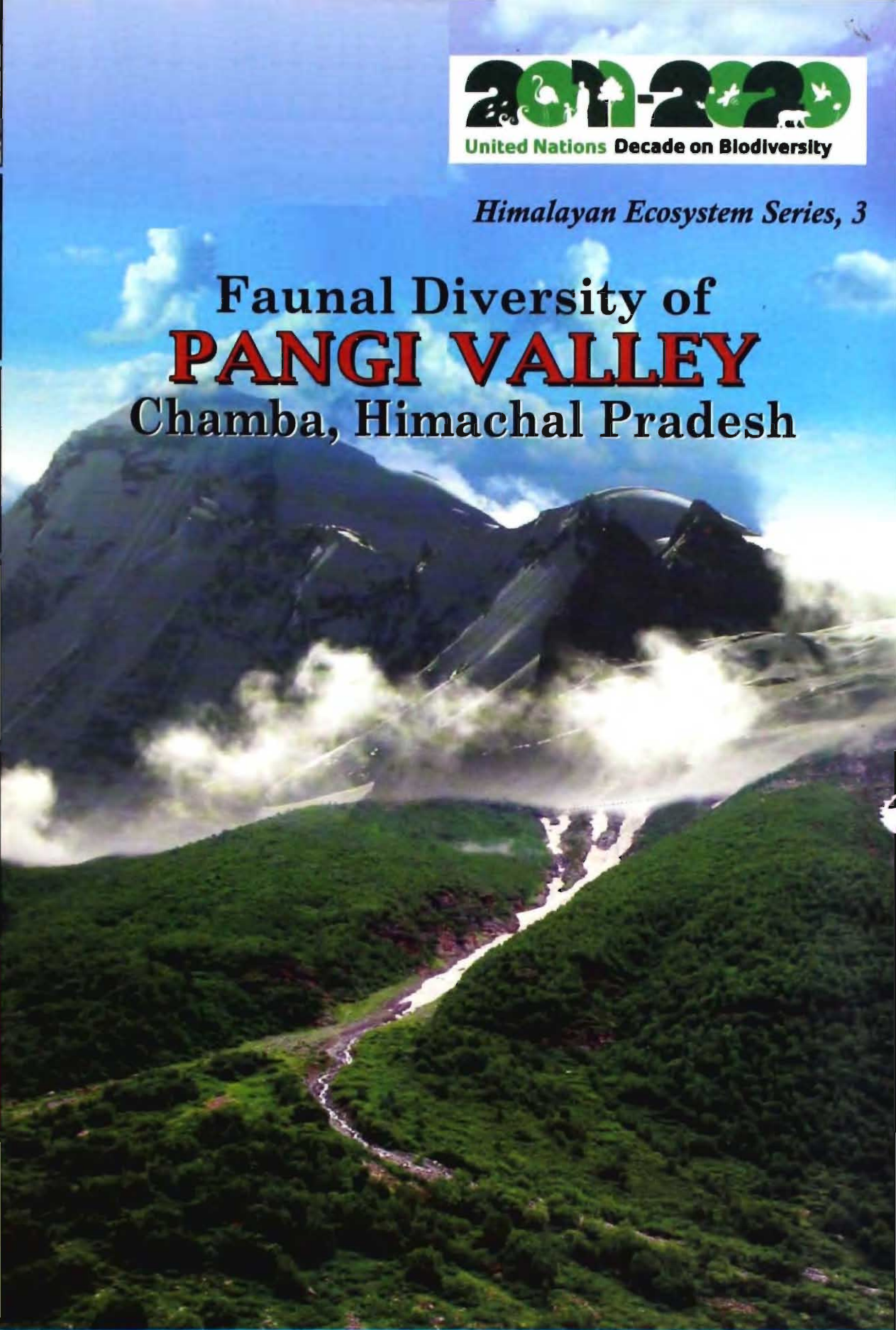




*Himalayan Ecosystem Series, 3*

# Faunal Diversity of **PANGI VALLEY** Chamba, Himachal Pradesh



**Zoological Survey of India**



*Himalayan Ecosystem Series, 3*

**FAUNAL DIVERSITY OF PANGI VALLEY  
(District Chamba, Himachal Pradesh)**

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

**Zoological Survey of India  
Kolkata**

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*HIMALAYAN ECOSYSTEM SERIES*  
FAUNAL DIVERSITY OF PANGI VALLEY

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## **PANGI VALLEY: AN OVERVIEW**

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### **INTRODUCTION**

India has unique geography which strongly influences its climate and subsequently its flora and fauna. This is particularly true in case of Himalaya in the North. Himalaya in fact is the youngest and highest mountain regions in the world that extends from northwest to east, covering a distance of about 2500 meters extending into countries like Afghanistan, Pakistan, India, Nepal, Bhutan and China. Due to its varied geography and altitude, it is considered as one of the hotspots of 15 mega diversity centers of the world. The Himalaya within India covers mainly 12 states i.e., Jammu and Kashmir, Himachal Pradesh, Uttarakhand in north and Sikkim, West Bengal, Arunachal Pradesh, Manipur, Mizoram, Tripura, Meghalaya in the east. Geographically in India, the Himalaya is divided into distinct zones i.e., east Himalaya, west Himalaya and North-west Himalaya with each zone having distinct climatic conditions and biota. The north-west Himalaya covers the states of Jammu and Kashmir and Himachal Pradesh.

Himachal Pradesh located between 30°22' and 30°12' north latitude and between 75°47' and 79°4' east longitude is totally a hilly state where the Himalaya is demarcated into various ranges like Outer Himalaya with Shivalik range, the Lesser Himalaya with Dhauladhar range, the Great Himalaya with Pir Panjal range and the Trans Himalaya with Zaskar range. It is characterized by an uneven elevation, which ranges from 350 meters to 7000 meters above sea level. Himachal Pradesh sharing its borders with Jammu and Kashmir in the north, Punjab in the west and south-west, Uttar Pradesh and Haryana in the south, Uttaranchal on south-east and Tibet on the east, spread across an area of 55,673 sq km occupying nearly 10.54% of the Himalayan land mass. The state has great climatic variations, ranging from hot and sub-humid tropical to cold glacial and alpine. The state has 63.9% percent of its area under forest cover. The forests are mainly of three types viz., Tropical Forests – confined to foothills with scrub of *Acacia* and *Zizyphus* and dry deciduous forests of Sal; Sub tropical forests from elevation of 500-1800m (subtropical evergreen forests

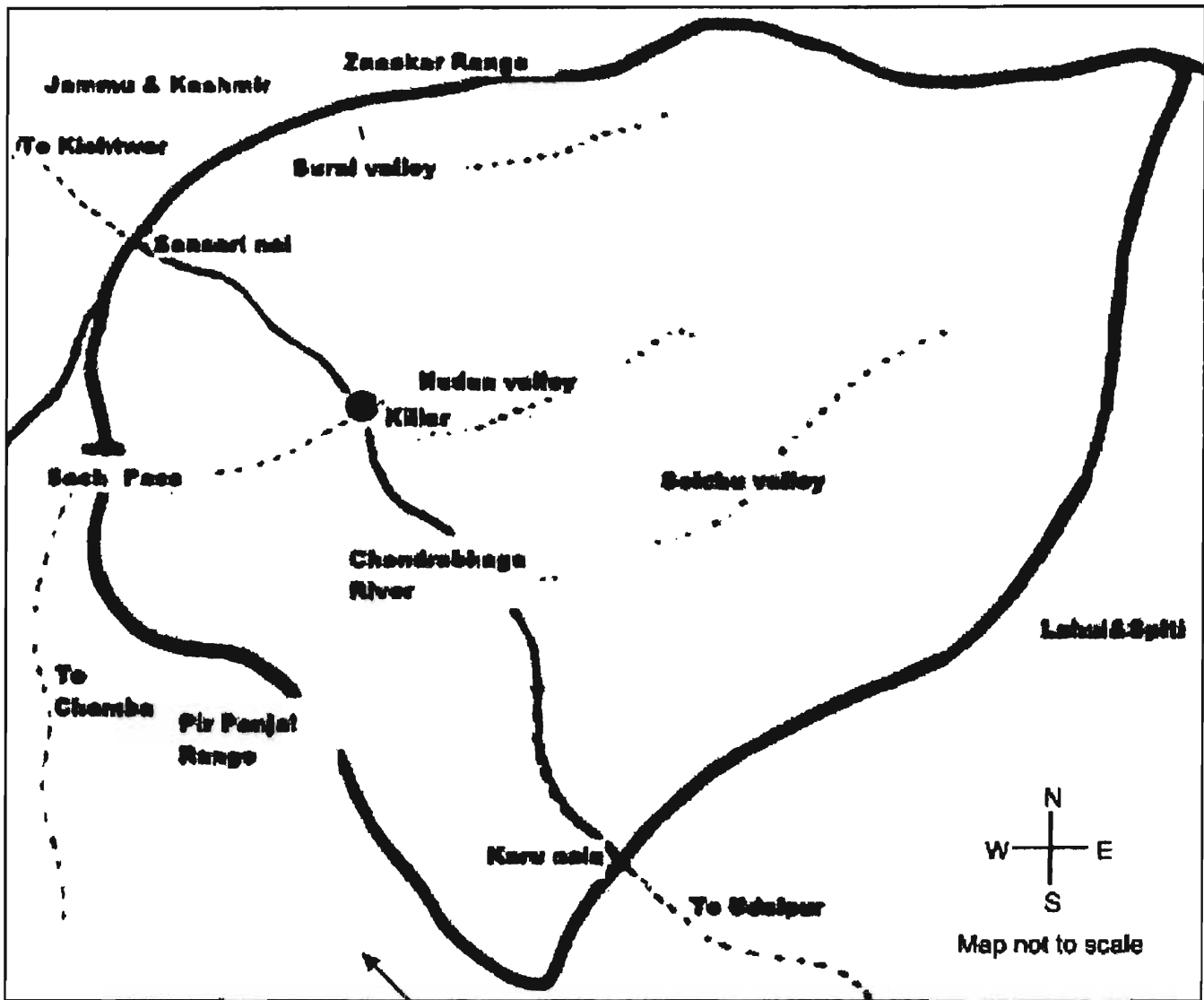


Fig.1. Schematic map of Pangi Valley

below 1200m dominated with species of *Albizzia*, *Terminalia* etc. and subtropical forests of Pine upto 1800 m.) and Temperate forests – from 1800m to 3000 m with trees of oaks, deodar, blue pine, horse chestnut, holm oak and edible pine. Himachal Pradesh is known for the natural beauty of its forests, rivers, valleys, hills and has a rich flora and a wide variety of wildlife. Politically the State is divided into 12 districts. Chamba is remarkable among the hill districts of the State for its natural features, situated in the north-west of the State between latitude 32°10' -33°13' N and longitude 75°45'-77°33' E. The district Chamba is divided into two Natural divisions namely, Ravi Valley including Chamba and Bharmour sub-tehsils (region between water shed of Dhaula Dhar and Pir Panjal with river Ravi and its tributaries) and Chenab or Pangi Valley including Pangi subtehsil (region between mountain ranges of Pir panjal and Zanskar with river Chander Bhaga and its tributaries).

Due to the various developmental activities such as modernization, building of dams and roads, conversion of natural land to cultivation use, the whole Himalayan ecosystem is considered to be under real threat. The area now seems to become prone to cloud bursts, landslides, flooding, besides melting of glaciers, thereby threatening its diverse and also endemic floral and faunal elements. The survey and documentation of the biotic resources of this ecosystem is the foremost need to conserve them. In a step towards this, the inventorying of faunal resources of one of the remote, isolated, inaccessible, vulnerable ecosystem of Pangi valley (Himachal Pradesh) in the Himalaya has been undertaken by the High Altitude Regional Centre, Zoological Survey of India, Solan, from 2007 to 2009.

### STUDY AREA: PANGI VALLEY

**Location and Boundaries:** Pangi is the remotest, rugged, snow bound, inaccessible, land-locked but picturesque and pristine narrow river valley in Himachal Pradesh. It is a small administrative subdivision of Chamba district situated in the northern extreme of the state where time and space acquired a new dimension. Sandwiched between two mighty mountain ranges, the Zanskar in the North and the Pir Panjal in the South it is an isolated valley. Positioned approximately between 32°11'30"-33°13'06"N and 75°45'-77°03'33"E, it is contiguous with Doda and Zanskar region of Jammu and Kashmir in the North and spreads over an area of 1600sq. Km. Pangi valley is irregularly triangular in shape (Fig.1), each side of which is about 56 kms in distance. It is bounded by Zanskar hills that lie in the Northern part of the valley and Pir Panjal in West. In southern side it shares boundaries with Lahaul and Spiti and in eastern side with Jammu and Kashmir. It is chiefly formed by river Chandrabhaga which cuts across the terrain in deep narrow gorge before entering Doda region of Jammu and Kashmir. With its deep river gorges and barren mountain peaks, it offers a wide range of scenery and vegetation. Till recently, this valley was the remotest tribal area of Himachal Pradesh where road access to the rest of the state was established only in the mid 1990s. Such was the obscurity of this forbidden land that Rajas of erstwhile Princely state of Chamba used to grant a special funeral

allowance to their employees serving in Pangti as their survival was never a matter of certainty. Now, the valley can be accessed from three directions, by crossing the Rohtang pass (Fig. 2) from Udaipur in Lahaul and Spiti via Karru Nallah, from Kishtwar in Jammu & Kashmir via Sansari Nallah and from Chamba via Sach pass (14478ft) or Cheni pass (14382ft). The 170 km long road link from the district headquarters Chamba to Killar, the headquarters of Pangti sub division via Sach Pass was established only in 2007. Earlier, people were required to undergo an 800 Kms long journey to reach Killar from Chamba via Rohtang Pass. The route through Kishtwar (part of J&K State) up to Killar is 116 kilometers in length. This road link has been recently established and small vehicles can ply up to the boundary of Pangti. These passes remain snow-clad for most part of the year and the valley can only be visited during late summers through these passes. Even during summers, much caution and care has to be exercised while crossing the passes. The weather is unpredictable and the tracks are dangerous, mostly on glaciers. There is always an impending fear of avalanches on the route. Although routes are always in the mercy of weather God as most of the road are narrow, dangerous, not of concrete, very dusty and prone to landslides, besides the many tributaries flowing through it (Fig. 3).

**Topography:** The Pangti valley has extremely difficult and rugged terrain with indifferent climatic conditions. The land locked Pangti is squeezed between two sub-systems of the Himalaya, the Zaskar (Fig. 4) and Pir Panjal Range (Fig.5) and hence the landscape is mostly tough, mountainous, dotted with a number of valleys. Although Pangti valley comes under the Biogeographic Province 2A (North West Himalaya) (Rodger and Panwar, 1988), the region actually meets the criteria as a transition zone between the Himalaya and Trans-Himalaya (Bhatnagar *et al*, 2008). The lowest altitudinal limit of Pangti is approx 2000m at Sansari Nala and ranges over to 6000 m comprising the lofty peaks adjacent to the Zaskar range. There are several peaks within this valley that have never been climbed and the onward paths lead to Kashmir, Lahaul and Zaskar. There are some beautiful sub valleys in Pangti such as Sural Valley, Hudan Valley, Saichu Valley and Parmar Valley, the way through which leads to Zaskar range. Biogeographically, Pangti region falls in the transition zone of the Himalaya and the Trans-Himalaya. This is very much evident in the faunal composition of the area which exhibits an assortment of elements from both the zones. This makes Pangti valley one of the most faunistically diverse areas in western Himalaya and also a priority area from conservation point of view (Bhatnagar *et al*, 2008). Besides, due to the somewhat inaccessible nature and low population density, vegetation cover is relatively intact which also accentuates its potential as an ideal refuge of wildlife.

**Chandrabhaga and its Tributaries:** The river Chandrabhaga forming the back bone of Pangti Valley (Fig. 6), flows through all the length of the valley through a distance of nearly 85 kms from Karru Nallah to Sansari Nallah. This river is believed to be the river Askini mentioned in Rigveda. The river originates from the mountains of Baralacha pass from two heads, the stream with its source on the south-eastern

side of the pass is called the Chandra and the other one which rises from the north-western side is called the Bhaga. After the confluence of these streams at Tandi (Lahaul) the river is known as Chandrabhaga. The river Chandrabhaga surges through Pangi valley after traversing Lahaul valley. From Tindi (in district Lahaul and Spiti) to Shour (first village of Pangi valley), the river Chandrabhaga runs a distance of about 26 kms and is very torrent and narrow. The river Chandrabhaga divides the Pangi valley into two unequal parts, the larger right bank which gradually rises to the Zanskar range and the narrow left flank ascends to steep slope towards the Pir Panjal range. In Chandrabhaga of Pangi valley on the south-eastern part is present the Karru Nallah bordering Lahaul and Spiti district of Himachal Pradesh and north-western limit by Sansari Nallah adjoining Doda district of Jammu & Kashmir. The main tributaries of Chandrabhaga in Pangi Valley are Karru and Saichu Nallahs. Karru Nallah is the first tributary entering into Chandrabhaga just at the entrance of Pangi valley from Lahaul side. The Saichu Nallah enters Chandrabhaga from its right side near village Cherry Banglow. The Saichu Nallah is in turn fed by a number of tributaries, the chief among which are Twan, Saichu and Chasak which meet at Saichu village. Several small streams born from Zanskar range and its branches feeding the river on its right bank in Pangi are Parmar, Kiryuni, Mahlu, Lujai Sechu Nallah, Huddan Nallah, Sural Nallah and Sansari Nallah. The latter is the last tributary of Chandrabhaga in Pangi before it enters into state of Jammu and Kashmir. On left bank of river Chandrabhaga, two small tributaries Cheni Nallah near Mindhal and Sach Nallah near Kellar enters into it. All tributaries rise in watersheds between Pangi and Zanskar and flow through well wooded valleys. The waters of Chandrabhaga are of grey colour in the summer because of melting of snow in its numerous sources (Fig. 7). The water also contains small quantity of gold. The rise of water in the river which is drawn from melting snow is gradual and steady, acquiring highest volume in the months of July and August. The volume of water in the river is so great and its current is so deep that it cannot be crossed in any part of its course. The river has been used for floating timber. Many avalanches also fill up the narrow parts of the river during winter up to that extent that villagers cross through these snow bridges from one side to the other. There are three major sub-valleys on the right side of the river, the Saichu valley, the Hudan valley and the Sural valley, comprising the catchment areas of respective streams which eventually fall into river Chandrabhaga. Almost the entire valley has number of small springs and streams which drive volume of water from snow covered cliffs. The Pangi river valley is quite exposed and extensive from Karru Nallah up to Purthi. Shour and Purthi are villages on the right bank of the river. After that river valley again narrows down up to villages Sach and Mindhal. From there the valley spreads out and the river flows in a north-westerly direction passing through Kellar and Dharwas where it leaves the Pangi valley to enter in to Jammu and Kashmir State. After entering Jammu and Kashmir, Chandrabhaga is known as Chenab.

## CLIMATE

By virtue of its geographic location beyond the reach of tropical monsoon rains, the agro-climate conditions of Pangri valley come under cold and dry zone (Fig. 8). The overall climate of the valley is semi-arid, typical of the inner Himalaya. It is characterized by cool summers with little rain and severe winters. The winters with heavy snowfall keeps the people confined to their houses in winter. However, significant changes have been noticed in the rainfall pattern since mid nineties with much wetter years. Most of the rainfall (230-740mm) is received during July-August although precipitation has also been recorded in winter months, when direct snowfall usually occurs. During peak winter, minimum temperature throughout the valley plummets much below zero degrees Celsius. Snowfall occurs after mid October in higher areas and reaching lower altitudes by the middle of December. Most of the areas receive heavy snowfall (3,000-4,700mm) during December to March with lofty peaks under perpetual snow cover although occasional snowfall also occurs during April. The region on the whole experiences severe winters with heavy snowfall, strong winds and frequent avalanches. Most of the streams also freeze during winter. During winter, the valley is locked from all the sides and remains cut off from the rest of the world because of heavy snowfall blocking all the approaches. The aerial route is the only way to reach here. The helicopter service is maintained by the state government for emergency situations. It is available in stipulated time intervals. The helipads are present in localities viz., Shishu, Tandi, Saach, Kellar, Sural and Purthi in Pangri valley. Weather opens up after April and reaches a comfortable day temperature of around 28 degree Celsius during June-July in the valley. The side valleys of Pangri i.e. Sural, Hudan and Saichu are much colder with generally foggy and cold afternoons even during summer months.

## PEOPLE AND THEIR SUSTAINANCE

Full of splendor and tribal majesty is the land locked valley of Pangri (Figs. 9 &10). It has been declared as one of the five Scheduled Tribal Areas of Himachal Pradesh. It has also been designated as Scheduled area under fifth Schedule of the constitution. Pangri valley is a small administrative unit of Chamba district. Traditional agriculture mixed with livestock production is the main way to support the economy of the people. Due to severe winters, most of the outdoor activities such as crop cultivation and harvesting, animal grazing, fodder and fuel wood collections are carried out in the five-six months of summer. Its terrain and climatic conditions permit little interaction between Pangri Valley and the areas across the high-mountain ranges including the district headquarters at Chamba town which located 150 km away. People are forced to depend solely on local natural resources to ensure their annual supplies of food, fodder, and fuel wood during the short summer season which they store for winters also. It doubles the effort. Thus the life of people in Pangri valley is extremely hard (Fig. 11). In the absence of any basic modern amenities, the people of Pangri commonly

have developed their own lifestyle and culture. People of Pangi valley are mainly Hindus called as Pangwals who observe unique customs and traditions. They are the main inhabitants of this area. The language of the People of Pangi is called as Pangwali. Small populations of Buddhist people forming Bhot tribes are the inhabitants along Zaskar hills. They live in higher reaches of the valley called Bhatris such as Sural Bhatris, Hundan Bhatris, Parmar Bhatris and Hillu-Tawan Bhatris. These tribes are a mixture of Aryan and Mongolian race. They follow Buddhism and generally construct Buddhist temples at these Bhatris. The native Pangwals and Bhotis are robust, hardworking, handsome people who keep the valley's unique culture alive in dresses, ornaments, folk songs, music and tribal dances.

### **HUMAN SETTLEMENTS AND DEVELOPMENT**

Pangi valley in Chamba district is one of the remotest tribal areas of Himachal, owing to its most difficult accessibility to the world. There are 16 panchayats headquarters of Pangi tehsil at large scale. The area of Pangi tehsil is spread over 1601 Sq. km with a population of 17,598 persons as per 2001 census. Kellar is the headquarters of Pangi valley. In Pangi Valley the agro-climatic conditions range between a height of 2,300 m to 3,600 m above sea level and all the villages are located within this range of height. Most of the villages are along the river Chandrabhaga. Shour is the first village of Pangi Valley from Lahaul side. It is situated on the right bank of river Chandrabhaga and all the sides are mountains with deodar trees, enflanked by snow covered peaks of high mountains. Shour is known for a traditional jhula- a swing-bridge made of twigs of willow tree or other twigs of similar twistable bushes or plants. Jhulla is directly above the torrent and it swings to and fro while crossing over it. Other villages following Shour along river Chandrabhaga are Sugalwas, Khelvi, Ajog, Purthi, Cherry banglow, Sach, Luj and Dharwas. The latter is the biggest village of the Pangi valley and is famous for natural spring of mineral water called Tilmili. There is a thick forest of widely grown thangi (hazel-nut). Luj is just at a distance of three kilometers and is the only village where chilgoja trees are found.

There are some beautiful valleys within Pangi region like Sural, Hundan and Saichu and in fact the entire area of Pangi valley is spread in them. All these valleys are connected with Zaskar and also have small human settlements. Sural is a beautiful sub-valley comprising of a cluster of villages namely Kanwas, Ganmas, Rusmus, Sural and Sural Bhatris. It lies at a distance of 12 kilometers from Dharwas towards its north-east. In this valley flowers of different kinds blossom in July-August. In Sural Bhatris there is a small Gompa and the Bhots inhabit this area. It is the highest village in this valley. A fine grove of bhoj patra trees (*Betula utilis*) are found to exist at this place. Hundan lies at a distance of eight kilometers towards east of Kellar. It is a combination of village i.e., Bhatwas, Tundrow, Ichhwas and Hundan Bhatris. About 2kms from Hundan Bhatris, there is a very beautiful lake covered on all sides by lovely pastures flanked by high snow covered mountains. Hundan (Fig. 12) is famous for Shilajjeet present on its high mountains. Saichu sub-valley is towards east and is at

about 17 kilometers from Sach village. Kuthal, Hillor and Sahli are the prominent villages falling on the way before reaching Saichu proper. Saichu proper is characterized by the confluence of three Nallahs namely Hillu-Tawan Nallah, Chasak Nallah and Saichu Nallah. To the opposite side at a distance of 4 kilometers from Saichu lies the Chasak village preceded by thick lush green forest of cedar trees. The Bhots inhabits these Bhatories. Most of these villages are with very rich pastures located usually on higher slope (Fig. 13). Each village usually has its own adhwari or cattle house near the pastures to keep the domestic animal in it during summer. During winter they keep these animals in their own houses. To combat extreme winter in each house there is normally a big iron hearth in which they burn animal dung to keep the house warm.

### FLORA

Approximately 80% of the valley comes under forest land consisting of conifer forests and alpine pastures and about 1.4% of geographical area is under cultivation. The vegetation of the valley is the consequence of geophysical conditions and precipitation pattern which is characterized by little rainfall and high snowfall. The cultivated fields give way to forests of pine, deodar, spruce and silver oak, and beyond that hardy shrubs. Champion and Seth's (1968) recognizes ten subtypes of the forest in the Pangi region 1) Neoza Pine Forest comprises species *Pinus geradiana*, *Cedrus deodara*, *Fraxinus floribunda*, *Celtis australis* in the dry and rocky areas in Luj and Kanun Reserve forest. 2) Dry Deodar Forest have species like *Cedrus deodara*, *Pinus wallichiana* and *Picea smithiana* and broad leaved trees in moist areas like *Corylus colurna*, *Celtis australis*, *Juglans regia*, *Prunus cornuta*, *Fraxinus xanthoxyloides* spread all over the Chenab and parts of Saichu Nallah. 3) Pohu Scrub Forest comprises *Parroita jacquemontiana* in Bara Bambal, Kulal, Chakmanda, Ajog and Kaslun. 4) West Himalayan Dry Temperate Deciduous Forest contains species like *Aesculus indica*, *Corylus colurna*, *Acer caesium*, *Celtis australis*, *Salix spp.*, *Juglans regia*, *Prunus cornuta*, *Fraxinus spp* spread in patches all over post-climax succession on moist soils. 5) West Himalayan High Level Dry Blue Pine Forest comprising species like *Pinus wallichiana*, *Betula utilis*, *Juniperus macropoda*, *Ribis spp*, *Rhamnus prostrate* and *Rhododendron campanulatu* in Seichu valley. 6) West Himalayan Subalpine High Level Fir Forest comprises *Abies pindrow*, *Betula utilis*, *Picia smithiana* above the other coniferous forests (2800- 3,200 m asl). 7) West Himalayan Birch/ Fir Forest having *Betula utilis* and *Rhododendron campanulatum* usually above West Himalayan Sub alpine High level Fir Forest. 8) Birch Rhododendron Scrub Forest found on the north and north western aspects of the valley and comprised of species like *Betula utilis*, *R. campanulatum*, *Salix spp*, Shrubs- *Cotoneaster*, *Lonicera* and *Sorbus* 9) Alpine Pastures includes Grasses *Agropyron longearistatum*, *A. semicostatum*, *Brachypodium sylvaticum*, *Bromus asper*, *Danthonia*, *Festuca*, *Oryzopsis*, *Poa. Forbs-Primula*, *Jurinea macrocephala*, *Aconitum hetrophylum*, *Pocorhiza kurrooa*, *Anemone*, *Iris*, *Gentiana*, many composites, crucifers and

*Ranunculaceae* found above the forest till snow line and 10) Dry Alpine Scrub comprises species *Juniperus pseudosalunia*, *Artemisia* spp., *Lonicera* spp., *Salix*, *Myricaria* and *Hippophae* in the patches within alpine meadows. Out of this, maximum area is occupied by mixed broad leaved forest (36.08%) followed by *Cedrus deodara* (26.94%), *Betula utilis* (18.07%) (Fig. 14), *Pinus wallichiana* (11.26%) (Fig. 15), *Corylus jacquemontii* (7.30%) and *Pinus gerardiana* (0.35%) forests.

There is a commonly used proverb in Pangi i.e., “Pangi ki Thangi” The Thangi or the hazel-nut is most popular plant grown in Pangi known for its nutritive seeds. Pangi valley is also a storehouse of diverse medicinal and aromatic plants. The low altitude zone (i.e., forests along with grasslands below the tree line) have been found to be dominated by species like guchhi (*Morchella esculenta*), kalazeera (*Bunium persicum*) whereas the high altitude pastures and meadows are inhabited by species like kutki (*Picrorhiza kurooa*), patish (*Aconitum violaceum* and *A. heterophyllum*), dhoop (*Jurinea macrocephala*), kuth (*Saussurea costus*) etc. (Rana and Rana, 2007). It has also a variety of native flowering plants like *Anthemis cotula*, *Nepeta spicata*, *Dianthus orientalis*, *Oxytropis* sp., *Cynoglossum* sp. etc. During the last couple of years, the tribal people of the valley had taken up the production of Peas (Matar) in a big way. It is considered to be an off-season vegetable since it is grown during the months of September- October. The other crops are maize, rice, potato and Rajmah.

## FAUNA

Due to the transitional nature of the valley, the fauna exhibit an assortment of elements from both Trans-Himalaya (predominantly Palearctic) and the Himalaya (predominantly Oriental). Further, because of the relatively intact vegetation cover and undisturbed nature of the habitat, Pangi holds the potential of a prime refuge of wildlife in Himachal Pradesh. However, information on the diversity and distribution of fauna in the valley is scarce with very little past efforts to document the same. Therefore, the High Altitude Regional Centre, Zoological Survey of India, Solan initiated a series of faunal survey covering various localities (Fig. 16) in the region from 2007-2009 with a view to develop a database on various faunal groups. The present document is the outcome of these efforts. During our field surveys, 219 Species pertaining to Eight faunal groups could be documented (Table-1). These include 41 species of Protozoa, 16 species of Orthoptera, 36 species of Butterflies, 20 species of Moths, 5 species of Heteroptera, 7 species of reptiles, 75 species of birds and 19 species of mammals. It is noteworthy to mention here that despite repeated efforts, Pisces and Amphibians could not be collected from Pangi valley. It may be due to torrential nature of the current in Chandrabhaga. The local people also stated that there are no fish and Amphibia in Pangi. They also mentioned that even introduced fishes in culture do not survive in Pangi Valley.

The present account is not exhaustive since constraints of logistics prevented us from surveying certain areas. Besides, all the seasons could not be covered.

**Table - 1 : Faunal Diversity of Pangri Valley**

<b>S. No.</b>	<b>Faunal Group</b>	<b>No. of Genera</b>	<b>No. of species</b>
1.	Protozoa	15	41
2.	Orthoptera	15	16
3.	Lepidoptera (Rhopalocera)	24	36
4.	Lepidoptera (Heterocera)	20	20
5.	Insecta: Heteroptera	05	05
6.	Reptilia	07	07
7.	Aves	50	75
8.	Mammalia	17	19
<b>Total</b>		<b>133</b>	<b>219</b>

### **THREATS AND CONSERVATION ISSUES**

Development comes at a heavy price in terms of environmental impact it leaves behind. This is particularly true in context of developing countries where rapid developmental activities always have adverse impact on the local flora and fauna. Pangri was the most inaccessible region of Himachal Pradesh till a few years back which has now opened up to development. The state government is also putting huge effort to the development of the region by infusing large amount of money to infrastructural projects. Changes in the land use pattern and lifestyle changes of locals are glaringly evident as a result these activities. Such changes, especially better road connectivity, has also enhanced many folds the threat to the survival of wildlife in this region. While no one can deny the right to develop, sudden and unplanned opening up of this once remote region to the fast paced world can have some devastating consequences on this ecologically fragile area. First, in the course of development of road network connecting every village in this rugged valley, many critical habitats and animal populations may be lost. Secondly, by opening the road connectivity, the momentum of construction activities will increase and this may not be ecologically sustainable. Thirdly, the sudden population influx that would be brought about by these infrastructural activities can be detrimental to the ecology of the region. Poaching and grazing by livestock are other major threats to the flora and fauna occurring in the region. Hunting by local people was evident but most damaging is the migratory labourers and outside professional hunters. These people were reportedly involved in large scale hunting of Musk deer, Black bear and also collect medicinal plants (Bhatnagar *et al*, 2008). Besides, local livestock holding has also increased in the last few years and livestock grazing in higher pastures is very evident. The migratory herds from Chamba also regularly migrate to alpine pastures during summer. These grazers compete with wild herbivores for scarce resources and the result can be devastating for the latter. Although, most parts of the valley are under the control of state forest department, local people enjoy unrestricted access to non-timber forest products from the forest tracts which may not be always a sustainable practice. The lone Wildlife Sanctuary in the valley namely Saichu Tawan

wildlife sanctuary although encompass a potentially good area for wildlife, the existing management set up is not satisfactory and there is urgent need to manage it in scientific line (Bhatnagar *et. al.*, 2008). Pangi harbours some of the pristine wildlife refuge in Himachal Pradesh and there is a pressing need for effective and scientific management of the region without depriving it from the basic amenities. One can only hope that development and conservation in this ecologically sensitive region will progress hand in hand.

