First report of the Giant Crab Spider, *Heteropoda venatoria* (Linnaeus), (Sparassidae: Araneae) from Konkan region, Maharashtra, India

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Sparassidae is the family of the Giant crab spiders. They are known as Giant crab spiders on account of their large size and crab like legs. *Heteropoda venatoria* (Linnaeus), (Sparassidae: Araneae: Arachnida) is a common species across tropical countries including India (Sethi and Tikader,1988). However, authentic reports from specific areas are lacking. The present report deals with the report of *H. venatoria* for the first time from the Konkan region of Maharashtra.

The spiders of the family Sparassidae are characterized by a cephalothorax broader than long (in most cases). Eyes variable in size in different genera, eight in number in two rows. Spiders are generally larger in size, do not make webs, and females carry a large cocoon beneath their body. Sternum heart shaped, legs powerful, laterigrade, spiny, apex of metatarsus with soft trilobate membrane, tarsi with two-toothed claws (Sethi and Tikader,1988).

The huntsman spider, *H. venatoria* (Linnaeus), commonly known as the Giant crab spider or the banana spider (due to its occasional appearance in marketed bananas), is a cosmopolitan species (Edwards, 1979). *H. venatoria* is a highly valued species in tropical countries because they capture and feed on cockroaches and other domestic insect pests. As with other vagrant spiders, huntsman spiders do not use webs to capture prey. Their great speed and strong chelicerae are used to capture the insects on which they feed. Poison is also injected into the prey from glands extending from the chelicerae. The capture the insects on which they feed. Poison is also injected into the prey from glands extending from the chelicerae. The flattened body enables this large spider to fit into surprisingly small cracks and crevices.

The abdomens of anterior median eye, tibia I with three to four pairs of ventral spines, the last pair distal and shorter (Kaston, 1972; Tikader, 1987; Pocock, 1900).

*H. venatoria* (Linnaeus) an adult male sighted and collected is described below.

Material examined: 1 B & (adult) collected, preserved dry.


Cephalothorax: Cephalothorax slightly wider than long. Carapace shorter than tibia of III leg. Clypeus yellow, carapace yellowish to brown with black pubescence near the hind part, cephalic region flat at the posterior end. Anterior and posterior lateral eyes equal in size, ocular quad narrow in front and longer than wide. Cephalothorax, with a thin ‘V’ or ‘Y’ yellow marking on median portion with a black central patch and the sub marginal portion is yellowish. The ocular region darker, chelicerae hairy. Labium wider than long, sternum brown and heart shaped.

Abdomen: Light brown, ovoid longitudinally, tapering at posterior end, truncated at anterior end clothed with hairs (Sethi and Tikader,1988). Dorsal surface with a longitudinal black marking at the anterior end and dark patches on the remaining part of the abdomen.

Legs: Long and very strong, hairy and spiny, characterized by 2 to 3 rows of dark spots, a single spot at the base of each spine. Such spots present on the dorsal part of the legs only. Coxae comparatively denser in hair as compared to the remaining part of the legs. Tibial apophysis of palp short, armed with two teeth. Leg formula: 2 1 4 3

Habitat: The vegetation type of the place of collection corresponds to that of a home garden. The garden comprises of many cultivated species as well as trees that are part of a natural distribution of the region such as Mangifera indica, Artocarpus integrifolia, Eugenia jambos, Achrus sapota,
First report of the Giant Crab Spider, *Heteropoda venatoria* from Konkan region, Maharashtra, India
Michelia champaka, Bauhinia racemosa, Tabernaemontana spp. etc.

Habits: In captivity, the spider was fed with Blatella spp., H. venatoria, and was observed to hunt voraciously. Some very minute and irregularly dispersed strands of silk were also observed along the walls of the jar.

Distribution: India: Ootacamund, Chennai city, Tamil Nadu; Siripur, Saran, Bihar; Tindilharia, Darjeeling, Kolkata, West Bengal; and almost entirely all over India. Cosmopolitan distribution throughout the world (Sethi and Tikader, 1988).

For species identification, books by Pocock (1900), Kaston (1972), and Tikader (1987) were used.

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References:

Insect diversity studies of Sukhna catchment area, Chandigarh, India

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India embraces three biological realms, viz., Indo-Malayan, Eurasian and Afrotropical and is observed with ten biogeographic zones and 26 biotic provinces (Alfred et al., 1998). There are 8% of world’s species diversity in India but India has only 2.4% of the total land mass of the world. Out of a total 86,874 animal species of this country, insect alone comprises 68.32% and Chordata only 5.70% (Alfred et al., 1998). Many investigators have studied the diversity, distribution and relative abundance of insect species from different parts of the country (Arrow, 1931a,b; Bingham, 1907a, b; Chopard, 1969; Evans, 1927; Mani, 1968, 1972; Talbot, 1939a, b; Wynter-blyth, 1957). But only a few investigations have been carried on insect diversity in this part of the country, however, a little has been done to survey the insect fauna from the Shivalik hills and adjoining areas. The present investigation was undertaken in order to study the diversity and distribution of different insect species in Sukhna catchment area of Chandigarh.

Material and Methods
Insect diversity studies were conducted in Sukhna catchment area (33°44’N latitude, 76°53’ E longitude; 347 msl) of Chandigarh. A survey for different insect species was made in nine collection sites of this catchment area from April to September, 2000. Different insect species were sampled at regular weekly intervals from all the localities (Table 1). It is bounded on the north and west by Punjab and east and south by Haryana. Total area of this Union territory is 140 sq. km out of which a beautiful lake of 1sq.km. has been created across the Sukhna Choa. Besides this Sukhna Choa, which is in north-east direction, there are two other rivulets namely Kanthal Choa in south and Patali Choa in the west. This area has alluvial soil with plants like mangoes, Eucalyptus, Acacia, Pipal etc. and crops like sugarcane, maize and wheat. The climate of Chandigarh is generally dry and pleasant with an average rainfall around of 108 cm. In summer, maximum temperature is around 44°C, whereas, in winter, the temperature goes down to 4-6°C.

Observation
Biodiversity studies were conducted on the diversity and distribution of different species in Sukhna catchment area at Chandigarh. Insect collections were made at regular weekly intervals in nine localities (Table 1) of this area from April to September, 2000.

Present biodiversity studies revealed 63 species of insect belonging to four insect orders i.e., orthoptera, coleoptera, lepidoptera and hymenoptera in this catchment area. Of order Orthoptera 7 belonged to family Acrididae and 4 to Pygromorpidae. Of coleoptera, 2 belonged to Chrysomelidae and 9 to Scarabidae. Besides Orthoptera and Coleoptera, 37 species of Lepidoptera were also recorded from the nine location sites of these 10, 8, 7, 4, 3, 3 and 2 belonged to families Nymphalidae, Pieridae, Satyridae, Lycaenidae, Danaidae, Hesperiidae and Papilionidae respectively. Not only three orders, but, Hymenoptera were also recorded from the Sukhna catchment area of Chandigarh which included 2 species of Vespidae and 2 of Apid families.

Analysis of data reveals that insect diversity of Sukhna catchment area constitutes about 0.01% of the total species known from the world and 0.21% of the species from the Indian fauna. The species recorded in the present communication may be scanty as compared to the Sukhna catchment area. However, further extensive & intensive surveys will certainly bring forward the remaining diversity of insects from Sukhna catchment area. Abundance of species at different localities is shown in the Table 1.
Table 1: Distribution of different insect taxa in different localities of Sukhna catchment area, Chandigarh, India.

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<td>6. Heteracris illustris Walker</td>
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<td>46. Precis hiera (Fabr.)</td>
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<td>47. Precis leonars (Linn.)</td>
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<td>48. Precis almana (Linn.)</td>
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<td>49. Precis altic (Johanssen)</td>
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<td>50. Cynthia cardui (Linn.)</td>
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<td>51. Phalaena phalantha (Drury)</td>
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<td>52. Ariadane merione (Cramer)</td>
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<td>53. Castalus rosimmon (Fabr.)</td>
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<td>54. Tarucus nara (Kollar)</td>
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<td>55. Pseudozizeeria maha (Kollar)</td>
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<td>56. Freyeria pulli (Kollar)</td>
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The literature on Cladocera of Bihar State (Bihar had presently been divided into Bihar and Jharkhand states) shows Gurney (1907), Brehm (1950), Nasar (1977), Rai & Sharma (1989), Chandrasekhar and Chatterjee (2003) are some of the major contributions on the group. Two lakes were identified from Bokaro district (23°23'N; 85°23'E) of Jharkhand, for the study. The Nehru Zoological Park, and a botanical park in the city (Saheed Udyan) were the study sites. A recreational facility like, boating is available here. Out of the 19 species of Cladocerans reported earlier from Bihar (Michael and Sharma, 1988), 12 species belong to 8 genera, spread in 5 families, have been recorded from these two lakes. This study gained its significance due to its maiden attempt on the fauna of water bodies from the district.

In order to cover the whole topography of these lakes, four spots have been selected from four different directions of the water bodies and plankton samples were collected from subsurface areas of each spot using plankton net (No. 25) with a 50 ml capacity plastic container tied at its end. These samples collected on 24th October, 2002 were preserved with 4% formaldehyde solution. Cladoceran fauna have been identified with the aid of the standard keys (Michael and Sharma, 1988 and Battish 1992).

A preliminary study on Cladoceran fauna of two lakes in Bokaro, Jharkhand

S.V.A. Chandrasekhar¹ and Tapas Chatterjee²

¹Freshwater Biological Station, Zoological Survey of India 1-1-300/B, Ashoknagar, Hyderabad – 500 020
²Department of Biology, Indian School of Learning, I.S.M. Annexe, Dhanbad – 826 004

The literature on Cladocera of Bihar State (Bihar had presently been divided into Bihar and Jharkhand states) shows Gurney (1907), Brehm (1950), Nasar (1977), Rai & Sharma (1989), Chandrasekhar and Chatterjee (2003) are some of the major contributions on the group. Two lakes were identified from Bokaro district (23°23'N; 85°23'E) of Jharkhand, for the study. The Nehru Zoological Park, and a botanical park in the city (Saheed Udyan) were the study sites. A recreational facility like, boating is available here. Out of the 19 species of Cladocerans reported earlier from Bihar (Michael and Sharma, 1988), 12 species belong to 8 genera, spread in 5 families, have been recorded from these two lakes. This study gained its significance due to its maiden attempt on the fauna of water bodies from the district.

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**SYSTEMATIC ACCOUNT**

**Family: SIDIDAE**

*Diaphanosoma sarsi* Richard, 1894
Material examined: NP; Female; L 1.4 mm
Distribution: Bihar, Rajasthan, Meghalaya and West Bengal.

*Diaphanosoma excisum* Sars, 1885
Material examined: NP; Female; L 1.2 mm
Distribution: West Bengal, Rajasthan and Bihar.

**Family: DAPHNIIDAE**

* Ceriodaphnia cornuta * Sars, 1885
Material examined: CP; Female; L 0.6 mm.
Distribution: West Bengal, Bihar, Kerala, Rajasthan, and Meghalaya.

*Simoccephalus vetulus* (O.F. Muller, 1776)
Material examined: NP and CP; Female; L 1.1 – 1.24 mm.
Distribution: Punjab, Kashmir, Rajasthan, Bihar and West Bengal.
Simocephalus exspinossus (Koch, 1841)
Material examined: NP; Female; L 0.9 mm
Distribution: Meghalaya and West Bengal.

Family: MOINIDAE
Moina micrura Kurz, 1874
Material examined: CP; Female; L 0.7 mm
Distribution: Niligiri Hills, Bijapur, Rajasthan, Punjab, Bihar and West Bengal.

Family: MACROTHRICIDAE
Macrothrix laticornis (Jurine, 1820)
Material examined: CP; Female; L 0.8 mm
Distribution: Ladakh and Niligiri Hills.

Family: CHYDORIDAE
Sub-family: CHYDORINAE
Chydorus sphaericus (O.F. Muller, 1776)
Material examined: CP; Female; L 0.45
Distribution: West Bengal, Bihar, Kashmir, Ladakh, Tamil Nadu and Meghalaya.

