 male, Jaipur Forest Area, 6.iii.2009, Coll. G. Sharma & Party; 1 male, Mount Abu Forest Area, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult medium sized with head and thorax of pale brown colour and abdomen fuscous. Fore wings are pale brown with purplish-grey tinge while hind wings are whitish suffused with fuscous towards the outer margin. Wing expanse, 22-26 mm.

*Distribution:* India: Karnataka, Tamil Nadu, Madhya Pradesh, Rajasthan, Haryana.

## (13). Family: Plutellidae

### 139. *Plutella xylostella* (Linnaeus, 1758)

1758. *Plutella xylostella* Linnaeus, *Syst. Nat.* (ed. 10). **1**: 538.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix. 2008, Coll. G. Sharma & party; 1 male, Ajmer Forest Area, 2-iii-2009, Coll. G. Sharma & party; 1 male, Keoladeo

National Park, Bharatpur, 11-iii-2009, Coll. G. Sharma & party; 1 male, Forest near Fateh Sagar Lake, Udaipur, 26-ix-2009, Coll. G. Sharma & party; 1 male, Sariska Tiger Reserve, Alwar, 4-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult 8-10mm, brown or grey conspicuous white spots on the forewings which appear like diamond patterns when wings lie flat over the body, pale whitish narrow wings with inner margins yellow, three pale whitish triangular markings on hind margin of each forewings, hindwings fringe of long fine hair.

*Distribution:* Throughout India. *Elsewhere:* Myanmar, Sri Lanka, Europe, Asia, Africa, Western Hemisphere, Oceania.

(14). Family PTEROPHORIDAE

140. *Exelastis atomosa* (Walsingham, 1885)

2008. *Exelastis atomosa* Wals. *Ann. of Pl. Pro. Sci.*, **16**(2): 367-369.

*Material examined:* 1 male, Puskar Forest Area, Ajmer, 10-ii-2010, Coll. G. Sharma & party; 1 male, Mount Abu Forest Area, Alwar, 30.i.2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adult brown, small moth, wings divided into narrow lobes fringed with scale, wing expanse 15 mm wing span, wings with several longitudinal fringe-like filamentous lobes; hindwings without scale tooth at dorsum of the third lobe, third lobe with one vein.

*Distribution:* India: Assam, Madhya Pradesh, Punjab, Maharashtra, Karnataka, Andhra Pradesh, Delhi, Gujarat, Karnataka, Maharashtra, Orissa, Rajasthan, Tamil Nadu, Uttar Pradesh. *Elsewhere:* Indonesia, Sri Lanka, Africa, Madagascar, Nepal, New Guinea.

141. *Sphenarches caffer* (Zeller, 1852)

1852. *Sphenarches caffer* Zeller. *Linn. Ent.*, **6**: 348.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix.2008, Coll. G. Sharma & party; 1 male, Puskar Forest Area, Ajmer, 4.iii.2009, Coll. G. Sharma & Party; 1 male, Jaipur Forest Area, 12-ii-2010, Coll. G. Sharma & party.

*Diagnostic characters:* Slender moth with lobed wings, fringed with scales, with two lobes in the forewings and three lobes in the hind wings; forewing veins R1, R2, R3, R4 and R5 present, R1 stalked with R2, Cu1 and Cu2 present and separate.

*Distribution:* Throughout India. *Elsewhere:* Africa, Maldives Islands, Philippines, Japan, Indonesia, Australia, New Hebrides and Tonga Islands in Oceania, West Indies Sri Lanka, Myanmar, Bangladesh, Pakistan.

## (15). Family PYRALIDAE

142. *Etiella zinckenella* (Treitschke, 1832)

1832. *Etiella zinckenella* Treitschke. *Schmett. Eur.* IX, 1, p. 201.

*Material examined:* 1 male, Puskar Forest Area, Ajmer, 10-ii-2010, Coll. G. Sharma & party; 1 male, Dewair, Rajsamand, 2-ii-2011, Coll. G. Sharma & party.