### ACKNOWLEDGEMENTS

The Project coordinator is thankful to the support, encouragement and facilities received to execute this study from The Director, Zoological Survey of India, Kolkata. Thanks are also due to Late Dr. H. S. Mehta, former Additional Director and then Officer-in-Charge, HARC, ZSI, Solan for initiating the project during his tenure. I am grateful to Dr. Kailash Chandra, Additional Director, HQ, Kalkota for helping in identification of Lepidoptera fauna and for the encouragement. The necessary permission to undertake the survey in this area by Chief Wildlife Warden, Himachal Pradesh and Resident Commissioner, Pangi is also gratefully acknowledged. Thanks are due to the unstinted support received from the State Forest Department and the Public Works Department during the surveys. My thanks are also due to all the scientists who contributed chapters to this document namely Dr. Bindu L., MBRC, Chennai, Sh. Biswabrota Biswas and Dr. Animesh Bal, Headquarea, ZSI, Kolkata, Dr. Indu Sharma, Dr. Uttam Saikia, Dr. Kamal Saini and Simranjeet Kaur, HARC, ZSI, Solan. Special thanks are due to Dr. Uttam Saikia and Dr. Kamal Saini for all their labours in bringing out the final proof of the document. The statistical analysis of the data provided in certain chapters by Dr. Kamal Saini is also thankfully acknowledged. I place on record the efforts put in by Shri Rati Ram Verma, Publication and production Officer, Kolkata to bring out this document. I shall be failing in my duty if I do not thank to Shri M .S. Verma, Lab. Asstt. and Shri Bir Singh, Motor Driver, for their all help in collections during surveys and running the vehicle in the very tough and difficult terrain of Pangi valley.

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PLATE - I



▲ **Fig. 2.** Way to Pangti valley via Rohtang Pass



**Fig. 3.** Landslide frequently blocks the Kellar-Sach Pass road ▶



▲ **Fig. 4.** Gradual Zaskar range near Hudan in Pangti



**Fig. 5.** Steep Pir Panjal range on left side of Chandrabhaga in Pangti ▶

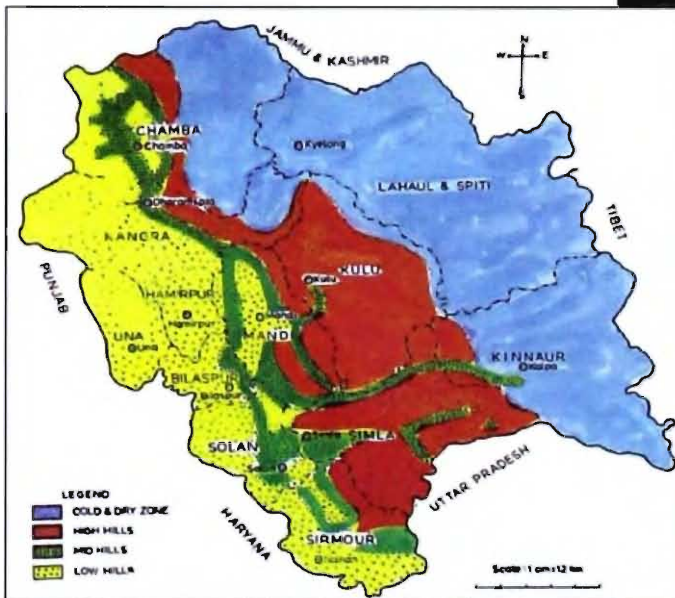
PLATE - II



▲ **Fig. 6.** Chandrabhaga river : Forming the back bone of Pangri valley



**Fig. 7.** Snow fed tributary of Sural Nallah ▶



▲ **Fig. 8.** Agro-climatic zones of Himachal Pradesh



**Fig. 9.** View of Zanskar range of Sural ▶

PLATE - III



▲  
**Fig. 10.** A view of Hudan Valley

**Fig. 11.** Hard life : a person dragging dry wood along long glaciers at Sural to store for winter



▲  
**Fig. 12.** Hudan Lake-2 kms from Hudan Bhattori

**Fig. 13.** A beautiful pastures in Sural Bhattori



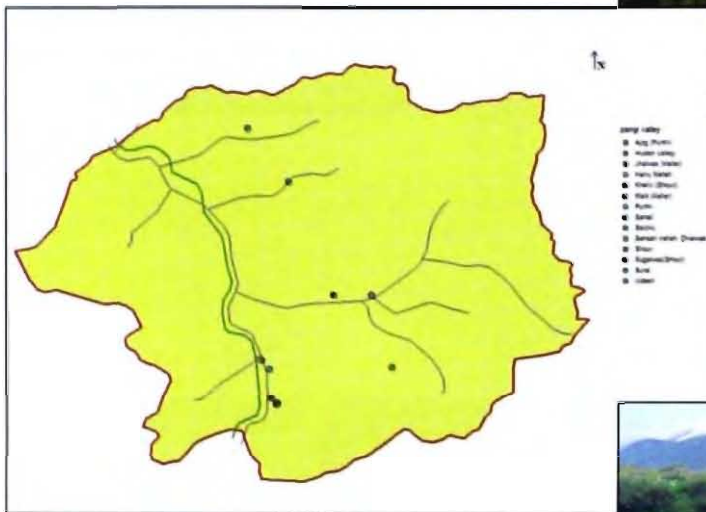
PLATE - IV



▲ **Fig. 14.** Bhoj patra (*Betula utilis*) forests at Sural valley



**Fig. 15.** *Pinus wallichiana* and mixed forests in Sahali ▶



▲ **Fig. 16.** Localities Surveyed in Pangri Valley from 2007 to 2009

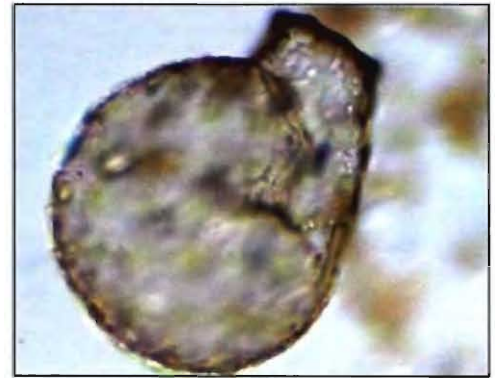


**Fig. 17.** Modern agriculture practices (at Sural) coming up in Pangri valley in recent years ▶

PLATE - V



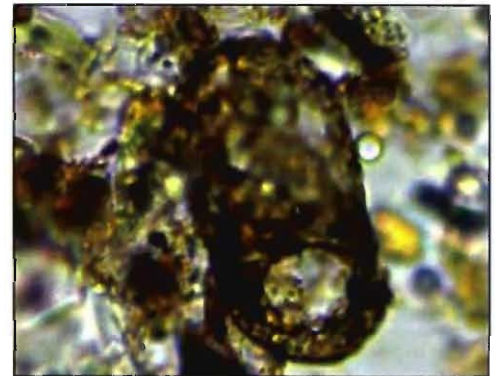
*Arcella discoides*



*Lesquereusia modesta*



*Lesquereusia spiralis*



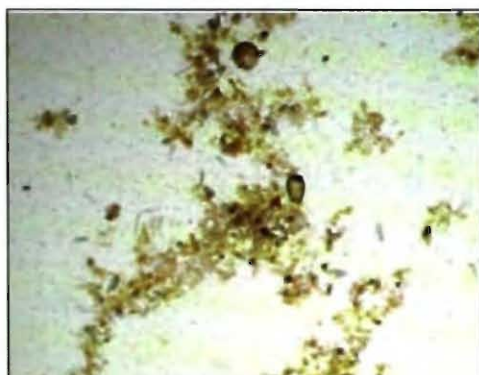
*Centropyxis arunachalensis*



*Centropyxis laevigata*



*Heleopera sphagni*



*Centropyxis minuta*



*Cyclopyxis eurystoma*

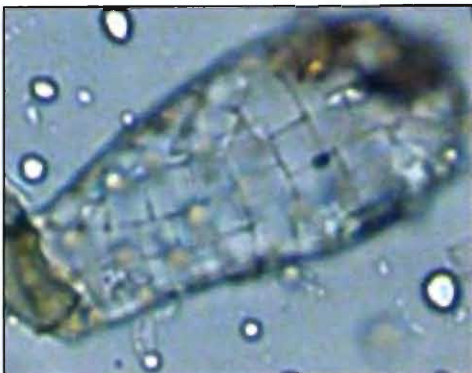
**PLATE - VI**



*Diffugia lobostoma*



*Diffugia lucida*



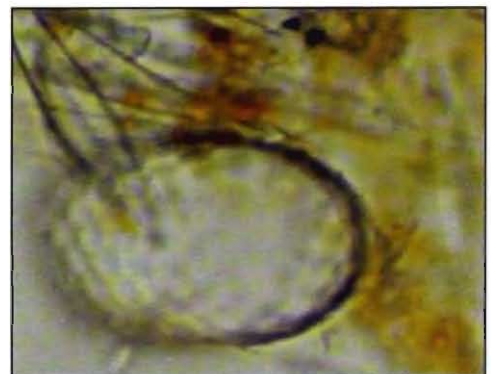
*Quadrulella symmetrica*



*Phryganella sp*



*Cyphoderia ampulla*



*Assulina seminulum*



*Trinema enchelys*

**PLATE - VII**



*Catantops pinguis innotabilis*



*Oxya fuscovittata*



*Oedaleus abruptus*



*Bryodema luctuosum indum*

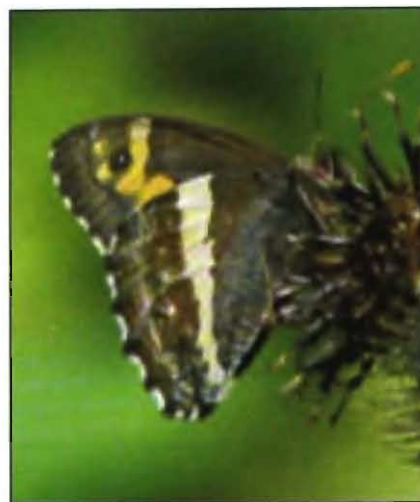
**PLATE - VIII**



*Albulina galathea*



*Aricia agestis*



*Aulocera saraswati*



*Chaetoprocta odata*



*Colias fieldii*



*Lycaena phalaes*



*Limenitis trivena*



*Melitaea arcesia*



*Maniola pulchra*

PLATE - IX



*Neptis mahendra*



*Papilio machaon*



*Pseudopilotes vicrama*



*Satryium sassanides*



*Vanessa cardui*



*Vanessa cashmiriensis*



*Pieris canidia*



*Evers huegelii*



*Callerebia kalinda*

**PLATE - X**



*Diphthera discibrunnea*



*Amphipyra monolitha*



*Cucullia albipennis*



*Euscotia inextricata*



*Chrysorabdia bivitta*



*Callimorpha principalis*

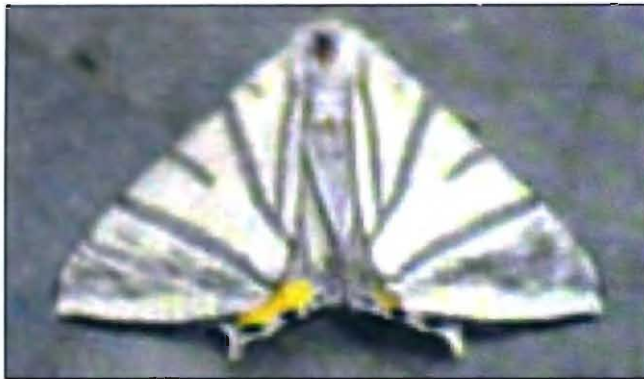
PLATE - XI



*Habrosyne pyritoides*



*Stamnodes pamphilata*



*Urapteryx ebuleatea*



*Abraxas sylvata*



*Biston regalis*



*Stenorumia ablunata*



*Saturnia lindia*



*Deilephila elpenor*

**PLATE - XII**



*Laudakia tuberculata*



*Asymblepharus himalayana*



*Orthriophis hodgsonii*



*Amphiesma platyceps*

**PLATE - XIII**



Common Rosefinch



European Goldfinch



Hill Pigeon



Oriental Turtle Dove



Rock Bunting



Yellow-breasted Greenfinch

**PLATE - XIV**



Long-tailed Shrike



Russet Sparrow



Dark-sided Flycatcher



Verditer Flycatcher



Yellow-billed Chough



Himalayan Griffon

**PLATE - XV**



*Pipistrellus coromandra* (Gray)



*Capra sibirica* (Linnaeus)



*Pseudois nayaur* (Hodgson)

**PLATE - XVI**



*Mustella sibirica* Pallus



*Vulpes vulpes montana* (Linnaeus)



*Macaca mulatta* (Zimmermann)



*Rattus turkestanicus* (Satunin)

## **PROTOZOA: RHIZOPODA**

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### **INTRODUCTION**

Testate amoebae or testaceans belonging to the superclass Rhizopoda (Classes Lobosea and Filosea) are one of the most abundant moss dwelling microfaunal components. These rhizopods are characterised by tests or shells which cover the entire body of the organisms for locomotion and collection of food. Taxonomic studies of these moss dwelling protozoa are almost neglected in India. Only a few species from testate amoebae from moss covered terrestrial habitats of Himachal Pradesh, Meghalaya, Sikkim, Tripura and West Bengal have been reported so far by Nair and Mukherjee (1968 a, b), Das *et al.* (1993, 1995, 2000) and Chathopadhyay and Das (2003). The present communication deals with 41 species of moss dwelling testate amoebae from Pangri Valley, Himachal Pradesh and all the 41 species are new records for Pangri Valley.

### **MATERIALS AND METHODS**

Moss samples were obtained from High altitude regional centre of Zoological Survey of India, Solan and the collections were made by Dr. A. K. Sidhu and party. Samples pertaining to soil mosses, rock mosses and tree mosses were collected from different localities and stored in closed plastic bags and brought to the laboratory and processed. 1-2g of moss sample comprising 10-15 small pinches was taken from different portion of the samples with tweezers. The same was placed in a petridish with 10-15 cm diameter. The sample was then processed with non-flooded Petri dish method (ie., sample was saturated , but not flooded with distilled water) as described by Foissner (1987, 1992) and kept the samples at least 24 hrs. for culturing. For identification of species and counting individual numbers, the sample was placed drop-wise on glass slides with the aid of a micropipette and investigated under a

compound microscope at magnification 400 X (objective 40 X and ocular 10 X). The identified specimens were air dried at room temperature and mounted in DPX (a synthetic neutral medium). To avoid crushing of the delicate voluminous tests, tiny pieces of broken cover slips were kept a little away from the specimens to support the cover slip. All the specimens were deposited in the Protozoology section, National Zoological Collections, Zoological Survey of India, Kolkata.

### SYSTEMATIC LIST

A total of 41 species of testate amoebae have been identified and recorded from moss samples of Pangi Valley. The systematic list of these testacean species is presented below.

Sub-Kingdom PROTOZOA

Phylum SARCOMASTIGOPHORA

Class LOBOSEA

Order ARCELLINIDA

Family ARCELLIDAE

1. *Arcella discoides* Ehrenberg, 1843
2. *Arcella* sp.
3. *Lesquereusia modesta* Rhumbler, 1895
4. *Lesquereusia spiralis* (Ehrenberg, 1840)

Family CENTROPYXIDAE

5. *Centropyxis aerophila* Deflandre, 1929
6. *Centropyxis arunachelensis* Chattopadhyay and Das, 2003
7. *Centropyxis cassis* (Wallich, 1864) Deflandre, 1929
8. *Centropyxis laevigata* Penard, 1890
9. *Centropyxis minuta* Deflandre, 1929
10. *Centropyxis orbicularis* Deflandre, 1929
11. *Centropyxis platystoma* (Penard) Deflandre, 1929
12. *Centropyxis sylvatica* (Deflandre, 1929) Bonnet and Thomas, 1955
13. *Centropyxis* sp.
14. *Cyclopyxis arcelloides* (Penard, 1902) Deflandre, 1929
15. *Cyclopyxis eurystoma* Deflandre, 1929
16. *Cyclopyxis kahli* Deflandre, 1929

17. *Plagiopyxis callida* Penard, 1910

18. *Plagiopyxis minuta* Bonnet, 1959

Family DIFFLUGIIDAE

19. *Diffflugia avellana*

20. *Diffflugia lobostoma* Leidy, 1879

21. *Diffflugia lucida* Penard, 1890

22. *Diffflugia oblonga* Ehrenberg, 1838

Family Nebelidae

23. *Heleopera rosea* Penard, 1890

24. *Heleopera sphagni* (Leidy, 1874) Leidy, 1875

25. *Heleopera sylvatica* Penard, 1890

26. *Quadrullella symmetrica* (Wallich, 1864) Schulze, 1875

27. *Phryganella* sp.

Class FILOSEA

Family CYPHODERIIDAE

28. *Cyphoderia ampulla* (Ehrenberg, 1840)

Family Euglyphidae

29. *Assulina seminulum* (Ehrenberg, 1848) Leidy, 1879

30. *Corythion dubium* Taranek, 1881

31. *Euglypha denticulata* Brown, 1912

32. *Euglypha laevis* (Ehrenberg, 1845) Perty, 1849

33. *Euglypha rotunda* Wailes & Penard, 1911

34. *Euglypha tuberculata* Dujardin, 1841

35. *Euglypha scutigera* Wailes and Penard, 1911

36. *Tracheleuglypha dentata* (Vejdowsky, 1832)

37. *Trinema complanatum* Penard 1890

38. *Trinema enchelys* (Ehrenberg, 1838) Leidy, 1878

39. *Trinema galeata* Penard, 1890

40. *Trinema lineare* Penard, 1890

41. *Trinema penardi* Thomas and Chardez, 1956

## SYSTEMATIC ACCOUNT

Sub-Kindom PROTOZOA  
 Phylum SARCOMASTIGOPHORA  
 Class LOBOSEA  
 Order ARCELLINIDA  
 Family ARCELLIDAE

### 1. *Arcella discoides* Ehrenberg, 1843

1843. *Arcella discoides* Ehrenberg, *Ber. K. Akad. Wiss.*, Berlin, p. 139.

1928. *Arcella discoides* Ehrenberg : Deflandre, *Arch. Protistenkd.*, **64**, p. 256.

*Material examined* : 2exs., Rock moss, Karru Nallah, 17. v. 2008; 1ex. soil moss, Hudan Valley, 26.v.2008.

*Diagnosis* : Test light yellow, smooth, flattened, circular in front view and planoconvex in lateral view with a rounded border, height of test about one-third to one-fourth the diameter, oral aperture large and circular.

*Distribution* : India: Andhra Pradesh, Arunachal Pradesh, Chandigarh, Himachal Pradesh, Kerala (Nilgiri Biosphere Reserve), Manipur, Meghalaya , Mizoram, Nagaland; Sikkim, Tripura, Uttarakhand, West Bengal.

*Remarks* : First report from Pangi Valley.

### 2. *Arcella* sp.

1830 (1832) *Arcella* Ehrenberg, *Abh. K. Akad. Wiss Berlin*, p. 40.

*Material examined* : 2exs., Rock moss, Purthi, 17.v. 2008.

*Diagnosis* : Test hemispherical, yellowish with hexagonal markings, aperture circular, central and not covering the entire diameter of the test

*Distribution* : India: Himachal Pradesh

### 3. *Lesquereusia modesta* Rhumbler, 1895

1895. *Lesquereusia modesta* Rhumbler, *Zeits. Wiss. Zool.*, **61** (1), p. 101, pl.4, fig. 2

*Material examined* : 3exs., Soil moss, Khelvi village, 16. v. 2008.

*Diagnosis* : Test opaque, hemispherical in appearance and encrusted with quartz crystals.

*Distribution* : India : West Bengal.

*Remarks* : First record from Himachal Pradesh as well as from moss. It was reported only from freshwater.

4. *Lesquereusia spiralis* (Ehrenberg, 1840)

1840. *Diffugia spiralis* Ehrenberg, *Monatsb. Akad. Wiss.*, Berlin, p. 199.

*Material examined* : 2exs., Soil moss, Khelvi village, 16. v. 2008

*Diagnosis* : Test transparent, hemispherical and composed of closely arranged vermiform pellets.

*Distribution* : Meghalaya, Tripura, West Bengal.

*Remarks* : First record from Himachal Pradesh as well as from moss. It was reported from freshwater only.

Family CENTROPYXIDAE

5. *Centropyxis aerophila* Deflandre, 1929

1929. *Centropyxis aerophila* Deflandre, *Arch. Protistenkd.*, **67**, p. 330.

*Material examined* : 1ex., Rock moss, Saichu, 22. vii. 2009; 2exs., Soil moss, Uddeen, 20. vii. 2009; 2exs. Soil moss, Killar, 27. v. 2008

*Diagnosis* : Test ovoid in ventral view and pear shaped in lateral view; flank of posterior part of the test little arched, often almost straight, fundus spheroidal with dorsal face strongly flattened towards oral aperture; test hyaline, yellowish or yellowish-brown, chitinous, finely punctuate and rough bearing foreign particles, usually vegetable fragments; aperture semi-circular

*Distribution* : Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Uttarakhand, West Bengal.

*Remarks* : First record from Pangi valley.

6. *Centropyxis arunachalensis* Chattopadhyay & Das 2003

2003. *Centropyxis arunachalensis* Chattopadhyay & Das. *Memoirs of the Zoological Survey of India*, **19**, pp. 114.

*Material examined* : 1ex., Soil moss, Hudan Valley, 26. v. 2008; 1ex., Tree trunk moss, 18. vii. 2007

*Diagnosis* : In ventral view test elongate oval, flanks of its post-oral part initially straight or concave and afterwards convex, dimensions 76.69-82.5  $\mu\text{m}$  x 42.5-43.82 $\mu\text{m}$ , aperture elliptical and eccentric; test yellowish, more or less elongate-oval with broader posterior part, in ventral view flanks of its post-oral part initially straight or concave and subsequently convex forming a broadly round posterior portion; in lateral view posterior part considerably arched while anterior part more or less flat;

aperture elliptical, eccentric and located near the anterior border of the test; test composed of quartz particles covered by organic layer.

*Distribution* : Arunachal Pradesh, Himachal Pradesh.

*Remarks* : First report from Pangri valley.

#### 7. *Centropyxis cassis* (Wallich, 1864) Deflandre, 1929

1864. *Diffugia cassis* Wallich, *Ann. Mag. Nat. Hist.*, 13.

1929. *Centropyxis cassis* Deflandre, *Arch. Protistenkd.*, **67**, p. 335.

*Material examined* : 3exs., Rock moss, Purthi, 17. V. 2008; 2exs., Soil moss, Uddeen, 20. vii. 2009.

*Diagnosis* : Test more or less hemispherical, yellowish brown in colour formed of quartz crystals, usually intermixed with small pebbles; in ventral view test elliptical with widely rounded posterior part, flank less arched or straight, parallel or subparallel, aperture semicircular, oral margin provided with well oriented thicker pebbles.

*Distribution* : Meghalaya, Orissa, Uttaranchal, West Bengal.

*Remarks* : Reported for the first time from Himachal Pradesh.

#### 8. *Centropyxis laevigata* Penard, 1980

1890. *Centropyxis laevigata* Penard, *Mem. Soc. Phys.*, Geneve, **31** (2), p. 151.

1902. *Centropyxis laevigata* Penard, *Faune Rhizopodique du basin du Lemman*, Geneve, p. 306.

1929. *Centropyxis laevigata* : Deflandre, *Arch. Protistenkd.*, **67**, p. 363.

*Material examined* : 2exs, Soil moss, Hudan Valley, 26. V. 2008; 1ex., Soil moss, Killar, 27. v. 2008, 2exs, Rock moss, Saichu, 22. vii. 2009.

*Diagnosis* : Test yellowish brown, nearly circular in ventral view, usually slightly compressed in one side, in lateral view test nearly hemispherical, being broader at posterior extremity; aperture eccentric, obliquely invaginated having apertural bridges and its outer margin broadly rounded.

*Distribution* : Mizoram, Sikkim, West Bengal.

*Remarks* : First report from Himachal Pradesh.

#### 9. *Centropyxis minuta* Deflandre, 1929

1929. *Centropyxis minuta* Deflandre, *Arch. Protistenkd.*, **67**, p. 366

1879. *Diffugia constricta* Leidy, *Freshwater Rhizopods of North America*, p. 18, figs. 15-16

1902. *Diffugia constricta* Penard, *Fauna Rhizopodique du basin du Lemman*, Geneve, p. 299, figs. 13-14.

*Material examined* : 4exs., Soil moss, Killar, 27. v. 2008; 2exs., Rock moss, Purthi, 17. v. 2008; 2exs., Rock moss, Saichu, 22. vii. 2009

*Diagnosis* : Test small, grayish or brown, less conspicuous, more or less circular in ventral view, subspherical in lateral view with slightly more elevated posterior part, aperture circular, eccentric and in general obliquely invaginated, test encrusted with siliceous particles.

*Distribution* : Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Uttarakhand, West Bengal.

*Remarks* : First Record from Pangivalley.

#### 10. *Centropyxis orbicularis* Deflandre, 1929

1929. *Centropyxis orbicularis* Deflandre, *Arch. Protistenkd.*, 67, p. 334.

*Material examined* : 3exs., Soil moss, Killar, 27. v. 2008; 2exs., Rock moss, Karru Nallah, 17. v. 2008, 1ex., Soil moss, Uddeen, 20. vii. 2009

*Diagnosis* : Test brownish, almost circular in ventral view, ventral surface flat; in lateral view test semi-circular, displaying considerable invagination towards the oral aperture; oral aperture nearly semi-circular, plagiostomic; test encrusted with large stony particles on its dorsal border.

*Distribution* : Uttarakhand, Andhra Pradesh.

*Remarks* : First report from Himachal Pradesh.

#### 11. *Centropyxis platystoma* (Penard, 1890) Deflandre, 1929

1890. *Diffugia platystoma* Penard, *Mem. Soc. Phys. Hist. nat. Geneve*.

1879. *Diffugia constricta* : Leidy, *Freshwater Rhizopods of North America*, pl. 18, figs. 20-21.

1902. *Diffugia constricta* : Penard, *Fauna Rhizopodique du basin du Lemane*, Geneve, p. 209.

1929. *Centropyxis platystoma* Deflandre, *Arch. Protistenkd.*, 67, p. 338.

*Material examined* : 2exs., Rock moss, Purthi, 17. v. 2008.

*Diagnosis* : Test colourless to light yellow, elongated and elliptical in ventral view; ventral post-oral portion of the test ovoid globular with rounded posterior end, a constriction most often clearly visible between ventral post-oral portion of the test and oral aperture; in lateral view, posterior part of the test strongly arched and anterior part more or less flat; aperture large, circular, and its pre-oral border often with large stony particles; test chitinous and encrusted with siliceous and quartz particles and occasionally with small pebbles.

*Distribution* : Andhra Pradesh, Arunachal Pradesh, Chandigarh, Himachal Pradesh,

Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Uttarakhand , West Bengal.

*Remarks* : First report from Pangri valley.

12. *Centropyxis sylvatica* (Deflandre, 1929) Bonnet & Thomas, 1955

1929. *Centropyxis aerophila* Deflandre var. *sylvatica* Deflandre, Arch. Protistenkd, **67**, p. 332.

1955. *Centropyxis sylvatica* Bonnet and Thomas, Bull. Soc. Hist. nat. Toulouse, **90**, p. 415.

*Material examined* : 2exs., Tree moss, Sugulwar, 18. vii. 2009 ; 1ex., Rock moss, Saichu, 22. vii. 2009

*Diagnosis* : Test hyaline, yellowish or yellowish brown, more or less ovoid or elliptical in ventral view; in lateral view test visible in two distinct parts, apertural region separated from the rest of the test by a perforated diaphragm; aperture eccentric and elliptical, test chitinous with quartz crystals; anterior margin of the test with few large stony particles.

*Distribution* : Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Sikkim.

*Remarks* : First report from Pangri valley.

13. *Centropyxis* sp.

1857. *Centropyxis* Stein, Sitz. Bohm. Gesellsch. Wiss.

1859. *Centropyxis* Stein, Abh. K. bohm. Gesellsch. Wiss., **10**, p. 43.

1929. *Centropyxis* Stein: Deflandre, Arch. Protistenkd., **67**, p. 322.

*Material examined* : 2exs., Rock moss, Karru Nallah, 17. v. 2008

*Diagnosis* : Test membranous, encrusted with foreign particles or covered with sandy material, dorsoventrally flattened, swollen at posterior portion and tapering towards apertural region, aperture eccentric, invaginated without a raised rim.

*Distribution* : India : Himachal Pradesh.

14. *Cyclopyxis arcelloides* (Penard, 1902) Deflandre, 1929

1902. *Centropyxis arcelloides* Penard, Faune Rhizopodique du basin du Lemane, Geneve, p. 309.

1929. *Centropyxis (Cyclopyxis) arcelloides* Deflandre, Arch. Protistenkd., **67**, p. 367.

*Material examined* : 3exs., Tree moss, Sugulwar, 18. vii. 2009

*Diagnosis* : Test circular in ventral and dorsal view, hemispherical in lateral view, brownish, covered with flat siliceous scale like structure, aperture centrally located, circular in shape, faintly invaginated and about half the diameter of the test.

*Distribution* : Andhra Pradesh, Arunachal Pradesh, Chandigarh, Himachal Pradesh, Manipur, Meghalaya, Mizoram, Sikkim, Uttarakhand, West Bengal.

*Remarks*: First report from Pangivalley.

15. *Cyclopyxis eurystoma* Deflandre, 1929

1929. *Centropyxis* (*Cyclopyxis*) *eurystoma* Deflandre, *Arch. Protistenkd.*, **67**, p. 371.

*Material examined* : 2exs., Rock moss, Karru Nallah, 17. v. 2008; 2exs., Tree moss, Sugawar, 18. vii. 2009.

*Diagnosis* : Test hemispherical in lateral view, circular or elliptical in ventral view, brownish, aperture central, circular and slightly invaginated with regular smooth edge and half or little more than half the diameter of the test; test encrusted with quartz particles.

*Distribution* : Arunachal Pradesh.

*Remarks* : First report from Himachal Pradesh.

16. *Cyclopyxis kahli* Deflandre, 1929

1929. *Centropyxis* (*Cyclopyxis*) *kahli* Deflandre, *Arch. Protistenkd.*, **67**, p. 370.

*Material examined* : 3exs., Soil moss, Hudan Valley, 26. v. 2008

*Diagnosis* : Test circular in in ventral and dorsal view, sometimes slightly elliptical, yellowish or greyish; in lateral view hemispherical, composed of xenosomes, distinct and rough on dorsal surface and comparatively smooth on ventral surface ; aperture centrally located, distinctly invaginated, roughly circular with irregular edge, completely or partially bordered by regularly arranged dent like xenosomes.

*Distribution* : Assam, Himachal Pradesh, Mizoram, Uttarakhand, West Bengal.

*Remarks* : First report from Pangi valley.

17. *Plagiopyxis callida* Penard, 1910

1910. *Plagiopyxis callida* Penard, *Rev. Suisse Zool.* **18**, p. 46.

*Material examined* : 2exs., Tree moss, Sugawar, 18. vii. 2009

*Diagnosis* : Test grey, yellow or brown, circular or largely oval in ventral view and hemispherical in lateral view, usually smooth and clear; posterior lip dipping into the interior of the test and anterior and posterior lips overlap to such an extent that aperture difficult to observe.

*Distribution* : Arunachal Pradesh, Himachal Pradesh, Manipur, Mizoram.

*Remarks* : First report from Pangivalley.

18. *Plagiopyxis minuta* Bonnet, 1959

1959. *Plagiopyxis minuta* Bonnet, Bull. Soc. Hist. Nat. Toulouse, **94**, p. 177.

*Material examined* : 3exs., Tree moss, Sugalwar, 18. vii. 2009

*Diagnosis* : Test gray yellow, clear and transparent, circular in dorsal view and semielliptical in lateral view, aperture very narrow, disposition of posterior lip more or less similar to that of the preceding species, test covered with relatively large siliceous platelets, specially on ventral side.

*Distribution* : Andhra Pradesh, Arunachal Pradesh, Himachal Pradesh, Manipur, Sikkim.

*Remarks* : First report from Pangi valley.

## Family DIFFLUGIDAE

19. *Diffflugia avellana* Penard, 1890

1890. *Diffflugia avellana* Penard, Mem. Soc. Phys. Et Hist. Nat., Geneve, p. 144.

1958. *Diffflugia avellana* : Gauthier-Lievre and Thomas, Arch. Protistenkd., **103**, p. 287.

*Material examined* : 2exs., Rock moss, Karru Nallah, 17. v. 2008; 3exs., Rock moss, Purthi, 17. v. 2008.

*Diagnosis* : Test ovoid-elongate in frontal view and more or less pyriform in lateral view; posterior border rounded and flanks converging imperceptively towards the aperture; aperture oval; test made up of siliceous particles.

*Distribution* : Delhi, Meghalaya.

*Remarks* : First report from Himachal Pradesh.

20. *Diffflugia lobostoma* Leidy, 1879

1879. *Diffflugia lobostoma* Leidy, Freshwater Rhizopods of North America, p. 112.

*Material examined* : 3exs., Rock moss, Purthi, 17. v. 2008

*Diagnosis* : Test ovoid, oral aperture usually quadrilobed in the form of a cross and sometimes trilobed, not enclosed by collar, test covered with angular quartz particles.

*Distribution* : Andhra Pradesh, Arunachal Pradesh, Chandigarh, Himachal Pradesh, Kerala (Nilgiri Biosphere Reserve), Manipur, Meghalaya, Nagaland, Rajasthan, Tripura, West Bengal.

*Remarks* : First report from Pangi valley.

21. *Diffflugia lucida* Penard, 1890

1890. *Diffflugia lucida*, Penard *Mem. Soc. Phys. Et. Hist. Nat. Geneve*, **31**, p. 145.

1958. *Diffflugia lucida* : Gauthier-Lievre and Thomas, *Arch. Protistenkd.*, **103**, p. 294.