Chydorus parvus (Daday, 1898)
Material examined: NP; Female; L 0.4 mm.
Distribution: West Bengal.

Subfamily: ALONINAE
Alona davidi davidi (Richard, 1895)
Material examined: CP; Male; L 0.56 mm
Distribution: West Bengal.

Alona davidi punctata (Daday, 1898)
Material examined: NP and CP; Female; L 0.36 – 0.38 mm
Distribution: West Bengal.

Biapertura karua (King, 1853)
Material examined: NP and CP; Female; L 0.62 – 0.67 mm
Distribution: Meghalaya and West Bengal.

Of the 12 species Simocephalus vetulus, Alona davidi punctata, Biapertura karua are exhibiting their presence in both the water bodies.

Acknowledgements:
The authors are grateful to M/S Indian School of Learning, I.S.M. Annexe, Dhanbad and Zoological Survey of India, Kolkata for extending facilities to carry out this work.

References

Hosted by Penang Butterfly Farm
“Conservation of Lepidoptera through Education & Research”

Objectives:
1. To assess the current Asian Lepidoptera Conservation Status;
2. To further develop a Regional Network of organizations under an umbrella body;
3. To continue to develop the Regional Conservation Strategy;
4. To spread the Conservation message and promote interaction from public.

Core Themes:
1. Identifying the Asian Lepidoptera status and its needs
2. Lepidoptera Research and Info Sharing
3. Education towards Lepidoptera Conservation
4. Global/Asian Lepidopteran Trend
For further details contact: alcs@butterfly-insect.com.
Urbanisation of Common Palmfly Butterfly (Elymnias hypermnestra caudata Butler)

Naresh Chaturvedi, Vinod Patil and Vithoba Hegde
Bombay Natural History Society, Hornbill House, Shaheed Bhagat Singh Road, Mumbai-400023.

The Common Palmfly butterfly is widely distributed and is common in the jungles and palm plantations of southern India (Gunathilagaraj, 1998). However, in Northern Western Ghats its presence was reported up to Kihim in Dist. Raigad, (Abdulali, 1972). It was followed by some stray records from Mumbai (Chaturvedi, 2005).

However, in a short period between November and December 2005, authors have observed 8 females and 5 males of this butterfly in the busy area of the Mumbai city.

The larval food plants of this butterfly are Palms i.e. Areca catechu, Arenga wightii, Cocos nucifera and Phoenix spp. and Bamboos of Calamus spp. During the current season we have recorded breeding of this butterfly on an ornamental palm of Raphis spp., which is new addition to its host plants.

It appears that due to ornamental palms being commonly planted at several places it can breed and sustained its population in the urban areas of Mumbai city.

References:

Butterflies of Government Vidarbha Institute of Science and Humanities campus, Amravati district, Maharashtra

V.S. Zade and Y.D. Sirdeshmukh
Department of Zoology, Government Vidarbha Institute of Science and Humanities, Amravati, Maharashtra, India.

The Government institute is situated towards the northern side of Amravati city at a latitude of 20°58’N and longitude of 77°50’E. The college campus extends over a span of 168 acres area. The campus includes botanical garden and a main college garden covering about a quarter of total area, comprising of various flowering plant species. Besides this, the vast area covers vegetation rich in tropical deciduous and semi-evergreen plant species of mesophytic nature. The Zoology museum of the institute has a rich collection of animals and is one of its type in Central India.

An account of butterflies recorded is given in Table. A total of 26 species of butterflies from 4 families were identified. The family Nymphalidae dominated with 12 species, followed by Pieridae (6 species), Papilionidae (5 species) and 3 species of Lycaenidae. Two species of butterflies, Danaid eggfly (Hypolimnas misippus) and Gram blue (Euchrysops cnejus) under the schedule I Part IV and schedule II Part I of Wildlife (Protection) Act of 1972 were also recorded from the campus. Butterflies were identified and verified following Gay et al., (1992), Wynter-blyth (1957) and Kunte (2000).

References:

Acknowledgement: The authors are greatful to Mr. Jayant Wadatkar of Zoology Department, Amravati University, Amravati for his kind cooperation and help.

Table: List of butterflies

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
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<tr>
<td><strong>Family: Papilionidae</strong></td>
<td></td>
</tr>
<tr>
<td>1. Common Rose</td>
<td>Pachiliopta aristolochiae</td>
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<tr>
<td>2. Common Mormon</td>
<td>Papilio polytes</td>
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<td>3. Lime Butterfly</td>
<td>Papilio polymnestor</td>
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<td>4. Tail Jay</td>
<td>Graphium agamemnon</td>
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<td>5. Crimson Rose</td>
<td>Pachiliopta hector</td>
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<tr>
<td><strong>Family: Lycaenidae</strong></td>
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<tr>
<td>6. Leaf Blue</td>
<td>Amybylopodia anila</td>
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<tr>
<td>7. Gram Blue</td>
<td>Euchrysops cnejus</td>
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<tr>
<td>8. Pale Grass Blue</td>
<td>Zizcrica maha</td>
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<td><strong>Family: Pieridae</strong></td>
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<tr>
<td>9. Common Grass Yellow</td>
<td>Eurema hecabe</td>
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<td>10. Three Spot Grass Yellow</td>
<td>Eurema blanda</td>
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<tr>
<td>11. Pioneer</td>
<td>Anaphaeis aurota</td>
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<tr>
<td>12. White Orange tip</td>
<td>Ixias mariannae</td>
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<tr>
<td>13. Mottled Emigrant</td>
<td>Catopsilia pyranthe</td>
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<tr>
<td>14. Common Emigrant</td>
<td>Catopsilia pomona</td>
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<tr>
<td><strong>Family: Nymphalidae</strong></td>
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<tr>
<td>15. Blue pansy</td>
<td>Junonia orithya</td>
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<tr>
<td>16. Lemon Pansy</td>
<td>Junonia lemonias</td>
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<tr>
<td>17. Blue Tiger</td>
<td>Tirumala limniae</td>
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<tr>
<td>18. Plain Tiger</td>
<td>Danaus chrysippus</td>
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<tr>
<td>20. Joker</td>
<td>Byblia ilithyia</td>
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<tr>
<td>21. Angled castor</td>
<td>Astrapia ariadne</td>
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<tr>
<td>22. Common Indian Crow</td>
<td>Euploea core</td>
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<tr>
<td>23. Common Evening Brown</td>
<td>Melanitis leda</td>
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<tr>
<td>24. Danaid Eggfly</td>
<td>Hypolimnas misippus</td>
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<tr>
<td>25. Great Eggfly</td>
<td>Hypolimnas bolina</td>
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<tr>
<td>26. Tawny Rajah</td>
<td>Charaxes bernardus</td>
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</table>
**Seasonal variation in the Common Evening Brown butterfly**

Alphonsa Xavier  
*Selection Grade Lecturer, Department of Zoology, Government Arts & Science College, Calicut, Kerala*  
*Email: pathusery@sify.com*

India, being a vast country with remarkable contrasts in physical features, climate and vegetation, possesses a very rich butterfly fauna. Interestingly, variation within species of butterflies is common in size, shape, colour and behaviour induced by genetic and nongenetic factors (Evans, 1932; Gay et al., 1992). Environmental factors such as geography, climate, season etc., also have a telling effect on the form and function of butterflies. Some butterflies show seasonal variation with two forms, the dry season form (DSF) and the wet season form (WSF) (Gay et al., 1992). This report relates to the seasonal variation exhibited by the Common Evening Brown.

During the course of one-year survey conducted to study the butterfly fauna of Government Arts & Science College, Calicut, Kerala, the Common Evening Brown could be detected quite often almost throughout the year in moderate numbers. But the butterfly exhibited seasonal variation with distinct morphological forms during the wet and dry seasons. During the monsoon months, from June to September, this butterfly had a series of eye-spots on the underside along the wing border. Some times, butterflies with minor damages on the wing near the eye-spots were detected which otherwise appeared normal. It is because the eye-spots or ocelli, act as ‘target areas’ for predators like birds, whose attack is deflected towards the eye-spots instead of some vital parts of the butterfly’s body. Losing bits of its wing edges does not adversely affect the butterfly (Gay et al., 1992). During summer, the butterfly was almost invisible among the dry leaves due to its mottled brown or grey colour. The eye-spots were very vague or either absent. Cryptic mottled markings were present on the underside of wings. These marking enable the butterfly to remain undetected while among the dry leaves and stones.

Thus it appears that seasonal morphological variation in the Common Evening Brown affords camouflage and protection to the butterfly. The seasonal variation is so perfect that the two forms may be mistaken for two separate species. But wing venation and other taxonomic features remain same in both the forms specifying their species status.

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Swarming and foundation of the colony in *Coptotermes heimi* (Wasmann) (Rhinotermitidae: Isoptera: Insecta)

C.B. Arora1 and H.R. Pajni2

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2Department of Zoology, Punjab University, Chandigarh, India

Swarming is a unique phenomenon shown by termites and other social insects like honey bees. In the case of termites, a bulk of the nymphs which are destined to become winged adults (alates) show the development of wings in the second or third stage of development and the process is different according to the species. The nymphs with vestiges of wings mature into fully winged males and females during April-June and well before the onset of monsoon. The alates, under the influence of temperature and moisture in the air, leave the colony in large numbers and fly about in all directions. Their presence in the air is indicated by their instinct of clustering around light sources particularly the fluorescent light. The alates fall to the ground and shed their wings, soon afterwards. The dealates dig their own holes in the soil or in a wall in pairs. It is a necessity that the burrowing pair must have one member of each sex for the foundation of a future successful colony. In the present observations the swarming and post swarming behaviour of a termite species *C. heimi*, which belongs to the primitive family Rhinotermitidae of the order Isoptera, have been discussed in detail.

The present observations on swarming and post swarming behaviour of *C. heimi* were made at Hoshiapur between June 2003-October, 2005. The climate of Hoshiapur is typically tropical with extreme cold and hot weather alternating with transitional mild periods and marked by fairly good monsoons.

It has been noticed that the swarming generally occurs during the monsoon in this region during June, July August months between 18.58 - 20.20 hrs. The alates escape from the nest in large numbers after the first shower of the monsoon and swarm in the air. The species has been noted to swarm three to four times in the season although stray alates can be seen on lights on numerous occasions.

The swarm is usually heavy when the rain is followed by bright sunshine and wind speed is low. Fast wind blows inhibit or at least delay the swarming which falls between 6.30 to 7.30 P.M. In the other regions the time of swarming varies between 7.30 to 10.00 P.M. The number of swarms occurring during the season has not been studied by many workers but according to Arora (1960), the species swarm 3 or 4 times, with the second swarming being the heaviest.

It is therefore evident that the swarming of this species is not related to the monsoon or the humid conditions. The species in fact has adapted to local conditions in different areas and shows a cyclical swarming year after year.

Founding of the Colony:

After dealation, the male and female individuals of the reproductive cast start running at a fast speed in different direction. The males follow but not very closely as in *Odontotermes obesus*, *O. indicus*, *O. gurdaspurensis*, *Microtermes obesi* and *Microcerotermes beeaeosi*, which depict this so-called ‘tandem formation’. Tandem formation is not practiced by the males and females of *C. heimi* even when confined in a petri dish in the laboratory and its absence has also been recorded in other primitive termite species such as *Kalotermes flavicollis*, *Reticulitermes lucifugus*, *Cryptotermes havilandii*, *Neotermes tectonae* and *Anacanthotermes ochraceous* (Nutting, 1969). Some females are not followed by any male.

The dealates start searching for existing crevices or holes in moist places particularly the walls, wood and rarely the ground, within 3-10 minutes of dealation. The crevices or holes to be used as nesting sites are thoroughly examined with the help of antennae and palpi. No dealate has been observed to prepare new holes in field or in the laboratory under captivity. Sometimes the dealates simply hide themselves under the debris, litter, stones, etc. Normally one sexual pair enters the new nesting site but up to eight dealates with variable sex ratio, have been noticed to enter the same site, sites receiving the individual of the same sex, as expected fail to find a new colony and die within a few days.

