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**Contribution to the knowledge of the Mammalian
Fauna of Jammu and Kashmir, India**

By
S. Chakraborty

Issued by the Director
Zoological Survey of India, Calcutta

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CONTRIBUTION TO THE KNOWLEDGE OF THE MAMMALIAN FAUNA OF JAMMU AND KASHMIR, INDIA

By

S. CHAKRABORTY

Zoological Survey of India, Calcutta

INTRODUCTION

Jammu and Kashmir ($32^{\circ}17'-37^{\circ}5'N$ and $72^{\circ}40'-80^{\circ}30'E$) occupies a strategic position with its borders touching Afghanistan in the north-west, Pakistan in the west, and China in the north and east. The vale of Ab-i-panja, the Panhandle (Wakhan) of Afghanistan, separate it from the Union of Soviet Socialist Republics. The state as a whole covers an area of 2,22,800 sq. km., but with the declaration of Cease-Fire line (1 Jan 1949), 83,808 sq. km. has gone under the control of Ajad Kashmir, and since 1962 about 41,500 sq. km. of area has been occupied by China through aggression (Singh, 1971).

Geographical location along with physical features of the state make it a proverbial bridge between the two major faunal regions, namely, Palaearctic and Oriental. Altitude and climate highly variable from one place to another resulting several distinct type of ecological niches alive with a variety of birds and animals. Several reports on the mammalian fauna of Jammu and Kashmir have been published from the second half of nineteenth century to date. But majority of these reports are by naturalists and deal with the larger species of mammals, so that the number of species particularly the smaller sized ones from the state still remains unknown or poorly known. No single comprehensive collection of mammals from Jammu and Kashmir had ever been made and specimens from such a zoogeographically important area accessible to different museums were exceedingly scant. Thus, for procurement of representative collection (specially of mammals) and studying their habits and ecology, the present author conducted faunistic surveys of the state during 1974 (August, September) and 1975 (October, November).

This paper provides : ecological condition of important collecting localities ; annotated list of the species obtained by these surveys, along with those already present in the collection of the Z.S.I., B.N.H.S., or recorded in the literature by earlier workers ; notes on the taxonomy, distribution, biology and habits of several species. An analysis of the mammalian fauna of the state is also made.

Measurements of Insectivora, Chiroptera and Rodentia were taken after Roonwal (1949), Khajuria (1952) and Ellerman (1963) respectively, while those of other groups taken after Pocock (1939, 1941) and some are self-explanatory. Colours given with initial capital letters in the text have been recognized according to Ridgway's (1886) nomenclature. Unless otherwise stated all measurements are given in millimetre.

ABBREVIATIONS

Following abbreviations have been used in the text :

- Apf=Anterior palatine foramen
 B.N.H.S.=Bombay Natural History Society
 Bul=Bulla
 Cb=Condylbasal length
 C¹—C¹=Width across upper canine
 C¹—M²=Upper teeth
 C₁—M₃=Lower teeth
 cm.=Centimetre
 Cw=Cranial width
 Dia=Diastema
 E=Ear
 Em=Front of eye to tip of muzzle
 Fa=Forearm
 Fc=Foot and claw
 Fr=Frontal
 Gl=Greatest length of skull
 Hb=Head and body
 Hf=Hind foot
 Hs=Width of horse-shoe
 Iw=Interorbital constriction
 m.=Metre
 M₁=First lower molar
 M¹—M¹=Width across upper first molar
 M²—M²=Width across upper second molar
 M³—M³=Width across upper third molar
 Mc(2)=Second digit metacarpal
 Mc(3)=Third digit metacarpal
 Mc(4)=Fourth digit metacarpal
 Mc(5)=Fifth digit metacarpal
 Ml=Length of mandible

mm. = Millimetre

Mw = Maxillary width

Nas = Nasal

Nll = Length of nose-leaf

Or = Orbit

Orn = Front of orbit to tip of nasal

Pal = Palate

Pb = Length of palatal bridge

Pm⁴ = Fourth upper premolar

Pw = Postorbital constriction

Px = Pollex

sq. km. = Square kilometre

T = Tibia

Tc = Thumb and claw

Tl = Tail

Tr = Tragus

Utr = Upper tooth row

Ums = Width of mesopterygoid space

Z. S. I. = Zoological Survey of India

Zw = Zygomatic width

SURVEY

Personnel : The survey were conducted under my leadership. The other party members who assisted were Sarvashri T. P. Bhattacharyya, B. B. Dutta, N. C. Gayen, C. K. Misra and A. K. Nag, all of them from my department. Facilities for field collection and accommodation were provided by the Director, Games and Fisheries, Department of Forest, and Public Works Department, Jammu and Kashmir.