*Diagnostic characters:* Adults are medium sized moths having purplish-brown or pale rufous body; forewings grayish-brown suffused with rufous and have a prominent pale white costal fascia and an antemedial yellowish-brown band with a ridge of raised pale reddish scales near its inner edge. Hind wings are semi transparent and fuscous. Wing expanse is 20 to 28 mm.

*Distribution:* Throughout India. *Elsewhere:* USA, Mexico, West Indies, South America, Hungary, France, Austria, southern Russia, UAE, part of Africa, Indian sub-continent, Indonesia, Japan and Australia.

## (16). Family SATURNIIDAE

143. *Actias selene* (Hübner, 1807)

1806. *Echidna caudata selene* Hubner. *Samml. Exot. Schmett.*, 1: 3.

1979. *Actias selene:* Arora & Gupta. *Mem. Zool. Surv. India*, 16(1): 12.

*Material examined:* 1 male, Mount Abu Forest Area, 19.ix. 2008, Coll. G. Sharma & party.

*Diagnostic characters:* Adult pale emerald green. Wings are whitish at the base, pale greenish all over and yellowish near the margins with a conspicuous cross band and a white eye-spot in the center, hindwings have a tail, pinkish in colour.

*Distribution:* Throughout India. *Elsewhere:* Bangladesh, Bhutan, China, Indonesia, Japan, Myanmar, Nepal, Pakistan, Sri Lanka, Russia.

## (17). Family: Sphingidae

144. *Acherontia styx* (Westwood, 1847)

1848. *Sphinx (Acherontia) styx* Westwood. *Cab. Or. Ent.* p. 88.

1937. *Acherontia styx styx* Bell and Scott. *Fauna Brit. India, Moths*, 5: 58-60.

*Material examined:* 1 male, Dewair, Rajsamand, 25.ix.2008, Coll. G. Sharma & party; 1 male, Forest near Fateh Sagar Lake, Udaipur, 26-ix-2009, Coll. G. Sharma & party.

*Diagnostic characters:* Head and thorax dark blue grey with black lateral lines, which meet behind, the centre of thorax occupied a fulvous 'skull-mark' with two back eyes.

Forewing mottled with various shades of brown, fulvous and grey, a pale spot in the end of the cell. Hindwing yellow with a post medial black band not reaching the costa or anal angle, a similar submarginal maculate band.

*Distribution:* Throughout India. *Elsewhere:* Asia minor, Borneo, Celebes, China, Japan, Malaysia, Myanmar, Philippines, Sri Lanka and Timor.

145. ***Agrius convolvuli*** (Linnaeus, 1758)

1758. *Sphinx convolvuli* Linnaeus. *Syst. Nat.*, **10**: 490.

1937. *Herse convolvuli convolvuli* Bell & Scott. *Fauna Brit. India, Moths*, **5**: 61-65.

*Material examined:* 1 male, Mount Abu Forest Area, 18.ix.2008, Coll. G. Sharma & party; 1 male, Jaipur Forest Area, 12-ii-2010, Coll. G. Sharma & party.

*Diagnostic characters:* Upperside grey. Forewing with many narrow whitish lunulate bands; black streaks outwards from cell below vein R1 and M1. Hindwing pale grey, with broad subbasal, two median and postmedian, fuscous transverse bands.

*Distribution:* Throughout India. *Elsewhere:* Eastern Hemisphere except the higher latitude, rarely in Siberia.

146. ***Hippotion celerio*** (Linnaeus, 1758)

1758. *Sphinx celerio* Linnaeus. *Syst. Nat.*, **10**: 491.

1937. *Hippotion celerio*, Bell & Scott. *Fauna Brit. India, Moths*, **5**: 417-420.

*Material examined:* 1 male, Ajmer Forest Area, 2-03-2009, Coll. G. Sharma & party; 1 male, Sariska Forest Area, Alwar, 17.ii.2010, Coll. G. Sharma & party.