*Material examined* : 2exs., Rock moss, Purthi, 17. v. 2008

*Diagnosis* : Test elongate, transparent, slightly compressed, covered with flat quartz particles.

*Distribution* : Nagaland, Sikkim, Uttarakhand.

*Remarks* : First report from Himachal Pradesh.

22. *Diffflugia oblonga* Ehrenberg, 1838

1838. *Diffflugia oblonga* Ehrenberg, *Infusionsthierchen*, p. 131, pl. 2.

*Material examined* : 3exs., Rock moss, Purthi, 17. v. 2008

*Diagnosis* : Test oblong with rounded base and composed of big angular quartz crystals of variable size; crown (post-oral portion) usually rounded, aperture circular

*Distribution* : Arunachal Pradesh, Chandigarh, West Bengal.

*Remarks* : First report from Himachal Pradesh.

Family NEBELIDAE

23. *Heleopera rosea* Penard, 1890.

1890. *Heleopera rosea* Penard, *Mem. Soc. Phys. Et. Hist. Nat. Geneve*, **31(2)** p. 166

1909. *Heleopera rosea* : Cash, Wailes and Hopkinson, *The British Freshwater Rhizopoda and Heliozoa*, **2**, p. 141.

*Material examined* : 2exs., Tree moss, Sugulwar, 18. vii. 2009; 1ex., Rock moss, Sugulwar, 18. vii. 2009.

*Diagnosis* : Test ovoid-elongate, vinous or rose coloured, compressed, lips yellow or sometimes light brown, corners of the oral aperture obtusely angular; test covered with siliceous platelets.

*Distribution* : Arunachal Pradesh, Himachal Pradesh, Manipur, Nagaland, Sikkim.

*Remarks* : First report from Pangi valley.

24. *Heleopera sphagni* Leidy, 1875

1874. *Diffflugia (Nebela) sphagni* Leidy, *Proc. Acad. Nat., Sci.*, p. 157.

1875. *Nebela sphagni* Leidy, *Proc. Acad. Nat. Sci.*, p. 119.

1879. *Heleopera picta* Leidy, *Freshwater Rhizopods of North America*, p. 162.

*Material examined* : 6exs., Tree moss, Sugalwar, 18. vii. 2009

*Diagnosis* : Test broadly ovoid, regular in outline, compressed, chitinous membrane usually yellowish, seldom brownish, test covered with irregular transparent siliceous platelets, presenting a reticulated appearance, fundus sometimes with little foreign material, zoochlorellae present in protoplasm.

*Distribution* : Sikkim, Uttarakhand, West Bengal.

*Remarks* : First report from Himachal Pradesh.

### 25. *Heleopera sylvatica* Penard, 1890

1890. *Heleopera sylvatica* Penard, *Mem. Soc. Phys. Et. Hist. Nat. Geneve*, 31(2), p. 168.

1909. *Heleopera sylvatica* : Cash, Wailes and Hopkinson. *The British Freshwater Rhizopoda and Heliozoa*, 2, p. 136.

*Material examined* : 2exs., Rock moss, Purthi, 17. v. 2008; 1ex., Tree moss, Sugalwar, 18. vii. 2009.

*Diagnosis* : Test obovoid in broad view, compressed, slightly yellowish, transparent, composed of siliceous shell platelets of different sizes, sometimes foreign material found in aboral region (fundus), aperture terminal, slightly convex in broad view, slitlike to elliptic with small border of organic cement.

*Distribution* : Nagaland.

*Remarks* : First report from Himachal Pradesh.

### 26. *Quadrullella symmetrica* (Wallich, 1864) Schulze, 1875

1864. *Diffugia symmetrica* Wallich, *An. Mag. Nat. Hist.*, 13, p. 245.

1875. *Quadrula symmetrica* (Wallich) Schulze, *Arch. Mik. Anat.*, p. 329.

1911. *Quadrula symmetrica* (Wallich) Cockrell, *Univ. Colo. Studies*, 8.

*Material examined* : 4exs., Rock moss, Purthi, 17. v. 2008; 3exs., Rock moss, Karru Nallah, 17. v. 2008; 3exs., Soil moss, Hudan Valley, 26. v. 2008.

*Diagnosis* : Test pyriform or ovoid in ventral view with sides (flanks) sloping or more less inflected to produce a neck of variable length, aperture transversely convex; in lateral view, test elongate elliptical, tapering to apertural end, which appearing notched; aperture transverse oval and entire located terminally; test colourless and transparent and composed of square chitinous platelets, arranged in more or less oblique transverse and longitudinal rows.

*Distribution* : Himachal Pradesh, Uttarakhand.

*Remarks* : First report from Pangi valley.

27. *Phryganella* sp.

1902. *Phryganella* Penard, *Faune Rhizopodique du Lemane Kundig*, Geneve, p. 423.

*Material examined* : 2exs., Tree moss, Sugawar, 18. vii. 2009

*Diagnosis* : Test hemispherical, spheroidal or ovoid with sand grains, minute diatom shells and /or other foreign elements; aperture terminal, pseudopods shortly pointed and radiating.

*Distribution* : India: Himachal Pradesh.

Class FILOSEA

Order TESTACEAFILOSA

Family CYPHODERIIDAE

28. *Cyphoderia ampulla* (Ehrenberg, 1840)

1840. *Diffugia ampulla* Ehrenberg, *Bericht preus. Akad. Wis.*, p. 199.

1878. *Cyphoderia ampulla* Leidy, *proc. Akad. Nat. Sci. Philad.*, p. 173.

*Material examined* : 3exs., Rock moss, Purthi, 17. v. 2008; 4exs., Rock moss, Karru Nallah, 17. v. 2008

*Diagnosis* : Test yellowish or brownish, translucent, covered with distinct circular or oval scales or plates lying appreciably apart, aperture circular, terminal, placed obliquely with a curved neck, fundus obtusely rounded.

*Distribution* : Uttarakhand.

*Remarks* : First record from Himachal Pradesh.

Family EUGLYPHIDAE

29. *Assulina seminulum* (Ehrenberg, 1848) Leidy, 1879

1848. *Diffugia seminulum* Ehrenberg, *Ber. Akad. Berlin*, p. 379.

1879. *Assulina seminulum* (partim) Leidy, *Freshwater Rhizopods of North America*, p. 225.

*Material examined* : 2exs., Tree moss, Sugawar, 18. vii. 2009; 1ex., Soil moss, Saichu, 22. vii. 2009.

*Diagnosis* : Test about one and a half time larger than that of *A. muscorum*, yellowish to dark brown, pyriform or ovoid in broad view, compressed, composed of imbricated oval or elliptical siliceous platelets, aperture terminal, oval, surrounded by a thin chitinous membrane with irregularly dentate or undulate margin.

*Distribution* : Assam, Nagaland, Sikkim, West Bengal.

*Remarks* : First report from Himachal Pradesh.

### 30. *Corythion dubium* Taranek, 1881

1881. *Corythion dubium* Taranek, *Sitzb. Bohm. Ges. Wiss.*, p. 232, Fig. 3.

1915. *Corythion dubium* : Cash, wailes and Hopkinson, *The British Freshwater Rhizopoda and Heliozoa*, 3, p. 96, 48, Figs. 6-18.

*Material examined* : 2exs., Rock moss, Sugalwar, 18. vii. 2009

*Diagnosis* : Test ovoid, flattened, compressed unsymmetrically; aperture subterminal, circular or oval, invaginated, apertural platelets with a median tooth; test formed of small oval non-imbricated siliceous platelets, platelets irregularly arranged.

*Distribution* : Arunachal Pradesh, Himachal Pradesh, Manipur, Mizoram, Sikkim, Tripura, West Bengal.

*Remarks* : First report from Pangi valley.

### 31. *Euglypha denticulata* Brown, 1912

1912. *Euglypha denticulata* Brown, 1912.

1912. *Euglypha denticulate* Brown, *Scott. Natur. P.* 111, pl.4, figs. 5-11.

1915. *Euglypha denticulate* : Cash, Wailes and Hopkinson, *The British Freshwater Rhizopoda and Heliozoa*, 3, p. 41, pl. 36, figs. 7-13.

*Material examined* : 3exs., Soil moss, Hudan Valley, 26. v. 2008; 2exs., Soil moss, Killar, 27. v. 2008

*Diagnosis* : Test small, glabrous, ovoid in ventral view, sometimes asymmetrical, compressed, formed of elliptical imbricated platelets in longitudinal rows, aperture elliptical, small, bordered by 8-9 unevenly denticulated apertural platelets, not shiny at their margin.

*Distribution* : Meghalaya, Tripura, West Bengal.

*Remarks* : First report from Himachal Pradesh.

### 32. *Euglypha laevis* (Ehrenberg, 1845) Perty, 1849

1845. *Diffflugia laevis* Ehrenberg, *Ber. Akad., Berlin*, p. 307.

1849. *Euglypha laevis* Perty, *Mitth. Nat. Ges. Bern.*, p. 163.

1915. *Euglypha laevis* : Cash, Wailes and Hopkinson, *The British Freshwater Rhizopoda and Heliozoa*, 3, p. 32, pl. 34, figs. 10-12, pl. 39, figs. 5-7, text figs. 118 & 122.

*Material examined* : 2exs., Rock moss, Purthi, 17. v. 2008; 1ex., Rock moss, Karru Nallah, 17. v. 2008.

*Diagnosis* : Test oviform, glabrous, transverse section elliptical or sub-circular,

aperture elliptical to sub-circular, bordered by a single row of apertural platelets pointed terminally, shiny at their margin and leaving wider gap in between their terminal ends, test platelets oval and slightly imbricated, often displaying a scallariform pattern.

*Distribution* : Meghalaya, Sikkim, Tripura, Uttarakhand, West Bengal.

*Remarks* : First report from Himachal Pradesh.

### 33. *Euglypha rotunda* Wailes and Penard, 1911

1911. *Euglypha rotunda* Wailes and Penard, *Proc. R. Irish Acad.*, 31, pp.17, 41, 60-62, pl. 4, 19a-g.

1915. *Euglypha rotunda*: Cash, Wailes and Hopkinson, *The british Freshwater Rhizopoda and Heliozoa*, 3, p. 31. Pl. 34, fig. 9; pl. 35, figs. 14-16, text-fig.121.

*Material examined* : 3exs., Tree moss, Sugawar, 18. vii. 2009

*Diagnosis* : Test small, oviform, glabrous, compressed, test platelets oval, about twice as long as broad, slightly imbricated, aperture circular, bordered by 8 apertural platelets; apertural platelets with one median tooth bent towards interior of the aperture and 2 pairs of lateral teeth, platelets of the test oval and imbricated.

*Distribution* : Assam, Arunachal Pradesh, Himachal Pradesh, Jammu & Kashmir, Manipur, Meghalaya, Mizoram, Tripura, Uttarakhand, West Bengal.

*Remarks* : First record from Pangi valley.

### 34. *Euglypha tuberculata* Dujardin, 1841

1841. *Euglypha tuberculata* Dujardin, *Zooph. Infus.* P. 251.

1915. *Euglypha tuberculata* : Cash, wailes and Hopkinson, *The British freshwater Rhizopoda and Heliozoa*, 3, p. 13, pl. 33, Figs. 6-7, Pl. 35, Figs. 3-5, text-figs. 112-114.

*Material examined* : 3exs., Soil moss, Hudan Valley, 26. V. 2008; 2exs., Soil moss, Uddeen, 20. vii. 2009.

*Diagnosis* : Test elongate-oviform, not compressed, glabrous, test platelets round or broadly oval, imbricating, giving a regularhexagonal design, aperture circular, bordered by 8-12 finely serrated platelets, arranged in a single or double rows.

*Distribution* : Arunachal Pradesh, Assam, Himachal Pradesh, Jammu & Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Uttarakhand, West Bengal.

*Remarks* : First record from Pangi Valley.

### 35. *Euglypha scutigera* Wailes and Penard, 1911

1911. *Euglypha scutigera* Wailes and Penard, *Proc. R. Irish Acad.*, 31, p. 41, pl. 4, Fig. 20.

1915. *Euglypha scutigera* : Cash, Wailes and Hopkinson, *The British Freshwater Rhizopoda and Heliozoa*, 3, p. 7, pl. 33, figs. 1-2, text-fig. 111.

*Material examined* : 2exs., Soil moss, Hudan Valley, 26. v. 2008.

*Diagnosis* : Test oviform, glabrous, not compressed, aperture circular, bordered by two rows of finely serrated apertural platelets, test platelets scutiform, arranged in alternate longitudinal rows.

*Distribution* : India: Meghalaya, Tripura.

*Remarks* : First record from Himachal Pradesh.

### 36. *Tracheleuglypha dentata* (Vejdowsky, 1832) Deflandre, 1928

1832. *Euglypha dentata* Vejdowsky, *Their. Org. Brunnenu Prag.*, p. 38

1890. *Sphenodaria dentata* Penard, *Mem. Soc. Geneve*, 31, p. 185

1928. *Tracheleuglypha dentata* (Vejdowsky) Deflandre, *Annales de Protistologie*, 1, pp. 37-43.

*Material examined* : 2exs., Soil moss, Hudan Valley, 26. v. 2008; 2exs., Soil moss, Killar, 27. v. 2008; 3exs., Rock moss, Purthi, 17. v. 2008; 2exs., Rock moss, Karru Nallah, 17. v. 2008; 2exs., Tree moss, Sugulwar, 18. vii. 2009.

*Diagnosis* : Test colourless, oviform, circular in transverse section, formed of circular or sub-circular platelets, regularly overlapping; aperture circular, terminal, surrounded by chitinous hyaline collar, denticulate or laciniate; in some population such collar lacking.

*Distribution* : Arunachal Pradesh, Himachal Pradesh, Manipur, Mizoram, Nagaland, Tripura, Uttarakhand, West Bengal.

*Remarks* : First record from Pangi Valley.

### 37. *Trinema complanatum* Penard, 1890

1890. *Trinema complanatum* Penard, *Mem. Soc. Geneve*, 31, p. 187.

*Material examined* : 4exs., Tree moss, Sugulwar, 18. vii. 2009

*Diagnosis* : Test small, hyaline having nearly equal width in broad view and tapering sharply towards the aperture in narrow side view; test formed of circular, imbricated siliceous platelets; aperture circular, oblique and invaginated

*Distribution* : India : Andhra Pradesh, Arunachal Pradesh, Himachal Pradesh, Mizoram, Sikkim, Uttarakhand and West Bengal.

*Remarks* : First record from Pangi Valley.

### 38. *Trinema enchelys* (Ehrenberg, 1838) Leidy, 1878

1838. *Diffugia enchelys* Ehrenberg (partim), *Infusionsth.*, p. 132, pl. 9, Figs. 4 a-b.

1878. *Trinema enchelys* Leidy, *Proc. Acad. Philad.*, p. 172.

1915. *Trinema enchelys* : Cash, Wailes and Hopkinson, *The British Freshwater Rhizopoda and Heliozoa*, 3, p. 86, pl. 47, figs. 1-10, pl. 48, figs. 1-3, text figs. 1-3.

*Material examined* : 5exs., Rock moss, Purthi, 17. v. 2008; 3exs., Soil moss, Hudan Valley, 26. v. 2008.

*Diagnosis* : Test hyaline, elliptic, formed of siliceous circular large platelets, scarcely overlapping, as well as smaller platelets of different sizes in between large ones; aperture circular, oblique, invaginated, bordered by toothed apertural platelets.

*Distribution* : Arunachal Pradesh, Himachal Pradesh, Mizoram, Meghalaya, Nagaland, Tripura, Uttarakhand, West Bengal.

*Remarks* : First record from Pangi Valley.

### 39. *Trinema galeata* Penard, 1890

1890. *Trinema enchelys* var. *galeata* Penard (partim), *Mem. Soc. Geneve*, 31, p. 186.

1942. *Trinema galeata* Jung, *Arch. Protistenkd.*, 95, p. 325, fig. 70.

*Material examined* : 4exs., Rock moss, Purthi, 17. v. 2008.

*Diagnosis* : Test hyaline, ovoid in ventral view, formed of circular platelets of different sizes, aperture oval and invaginated, two distinct curved lines running from the aperture to the sides of the test, forming an anterior apertural rim and clearly dividing crown from fundus which is bulgy.

*Distribution* : Meghalaya.

*Remarks* : First record from Himachal Pradesh.

### 40. *Trinema lineare* Penard, 1890

1890. *Trinema lineare* Penard, *Mem. Soc. Geneve*, 31, p. 187, pl. 11., Figs. 5-17.

1915. *Trinema lineare* : Cash, Wailes and Hopkinson, *The British Freshwater Rhizopoda and Heliozoa*, 3, p. 91, pl. 47, figs. 11-21 and text-fig. 153.

*Material examined* : 3exs., Tree moss, Sugawar, 18. vii. 2009; 2exs., Rock moss, Sugawar, 18. vii. 2009.

*Diagnosis* : Test hyaline, elliptic or elongate, formed of circular platelets of different sizes, aperture circular, oblique, invaginated, bordered by toothed apertural platelets.

*Distribution* : Arunachal Pradesh, Assam, Himachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, West Bengal.

*Remarks* : First report from Pangi Valley.

41. *Trinema penardi* Thomas and Chardez, 1956

1958. *Trinema penardi* Thomas and Chardez, *Cahiers des Naturalistes, Bull. N.p.*, 14, p. 101.

1988. *Trinema penardi* : Luftenegger *et al.*, *Arch. Protistenkd.*, 136, p. 185, figs. 24, 25b.

*Material examined* : 5exs., Rock moss, Purthi, 17. v. 2008

*Diagnosis* : Test hyaline-ovoid in ventral view, in lateral view pointed towards aperture, formed of circular platelets of different sizes, aperture oval and invaginated; one distinct curved line running from aperture to the side of the test separating crown from bulgy fundus, so that the test appears to be composed of two distinct parts.

*Distribution* : Uttarakhand.

*Remarks* : First record from Himachal Pradesh.

## SUMMARY

The present communication deals with 41 species of moss dwelling testate amoebae from Pangi Valley, Himachal Pradesh belonging to 6 families. Of these 21 species are first records from Himachal Pradesh and 20 species are reported for the first time from Pangi Valley. Also recorded two species viz., *Lesquereusia modesta* and *L. spiralis* for the first time from moss, which were earlier reported only from freshwater bodies.

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## **INSECTA : ORTHOPTERA**

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### **INTRODUCTION**

Pangri Valley, the region of this study, is particularly interesting due to the climatic peculiarities that characterize it. The present study is based on the specimens of Orthoptera collected during the course of surveys (2007-2009) in various agricultural areas, meadows, pasture, high land, valleys, grassland, etc. of different regions of Pangri. Representative samples were collected from various localities and identified down to species level. From this 16 species of Orthoptera representing 15 genera and 4 families were identified. Their distinguishing characters and distribution are given inside the paper.

*Key words* : Orthoptera, Acridoidea, Diversity,

### **METHODOLOGY**

Regular collections were made from each habitat using an insect net of conventional design of 30 cm diameter. Sampling technique by sweeping was made for half an hour on every occasion. To measure the diversity of the species in the Pangri valley, the Shannon index was used. This index accounts for both species richness and evenness. Richness is simply the number of different species found in the valley and evenness is the relative proportion of those species (Enger and Smith, 2000).

As a measure of alpha diversity (diversity within a habitat) the most popular and widely used Shannon's diversity index ( $H'$ ) was calculated since it is well accepted that all species at a site within and across systematic groups contribute equally to its biodiversity (Ganeshiah et.al., 1997). In addition Simpson's diversity index, Hill's First ( $N_1$ ) and second ( $N_2$ ) abundance number, Margalef's richness index ( $R_1$ ), Menhinick richness index ( $R_2$ ) and Evenness indices ( $E_1, E_2, E_3, E_4$  and  $E_5$ ) were also calculated as per Ludwig and Reynolds (1988).

## OBSERVATIONS

The 16 species studied from the Pangri Valley are represented in Table-1

Table-1

Sub order	Family	Species	% Relative abundance
Caelifera	Acrididae	<i>Trilophidia annulata</i> (Thunberg)	11.023
Caelifera	Acrididae	<i>Oedaleus abruptus</i> (Thunberg)	7.086
Caelifera	Acrididae	<i>Gastrimargus africanus africanus</i> (Saussure)	13.385
Caelifera	Acrididae	<i>Sphingonotus savignyi</i> Sauss	2.362
Caelifera	Acrididae	<i>Bryodema luctuosum indum</i> (Saussure)	2.362
Caelifera	Acrididae	<i>Oedipoda himalayna</i> Uvarov	1.574
Caelifera	Acrididae	<i>Oxya fuscovittata</i> (Marschall)	8.661
Caelifera	Acrididae	<i>Cyrtacanthacris tatarica</i> (Linn)	1.574
Caelifera	Acrididae	<i>Patanga succincta</i> (Johansson)	3.149
Caelifera	Acrididae	<i>Xenocatantops humilis humilis</i> (Serville)	5.511
Caelifera	Acrididae	<i>Catantops pinguis innotabilis</i> (Walker)	10.236
Caelifera	Acrididae	<i>Paraconophyma scabra</i> (Walker)	2.362
Caelifera	Acrididae	<i>Xenocatantops karnyi</i> (Kirby)	0.787
Caelifera	Tetrigidae	<i>Hedotettix attenuatus</i> Hancock	9.448
Caelifera	Tetrigidae	<i>Eucriotettix grandis</i> (Hancock)	3.937
Ensifera	Gryllidae	<i>Teleogryllus mitratus</i> (Burmeister)	16.535

The classification followed here is after Drish (1965), Uvarov (1966) and Bhowmik (1985) is also a useful guide for family Acrididae.

## SYSTEMATIC ACCOUNT

- Order ORTHOPTERA  
 Sub order CAELIFERA  
 Infraorder ACRIDIDEA  
 Super Family ACRIDOIDEA  
 Family ACRIDIDAE  
 Sub family OEDIPODINAE

### 1. *Trilophidia annulata* (Thunberg)

1815. *Gryllus annulatus* Thunberg. Mémoires de l'Académie Impériale des Sciences de St. Pétersbourg. 5:234

1986. Bhowmik. Zool. Surv. India, Tech. Monogr. 14:79

2005. *Trilophidia annulata* Kim, T.W. & J.I. Kim. Entomological Research (Seoul). 35(2):90.

*Material Examined* : 14 exs. (12 M, 2 F), Killar 13.VIII.2007 Coll. T.R.Sharma & Party, Dharvas 16.VIII.2007 Coll. T.R.Sharma & Party

*Diagnostic Features* : Antenna 19-21 segmented. Fastigium of vertex elongate trapezoid. Frontal ridge sulcate slightly widening between antennae. Pronotum with well marked crest. Tegmen long. Posterior femur stout.

*Distribution* : Bangladesh, Borneo, Hong Kong, Japan, Jawa, Korea, Malaya, Mangolia, Myanmar, Pakistan, Malayasia, Singa Pore, Sri Lanka, Indonesia and Taiwan.

### 2. *Oedaleus abruptus* (Thunberg)

1815. *Gryllus abruptus* Thunberg. Mémoires de l'Académie Impériale des Sciences de St. Pétersbourg. 5:233.

2005. *Oedaleus abruptus* Zheng, Z. Journal of Huazhong Agricultural University. 24(3):237, 239.

*Material Examined* : 9 exs. (6M, 3F), Malid 27.V.2008 Coll. A.K.Sidhu & Party, Killar 12.VIII.2007 Coll. T.R. Sharma & Party

*Diagnostic Features* : Usually small species. Antenna about one third times long as head and pronotum together. Fastigium of vertex longer than wide and concave. Posterior tibia with 13 inner and 12 outer spines.

*Distribution* : Bangladesh, Burma, China, Hawaiian Islands, Pakistan, Sri Lanka, Thailand and Nepal.

### 3. *Gastrimargus africanus africanus* (Saussure)

1888. *Oedaleus (Gastrimargus) marmoratus africana*; marmoratus var. Africana Saussure. Mémoires de la Société de Physique et d'Histoire Naturelle de Genève. 30(1):1-182

1970. *Gastrimargus africanus*, Rowell. Anti-locust Bulletin, London. 47:48 pp.

2001. *Gastrimargus africanus*, Ingrisich & Garai. Esperiana, Schwanfeld. 8:763.

2004. *Gastrimargus africanus*, africanus Baccetti. Redia. 86:32.

*Material Examined* : 17 exs. (09F, 08), Killar 13.VIII. 2007 Coll. T.R.Sharma & Party, Sansari Nallah 16.VIII.2007 Coll. T.R.Sharma & Party.

*Diagnostic Features* : Fastigium of vertex concave, Pronotum moderately tectiform, longer tegmina, bright yellow coloration of wings.

*Distribution* : Comoro Island, Myanmar, Nepal, Pakistan, Saudi Arabia, Sri Lanka, Thailand, Tibet and Yaman.

#### 4. *Sphingonotus savignyi* Sauss

1884. *Sphingonotus savignyi*, Saussure., Mem. Soc. Phys. Hist. Nat. Geneve 28(9):198.

2008. *Sphingonotus savignyi*, Usmani, Zootaxa 1946:35.

*Material Examined* : 3M, Killar 12.VIII.2007 Coll. T.R.Sharma & Party; Malid 27.V.2008 Coll. A.K.Sidhu & Party

*Diagnostic Features* : Antennae ringed with whitish, pronotum constricted in front, obtusely rounded off behind. Upper surfaced thickly punctured, median carina slender. Hind femora pale, with three blackish bands above.

*Distribution* : Kashmir, Ladakh, North Africa, Central and Western Asia.

#### 5. *Bryodema luctuosum indum* (Saussure)

1884. *Bryodema inda* Saussure, Mem. Soc. Phys. Hist. Nat. Geneve 28(9):181.

2006. *Bryodema luctuosum indum* Zhang, D.-C., Wenqiang Wang & X.-C. Yin, Entomol. News 117(1):17.

*Material Examined* : 3M, Killar 12.VIII. 2007 Coll. T.R.Sharma & Party

*Diagnostic Features* : Large stout, granulated insects. Vertex broad, bordered by shallow laterl carinae curving backwad within each eye to the occiput. Antennae short filiform. Pronotum short broad granulated. Tegmina long, roundly truncate at the extremity. Legs short hind tibiae with nine or ten spines.

*Distribution* : Asia-Tropical, Indian Subcontinent

#### 6. *Oedipoda himalayna* Uvarov

1925. *Oedipoda himalayana* Uvarov, Mission Guy Babault dans les provinces centrales de l'Inde, et dans la region Occidentale de l'Himalaya 1914. Acrididae 1925:22.

*Material Examined* : 2M, Dharvas 16.VIII. 2007 Coll. T.R.Sharma & Party

*Diagnostic Features* : Head rugose, antennae longer than haed and pronotum. Median carina of pronotum rose throughout, prosternal tubercle absent; apical half of tegmina transparent. Hind femora narrower than tegmina.

*Distribution* : Asia-Tropical, Indian Subcontinent, West-Himalaya, Jammu & Kashmir.

#### Sub family OXYINAE

#### 7. *Oxya fuscovittata* (Marschall)

1836. *Gryllus fuscovittata* Marschall. Annalen des Naturhistorischen Museums in Wien. 1(2):211.

1963. *Oxya fuscovittata* Shumakov. Trudy Vsesoyeznogo Entomologicheskogo Obshchestva, Moskva [= Horae Societatis Entomologicae Unionis Sovieticae]. 49:88.

1986. Bhowmik. Zool. Surv. India, Tech. Monogr. 14:109.

*Material Examined* : 11 exs. (07 M, 04 F), Killar 12.VIII.2007 Coll. T.R.Sharma & Party; Khelvi 16.V.2008 Coll. A.K.Sidhu & Party

*Diagnostic Features* : General colouration is green in fresh specimen. Its broad, compressed and apically somewhat bifid male cercus distinguish the species; and the short, tooth like spines on the ovipositor valves of females and absence of lateral longitudinal ridges of sub genital plates on ventral side.

*Distribution* : Afganistan, Bangladesh, Pakistan & USSR (South West)

### Sub family CYRTACANTHACRIDINAE

#### 8. *Cyrtacanthacris tatarica* (Linn)

1758. *Gryllus (Locusta) tataricus* Linnaeus, Systema Naturae per Regna tria naturae (10th ed.) 1:432.

1956. *Cyrtacanthacris tatarica tatarica* ohnston, H.B, Annotated catalogue of African grasshoppers 379, 380.

1998. *Cyrtacanthacris tatarica* iang, G. & Z. Zheng, Grasshoppers and Locusts from Guangxi 131.

2006. *Cyrtacanthacris tatarica* Li, Hongchang, Hsia & et al. Fauna Sinica, Insecta 43:455.

*Material Examined* : 2M, Gosti 11.VIII. 2007 Coll. T.R.Sharma & Party

*Diagnostic Features* : Large size, fatigium of vertex rounded, interocular distance narrow. The species is unique in having a whitish coloration on posterior femora and on lateral lobes of Pronotum and reticulated brownish patches on tegmina.

*Distribution* : Western Asia, South and Central America and Nepal.

#### 9. *Patanga succincta* (Johansson)

1763. *Gryllus (Locusta) succinctus* Johannson, In Linnaeus. Amoenitates Academicae seu dissertationes variae Physicae, Medicae, Botanicae anthehac seorsim editae, 2nd ed. 6:398.

1923. *Patanga succinct* Uvarov, Ann. Mag. nat. Hist. 9 12:365.

1998. *Patanga succinct* Jiang, G. & Z. Zheng, Grasshoppers and Locusts from Guangxi 137 .

2008. *Patanga succincta* Song & Wenzel, Cladistics 24:515-542.

*Material Examined* : 4 exs. (3F, 1M) , Killar 12.VIII.2007 Coll. T.R.Sharma & Party; Kufa 10 .VIII.2007 Coll. T.R.Sharma & Party

*Diagnostic Features* : Head, pronotum and abdomen varied with light greenish

yellow and brown in fresh specimen. Eyes oval, the face yellow with brown stripes over the carinae and below the eyes. Legs dark brown; hind femora yellow, obliquely lined with brown on the outer surface; hind tibiae with 8 to 10 white black tipped spines.

*Distribution* : Asia-Tropical, Malesia and Jawa.

#### Sub family CATANTOPINAE

##### 10. *Xenocatantops humilis humilis* (Serville)

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

1953. *Xenocatantops humilis humilis* : Drish and Uvarov, *Tijdschr.Ent.*, **96** (3): 237.

*Material Examined* : 7 exs. (2M, 5F), Sural 15.VIII.2007 Coll. T.R.Sharma & Party; Sansari Nullah 16.VIII.2007 Coll. T.R.Sharma & Party

*Diagnostic Features* : Body finely rugose, posterior femur stout with a external and 9-10 internal black tipped spines. Supra anal plates roughly triangular with a median groove extending beyond middle of it. Uniqueness of species is male circus.

*Distribution* : Borneo, Burma, Indo China, Java, Malaya, Nepal, New Guinea, Philippines, Srilanka, Indonesia, Thailand, Tibet and Yunnan.

##### 11. *Catantops pinguis innotabilis* (Walker)

1870. *Acridium innotabile* Walker, Cat. derm. salt. Br. Mus., 4: 629.

1935. *Catantops pinguis innotabilis*: Dirsh and Uvarov, *Tijdschr, Ent.* **96** (3): 233.

*Material Examined* : 13 exs. (9M, 4F), Sansari Nullah 16.VIII.2007 Coll. T.R.Sharma & Party; Khelvi 16.V.2008Coll. A.K.Sidhu & Party

*Diagnostic Features* : Eyes big, lateral brown and approximating an dorsum supra anal plate triangular with a median longitudinal groove. Posterior tibia with 10-11 internal and 9-10 external black tipped spines. The species is distinguishable by its parallel-sided frontal ridge.

*Distribution* : Burma, Indo-China, Java, New Guinea, Philippines, Srilanka, Indonesia, South Tibet and Thailand.

##### 12. *Paraconophyma scabra* (Walker)

1870. *Caloptenus scaber* Walker, F, Catalogue of the Specimens of Dermaptera Saltatoria in the Collection of the British Museum 4:707.

1910. *Mesambria scabra* Kirby, W.F, A Synonymic Catalogue of Orthoptera (Orthoptera Saltatoria, Locustidae vel Acridiidae) 3(2):440.

1984. *Paraconophyma scabra* Bhowmik & Halder, *Rec. Zool. Survey India* **81**(1-2):179.

1986. *Paraconophyma scabra* Bhowmik, *Zool. Surv. India, Tech. Monogr.* 14:145.

*Material Examined* : 3M, Malid 27.V.2008 Coll. A.K.Sidhu & Party

*Diagnostic Features* : Antenna as long as head and pronotum taken together and filiform. Frontal ridge sulcate, slightly punctured above. Tegmen narrow, parallel sided, truncate at extremity, extending to end of first abdominal segment. Posterior femur thick as long as abdomen. Posterior tibia with 7-8 external spines.

*Distribution* : Asia-Tropical, Indian Subcontinent, Burdwan

### 13. *Xenocatantops karnyi* (Kirby)

1910. *Catantops karnyi* Kirby, W.F., A Synonymic Catalogue of Orthoptera (Orthoptera Saltatoria, Locustidae vel Acridiidae) 3(2):483

1982. *Xenocatantops karnyi* Jago. *Trans. Amer. Entomol. Soc.* 108(4):454.

*Material Examined* : 1M, Killar 12.VIII. 2007 Coll. T.R.Sharma & Party

*Diagnostic Features* : Eyes almost touching above, an irregular dark brown band behind the eyes, pronotum broad, legs testaceous, hind femora with two oblique black bands on the sides.