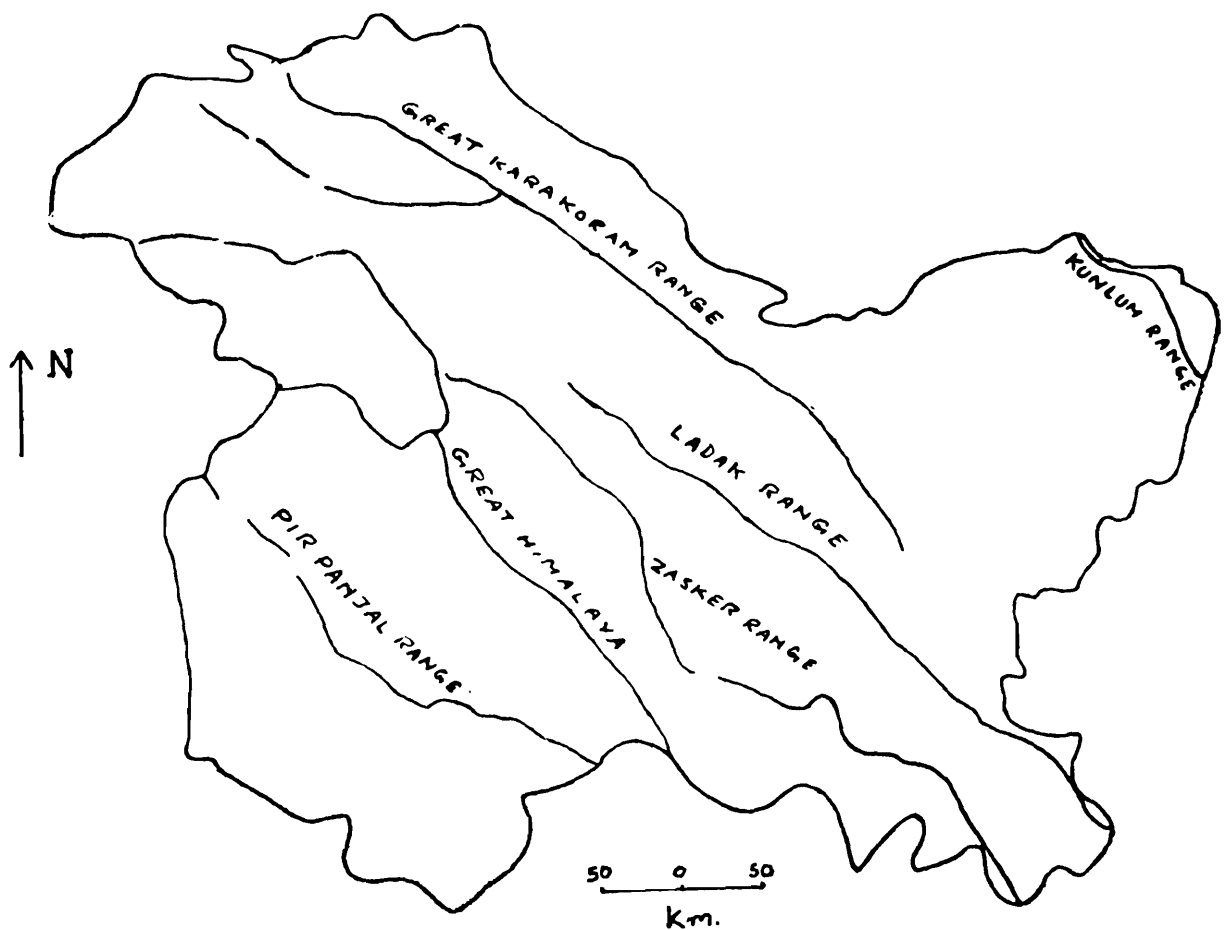
Method : The principal object of the surveys was to obtain a geographically representative collection of mammals and ecological data. To best accomplish this a variety of methods were employed. For trapping small mammals, Break-neck trap, Japanese wire trap, Wonder trap and Japanese mist-net were used. For night collection artificial lights were used, such as flash lamp, head light, etc., which were useful in spotting and shooting the animals. During daytime specimens of birds and a few mammals were shot. Traps were also distributed among the villagers for making indoor and field collection.