The new entrants seal the outer opening of the site with the help of excreta and other available material such as soil particles or wood pieces. They make a 3-5cm. or more deep tunnel if the same is not already available. But the end of the tunnel inside is converted into a chamber with a maximum dimensions 2.5cm.x1.5cm. This is known as ‘copularium’. This whole process tunnel construction and the copularium takes 30-40 minutes in the soil or in the walls of a house but requires several hours in the case of wood. Nutting (1969) has also reported that other termite species take few minutes to a few hours in the completion of the copularium.

Copulation:

It is very difficult to observe the copulation inside the copularium. The same, therefore, was studied in the laboratory by releasing several dealate pairs in the soil contained in a glass trough. The sexes copulate 1-3 hours after the construction of the copularium. The
pre-copulation period in other species is 13 hours in *R. hesperus* one day in *R. lucifugus*, two days in *Cubitermes uagandensis* and 10-15 days in *K. flavicollis* (Nutting, 1969).

Copulation takes place in one-above other position. The male mounts the body of the female and holds the latter firmly with its legs. The antennae of the two sexes are directed parallel to each other and show up and down and, side to side movements before the actual genital contact. The copulations lasts for 30-58 seconds in different pairs. Nutting (1969) record copulation period of 1-4 minutes in *Zootermopsis angusticollis* and 30 seconds to 2 minutes in other termite species.

Oviposition: The female starts laying 1-4 days after the copulation. To start with, a batch of 3-12 eggs per day, mixed with a semitranslucent foul smelling fluid is laid. Egg laying capacity of the female increases by 2-5 eggs per day after an interval of 7-10 days. The average reaches to 16-20 eggs per day after 21-24 days of copulation.

The primary royal pair is never seen in any of the established colony. These are only 2-6 secondary neotenics and their egg clusters (5-47 in numbers) are seen frequently. The rate of egg laying of these neotenics is found 3-9 eggs per day in the laboratory during the months of monsoon. It is found to decrease to 2-5 eggs per day in the months of December and January. Eggs size vary from 0.52-0.59 X 0.24-0.29 mm.

Acknowledgements: The authors are sincerely thankful to The Chairman, Department of Zoology, Panjab University, Chandigarh and Dr. Janmit Singh, Principal, D.A.V. College, Hoshiarpur for providing the necessary laboratory and library facilities and, to Mr. Kapil Chopra, Lecturer, D.A.V. College for his manifold help.

References:


Table 1. Data indicating sex ratio of *C. heimi* during the study period 2003-2005 (three seasons)

<table>
<thead>
<tr>
<th>Year</th>
<th>Date of alate Collection</th>
<th>Total alates collected</th>
<th>Male</th>
<th>Female</th>
<th>Sex Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>10.7.2003</td>
<td>135</td>
<td>70</td>
<td>65</td>
<td>1.07 : 0.92</td>
</tr>
<tr>
<td>2.</td>
<td>21.7.2003</td>
<td>252</td>
<td>130</td>
<td>122</td>
<td>1.06 : 0.93</td>
</tr>
<tr>
<td>3.</td>
<td>29.7.2003</td>
<td>92</td>
<td>43</td>
<td>49</td>
<td>0.87 : 1.13</td>
</tr>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>09.7.2004</td>
<td>105</td>
<td>52</td>
<td>53</td>
<td>0.98 : 1.01</td>
</tr>
<tr>
<td>2.</td>
<td>15.7.2004</td>
<td>118</td>
<td>54</td>
<td>64</td>
<td>0.84 : 1.18</td>
</tr>
<tr>
<td>3.</td>
<td>28.7.2004</td>
<td>72</td>
<td>38</td>
<td>34</td>
<td>1.11 : 0.89</td>
</tr>
<tr>
<td>4.</td>
<td>03.8.2004</td>
<td>137</td>
<td>77</td>
<td>60</td>
<td>1.28 : 0.77</td>
</tr>
<tr>
<td>2005</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>29.6.2005</td>
<td>148</td>
<td>77</td>
<td>71</td>
<td>1.08 : 0.92</td>
</tr>
<tr>
<td>2.</td>
<td>12.7.2005</td>
<td>84</td>
<td>41</td>
<td>43</td>
<td>0.95 : 1.04</td>
</tr>
<tr>
<td>3.</td>
<td>21.7.2005</td>
<td>69</td>
<td>37</td>
<td>32</td>
<td>1.15 : 0.86</td>
</tr>
<tr>
<td>4.</td>
<td>28.7.2005</td>
<td>52</td>
<td>24</td>
<td>28</td>
<td>0.85 : 1.16</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1264</td>
<td>643</td>
<td>621</td>
<td>1.03 : 0.96</td>
</tr>
</tbody>
</table>
Swarming and foundation of the colony in *Coptotermes heimi* (Wasmann) (Rhinotermitidae: Isoptera: Insecta)

**Image 1.** Already existing hole in a tree from which alates emerge for swarming.

**Image 2.** Alates of *C. heimi* on a wall during swarming.

**Image 3.** Alates and dealates of *Coptotermes heimi*

**Image 4.** Tandem formation in *Microtermes obesi*

**Image 5.** Neotenic reproductives of *Coptotermes heimi*

**Image 6.** A group of eggs of *Coptotermes heimi*
A preliminary report on the diversity of spiders in the coffee plantations of Yercaud, Tamil Nadu, India

C. M. Senthil Kumar* and A. Regupathy
Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore – 641 003, Tamil Nadu, India

Introduction
Spiders are gaining favour in ecological studies as indicators of environmental quality (Clausen, 1986; Maelfait et al. 1990) and as biological control agents in agricultural ecosystems (Riechert and Lockley, 1984; Nyffeler and Benz, 1987; Bishop and Riechert, 1990). They are the abundant natural enemies in any agro-ecosystem and found in most terrestrial habitats and often present in high numbers (Kaston, 1978). All spiders are predaceous and insects constitute their primary prey (Tumbull, 1973). Although much is known about invertebrate diversity in temperate habitats, studies on species diversity in tropical ecosystems are more recent. This applies equally to research on spider diversity in tropical areas (Russel-Smith, 2002). The regulation of insect populations by spiders in agricultural and epidemiological settings is receiving more attention as IPM replaces the chemical control (Riechert and Bishop, 1990). The present study is an effort to document the diversity of spiders in the coffee plantations of Shervaroy’s hills located in Tamil Nadu, India.

Materials and Methods
Study locations
Diversity studies were carried out in two coffee plantations, from two locations in Shevaroy’s hills (11°48’N & 78°12’E), Tamil Nadu, India, viz., Horticultural Research Station, Yercaud (4500 ft above MSL) and a private plantation (Geinden Estate) located at Semmanthanam (3900 ft above MSL), 10 km away from the former. In these sampling sites pest control operations were almost nil.

Sampling
The sampling methods were designed to bring the diversity of spiders harboured in various plant parts, field margins and the influence of shade trees on the distribution and abundance. Bushes of coffee plants, in five replicates were randomly selected in each location. In each replicate, three bushes giving a total of 15 plants were sampled per location in each season. The bushes were carefully observed in all places and the spiders present were collected and transferred to 70 per cent alcohol individually in glass vials. Similarly, the spiders in the field margins and strips of Yercaud coffee plantations alone were enumerated along the bunds to a length of 10m, collected and preserved in 70 per cent alcohol. The studies were carried out for a period of one year and sampling was carried out at weekly intervals. The overall collection of spiders was identified up to genus or species level with the aid of experts and available literatures.

Results and Discussion
A summary of the different species of spiders recorded from the two locations is presented in Table 1. Also, the list of shade trees available in the coffee plantations is given in Table 2. Twelve species of foliage dwelling spiders belonging to 10 genera and seven families were recorded in Yercaud coffee plantations (Table 1).

Among the different spiders collected, Epeus sp. and Oxytate virens (Thorell, 1891) dominated the Yercaud population and spiders like, Tetragnatha sp., Viciria sp., Oxyopes sp., Linyphia sp. and Telamonia dimidiata (Simon, 1899) contributed less to the community in Yercaud. The other spiders like Argyrope sp., Araneus sp. and Clubiona sp. had a medium distribution among the population. Cyclosa sp. was found to occur both in the foliage and in field margins. Among the spiders collected from field margins, 10 species belonging to 7 families and 8 genera were recorded (Table 1). The population was highly dominated by Hippasa sp. having its occurrence throughout the season, followed by Plexippus sp., Leucasea decorata (Blackwall, 1864), Cyclosa bifida (Doleschall, 1857), Argyrodes sp., Cyclosa sp. and Araneus sp. The other spiders, Heteropoda sp. and Philodromus sp. were sparse in population. Among these two spiders, Philodromus sp. was rare in occurrence.

In Semmanatham, 18 species of spiders belonging to 10 families and 15 genera were recorded during the survey period (Table 1). As far as the individual spiders are concerned, Telamonia dimidiata (Simon, 1899) dominated throughout the season and it was co-dominated by Clubiona sp. and Linyphia sp. Among the other species recorded, Araneus sp., Argyrope anasuja Thorell, 1887, Thomisus sp., Uloborus sp., Hersilia sp., Olios milleti Pocock, 1901 and Myrmarachne sp. contributed more or less equal to the overall population. The other species belonging to the Nephila genera were numerically low in occurrence and the kleptoparasite, Argyrodes sp. was present in equal numbers with its host Nephila pilipes. The results indicated that the location with high plant diversity (Semmanthanam) harbours more spiders than the other location (Yercaud), which is less diverse in plant community with silver oak as the only source of shade. The presence of unique species in all habitats highlights the importance of conserving a wide array of representative habitats within ecosystems (Whitmore et al., 2002).

Acknowledgement:
The authors are grateful to Dr. M. Ganesh Kumar, TNAU and Dr. Manju Siliwal, WILD Society, Coimbatore for their help in identification of spiders. Thanks are due to Mr. Lakshmanan of Geinden Estate for his help in conducting spider studies.

References:
Table 1. List of spiders recorded from coffee plantations of Yercaud and Semmanatham

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Spider species</th>
<th>Family</th>
<th>Habitat</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Argiope sp</td>
<td>Araneidae</td>
<td>F</td>
<td>YCD</td>
</tr>
<tr>
<td>2</td>
<td>Argiope anasuja Thorell, 1887</td>
<td>Araneidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>3</td>
<td>Araneus sp.</td>
<td>Araneidae</td>
<td>F</td>
<td>YCD</td>
</tr>
<tr>
<td>4</td>
<td>Araneus sp.</td>
<td>Araneidae</td>
<td>F</td>
<td>YCD</td>
</tr>
<tr>
<td>5</td>
<td>Araneus sp.</td>
<td>Araneidae</td>
<td>F</td>
<td>YCD</td>
</tr>
<tr>
<td>6</td>
<td>Araneus sp.</td>
<td>Araneidae</td>
<td>F</td>
<td>YCD</td>
</tr>
<tr>
<td>7</td>
<td>Araneus sp.</td>
<td>Araneidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>8</td>
<td>Araneus sp.</td>
<td>Araneidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>9</td>
<td>Araneus sp.</td>
<td>Araneidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>10</td>
<td>Cyrtophora moluccensis (Doleschall, 1857)</td>
<td>Araneidae</td>
<td>F &amp; FM</td>
<td>YCD</td>
</tr>
<tr>
<td>11</td>
<td>Cyclosa sp.</td>
<td>Araneidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>12</td>
<td>Cyclosa bifida (Doleschall, 1859)</td>
<td>Araneidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>13</td>
<td>Neoscona sp.</td>
<td>Araneidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>14</td>
<td>Gasteracantha geminata (Fabricius, 1798)</td>
<td>Araneidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>15</td>
<td>Nephila pilipes (Fabricius, 1793)</td>
<td>Nephilidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>16</td>
<td>Hippasa sp.</td>
<td>Lycosidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>17</td>
<td>Leucauge decorata (Blackwall, 1864)</td>
<td>Tetragnathidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>18</td>
<td>Tetragnatha sp.</td>
<td>Tetragnathidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>19</td>
<td>Telamonia dimidata (Simon, 1899)</td>
<td>Salticidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>20</td>
<td>Vicia sp.</td>
<td>Salticidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>21</td>
<td>Plexippus sp.</td>
<td>Salticidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>22</td>
<td>Epeus sp.</td>
<td>Salticidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>23</td>
<td>Myrmarachne sp.</td>
<td>Salticidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>24</td>
<td>Thomisus sp.</td>
<td>Thomisidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>25</td>
<td>Philodromus sp.</td>
<td>Thomisidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>26</td>
<td>Oxytate vires (Thorell, 1891)</td>
<td>Thomisidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>27</td>
<td>Oxyopes sp.</td>
<td>Thomisidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>28</td>
<td>Uloborus sp.</td>
<td>Thomisidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>29</td>
<td>Argyrodes sp.</td>
<td>Thomisidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>30</td>
<td>Argyrodes sp.</td>
<td>Thomisidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>31</td>
<td>Argyrodes sp.</td>
<td>Thomisidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>32</td>
<td>Hersilia sp.</td>
<td>Thomisidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>33</td>
<td>Clubiona sp.</td>
<td>Thomisidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>34</td>
<td>Olios milled Pocock, 1901</td>
<td>Oxyopidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>35</td>
<td>Heteropoda sp.</td>
<td>Oxyopidae</td>
<td>F</td>
<td>SMN</td>
</tr>
<tr>
<td>36</td>
<td>Linyphia sp.</td>
<td>Oxyopidae</td>
<td>F</td>
<td>SMN</td>
</tr>
</tbody>
</table>