*Diagnostic characters:* Adult 40 mm long with wingspan of 70mm, brown in colour with a grey patch on the top of the head which extends to the thorax as a yellow and white line. The forewings are brown with a broad white band extending to the tip, with a median dark line all along its length and some ochraceous and pale brown lines behind it and the hind wings have a red tinge near the base and are patterned with black, base and anal angle bright pink and outer area ochraceous-brown with a black submarginal band.

*Distribution:* Throughout India. *Elsewhere:* Africa, Australia, Borneo, Europe, Fiji, Java, Sri Lanka and Timor.

### 3.4 Discussion

The various workers has done studies on butterflies of India such as de Niceville (1886, 1890), Moore (1890-1903), Marshall & de Niceville (1882), Swinhoe (1893, 1905-1912), Bingham (1905, 1907), Evans (1932), Talbot (1939, 1947), Wynter-Blyth (1957), Cantlie (1962) and presently Gaonkar (1996), Gunathilagaraj *et al.* (1998, 2000), Gupta and Mondal (2005), Haribal (1998), Heppner (1998), Kumar *et al.* (2007 a&b), Kunte (2000), Mathew and Rahamathulla (1993), Lewis (1973), Sharma *et al.* (2006), Varshney (1993, 1994, 1997) *etc.* Evans (1932) recorded approximately 1,439 species of butterfly from British India, including Ceylon and Burma and from India 1,501 species of butterfly recorded so far (Kunte, 2000). During present study around 146 of Lepidoptera *i.e.* 90 species of Butterflies and 56 species of Moths has been recorded from Aravalli Range of Rajasthan and this Range is also rich in flora *i.e.* around 200 species. The association between butterflies and plants is highly specific. Unlike bees, butterflies feed entirely on nectar, which they obtain through their long proboscis from flower. Thus pollination, a crucial link in the survival of ecosystem, is one such factor that needs to be well understood to develop appropriate strategies for conservation of the biodiversity. The some of Moths species recorded during present study are serious pests of vegetables in Aravalli Range of Rajasthan and throughout India (Sharma *et al.*, 2008; Sharma and Ramamurthy, 2009).

The Government of India under Indian Wildlife (Protection) Act, 1972 provided protection to 452 species of butterfly in three Schedules (out of six) as in Schedule I, Part IV, 128 species of butterfly; in Schedule II, Part II, 305 species and in Schedule IV (Secs. 2,8,9,11 and 61), 19 species listed (Anonymous, 2003). During present study recorded three species, which are listed in Indian Wildlife (Protection) Act, 1972 *i.e.* one species in Schedule I (*Atrophaneura hector* Linnaeus) and two species in Schedule II (*Lampides boeticus* Linnaeus and *Hypolimnas misippus* Linnaeus).

The Ministry of Environment and Forests, Government of India through various schemes encouraged researchers and organization to develop 'butterfly gardens' through relatively simple methods involving introduction of appropriate, naturally occurring host plants and recreating the natural habitats and Rajasthan Forest Department has taken initiative to develop 'butterfly garden' in Nahargarh Biological Park, Jaipur and declared Mount Abu as Eco-Sensitive Zone in the Aravalli Range. The illegal export/collection by visitors of rare species those restricted to particular habitats and the collection by immature workers (School/college students) will adversely affected fauna of Aravalli Range. Although Aravalli Range has a rich Lepidoptera fauna, but due to various reasons such as habitat destruction, fire, use of pesticides and weedicides and illegal collection for trade, many species are still under threat. By the Government of India efforts in conservation of biodiversity/habitats and protection of threatened species under law, still there is need of public awareness/participation and interaction/collaborative work between researchers and to develop standard common methodology for study to conserve these valuable creatures.