Before preservation of the specimens, weight, external measure-

ments, condition of external genitalia, mammae, uterus and stomach were noted.

PHYSIOGRAPHY

The region consists of huge mountain masses interspersed with longitudinal valleys. In the whole region there are four larger mountain ranges, *viz.*, the Karakoram, the Ladakh, the main Himalaya or Zasker and the Pir Panjal (Text-fig. 1). Between these ranges are the valleys of Gilgit, Shyok, Indus and Jhelum. The south of the Pir Panjal is the Siwalik range, comparatively much lower in elevation and known as the Jammu hills.



Text-fig. 1. Map of Jammu and Kashmir showing the main mountain ranges (adopted from Singh, 1971).

The Jammu hills rise from the Punjab plain with a gentle slope, and elevations rarely exceed 1,200 m. In these hills two typical *duns* are of Udhampur and Kotli.

Elevations of Pir Panjal vary from 3,500 to 5000 m. It is characterised by deeply cut valleys and precipitous gorges. The Pir Panjal

trends N.W.—S.E. and continues beyond the region into the Dhauladhar range in Himachal Pradesh.

The Vale of Kashmir lies between the Pir Panjal and Himadri. Its floor stands 1600 m. above sea level in the Jhelum flood plain. Flat-topped terrace like features have developed in the morainic deposits of the Pleistocene glaciation, the *Karewas*, which are better developed in the southern section of the vale.

The great Himalayan ranges including the well known Zasker range are situated in the north of the Vale of Kashmir. At its western end near the Indus bend stands the mighty Nanga Parbat attaining an elevation of 8,126 m. in its highest peak. The transverse gorges of the streams, dissecting the slopes of the huge mountain ranges, serve as the main transportation lines. The eastern section of the Zaskar Range in Rupshu consists of intricately ramifying glaciated ranges of crystalline rocks.

The Ladakh range, situated between the Indus and the Shyok rivers, forms a prominent range in the Trans—Himalayan region. It is rather a straight range with a N.W.—S.E. trend. The crest of this wall-like range is almost even, somewhat planated during the past glaciation.

The Karakoram range, extending from the Hunza in the north-west to the Shyok in the east for a total distance of 400 km. Almost the entire crest line is covered with perpetual snow with a number of giant glaciers crawling slowly down the slope. Its highest peak is Mt. Godwin Austen (8,611 m.).

The Aksai Chin region, situated in the north-eastern portion of Kashmir, represents a much denuded peniplained surface of an intermontane plateau. The whole area is well over 4500 m. above the sea level and bears a definite stamp of excessive glacial erosion.

CLIMATE

From the Alpine (Ladakh region) to the subtropical (Jammu region) are the extreme variants of climate in the state owing to its location and topography. The sheltered valley of Kashmir, however, exhibits an exception to its surrounding region.

The temperature in the region varies spatially. Dras is the coldest while Jammu is the hottest. Mean monthly temperature is lowest in January and highest in June or July. Mean monthly temperature in January varies from -17°C . at Dras, -2.3°C . at Srinagar to 14°C . at Jammu city.

Precipitation in the region is both in the form of rain and snow ; the two generally occur in different seasons and vary inversely in intensity except in the exceptionally high zones. Western disturbance is more active than the monsoon currents throughout the region, though the latter are stronger in the south of Pir Panjal. The average annual rainfall is about 65 cm. with wide spatial variations, ranging from 5 cm. in Gilgit, 8 cm. in Ladakh, 17.5 cm. in Skardu-Deosai, 67.5 cm. in Kashmir valley to 115 cm. in Jammu region, though Sonamarg is the wettest station (181 cm.).

Monsoon generally approaches the region by the first week of July and lasts till 15th September. It is more active in Jammu. The period, on the average accounts for about 40 per cent of the total rainfall of Kashmir region. November is the driest month with less than 1 cm. of precipitation.

In winter (December-March) the region is swept over by the western disturbances which are responsible for about 40 per cent of precipitation. High R. H., cloudy skies, fog, mist and higher incidence of snow are common features of the winter climate in most of Kashmir. The significant feature associated with the westerlies is the snowfall which is partly influenced by altitudes as well. Snowfall ranges between 20-30 cm. at Srinagar and 80-90 cm. at sonamarg. It is also heavy on the Pir Panjal ranges, and decreases rapidly eastward.