* F – Foliage; FM – Field Margins; YCD – Yercaud and SMN – Semmanatham

Table 2. List of shade trees grown in coffee plantations of Yercaud and Semmanatham

<table>
<thead>
<tr>
<th>Botanical name</th>
<th>Family</th>
<th>Type of shade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albizzia lebbeck (Benth)</td>
<td>Bignoniaceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>A. moluccana (Miq.)</td>
<td>Bignoniaceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>A. odoratissima (Benth)</td>
<td>Bignoniaceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>A. stipulata (Boiv.)</td>
<td>Bignoniaceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>Artocarpus integrifolia (L.)</td>
<td>Moraceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>Bischofia javanica (Bl.)</td>
<td>Moraceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>Cedrela toona (Roxb.)</td>
<td>Meliaceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>Delbergia latifolia (Roxb.)</td>
<td>Leguminosae</td>
<td>Permanent</td>
</tr>
<tr>
<td>Erythrina lithosperma (Bl.)</td>
<td>Leguminosae</td>
<td>Temporary and Lopping</td>
</tr>
<tr>
<td>Ficus glomerata (Roxb.)</td>
<td>Moraceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>F. infectoria (Roxb.)</td>
<td>Moraceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>F. nervosa (Roth)</td>
<td>Moraceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>F. retusa (L.)</td>
<td>Moraceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>F. tjakela (Burn)</td>
<td>Moraceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>F. tsiela (Roxb.)</td>
<td>Moraceae</td>
<td>Permanent</td>
</tr>
<tr>
<td>Grevillea robusta (Cunn.)</td>
<td>Proteaceae</td>
<td>Temporary</td>
</tr>
<tr>
<td>Pterocarpus marsupium (Roxb.)</td>
<td>Leguminosae</td>
<td>Permanent</td>
</tr>
<tr>
<td>Syzygium jambolans (Lam.)</td>
<td>Myrtaceae</td>
<td>Permanent</td>
</tr>
</tbody>
</table>


Obituary
Mr. Naresh Chaturvedi, Curator and Entomologist of BNHS passed away on 9 March, 2008 due to a cardiac arrest. Mr. Naresh though entomologist by education, was keenly interested in Nature in general. May his soul rest in peace.
Butterfly Diversity of Assam Agricultural University Campus, Jorhat
A. Rahman, P. Patgiri, Roshmi Borah, Anjumoni Divee, and Monimala Saikia
Department of Entomology, Assam Agricultural university, Jorhat, Assam.

Butterflies are most fascinating creatures on earth. There are almost 1500 species of butterflies occurring in Indian subcontinent (Gay et al. 1932); consists of both Paleartic and Oriental forms (Evans, 1992; Wynter-Blyth, 1981), which vary greatly in colours, size and habitats. Since the advent of human civilization, butterflies have regarded as symbol of beauty and grace. Their marvelous colour, shapes and graceful flight gives pleasure to every one. They are beneficial as pollinators, indicators of environmental quality and have aesthetic and commercial values. Butterflies hold an important place in the web of life, being closely associated with plant life. Our wealth of butterflies is truly great and varied.

Butterflies show distinct pattern of habitat utilization. The nature of vegetation is the important factor, which determines the dependence and survival of a particular habitat. Several species of butterfly are exclusively forest dwellers, and their presence or absence serves to monitor the ecological changes in habitat, warning us about the deteriorating environment, they are easily affected by even minor perturbations in the habitat. Thus, they have been considered as indicators of environment quality and the health of an ecosystem. Most butterflies have specific habitat requirements. There is an intimate association between butterflies and plants. Thus the distributions of butterflies is exclusively dependent on the availability of their food plants.

In present time, as a result of rapid decline in forest cover and vegetations, and the consequent upon depletion in their habitat, the very existence of these lovely creatures has been threatened. The situation has been exacerbated by the increasing use of chemical fertilizers and pesticides (Gay et al. 1992). Till now no any previous study had been carried out to explore the butterfly diversity of the campus of Assam Agricultural University, Jorhat (AAU). The present investigation in an outcome of a pilot survey of butterfly diversity.

Jorhat, the last capital of Ahom Kingdom, at present a district of Assam is located between the Brahmaputra on the North and Nagaland on the South at 26°44' N of Jorhat as a whole is subtropical humid hot summer and cold winter with an average annual rainfall around 1847.2mm. The highest mean maximum temperature varies 33°C and mean minimum temperature varies between 11°C. The green campus of AAU-Jorhat a quiet and peaceful place, away from urban distraction, is an ideal place for study of biodiversity elements. Alibizza lebeck, Alianthus excelsa, Azadirachta indica, Caesalpinia pulcherrima, Cassia surculata, Cassia fistula, Ficus bengalensis, Ficus religiosa, Mangifera indica, Pithecellobium claloe, Spathodea campanulata, terminalia catapa, Thespiesa populanea etc. and birds like sparrows, Mynahs, Kites Babblers, Warblers, Weaver birds, Water heron, Egrets and small Waders.

The present study was carried out to know the existing butterfly diversity in an around campus area of AAC. The visit were made from September - December 2005 on weekly basis. For this, various areas like ICAR Farm, tea gardens, horticultural orchard, educational premies, sport complexes, library buildings, hostels and vicinity of human habitation were surveyed. All butterflies sighted were identified and recorded. The identifications were based on direct visual observations and confirmed with the help of published nature guide (Evans, 1932; Lewis, 1973; Thomas et al. 1980; Wyater Blyth, 1981; Frees, 1984; Gay et al., 1992). Some of sighted butterflies were captured by insect collecting net or sweeping net for further identification.

Table 1. Checklist of butterflies of Assam Agricultural University campus, Jorhat.

<table>
<thead>
<tr>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papilionidae</td>
<td>Papilio polytes</td>
<td>Papilio demoleus</td>
</tr>
<tr>
<td>Lime butterfly</td>
<td>Papilio polyomnestor</td>
<td>Papilio spp.</td>
</tr>
<tr>
<td>Blue butterfly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lemon butterfly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pieridae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indian cabbage white</td>
<td>Pieris canidia</td>
<td></td>
</tr>
<tr>
<td>Cabbage white</td>
<td>Priris sp.</td>
<td></td>
</tr>
<tr>
<td>Clouded yellows</td>
<td>Collas sp.</td>
<td></td>
</tr>
<tr>
<td>Common grass yellow</td>
<td>Eurema hecabe</td>
<td></td>
</tr>
<tr>
<td>Common emigrant</td>
<td>Catopsilia pomora</td>
<td></td>
</tr>
<tr>
<td>Molted emigrant</td>
<td>Catopsilia pyranthe</td>
<td></td>
</tr>
<tr>
<td>Lycanidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red Pierrot</td>
<td>Taliada nyseus</td>
<td></td>
</tr>
<tr>
<td>Common cerulean</td>
<td>Jamidas celeno</td>
<td></td>
</tr>
<tr>
<td>Peabluwe</td>
<td>Lamprides boeticus</td>
<td></td>
</tr>
<tr>
<td>Danidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common tiger</td>
<td>Danaus plexippus</td>
<td></td>
</tr>
<tr>
<td>Common crow</td>
<td>Euploea core</td>
<td></td>
</tr>
<tr>
<td>Nymphalidae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common sailer</td>
<td>Neptis hylas</td>
<td></td>
</tr>
<tr>
<td>Lemon pancy</td>
<td>Junonia leonina</td>
<td></td>
</tr>
<tr>
<td>Peacock pancy</td>
<td>Junonia almana</td>
<td></td>
</tr>
<tr>
<td>Blue pancy</td>
<td>Junonia orithya</td>
<td></td>
</tr>
<tr>
<td>Grey count</td>
<td>Euthalia lepidae</td>
<td></td>
</tr>
<tr>
<td>Orange stripe</td>
<td>Apatura parikatia</td>
<td></td>
</tr>
<tr>
<td>Yellow jack sailer</td>
<td>Neptis viraja</td>
<td></td>
</tr>
<tr>
<td>Stayridae</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common evening Brown</td>
<td>Melanitis leda</td>
<td></td>
</tr>
<tr>
<td>Dark evening Brown</td>
<td>Melanitis phedima</td>
<td></td>
</tr>
<tr>
<td>Nigger</td>
<td>Ostrinia xerinioides</td>
<td></td>
</tr>
<tr>
<td>Ringed Argus</td>
<td>Erinia annada</td>
<td></td>
</tr>
<tr>
<td>Tiger plum fly</td>
<td>Elymnias nesoea</td>
<td></td>
</tr>
<tr>
<td>Common plum fly</td>
<td>Elymnias hypermnestra</td>
<td></td>
</tr>
<tr>
<td>Hesperiidae</td>
<td>The spotted small flat</td>
<td>Sarangesa purendra</td>
</tr>
</tbody>
</table>

Table 1 shows checklist of butterflies present during the investigation. In total, 29 species of butterflies under 20 genera belonging to 7 families from the campus area, have been included which exhibits 1:2.86: 4.28 ratio of family, genera and species of which maximum (7) no. of species belongs to family. Nymphalidae; which form almost 23.33% of total recorded species, followed by family Pieridae and...
Satyridae of which contain 6 no. of species of each (20%). Family Papilionidae 5 species (16.66%), 3 species (10%) of Lycanidae, 2 species (6%) of Danaidae. While any 1 species (3.33%) of butterfly was recorded from family Hesperidae.

A detailed investigation is a prime requisite for a methodical evaluation of butterfly diversity and factors accountable for their prevalence in the campus area.

References


A Preliminary note on Odonata in the Eastern Ghats of Tamil Nadu

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Odonata are one of the most elegant and beautiful creatures of nature and these have no parallel in the whole insect order with regard to their prevalence and abundance in nature (Srivastava and Agarwal, 1992). These are beneficial insects and are wonderful predators for many known and unknown insect pests (Kumar, 2002). Ecologically, Odonates are most powerful determining factors in preserving the balance of life in the ponds, rivers, lakes and their surroundings (Tillyard, 1917). Prasad and Varshney (1995) have published a checklist of 499 species and sub species of Indian odonata under 139 genera in 7 superfamilies, 17 families and 32 subfamilies. Biological diversity of Indian odonata covers about 10 per cent of world fauna (Tyagi, 1997). Several attempts have been made on checking list of odonata in Tamil Nadu, South India, particularly in rice ecosystem. Gunathilagaraj et al. (1999) reported 16 species of odonata from rice fields of Coimbatore region. In rice fields of Annamalai University, Tamil Nadu and about 24 species of odonata were recorded (Asaithambi and Manickavasagam, 2002) and 12 species from rice fields of Madurai (Kandibane et al., 2003). Palot and Soniya (2000) reported 14 species of odonata from Courtallam region of Tamil Nadu.