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# ARAVALLI RANGE – SATELLITE IMAGE

## RAJASTHAN

(False Colour Composite Image)

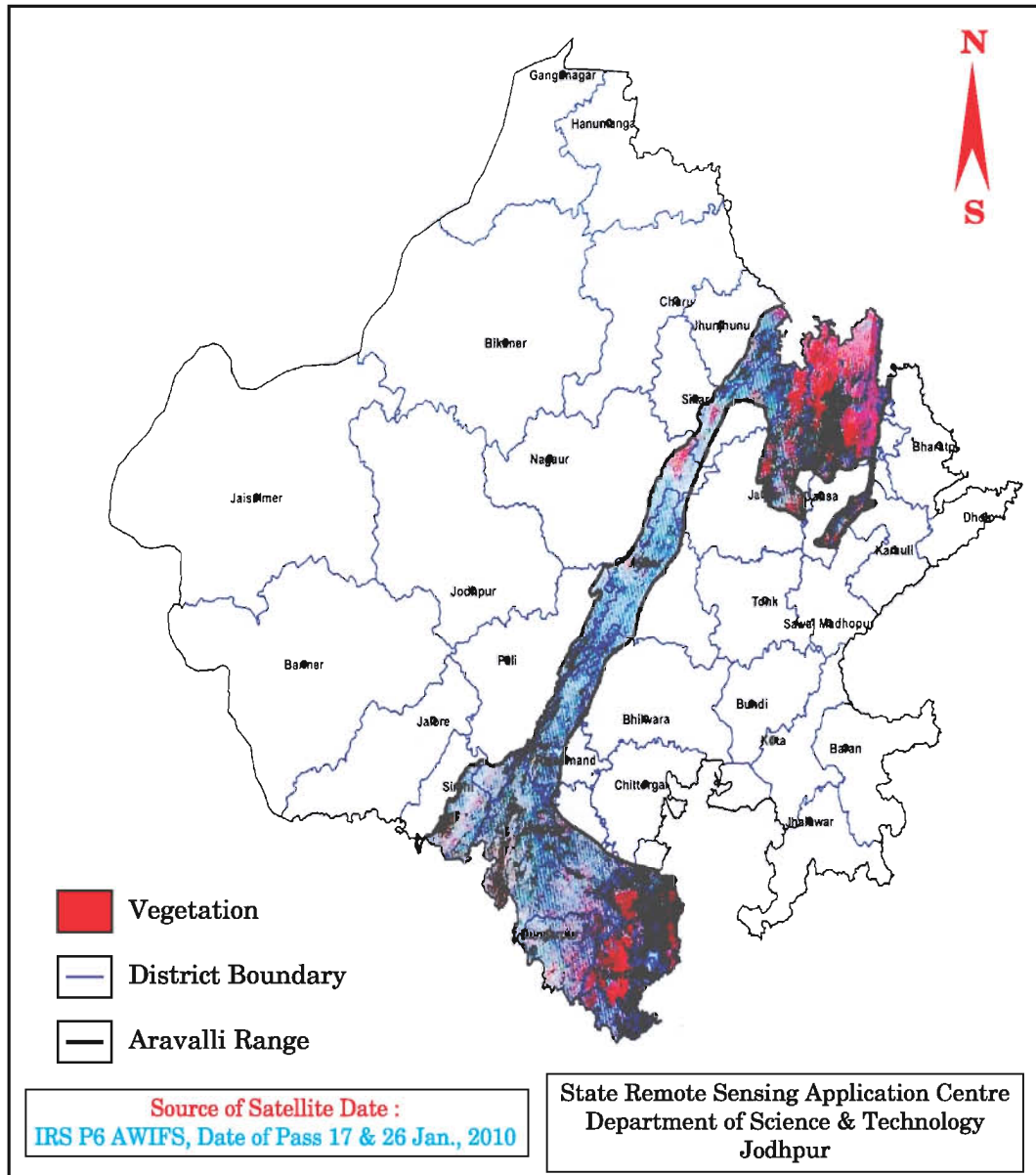


Fig. 2. Map of Rajasthan showing the Aravalli Range – Satellite image

**Plate - I**

**Different Habitat in and around Aravalli Range, Rajasthan**



**Habitats in and around Mount Abu**



**Habitats in and around Udaipur**



**Habitats in and around Rajsamand**



**Habitats in and around Ajmer**

**Plate - II**