*Distribution* : Asia-Tropical, Malesia, Jawa

Infraorder TETRIDIDEA

Super Family TETRIGOIDEA

Family TETRIGIDAE

### 14. *Hedotettix attenuatus* Hancock

1904. *Hedotettix attenuates* Hancock, J.L. *Spolia Zeylanica* 2:151.

2001. *Hedotettix attenuatus* Majeed, A., A. Suhail, Sabir & Yousuf. *Online Journal of Biological Sciences* 1(3):163.

2005. *Hedotettix attenuatus* Zheng, Z. *Fauna of the Tetrigoidea from Western China* 263.

*Material Examined* : 12 exs. (4F, 8M), Killar 13.VIII.2007 Coll. T.R.Sharma & Party; Malid 27.V.2008 Coll. A.K.Sidhu & Party ; Khelvi 16.V.2008 Coll. A.K.Sidhu & Party

*Diagnostic Features* : Vertex narrower than an eye. Antennae filiform placed below the middle of eyes, frontal Costa bifurcate behind the paired ocelli, pronotum sub truncate or truncate anteriorly. Anterior femora elongate, very finely granulate on margins.

*Distribution* : Asia-Tropical, Indian Subcontinent, Sri Lanka, Kesbewa and Colombo.

### 15. *Eucriotettix grandis* (Hancock)

1912. *Criotettix grandis* Hancock, J.L. *Mem. Dept. Agric. India* (Ent. Ser.) 4(2):132.

2005. *Eucriotettix grandis* heng, Z. *Fauna of the Tetrigoidea from Western China* 96.

2008. *Eucriotettix grandis* Buzzetti & Devriese. Boll. Mus. civ. St. nat. Verona 32:163.

*Material Examined* : 5 exs. (3M, 2 F), Kufa 10.VIII.2007 Coll. T.R.Sharma & Party

*Diagnostic Features* : Head slightly exserted, antenna filiform and located on the inferior margin of eyes. Eyes globular and a little elevated above the vertex. Pronotum angularly excavate slightly in the middle.

*Distribution* : Asia-Tropical, Indian Subcontinent, near Darjeeling, Cherapunji, Khasi Hills.

Infraorder GRYLLIDEA

Super Family GRYLLOIDEA

Family GRYLLIDAE

### 16. *Teleogryllus mitratus* (Burmeister)

1838. *Gryllus mitratus* Burmeister. Handbuch der Entomologie. 2(2):I-VIII:734.

2001. Ingrisch & Garai. Esperiana, Schwanfeld. 8:758.

*Material Examined* : 21 exs. (16F, 5M), Killar 13.VIII.2007 Coll. T.R.Sharma & Party; Sural 15.VIII.2007 Coll. T.R.Sharma & Party; Sansari Nullah 16.VIII. 2007 Coll. T.R.Sharma & Party; Shour 16.V.2008 Coll. A.K.Sidhu & Party

*Diagnostic Features* : General coloration is reddish brown, tegmina and legs often paler. Head with a faint yellowish band along internal margin of eyes, Pronotum wider than long, anterior ocellus horizontal, tegmina reaching up to apex of abdomen.

*Distribution* : Bhutan, Japan, Johare, Kualalumpur, Malaya, Philippines, Srilanka, Taiwan and Tibet.

The species diversity indices of the Orthoptera fauna in Pangri Valley Distt. Chamba (HP) is presented in Table bellow.

Diversity Indices		Values
Richness Indices	Margalef richness index (R1)	3.096
	Menhinick richness index (R2)	1.419
Diversity Indices	Simpson Index	0.9
	Shannon Index	2.486
Evenness Indices	Pielou's J (E1)	0.896
	Sheldon's (E2)	0.750
	Heip (E3)	0.734
	Hill's Ratio (E4)	0.092
	Mcdfied Hill's Ratio (E5)	0.010

## DISCUSSION

The Orthoptera fauna of Pangi Valley admits an admixture of species almost from Himalaya and Trans-Himalayan region. Few species of Himalayan and Trans-Himalayan origin in the area suggest overlapping through the million years of geological ages and a clear picture of distribution pattern of these species along the Himalayas. In this connection present author supports the earlier finding of Bhowmik and Halder, 1983.

The concept of species diversity generally consist of two components namely species richness and species diversity. The richness indices R1 and R2 are high value than the average value in the value as shown in Table above. Diversity indices also qualify the average range. The present analysis indicates higher value of Shannon index, indicating species to be more diverse in the Pangi Valley. Simpson's diversity index gives low value for Orthoptera species, since the value of 1 decrease with increasing diversity (Ludwig and Reynolds, 1988). Evenness index provide an insight into the relative abundance of the species in the community. The value of indices indicates that the species are evenly distributed (Sanjayan et.al., 1995).

## SUMMARY

During the entire study, 16 species of Orthoptera belonging to 15 genera and 4 families were recorded from the Pangi valley (Table-1). Family Acrididae is the largest family represents 13 species, including the three threaten species i.e. *Sphingonotus savignyi* Sauss, *Bryodemella luctuosum* indum (Saussure) and *Xenocatantops karnyi* (Kirby). Statistical analysis reveals the diverse and evenness of species distribution in the valley.

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## **LEPIDOPTERA: RHOPALOCERA**

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### **INTRODUCTION**

Butterflies (order Lepidoptera) are increasingly being recognized as a flagship species group to monitor global warming and effects of habitat loss. The importance of butterflies is many folds. Apart from being aesthetically attractive, they act as indicators to depict the health of a habitat. The adults act as incidental, wild pollinators and help in pollination of many native plants. The butterfly diversity in an ecosystem tells how much healthy the ecosystem is, as butterflies are very sensitive to any change in the environment. But in the present day scenario, many butterfly species are under a real threat due to depletion of the natural floral cover due to various developmental activities. They are also further exploited due to their use in insect trade. Thus there is an urgent need to inventory these species and to know their status. 690 species of butterflies have been recorded from the entire Himalayan region (Haribal, 1992), of which 288 species occur in Himachal Pradesh (Arora *et. al.* 1995, 2005). Pangi valley is one of the remotest areas of Himachal Pradesh. It is the transition zone between trans Himalaya and the Himalaya. Sandwiched between Pir Panjal and Zaskar range, it is an isolated valley with unique faunal elements least explored. In fact mixing of Palaearctic and Oriental elements takes place in this area. As a part of approved project on Pangi valley, the butterfly fauna of this area is studied for the first time. Total 36 species referable to 24 genera and five families have been inventoried from this area and the status of various species has been assessed. The species *Polyommatus florenciae* Tytler has been recorded as new to India. The works followed for nomenclature and distribution of various species are of Bingham (1905, 1907); Evans (1932); Wynter-Blyth (1957); Cantlie (1963); Varshney (1985, 1990, 1997) and Bridges (1988).

### **DATA ANALYSIS**

Diversity index is a statistic which is intended to measure the biodiversity of an

ecosystem. As a measure of alpha diversity (diversity within a habitat) the most popular and widely used Shannon's diversity index (H') and Simpson's index was calculated since it is well accepted that all species at a site within and across systematic group contribute equally to its biodiversity (Ganeshaiyah *et.al.*, 1997). In addition Simpson's diversity index, Species richness Margalef's richness index (R1), Menhinick richness index (R2) and Evenness indices (E2,) were also calculated as per Ludwig and Reynolds (1988).

## SYSTEMATIC ACCOUNT

### Family NYMPHALIDAE

Genus : *Vanessa* Fabricius, 1807

*Vanessa* Fabricius, 1807, *Magazin f. Insektenk.* (Illiger) 6: 281.

**Type-species** : *Papilio atalanta* Linnaeus

*Nymphalis* Latreille, 1804, *Nouv. Dict. Hist. nat.* 24 (6): 184, 199.

*Cynthia* Fabricius, 1807, *Magazin f. Insektenk.* (Illiger) 6: 281.

*Pyrameis* Hübner, [1819], *Verz. bek. Schmett.* (3): 33.

*Bassaridius* Hübner, [1821], *Samml. exot. Schmett.* 2 : pl. 24.

*Ammiralis* Rennie, 1832, *Conspectus Butts. Moths*: 10.

*Phanessa* Sodoffsky, 1837, *Bull. Soc. imp. Nat. Moscou* 10 (6): 80.

*Neopyrameis* Scudder, 1889, *Butts eastern U.S. Canada* (1) (3): 434.

*Fieldia* Niculescu, 1979, *Revue verviet. Hist. nat.* 36 (1-3): 3.

### 1. *Vanessa cashmirensis* Kollar, 1844

**Common Name** : Indian Tortoiseshell.

*Vanessa caschmirensis* Kollar, 1844, in Hügel, *Kaschmir und das Reich der Siek*, 4 (2): 442, pl. 9, f. 3-4.

**Type locality** : Kashmir.

**Diagnostic features** : Sexes similar; forewing narrower, more produced and cut off at apex; termen slightly concave; hindwing toothed at vein 4; wings dorsally tawny; forewing with one black patch in cell, one at end cell and one beyond the cell; upperside of hindwing blue submarginal spots inwardly bordered brownish.

**Wing expanse** : 55-65 mm.

**Material examined** : Purthi, Ajog, 3 exs, 19.V. 2008, coll. A. K. Sidhu and party; Shour, 10 exs, 15.V. 2008, coll. A. K. Sidhu and party; Sural, Sural Nallah, 1 exs, 22.V. 2008, coll. A. K. Sidhu and party; Kellar, Malit, 2 exs, 27.V. 2008, coll. A. K. Sidhu and party; Purthi, 3 exs, 18.V. 2008, coll. A. K. Sidhu and party; Shour, Karru Nallah, 2 exs, 17.V.2008, coll. A. K. Sidhu and party.

*Distribution Elseware* : Himalaya, Pamir.

*Remarks* : This species is quite common in hilly areas of North-west India including Pangli valley.

## 2. *Vanessa cardui* (Linnaeus, 1758)

*Common Name* : Painted Lady

*Papilio cardui* Linnaeus, 1758; *Syst. Nat.* (Edn 10) 1: 475.

*Type locality* : Sweden

*Diagnostic features* : Sexes similar; Wings dorsally pinkish red with black markings; forewing slightly concave below apex; hindwing slightly wavy but otherwise evenly rounded; upperside of forewing with apex black bearing inner three conjoined and four separate marginal white spots Wing expanse : 55-70 mm.

*Material examined* : Kellar, Jhalwas, 1 ex, 25.V.2008, coll. A. K. Sidhu and party; Shour, Khelvi, 1 exs, 16.V.2008, coll. A. K. Sidhu and party; Purthi, 1 ex, 18.V.2008, coll. A. K. Sidhu and party; Purthi, Ajog, 3 exs, 19.V.2008, coll. A. K. Sidhu and party; Shour, 1 ex, 17.VII.2009, coll. A. K. Sidhu and party.

*Distribution Elseware*: Europe, Africa, Asia, Australia, New Zealand and Hawaii.

*Remarks* : This species is commonly available in North-West India including Pangli Valley.

## 3. *Vanessa xanthomelas* (Esper, 1781)

*Common Name* : Large Tortoise shell

*Papilio xanthomelas* Esper, 1781; *Die Schmett. Th. I, Bd. 2* (3): 77, pl. 63, f. 4.

*Diagnostic features* : Sexes similar; wings dorsally tawny; upperside of hindwing with base not dark. Large irregular black spot present at midcosta. Margin dark with irregular lunular blue band. Middle and hind legs brown in colour.

*Wing expanse* : 60-70 mm.

*Material examined* : Sural, 1 ex, 25.VII.2009, coll. A. K. Sidhu and party.

*Distribution Elseware* : Baluchistan, Northern Waziristan to Kumaon.

*Remarks* : It has very localized distribution in Pangli Valley. It has been observed only in Sural valley where it is quite rare.

## Genus *Melitaea* Fabricius, 1807

*Melitaea* Fabricius, 1807, *Magazin f. Insektenk.* (Illiger) 6: 284.

*Type-species* : *Papilio cinxia* Linnaeus

*Schoenis* Hübner, [1819], *Verz. bek. Schmett.* (2): 28.

*Cinclidia* Hübner, [1819], *Verz. bek. Schmett.* (2): 29.

#### 4. *Melitaea arcesia* Bremer

*Common Name* : Black vein Fritillary

*Melitaea arcesia* Bremer, 1861, *Melanges biol. Acad. St.-Petersb.* 3: 538.

*Type-locality* : Baical and Dahuria

*Diagnostic features* : Sexes similar; wings dorsally tawny with rows of black spots; underside of hindwing with tawny black-edged spots on a pale ground. One band present at margin; one submarginal; one discal and one at base.

*Wing expanse* : 40-45 mm.

*Material Examined* : Sural, Sural Nallah, 4 exs, 22.V.2008, coll. A. K. Sidhu and party; Kellar, Hudan Valley, 1 exs, 26.V.2008, coll. A. K. Sidhu and party; Sural, 1 ex, 25.VII.2009.

*Distribution Elsewhere* : Chitral to Sikkim , South Siberia (mountains), Mongolia, North China – Central China.

*Remarks* : This species has observed to have very localized distribution in Pangi Valley. It has been observed only in Sural valley where it is available in good numbers.

#### *Neptis* Fabricius, 1807

*Neptis* Fabricius, 1807; *Magazin f. Insektenk.* (Illiger) 6: 282.

*Type-species* : *Papilio aceris* Esper

*Philonoma* Billberg, 1820; *Enum. Ins. Mus. Billb.*: 78.

*Paraneptis* Moore, 1898; *Lepidoptera Indica* 3 (32):146.

*Kalkasia* Moore, 1898; *Lepidoptera Indica* 3 (32):146.

*Hamadryodes* Moore, 1898; *Lepidoptera Indica* 3 (32): 146.

*Bimbisara* Moore, 1898; *Lepidoptera Indica* 3 (32): 146.

*Bimbisara* Moore, [1899]; *Lepidoptera Indica*, 4 (37): 1.

*Stabrobates* Moore, 1898; *Lepidoptera Indica* 3 (32): 146.

*Stabrobates* Moore, [1899]; *Lepidoptera Indica*, 4 (37): 15

*Rasalia* Moore, 1898; *Lepidoptera Indica* 3 (32): 146.

*Rasalia* Moore, [1899]; *Lepidoptera Indica*, 4 (39): 44

*Neptidomima* Holland, 1920; *Bull. amer. Mus. nat. Hist.* 43 (6) : 116.

5. *Neptis mahendra* Moore, 1872

*Common Name* : Himalayan Sailer.

*Neptis mahendra* Moore, 1872; *Proc. zool. Soc. Lond.* **1872** (2) : 560.

*Diagnostic features* : Upperside of forewing with cell streak divided into a basal streak and a spot beyond it; discal spots in 2 and 3 not in line with spot in 5; upperside of hindwing with discal band widens to costa. Markings in underside of wings black edged; underside of forewing with spots at end cenn well separated from basal streak.

*Wing expanse* : 55-60 mm.

*Material Examined* : Shour, 2 exs, 18.VII.2009, coll. A. K. Sidhu and party.

*Distribution Elseware* : Chitral to Kumaon.

*Remarks* : This species has observed to be less available in Pangi valley.

Genus : *Limenitis* Fabricius, 1807

*Limenitis* Fabricius, 1807; *Magazin f. Insektenk.* (Illiger) **6**: 281.

*Type-species* : *Papilio populi* Linnaeus

*Callianira* Hübner, [1819]; *Verz. bek. Schmett.* (3): 38.

*Nymphalus* Boitard, 1828; *Manuel Ent.* **2**: 300.

*Basilarçhia* Scudder, 1872; 4th Ann. Rep. Peabody Acad. Sci. (1871): 29.

*Ladoga* Moore, [1898]; *Lepidoptera Indica* **3** (32):146.

*Sinimia* Moore, [1898]; *Lepidoptera Indica* **3** (32):146.

*Ladoga* Moore, [1898]; *Lepidoptera Indica* **3** (33):174.

*Nymphalis* Felder, 1861; *Nov. Act. Leop. Carol.* **28** (3): 41.

*Chalinga* Moore, [1898]; *Lepidoptera Indica* **3** (32):146.

*Chalinga* Moore, [1898]; *Lepidoptera Indica* **3** (33):172.

*Sinimia* Moore, [1898]; *Lepidoptera Indica* **3** (33):172.

*Nympha* Krause, [1939]; in Thon, *Faun. Thüringen* 4 (Schmett.) (4/5): 86.

*Eolimenitis* Kurentsov, 1950; *Byull. mosk. Obshch. Isp. Prir.* (Ser. biol) **55** (3): 37-45.

6. *Limenitis trivena* (Moore, 1864)

*Common Name* : Indian White Admiral.

*Limenitis trivena* Moore, 1864, in Lang, *Ent. mon. Mag.* **1** :133.

*Diagnostic characters* : Sexes similar. Wings dorsally dark brown; white discal band present across both the wings, crossed by black veins on hind wing and consists of separate spots on the forewing; forewing with a basal spot in 1b; marginal line of yellowish white spots present on both the wings and inner to marginal row present row of obscure reddish spots. Wings ventrally of chalky yellow colour.

*Wing expanse* : 65-75 mm.

*Material Examined* : Purthi, 1 exs, 18.V.2008, coll. A. K. Sidhu and party; Sugawas, Shour, 1 ex, 18.VII. 2009, coll. A. K. Sidhu and party; Purthi, 1 ex, 19.VII. 2009, coll. A. K. Sidhu and party; Udeen, 4 exs, 20.V.2009, coll. A. K. Sidhu and party; Sural, 1 ex, 25.VII.2009, coll. A. K. Sidhu and party.

*Distribution* : North-West Himalayas, Kashmir, Chitral - Kumaon.

*Remarks* : This species is moderately available in Pangri valley.

*Family* : Pieridae

Genus : ***Pieris*** Schrank, 1801

*Pieris* Schrank, 1801; *Fauna Boica* 2 (1): 152, 161.

*Type-species* : *Papilio brassicae* Linnaeus

#### 7. ***Pieris brassicae*** (Linnaeus, 1758)

*Common Name* : Large cabbage White.

*Papilio brassicae* Linnaeus, 1758, *Syst. Nat.* (Ed. 10) 1: 467.

*Diagnostic features* : Male with wings dorsally white with black apex of forewing and apical spot on hindwing; no discal spot present in forewing; underside of hindwing pale yellow. Female similar with two additional discal spots on upper side of forewing.

*Wing expanse* : 65-75 mm.

*Material Examined* : Purthi, 2 exs, 18.V.2008, coll. A. K. Sidhu and party; Shour, Khelvi, 1 exs, 16.V. 2008, coll. A. K. Sidhu and party; Shour, 1 exs, 15.V.2008, coll. A. K. Sidhu and party; Shour, 1 ex, 18.VII.2009, coll. A. K. Sidhu and party; Purthi, 3 exs, 19.VII. 2009, coll. A. K. Sidhu and party; Udeen, 1 ex, 20.VII. 2009, coll. A. K. Sidhu and party; Sural, 2 exs, 24.VII.2009, 1 ex, 25.VII.2009, coll. A. K. Sidhu and party;

*Distribution* : Throughout Europe, North Africa and Asia to the Himalayas.

*Remarks* : This species is very common in agricultural fields of Pangri and is widely distributed. In India it is available from plains to high altitude areas.

#### 8. ***Pieris canidia*** (Linnaeus, 1768)

*Common Name* : Indian Cabbage White

*Papilio canidia* Linnaeus, 1768, in Sparrman, *Amoenit. acad.*, 7 (150): 504.

**Diagnostic characters** : Male upperside of wings white; upperside of forewing with apex black, inwardly dentate black outer margin and with a black discal spot; upperside of hindwing with apical spot and terminal spots. Female similar to male with an additional discal spot on upperside of hindwing.

**Wing expanse** : 45-60 mm.

**Material examined** : Kellar, Jhalwas, 1 ex, 25.V.2008, coll. A. K. Sidhu and party; Shour, 1 ex, 15.V.2008, coll. A. K. Sidhu and party; Dharwas, Sansari Nallah, 1 ex, 24.V.2008, coll. A. K. Sidhu and party; Shour, 1 ex, 17.VII.2009, coll. A. K. Sidhu and party; Purthi, 3 exs, 19.VII. 2009, coll. A. K. Sidhu and party; Udeen, 2 exs, 20.VII. 2009, coll. A. K. Sidhu and party.

**Distribution** : North-West India, Himalayas, Assam, Burma, Nilgiris, Palnis, Travancore, Cochin, Tibet and West China.

**Remarks** : As per present surveys, this species is moderately available in agricultural fields of Pangi and surrounding areas.

Genus : *Colias* Fabricius, 1807

*Colias* Fabricius, 1807; *Magazin f. Insektenk.* (Illiger) 6: 284.

**Type-species** : *Papilio hyale* Linnaeus

### 9. *Colias fieldii* Menetries

**Common Name** : Dark clouded yellow

*Colias fieldii* Menetries, 1855, *Cat. lep. Petersb.* 2: 79, 1: pl. 1, f. 5.

**Type-locality** : "Monts Himalaya"

**Diagnostic characters** : Male: upper side of forewing deep orange yellow; base dusted with greenish-black scales and with broad unspotted black outer border; with prominent black cell spot. Upperside of hindwing deep orange; heavily dusted with black scale at base and posterior part of wings, inner margin pale yellow and outer broadly black. Underside of forewing paler on basal area and outer broader area of forewing pale dull green. Discocellular spot large. Underside of hindwing discocellular spot double, with silvery white centre but encircled with salmon pink.

**Female** : As male but borders spotted with ground colour; Upperside of hindwing heavily dusted with black scaling.

**Wing expanse** : 45-55 mm.

**Material Examined** : Shour, Karru Nallah, 3 exs, 17.V.2008, coll. A. K. Sidhu and

party; Shour, Khelvi, 2 exs, 16.V.2008, coll. A. K. Sidhu and party; Purthi, 5 exs, 18.V. 2008, coll. A. K. Sidhu and party; Shour, 11 exs, 15.V. 2008, coll. A. K. Sidhu and party; Purthi, Ajog, 3 exs, 19.V. 2008, coll. A. K. Sidhu and party; Kellar, Malit, 2 exs, 27.V. 2008, coll. A. K. Sidhu and party; Shour, 2 exs, 17.VII. 2009, 2 exs, 18.VII. 2009, coll. A. K. Sidhu and party; Udeen, 2 exs, 20.VII. 2009, coll. A. K. Sidhu and party; Sural, 4 exs, 24.VII. 2009, 1 ex, 25.VII. 2009, coll. A. K. Sidhu and party.

*Remarks* : As per present surveys, *Colias fieldii* is commonly available in North-West India from plains to high altitude areas including Pangri valley.

#### 10. *Colias erate* (Esper, 1805)

*Common Name* : Pale Clouded yellow

*Papilio erate* Esper, 1805, *Ausl. Schmett.* 1 (2): 13, pl. 119, f. 3.

*Diagnostic features* : Male with wings dorsally lemon yellow with broad unspotted black outer border, a prominent black spot present in cell of forewing. Female as in male but borders spotted with ground colour; upperside of hindwing heavily dusted with black scales.

*Wing expanse* : 40-45 mm.

*Material examined* : Shour, Karru Nallah, 1 exs, 17.V.2008, coll. A. K. Sidhu and party.

*Distribution* : Himalayas from Chital to Kumaon; hills of South India.

*Remarks* : As per present surveys, *Colias erate* is moderately available in North-West India from plains to high altitude areas.

#### Genus : *Pontia* Fabricius, 1807

*Pontia* Fabricius, 1807, *Magazin f. Insektenk.* (Illiger) 6: 283.

*Type-species* : *Papilio daplidice* Linnaeus

#### 11. *Pontia daplidice* (Linnaeus, 1758)

*Common Name* : Bath White.

*Papilio daplidice* Linnaeus, 1758, *Syst. Nat.* (Ed. 10) 1: 468.

*Diagnostic characters* : Male with wings white; upperside of forewing with apex black studded with white spots and lines, end cell with black spot; underside of hindwing blotched with green colour. Female similar to male except upperside of forewing with a discal spot and upperside of hindwing with an obscure row of terminal and marginal spots.

*Wing expanse* : 45-50 mm.

**Material examined** : Shour, Karru Nallah, 1 exs, 17.V.2008, coll. A. K. Sidhu and party; Sural, 1 ex, 25.VII.2009.

**Distribution** : Central and Southern Europe, Baluchistan, Peshawar, Chitral, Kashmir and along the Himalayas right across the Central Himalayas up to Darjeeling.

**Remarks** : This species is widely distributed from plains of India to high altitude areas. It is rare in Pangi valley.

Genus : *Euchloe* Hübner, [1819]

*Euchloe* Hübner, [1819]; *Verz. bek. Schmett.* (6): 94.

**Type-species** : *Euchloe ausonia* var. *esper* Kirby

*Phyllocharis* Schatz, [1886], in Staudinger & Schatz, *Exot. Schmett. Bd 1* (Th. 2, Lief. 2): 71.

*Elphinstonia* Klots, 1930, *Bull. Brooklyn ent. Soc.* 28: 87.

## 12. *Euchloe daphalis* Moore, 1865

**Common Name** : Pearl white.

*Euchloe daphalis* Moore, 1865, *Proc. zool. Soc. Lond.* 1865 (2): 491, pl. 31, f. 14.

**Diagnostic characters** : Sexes similar. Wings dorsally white; forewing with apical area black with spots of ground colour; spot at end cell present. Underside of hindwing with irregular network of greenish brown lines enclosing pearl shaped spots.

**Wing expanse** : 40-45 mm.

**Material Examined** : Purthi, 1 exs, 18.V.2008, coll. A. K. Sidhu and party.

**Distribution** : West Pamirs, North Afghanistan, Chitral to Kumaon.

**Remarks** : This species is very rare in Pangi valley. Reported as rare in previous works.

## Family PAPILIONIDAE

Genus : *Papilio* Linnaeus, 1758

*Papilio* Linnaeus, 1758, *Syst. Nat.* (Edn 10) 1: 458.

**Type-species** : *Papilio machaon* Linnaeus

## 13. *Papilio machaon* Linnaeus, 1758

**Common Name** : Common Yellow Swallowtail

*Papilio machaon* Linnaeus, 1758, *Syst. Nat.* (Edn 10) 1: 462.

*Diagnostic features* : Sexes similar; wings dorsally yellow with black markings, veins black; upperside of forewing with basal area black dusted with yellow scales, rest of the cell yellow with a black bar in cell and a black bar at end cell, marginal area black with a complete series of regular small yellow spots near termen. The hind wings have a pair of protruding tails, below each tail is a red eye spot.

*Wing expanse* : 75-90 mm.

*Material examined* : Purthi, 1 exs, 18.V. 2008, coll. A. K. Sidhu and party; Purthi, Ajog, 1 ex, 19.V. 2008, coll. A. K. Sidhu and party.

*Distribution* : Throughout the Palearctic region in Europe and Asia, across North America.

*Remarks* : This species though widely distributed and moderately available in hilly areas of north-west India as well as in Pangri Valley.

#### Family LYCAENIDAE

Genus : *Lycaena* Fabricius, 1807

*Lycaena* Fabricius, 1807; *Magazin f. Insektenk.* (Illiger) 6: 285.

*Type-species* : *Papilio phlaeas* Linnaeus

*Lycia* Sodoffsky, 1837; *Bull. Soc. imp. Nat. Moscou* 10 (6): 81.

*Heodes* Dalman, 1816; *K. svenska VetenskAkad. Handl., Stockholm* 1816 (1): 63.

*Chysoptera* Zincken, 1817; *Allgem. Lit. Ztg, Halle* 1817 (3): 75.

*Tharsalea* Scudder, 1876; *Bull. Buffalo Soc. nat. Sci.* 3: 125.

*Gaeides* Scudder, 1876; *Bull. Buffalo Soc. nat. Sci.* 3: 126.

*Chalceria* Scudder, 1876; *Bull. Buffalo Soc. nat. Sci.* 3: 125.

*Epidemia* Scudder, 1876; *Bull. Buffalo Soc. nat. Sci.* 3: 127.

*Rumicia* Tutt, 1906; *Ent. Rec.* 18: 131.

*Hyrceanana* Bethune-Baker, 1914; *Ent. Rec.* 26: 135.

*Thersamonia* Verity, 1919; *Ent. Rec. J. Var.* 31: 28.

#### 14. *Lycaena phlaeas* (Linnaeus, 1761)

*Common Name* : Common Copper.

*Papilio phlaeas* Linnaeus, 1761, *Fauna Suecica* (Edn 2): 285.

*Type-locality* : Sweden.

*Diagnostic features* : Underside of hindwings grey brown in colour; spots minute

and no white band; obscure grayish red marginal band present. Male with upperside of forewing dark shining copper coloured with black spots; discal area with overlaid with black scales; in female copper colouration brighter. In both sexes on upperside of hindwing dark brown with small bluish discal spots; marginal band copper coloured.

*Wing expanse* : 28-34 mm.

*Material Examined* : Shour, 2 exs, 15.V. 2008, coll. A. K. Sidhu and party; Shour, Khelvi, 1 exs, 16.V. 2008, coll. A. K. Sidhu and party; Shour, Karru nallah, 1 ex, 17.V. 2008, coll. A. K. Sidhu and party ; Purthi, 5exs, 18.V. 2008, coll. A. K. Sidhu and party; Purthi, Ajog, 3 exs, 19.V. 2008, coll. A. K. Sidhu and party; Sural, Sural Nallah, 1 exs, 22.V. 2008, coll. A. K. Sidhu and party; Kellar, Hudan Valley, 1 exs, 26.V. 2008, coll. A. K. Sidhu and party; Shour, 1 ex, 17.VII. 2009, 3 exs, 18. VII. 2009, coll. A. K. Sidhu and party; Udeen, 1 ex, 20.VII. 2009, coll. A. K. Sidhu and party; Sural, 24.VII. 2009, coll. A. K. Sidhu and party.

*Distribution* : Himalayas, Blauchistan.

*Remarks* : This species is widely distributed and commonly available in hilly areas of north-west India as well as in Pangi Valley.

Genus : *Everes* Hübner, [1819]

*Everes* Hübner, [1819]; *Verz. bek. Schmett.* (5): 69.

*Type-Species* : *Papilio amyntas* Denis & Schiffermüller

#### 15. *Everes huegellii* (Gistel)

*Common Name* : The Tailed Cupid

*Lycaena huegellii* Gistel, 1857, *Vacuna* 2 (2) : 605; Cantlie, 1963, *Lyc. Butts*

*Revised* : 37 (*Everes*).

*Diagnostic features* : In male wings dorsally shining blue with broad dark borders and spot at end cell ; in female plain brown with orange tornal markings on hindwing. Ventrally wings grey; on forewing discal spots decrease in size towards apex; hindwing with marginal orange band extensive.

*Wing expanse* : 34-40 mm.

*Material Examined* : Shour, Khelvi, 1 exs, 16.V.2008, coll. A. K. Sidhu and party; Purthi, 1 ex, 18.V.2008, coll. A. K. Sidhu and party; Kellar, Malit, 1 exs, 27.V.2008, coll. A. K. Sidhu and party; Udeen, 1 ex, 20.VII.2009, coll. A. K. Sidhu and party.

*Distribution* : Himalayas to Karens.

*Remarks* : This species is moderately available in Shour and Purthi of Pangi Valley.

Genus : ***Celastrina*** Tutt, 1906

*Celastrina* Tutt, 1906; *Ent. Rec.* 18: 131.

*Type-Species* : *Papilio argiolus* Linnaeus

16. ***Celastrina argiolus*** (Linnaeus, 1758)

*Common Name* : Hill Hedge Blue.

*Papilio argiolus* Linnaeus, 1758; *Syst. Nat.* (Edn 10) 1:483.

*Type-locality* : England

*Papilio cleobis* Sulzer, 1776; *Gesch. Ins. nach linn. Syst.*: pl. 18, f. 13-14.

*Papilio marginatus* Retzius, 1783; *Gen. Spec. Ins.*: 30.

*Papilio acis* Fabricius, 1787; *Mantissa Insectorum*, 2: 73.

*Lycaenopsis argiolus* r. *britannica* Verity, 1919; *Ent. Rec. J. Var.* 31: 46.

*Lycaenopsis argiolus* f. *calidogenita* Verity, 1919; *Ent. Rec. J. Var.* 31: 46.

*Diagnostic features* : Male with wings dorsally blue with broad dark border on forewing, increasing to apex, female with very broad dark borders and discal area pale blue. Wing below grey coloured in both sexes.

*Wing expanse* : 25-34 mm.

*Material examined* : Shour, Khelvi, 1 exs, 16.V. 2008, coll. A. K. Sidhu and party; Purthi, Ajog, 2 exs, 19.V.2008, coll. A. K. Sidhu and party.

*Distribution* : Eurasia and South Asia, Chitral to Kumaon.

*Remarks* : This species is commonly available in hilly areas of north-west India and as per present surveys, it is commonly present in wild vegetation and in agricultural fields of Pangri.

Genus : ***Rapala*** Moore, [1881]

*Common Name* : Flashes

*Rapala* Moore, [1881]; *Lepid. Ceylon* 1 (3): 105.

*Type-species* : *Thecla varuna* Horsfield

*Hysudra* Moore, 1881; *Proc. zool. Soc. Lond.* 1881: 250.

*Nadisepa* Moore, 1882; *Proc. zool. Soc. Lond.* 1882 (1): 249.

*Atara* Zhdanko, 1996; *Zool. zhurn.* 75: 783.

17. ***Rapala selira*** (Moore, 1874)

*Common Name* : Himalayan Red Flash.

*Deudorix selira* Moore, 1874; *Proc. zool. Soc. Lond.* 1874 (1) : 272.

*Diagnostic features* : Wings dorsally brown with large orange area in the disc on

forewing and broad orange marginal band on hindwing; ventrally wings with a bar at end cell and discal band across both the wings; hind wing with a tornal lobe having tornal spot and a thread like tail.

*Wing expanse* : 32-34 mm.