However, there were very few attempts made on insect diversity at Eastern Ghats of Tamil Nadu. A survey was carried out during July 2005 - August 2006 at Shevaroy hills of Eastern Ghats in Tamil Nadu on dragonfly. Eastern Ghats are discontinuous mountain range cut through by four major rivers of South India. It runs from West Bengal in North through Orissa, Andhra Pradesh and Tamil Nadu in the south. Shevaroy hills are at Eastern Ghats in Tamil Nadu with an elevation ranged 1500M above Mean Sea Level.

Eight species of dragonflies (Anisoptera: Odonata) were recorded during the study period (Table.1) which belongs to two families viz., Libellulidae and Aeshnidae. In Libellulidae, seven species were recorded and one species recorded in Aeshnidae from the hill region of Shevaroys. The adult habitat of the different species observed in the hills indicated that Anax immaculifrons, Brachythemys contaminata, Crocothemis servilla and Neurothemis tullia tullia were confined near water sources. The other species Tramea limbata, Diplocodes trivialis, Orthetrum sabina and Pantala flavescens were found in all types of ground vegetation such as grasslands, ornamental flower gardens and uncultivated fallow lands. Among the eight species, Pantala flavescens was abundant in the region. However in rice fields, Gunathilagaraj et al. (1999) reported O. sabina was most abundant in plain region. Earlier, Fraser (1936) similarly indicated that O. sabina is the most dominant and predacious of all dragonflies in South India. Further investigations on seasonal abundance, weather influence and ecological role of dragonflies in the Shevaroy hills of Eastern Ghats are in progress.

Table 1. List of Odonata - dragonfly species recorded in the Shevaroy hills

<table>
<thead>
<tr>
<th>Species</th>
<th>Adult habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Family: Aeshnidae</strong></td>
<td></td>
</tr>
<tr>
<td>Anax immaculifrons Rambur</td>
<td>Near water sources</td>
</tr>
<tr>
<td><strong>Family: Libellulidae</strong></td>
<td></td>
</tr>
<tr>
<td>Brachythemys contaminata (Fabricius)</td>
<td>Near water sources</td>
</tr>
<tr>
<td>Crocothemis servilla (Drury)</td>
<td>In grass lands and uncultivated fallow lands</td>
</tr>
<tr>
<td>Diplocodes trivialis (Fabricius)</td>
<td></td>
</tr>
<tr>
<td>Neurothemis tullia tullia (Drury)</td>
<td>Near water sources</td>
</tr>
<tr>
<td>Orthetrum sabina (Drury)</td>
<td>In grass lands, ornamental flower garden and uncultivated fallow lands</td>
</tr>
<tr>
<td>Pantala flavescens (Fabricius)</td>
<td>In grass lands, ornamental flower garden and uncultivated fallow lands</td>
</tr>
<tr>
<td>Tramea limbata Rambur</td>
<td>In grass lands and uncultivated fallow lands</td>
</tr>
</tbody>
</table>

References


No. 16 Bugs ‘R’ All

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New record of Comperiella indica Ayyar (Hymenoptera: Encyrtidae) from Coccus viridis (Green) (Hemiptera: Coccidae)

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Abstract
Comperiella indica Ayyar (Hymenoptera: Chalcidoidea: Encyrtidae) is recorded as parasitizing Coccus viridis (Green) (Hemiptera: Coccidae) from Karnataka. These are new distribution and host records for the parasitoid.

Introduction
The genus Comperiella Howard (Hymenoptera: Chalcidoidea: Encyrtidae) is represented by five species in India, one of them, C. unifasciata Ishii, being a doubtful record for India (Hayat, 2006). The members of the genus are known to be parasitoids of diaspine scales (Hemiptera: Diaspididae).

In India, Comperiella indica Ayyar is presently known from Tamil Nadu and Uttar Pradesh. During surveys for chalcidoids in southern India, we collected this species from Karnataka and also examined one male identified as C. indica from the unsorted collections of PDBC collection. Karnataka is a new distribution record for this species. The specimens of this study are deposited in the Introduction & Biosystematics Division of Project Directorate of Biological Control, Bangalore. Brief diagnostic and biological notes are provided for the parasitoid and its host in this paper.

Diagnostic features of Comperiella indica Ayyar (Figs. 1-4)*

Body (Figs. 1, 2)* elongate, dorsoventrally somewhat flattened. Head with dark dorsal median longitudinal band on frontovertex around ocelli, narrower than the pair of lateral white bands. Mesosoma (thorax) dark metallic blue; pronotum with a pair of white bands interrupted in the middle; mesoscutum with a median, longitudinal, metallic greenish-blue band. Antenna (Fig. 3)* short, compact, scape flattened and expanded beneath, flagellar segments strongly flattened and transverse, club 1.63x as long as flagellum. Fore wing (Fig. 4)* infuscate, with a complete, longitudinal, median dark band reaching up to apex and a second, smaller, triangular patch placed below the median band. Ovipositor subequal in length to mid tibia, not exserted apically. Live specimens are characterised by the wing tips which are folded upwards as the insect moves around in search of its host as reported by Prinsloo (1984).

This species agrees with the key diagnostic characters provided by Hayat (2006) for C. indica.

Specimens examined

Biology
All the host records of Comperiella spp. listed by Hayat (2006) pertain to Diaspididae. We reared the species from Coccus viridis (Green) (Homoptera: Coccidae), which is a new host record for the species. It was originally recorded from India on Octaspis tamarindi (Green) (=Aspidiotus tamarindus Ayyar) (Ayyar, 1934).

Acknowledgement
This work was carried out under the Network Project on Insect Biosystematics funded by the Indian Council of Agricultural Research, New Delhi.

References:

(* See web version to refer to Figures).

Announcement of the
18th INTERNATIONAL SYMPOSIUM OF ODONATOLOGY
Hislop College, Nagpur, India
5-13 November 2008

The above dates include the Post Symposium Tour (10-13 November) to Pench/Kanha/Tadoba National Parks of central India

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India including data on larval studies. Oriental Insects 29: 385-428.
New record of *Comperiella indica* Ayyar from *Coccus viridis* (Green)

**Figures 1 & 2.** Dorsal view of female of *Comperiella indica* Ayyar

**Figure 3.** Female antenna

**Figure 4.** Female fore wing
**A new natural enemy of *Spilarctia obliqua* Walk.**
(Lepidoptera : Arctiidae)
M. Ahmad and M. Faisal
Forest Entomology Division, F.R.I.,Dehradun 248006, India
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*Spilarctia obliqua* Walk. a polyphagous defoliator is commonly known as Bihar hairy caterpillar. The farming community is familiar with this pest as it defoliates 96 host plants belonging to 34 different families including *Butea frondosa, Cedrela toona, Mangifera indica, Paulownia fortunei* etc. It has also been reported infesting 15 species of medicinal plants including *Asparagus officinalis, Butea monosperma, Cordia tremula, Hibiscus rosasinensis, medicinal plants including Asparagus officinalis, Butea monosperma, Cordia tremula, Hibiscus rosasinensis, Mentha arvensis, Ocimum spp, Tinospora cordifolia and Wibania somnifera* (Mathur, 1962).

Inspite of its wide range of host plants and its pest status, *S. obliqua* attracts number of natural enemies in the form of parasitoids and predators. *S. obliqua* has been reported to be parasitized in nature during its all development stages including egg, larva and pupa. Important egg parasitoids recorded on *S. obliqua* include *Trichogramma perkinsi*, *T. australicum* (Somchaudhury and Dutt, 1988) and *Telenomus molorchus* (Joshi et al., 1983).

Association of larval parasitoid *Apanteles oblique* walk. (Singh and Gangrade, 1975) and pupal parasitoid *Blepharella lateralis* (Kumar and Yadav, 1987) has also been reported with *S. obliqua*.

During insect survey at Sahaspur (Dehradun) second instars larvae of *S. obliqua* were collected on *Paulownia fortunei* in August 2003. The larvae were brought to the laboratory and reared in glass chimney cages by providing fresh *Paulownia* foliage daily. The larvae got pupated but adult did not emerge. Instead emergence of parasitic wasps was recorded from such pupae. The parasitoids was identified as *Brachymeria lasus* walk. (Hymenoptera: Chalcididae). It forms new parasitic record on the larva/pupa of *S. obliqua* and a new host record to the parasitoid.

*B. lasus* (Walk), a widely distributed pupal parasitoid, has been reported parasitise over hundred insect species belonging to Lepidoptera, Hymenoptera, Diptera etc. (Habu, 1962). Its potential as a biocontrol agent against *S. obliqua* has to be explored.

References


**First record of *Nephila pilipes* (Fabricius, 1793) from Nepal (Araneae: Nephilidae)**
Dimitar Bechev¹ and Christo Deltshev²

**Introduction**
The giant wood spider *Nephila pilipes* (Fabricius, 1793) is a large species with length of the body by female about 40-43mm (Hormiga et al., 2000), which constructs orb webs in the understorey of tropical/subtropical forests (Murphy & Murphy, 2000). The species is distributed in an area from China and Philippines to Australia (Platnick, 2008), and also India (Su et al., 2007). A female specimen was observed and photographed in Nepal, Annapurna Conservation Area, near Tatopani, 1190 m a.s.l., 12 October, 2006. The web is in distance about 4 m from the ground, on single tree situated near wood. The locality is in subtropical life zone (Shrestha, 2003).

**Acknowledgements**: We thank Dr. Matja• Kuntner (Ljubljana) for confirmation of the specific identification on the base of the photo and University Fund – Plovdiv, for the financial support of the expedition in Nepal.

**References**
To strengthen the faunistic research, National Insect Museum planned a fifteen (15) days training/expedition programme from May 29 - June 12, 2007. The training/expedition involved activities which added to capability of the scientists to maintain and expand the museum to international standards.

The whole technical training/expedition programme was divided into three phases. In the first phase lectures were delivered by foreign experts. In the second phase field trips for Murree and Northern Areas were undertaken for insect collection. While third phase comprised of lectures, state-of the art formal preservation, identification of insects, cataloguing and display of insects in the show-cases of the museum gallery in the newly constructed building of National Insect Museum at NARC.

During expedition 30 scientists, students, Lab. and field workers participated from different institutions of Pakistan. These includes Pakistan Agricultural Research Council / National Agricultural Research Centre, Islamabad, Natural History Museum, Islamabad, Arid Zone Research Centre (PARC) Quetta, different Universities and Agricultural Institutes including three foreign experts namely (i) Professor Giuseppe M. Carpaneto, Professor of Zoology, Department of Biology, University of Rome, Italy (ii) Hans Muhle, Vice President Munich Entomology Society and Coleoptera specialist (Forest and orchard insect pests) Reviser, Nature Protection and Environmental projects, Munich, Germany and (iii) Prof. Dr. Klaus Schönitzer Zoologische Staatssammlung München (ZSM) (Bavarian State Collection of Zoology), Munich, Germany.

During expedition 31 localities were visited for the collection of insects. The visit yielded 1999 specimens belonging to almost all important orders of insects. Of the 130 identified Insects, 44 belongs to Coleoptera, 27 to Heteroptera, 31 to Hymenoptera, 8 to Orthoptera, 36 to Lepidoptera, 10 to Odonata and 1 to Mantodea. The rest of the insects are under process of identification. New host plants of some insects were also recorded. After specific identification, it is hoped that some new records may be obtained.

The insect fauna of Northern areas is less explored with inadequate information. The result of this expedition along with some previous studies will give a picture of insect fauna of northern areas. However, the information is still incomplete and more surveys are needed. The salient features of the training expedition were:

i. It was a rigorous collection expedition in the real habitats of insect fauna and was carried out in the unique ecologies (mountain and alpine pastures of Pakistan).

ii. It added substantial faunal collection.

iii. It also produced continual interaction with experts all over the country and strong sustainable linkage with institutions where the overseas experts belong to.

Expeditions are an important part of the scientific research depending on the objectives. The objective of this expedition was to explore the insect fauna. These provide comprehensive collections of fauna and flora, to see the diverse range of species that live in an area with emphasis on distributional and seasonal occurrence of species known or suspected to be of economic importance. These are an integral part of biodiversity studies and provide informatics on flora and fauna.