**Different Habitat in and around Aravalli Range, Rajasthan**



**Habitats in and around Jaipur**



**Habitats in and around Alwar**



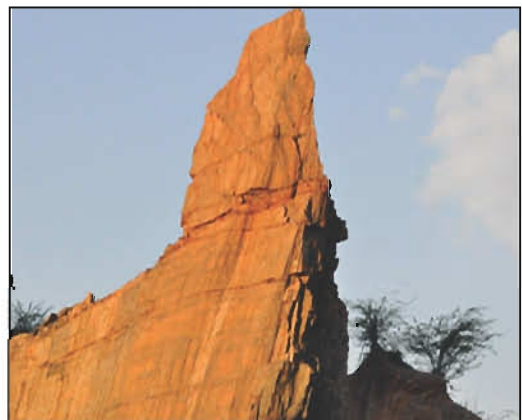
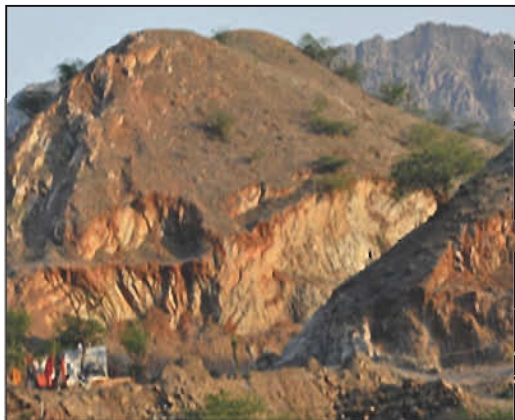
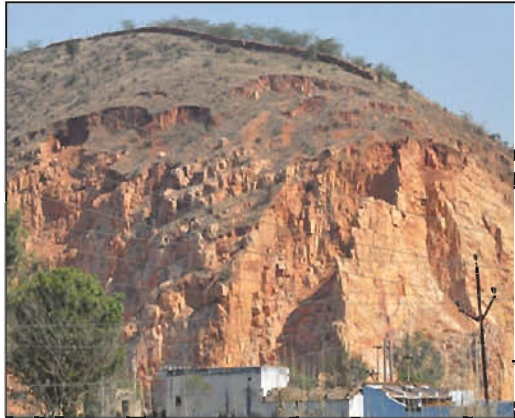
**Habitats in and around Sariska Tiger Reserve**



**Habitats in and around Keoladeo National Park**

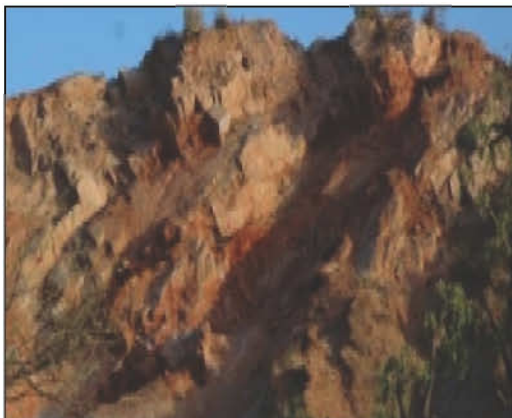
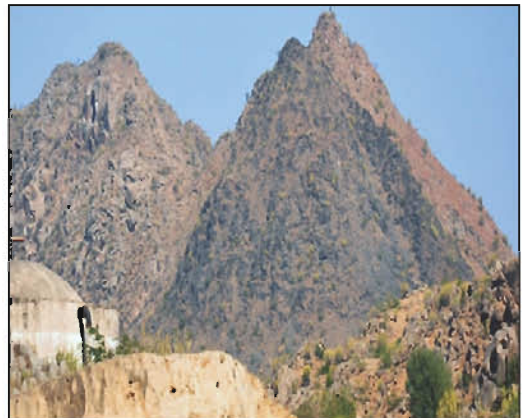
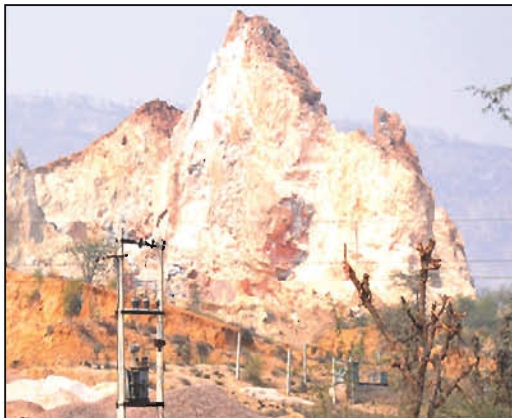
**Plate - III**