Considering the overall distribution of climatic elements, four units become obvious : the windward Kashmir (Jammu region), the leeward Kashmir (Ladakh region), the high altitude Kashmir (Himadri, Pir Panjal), and the Kashmir valley.

Of considerable interest in such areas of high altitude and alternating valley-range configuration are the microclimates operating over the terrain-facets, and snowfall, their duration and amount. Local air masses descending the mountain slopes and the intensity of solar radiation received, affect or rather determine the habitats of different species of animals and plants.

NATURAL VEGETATION

Lithology, slope, altitude and climate combine together to produce variety of vegetal covers. The vegetation varies from the the Himlayas meadows in rocky and often snow covered Ladakh and high altitudes above snow line to the evergreen conifers on the gentler slopes of the ranges, also from scrub jungle of the foot hills to the deciduous forests of the lower southern slopes of the Pir Panjal. Out of the total area of 3200 sq. km. of the forested tract in the region, Ladakh has only about 5 sq. km., while Kashmir valley is the most thickly forested region where the districts of Baramula and Anantnag have respectively 71 and 60 per cent of their areas under forest. The valley as a whole shows 58.4 percent of its area under forest, while Jammu region about 46 per cent varying spatially. Species have strong regional association with punctuation by the altitudinal zones, however, in general, conifers account for about 85 per cent of the forest area.

On the rainier southern slope of the Pir Panjal, vegetation cover is thinner while the northern slopes are covered with thick coniferous forest. Sparse and dry scrubs mark the vegetal cover of the Siwalik zone. Except the few patches of Himalayan meadows, Ladakh is almost devoid of vegetal cover. Stunted cedars and willows are found in moister strips. Trees are planted along the streams near villages.

In the Kashmir Valley, well marked vegetation is willow which covers the marshy areas only. Fir has its best growth somewhat higher up in the valley. The commercial fir forests cover 2,942 sq. km. Other species of conifers—Deodar and Kali occupy high slopes and have more denser cover.

In the rest of the region the natural vegetation is of mixed type, unclassified, termed as mountain vegetation.

SOME IMPORTANT ECOLOGICAL DIVISIONS

Gilgit area :

Dry climate with an average annual rainfall of about 5 cm. Gilgit itself is never very cold, and snow seldom lies for more than a few hours, except in the very high region of eternal snow. In summer it is hot owing to the radiation from the rocky mountains.

Bases of mountains are barren, but from 1800 to 4400 m. there are

fine forests or patches consisting of juniper, fir, pencil cedar, *Pinus excelsa* and many annual grasses such as *Draba trineria*, *Polygonum affine*, *Euphorbia kanaorica*, etc. Edible pine is common in Astor, ranging from 2100 to 3050 m. The tamarisk does well in the barren valleys up to 1800 m. Roughly speaking, the upper limit of vegetation round Gilgit is 4900 m., above this, rocks are covered with lichens.

Among the mammalian fauna of the area, *Eptesicus nilssoni khasgaricus* Bobrinskii, *Barbestella leucomelas darjeelingensis* (Hodgson), *Canis lupus chanco* Gray, *Mustela erminea ferghanae* (Thomas), *Ursus arctos* Linnaeus, *Panthera uncia* (Schreber), *Moschus moschiferus* Linnaeus, *Capra falconeri falconeri* (Wagner), *Eupetaurus cinereus* Thomas, *Alticola roylei* (Gray), *Hyperacrius fertilis* True, *Ochotona macrotis* (Günther) and *Marmota caudata* (Jacquemont) are important.

Ladakh area :

The continentality in association with height, imparts the Ladakh region a character akin to the cold highland type. Average monthly temperature ranges between -7.9° and 17.8° C. with about five months experiencing below freezing temperature. Because of this atmosphere, radiation and isolation are extremely rapid resulting in extremes of temperatures in shade and sunshine. The Himalayan ramparts being a meteorological barrier, the monsoonal influence is weak, and out of 11.5 cm. of total precipitation more than 40 per cent is received during December to March. Thus, low temperature and low relative humidity impart a keen atmospheric condition to the region.