*Material examined* : Purthi, 2 exs, 18.V. 2008, coll. A. K. Sidhu and party; Purthi, Ajog, 2 exs, 19.V. 2008, coll. A. K. Sidhu and party.

*Distribution* : North West Himalayas, Chitral Kumaon, Kashmir.

*Remarks* : This species has found to be rare in Pangli valley though reported as common in previous literature.

#### Genus : *Aricia* Reichenbach, 1817

*Aricia* Reichenbach, 1817; *Jenaische Allgem. Lit. Ztg, Jena* 14 (1): 280.

*Type-species* : *Papilio agestis* Denis & Schiffermüller

*Eumedonia* Forster, 1938; *Mitt. münch. ent. Ges.* 28: 113.

*Icaricia* Nabokov, 1944; *Psyche* 51: 104.

*Pseudoaricia* Beuret, 1959; *Mitt. ent. Ges. Basel* (n.f.) 9: 84.

*Ultraaricia* Beuret, 1959; *Mitt. ent. Ges. Basel* (n.f.) 9: 84.

#### 18. *Aricia agestis* ([Schiffermüller], 1775)

*Common Name* : Brown Argus.

*Papilio agestis* [Schiffermüller], 1775, *Ankündigung eines systematischen Werkes von den Schmetterlingen der Wienergegend* : 184, No. N.13.

*Diagnostic features* : Wings are tailless. Male and female with wings dorsally dark brown with orange marginal spots on both wings. In female these spots are prominent and complete and in male they are somewhat obscure. Underside of wings pale brown or white; always have bar at end cells.

*Wing expanse* : 25-30 mm.

*Material Examined* : Shour, Khelvi, 1 exs, 16.V. 2008, coll. A. K. Sidhu and party; Shour, 1 ex, 17.VII. 2009, coll. A. K. Sidhu and party; Sural, 1 ex, 24.VII. 2009, 3 exs, 25.VII. 2009, coll. A. K. Sidhu and party.

*Distribution* : Chitral to Kumaon.

*Remarks* : This species is commonly available in hilly areas of north-west India and as per present surveys, it is rare in Pangli Valley.

#### Genus : *Pseudophilotes* Beuret, 1958

*Pseudophilotes* Beuret, 1958; *Mitt. ent. Ges. Basel* (n.f.) 8 (6): 100.

*Type-species* : *Papilio baton* Bergtrasser

### 19. *Pseudiphilotes vicrama* (Moore, 1865)

*Common Name* : Chequered Blue.

*Polyommatus vicrama* Moore, 1865; *Proc. zool. Soc. Lond.* **1865** (2): 505.

*Diagnostic features* : Male with wings dorsally dusky blue; female dark brown; wings with fringe prominently chequered; ventrally wing creamish in colour with black spots, marginal spots orange crowned.

*Wing expanse* : 24-26 mm.

*Material examined* : Shour, Khelvi, 1 exs, 16.V. 2008, coll. A. K. Sidhu and party; Purthi, 1 exs, 18.V. 2008, coll. A. K. Sidhu and party; Purthi, Ajog, 2 exs, 19.V. 2008, coll. A. K. Sidhu and party; Sural, 1 ex, 24.VII. 2009, coll. A. K. Sidhu and party.

*Distribution* : Baluchistan, Chitral to Shipki.

*Remarks* : It is an high altitude species. It is moderately available in wild vegetation of Pangri Valley, as per the present surveys.

Genus : *Lampides* Hübner, [1819]

*Lampides* Hübner, [1819]; *Verz. bek. Schmett.* (5): 70.

*Type-species* : *Papilio boeticus* Linnaeus.

*Cosmolyce* Toxopeus, 1927; *Tijdschr. Ent.* **70**: 268.

*Lampidella* Hemming, 1933; *Entomologist* **66**: 224.

### 20. *Lampides boeticus* (Linnaeus, 1767)

*Common Name* : Pea Blue.

*Papilio boeticus* Linnaeus, 1767; *Syst. Nat.* (Edn 12) **1** (2): 789.

*Type locality* : Algeria

*Papilio damoetes* Fabricius, 1775; *Syst. Ent.*: 526.

*Papilio coluteae* Fuesly, 1775; *Verz. bekannt. schweiz. Ins.*: 31.

*Papilio archias* Cramer, [1777]; *Uitl. Kapellen* **2** (9-16): 129.

*Papilio pisorum* Fourcroy, 1785; *Ent. Paris.* **2**: 242.

*Papilio boetica* Fabricius, 1793; *Ent. Syst.* **3** (1): 280.

*Lampides armeniensis* Gerhard, 1882; *Berl. ent. Z.* **26**: 125-126.

*Polyommatus bagus* Distant, 1886; *Ann. Mag. nat. Hist.* (5) **17** (102) :532.

*Lampides grisescens* Tutt, [1907]; *Nat. Hist. Brit. Butts* **2**: 335.

*Lampides caerulea* Tutt, [1907]; *Nat. Hist. Brit. Butts* **2**: 336.

*Lampides caeruleafasciata* Tutt, [1907]; *Nat. Hist. Brit. Butts* **2**: 336.

*Lampides clara* Tutt, [1907]; *Nat. Hist. Brit. Butts* **2**: 336.

- Lampides clarafasciata* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 336.  
*Lampides coerulea* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 336.  
*Lampides ab. fasciata* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 336.  
*Lampides fusca* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 336.  
*Lampides ab. fuscafasciata* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 336.  
*Lampides typicamarginata* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 336.  
*Lampides ab. major* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 337.  
*Lampides minor* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 337.  
*Lampides typicafasciata* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 337.  
*Lampides ab. albovittata* Oberthür, 1910; *Ètud. Lépid. Comp.* 4:156.  
*Lampides ab. ecaudata* Oberthür, 1910; *Ètud. Lépid. Comp.* 4:157.  
*Polyommatus yanagawensis* Hori, 1923; *Ins. World* 27: 233.  
*Lampides obsoleta* Evans, [1925]; *J. Bombay nat. Hist. Soc.* 30 (2): 351.  
*Lampides fusca* de Sagarra, 1926; *Bull. Inst. catal. Hist. nat.* (2) 6: 136.  
*Lycaena ab. minor* Pionneau, 1928; *Misc. Ent.* 31 (5): 50.  
*Lampides infuscata* Querci, 1932; *Treb. Mus. Cienc. nat. Barcelona*: 166.  
*Lampides ab. kawachensis* Hirose, 1933; *Trans. Kansai ent. Soc.* 2: 36.  
*Lampides anamariae* Gómez Bustillo, 1973; *Revta Lep.* 1 (1-2): 30.

**Diagnostic features** : Both male and female tailed. Wings below pale brown or whitish with narrow bands and no spots except the two black orange crowned tornal spots on hindwing. In male wings above violed blue, frosted over and two tornal spots on hindwing. In female wings above dark brown, blue at base, generally with obscure marginal white crescents which may be continued to forewing.

**Wing expanse** : 26-36 mm.

**Material Examined** : Shour, Karru Nallah, 1 exs, 17.V. 2008, coll. A. K. Sidhu and party.

**Distribution** : India, Ceylon and Burma.

**Remarks** : It is a cosmopolitan species available from plains of India to high altitudes. It is recorded as minor pest of pea. During present surveys it is less available in Pangri valley.

Genus : *Satyrium* Scudder, 1876

*Satyrium* Scudder, 1876; *Bull. Buffalo Soc. nat. Sci.* 3: 106.

**Type-Species** : *Lycaena fuliginosa* Edwards

*Argus* Gerhard, 1850; *Versuch Mon. europ. Schmett.*: 4.

*Callipsyche* Scudder, 1876; *Bull. Buffalo Soc. nat. Sci.* 3: 106.

*Fixsenia* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 142.

- Nordmannia* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 143.  
*Leechia* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 142.  
*Edwardsia* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 142.  
*Felderia* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 142.  
*Kollaria* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 142.  
*Erschoffia* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 142.  
*Klugia* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 142.  
*Bakeria* Tutt, [1907]; *Nat. Hist. Brit. Butts* 2: 142.  
*Chattenedia* Tutt, [1908]; *Nat. Hist. Brit. Butts* 2: 483.  
*Chattenedia* Tutt, [1908]; *Ent. Rec.* 20 (6): 143.  
*Strymonidia* Tutt, [1908]; *Nat. Hist. Brit. Butts* 2: 483.  
*Thecliolia* Strand, 1910; *Ent. Rundsch.* 27: 162.  
*Superflua* Strand, 1910; *Ent. Rundsch.* 27: 162  
*Pseudothecla* Strand, 1910; *Ent. Rundsch.* 27: 162.  
*Tuttiola* Strand, 1910; *Ent. Rundsch.* 27: 162.  
*Necovatia* Verity, 1951; *Rev. franç. Lépid., Suppl.* 183.  
*Euristrymon* Clench, 1961; in P & A. Erlich (eds.), *How to know the butterflies*: 184, 212.  
*Armenia* Dubatolov & Korshunov, 1984; in, *Insects and Helminths* 17: 53.

### 21. *Satryium sassanides* (Kollar, 1849)

*Common Name* : Whiteline Hairstreak.

*Thecla sassanides* Kollar, (1849), *Denkschr. Akad. Wiss. Wien.* 1: 51.

*Diagnostic features* : Both sexes with wings dorsally dark brown and unmarked; ventrally wings of dark brown colour with narrow white discal line which is inwardly black edged across both the wings; a marginal series of obscure black spots present. Hind wing with lobe and tornal spot in 2, the spot black edged, orange crowned; hindwing with single tail.

*Wing expanse* : 28-35 mm.

*Material Examined* : Shour, 2 exs, 15.V. 2008, coll. A. K. Sidhu and party; Shour, 1 ex, 17.VII. 2009, coll. A. K. Sidhu and party.

*Distribution* : Iran, Kashmir, Baluchistan, North-West Himalayas, Chitral, Mussoorie.

*Remarks* : This species is the only representative of this genus in India. It is typically high altitude species moderately available in Pangri Valley.

*Genus* : *Polyommatus* Latreille, 1804

*Polyommatus* Latreille, 1804, *Nouv. Dict. Hist. nat.* 24 (6): 185, 200.

**Type-Species** : *Papilio icarus* Rottemburg

*Nomiades* Hübner, [1819]; *Verz. bek. Schmett.* (5): 67.

*Bryna* Evans, 1912; *J. Bombay nat. Hist. Soc.* **21**: 284.

*Cyaniris* Dalman, 1816; *K. svenska VetenskAkad. Handl., Stockholm 1816* (1): 63.

*Agrodiaetus* Hübner, 1822; *Syst.-alph. Verz.:* 1-10.

*Meleageria* Sagarra, 1925; *Bull. Inst. catal. Hist. nat.* (2) **5**: 271.

*Uranops* Hemming, 1929; *Ann. Mag. nat. Hist.* (10) **3**: 243.

*Lysandra* Hemming, 1933; *Entomologist* **66**: 277.

*Kretania* Beuret, 1959; *Mitt. ent. Ges. Basel* (n.f.) **9**: 83.

## 22. *Polyommatus icarus* (Rottemburg, 1775)

**Common Name** : The Violet Meadow Blue

*Papilio icarus* Rottemburg, 1775, *Der Naturforscher* **6**: 31.

**Type-Locality** : Berlin

**Diagnostic characters** : Male with wings dorsally bright lilac blue, narrow threadlike dark border on forewing; female wings dorsally brown, plain with or without orange spots on margin. Forewings below with discal spots in 4, 5 and 6 on forewing in a curved line; hindwings below with spot in 6 nearer to 5, no metallic scales at tornus.

**Wing expanse** : 30-36 mm.

**Material Examined** : Sural, 1 exs, 24.VII. 2009, 1 ex, 25.VII. 2009, coll. A. K. Sidhu and party.

**Distribution** : Baluchistan, Chitral to Murree.

**Remarks** : This is typically high altitude butterfly commonly available in Sural and Udeen at Pangi valley at altitude of above 3000 meters.

## 23. *Polyommatus eros* (Ochsenheimer, 1808)

**Common Name** : Common meadow blue

*Papilio eros* Ochsenheimer, 1808; *Schmett. Europa* **1** (2): 42.

**Diagnostic characters** : Male with wings dorsally shining blue, border dark; female wings dorsally brown with well developed marginal spots. Underside of wings pale grayish brown; underside of hind wing spot in 6 nearer to spot in 7 than to 5; underside of forewing spots in 4, 5 and 6 usually in straight line; no metallic tornal scales.

**Wing expanse** : 34-38 mm.

**Material Examined** : Sural, 1 exs, 24.VII. 2009 coll. A. K. Sidhu and party.

**Distribution** : Baluchistan, North and North western ranges of Himalayas and upto Sikkim.

*Remarks* : It is also a typically high altitude butterfly common in Sural in Pangri valley.

#### 24. *Polyommatus florenciae* Tytler

*Common Name* : The Silvery Meadow Blue.

*Lycaena florenciae* Tytler, 1926, J. Bombay nat. Hist. Soc. **31** : 583.

*Diagnostic characters* : Uppersurface of wings pale silvery blue, with border thin and black, termen with a row of more projecting equal white cilia and less projecting equal light brown cilia, dorsum hairy, undersurface greyish brown with metallic green suffusion at base, basal spot in Sc+R1 prominent, others obscure, sometimes a spot in cell, a triangular white spot end cell, a discal series of spots, a broad white dash extending beyond end cell towards termen, a marginal row of spots, all spots black to dark brown, encircled white.

*Distribution* : Baroghil Pass, Gilgit to Chitral, Hunza.

*Wing expanse* : 34-40 mm.

*Material Examined* : Sural, 1 exs, 24.VII. 2009; 7 exs, 25.VII. 2009, coll. A. K. Sidhu and party.

*Remarks* : It is high altitude butterfly common in Sural in Pangri valley. Previously this species has been recorded from various high altitude areas in Afghanistan and Pakistan and is a new record from India.

Genus : *Albulina* Tutt, 1909

*Albulina* Tutt, 1909, *Nat. Hist. Brit. Butts* **3** (6): 154.

*Type-Species* : *Papilio pheretes* Hübner

*Albulina* Tutt, 1909, *Ent. Rec.* **21** (5): 105.

*Vacciniina* Tutt, 1909, *Nat. Hist. Brit. Butts* **3** (6): 154.

*Vacciniina* Tutt, 1909, *Ent. Rec.* **21** (5): 108.

*Plebejidea* Koçak, 1983, *Priamus* **3** (1): 29.

*Patricius* Bálint, 1991, *A Janus Pannonius Múzeum Évkönyve* (Pécs) **35**: 40.

*Farsia* Zhdanko, 1992, *Zool. zhurn.* **71**: 152.

*Pamiria* Zhdanko, 1995, *Zool. zhurn.* **74** (10): 120.

*Xinjiangia* Huang & Murayama, 1988, *Nature & Insects* **23** (12): 28.

#### 25. *Albulina galathea* (Blanchard, [1844])

*Common Name* : Large green underwing.

*Lycaena galathea* Blanchard, [1844], in Jacquemont, *Voy. Inde* **4** (Zool.): 21, pl. 1, f. 5-6.

*Type-Locality* : Kashmir

*Diagnostic characters* : Male with wings dorsally dark violet blue, narrow dark border on forewing; female wings dorsally brown, plain or with orange spots on margin of hindwing and above tornus on forewing. Hindwings below metallic green in both sexes with white discal spots; underside of forewing suffused white especially towards apex.

*Wing expanse* : 32-39 mm.

*Material Examined* : Udeen, 1 ex, 20.VII. 2009, coll. A. K. Sidhu and party; Sural, 1 exs, 24.VII.2009; 5 exs, 25.VII.2009, coll. A. K. Sidhu and party.

*Distribution* : Chitral to Kumaon.

*Remarks* : This species is confined to high altitudes only and rare in Sural area of Pangi valley.

#### 26. *Albulina omphisa* (Moore, [1875])

*Common Name* : Dusky green underwing

*Polyommatus omphisa* Moore, [1875], *Proc. zool. Soc. Lond.* 1874 (4): 573, pl. 66, f. 2.

*Type-Locality* : Dras Valley, Ladak

*Diagnostic characters* : In male wings dorsally dusky violet blue shading to broad dark border; female plain brown; underside of forewing brown; underside of hindwing green upto margins, spots faint.

*Wing expanse* : 30-32 mm.

*Material Examined* : Sural, 1 ex, 24.VII. 2009 coll. A. K. Sidhu and party.

*Distribution* : Himalayas, North China.

*Remarks* : It is typically high altitude butterfly, quite rare in Sural area of Pangi valley.

#### 27. *Albulina metallica* (Felder and Felder, 1865)

*Common Name* : The Small Green Underwing.

*Lycaena metallica* Felder & Felder, 1865, *Reise Novara* (2) : 283; *Albulina metallica* Cantlie, 1963, *Lyc. Butts Revised*: 56.

*Diagnostic characters* : Upperside of wings violet blue with well defined dark brown border along termen, veins dark brownish, termen with a row each of shorter, equal white cilia and longer, equal dark brown cilia, dorsum hairy, underside greyish brown with metallic blue scales near base, a spot end cell, a linear series of prominent discal spots, all spots black, edged white both inwardly as well as outwardly;

hindwing oval, tailless, upperside violet blue, with well defined dark brown border, veins dark brownish, termen with a row each of less projecting equal dark brown cilia and more projecting equal white cilia, dorsum hairy, underside metallic green, veins brownish, a spot end cell, a discal series of spots extending from Sc+R1 to Cula, all spots white, obscure.

*Wing expanse* : 26-30 mm.

*Material Examined* : Sural, 2 exs, 25.VII. 2009 coll. A. K. Sidhu and party.

*Distribution* : Lahaul, Ladak, Chitral, Warsangol, Gilgit, Kullu, Koksar and Rupshu.

*Remarks* : A palearctic species, rare in Pangi valley.

#### 28. *Chaetoprocta odata* (Hewitson, 1865)

*Common Name* : Walnut Blue.

*Dipsas odata* Hewitson, [1865]; *Ill. diurn. Lep. Lycaenidae* (2): 66.

*Diagnostic characters* : In both sexes wings dorsally dark shining purple with basal borders and apes; ventrally wings grayish white with broad discal band, lower two spots of the band shifted in on forewing, marginal band on forewing ending in two large diffuse dark spots; hindwing tornal area yellow. Tailed.

*Wing expanse* : 32-36 mm.

*Material Examined* : Shour, 7 ex, 17.VII. 2009, 6 exs, 18.VII. 2009, coll. A. K. Sidhu and party; Purthi, 6 exs, 19.VII. 2009, coll. A. K. Sidhu and party.

*Distribution* : Chitral to Kumaon.

*Remarks* : This species is pest on walnut tree. It is quite abundant in Pangi valley especially in Shour and Purthi areas where lots of walnut tree plantations are present.

### Family SATYRIDAE

Genus : *Aulocera* Butler, 1867

*Common Name* : Banded Satyrs

*Aulocera* Butler, 1867, *Ent. mon. Mag.* 4: 121.

*Type-Species* : *Satyrus brahminus* Blanchard

#### 29. *Aulocera saraswati* (Kollar, [1844])

*Common Name* : Striated Satyr.

*Satyrus saraswati* Kollar, [1844], in Hügél, *Kaschmir und das Reich der Siek*, 4(2): 455, pl. 15.

**Diagnostic characters** : Wings dorsally dark brown with white band, the band white in colour, broad and straight, reaching dorsum on hindwing; wings below variegated with brown, more pale and grey.

**Wing expanse** : 65-75 mm.

**Material Examined** : Shour, 1 ex, 17.VII. 2009, coll. A. K. Sidhu and party.

**Distribution** : Himalayas.

**Remarks** : It is rare in Pangi Valley and is available in Udeen and Sural.

30. ***Aulocera swaha*** (Kollar, [1844])

**Common Name** : Common Satyr

*Satyrus swaha* Kollar, [1844], in Hügel, *Kaschmir und das Reich der Siek*, 4 (2): 444, pl. 14, f. 1-2

**Diagnostic characters** : Wings dorsally dark brown with white band, the band varying from white to bright yellow in colour, narrowing towards dorsum on hindwing which it never reaches except rarely in female; wings below variegated with brown, white pale and grey.

**Wing expanse** : 60-70 mm.

**Material Examined** : Udeen, 1 ex, 20.VII. 2009 coll. A. K. Sidhu and party.

**Distribution** : Himalayas.

**Remarks** : This species is commonly available in Pangi especially in areas of Sural, Sahali and Udeen.

31. ***Aulocera brahminus*** Blanchard, 1853

**Common Name** : Narrow-banded Satyr.

*Satyrus brahminus* Blanchard, 1853; *Voy. Pol. Sud.*, 4: 22, pl. 2, f. 4.

**Diagnostic characters** : Wings are more rounded and the discal band on hindwing is narrower. In male wings dorsally dusky violet blue shading to broad dark border; female plain brown; underside of forewing brown; underside of hindwing green upto margins, spots faint.

**Wing expanse** : 55-65 mm.

**Material Examined** : Sural, 2 exs, 24.VII. 2009, 4 exs, 25.VII. 2009, coll. A. K. Sidhu and party.

**Distribution** : Kashmir to Nepal.

**Remarks** : It is typically high altitude butterfly, quite rare in Sural area of Pangi valley.

Genus : *Maniola* Schrank, 1801

*Common Name* : Meadowbrowns

*Maniola* Schrank, 1801, *Fauna Boica* 1 (2): 152, 170.

*Type-Species* : *Maniola lemur* Schrank.

*Epinephele* Hübner, [1819]; *Verz. bek. Schmett.* (4): 59.

*Epinephila* ; Stephens, 1850, *List. Spec. Br. Anim. Colln Br. Mus.* 5 (Lepidoptera): 7.

*Epinephile* ; Kirby, 1871, *Syn. Cat. diurn. Lep.* : 76.

32. *Maniola davendra* Moore, 1865

*Common Name* : White Ringed Meadow Brown.

*Maniola davendra* Moore, 1865, *Proc. Zool. Soc. Lond.* 1865: 502, pl. 30, f. 7.

*Type-locality* : Spiti

*Diagnostic characters* : Upperside of forewing copper coloured with a prominent black ocellus towards the apex. Underside of hindwing with ocelli in space 1,2,5 and 6, ocelli variable; discal line dark, outwardly white margined. Male with very prominent dark band from vein 1 to vein3.

*Wing expanse* : 48-55 mm.

*Material Examined* : Pruthi, 2 exs, 17.V. 2008, coll. A. K. Sidhu and party.

*Distribution* : Baluchistan to Kumaon.

*Remarks* : This species is quite rare in Pangi Valley and is included in Wildlife (Protection) Act, 1972, Schedule II Part II.

33. *Maniola pulchra* C. & R. Felder (1867)

*Common Name* : Tawny Meadow brown

*Epinephele pulchra* C. & R. Felder, 1867, *Reise Fregatte Novara, Bd 2* (Abth. 2) (3): 491.

*Diagnostic characters* : Upperside of forewing copper colour completely overlaid with dark scales; a black spot present near apex. Underside of hindwing without ocelli, completely brown.

*Wing expanse* : 41-44 mm.

*Material Examined* : Sour, 2 exs, 17.VII. 2009, Purthi, 3 exs, 19.V. 2008, coll. A. K. Sidhu and party.

*Distribution* : Chitral to Kumaon.

**Remarks** : It is moderately available of Pangri valley and is typically a inhabitant of deodar forests.

Genus : *Pararge* Hübner, [1819]

*Pararge* Hübner, [1819]; *Verz. bek. Schmett.* (4): 59.

**Type-Species** : *Papilio aegeria* Linnaeus.

34. *Pararge eversmanni* (Eversmann, 1847)

**Common Name** : Yellow Wall

*Hipparchia eversmanni* Eversmann, 1847, *Bull. Soc. Imp. Nat. Moscou* 20 : pl. 2, f. 5-6.

**Type-Locality** : Lepsa, Kazakhstan

**Diagnostic features** : Wings dorsally yellow in colour. Upperside of forewing without pupilled ocelli, forewing with upper apex cell right angled; underside of forewing with two dark lines in the cell; vein mv quite swollen; hindwing with vein V3 from end cell.

**Material Examined** : Pruthi, 2 exs, 19.VII. 2009, coll. A. K. Sidhu and party.

**Wing expanse** : 55-60 mm.

**Distribution** : Chitral-Kashmir.

**Remarks** : This species is typically high altitude butterfly, moderately available in Pangri. Recoded as rare in previous literature (Evans, 1932; Wynter-Blyth, 1957) but was commonly available in Pruthi inhabiting among Deodar trees resting on its trunks.

Genus : *Callerebia* Butler, 1867

*Callerebia* Butler, 1867; *Ann. Mag. nat. Hist.* (3) 20 (117) : 217.

**Type-Species** : *Erebia scanda* Kollar.

35. *Callerebia kalinda* (Moore, 1865)

**Common Name** : Scarce Mountain Argus.

*Erebia kalinda* Moore, 1865, *Proc. zool. Soc. Lond.* 1865 (2): 501, pl. 30, f. 5.

**Diagnostic features** : Both sexes similar; underside of hindwing dark brown, powdered with white scales, no ocelli present, complete row of discal white spots present. Upperside of forewing with prominent post discal copper area with a single pupilled ocellus which is prominently yellow ringed. Upperside of hind wing with obscure copper coloured postdiscal patch.

*Wing expanse* : 45-50 mm.

*Material Examined* : Uddeen, 2 exs, 20.VII. 2009, coll. A. K. Sidhu and party; Sural, 1 ex, 25.07. 2009, coll. A. K. Sidhu and party.

*Distribution* : Himalayas, Chitral, Kumaon.

*Remarks* : This species is typically high altitude butterfly, moderately available in Pangri. Recoded as rare in previous literature (Evans, 1932; Wynter-Blyth, 1957) but was commonly available in a nursery of medicinal plants at Udeen. This species is included in Schedule II part II of The Wildlife (Protection Act), 1972.

### 36. *Callerebia nirmala* Moore, 1865

*Common Name* : Common Argus.

*Erebia nirmala* Moore, 1865; *Proc. zool. Soc. Lond.* **1865** (2): 501.

*Diagnostic features* : Both sexes very variable; underside of hindwing without marginal band or line; a complete row of marginal ocelli may be present or number may be reducing upto one or white spots replace some of them.

*Wing expanse* : 45-55 mm.

*Material Examined* : Shour, 2 exs, 17.VII. 2009, 2 exs, 18. VII. 2009, coll. A. K. Sidhu and party; Purthi, 2 exs, 19.VII. 2009, coll. A. K. Sidhu and party; Uddeen, 2 exs, 20.VII. 2009, coll. A. K. Sidhu and party; Sahali, 1 ex, 21. VII. 2009, coll. A. K. Sidhu and party; Saichu, 2 exs, 22.VII. 2009, coll. A. K. Sidhu and party.

*Distribution* : Afghanistan, West Himalayas, Kumaon.

*Remarks* : This species is typically high altitude butterfly, commonly available in Pangri.

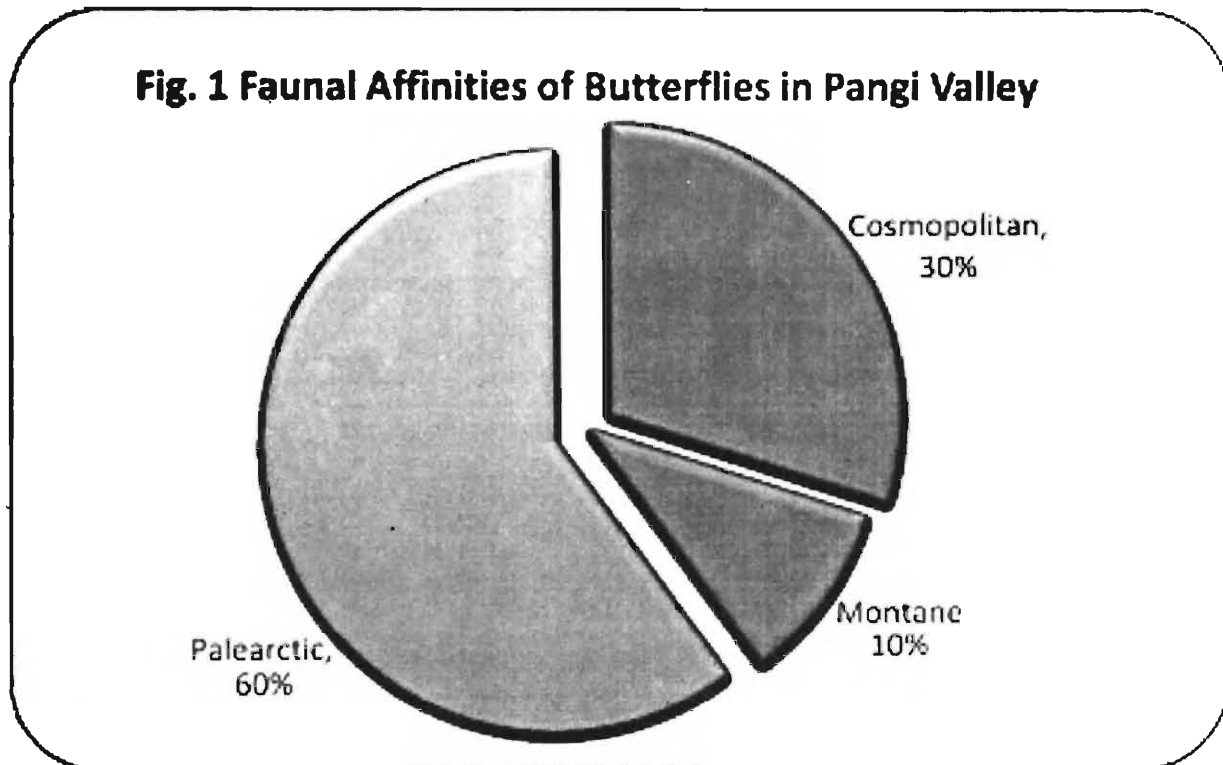
The species diversity indices of the Lepidoptera: Rhopalocera from Pangri Valley, District Chamba (HP) is presented in Table-1

**Table-1**

Diversity Indices		Values
Richness Indices	Margalef richness index (R1)	6.304
	Menhinick richness index (R2)	2.36
Diversity Indices	Simpson Index	0.9331
	Shannon Index	3.063
Evenness Indices	Sheldon's (E2)	0.6112

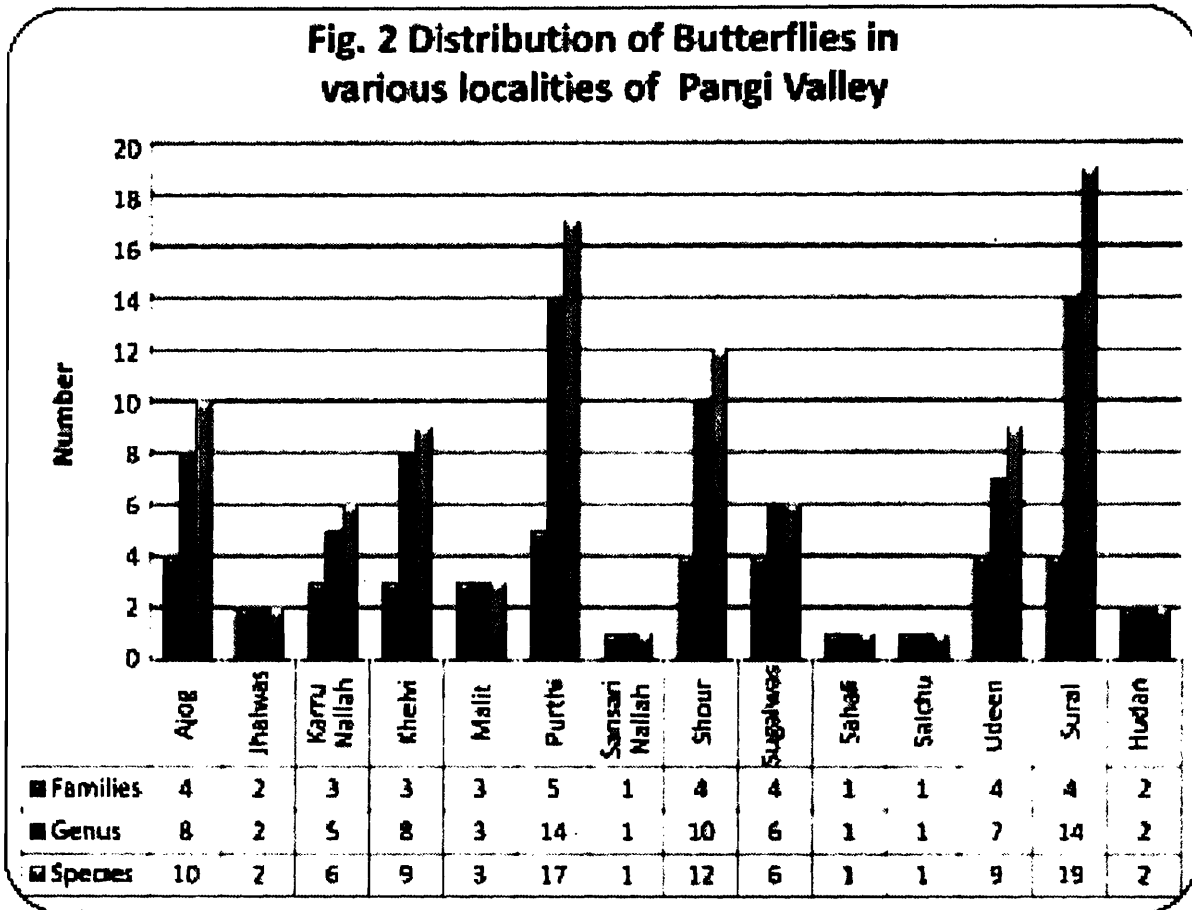
## DISCUSSION

Pangi valley is potentially an ideal refuge for wild animals because of its remoteness and low human population density and the forest cover is relatively intact. However, it is the least explored area with no data available on its faunal diversity except for some large mammals. As Pangi valley falls in the transition zone