**Anthropogenic activities in Aravalli Range, Rajasthan**



**Plate - IV**

**Anthropogenic activities in Aravalli Range, Rajasthan**



**Plate - V**

**Damselflies of Aravalli Range, Rajasthan**



*Ceriagrion coromandelianum*



*Ischnura aurora*



*Pseudagrion rubriceps*



*Pseudagrion microcephalum*



*Rhodischnura nursei*



*Disparoneura quadrimaculata*

**Plate - VI**

**Damselflies and Dragonflies of Aravalli Range, Rajasthan**



*Neurobasis chinensis*



*Ictinogomphus rapax*



*Anax parthenope*



*Acisoma panorpoides*



*Brachythemis contaminata*



*Bradinopyga geminata*

**Plate - VII**

**Dragonflies of Aravalli Range, Rajasthan**



*Crocothemis servilia*



*Neurothemia fulvia*



*Neurothemis tullia*



*Orthetrum glaucum*



*Orthetrum pruinosum neglectum*



*Orthetrum sabina*

**Plate - VIII**

**Dragonflies of Aravalli Range, Rajasthan**



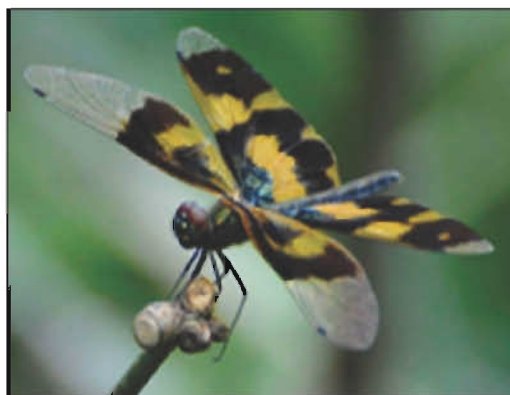
*Orthetrum triangulare*



*Palpopleura sexmaculata*



*Pantala flavescens*



*Rhyothemis variegata*



*Tholymis tillarga*



*Tramea basilaris bumeisteri*

**Plate - IX**

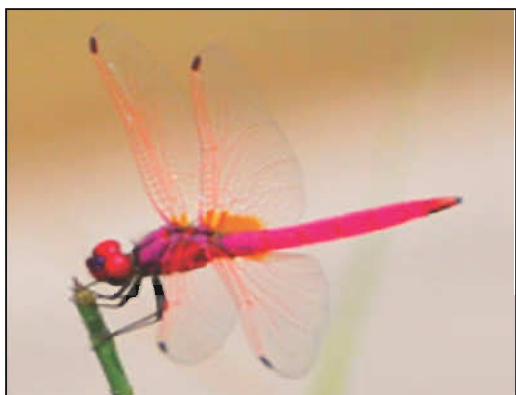
**Dragonflies of Aravalli Range, Rajasthan**