Insects with their global distribution constitute 75% of animal biodiversity and have intrinsic relation in many ways with human beings. In many cases they are detrimental, competing man for food and destroy approximately one third of agricultural products. Some transmit diseases to human and other beneficial organisms. Insect damage to our natural resources amount to billions of rupees. World Trade Organization (WTO) regime and future quarantine procedure would require precise insect identification for certification. To reduce the use of insecticides in our crops by introducing insect bio-control agents are often hampered due to lack of proper identification of predators and parasites. Besides management of insect pollinators require minute identification of the pollinating species in different habitats. Furthermore, insects are increasingly becoming important as biodiversity indicator.

Pakistan has abundance of Oriental, Palaearctic and Ethiopian fauna. Its Oriental representation of species is continuous cycle, grow of Indian States - Punjab and Rajasthani and Palaearctic is continuous with those of Iranian Baluchistan, eastern Afghanistan, and Russia (separated only by a few kilometers) and northwestern and eastern China. It also has a definite Ethiopian influence which runs along the southern coastal areas of Sindh and eastern Mekran in Baluchistan.

Pakistan has very diversified habitat with regard to flora/fauna. There are known pests of cultivated crops, but due to change of population controlling factors some new pests have emerged. The cropping patterns have changed and new crop varieties have been introduced. International trade in agricultural commodities has created introduction of exotic insect species. Thus collection will focus on local as well as introduced species.

Majority of insect species in the country are still undescribed. Preparation of an inventory of insect fauna of Pakistan, its collection and preservation of type specimens is highly essential. With changing environment, cropping pattern, crop varieties, irrigation system and use of synthetic agro-chemicals, re-assessment of all insect taxa covering aspects of changing distribution and status, life cycle, growth and decline cycle, natural enemies, host relationship, alternate host and economic analysis of pest infestation has become crucial. Future quarantine procedures and WTO regimes would require precise insect identification for certification. Furthermore management of insect pollinators requires identification of the pollinating species in different habitats. At present the only way to get unique specimens identified is through reference museums overseas. This is expensive and requires hard currency. Besides, shipments of biological specimens are extremely difficult and involve stringent formalities and it takes months to get the results.

Entomologists have big task for insect identification and confirm the previous identifications. Thus it is essential to explore these in every habitat. It is also important to understand their ecology, biology and classification for their better management.

Description of the Areas

The localities visited during expedition were i) Federal capital areas: Islamabad & vicinities i.e. Rawal Dam, Taxila, Margalla hills and National Agricultural Research Centre; ii) Murree hills (Lawrence College); iii) Mansehra District: Shinkiari; iv) Kohistan District: Somer Nala and Dassu; Northern areas: v) District Chilas: Gas Das and...
Goner Farm; District Gilgit: Rakaposhi view point, Sikandarabad, Aliabad, Karimabad, Gulmit, Khunjerab, Borith Lake, Juglot and Bunji; vi) District Ghizer: Golapur, Goharabad, Singal, Kitch, Sher Qila, Theen and Basin Nala; and vii) District Astor: (Doian, Astor Valley: Rama forest and Gorikot). These localities are described below.

Federal Capital Areas
Islamabad is located at 33°402N, 73°102E. The city is situated at the edge of the Pothohar plateau, south of the Margalla hills, 14 km north-east of Rawalpindi. The area's micro-climate is regulated by three man-made lakes (Rawal, Simli and Khanpur). Rawal Lake is located within an isolated section of the Margalla Hills National Park. This artificial lake covers an area of 8.8 km². The area around the lake has been planted with flowering trees and laid out with gardens. The city has an extreme climate with hot summers with monsoon rains occurring during July and August, and fairly cold winters with sparse snowfall over the hills and sleet in the city. The weather ranges from a minimum of -4 °C in January to a maximum of 45 °C in June. The area of this city was formerly scrub forest and open ground. The city's pleasant climate has enabled the introduction of many exotic plants to the area.

Margalla Hills, which are mountain range situated at the northeast to west and southwest of Islamabad, start near Tret and end near Taxila. Taxila is located 30 km from Islamabad. The Margalla Hills National Park comprises of Margalla Range (12605 ha). The hill ranges nestle between an elevation of 685 meters at the western end and 1604 meters on its east. The vegetation of southern slopes is short stature, comprising of deciduous and evergreen trees with diverse shrub growth. Carissa opaca and Dodonaea viscosa being the dominant species. In the north, are Pines (Pinus longifolia) and groves of Oak (Quercus leucotrichophora) with undergrowth of Myrsine africana. There are dense stands of Paper Mulberry (Broussonetia papyrifera) in different parts of Islamabad. There is also much wildlife including insects in the Margalla hills.

Murree Hills
The Murree Hills, 55 km from Islamabad, lie in north latitude 33°54’N and east longitude 73°26’E, at 2,100 meters above sea level and have a Himalayan atmosphere. Murree is rich with coniferous forests of different ages, including Pinus wallichiana, P. longifolia and Cedrus deodara; broad-leaved trees include Juglans regia, Quercus leucotrichophora, Q. baloot, Aesculus indica and Cornus alba while predominant shrub species include Viburnum foetens and Rubus spp. Wild flowering plants include Impatiens spp. and Chrysanthemum leucanthemum.

Northern Areas
The northern areas of Pakistan have diversified flora and fauna because of varied climatic conditions and unique ecology. Still little information is available on insect diversity in this region. However, some biologists have made efforts to identify butterfly species and documented their distribution and status.

Nature has endowed the area with high peaks and large glaciers concentrated in a relatively small radius. The region is home to some of the world’s highest mountain ranges; the main ranges are the Karakoram and the western Himalayas. The Pamir mountains are to the north, and the Hindu Kush lies to the west. There are five peaks which are above 8,000 m in the Northern areas of Pakistan. K-2 with a height of 8,611 m (28,416 ft) lies majestically in Skardu district overlooking the Chinese territory. Nanga Parbat, 8,138 m (26,855 ft) high is located in Diamer whereas the 7,788 m (25,700 ft) high Rakaposhi is situated in Gilgit. Some 28 peaks of the area are over 6,666 m (20,000 ft) high. Three of the world’s seven longest glaciers outside the polar regions are also in Northern areas, the Biafo Glacier, Baltoro Glacier, and Batura Glacier. There are several high altitude lakes in the Northern areas such as Shesosar Lake in Deosai Plains, Satpara Lake in Skardu, Katchura Lake in Skardu, Borith Lake in upper Hunza, Rama Lake near Astore, Rush Lake near Nagar and Kromber Lake in Kromber Pass. Northern areas border the Wakhan corridor of Afghanistan to the northwest, the Xinjiang territory of China to the northeast, the Indian-held state of Jammu and Kashmir to the southeast, the region of Pakistani-administered Azad Kashmir to the southeast and the North-West Frontier Province to the west. The climate of this area varies from region to region. It is greatly influenced by the presence of high mountain systems which create rain shadows in some places and high precipitation in others. The eastern part of the area is moist temperate zone of the western Himalayas but moving northwestern the Karakoram and the Hindukush ranges present a much drier environment. Climatically the Karakoram and Hindukush create a barrier between the monsoon-dominated lands of South Asia to their south and the vast deserts of Central Asia to their north.

Gilgit and Chilas are hot during the day in summers, yet cold at nights, and valleys like Astore, Khaplu, Yasin, Hunza and Nagar have mild summers and severe winters.

Northern area is divided into two regions i.e. Baltistan and Gilgit, further divided into six districts. Baltistan consists of two districts (Skardu and Ghangche) while Gilgit region consists of four districts Astore, Diamer, Ghizer and Gilgit.

In Skardu district Indus River enters the Northern areas of Pakistan from Jammu and Kashmir. Ghanche is the eastmost district of Baltistan. To its east is Leh district of Ladakh, northeast is Aksai Chin (China), to north and northwest is Skardu district, to its west is Astore district and to its south is Jammu and Kashmir. Its capital is Khaplu. Astore district is bounded by Diamer district in the west and Skardu district in the east. Diamer is the district where the Karakoram Highway enters Northern areas from NWFP, Pakistan. Chilas is the capital of the Diamer district. The Diamer district is bounded by Astore district in the east, NWFP in the south / south west, Ghizer district in the north / northwest and Gilgit district in the north / north east. Ghizer district is the westernmost district of the Northern areas. It is bound by NWFP on three sides (north, west and south / south west), by Diamer district in the south / southeast and by Gilgit district in the east. A small strip of Ghizer district (roughly 35 x 12 km) is sandwiched between the NWFP and the Wakhan Corridor (Afghanistan). Gakuch is the capital of the Ghizer district. Gilgit district is bounded by Wakhan Corridor (Afghanistan) in the north, Xinjiang (China) in the north / northeast, Skardu district in the south / southeast. Gilgit town is the capital of the Gilgit district and also capital city of the Northern areas, Pakistan. The region is significantly mountainous, lying on the foothills of the Karakoram mountains.

Gulmit is a fertile plateau (2,500 meters/8,200 feet) high, with irrigated fields on either side of the road. Naltar is an area of alpine meadows and pine forests (3,000 meters/10,000 feet) above sea level and surrounded by snow-capped mountains and fertile, high-altitude pastures. Gilgit is at an elevation of 1453 meter. It is surrounded by lakes, rivers, glaciers and high mountain ranges. In Karimabad there are terraced fields and fruit orchards. Deosai Plains is located above the tree line, the second highest plains of the world (4,115 m/13,500 feet) in the South of Skardu and in the East of the Astore valley. The area was declared as a National Park in 1993. The Deosai plains
cover an area of almost 3,000 square kilometers. For just over half the year (between November and May), Deosai is snow-bound.

**Forests:** Montane Sub-Tropical Scrub forests are found between 750 to 3,900 meters elevation and are divided into **_Dodonea_** scrub, **_Pistacia_** scrub and sub-tropical stream bed scrub. Montane sub-tropical scrub comprises of **_Capparis spinosa_**, **_Pistacia_**, **_Artemisia_**, **_Saccharum_**, **_Dodonea_**, **_Berberis_**, **_Rosa_** and **_Daphne oleoides_**. This area lies along the Indus River up to Raikot and Bunji.

Montane Dry Temperate Coniferous forests contain deodor (Cedrus deodara), blue pine (Pinus wallichiana), fir (Abies pindrow), spruce (Picea smithiana), chilgoza (Pinus gerardiana) and juniper (Juniperus spp), both in pure or mixed stands. All the important coniferous forests are found in this zone. These are mostly found in district Diamer, some parts of districts Gilgit, Skardu and two villages (Sher Qila and Singal) of Ghizer district.

Montane Dry Temperate broad leaved forests have broad leaved species. These are found in pockets within the temperate coniferous zone. The main species in this zone include evergreen oak (Quercus baloot), ash (Fraxinus spp.), poplar (Populus), willow (Salix) and Artemisia.

Sub-Alpine forests have the highest snowfall in Northern Areas, up to 3 m/year, but get little rainfall. Plant species found in this zone include birch, willow, juniper, Ephedra, Viburum, Andropogon, Berberis, Lonicer and Ribes.

Northern Dry Scrub forest is scattered vegetation. Rivers and streams supports seabuckthorn (Hippophae rhamnoides) and willow species. Scattered and stunted juniper trees also grow on hillsides.

In rangelands native vegetation is mostly grass, grass-like plants, forbs and shrubs. They are not suitable for agriculture but are good sources of forage for free grazing animals as well as a source of wood products, water and wildlife. Rangelands occupy 2.1 million hectare of the Northern Areas and are the primary source of forage for livestock. Thus they play an important role in the rural economies of this region.

**Crops:** As the whole area is mountainous, therefore less land is available for cultivation of crops. Cereal crops are wheat, maize; Fruits are apple, apricot, grape, peach, cherry, plum, guava, almond, walnut, pomegranate and mulberry. Vegetables are cabbage, cauliflower, tomato, brinjal, peas, carrot, pumpkin, spinach, lady finger and potato.

**Collection Methodology**

Before departure for expedition the expedition team was briefed by the experts about the collection methodology, temporary preservation of insects and their handling. The collection was done by hand, sweeping nets, aspirators, malaise trap and light trap. Building a worth while insect collection is a difficult and time consuming effort. It should be done in such a way as to be of value to the scientific community. Each insect should be collected in good condition, correctly mounted and well-preserved. It should also tell a story about where, when, and by whom it was collected.