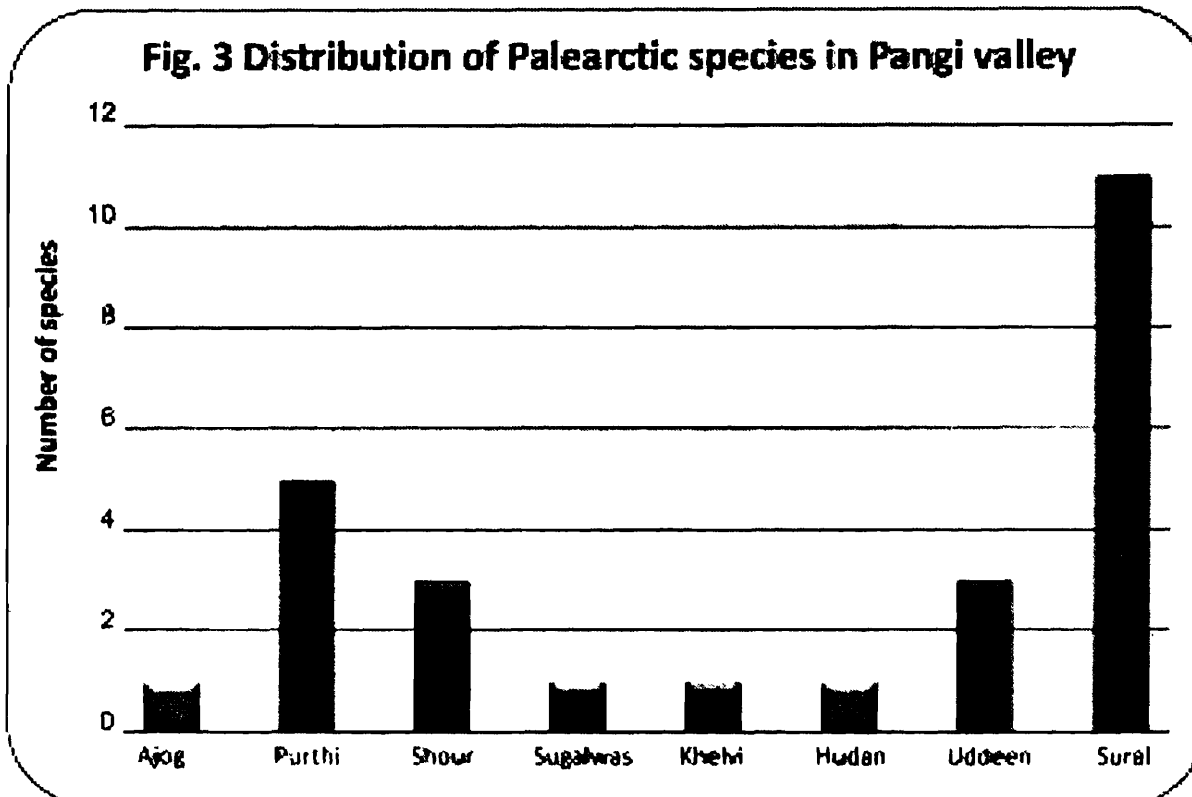


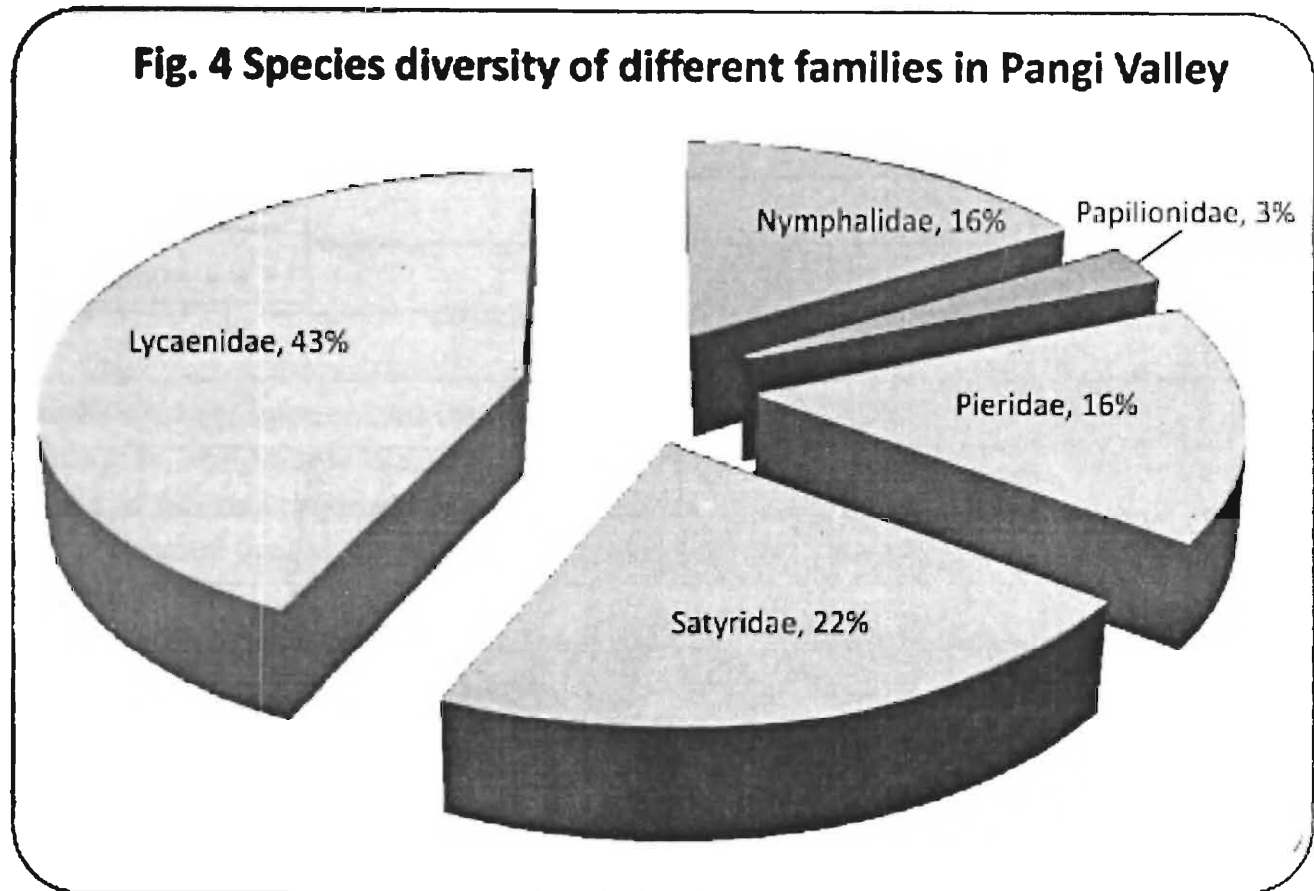
of Himalaya and trans-Himalaya, both the Palearctic and oriental elements are present in this area (Fig.1). Out of 36 species collected from Pangi valley, 17 species are typically Palearctic viz., *Euchloe daphalis*, *Pseudiphilotes vicrama*, *Satryium sassanides*, *Polyommatus icarus*, *Polyommatus eros*, *Polyommatus florenciae*, *Albulina galathea*, *Albulina omphisa*, *Albulina metallica*, *Aulocera saraswati*, *Aulocera swaha*, *Aulocera brahminus*, *Maniola devendra*, *Maniola pulchra*, *Parage eversmanni*, *Callerebia kalinda* and *Callerebia nirmala*. The remaining species are Oriental fauna. Seven species (*Pieris brassicae*, *Pieris canidia*, *Colias fieldii*, *Colias erate*, *Pontia daplidice*, *Vanessa cardui* and *Lampides boeticus*) occur throughout from the plains of North-West India up to Himalaya and are also present in Pangi Valley. The other species are montane species with altitudinal range starting from 1200 m. It has also been observed that the species diversity is more in Deodar forests and Bhojpatra forests of Purthi and Sural respectively as compared to other places (Fig. 2). The species diversity of Palearctic species has been found to be maximum at Sural valley

**Fig. 2 Distribution of Butterflies in various localities of Pangri Valley**



**Fig. 3 Distribution of Palearctic species in Pangri valley**

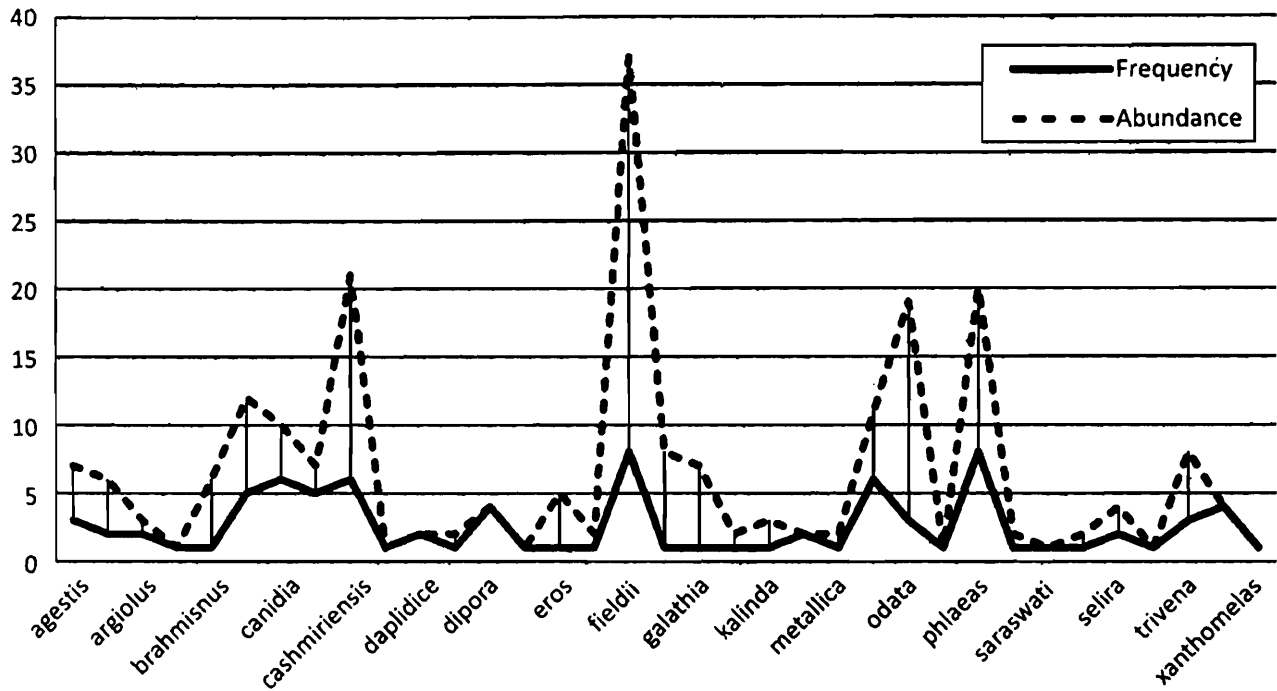




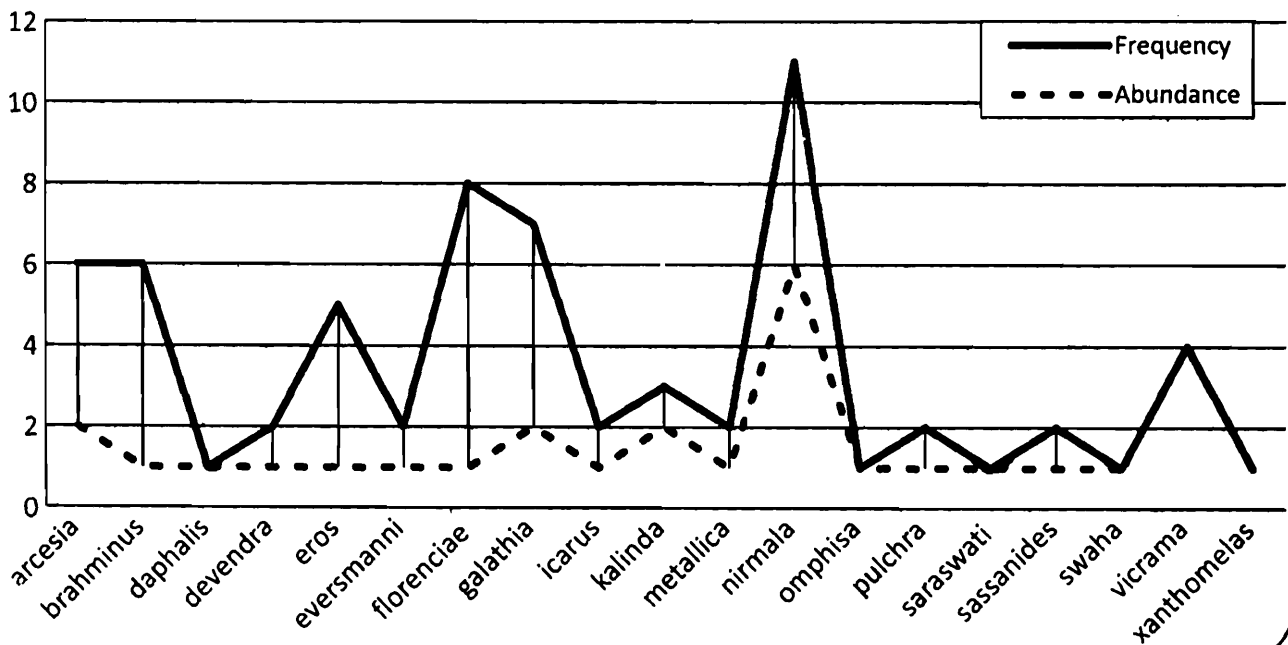
(Fig. 3) which has an altitude of 3200-3400 m ASL. Family wise, the family Lycaenidae has maximum number of species in Pangri valley followed by families Satyridae, Nymphalidae, Pieridae and Papilionidae (Fig. 4). The families Danaidae and Hesperidae could not be observed in Pangri valley. The most abundant species in Pangri valley are *Colias fieldii*, *Lycaena phalaena*, *Chaetoprocta odata*, *Vanessa cashmirensis* and *Pieris brassicae*, all of which are oriental species having a wide range of distribution (Fig. 5). Among Palaearctic species, *Callerebia nirmala*, *Polyommatus florenceae* and *Albulina galathea* are found to be abundant in this area as compared to the remaining species (Fig. 6). It has also been observed that even in Pangri Valley, the Palaearctic species have a somewhat localized distribution and not occurring frequently.

In the present study, the species richness indices R1 and R2 were calculated and the values were found high both by the Margalef index and Menhinick index (table -1), representing different taxa present in the sample. Similarly the Shannon's diversity index appears to have elevated value (3.063) exhibiting a diverse picture of the species in Pangri Valley having no ecological disturbances. Simpson's diversity index on the contrary to the Shannon's indicates a value of 1 decreasing with increasing diversity (Ludwig and Reynold, 1988). Evenness index provide an insight

**Fig. 5 Frequency and abundance of various butterfly species in Pangri Valley**



**Fig. 6 Frequency and abundance of Palearctic species in Pangri Valley**



into the relative abundance of the species in the community. Sheldon's index of evenness approaches moderate evenness of species in the valley. Among other evenness indices only sheldon's is calculated because of the statistical behavior of this index that eventually turned out to be far better than that of all other evenness indices.

### SUMMARY

In the present work thirty six species of butterflies referable to 24 genera and five families have been inventoried from the Pangi Valley. The original reference, synonymy, diagnostic characters etc. have been provided for all the species. The status of various species is assessed. The species *Polyommatus florenciae* Tytler has been recorded for the first time from India. *Maniola davendra* Moore and *Callerebia kalinda* Moore included in Wildlife (Protection) Act, 1972, have been recorded from this area. The species richness indices, biodiversity indices and Evenness indices have also been discussed and on their basis it has been concluded that the area is rich in butterfly diversity.

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## LEPIDOPTERA: HETEROCERA

AVTAR KAUR SIDHU, SIMRANJEET KAUR AND INDU SHARMA

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### INTRODUCTION

The total moth fauna of Himachal Pradesh has not been recorded so far. Walia (2005) recorded 445 species from the state. The moth diversity of Pangri valley has been studied for the first time. A total of 20 species referable to 20 genera and nine families are identified. All the species are new records to the moth fauna of Pangri Valley, though the list is far from complete. In the present surveys, the Sural and the Saichu valleys in Pangri have been found to be rich in moth diversity.

### SYSTEMATIC ACCOUNT

Family NOCTUIDAE

Genus : *Diphthera* Ochseneheimer, 1816

1816, *Diphthera* Ochseneheimer, Eur. Schmett. iv: 63.

*Type-Species* : *Diphthera orion* Linnaeus

1. *Diphthera discibrunnea* Moore , 1867

1867, *Diphthera discibrunnea* Moore, Proc. Zool. Soc. 1867: 46.

*Material examined* : Sahali, 20.VII. 2009, 3 exs, coll. A. K. Sidhu and party; Sural, 1 ex, 24.VII. 2009, coll. A. K. Sidhu and party.

*Diagnostic features* : An owlet moth with black tinged bright green head and thorax; abdomen pale. Forewing bright green in colour with a subbasal black line and black spots on antemedial line; blackish bands and linules are present near costa and margin respectively. Hindwing off white in colour with fuscous submarginal band and a cell spot present.

*Wing expanse* : 36 mm. in males and 42 mm. in females.

*Distribution* : Sikkim, Nagas.

Genus : ***Amphipyra*** Ochsenheimer, 1816

1816, *Amphipyra* Ochsenheimer, *Schmett. Eur.* 4: 70.

*Type-Species* : *Amphipyra tragopogonis* Linnaeus

1820, Pyrois Hübner, *Verz. bek. Schmett.* (13): 208.

1991, Pyramidampa Beck, *Atalanta* 22 (2/4): 218.

1991, Adamphipyra Beck, *Atalanta* 22 (2/4): 219.

1991, Tetrapyra Beck, *Atalanta* 22 (2/4): 219.

1991, Antiamphipyra Beck, *Atalanta* 22 (2/4): 220.

2. ***Amphipyra monolitha*** Guenee, 1852

1852, *Amphipyra monolitha* Guenee, *Noct.* ii : 414.

*Material examined* : Sahali, 19.VII. 2009, 2 exs; 20.VII. 2009, 1 ex; coll. A. K. Sidhu and party.

*Diagnostic features* : An owlet moth with dark brown head and thorax ; abdomen fuscous with yellowish band present on sterna. forewing with subbasal , antemedial and postmedial double lines filled with lustrous grey, black streaks on costal area outer margin silvery grey. Hindwing copper brown with pale brown costal area; a broad marginal band present underside.

*Wing expanse* : 66 mm.

*Distribution* : Dharamsala, Sikkim.

*Elsewhere* : North China, Japan.

Genus : ***Cucullia*** Schrank, 1802

1802, *Cucullia* Schrank, *Fauna Boica* ii(2): 157.

*Type-Species* : *Cucullia verbasci* Linnaeus

1821, *Callaenia* Hübner, *Verz. bek. Schmett.* (16): 246.

1882, *Epinyctis* Grote, *Can. Ent.* 14 (4) : 75.

1894, *Copicucullia* Smith, *Trans. amer. ent. Soc.* 21: 84.

3. ***Cucullia albipennis*** Hampson, 1894

1904, *Halisidota albipennis* Hampson, *Ann. Mag. Nat. Hist.* (7) 14 (81) : 166.

*Type-Locality* : Nassau

*Material Examined* : Shour, 17.VII. 2009, 2 exs; 18.VII. 2009, 1 ex, coll. A. K. Sidhu and party.

**Diagnostic Features** : A noctuid moth with white head and thorax; black band on collar; abdomen pale brownish. Forewing white with slight brown bands present; a black line present on antemedial; edge incomplete black; black marginal specks and outer streaks present. Hindwing white with outer marginal area fuscous.

**Wing Expanse** : 30 mm.

**Distribution** : Sultanpur, Kangra.

Genus : *Euscotia* Butler, 1889

1889, Butler, Ill. Het. vii : 47.

#### 4. *Euscotia inextricata* Moore , 1881

1881, *Euscotia inextricata* Moore, *Proc. Zool. Soc.* 1881 : 342.

**Material Examined** : Sahali, 19.VII. 2009, 1 ex; 20.VII.2009, 1 ex, coll. A. K. Sidhu and party.

**Diagnostic Features** : Ground color is grayish brown; black lines present on head, collar and patagia. forewing with irregularly dentate subbasal, antemedial and postmedial lines ; brown streaks present at little distance from margin. Hindwing white; little brown on outer area and margin

**Wing expanse** : 57 mm.

**Distribution** : North-West Himalayas and Nilgiris.

### Family ARCTIIDAE

Genus : *Chrysoabdia* Butler, 1877

1877, *Chrysoabdia* Butler, *Trans. Ent. Soc. Lond.* 1877: 357.

**Type species** : *Chrysoabdia viridata* Walker.

#### 5. *Chrysoabdia bivitta* (Walker, 1856)

1856, *Lithosia bivitta* Walker, *List Spec. Lepid. Insects Colln Br. Mus.* 7: 1682.

1900, *Chrysoabdia bivitta* Hampson, *Cat. Lep. Phalaenae Br. Mus.* 2 : 183, pl. 23, f. 11.

**Material Examined** : Sahali, 20.VII. 2009, 2 exs, coll. A. K. Sidhu and party; Sural 25.VII. 2009, 1 ex, coll. A. K. Sidhu and party.

**Diagnostic Features** : A tiger moth with yellow head thorax and abdomen; tegula lustrous blue. Fore wing grayish yellow with blue streaks on costal area. Patches of grayish yellow scales present on blue fascia. Hindwing paler.

**Wing Expanse** : 50-68 mm.

**Distribution** : North-West Himalayas; Sikkim; Assam; Burma.

Genus : ***Callimorpha*** Latreille, 1809

1809, *Callimorpha* Latreille, *Genera Crust. Insect.* iv; 220.

*Type-Species* : *Callimorpha dominula* Linnaeus

1939, *Panaxia* Tams, *Entomologist* 72: 73.

#### 6. ***Callimorpha principalis*** Kollar, 1844

1844, *Callimorpha principalis* Kollar, Hugel's *Kaschmir* iv : 465.

*Material examined* : Sahali, 21.VII. 2009, 4 exs, coll. A. K. Sidhu and party; Sural, 25.VII.2009, 1 ex, coll. A. K. Sidhu and party.

*Diagnostic features* : A tiger moth with crimson head ; joints on the palpi spotted black; collar black with crimson edges ;metallic green vertex on orange thorax ; crimson spots present on black legs ; abdomen crimson with lower area pale yellow. Forewing metallic green with yellow spots. Hindwing orange in colour with veins streaked black.

*Wing expanse* : 86mm.

*Distribution* : Kashmir; North-West Himalayas; Sikkim.

*Elsewhere* : Burma.

Family LASIOCAMPIDAE

Genus : ***Estigena*** Moore, 1859

1859, *Estigena* Moore, *Lep. E. I. Co.* : 426.

*Type-Species* : *Estigena pardalis* Walker

#### 7. ***Estigena pardalis*** Walker, 1873

*Estigena pardalis* Walker, 1873, *Cat.* vi : 1453.

*Material examined* : Sahali, 19.VII. 2009, 5 exs; 20.VII. 2009, 2 exs, coll. A. K. Sidhu and party.

*Diagnostic features* : Head and thorax dark brown ; abdomen pale in colour. Forewing ochreous brown crossed by four wavy dark lines ; a black mark present at the end of cell. Hind wing red brown; inner area paler and wavy lines present.

*Wing expanse* : In male 38-48 mm. and 70-76 mm. in female.

*Distribution* : Throughout India; Nagas; Andamans; Mergui.

*Elsewhere* : Arabia; Ceylon; Java.

## Family DREPANIDAE

Genus : *Habrosyne* Hübner, [1821]1821, *Habrosyne* Hübner, *Verz. bek. Schmett.* (15): 236.*Type-Species* : *Phalaena derasa* Linnaeus1845, *Gonophora* Bruand, *Mém. Soc. Emul. Doubs* 2 (2): 891921, *Cymatochrocis* Houlbert, in Oberthür, *Étud. Lépid. Comp.* 18 (2) : 45.1927, *Hannya* Matsumura, *J. Coll. Agric. Hokkaido Imp. Univ.* 19 (1): 15.1933, *Miothyátira* Matsumura, *Insecta Matsumurana*, 7: 194.1943, *Habrosynula* Bryk, *Ark. Zool.* 34 (A 11): 6.8. *Habrosyne pyritoides* Linnaeus, 17661766, *Habrosyne pyritoides* Linnaeus, *Syst. Nat.*i ; 851.*Material examined* : Sahali, 20.VII. 2009, 2 exs, coll. A. K. Sidhu and party; Sural 25.VII. 2009, 1 ex, coll. A. K. Sidhu and party.*Diagnostic features* : Head and thorax lustrous brown in color; collar with dark lines; abdomen fuscous in color. Fore wing grayish with a golden brown triangular patch boarded by white line from inner side; whitish streak present along costal margin; submarginal pale band present; cilia also pale. Hindwing fuscous.*Wing expanse* : 40-54 mm.*Distribution* : Dharamsala; Sikkim.*Elsewhere* : Europe; Burma.

## Family GEOMETRIDAE

Genus : *Stamnodes* Guenee ,(1857)1857, *Stamnodes* Guenee, *Phal.* ii ; 515.*Type-Species* : *Stamnodes pauperaria* Eversm.9. *Stamnodes pamphilata* Fabricius, 18571857, *Stamnodes pamphilata* Fabricius, *Reis. Nov.* : pl.132 , fig.34.*Material examined* : Sural 23.VII.2009, 1 ex; 24.VII.2009, 2 exs, coll. A. K. Sidhu and party.*Diagnostic features* : A geometerid moth with light orange suffused with fuscous head, thorax and abdomen Wings with basal area fuscous and chequered fuscous

white cilia ; four white spots present on costal area of forewing ; fuscous apical area and postmedial patch. Narrow fuscous margin on brown hindwing.

*Wing expanse* : In males 34 mm. and 42 mm. in females.

*Distribution* : Kulu; Thundiani; Dharamshala.

Genus : *Urapteryx* Leach, 1814

1814, *Urapteryx* Leach, *Zool. Miscell.* 1: 79.

*Type-Species* : *Phalaena sambucaria* Linnaeus

1820, *Uraptera* Billberg, *Enum. Ins. Mus. Billb.*: 88 (emend.).

1825, *Acaena* Treitschke, in Ochsenheimer, *Schmett. Eur.* 5 (2): 429.

1847, *Uropteryx* Agassiz, *Nomencl. zool.* (Index univl.): 267, 384.

1894, *Euctenurapteryx* Warren, *Novit. zool.* 1 (2): 399.

1906, *Phrudura* Swinhoe, *Ann. Mag. Nat. Hist.* (7) 17: 554.

10. *Urapteryx ebuleatea* Guenee, 1878

1878, *Urapteryx ebuleata* Guenee, *Phal.* i : 32.

*Material examined* : Sahali, 20.VII. 2009, 2 exs, coll. A. K. Sidhu and party; Sural 24.VII.2009, 1 ex, coll. A. K. Sidhu and party.

*Diagnostic features* : A geometerid moth with palpi and frons pale in males. Fuscous striations on wings but absent from costal area of forewing. Female predominantly whitish.

*Wing expanse* : 60-68 in males, 60-84 in females.

*Distribution* : North-West Himalayas; Sikkim; Khasis; Shillong.

Genus : *Abraxas* Leach, [1815]

[1815], *Abraxas* Leach, in Brewster, *Edinburgh Ency.* 9: 134.

*Type-Species* : *Phalaena grossulariata* Linnaeus

[1825], *Calospilos* Hübner, *Verz. bek. Schmett.* (20): 305.

[1879], *Potera* Moore, *Proc. zool. Soc. Lond.* 1878 (4) : 852.

1894, *Omophyseta* Warren, *Novit. zool.* 1 (2): 414.

1900, *Silabraxas* Swinhoe, *Cat. Het. Mus. Oxford* (2) : 305.

1901, *Choorechillum* Lucas, *Proc. R. Soc. Qd* 16 : 73.

1934, *Dextridens* Wehrli, *Ent. Z. Frankfr. a.M.* 48: 140.

1934, *Isostictia* Wehrli, *Ent. Z. Frankfr. a.M.* 48: 139.

1935, *Diceratodesia* Wehrli, *Ent. Rdsch.* 52: 117.

1935, *Mesohypoleuca* Wehrli, *Int. Ent. Z.* 29: 1.

1935, *Rhabdotaedoeagus* Wehrli, *Ent. Rdsch.* 52: 101.

1935, *Spinuncus* Wehrli, *Ent. Z. Frankfr. a.M.* 48: 162.

1935, *Trimeresia* Wehrli, *Ent. Rdsch.* 52: 119.

### 11. *Abraxas sylvata* (Scopoli, 1763)

1763, *Phalaena sylvata* Scopoli, *Ent. Carniolica*: 632.

*Material examined* : Sahali, 20.VII. 2009, 2 exs; 21.VII.2009, 1 ex, coll. A. K. Sidhu and party.

*Diagnostic features* : A geometrid moth with head , thorax and abdomen orange with black spots. Forewing white with olive basal patch ; darkly spotted grey patches extending to costa and sometimes below cell; postmedial series of spots with dark streaks. Hindwing wing with antemedial and postmedial series of spots and olive patch on inner margin of later.

*Wing expanse* : 42 mm.

*Distribution* : North-West Himalayas; Sikkim; Nilgiris and Penang.

*Elsewhere* : Europe; North Asia; Japan; China.

Genus : *Boarmia* Treitschke

1825, *Boarmia* Treitschke, *Eur. Schmett.* v, ii; 433

*Type-Species* : *Boarmia cinctaria* Schiff., Europe

### 12. *Boarmia subplagiata* Walker, 1890

1890, *Boarmia subplagiata*, Walker, *Cat.* xii; 319.

*Material examined* : Sahali, 20.VII. 2009, 5 exs, coll. A. K. Sidhu and party; Sural 23.VII.2009, 1 ex, coll. A. K. Sidhu and party.

*Diagnostic features* : Head fuscous brown with dark irrorations, hoary thorax and collar with black fringes. Forewing with a speck beyond cell; antemedial and postmedial black line oblique to inner margin. Hindwing with black line extending from apex to inner margin and a large white patch on outer margin; dark submarginal band underside.

*Wing expanse* : 42 mm.

*Distribution* : North-West Himalayas, Sikkim.

*Elsewhere* : Japan.

Genus: ***Biston*** Leach, 1815

1815, *Biston* Leach, in Brewster, *Edinburgh Ency.* 9: 134.

*Type-Species* : *Biston stratiaria* Hubner

### 13. ***Biston regalis*** Moore, 1888

1888, *Biston regalis* Moore, *Lep. Atk.* : 234.

*Material examined* : Sahali, 20.VII. 2009, 2 exs, coll. A. K. Sidhu and party.

*Diagnostic features* : Head, thorax and abdomen irrorated with brown and black spots with white spotted vertex, wings predominantly brown, black striations on forewing; antemedial and postmedial black line curved inwards; whitish apical and basal areas. Hind wing whitish with little brown.

*Wing expanse* : 66-74 mm. in males and 108 mm in females.

*Distribution* : North-West Himalayas; Khasis.

*Elsewhere* : Japan.

Genus: ***Gnophus*** Treitschke , 1827

1827, *Gnophus* Treitschke, *Eur. Schmett.vi*, i; 160.

*Type-Species* : *Gnophus furvatus*, Schiff

### 14. ***Gnophus eolarius*** Guenee, 1867

1867, *Gnophus eolarius*, Guenee, *Phal.* I: 294.

*Material examined* : Sahali, 20.VII. 2009, 2 exs, coll. A. K. Sidhu and party; Sural 25.VII. 2009, 1 ex, coll. A. K. Sidhu and party.

*Diagonostic features* : A geometerid moth with head, thorax and abdomen brownish grey. forewing with antemedial and postmedial dark line. upper margin and submarginal lines of hindwing pale in colour; whitish underside with broad marginal fuscous band.

*Wing expanse* : 48-60 mm.

*Distribution* : Throughout the Himalayas and Punjab, Khasis.

Genus : ***Stenorumia*** Hampson, 1895

1895, *Stenorumia* Hampson, *Fauna Br. India* (Moths) 3 : 143 (key), 182.

*Type-species* : *Rumia ablunata* Guenée

15. *Stenorumia ablunata* Guenee, 1857

1857, *Rumia ablunata* Guenée, in Boisduval & Guenée *Hist. nat. Insectes* (Spec. gén. Lépid.) 9: 110.

*Material examined* : Sahali, 19.VII. 2009, 2 exs, 20.VII. 2009, 3 exs, coll. A. K. Sidhu and party.

*Diagnostic features* : A yellowish geometrid moth, wings with reddish cilia; forewing with rufous costa and a curved line extending from costa to inner margin; hindwing with a postmedial line.

*Wing expanse* : 26 mm.

*Distribution* : North-West Himalayas.

Genus : *Crocallis*, Treitschke, 1827

1827, *Croacalis* Treitschke, *Eur. Schmett.* vi, i; 151.

*Type-Species* : *Crocallis tusciaria* Borkh

16. *Crocalis obilucaria* Moore, 1867

1867, *Crocalis obilucaria* Moore, *Proc. Zool. Soc.* 1867 :622.

*Material examined* : Sahali, 20.VII. 2009, 2 exs, coll. A. K. Sidhu and party; Sural 23.VII.2009, 1 ex, coll. A. K. Sidhu and party.