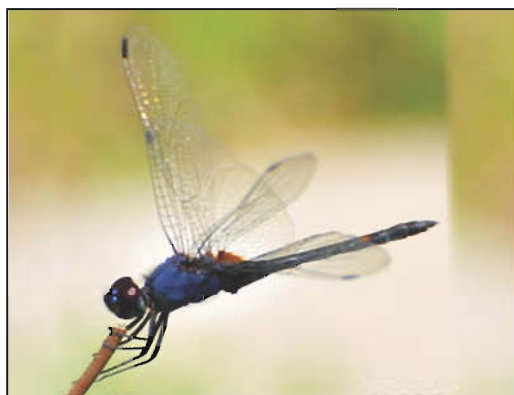
*Tramea limbata*



*Tramea virginia*



*Trithemis aurora*



*Trithemis festiva*



*Trithemis kirbyi*



*Trithemis pallidinervis*

**Plate - X**

**Butterflies of Aravalli Range, Rajasthan**



*Danaus chrysippus*



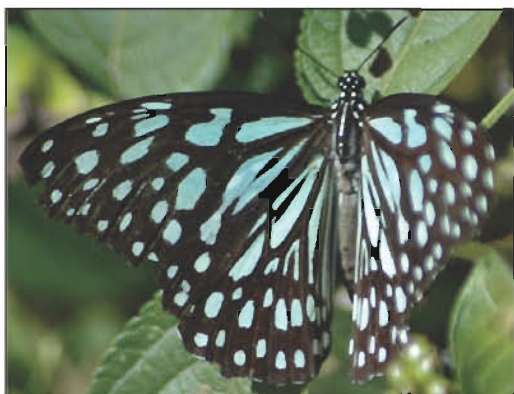
*Danaus genutia*



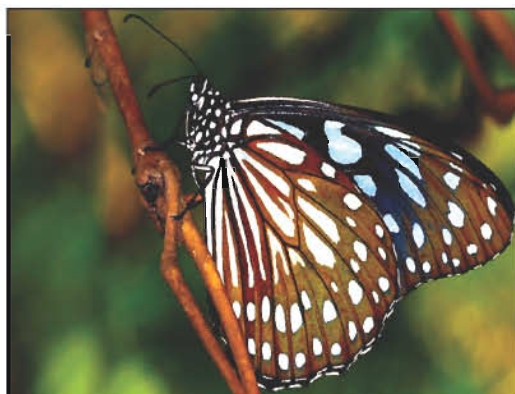
*Acraea violae*



*Euploea core*



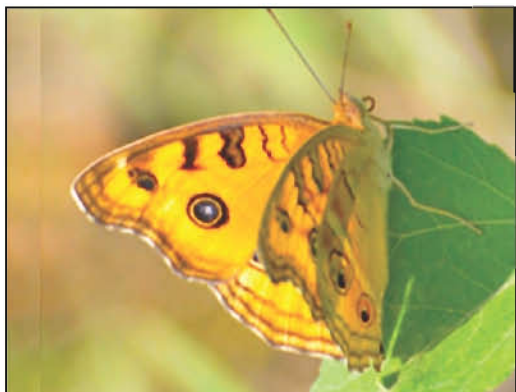
*Tirumala limniace*



*Tirumala septentrionis*

**Plate - XI**

**Butterflies of Aravalli Range, Rajasthan**



*Junonia almana*



*Junonia hierta*



*Junonia orithya*



*Junonia lemonias*



*Junonia iphita*



*Phalanta phalantha*

**Plate - XII**

**Butterflies of Aravalli Range, Rajasthan**



*Hypolimnas misippus*



*Hypolimnas bolina*



*Euthalia nais*



*Cynthia cardui*



*Vanessa indica*



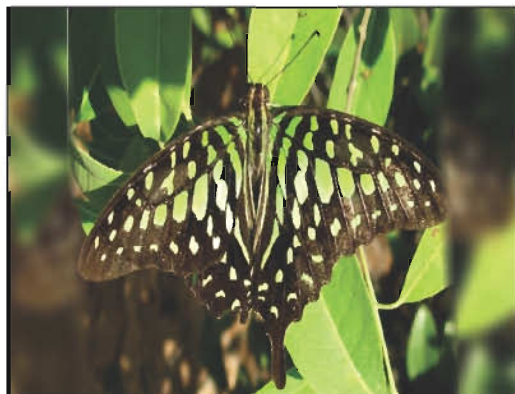
*Lethe rohria*

**Plate - XIII**

**Butterflies of Aravalli Range, Rajasthan**



*Atrophaneura aristolochiae*



*Graphium agamemnon*



*Graphium sarpedon*



*Papilio demoleus*



*Papilio polytes*



*Papilio polyctor*

**Plate - XIV**

**Butterflies of Aravalli Range, Rajasthan**



*Catopsilia pomona*



*Anaphaeis aurota*



*Colotis etrida*



*Ixias marianne*



*Delias eucharis*



*Pareronia valeria*

**Plate - XV**

**Butterflies of Aravalli Range, Rajasthan**



*Castalius rosimon*



*Tarucus nara*