Flora is scanty, consisting of dense growth of small crooked trees or large shrubs often with variable broad-leaved understory, predominantly *Betula*, and many flowers in the open, away from the Rhododendron thickets including many epiphytic mosses and lichens. In occasional ravines pencil cedar and wild willows are found. In spring and summer, wiry tufts of grass and small shrubs clothe the barren plateau, which is the only food for the herbivorous animals living there. Melting snow is the usual liquid nourishment. In many places the earth is salt encrusted, which is also taken by the herbivorous animals.

Equus hemionus kiang Moorcroft, *Bos grunniens* Linnaeus, *Procapra picticaudata* Hodgson, *Pantholops hodgsoni* (Abel), *Pseudois nayaur* (Hodgson), *Canis lupus chanco* Gray, *Panthera uncia* (Schreber), *Lepus oiostolus* Hodgson, *Ochotona roylei wardi* Bonhote, *O. macrotis*

(Günther) and *Marmota bobak* (Hodgson) are important among the mammalian species.

Valley of Kashmir :

Quite conspicuous is the position of Kashmir valley within the sub-humid high altitude zone. As the altitude rises towards the meadowy slopes of the Pir Panjal, temperature decreases from 24°C. at Srinagar (1893 m.) to 10°C. at an elevation of 3,600 m. during end of March to middle of June. From the last part of June, heat increases with high humidity till the middle of August. Severe winter extends from the last week of December to the first week of March, during which temperature often descends to below freezing point. Total rainfall in the valley is 65 cm. on average. January to March is the rainiest period exhibiting greater activity of pre-monsoon and winter disturbances accompanied by heavy snowfall.

Coniferous and oak forest predominating the hill slopes with mostly evergreen undergrowth including *Strobilanthes*, many climbers such as *Rosa*, *Clematis* and mosses. Dominant conifers are *Abies*, *Cedrus*, *Picea*, *Pinus excelsa*, etc. Rhododendrons are local and rather scarce. Thorny scrub is found in the vicinity of streams, and low thorny bushes mainly of *Caragana* on the slopes not far from the streams.

Rhinolophus ferrumequinum proximus Andersen, *Myotis blythi* (Tomes), *Myotis longipes* (Dobson), *Eptesicus serotinus pachyomus* (Tomes), *Macaca mulatta villosa* True, *Vulpes vulpes montana* (Pearson), *Vulpes bengalensis* (Shaw), *Selenarctos thibetanus laniger* Pocock, *Martes foina intermedia* (Severtzov), *Paguma larvata wroughtoni* Schwarz, *Cervus elaphus hanglu* Wagner, *Apodemus flavicollis* (Melchior), *Rattus vicerex* (Bonhote), etc., are among the important mammalian species.

Jammu region :

This region reflects a humid subtropical (monsoon type) climate with average monthly temperature ranging between 13°C. (January) to 33°C. (June). The proximity to the high altitude restricts the instances of 'loo' but helps to increase the impact of cold waves accompanying the westerlies. A well-marked double maxima in rainfall is introduced

by the western disturbances (December-February) which account for about 20 per cent of 115.5 cm. of annual total.

Flat bottoms of ravines sometimes covered in part with long tufty jungle grass locally known as *Khur*. Edges of ravines are adorned with oleander bushes. In Jasrota region there is some bamboo forest. The outer hills support a forest of mixed deciduous species as well as long-leaved pine. The outermost ridge is covered with more or less dense forest of small-leaved acacias (*Acacia arabica*, *A. modesta*) with some ber tree (*Zizyphus jujuba*) intermingled, and an undergrowth of the shrub, *brenkar*. This forest sometimes spreads down on to the loamy ground of the plains. Among the other plants *Euphorbia*, peepul, banyan, palm, *Pinus longifolia*, Himalayan oak, spruce and deodar are found in different areas.

Hemiechinus auritus (Gmelin), *Suncus murinus* (Linnaeus), *Pteropus giganteus* (Brünnich), *Cynopterus sphinx* (Vahl), *Rhinopoma hardwickei* Gray, *Macaca mulatta mulatta* (Zimmermann), *Vulpes bengalensis* (Shaw), *Canis aureus* (Linnaeus), *Viverricula indica* (Desmarest), *Sus scrofa cristatus* (Wagner), *Lepus arabicus* Ehrenberg, *Hystrix indica* Kerr, *Funambulus pennanti* Wroughton, *Tatera indica* (Hardwicke), *Nesokia indica* Gray, etc., are among the important mammalian species.