*Diagnostic features* : Head and thorax hairy, ground colour of forewing yellow with fuscous blotches; postmedial with pale outer edge and oblique near the apex.

*Wing expanse* : 42-60 mm.

*Distribution* : North-West Himalayas, Khasis.

*Elsewhere* : Japan.

Family LYMANTRIIDAE

Genus : *Euproctis* Hübner, 1819

1819, *Euproctis* Hübner, *Verz. bek. Schmett.* (10): 159.

*Type-Species* : *Euproctis chrysorrhoea* Linneaus

1828, *Porthesia* Stephens, *Ill. Br. Ent.* (Haustellata) 2 (1): 65.

1855, *Dulichia* Walker, *List Spec. Lepid. Insects Colln Br. Mus.* 4: 809.

1855, *Lopera* Walker, *List Spec. Lepid. Insects Colln Br. Mus.* 4: 919.

1858, *Urocoma* Herrich-Schäffer, *Samml. aussereurop. Schmett.* (I) 1: 82.

1984, *Sphrageidus* Maes, *Nota lepid.* 7 (1): 56.

### 17. *Euproctis vitellina* Kollar, 1844

1844, *Euproctis* Kollar, Hugel's Kashmir, iv : 471.

*Material examined* : Sahali, 20.VII. 2009, 2 exs, 21.VII. 2009, 1 ex, coll. A. K. Sidhu and party; Sural 23.VII.2009, 1 ex, coll. A. K. Sidhu and party.

*Diagnostic features* : A tussock moth with orange yellow head, thorax and abdomen. Forewing with bifurcated medial pale edged band of dark scales; submarginal black spots present. Hind wing paler. Female with anal tuft light brown.

*Wing expanse* : 38 mm. in males and 54 mm. in females.

*Distribution* : North-West Himalayas

### Family SATURNIIDAE

Genus : *Saturnia* Schrank, 1802

1802, *Saturnia* Schrank, Faun. Boica, ii, pt.2; 149.

1818, *Pavonia* Hubner, Verz :157.

1855, *Rinaca* Walker, Cat.vi: 1274.

1867, *Caligula* Moore, P.Z.S. : 684.

*Type-Species* : *Saturnia pini* Schr.

### 18. *Saturnia lindia* Moore, 1892

1892, *Saturnia lindia* Moore, Trans. Ent. Soc.third ser ii : 424.

*Material examined* : Shour, 18.VII. 2009, 2 exs, 19.VII. 2009, 1 ex, coll. A. K. Sidhu and party.

*Diagnostic features* : A crepuscular flying moth with head, thorax and abdomen grey. Forewing with concentric coloured ocellus; waved postmedia lines. Hindwing with ocellus orange from inner side; two waved postmedial lines.

*Wing expanse* : 86 mm.

*Distribution* : Kullu.

### Family SPHINGIDAE

Genus : *Deilephila* Laspeyres, 1809

1809, *Deilephila* Laspeyres, *Jenaische allg. Literatur-Zeit.* 4(240): 100.

*Type-Species* : *Sphinx elpenor*

19. *Deilephila elpenor* Linnaeus, 1758

1758, *Sphinx elpenor* Linnaeus, *Syst. Nat.* (Edn 10) 1: 491.

*Material examined* : Sahali, 20.VII. 2009, 1 exs, coll. A. K. Sidhu and party; Sural 24.VII.2009, 1 ex, coll. A. K. Sidhu and party.

*Diagnostic features* : A hawk moth with bronze green head and thorax; antennae, sides of palpus and head pink; thorax with orange from dorsal and lateral sides; abdomen with a broad bronze green subdorsal band and pink and black lateral sides. Wings rosy red from underside; forewing bronze green with crimson costal area; pink bands present from cell and apex to inner margin. Hindwing with basal area black and distal area rosy.

*Wing expanse* : 60-84 mm.

*Distribution* : East Himalayas (Khasi hills)

*Elsewhere* : China, Mongolia, North Korea, South Korea, Japan and Russia.

## Family PYRALIDAE

Genus : *Bostra* Walker, 1863

1863, *Bostra* Walker, *List Spec. Lepid. Insects Colln Br. Mus.* 27: 123.

*Type-Species* : *Bostra illusella* Walker

20. *Bostra vibicalis* Lederer, 1863

1863, *Bostra vibicalis* Lederer, *Wien. ent. Mon.* vii : 338.

*Material examined* : Sahali, 20.VII. 2009, 2 exs, coll. A. K. Sidhu and party. Sahali, 20.VII. 2009, 2 exs, coll. A. K. Sidhu and party; Sural 25.VII. 2009, 1 ex, coll. A. K. Sidhu and party.

*Diagnostic features* : A snout moth with ground colour brown and fuscous irrorations. Forewing with a dark cell spot; pale dark edged antemedial and postmedial lines. Hindwing with dark slightly curved lines start from inner margin at a single point.

*Wing expanse* : 34mm.

*Distribution* : North-West Himalayas, Bombay

*Elsewhere* : Ceylon and Rangoon.

## SUMMARY

In the present work twenty species of butterflies referable to 20 genera and 9 families have been inventoried from Pangi Valley. The original reference, synonymy,

diagnostic characters etc. have been provided for all the species. The status of various species in this area has been assessed. In the present work it has been observed that the area of Sahali and Sural are rich in moth diversity.

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Hampson, G. F. 1895, *Fauna of British India Moths-3*:1-517.  
Hampson, G. F. 1896, *Fauna of British India Moths-4*:1-595.

## INSECTA : HETEROPTERA

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### INTRODUCTION

Heteroptera is one of the suborder of the order Hemiptera. In Heteroptera wings are folded one upon another flat over the abdomen and the forewing or hemelytron usually sclerotized basally and membranous apically. Base of the rostrum not touching anterior coxae. In the comprehensive review "True bugs of the world" (Schuh and Slater 1995) estimates the number of Heteropteran species as 38000 all over the world. Based upon the search of literatures, using Zoological Records, Henry (2009) estimated worldwide the number of Heteroptera species as 42,347. The present paper recorded all the five species of Pentatomidae, Lygaeidae and Pyrrhocoridae for the first time from Himachal Pradesh.

### SYSTEMATIC ACCOUNT

Super Family PENTATOMOIDEA

Family PENTATOMIDAE

**Genus : *Zicrona* Amy. & Serv., 1843**

1843. *Zicrona* Amy. & Serv., Hem.,: 86.

1. ***Zicrona caerulea*** (Linn., 1758)

1758. *Cimex caerulea* Linn., *Syst. Nat.*, 10 (1): 445.

1843. *Zicrona illustris* : Amy. & Serv., *Hem.*,:87.

1904. *Zicrona caerulea* : Distant, *Fauna Brit. India, Rhynchota*, 1: 255.

2003. *Zicrona caerulea* : Chakraborty and Ghosh, *State Fauna Series 9 : Fauna of Sikkim*, 2: 515.

**Diagnostic Characters** : Entirely violaceous blue with the antennae and membrane black; body above finely and sparingly punctuate; scutellum a little depressed at basal angle.

*Material examined* : 1ex., Sural Nallah, Pangi, Dist. Chamba, 25.5.08, coll. A.K.Sidhu and party.

*Distribution* : Himachal Pradesh, Kashmir, Nagaland, West Bengal.

*Elsewhere* : Myanmar, Palaearctic and Oriental region.

*Remark* : This species is known to be predaceous in nature.

Genus : *Nezara* Amy. & Serv., 1843

1843. *Zicrona* Amy. & Serv., Hem.,: 143.

### 2. *Nezara viridula* (Linn., 1758)

1758. *Cimex viridula* : Linn., *Syst. Ent.*, 10: 444.

1904. *Nezara viridula* : Distant, *Fauna Brit. India, Rhynchota*, 1: 255.

2010. *Nezara viridula* : Biswas and Bal, *State Fauna Series 18 : Fauna of Uttaranchal*, 2:236.

*Diagnostic Characters* : Generally pale to dark green sometime yellowish green; body densely punctuate; antennae green with apices of third, fourth and fifth joint purplish; extremities of segmental margins of the abdomen black.

*Material examined* : 2exs., Jalwas, Pungi, Dist. Chamba, 25.5.08, coll. A.K.Sidhu and party; 1ex., Taisural, Sural vally, Dist. Chamba, 21.05.08, col. A.K.Sidhu and party; 1ex. Sural Nallah, Dist. Chamba, 22.05.08, coll. A.K.Sidhu and party.

*Distribution* : Cosmopolitan.

*Elsewhere* : Australian, Ethiopian, Nearctic, Neotropical, Oriental and Palaearctic region.

*Remarks* : There are four varieties of this widely distributed species occurs in India.

Super Family PYRRHOCOROIDEA

Family PYRRHOCORIDAE

Genus : *Euscopus* Stal, 1870

1870. *Euscopus* Stal, *En. Hem.*, 1: 102 & 106.

### 3. *Euscopus rufipes* Stal, 1870

1870. *Euscopus rufipes* Stal, *En. Hem.*, 1:106.

1902. *Euscopus rufipes* : Distant, *Fauna Brit. India, Rhynchota*, 2: 106.

1998. *Euscopus rufipes* : Sen et al., *State Fauna Series 3: Fauna of West Bengal, Part-5:433-447*.

2010. *Euscopus rufipes* : Saha and Bal, *State Fauna Series 18: Fauna of Uttarakhand, Part-2 :250*

**Diagnostic Characters** : Body black; pronotal margins, apex of scutellum, corium, lateral margins of prosternum and legs blood red in colour; a large rounded discal spot on clavus; apical angle of corium black; a rounded black spot near basal lateral margins of third, fourth and fifth segment; disc of the pronotum, scutellum and corium thickly punctuate.

**Material examined** : 3exs.,Karru Nallah, Pangi valley, Dist. Chamba, 17.05.08,coll. A.K.Sidhu.

**Distribution** : Meghalaya, Nagaland.

**Elsewhere** : Bangladesh, Java, Myanmar.

Super Family LYGOIDEA

Family LYGAEIDAE

Genus : *Elasmolomus* Stal,1872

1872. *Elasmolomus* Stal, *Ofv. Vet. Akad. Forh.*, 89:58.

4. *Elasmolomus sordidus* (Fabricius,1787)

1787. *Cimex sordidus* Fabr., *Mant.*, 2:302

1902. *Aphanus sordidus* : Distant, *Fauna Brit. India, Rhynchota*, 2:79.

1988. *Elasmolomus sordidus* : Mukhopadhyay, *Rec. Zool. Surv. India, Occ. Paper No.107*.

1994. *Elasmolomus sordidus* : Chakraborty *et al.*, *State Fauna Series 3: Fauna of West Bengal, Part-5:436*.

**Diagnostic Characters** : Head, anterior lobe of pronotum, sternum, base of scutellum jet black, posterior lobe of pronotum, scutellum, corium yellowish brown and thickly punctured with brown, membrane hyaline with a dark spot at base, legs,femora tibiae punctured with brown, two spots on the posterior margin of metasternum, lateral marginal spots to abdomen luteous.

**Material examined** : 2exs.,Taisural, Sural valley,Pangi, Dist. Chamba, 25.05.08,coll. A.K.Sidhu.

**Distribution** : Assam, Bihar, Maharashtra, Meghalaya, Nagaland, West Bengal.

**Elsewhere** : China, Myanmar, Sri Lanka.

Genus : *Spilostethus* Stal,1868

1868. *Spilostethus* Stal, *Kongl. Svensk. Vet. Acad. Handl.*, 7(11): 72.

5. *Spilostethus pandurus militaris* (Fabricius,1775)

1775. *Cimex militaris* Fabricius, *Syst. Ent.*,:117.

1912. *Spilostethus pandurus* : Oshamin, *Cat.Hem.*, 1:27.

1998. *Spilostethus pandurus militaris* : Mukhopadhaya, *Rec. Zool.Surv. India. Occ. Paper No.* 107:15.
2010. *Spilostethus pandurus militaris* : Saha and Bal, *State Fauna Series 18: Fauna of Uttarakhand, Part-2* :223.

*Diagnostic Characters* : Pale blood reddish; apex of head, a spot at inner margin of eyes, antennae, rostrum, pronotum, scutellum, a small spot near apex of clavus, a transverse fascia to pronotum, prosternum, abdominal segmental margins, stigmata spots and legs black, membrane brownish yellow with some black basal veins and usually having a white spot at base;rostrum reaching the intermediate coxae; femora spined beneath.

*Material examined* : 2exs.,Taisural, Sural valley,Pangri, Dist. Chamba, 25.05.08,coll. A.K.Sidhu.

*Distribution* : Karnataka, Maharashtra,Punjab,Uttaranchal Meghalaya, Nagaland, West Bengal.

*Elsewhere* : Australia, Myanmar, South Africa.

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## REPTILIA

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### INTRODUCTION

Reptiles constitute a significant portion of vertebrate fauna of Himachal Pradesh comprising 55 species in 41 genera and 14 families (Saikia *et al.* 2007, Saikia *et al.* 2010a, b). However, considering the significant lack of field studies on these often ignored creatures, our present understanding of diversity and distribution of reptiles in Himachal Pradesh is far from satisfactory. Pangri valley in Chamba district of Himachal Pradesh by virtue of its rugged terrain and remote location is one of the least faunistically explored regions of the state and no previous information on reptile fauna of the area is available. With a view of bridging this information gap, Zoological Survey of India, Solan initiated a series of faunistic surveys to the region from 2007 to 2009. The present account is a partial outcome of this and deals with the reptile species recorded during the three field surveys to the valley. The inventory comprises of seven species in seven genera and four families. Interestingly, many people in the valley reported the presence of a "white snake" in the area. On showing colour plates, some pointed it out as the eastern cliff racer *Coluber ladacensis*. Considering the proximity of the region with Jammu & Kashmir from where the snake is known, its occurrence in Pangri can not be ruled out although definitive evidence is needed to establish it. Apparently, the reptile diversity is not very high in the area although, it is expected that the species count will rise to some extent with intensive surveys in suitable seasons.

### METHODOLOGY

The study was carried out as part of the general faunistic survey plan of High Altitude Regional Centre, Zoological Survey of India, Solan. Three field surveys of 10-15 days duration were carried out during Aug, 2007, May, 2008 and July, 2009. Visual encounter methodology (Heyer *et al.* 1994) was employed for most part, supplemented by opportunistic observations. Since, reptilian survey is constrained by weather and season, indirect evidences are relied upon to a great extent for

inventorying. This involved questioning of villagers regarding presence of prospective species and showing a coloured photographic guide on snakes. Information thus obtained from them was cross checked and only those appeared to be reliable are included. The scientific and common names followed are after Das (1997, 2003).

## SYSTEMATIC ACCOUNT

### Family AGAMIDAE

#### 1. *Laudakia tuberculata* (Hardwicke and Gray, 1827)

*Common Name* : Kashmir Rock Agama

1827. *Agama tuberculata* Hardwicke and Gray, *Zool. Journ.* 3: p. 218 (type loc. Bengal)

1935. *Agama tuberculata*, Smith, *Fauna Brit. Ind.* 2: p. 214

2003. *Laudakia tuberculata*, Das, *J. Bombay Nat. Hist. Soc.* 100(1&2): p. 461

*Diagnostic characters* : A sturdy agamid with flattened head and body. It reaches a maximum SVL length of 128mm and tail length is 1.6 to 1.9 times the SVL (Minton, 1966). Normal colour is brownish grey to grayish black with whitish dorsal spots although it is extremely variable. Males have typical bluish tinge on the dorsum. Upper head scales are unequal, convex, smooth or keeled. Dorsum with keeled enlarged scales which are as large as ventral scales of the body. Flanks have few enlarged scales. An elongated patch of enlarged scales are present on the belly.

*Material examined* : Three subadult and two adult individual examined but not retained

*Distribution* : Western Himalaya (Kashmir, Uttaranchal and Himachal Pradesh). In Himachal Pradesh, throughout the state including the Trans-Himalayan districts of Lahaul & Spiti and Kinnaur up to an altitude of 3650m (Saikia *et. al.* 2007)

*Ecological note* : This is the most commonly observed reptile throughout Pangi valley region. It was seen from May to August at most places basking on rocks up to an altitude of 2800m. Two large male individual examined had a total length over 45cm. Almost all the large individuals observed had regenerated tails as discernable from the colour variations.

### Family SCINCIDAE

#### 2. *Asymblepharus himalayanus* (Gunther, 1864)

*Common Name* : Himalayan Ground Skink

1864. *Eumeces himalayanus* Gunther, *Rept. Brit. Ind.*: 86 (Western Himalayas)

1872. *Mococa himalayana* Stoliczka, *J. Asiat. Soc. Beng*: 46 (Wangu valley, Kashmir)

1935. *Leiolopisma himalayanum* Smith, *Fauna Brit. Ind.* 2: 299

**Diagnostic characters** : This is a small skink with a glossy bronze dorsum with numerous light and dark spots, many individuals have dark brown vertebral stripe. Lateral stripes of brass colour present and immediately below this runs a dark brown stripe from snout to proximal parts of the tail. This lower stripe is bordered by a narrow irregular white stripe edged with black. Venter is bluish white. The lower eyelid has a semitransparent disc. Supranasal absent, four supraoculars, six to seven upper labials. Snout bluntly pointed and ear opening oval, smaller than eye. Body scales smooth, 24-30 rows in the midbody. The four median pairs of dorsal scales are twice as large as the lateral scales. A pair of very large preanal scales present.

**Material examined** : 4, Sural, Pangi Valley, Coll. U. Saikia, 12.viii.07

**Distribution** : Kashmir, Himachal Pradesh and Utarakhand. In Himachal Pradesh, through out the state including trans-Himalaya up to an altitude of 4250m (Saikia *et. al.* 2007).

**Ecological note** : A very common skink in Pangi valley and observed in a variety of habitat like underneath grass, small bushes, under stone and in dry sandy streambanks. At Sural, this skink has been observed to ascend up an altitude of 3500m, mostly hiding beneath small rocks in grassy slopes and digging in loose sand in dry streambanks. Specimens caught during August had bluish white venter till the level of the forelimbs and bright orange coloration from fore limbs up to mid tail length or tail tip.

## Family COLUBRIDAE

### 3. *Ptyas mucosa* (Linnaeus, 1758)

**Common Name** : Indian Rat Snake

1758. *Coluber mucosus* Linnaeus, *Mus. Ad. Frid.* i: p. 37, pl. 23 and *Syst. Nat. Ed.* 10, p. 226 (India: Stockholm)

1864. *Ptyas mucosus*, Gunther, *Rept. Brit. Ind.*: p. 249

1943. *Ptyas mucosus*, Smith, *Fauna Brit. Ind.* 3: p. 159

2003. *Ptyas mucosa*, Das, *J. Bombay Nat. Hist. Soc.* 100(1&2): p. 480

**Diagnostic characters** : A large slender snake that reaches a maximum length of 3500mm (Whitaker and Captain, 2004). Head distinctly broader than neck. Body colour variable from olive, brown, grey or black. Venter is cream coloured or dirty white with dark cross bars. Midbody scale rows 17, 18 or 19: 17 or 16:14 (Whitaker and Captain, 2004), smooth or keeled. Anal scale divided, subcaudals 100-146, paired. Normally 2-3 temporals present.

*Material examined* : Nil, included on the basis of secondary evidence

*Distribution* : Throughout India. In Himachal Pradesh, throughout the state except Trans-Himalaya up to an altitude of 3975m (Saikia *et. al.* 2007)

*Remarks* : Not observed in the field, but many of the local informants could identify the snake from coloured photographs and reported to be common in the area. Common in all parts of range (Whitaker & Captain, 2004)

#### 4. *Orthriophis hodgsonii* (Gunther, 1860)

*Common Name* : Himalayan Trinket Snake

1860. *Spilotes hodgsonii* Gunther *Proc. Zool. Soc.* : 146 (Nepal)

1890. *Coluber hodgsonii* Boulenger *Fauna Brti. Ind.* : 332

2003. *Orthriophis hodsonii* Das *J. Bomby. Nat. Hist. Soc.* 100(1&2)

*Diagnostic characters* : A slender bodied and smooth snake attaining adult length of 120-160cm. Yellowish to olive brown back. Some scales edged with black or white which grouped together form cross bands or mesh like pattern. A dark long blotch often present on the head. Venter is bright yellow. Outer edges of belly scales are distinctly keeled edged with black, underside of tail is blackish. Scales in 21 or 23: 23: 17 rows, smooth or feebly keeled. Ventrals 228-27. Anal scales divided and subcaudals 72-92 paired (Whitaker and Captain, 2004)

*Material examined* : None, observed in the field

*Distribution* : Jammu & Kashmir, Himachal Pradesh, Utarakhand, Northern Punjab, possibly Bihar and Uttar Pradesh, West Bengal, Sikkim and Meghalaya (Whitaker and Captain, 2004). In Himachal Pradesh, throughout the state possibly including the trans-Himalaya (Saikia *et. al.* 2007)

*Ecological note* : The snake was observed while crossing a road near agricultural field at Shaur. Locals reported the snake as common in the area. Personal observations suggest that it is common in many parts of Himachal Pradesh and often found in close vicinity of human settlement. A large individual caught in Solan was very docile and rarely attempted to bite when handled.

#### 5. *Boiga trigonatus* (Schneider, 1802)

*Common Name* : Common Cat Snake

1802. *Coluber trigonatus* Schneider, in *Bechst. Transl. Lacep.* iv p. 256 (Vizagapatam)

1943. *Boiga trigoinata* Smith *Fauna Brit Ind.*: p349

2003. *Boiga trigonatus* Das *J. Bomby. Nat. Hist. Soc.* 100(1&2)

*Diagnostic characters* : A slender snake with a distinctly broad triangular head. Tail very long. Eyes large with a vertical pupil. Dorsally light brown with darker

**zigzag markings.** Top of the head has a distinct Y shaped mark. Underside whitish with small black spots on the edges. Dorsal scales smooth, in 21:21:15 oblique rows. Ventrals 206-256, anals entire, subcaudals paired (Whitaker and Captain, 2004)

*Material examined* : None, a killed specimen observed in the field.

*Distribution* : Throughout mainland India (Whitaker and Captain, 2004); In Himachal Pradesh, Solan and Chamba districts up to an altitude of 2450m (Saikia *et al.* 2007).

*Remarks* : Because of nocturnal nature, this snake is hardly encountered. One specimen killed by local people was seen between Shaur and Purthi. Most of the people interviewed could not identify the snake to be present in the area. Abundance status in the valley unclear but is reported to be common throughout the other parts of the range (Whitaker and Captain, 2004)

### 6. *Amphiesma platyceps* (Blyth, 1854)

*Common Name* : Himalayan Keelback

1854. *Tropidonotus platyceps* Blyth, *J. Asiat. Soc. Bengal* xxiii, p. 297 (Assam and Drjeeling)

1943. *Natrix platyceps* Smith *Fauna Brit. Ind.* p. 305

2003. *Amphiesma platyceps* Das *J. Bomby. Nat. Hist. Soc.* 100(1&2)

*Diagnostic characters* : A slender bodied snake with a maximum length of 88cm. Dorsal colour olive brown and yellowish below with a variable pattern of spots or lines. Two white black-edged streaks on each side of the head, an elliptic mark on the head or a black line from eye to mouth is often present (Smith, 1943). Scales in 19:19:17rows and weakly keeled (Whitaker and Captain, 2004).

*Material examined* : None, a specimen observed in the field.

*Distribution* : Himalayan region from Jammu and Kashmir to Assam (Whitaker and Captain, 2004). In Himachal Pradesh, Shimla and Chamba district (pers. obs.)

*Observation* : A juvenile specimen was observed near Purthi (c. 2400m). It had a black edged white line running between the head and neck and two small u-shaped white marks on the parietal scales. Dorsum was speckled with small black spots.

## Family VIPERIDAE

### 7. *Gloydius himalayanus* (Gunther, 1864)

*Common Name* : Himalayan Pit viper

1864. *Halys himalayanus* Gunther *Rept. Brit. Ind.* p. 393 (Garhwal, Western Himalayas)

1943. *Ancistrodon himalayanus* Smith *Fauna Brit Ind.* p. 495

2003. *Gloydius himalayanus* Das *J. Bomby. Nat. Hist. Soc.* 100(1&2)

*Diagnostic characters* : A heavy and stout snake reaching about 60 cm in length, tail very short. Scales strongly keeled and those over forehead are very large. Heat sensitive pit between nostril and eye. Dorsal coloration is drab brown with grayish tinge and wavy dark brown cross bars. There is a dark line from eye to the angle of mouth. Underside dirty white heavily mottled with shades of brown. Dorsal scales in 20-22: 17-23: 15-17 rows, ventrals 140-175, anals entire, Supralabials 5-7(Whitaker and Captain, 2004).

*Material examined* : None, included on the basis of secondary evidence.

*Distribution* : Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Northern Punjab and Uttar Pradesh (Whitaker and Captain, 2004). In Himachal Pradesh, Solan, Shimla and Kangra districts (Saikia *et al.* 2007).The snake was reported at an altitude of 4850m near Dharamsala glacier in Kangra which is probably the highest altitude attained by a snake (Whitaker and Captain, 2004)

*Remarks* : Included on the basis of reliable reports of locals. A few informants could positively identify the snake and insisted that it is not Russell's viper and is not uncommon in the area.

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## **AVES**

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### **INTRODUCTION**

Comprising over 600 species, the avifauna of Himachal Pradesh represents an impressive 50% of the total species recorded from India (Rahmani, 2004) in an area that constitutes barely 1.76% of the entire geographical spread of the country. Himachal Pradesh represents an overlapping zone of three avifaunal realms-the Indo-Malayan, the Palaearctic and the Afrotropical regions (Besten, 2004) and this union significantly contributes to the remarkable avifaunal diversity of the state. Besides, topographical variations from hot plains to lofty mountains, each harboring unique sets of biotic community is another major contributing factor to this diversity. Further, many large natural and man made wetlands in the state also harbour an array of Wetland associated birds besides serving as wintering grounds for a large number of migratory birds. Besides, the Western Himalaya has been recognized as one of the endemic species areas in the world for birds (Besten, 2004) and a number of endemic species like Cheer Pheasant, Western Tragopan etc. occur in this area.

Ornithological study in Himachal Pradesh started during the erstwhile British regime which made Shimla their summer capital and also other popular hill stations like Dalhousie, Dharamsala and Kullu. The earliest report on the avifauna of Himachal Pradesh can be traced back to Theobald (1862) who travelled from Shimla to the Spiti valley and Chomoriri (Tshomoriri) Lake in 1861 and made observations on the birds encountered en route. Afterwards, a number of expeditions were undertaken by different workers like Tytler (1868) who recorded bird species during a march from Shimla to Mussoorie. Dodsworth (1910-14) made detailed observation on the avifauna of Shimla and adjacent areas. Englishman Hugh Whistler published an account of birds of Kangra and Kullu districts in erstwhile Punjab state (Whistler, 1926a,b). From (1946) studied avifauna of Mahasu-Narkanda Baghi area, and perhaps, it was Jones (1947a, b, 1948) who made available a comprehensive account on pre-independence records of birds from Shimla Hills and presented a list of as many as 199 species.

Ali and Ripley (1983) in their monumental work presented a summarized account of the avifauna of Himachal Pradesh particularly from areas like Shimla, Dalhousie,

Dharamshala etc. Subsequently, many studies were conducted on various aspects of avifauna of the State like geographical and altitudinal distribution pattern (Narang, 1989; Mahabal, 1992 a,b, 1996; Mahabal and Mukherjee, 1991; Mahabal and Sharma, 1992; Mahabal, 2005; Suyal, 1992; Thakur *et. al.*, 2008), seasonal changes in diversity (Sharma and Mahabal, 1997) etc. Avifauna of conservation areas like Wildlife Sanctuaries and National Parks of Himachal Pradesh has also been studied to some extent by Pandey (1989a,b), Mahabal (2000a,b), Mahabal and Sharma (1993), Thakur *et. al.* (2002), Bhargav *et. al.* (2007), Tak and Paliwal (2008), Sharma *et. al.* (2009) etc.

Pangri valley, a remote and rugged region in Chamba district of Himachal Pradesh, situated in the transition zone between Himalaya and Trans-Himalaya, exhibit an inter mix of floral and faunal elements from both the regions and also is one of the most faunistically diverse area of the Western Himalaya (Bhatnagar *et. al.* 2008). Due to remoteness and low population pressure, forest cover in Pangri valley is still relatively intact and is potentially a good refuge for wild animals. However, reports of fauna from this important region is very few and scattered and that on avifauna is probably non existent except for the 62 species reported from the region by the present author (Saikia *et. al.*, 2009). The present account includes a few additional species encountered during following surveys and enumerates a total of 75 species in 20 families.

As per the approved survey programme, the author visited the area thrice during August 2007 and May 2008 and July, 2009. Each survey was approximately of two weeks durations and areas namely Shaur, Purthi, Seichu, Sahli, Killar, Hudan valley, Dharwas, Sansari Nallah, Sural were covered. Bird species were recorded using a pair of 10x50 binoculars mostly in the morning between 6-9hrs. Any opportunistic sighting was also noted. Field identification was done following Kazmierczak and van Perlo (2000) and Grewal *et. al.* 2002. A few species (marked with asterisk) are included on the basis of reliable secondary evidence (call, reports by locals etc.). The common names in the text follow Manakadan and Pittie (2001). Abundance status mentioned is based on frequency of sightings during the whole survey period and do not necessarily indicate actual abundance in the area.

It is important to mention that the inventory presented here is based on surveys conducted only in Summer and Monsoon seasons. Hence, species count is very likely to go up if other seasons could be covered. Some local residents also informed that a few “duck” species appear in the area (probably en route to lower areas during winter migration) especially in Sural valley during winter. Avifauna of the valley also holds some endemic Palaearctic elements namely Black headed Jay, Himalayan Pied Woodpecker and Orange Bullfinch. Although not documented during field study, local inhabitants reported the presence of Cheer Pheasant, another Palearctic relict species (Ripley, 1961). Pangri valley also potentially holds an ideal breeding population of globally threatened Western Tragopan and Chir Pheasant. Thus, from avifaunal point of view, Pangri region is a priority area for conservation in Himachal Pradesh and there is a pressing need for effective and scientific management of the region. It is hoped that the recent developmental activities do not come at the cost of fragile ecology of the region and the valley remains as fascinating and flourishing as ever.

## Systematic list of bird species recorded from Pangri Valley, Chamba district.

Sl. No.	Common Name	Scientific Name	Abundance status	Observed Months
1	Black Kite	<b>Family: Accipitridae</b> <i>Milvus migrans</i> (Boddaert)	Commonly observed	May, August
2	Mountain Hawk Eagle	<i>Spizaetus nipalensis</i> (Hodgson)	Uncommon	May
3	Black Eagle	<i>Ictinaetus malayensis</i> (Temminck)	Uncommon	May, August
4	Himalayan Griffon	<i>Gyps himalayensis</i> Hume	Common	May, August
5	Egyptian vulture	<i>Neophron percnopterus</i> (Linnaeus)	Common	May, August
6	Lamergier	<i>Gypaetus barbatus</i>  (Linnaeus)	Uncommon	May
7	Common kestrel	<b>Family: Falconidae</b> <i>Falco tinnunculus</i> Linnaeus	Very common	May, August
8	Chukar	<b>Family: Phasianidae</b> <i>Alectoris chukar</i> (Gray)	Common, call often heard	May, August
9	Hill Partridge	<i>Arborophila torqueolan</i> (Valenciennes)	Common	May
10	Black francolin	<i>Francolinus francolinus</i> (Linnaeus)	Uncommon	August
11	Western Tragopan*	<i>Tragopan melanocephalus</i> (Gray)	Secondary information, probably  Uncommon	—  —
12	Cheer Pheasant*	<i>Catreus wallichii</i> (Hardwicke)	Secondary information, possibly common in suitable areas	—

Table contd.

Sl. No.	Common Name	Scientific Name	Abundance status	Observed Months
13	Himalayan snowcock*	<i>Tetraogallus himalayensis</i> Gary	Secondary information, possibly common in upper reaches	—
14	Eurasian Cuckoo	<b>Family: Cuculidae</b> <i>Cuculus canorus</i> (Linnaeus)	Uncommon	July
15	Blue Rock Pigeon	<b>Family: Columbidae</b> <i>Columba livia</i> Gmelin	Very common	May, July, August
16	Hill Pigeon	<i>Columba rupestris</i> Pallas	Very common	May, July, August
17	Sow Pigeon	<i>Columba leuconota</i> Vigors	Common	May
18	Oriental Turtle Dove	<i>Streptopelia orientalis</i> (Latham)	Very common	May, July, August
19	Common Swift	<b>Family: Apodidae</b> <i>Apus apus</i> (Linnaeus)	Common	May
20	Fork-tailed Swift	<i>Apus pacificus</i> (Latham)	Common	May
21	Himalayan Swiftlet	<i>Collocalia brevirostris</i> (Horsfield)	Common	May
22	Alpine swift	<i>Tachymarptis melba</i>	Common	July
23	White-throated Needletail	<i>Hirundapus caudacutus</i>	Uncommon	July
24	Hoopoe	<b>Family: Upupidae</b> <i>Upupa epops</i> Linnaeus	Very common	May, July, August
25	Himalayan Woodpecker	<b>Family: Picidae</b> <i>Dendrocops himalayensis</i> (Jardine & Selby)	Very common	May, July, August

Table contd.