Satisfactory killing, preserving and permanent mounting methods should retain the natural color of insects, not distort their shape, make all cuticular structures including sensory organs visible and preserve these for future for an indefinite period.

For insect identification, collection is the first step and next step is their conservation, investigation and documentation. This can only be done on the basis of a good collection which is run by trained entomologists. Because of their incredible diversity it is important that the insects are caught and collected selectively, i.e. it is not possible to collect simply all insects in an area. Different methods have to be adopted. Some groups of insects like bees can best be swept with a net on blossoms, others have to be attracted by ultra violet light, and again others can be found on plants or in litter. For hand collecting, nets with gauze and a stick are used. The insects are handled with the fingers, forceps or sucked with an aspirator.

Insects must be killed in different ways. Diptera and most Lepidoptera are generally killed with cyanide, Hemiptera and Hymenoptera are usually killed with ethyl alcohol, microlepidoptera are mostly killed with liquid ammonia, and other insects like Ephemeroptera and Trichoptera are put into alcohol.

It is important to label the insects for later preparation. In the field simple (provisionary) labeling is done. Later the pinned insects get a detailed label with exact geographic data, heights and habitat where the insect was caught. Furthermore it should be noted who caught the insect by what mean and when. Sometimes it is important to note food plants or other ecological details. Malaise trap and/or light traps are also used for collection.

**Malaise Trap**

A malaise trap was installed at the rear side of National Insect Museum building at NARC on 29th of May and dismantled on 12th of June, 2007. The Malaise trap is designed to catch those insects which attempt to fly over a barrier. This trap consists of a barrier of fine black Terylene mesh ca. 1.8 m long and 1.1m high at one end and 1.8 m at the other. End pannels of similar material provide return walls to prevent insects from flying around the net. A slipping pitched roof of white Terylene mesh completes the main body of the trap. A killing bottle is attached at the top of the gable. It is filled with 70 % ethanol. The Malaise trap is generally very efficient to catch Diptera as well as certain Hymenoptera.

**Light Trap**

Night catches at three locations were held with the aid of fluorescent light bulbs. The flourescent light attracts the insects. Additionally there is also visible light which enables the entomologists to catch the insects with a sweeping net. Locations were Karimabad, Gilgit and Chilas.

Light catching in Karimabad and Gilgit resulted in rather few insects, probably because of the windy and cold weather and the full moon. An interesting insect, found at Gilgit, is an Ichneumon wasp of the subfamily Tryphoninae.

In Chilas the light attracted many beetles Hybosoridae, Carabidae, Elateridae, Cicindelidae, numerous Mole Crickets (Orthoptera: Gryllotalpidae) and grasshoppers (Orthoptera: Acrididae), some moths (Lepidoptera: Noctuidae) and mayflies (Ephemeroptera).

**Conclusion and Recommendations**

The maximum number of insects collected belonged to order Coleoptera (913) followed by Hymenoptera (353), Heteroptera (206) and Lepidoptra (154). It does not necessarily show that the area is especially rich for Coleoptera; it was due to easy availability and catchments of coleoptera. The abundance of some of the insects in certain areas does not depict anything because the collection was not based on statistical sampling. It was a random collection.

During the expedition insects belonging to all the important order of insects have been collected. On the base of the preliminary identification an annotated list is presented. However, the in depth study of taxonomists by local and foreign entomologists will surely
enrich the already existing knowledge of the fauna of the area. However, the pictures of insect fauna of the area are still murky. It can be more cleared by more trips of the area in different season of the year. When the taxonomic studies will be completed the finding will be published in internationally reported journals. All the participants became well versed with collection methodology, preservation and storing techniques. Moreover they have gathered enormous taxonomical knowledge which will be highly useful in the future work.

The benefit of this expedition is that quite a large fauna of the area has been explored but still much more detailed investigations are needed to have a more complete faunistic picture.

The identification of insects to species or generic level is a difficult and uncurious task, when the whole class of insects is to be tackled. It becomes more difficult in the absence of availability of local taxonomist of each order/family. However at a meager human resource capital it was possible to give name to 130 insects. This is a substantial achievement and had been possible by the technical input received from foreign experts and hard work of local contributors of this expedition. Of the 130 identified Insects, 44 belongs to Coleoptera, 27 to Heteroptera, 31 to Hymenoptera, 8 to Orthoptera, and 36 to Lepidoptera, 10 to Odonata and 1 to Mantodea. Order wise details of identified species during expedition are given below.

Order: Coleoptera = 44 (37 species, 1 subspecies and 6 generic level)

Family Coccinellidae (9 species, 1 subspecies and 1 generic level)
Adalia tetraspilota, Adonia variegata, Coccinella septempunctata, Epliachna sp., Macrosite hauseri, Menochilus sexmaculatus, Oenopia oecina, Propylea dissecta, Propylea quotranscutata and Hormonia dimidiata

Family Buprestidae (5 species and 4 generic level)
Agrilus sp., Amorphosoma sp., Anthaxia coxalis, Anthaxia sp., Buprestis decemspilota, Chalcophorella orientalis, Meliboeus sp., Alissonotum sp. and Horminia semistriata and Capnodis sexmaculatus

Family Scarabaeoidea (23 species and 2 generic level)
Alisoxonum sp., Apochlaenius immarginatus, Aphanisius irregulare, Aphanisius kashmiriensis, Aphanisius livids, Aphanisius pamirensis, Aphanisius pereirai, Caccobius denticollis, Caccobius tuberculatus, Ctenopelta nicotri, Ctenopelta sphenopeltis, Onitis subopacus, Onthophagus luridipennis, Onthophagus mopsus, Onthophagus concor, Onthophagus falsus, Onthophagus kashmiriensis, Onthophagus marginalis, Onthophagus marginalis nigrimargo, Onthophagus tibatus, Sisyphus neglectus, Sphecoeta sp. and Tinocestus modestus

Order: Heteroptera = 27 (17 upto species and 10 generic level)
Family Cicadidae (08 species)
Cicadattra lacteipennis, Cicadattra hyalina, Oncotympana expansa, Oncotympana oebuiliba, Paraha reticulate, Haphsa nichomache Psamocarhis guereula and Platytopia saturote

Family Cydnidae (01 species)
Cydnus aterimus

Family Lygaeidae (02 generic level)
Lygaeus sp., Nyssus sp.

Family Miridae (01 species and 02 generic level)
Adelphocoris sp., Stenodermis sp., Tuponia elegans

Family Psyllidae (02 species)
Psylla cf. similae and Trioza chenopodii

Family Pentatomidae (04 generic level)
Bagrada sp., Carcopsis sp., Dolicos sp., Eurydema sp.

Family Rhopalidae (04 species and 01 generic level)
Liorussus hyalinus, Rhopalus maculates, Rhopalus parumpunctatus, Rhopalus sp., Sictopleurus abutilon

Family Reduviidae (01 generic level)
Empicipis sp.

Family Membracidae (01 species)
Oxyrachis taranda

Order: Hymenoptera = 31 (1 subspecies, 15 species, 15 generic level)
Family Vespidae (11 species, 1 subspecies and 1 generic level)
Allorhynchium argentatum, Antenapica kashmiriensis, Anthodynerus limbatus, Delta p. pyrophora, Euodynerus disconotatus sulphuripes, Euodynerus s. semisaecularis, Orenemonoides edwardsi, Polistes (Polistella) sp., Polistes indicus, Polistes wattii, Ropalidia fasciata, Ropalidia spatulata and Vespa orientalis

Family Apidae (4 species and 2 generic level)
Apis dorsata, Apis mellifera, Bombus melanarius, Bombus tunicatus and Bombus sp.

Family Halictidae (5 generic level)
Halictus sp., Lasioglossum sp., Nomia sp., Pseudapis sp. and Sphecodes sp.

Family Anthophoridae (2 generic level)
Ceratinia sp. and Xylocoa sp.

Family Megachilidae (4 generic level)
Coelioxyx sp., Icteranthidium sp., Megachile sp. and Osmia sp.

Family Chrysidae (1 generic level)
Stilbum sp.

Order: Orthoptera = 08 (7 species, 1 generic level)
Family Acrididae (7 species and 1 generic level)
Anacridium aegyptium, Eremoptera cinerasceus, Odealeus senegalis, Phingonotus sp., Phingonotus akbarii, Phingonotus balteatus, Phingonotus huberii and Phingonotus savignyi

Family Lepidoptera = 36 (30 species, 1 subspecies and 5 generic level)
Aglaia ariciae, Argyreus hyberius, Kallima inachis, Lasiomma (Pararge) schakra, Lethe verma, Libythea leptia, Libythea myrrha sanguinalis, Limenitis trivena, Neptis duryodana, Precis orthya, Sephisa dichroa, Tirumala limbicae, Vanessa cardui and Ypthima sp.

Family Pieridae (9 species)
Anaphaeis aurora, Aporia leucodyce, Catopsila pomona, Colias erate, Colias fieldi, Gonepteryx rhammi, Pieris brassicae, Pieris rapae and Pontia chloridice.

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Family Brachodidae (1 generic level)
Atrychia sp.

Family Lycenidae (4 species)
Chaetoptera odata, Heliophorus sena, Lycaena phlaeas and Strymon assamica

Family Nemobiidae (1 species)
Dedusa durga

Family Geometridae (3 generic level)
Alcis sp., Entepria sp. and Idaea sp.

Family Papilionidae (4 species)
Papilio demoleus, Papilio machaon, Papilio polyctor and Papilio polytes

Order: Odonata =10 (7 species, 1 subspecies and 2 generic level)
Family Coenagrionidae (1 species)
Agriocnemis pygmea

Family Platycneminae (1 species)
Calicnemis eximia

Family Coenagrionidae (2 species)
Ischnura delicata, Ischnura elegans and Ischnura elegans

Family Synlestidae (1 species)
Megalestes major

Family Libellulidae (2 species, 1 subspecies and 2 generic level)
Orthetrum glaucum, Orthetrum pruinosum neglectum, Pantala flavescens, Crotaphis sp. and Erythemis sp.

Order: Mantodea = 1 (1 species)
Family Mantidae (1 species)
Belaphosis mendiu

Area Wise Vegetation Details

Chilas, Gas Das and Goner Farm
Vegetation around Chilas including Gas Das comprises of Calotropis procura, Echinops sp., Periploca aphylla, Capparis spinosa, Heliotropium sp. Roadside plantation consists of Robinia pseudocacia, Ailanthus, Populus, Salix and Dalbergia sissoo and sometimes Platanus orientalis; in addition Morus nigra, Elaeagnus are also often found growing around orchards and fields. Another tree of common occurrence is Tamarix. While at Goner Government Farm pomegranate, almond, apricot, prune, peach, cherry, walnut, apple, mulberry were the fruit trees grown. Moreover wheat and clover were also grown.

Rakaposhi View Point
In and around orchards fruit trees such as apricot, cherry, walnut and bushes like Salix spp. were common. Alfalfa was also grown.

Karimabad, Aliabad and Sikanderabad
Orchards comprise of fruit trees like apple, apricot, cherry, plum, walnut and mulberry species (Morus alba). Elaeagnus trees and Hippophae rhamnoides (Seabkthorn) shrubs are also common. Cultivated crops include maize, potato, wheat, clover etc. Grasses were also plentiful.

Gulmit
Around orchards, trees like Populus, Elaeagnus, Robinia pseudocacia, Salix spp., Juglans regia, were observed while common bushes were Hippophae rhamnoides, Rosa webbiana and crops included potato, wheat, alfalfa.

Khunjerab National Park
Vegetation comprised of Hippophae rhamnoides (Seabkthorn), Rosa webbiana, Ephedra, Salix, Tamaricaria, Ranunculus, Artemisia and Sempervivum.

Borith Lake
It is isolated ecology surrounded by Hippophae rhamnoides bushes (Seabkthorn) and Salix spp.

Gilgit
In and around the hotel where collection was done Platanus orientalis and plum, apricot, peach, pomegranate & mulberry trees were common.