DESCRIPTIVE GAZETTEER OF MAIN COLLECTION LOCALITIES

Shikargarh, c 2000 m., Islamabad district (26-31 Aug 1974): A small village of Kashmir valley, situated on the hillside, about 50 km. south-east of Srinagar. Climatically it is typical of the valley. Temperature during our halt varied from 9°C. to 17°C. Agriculture depends mainly on artificial irrigation and done throughout the year except winter months with rotation of crops. Surrounding mountains are covered with forest of blue pine and some undergrowth of nettle and other herbs. Except for some barren rocks and cultivated lands, rest of the ground is covered with fine grass which supports cattle farming. Infestation of murid pests was noticed in the fields as well as in the cottages. The forest is alive with the Rhesus Macaque, Langur, Asiatic Black Bear, Masked Palm Civet, Jungle Cat, Leopard Cat and various birds, more common forms being the Long-tailed Minivet, Rufous-backed Shrike, Scully's Wood Owl, Laughing Thrushes, Paradise Flycatcher, Yellow billed Magpie, Goldfinch, Pied Woodpecker, etc. Flying squirrels are found on the roofs of the cottages and the pine trees

bordering the village. Small caves and crevices among the rocks provide shelter to a number of Microchiropteran bats and arthropods. In the higher region, Goral, Ibex, etc., were said to be common a few years ago, but at present there is none due to changes in the environment and regular poaching.

Shar, c 1900 m., Islamabad district (1-9 Sep 1974) : A well developed village, almost on the plains, situated about 40 km. south of Srinagar. The area is dry, and during our halt the temperature varied from 10°C. to 20°C. However, the village receives snow from the end of November to middle of March. Cultivation depends mainly on irrigation from a single stream passing through the village. There is no true forest, but a number of scattered deodar and willow trees are found. Some patches of bush jungle consisting of *Lantana*, *Croton*, nettle, etc., are found which give shelter to a number of small birds, namely, Laughing Thrushes, White-cheeked Bulbul, Ring Dove, Warblers, Starlings, Wagtails, Golden Oriole, etc. Along the stream, Pied Kingfisher and White-capped Redstart are frequently met with. Fields are heavily infested with murid pests. Jackal, Asiatic Black Bear and Jungle Cat are common around village. A colony of small Indian Mongoose was observed in the burial ground of the village, presumably feeding on the buried dead bodies, fishes and molluscs of the neighbouring paddy field.

Establishment of a cement factory about 3 km. south of the village is leading to gradual urbanisation of the area together with considerable destruction of fauna and flora.

Daksum, c 2438 m., Islamabad district (10-20 Sep 1974) : It is a forest retreat, about 48 km. south-east of Anantnag, girdled by mountains and streams. The area is cold and dry, temperature varying from 6°C. to 15°C. during our stay there. It enjoys occasional shower during cold season and remains snow covered from the end of October to March. Except for a few patches of cultivated fields, the surrounding area up to about 3000 m. is forested, chiefly of pine trees with thick undergrowths particularly near the streams. The forest provides shelter to a large number of animals including the Red Fox, Indian Fox, Asiatic Black Bear, Leopard, Rhesus Macaque, Goral, Kashmir Stag and Flying Squirrel. In the higher rocky mountains, Himalayan Marmot is found. Among the avifauna Chukar (now rare), White-

breasted Dipper, Rosefinches, Goldfinches, Himalayan Tree Creeper and Ring Dove are quite conspicuous.

Jhajjar Kotli, c 550 m., Jammu District (19-25 Oct, 11-25 Nov 1975); It is a small village about 35 km. north of Jammu city by the side of Jammu-Srinagar national highway. A stream locally known as Jhajjar Nullah having a shingle bed of about 80 m. wide passes by the side of this village. This area though enjoying south-west monsoon, is yet somewhat arid. The soil is porous, being of a lighter loam and liable to have beds of shingles in it. Temperature during the end of October varied from 14°C. to 23°C., while in November it was 10°C. to 18°C. There is no true forest but grass jungle along the Jhajjar Nullah and scattered bush Jungles composed of acacias and *Lantana* with some fig trees are found throughout. Cultivation is done throughout the year.