Sl. No.	Common Name	Scientific Name	Abundance status	Observed Months
26	Brown-fronted Woodpecker	<i>Dendrocops auriceps</i> (Vigors)	Common	August
27	Scaly-bellied Woodpecker	<i>Picus squamatus</i> Vigors	Very common	May, July, August
28	Bay-baked Shrike	<b>Family: Lanidae</b> <i>Lanius vittatus</i> Valenciennes	Uncommon	May
29	Long-tailed Shrike	<i>Lanius schach</i> Linnaeus	Very common	May, July, August
30	Red-billed Chough	<b>Family: Corvidae</b> <i>Pyrrhocorax</i> <i>pyrrhocorax</i> (Linnaeus)	Common	May, July, August
31	Yellow-billed Chough	<i>Pyrrhocorax graculus</i> (Linnaeus)	Common	May, July, August
32	Large-billed Crow	<i>Corvus macrorhynchos</i> Wagler	Very common	May, July, August
33	Black-headed Jay	<i>Garrulus lanceolatus</i> Vigors	Uncommon	May
34	Scarlet minivet	<b>Family: Campephagidae</b> <i>Pericrocotus flammeus</i> (Forster)	Common	May
35	Slaty blue Flycatcher	<b>Family: Muscicapidae</b> <i>Ficedula tricolor</i> (Hodgson)	Common	May
36	Ultramarine Flycatcher	<i>Ficedula superciliaris</i> (Jerdon)	Common	May, July, August
37	Asian brown Flycatcher	<i>Muscicapa dauurica</i> Pallas	Uncommon	July
38	Dark-sided Flycatcher	<i>Muscicapa sibirica</i> Gmelin	Uncommon	July

Table contd.

Sl. No.	Common Name	Scientific Name	Abundance status	Observed Months
39	Rusty-tailed Flycatcher	<i>Muscicapa ruficauda</i> Swainson	Common	May, July, August
40	Lesser Whitethroat	<i>Sylvia curruca</i> (Linnaeus)	Seen once	May
41	Goldcrest	<i>Regulus regulus</i> (Linnaeus)	Common	May, August
42	Large-billed Leaf Warbler	<i>Phylloscopus magnirostris</i> Blyth	Uncommon	May
43	Greenish Warbler	<i>Phylloscopus trochiloides</i> (Sundevall)	Common	May, August
44	Lemon-rumped Warbler	<i>Phylloscopus chloronatus</i> (Gray & Gray)	Uncommon	May
45	Mountain Chiffchaff	<i>Phylloscopus sindianus</i> Brooks, W. E. 1880	Uncommon	July
46	Western crowned Warbler	<i>Phylloscopus occipitalis</i> (Blyth, 1845)	Uncommon	July
47	Streaked Laughingthrush	<i>Garrulax lineatus</i> (Vigors)	Very common	May, July, August
48	Blue Whistling Thrush	<i>Myophonus caeruleus</i> (Scopoli)	Very common	May, July, August
49	Little Forktail	<i>Enicurus scouleri</i> (Vigors)	Common	May
50	Pied Bushchat	<i>Saxicola caprata</i> (Linnaeus)	Common	May, July, August
51	Common Stonechat	<i>Saxicola torquata</i> (Linnaeus)	Very common	May, July, August
52	White-capped Redstart	<i>Chaimarrornis leucocephalus</i> (Vigors)	Very common	May, July, August
53	Plumbeous Redstart	<i>Rhyacornis fuliginosus</i> (Vigors)	Very common	May, July, August

Table contd.

Sl. No.	Common Name	Scientific Name	Abundance status	Observed Months
54	Orange-flanked Bush Robin	<i>Tarsiger cyannurus</i> (Pallas)	Uncommon	May
55	Brown Dipper	<b>Family: Cinclidae</b> <i>Cinclus cinclus</i> (Linnaeus)	Common	May, August
56	Great tit	<b>Family: Paridae</b> <i>Parus major</i> Linnaeus	Very common	May, July, August
57	Spot-winged Tit	<i>Parus melanolophus</i> Vigors	Very common	May, July, August
58	Rufous-naped Tit	<i>Parus rufonuchalis</i> Blyth	Uncommon	May
59	Black-lored Tit	<i>Parus xanthogenys</i> Vigors	Uncommon	July
60	Green-backed Tit	<i>Parus monticolus</i> Vigors	Very common	May, July, August
61	Common Rosefinch	<b>Family: Fringillidae</b> <i>Carpodacus erythrinus</i> (Pallas)	Very common	May, July, August
62	Dark-breasted Rosefinch	<i>Carpodacus nipalensis</i> (Hodgson)	uncommon	May
63	Streaked Rosefinch	<i>Carpodacus rubicilloides</i> Przewalski, 1876	Uncommon	July
64	Orange Bullfinch	<i>Pyrrhula aurantiaca</i> Gould	Uncommon	May
65	Yellow-breasted Greenfinch	<i>Carduelis spinoides</i> Vigors	Common	May, July, August
66	European Goldfinch	<i>Carduelis carduelis</i> (Linnaeus)	Very common	May, July, August

Table contd.

Sl. No.	Common Name	Scientific Name	Abundance status	Observed Months
67	Wallcreeper	<b>Family: Sittidae</b> <i>Tichodroma muraria</i> (Linnaeus)	Common	May, August
68	White-tailed Nuthatch	<i>Sitta himalayensis</i> Jardine & Selby	Uncommon	August
69	Eurasian Treecreeper	<b>Family: Certhiidae</b> <i>Certhia familiaris</i> Linnaeus	Very common	May, July, August
70	Grey Wagtail	<b>Family: Motacillidae</b> <i>Motacilla cinerea</i> Tunstall	Very common	May, July, August
71	Yellow Wagtail	<i>Motacilla flava</i> Linnaeus	Very common	May, July, August
72	House sparrow	<b>Family: Passeridae</b> <i>Passer domesticus</i> (Linnaeus)	Very common	May, July, August
73	Russet sparrow	<i>Passer rutilans</i> Temminck	Very common	May, July, August
74	Rock Bunting	<b>Family: Emberizidae</b> <i>Emberiza cia</i> Linnaeus	Very common	May, July, August
75	White-capped Bunting	<i>Emberiza stewarti</i> (Blyth)	Uncommon	May

### SUMMARY

An avifaunal inventory of Pangi Valley, Chamba district of Himachal Pradesh comprising 75 species of birds in 20 families recorded during three field surveys is presented. Being positioned in the transition zone between the Himalaya and the Trans-Himalaya, the valley is faunistically diverse which is also apparent with respect to avifauna. While most of the bird species occurring in the valley are of Oriental affinity, some endemic Palearctic elements like Black-headed Jay, Himalayan Pied

Woodpecker, Orange Bullfinch, Cheer Pheasant are also present in the area. The present inventory is a product of time constraint surveys and it is expected that the species inventory will increase significantly if surveys covering all the seasons could be conducted.

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## **MAMMALIA**

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### **INTRODUCTION**

The Pangri region, a remote and rugged valley of River Chandrabhaga in Chamba district of Himachal Pradesh and sandwiched between the Pir Panjal and the mighty Zhanskar mountain ranges represents a transitional area to the Trans-Himalayan region. Being in the transition zone between Himalaya and Trans-Himalaya, Pangri valley exhibits an inter mix of floral and faunal elements from both the regions and also is one of the most faunistically diverse area of the western Himalaya (Bhatnagar *et. al.* 2008). Himalayan Thar, Grey Goral, Serow etc. are some of the representative Himalayan species while Asiatic ibex, Bharal, Long-tailed marmot etc. are some of the Trans-Himalayan mammalian elements of Pangri valley. Because of remoteness and low population density (9/km<sup>2</sup>), anthropogenic pressure on environment is comparatively low and hence forest cover is relatively intact in most parts of this region. Thus, Pangri region represents a potentially ideal sanctuary for varied wild animal species. But except for large mammals, efforts to document diversity, distribution and status of fauna of this zoogeographically interesting region is very few and scattered. The first report pertaining to the fauna of Pangri Valley is that of Lindsay (1927) who based on the collection of Mammal Survey of India organized by Bombay Natural History Society, reported some mammals like smaller Kashmir flying Squirrel and Himalayan Palm Civet from the area. Of late, Bhatnagar *et. al.* (2008) conducted a status survey of mammals of the area and reported the occurrence of 11 species of large mammals from the area. The present account is a compilation of information of the mammalian species occurring in the area which is mainly based on information collected during three field surveys to the region from 2007-2009. This includes a few direct sightings and reliable secondary evidences collected in the field. Besides, knowledgeable locals especially ex hunters were also interviewed regarding presence and abundance of mammal species. Published literature on mammalian fauna of the area is also taken in to account for compilation of the present inventory

which comprises of 19 species referable to 17 genera in 11 families. Interestingly, people of the valley talks about a rejected progeny of leopard (Thar in local language) which they confidently identified from coloured photographs as Marbled cat *Paradofelis marmorata*. If this is true, it would mean a considerable westward range extension of Marbled cat from Nepal. The same observation was also noted by Bhatnagar *et. al.* (2008).

### SYSTEMATIC ACCOUNT

Order RODENTIA

Suborder SCIUROGNATHI

Family MURIDAE

#### 1. *Rattus turkestanicus turkestanicus* (Satunin, 1903)

*Common Name* : Turkistan Rat

1903., *Mus turkestanicus* Satunin, *Ann. Mag. Zool. Acad. Imp. Sci. St. Petersburg*, 7: 588.

*Diagnostic features* : A medium sized rat with tail longer than head-body, Dorsum sandy brown and venter white or dorsum dark brown and venter white with greyish hair roots, Tail usually bicoloured, dark above and light below although specimens with indistinctly coloured or even unicoloured tails are also known (Agrawal, 2000)

*Distribution* : *India*: Himachal-Pradesh, Jammu and Kashmir.

*Elsewhere* : Afghanistan, China, Iran, Nepal, Pakistan, Russian Turkestan.

*Observation* : A male individual was collected in a Sherman trap around the PWD rest house, Dharwas (2460m). The specimen had soft fur with sandy brown dorsum and pure white venter and bicoloured tail. The external and cranial measurements of the collected specimen are as follows

HB-120mm, Tl-160mm, HF-30.5mm, E-21mm, ON-37.5mm, CB-35mm, N-13.mm, PL-18.4mm, MTR-6mm, BL-5.8mm, APF-5.6mm, IW-5mm, D-8.7mm, ML-19.6mm

*Conservation Status* : IWPA: Schedule V, CAMP: DD (Nationally and Globally).

Family SCIURIDAE

#### 2. *Marmota caudata* (Geoffroy, 1844)

*Common Name* : Long-tailed Marmot

1844., *Arctomys caudate* Geoffroy, In: *Jacquemont, Voy. Dans l'Inde*, 4, zool, p.66.

*Diagnostic features*: Stout and bulky body, Greysish-brown fur on its body with

small black hair on its back, Face is much darker than the body, Rostrum is comparatively larger, Enlarged nasal passage, Head is flat with black eyes, Small rounded ears, Neck is comparatively shorter, Short stocky limbs, Overall similar to Himalayan Marmot be differentiated from the later by the longer tail length (23-28cm) which is about half of the body length.

*Distribution : India:* Jammu and Kashmir, Himachal Pradesh.

*Elsewhere :* Afghanistan, China, Kirgizstan, Tadzhikistan, Pakistan.

*Conservation Status :* IWPA: Schedule-II, Part-II; Cites: Appendix III; CAMP: VU (Nationally), DD (Globally).

*Remarks :* Although not sighted in the field, their burrows were observed in upper Sural valley area. Local people informed that during the onset of spring season, these animals can be abundantly seen grazing in higher meadows. A few people also informed that it can also be seen on the western bank of Chandrabhaga in Saach Pass and Bogotu area.

### 3. *Hylomys fimbriatus* (Gray, 1837)

*Common Name :* Small Kashmir flying squirrel

1837., *Sciuropterus fimbriatus* Gray, *Ann. Mag. Nat. Hist.*, 1: 584.

*Diagnostic features :* A small sized squirrel with flying membrane on both the sides, Body fur long, Pinkish brown in colour with interspersed black hair, Underside is cream, Muzzle is elongated and ears are hairless, Short feathery broad tail with a narrow black tip.

*Distribution : India:* Himachal-Pradesh, Jammu and Kashmir, Uttar-Pradesh.

*Elsewhere :* Pakistan.

*Observation :* Because of the inadequacy of night observation, the squirrel could not be observed in the field. But abundant evidences in the form of half eaten nuts especially walnut were recorded in Shaur and Purthi area. Local people also reported their presence in the area. Lindsay (1927) also reported this species from the valley.

*Conservation Status :* CAMP: LRnt (Nationally), DD (Globally).

Order Chiroptera

Family Vespertilionidae

### 4. *Pipistrellus coromandra* (Gray, 1838)

*Common Name :* Coromandel Pipistrelle

1838., *Scotophilus coromandra* Gray, *Mag. Zool. Bot.*, 2: 498.

**Diagnostic features :** A small Pipistrelle with an average forearm length of 3cm, Very similar to congeneric *tenuis* externally with overlapping body measurements, Pelage colour varies from uniform brown, Chestnut to dark clove brown (Bates and Harrison, 1997); in specimens examined from Himachal Pradesh, it is dark brown, Ventral surface is paler with dark hair roots, The ears and wing membrane dark, Hairless, Tragus forward curving and bluntly rounded, Calcarial lobe small.

**Distribution :** *India:* North to Jammu Kashmir, East to north eastern states including Tripura, Car Nicobar Island.

**Elsewhere :** Afghanistan, Bangladesh, Bhutan, China, Myanmar, Nepal, Pakistan, Thailand, Vietnam.

**Observation :** Two individuals of this species were caught by scooping a butterfly net while foraging around a light post at Shaur. An active flyer, it can avoid a mist net very efficiently and no individuals could be caught in three sessions of netting in an area frequented by the species. This wariness to mist net was also noted by Chakraborty (1983). This species was also observed foraging around light sources at Dharwas in July. Feeding activity starts before darkness sets in fully and it continues for about 50-60minutes after which they disappear for some time again to restart foraging. This pattern of feeding behaviour was observed till 2230 hours after which it becomes sporadic although Bhattacharyya (1985) reported that foraging continues throughout the night in this fashion. Dodsworth (1913) noted that this bat was very common in Shimla but disappears during winter and therefore must be hibernating. Gut content of a preserved specimen contained mostly undigested parts of moths and Dipterans. The external and cranial measurements of the collected specimens are as follows:

HB-37mm, TL-29mm, HF-4.5mm, FA-33mm, E-10mm, Tr-4mm, GTL-12mm, CBL-11.5mm, CCL-11.1mm, CM3- 4.1mm, M3-M3-5.3mm, BB-6.2mm, PC-3.4mm, ZW-7.1, CM3-4.mm, C1-C1-3.7mm, M-8.5mm.

**Conservation Status :** CAMP: LRnt (Nationally), DD (Globally).

Order Artiodactyla

Family Bovidae

Subfamily Caprinae

### 5. *Capra sibirica* (Linnaeus), 1758

**Common Name :** Himalayan or Asiatic ibex

1776. *Ibex sibiricus* Pallas, *Spic. zool.*, 11: 52.

**Diagnostic features :** A sturdy built goat with short legs and ear, A full grown male

may reach over one meter height at shoulder, Females slightly shorter than male, Male ibex has distinctive thick, Scimitar-shaped horns, Females have thin parallel horns, Colour is variable; winter coat is yellowish white, more or less tinged with brown or gray, In summer the general hue is dark brown with irregular white patches, Female is yellowish brown and insignificant to look at.

*Distribution : India:* Himachal Pradesh, Jammu & Kashmir, and Uttaranchal.

*Elsewhere :* Afghanistan, China, Mongolia, Pakistan, Former Russia.

*Remarks :* Although not sighted in the field, locals reported the presence of this species (Tarangur in local dialect) in upper Sural and Seichu valley in good numbers. Bhatnagar et al. 2008 reported that the species is distributed in the valley between 3200-4200m.

*Conservation Status :* IWPA: Schedule I, RDB EN, CAMP: VU (Nationally), DD (Globally).

### 6. *Hemitragus jemlahicus* (Smith, 1826)

*Common Name :* Himalayan Thar

1826. *Capra jemlahicus* Smith, In Griffith et al. *Anim. Kingdom.*, Vol.4, plate (1826) opp.p.308 (1827).

*Diagnostic features :* A heavily built animal with comparatively small head with large eyes and small pointed ears, Head and body length measures 80-100cm (Alfred et. al. 2006), Curved horns, Males are larger and have different coloration and horn structure than the females, Body covered with long thick hairs, Hairs on the face and head are short and that of neck and head sweep on the knee.

*Distribution : India:* Jammu and Kashmir, Himachal Pradesh, Uttrakhand, Sikkim, West Bengal.

*Elsewhere :* China, Bhutan, Nepal, Introduced in New Zealand and South Africa.

*Conservation Status :* IWPA: Schedule I, Part I; RDB: EN; CAMP: LRnt (Nationally), DD (Globally).

*Remarks :* Included on the basis of reliable information from local hunters and published literature. One informant reported that the animal (Kath in local parlance) is apparently restricted to the western bank of Chandrabhaga and not uncommon.

### 7. *Naemorhedus goral* (Hardwicke, 1825)

*Common Name :* Himalayan Grey goral

1825., *Antelope goral* Hardwicke, *Trans. Linn. Soc. London*, 14: 518

**Diagnostic features :** A goat like animal with large bell shaped ears and backwardly curved small ringed horns, Horns of the male thick and more divergent than females, Overall coat colour greyish brown, White patches present on upper lip, chin, throat and neck, A distinctive black band runs through the spine, Tail is longer than the wild goat, extended below belly, Legs sturdy with broad hooves (Alfred et al.2006).

**Distribution :** *India:* Himachal-Pradesh, Jammu and Kashmir, North-eastern States, Uttar-Pradesh, Sikkim, West Bengal.

**Elsewhere :** Bhutan, China, Korea, Myanmar, Pakistan Tibet.

**Conservation Status :** IWPA: Schedule III; CITES: Appendix I; IUCN: Lower risk

**Remarks :** According to some local informants, goral occurs on both the banks of Chandrabhaga at moderate heights and the area near Cherry Bungalow was once a stronghold of the animal. This was also affirmed by Bhatnagar *et al.* (2008).

### 8. *Naemorhedus sumatraensis* (Bechstein, 1799)

**Common Name :** Himalayan Serow

1799., *Antilope sumatraensis* Bechstein, In Pennat, *Allgemeine, Ueber, Vierfuss. Thiere*, 1:98.

**Diagnostic features :** Large goat like animal with large head, ears, thick neck and short limbs, Head and body length is 90-150cm, Tail length 8-12cm, Horns comparatively smaller, conical and wrinkled, Colour of coat varies from black to blackish grey with some white on the chest and lower parts without any sexual variations. (Alfred et al.2006).

**Distribution :** *India:* Arunachal Pradesh, Himachal-Pradesh, Jammu and Kashmir, Sikkim, Uttar Pradesh, West Bengal.

**Elsewhere :** China, Thailand, Myanmar, Malay Peninsula, Nepal, Siam.

**Conservation Status :** IWPA: Schedule I, Part; RDB: VU; Appendix I, CAMP: VU (Nationally), DD (Globally).

**Remarks :** As per information of the locals, there is another Goral like ungulate in the valley with darker colour coat and pointed horns (Jingal in local dialect). On showing colour photographs, they confirmed it to be Himalayan Serow which they say only found on the western side of Chandrabhaga. Bhatnagar et al (2008) noted that this species most probably occurs near Ajog between 2500-3200m and is one of the least common Bovid in the valley. One ex hunter we interviewed at Shaur told that it is also found in the hill on the other bank of Chandrabhaga at Sahur.

### 9. *Pseudois nayaur* (Hodgson, 1833)

**Common Name :** Blue sheep

1833., *Ovis nayaur Hodgson, Asiat. Res.*18 (2): 135

**Diagnostic features :** A stocky built ungulate with short legs, Body length varies from 120-160cm and shoulder height up to 90cm, An adult male weighs up to 75 kg, Males possess wrinkled curved horns directed sidewise forming a semi-circle, Coat is short and thick, In the winter, coat colour is slaty blue offset by white legs and belly, Conspicuous blue-black stripe down the foreparts of the shanks and another horizontal stripe that divide the white belly from the grey flanks, In summer, the under wool is shed and the fur becomes reddish-grey in colour, Tail is short and black tipped.

**Distribution :** *India:* Himachal-Pradesh, Jammu and Kashmir, Sikkim.

**Elsewhere :** Nepal, Pakistan, China, Mongolia, Pamir range in Tadzhikistan.

**Conservation Status :** IWPA: Schedule 1, Part 1; RDB: VU; CAMP: LRIc (Nationally), DD (Globally).

**Remarks :** Bhatnagar *et. al.* (2008) reported that Blue sheep is probably absent in Pangri valley. But one former hunter we interviewed at Shaur clearly identified it from pictures and admitted killing one animal 8-9 years back around Sidhani nala area inside Seichu Taun WLS. A small population of this ungulate may possibly survive in that isolated area.

## Family MOSCHIDAE

### 10. *Moschus chrysogaster* (Hodgson)

**Common Name :** Himalayan Musk Deer

1839., *Moschus chrysogaster Hodgson, J. Asiat. Soc. Bengal.* 8:203.

**Diagnostic features :** A small hornless ungulate with pointed face, small head and large ears, Tail very short and completely encircled by long hairs of anal region, Rump higher than shoulders, Short spiny coat is dark grey-brown with a rusty tinge and pale spots over back and flanks, Adult males have a pair of long downward curved incisors, Also, adult males have a circular pouch (gland) under the skin in the lower region of the belly called musk pods.

**Distribution :** *India:* Himachal-Pradesh, Jammu and Kashmir, Uttar-Pradesh, Sikkim.

**Elsewhere :** Central Tibet to Central China, North Afghanistan, North Pakistan, Nepal.

**Conservation Status :** IWPA: Schedule I, Part I; CITES: Appendix I; RDB: VU; CAMP: CR (Nationally), DD (Globally)..

*Remarks* : Although not observed in the field, many of the locals reported this species as common in upper Sural and Seichu valley. A few local hunters informed that this is one of the most common targets for the poachers and this can have a significant bearing on its current population trend which appears to be in decline.

Order CARNIVORA

Family MUSTELIDAE

11. *Mustella sibirica* Pallus, 1773

*Common Name* : Himalayan Weasel or Siberian Weasel

1773., *Mustela sibirica* Pallas, *Reise Prov. Russ. Reichs.*, 2 : 701.

*Diagnostic features* : Body cylindrical with flattened head, small ears, Short muzzle and legs, Forelegs comparatively shorter than hind legs, No demarcation between dorsal and ventral colour, Colour varies from bright chocolate to deep golden brown, Muzzle, chin and upper lip white.

*Distribution* : *India*: Kashmir, Himachal-Pradesh, Uttar-Pradesh, Sikkim, West Bengal, Arunachal-Pradesh,

*Elsewhere* : Siberia, Ural Mountains, Bhutan, China, Korea, Indonesia, Japan, Myanmar, Nepal, Thailand, Taiwan, Tibet.

*Conservation Status* : IWPA: Schedule-II, Part-II; CITES: Appendix III; CAMP: LRnt (Nationally), DD (Globally).

*Remarks* : Although not observed in the field, many locals could positively identify the animal from photographs and thus included in the current inventory.

Family FELIDAE

12. *Uncia uncia* (Schreber, 1775)

*Common Name* : Snow leopard

1775., *Felis uncia* Schreber, *Die Saugheithiere*, 2 (14): pl. 100 (1775); text, 3 (22): 386-387 (1777).

*Diagnostic features* : Head and body length is 100 to 130cm, tail length is 80 to 100 cm, shoulder height is about 60cm. The sexes are alike, but the male is larger weighing 40-45 kg, the female weighing 30-40 kg (Pfister, 2004), Body colour varies from pale gray to creamy smoke gray, and the under parts are whitish, On the head, neck and lower limbs are solid spots, On the back, sides and tail are large rings or rosettes that enclose some small spots, Other distinctive features include a short snout, high forehead, short legs and a long bushy tail.

**Distribution :** *India* : Himachal-Pradesh, Kashmir, Arunachal-Pradesh, Uttar-Pradesh.

**Elsewhere :** Afghanistan, Bhutan, China, Mongolia, Pakistan, Nepal, Russia, Kazakhstan, the Kyrgyz Republic, Tajikistan, Uzbekistan.

**Conservation Status :** IWPA: Schedule I, Part I; RDB: EN; CITES: Appendix I; CAMP: CR (Nationally), DD (Globally).

**Remarks :** Pangri valley appears to be a stronghold of this endangered feline. A few informants reported that during winter, snow leopard comes down in search of preys. One hunter reported seeing one animal chasing a herd of Ibex near Karu nala during April 2009. Bhatnagar et al. (2008) confirmed its presence in upper Sural valley and Harvi nala area between 3500-4000m.

### 13. *Panthera pardus* (Linnaeus, 1758)

**Common Name :** Leopard or Panther

1758., *Felis pardus* Linnaeus, *Syst. Nat.*, 10th Ed., 1: 41.

**Diagnostic features :** Smaller cat than a tiger, Head and body length is 115-215cm, Tail length is 70-105cm and shoulder height is 50-70 cm (Alfred et. al. 2006), Long body with stout legs and long tail, Ears round with black side and a clear median white spot, Colour of the body is pale yellow with dark rings on the sides of body and tail, Under parts and inner side of the limbs white.

**Distribution :** *India* : Throughout India.

**Elsewhere:** Algeria, Afghanistan, Angola, Arabia, Botswana, Cameroon, Central African Republic, Congo, Chad, China, Egypt, Ethiopia, Gabon, Guinea-Bissau, Indonesia, Iran, Iraq, Kenya, Korea, Liberia, Laos, Malawi, Malaysia, Mauritania, Morocco, Mozambique, Myanmar, Namibia, Nepal, Niger, Nigeria, Pakistan, Senegal, Sierra Leone, Somalia, South Africa, Sri Lanka, Sudan, Tanzania, Thailand, Tunisia, Turkey, Uganda, CIS Countries, Vietnam, Zaire, Zambia, Zimbabwe.

**Conservation Status :** IWPA: Schedule I, Part I; CITES: Appendix I; RDB: VU; CAMP: VU (Nationally), DD (Globally).

**Remarks :** Included on the basis of reports from locals and appear to be common in the area especially around human habitation.

### Family CANIDAE

### 14. *Canis lupus chanco* Linnaeus, 1758

**Common Name :** Tibetan wolf

1758., *Canis lupus* Linnaeus, *Syst. Nat.*, 10th ed., 1: 39

*Diagnostic characters* : This is one of the largest member of the family Canidae, Head and body length is generally about 95-140cm, Tail 35-40cm and shoulder height 75-80cm, Males are larger on average than the females, No sexual dimorphism, Tibetan wolf varies greatly in pelage colour from light to sandy brown, dark grey or even black, Black individuals are common in some populations especially those of Tibet, Ladakh and northern slopes of Himalayas, The face is pale and under parts are generally lighter coloured, It has got long legs and ears. Tail is bushy and tipped black.

*Distribution* : *India* : High altitude areas (above 3500m) of Kashmir, eastern Ladakh, Lahaul and Spiti district, Pangi Valley of Himachal Pradesh, Sikkim and Arunachal Pradesh.

*Elsewhere*: Tibet, China, Mongolia and Afghanistan.

*Conservation status* : IPWA: Schedule I, Part I; RDB: Vu.; CITES: appendix I.

*Remarks* : Bhatnagar et al. (2008) reported that they could not gather any reliable evidence regarding the presence of Tibetan wolf in the valley although sources indicated that they might be present in bordering areas with Zaskar. One informant at Shaur informed seeing this “dog like” animal near Karu nala and attributed a few killings of cattle in 2008 to this animal. However, the facts remain to be ascertained.

### 15. *Vulpes vulpes montana* (Linnaeus, 1758)

*Common name* : Hill fox

1758. *Vulpes vulpes* Linnaeus, *Syst. Nat.* 10th ed., 1:39

*Diagnostic characters* : Head and body length 55 to 75cm, tail length 40 to 50cm and weighs up to 5 kg, The typical coloration varies from pale yellowish red to deep reddish brown upper parts and pure white, grey or silvery under parts, The lower part of the leg is usually black and the tail is bushy tipped with white, which distinguishes it from other Indian foxes, Body is well proportioned with slender limbs. The head rather pointed and narrow with pointed blackish ears.

*Distribution* : *India* : Throughout the Himalayas from Ladakh to Sikkim.

*Elsewhere* : Tibetan plateau, Pakistan and Afghanistan.

*Conservation status* : IPWA: Schedule II, Part II; CITES: Appendix III; CAMP: LRnt (Nationally), DD (Globally).

*Observation* : Observed at Shaur and scats collected from Sural at an altitude of 3400m. Apparently common throughout the valley. A government Official at Killar informed that an outbreak of Rabies among street dogs occurred in the valley in 2008

and then transmitted to hill fox. The affected foxes came out to attack people even during daylight.

#### Family VIVERIDAE

##### 16. *Paguma larvata* (Hamilton-Smith, 1827)

*Common Name* : Himalayan Masked Palm Civet

1827., *Gulo larvatus* Hamilton-Smith, In Griffith *et al. Anim. Kingdom* 2: 281.

*Diagnostic features* : It has a large body with long tail, Head and body length is 41-73 cm and tail length is 39-56cm, Body colour is greyish to black, It is differentiated from other civets by white whiskers all over the body and absence of any spot on the body, It has small pointed head with rounded ears, Prominent feature is of abundant vibrissae, which are white in colour, A white band from the centre of the forehead to the tip of nose and another band beneath ears passing over the cheeks is present (Alfred *et. al.* 2007).

*Distribution : India* : Himachal-Pradesh, Andaman Island, Uttar-Pradesh, Sikkim, West Bengal, North eastern States.

*Elsewhere*: China, Combodia, Formosa, Indonesia, Japan, Laos, Malaysia, Myanmar, Nepal, Pakistan, Singapore, Tibet, Taiwan, Thailand, Vietnam.

*Conservation Status* : IWPA: Schedule II, Part II; CITES: Appendix III; CAMP: LR Ic (Nationally), DD (Globally).

*Remarks* : Included after Lindsay (1927). Abundance status is unclear.

#### Family URSIDAE

##### 17. *Ursus arctos* Linnaeus, 1758

*Common Name* : Brown Bear

1758., *Ursus arctos* Linnaeus, *Syst. Nat.*, 10th ed. 1: 47.

*Diagnostic features* : Dark brown in colour, distinct V-shaped pale marking on chest, heavy built with a very short stumpy tail, stocky limbs, small head with pointed snout and small rounded ears, Flat paws with strong, long straight claws, Males heavier than females (Alfred *et. al.* 2006).

*Distribution : India* : Himachal-Pradesh, Ladakh (Jammu and Kashmir).

*Elsewhere* : Afghanistan, Albania, Asia Minor, Austria, Bulgaria, China, CIS Countries, Central Asia, Czechoslovakia, Estonia, Finland, France, Germany, Italy,

Iran, Japan, Korea, Manchuria, Mongolia, North America, Nepal, Pakistan, Palestine, Poland, Romania, Scandinavia, Siberia, Syria, Sweden, Switzerland, Tibet.

*Conservation Status* : IWPA: Schedule I, Part I; CITES: Appendix I; RDB: EN, CAMP: LRnt (Nationally), DD (Globally).

*Remarks* : Of the two species of bears in the area, brown bear is confined to relatively higher altitudes on the eastern bank of Chandrabhaga although they come down to lower areas in search of food. People at Sahli and Sural areas reported their presence in good numbers.

### 18. *Ursus thibetanus* Cuvier, 1823

*Common Name* : Black Bear

1823., *Ursus thibetanus* Cuvier, *Rech. Oss. Foss., Nouv. ed.*, 4: 325.

*Diagnostic features* : It is a large size Bear with smooth and shining black fur, Claws on the forelegs are horny, Short and sharply curved and thus adapted for tree climbing, V-shaped white coloured mark on the chest, Four premolars and six incisors in the upper jaw are present, Long hairy hump absent in this species, Males are always larger in size and weight than females (Alfred *et. al.* 2007).

*Distribution* : *India* : Himachal-Pradesh, Jammu and Kashmir, North Eastern states, Sikkim, Uttar-Pradesh, and West Bengal.

*Elsewhere*: Afghanistan, China, Formosa, Indo-China, Japan, Korea, Laos, Manchuria, Myanmar, Nepal, Pakistan, Siam, Sibarica in Russia, Taiwan, Thailand, Vietnam.

*Conservation Status* : CITES: Appendix I; CAMP: LR1c (nationally), DD (Globally).

*Observation* : One individual was observed at Sural in July while crossing a glacier. Most people interviewed reported it to be common throughout the valley on both the banks of Chandrabhaga and known to be a regular crop raider. Incidentally, this species is also at the focal point of human-animal conflict in the valley and many people can be found in the areas that were injured in a black bear attack.

Order Primates

Family CERCOPITHECIDAE

### 19. *Macaca mulatta* (Zimmermann, 1780)

*Common Name* : Rhesus Macaque

1780., *Cercopithecus mulatta* Zimmermann, *Geogr Gesch. Mensch. Vierf. Thiere*, 2: 195.

*Diagnostic features* : Average body length is 53 cm, It is grey or brown in colour with pink face, Full of soft fur, Females are smaller than males.

*Distribution* : *India* : Whole North and Northeast India.

*Elsewhere*: Afghanistan, Nepal, Pakistan, Bhutan to Thailand including China.

*Conservation Status* : IWPA: Schedule II; CITES: Appendix II; CAMP: LR Ic (Nationally), DD (Globally).

*Observation* : Commonly observed around Shaur, Purthi area near cultivations.

### SUMMARY

During the studies 19 species comprising of 17 genera, 11 families and 4 orders has been recorded from the Pangti. Due to its remoteness and tough terrain, the anthropogenic stresses are less and its forests are intact. Thus, the mammalian fauna is also protected and is reflected in terms of the mammalian wealth of the valley. However, the connectivity of the road to the valley which has come up recently is threat to the fauna in near future.

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