*Celastrina huegelii*



*Catoctysops strabo*



*Euchrysops cnejus*



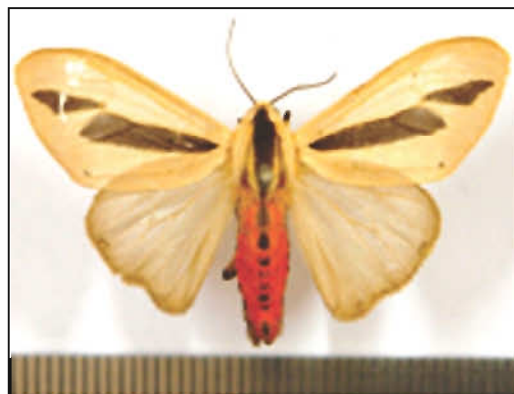
*Lampides boeticus*

**Plate - XVI**

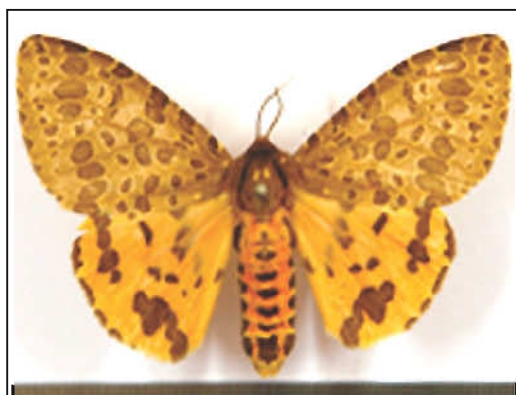
**Moths of Aravalli Range, Rajasthan**



*Amsacta moorei*



*Creatonotos gangis*



*Pericallia ricini*



*Spilosoma obliqua*



*Utetheisa pulchella*



*Crocidolomia binotalis*

**Plate - XVII**

**Moths of Aravalli Range, Rajasthan**



*Dichocrocis punctiferalis*



*Hellula undalis*



*Maruca testulalis*



*Spoladea recurvalis*



*Syllepte derogata*



*Helcystogramma hibisci*

**Plate - XVIII**

**Moths of Aravalli Range, Rajasthan**



*Hyposidra successaria*



*Euproctis fraterna*



*Olene mendosa*



*Somena scintillans*



*Acantholeucania loreyi*



*Acontia nitidula*

**Plate - XIX**

**Moths of Aravalli Range, Rajasthan**



*Agrotis c-nigrum*



*Agrotis ypsilon*



*Anadevidia peponis*



*Antoba olivacea*



*Anua coronata*



*Elygea materna*

**Plate - XX**

**Moths of Aravalli Range, Rajasthan**



*Helicoverpa armigera*



*Helicoverpa assulta*



*Othreis fullonica*



*Spodoptera litura*



*Thysanoplusia orichalcea*



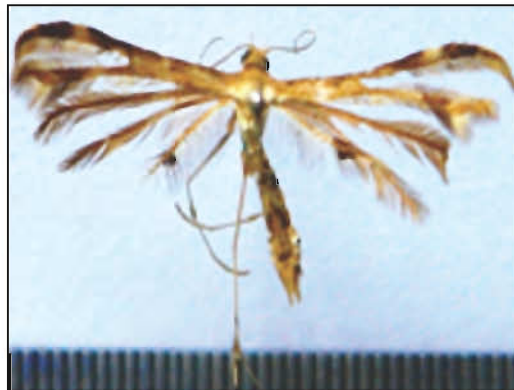
*Earias vittella*

**Plate - XXI**

**Moths of Aravalli Range, Rajasthan**



*Plutella xylostella*



*Sphenarches caffer*



*Actias selene*



*Acherontia styx*



*Agrius convolvuli*



*Hippotion celerio*