Rodents are too many, represented by a number of species, infesting both the fields and houses. A number of orchards specially of Guava attract parakeets during the day and Megachiropteran bats at night. Bush jungles provide shelter to the Bush Rat, Jackal, Common Mongoose, Small Indian Civet, Myna, Finches, Warblers, Bush Chat, Wagtails, etc. Along the Nullah, Sandpipers, Pied Kingfisher, White-capped Redstart, etc., are found during the day.

Patni Top, c 2060 m., Udhampur district (26-31 Oct 1975): A picnic spot on the hill top, about 112 km. north-east of Jammu city by the side of the Jammu-Srinagar national highway. The area is very cold and moist, having considerable amount of rainfall. Temperature during the end of October varied from 6°C. to 13°C. It remains snow covered for four months from the end of November. There is very little cultivation. The area is mostly covered with forest of pine (both natural and planted), deodar and spruce. Exposed sunny parts are covered with fine grasses. Mammalian fauna appeared to be very poor, but birds are in plenty. The Gray Tit, Laughing Thrushes, Bush Chat, Himalayan Tree Creeper, Yellow-billed Magpie, Green Woodpecker, etc., are important among the avifauna.

Rambon, c 951 m., Doda district (1-10 Nov 1975): A small town on the hill slope, about 190 km. north of Jammu city by the Jammu-Srinagar national highway on the bank of the river Chenab. The area is moist and comparatively hot, the temperature during our stay, varied

from 12°C. to 25°C. It is an important halting station for most of the vehicles passing through the highway. As a result there are a number of hotels, restaurants and other shops. There is no true forest, but scattered bush jungles similar to that of Jhajjar Kotli are found throughout. The hill slopes are well cultivated with wheat and maize.

Rodents of this area are interesting and varied, as regularly these animals are transported with food bags, etc., from different parts of the country. Many of them have established in the neighbouring shops, but some have spread out to the nearby fields also. Except for a number of bats, rats and jackal, no other mammalian species was observed during the period of survey, but it is said that during the winter, various mammalian species including the Rhesus Macaque, Langur, Indian Fox, Asiatic Black Bear, etc., come down here from higher elevations. A number of scavenger birds including the Indian Scavenger Vulture are found, which help to keep the bank of Chenab clean, where all the wastes of the town are thrown.

MAJOR FAUNAL WORKS

Knowledge of the mammalian fauna of Jammu and Kashmir is mainly due to Jerdon (1867), Drew (1875), Dobson (1876), Lydekker (1877), Blanford (1888-1891), True (1894), Pocock (1939, 1941), Ellerman and Morrison-Scott (1951), Ellerman (1963) and Prater (1965), Ward (1905, 1921 to 1928) in a series of publications gave a detailed account of a number of species particularly those of larger sizes. However, the history of the development of knowledge about the mammalian fauna started with Waterhouse (1841), Moorcroft and Trebeck (1841), Blyth (1841, 1841a, 1855, 1863), Vigne (1842) and Cunningham (1853, reprinted in 1970). Mammal Survey by the B.N.H.S. could cover only a part of the Islamabad district of this state and the report on the same was given by Hinton and Thomas (1926). In addition to those, numerous other publications dealing mainly with the taxonomy and distribution of mammals are available, of which publications of Blanford (1875, 1877, 1879, 1898), Günther (1875), Thomas (1880, 1888, 1893, 1911, 1917, 1922, 1926), Scully (1880), Miller (1897, 1899, 1911, 1913, 1913a), Andersen (1905), Bonhote (1905), Hamilton (1907), Wroughton (1908), Pocock (1908, 1930, 1932, 1934, 1936), Osmaston (1930), Khajuria (1955), Khan (1970), Sharma and Sharma (1976) and Roberts (1977) are important. Out of 138 species and subspecies dealt with in the present paper, 13 are recorded for the first time from this territory.

AN ANALYSIS OF THE MAMMALIAN FAUNA

The mammalian fauna of Jammu and Kashmir is very varied (Table 1). This is largely due its role as a transitional zone between two of the world's six major zoogeographical region, the Palaearctic and the Oriental. Moreover, there are some species which are Ethiopian in origin while some are endemic. The present distribution of the mammalian fauna also owes much to this various origins as well as to the routes they had to take to overcome some important barriers to their dispersal. These barriers are the high mountain ranges, such as Pir Panjal range, the main Himalayan range, Karakoram range, etc., extreme dryness with desert conditions in the east and the river Indus with its numerous tributaries passing through the country.