Punyal valley: Golapur, Goharabad, Sher Qila, Kitch
It is a lush green locality with many fruit trees like apricot, cherry, walnut, almond mulberry species like Morus alba, Morus nigra etc., while common forest trees were Fraxinus, Pistacia, Elaeagnus and willows (Salix spp.). Hippophae rhamnoides (Seabkthorn) and Tamarix were also common with an undergrowth of Rumex hastatus. Cultivated crops included maize, potato, wheat, clover etc. Grasses were also plentiful.

Theen and Basin Nala
Tamarix sp. was common along rivers and streams.

Juglot
Fruit trees like cherry, almond, apricot, plum and medicinal plants (Foeniculum vulgare, Carum copticum, Coriandrum sativum and Nigella sativa) were grown at Karakoram Agricultural Research Institute for Northern Areas beside clover, alfalfa, onion and tomato.

Astore Valley
Forest trees include Pinus wallichiana and Pinus gerardiana. Artemisia sp. was also common. Orchards comprise of fruit trees like apricot, cherry and apple. Cultivated crops include potato, maize, wheat, black cumin etc. Grasses were also plentiful.

Rama forest
Rama forests were dominated by conifers. Abies pindrow, Picea smithiana and Pinus wallichiana being the dominant species with an undergrowth of Viola sp., Astragalus sp.

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Vermitechnology in all-round & Sustainable development of human Society
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Bioconversion of organic waste into compost through culture of suitable varieties of earthworms is called vermicomposting biotechnology or vermitechnology. The process of composting through vermiculture is very simple, easy, highly effective, environment-friendly and economically feasible. Special types of surface dwelling or non-burrowing earthworms, also known as epigeic or manure worms, are suitable for this purpose. These worms do not need soil for survival and live and flourish in organic waste particularly mixed with cattle dung containing high (> 40%) humidity and good aeration. They are able to tolerate extreme conditions of cold and hot weathers. They have short life cycle and rapid rates of digestion and reproduction. They are voracious eaters, fast breeders, remain active throughout the year and work like a factory. They consume organic waste more than their own body weight per day. They collaborate with waste degrading, aerobic bacteria and prevent the propagation of pathogenic microorganisms (responsible for spread of diseases and foul smell) in the garbage. They are highly efficient in recycling of waste into high quality vermicompost and the practice can be organized for small, medium or large-scale garbage management. Vermitechnology is helpful in all-round and long-lasting, sustainable development of human civilization.

Different types of bio or organic waste products are the major source of environmental pollution, foul smell, filthy and unhygienic atmosphere, spread and propagation of diseases and they spoil the image of area and the city. Safe, non hazardous and ecofriendly disposal and management of domestic, agricultural and industrial waste are difficult challenge to the administration. Large-scale use of vermicompost and other organic composts help to resolve waste generated problems, as waste and useless matter is recycled in high quality compost and reduce the environmental pollution caused by mishandling of waste and excessive use of agricultural chemicals.

Vermicompost is excellent and complete manure. It is approximately 5 times more potent than the country (dung) manure. It provides all essential micro and mega-nutrients to the plants while the chemical fertilizers contribute one or two factors. Its use enhances the quantity and quality of plant products. They are free from dangerous and toxic chemical residues. Whereas the use of chemical fertilizers enhances only the quantity.

Excessive and non-judicious use of chemical fertilizers and pesticides causes depletion of useful flora and fauna of the

International Congress of Global Warming on Biodiversity of Insects:
Management and Conservation

International Congress of Global Warming on Biodiversity of Insects: Management and Conservation is organized by the Department of Zoology, School of Life Sciences, Bharathiar University, Coimbatore, India, from 9-12 February, 2009.

Abstracts: All abstracts for presentation as well as posters must be submitted to the Conference Secretariat before 25th October, 2008. Abstracts received after this date cannot be guaranteed for inclusion in the Abstract book.

Authors are invited to submit their abstracts in duplicate for oral / poster presentation not exceeding 300 words including title, author(s) and affiliation. The name of the presenting author should be underlined. Abstracts of papers should be prepared using MS word, font size 12, Times New Roman, double line spacing and sent to the Organizing Secretary of the Congress. Oral Presentation

If you intend to give an oral presentation, please provide a title of the paper on the registration form and submit the abstract of your paper as indicated above. The duration of an oral presentation is 15 minutes (12 mts. Presentation + 3 mts. discussion).

Posters: We also invite poster presentation. The posters will be displayed on boards 120 x 120 cm. During the poster session a committee appointed by the organizers will judge all posters. Best three posters will be invited to give an oral presentation about their work during a special session and they will be awarded prizes.

Language: English

Venue: Department of Zoology Schoolof Life Sciences Bharathiar University, Coimbatore, 641 046 India

Registration Fee Indian Delegates : Rs.1, 500/
Delegates from Industries : Rs.2,500/
Accompanying Person : Rs.1,000/

Student Delegates : Rs. 1, 000/
Foreign Delegates from Developed Countries: US $ 300/
Foreign delegates from Developing Countries: US $ 200/
An extra fee of Rs. 250/- (Indians), US $ 50 (foreigners) will be charged after 25 October 2008.

The Registration fee should be sent through bank draft drawn in favour of T he Registrar, Bharathiar University, payable at Coimbatore-641 046, India copy to The Organizing Secretary, (GW-BMC,09) Department of Zoology, School of Life Sciences, Bharathiar University, Coimbatore - 641 046, India before 25th October, 2008 through International Money Order or Bank Draft or through Swift Transaction.

The registration form along with the abstract of research paper should reach the Organizing Secretary by 25th October, 2008.

For other details write to Dr. K. Murugan, Professor/Department of Zoology, School of Life Sciences, Bharathiar University, India.
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was inaugurated on Sunday, 5th June (World Environment Day) at Charak Udyan of Jiwaji University, Gwalior. It established at Charak Udyan of Jiwaji University, Gwalior. It Vermicomposting & Organic Compost Center has been established for educational and technological advancement, for environmental conservation, socio-economic aspects and in waste management, organic and sustainable agriculture. Realizing the significance of vermitechnology in organic interest in process of learning something new. Vermicomposting to pass their time. Students can take flowers. The elderly people can become active in vermicompost for their kitchen garden and to grow beautiful flowers. The elderly people can become active in vermicomposting to pass their time. Students can take interest in process of learning something new.

Realizing the significance of vermitechnology in organic waste management, organic and sustainable agriculture, environmental conservation, socio-economic aspects and in education and technological advancement, a Vermicomposting & Organic Compost Center has been established at Charak Udyam of Jiwaji University, Gwalior. It was inaugurated on Sunday, 5th June (World Environment Day), 2005. A hut has been constructed using iron framework and thatched roofing. On the surface of cemented floor vermibeeds are maintained using plant bases waste from the campus and cattle dung. In addition to this, a platform was also erected so that compost tea and vermiwash can also be collected. Both these products are useful as liquid fertilizers and as pest controlling agent. Suitable species of live earthworms including red wriggler Eisenia fetida, giant African night crawler, Eudrilus euginae and oriental worm, Perionyx excavatus were purchased from the reliable source.

Vermiculture activities were extended outside the hut also. Vermi-tanks have been constructed using bricks, surface vermi-beds have been set up under the shade of trees. A variety of discarded and useless containers (such as cracked wash basins, discarded wooden boat, wooden cartoons, perforated plastic containers, bamboo baskets, plastic bags, car tyres, metal tanks of desert coolers) have been used to set up container units of vermiculture. A system of hanging vermicomposting units has been developed by the center using discarded car tyres and plastic bags.

Within a short period of 7 months (June to December 2005), significant progress has been made. The plant waste biomass of the campus is mixed with cattle dung for recycling into high quality vermicompost through culture of worms. During this period approximately 60 quintal of vermicompost generated by the center has been supplied to different departments of the University. So far the center has become capable to manage about 15 % of the campus waste. Now the center has become ‘Self-sustainable’ (no profit no loss basis). It is for the first time in the history of Jiwaji University that such a ‘Self-sustainable’ unit has been established which has shown excellent results within a short period of time. A target to process about 50% of the campus waste is planned for the next six months so that the practice of burning of the waste (so also the associated problem of pollution) is minimized and the campus becomes greener with the use of vermicompost. Then it can proudly be said ‘Our Campus, Clean Campus, Green Campus’.

Everybody’s contribution is expected in this important task of national and social benefit. The Center is planning to organize and conduct awareness, popularization and training programmes and workshops and other promotional activities.
Poaching threatening butterfly species

Lalit Mohan & Charu Chibber (Correspondent) Patiala April 14

Though news about illegal poaching of tiger and its declining population has been hogging headlines every now and then, many smaller species are also facing a similar bleak future due to poaching.

H.S. Rose from the Zoology Department of Punjabi University, Patiala, has been carrying out research for the past seven years under the project earmarked by the Union Ministry of Environment to identify and document moths across the country.

While talking to The Tribune, he said 300 species of butterflies in the country had been enlisted in the red data book under the endangered species category.

Large-scale poaching and international smuggling nexus is threatening many species of butterflies and moths in the Himalayas. The appolo butterflies and swallow-tail species are the most threatened. They are found at an altitude of 12,000 feet. Near the Rohtang Pass researchers noticed that foreiners hire local people to poach these species of butterflies. The foreiners engaged in illegal trade of butterflies in the Rohtang area pay Rs 20 to 30 per butterfly to the locals. The locals on their part also collect these and sell these to foreiners for being smuggled to foreign countries.

In international market some of the butterflies have an ornamental value and are sold at a very high price. A pair of bird wing butterfly found on Tiger Hill of Jammu and Kashmir is sold at price ranging from $ 2,500 to $ 3,500 in the international market. The yellow colour in the wings of some species of butterflies is permanent. It is even used in gold ornaments in some countries. In Taiwan wall plates used for decorating houses are made from wings of butterflies, he said.

He further stated that in 1994 some butterfly smugglers were nabbed in Delhi and 26,000 specimens of moths and butterflies collected from the Himalayas were seized from them. The government on its part failed to find an expert to identify species that were covered under the Wildlife Preservation Act among them. Owing to this laxity, the smugglers were freed.

No major research has been carried on moths and butterfly species in India after Independence. The present project being run from the university is first of its kind. The researchers under the project have collected samples of about 700 species of moths found across the country.

"I want that these rare specimens should be handed over to some natural museum," Rose said.

The researchers under the project have run from the university is first of its kind. Independence. The present project being run from the university is first of its kind. Independence. The present project being run from the university is first of its kind.

Termites are ‘social cockroaches’

The termites classification debate stretches back decades UK scientists have said that they have produced the strongest evidence to date that termites are actually cockroaches.

They said their research showed that termites no longer merit belonging to a different order (Isoptera), but should be treated as a family of cockroaches. The study examined the DNA sequences of five genes in the creatures, and found that termites’ closest relatives were a species of wood-eating cockroaches. The findings appear in the Royal Society’s Biology Letters journal.

One of the paper’s co-authors, Paul Eggleton, explained why their research had unmasked termites “true identity”. “In the past, people thought that because termites were so different in appearance, they belonged to a different order,” he said. “It has only been recently when we have been able to look at other things than the obvious body shapes and sizes that we began to realise that they are very similar to cockroaches.”

All living organisms, once they have been described, are classified in a taxonomic system, which places the organism in a unique hierarchy of categories from kingdom, through phylum, class, order, family, genus and finally species. Dr Eggleton, from the Natural History Museum (NHM), London, said examining the insects’ DNA offered much more robust data about the relationship between the insects. "What we have done is produce the strongest set of data to date that termites are actually social cockroaches."

Dr Paul Eggleton. The team sequenced the DNA of five genes from 107 species of Dictyopera (termites, cockroaches and mantids) to develop a picture of the creatures’ evolutionary history.

The researchers concluded that termites should be classified as a family (Termitidae) within the cockroaches’ order (Blattodea). Dr Eggleton was not surprised by the results. He said the classification of termites was an ongoing debate that stretched back to the 1930s. He added that disagreements began when researchers found some of the microbes in the guts of termites that allow them to digest wood were also found in a group of cockroaches. “The argument has gone backwards and forwards because of differing datasets over the years,” he explained. "I think what we have done is produce the strongest set of data to date that termites are actually social cockroaches.”

Source: http://news.bbc.co.uk/1/hi/sci/tech/6553219.stm