Palaearctic elements : About 65 per cent of the mammalian fauna of Jammu and Kashmir are Palaearctic and appear to have come from Iran through Pakistan, for example, *Rhinolophus ferrumequinum* (Schreber), *R. hipposideros* (Bechstein), *Martes foina* (Erxleben), *Cricetulus migratorius* (Pallas), etc., or from across the Himalayas and Hindu Kush mountains, for example, *Crocidura russula* (Hermann), *Ursus arctos* Linnaeus, *Mustela erminea* Linnaeus, *M. altaica* Pallas, *Lutra lutra* (Linnaeus), *Felis lynx* Linnaeus, *Cervus elaphus* Linnaeus, *Marmota caudata* (Jacquemont), *Eptesicus serotinus* (Schreber), *Apodemus flavicollis* (Melchior), etc. The other route is through Tibet which was availed of by *Bos grunniens* Linnaeus, *Procapra picticaudata* Hodgson, *Lepus oiostolus* Hodgson, *Ochotona ladacensis* (Günther), *Marmota bobak* (Muller), etc. Some animals were transported by the human beings, for example, *Rattus norvegicus* (Berkenhout), *Mus musculus* Linnaeus, etc.

Ethiopian elements : About 2 per cent of the mammalian fauna of Jammu and Kashmir have Ethiopian affinities, for example, *Rhinopoma hardwickei* Gray, *Felis chaus* Guldenstaedt, *Hemiechinus auritus* (Gmelin), etc., which must have entered from Pakistan through Punjab and Rajasthan.

Oriental elements : About 29 per cent of the mammalian fauna of Jammu and Kashmir are Oriental and have entered from the southern side through Punjab, Himachal Pradesh and Pakistan, for example, *Rousettus leschenaulti* (Desmarest), *Pteropus giganteus* (Brunnich), *Cynopterus sphinx* (Vahl), *Megaderma lyra* Geoffroy, *Macaca mulatta*

(Zimmermann), *Presbytis entellus* (Dufresne), *Martes flavigula* (Boddaert), *Viverricula indica* (Desmarest), *Golunda ellioti* Gray, etc. Some animals were carried by the human beings, for example, *Rattus rattus* (Linnaeus), *Mus booduga* (Gray), *Mus cervicolor* Hodgson, *Suncus murinus* (Linnaeus), etc.

Endemic elements : About 3 per cent of the mammalian fauna of Jammu and Kashmir appear to be endemic, for example, *Mus sublimis* Blanford, *Myotis longipes* (Dobson), etc.

Jammu and Kashmir displays an extreme variation of altitudes from 8126 m. at Nanga Parbat to almost plain of Jammu, which in turn affects the temperature, the type of vegetation and its associated fauna. It has equivalents of many of the world's most important climatic and vegetational zones or biomes, and some interesting comparison can be made. Thus, the arctic zone mirrored in areas of permanent snow and ice over 5000 m., below this, is the alpine meadow and scrub with its Red Fox, *Vulpes vulpes montana* (Pearson), Lynx, *Felis lynx* Linnaeus and Royle's Pika, *Ochotona roylei* (Ogilby) which are comparable to the Tundra biome with Siberian race of Red Fox, *V. v. daurica* Ognev, Lynx, *F. lynx*, and Siberian Pika, *Ochotona hyperborea* (Pallas). Next comes the coniferous forest, with a subspecies of Red Deer, *Cervus elaphus hanglu* Wagner, Musk Deer, *Moschus moschiferus* Linnaeus, Alpine Weasel, *Mustela altaica* Pallas, Small Kashmir Flying Squirrels, *Hylopetes fimbriatus* (Gray) and *H. baberi* (Blyth), which can be compared with the boreal forest biome or Taiga harbouring another subspecies of the Red Deer, *C. e. asiaticus* Lydekker, Musk Deer, *M. moschiferus*, Alpine Weasel, *M. altaica* and Boreal Flying Squirrel, *Pteromys volans* (Linnaeus). Further down is the moist temperate Himalayan forest with such species as the Leopard, *Panthera pardus* (Linnaeus), Rhesus Macaque, *Macaca mulatta* (Zimmermann), Langur, *Presbytis entellus* (Dufresne), Giant Red Flying Squirrel, *Petaurista petaurista* (Pallas), etc. This zone is comparable to the deciduous forest biome with similar mammalian species in different parts of India. Last comes the almost plain land of Jammu region with some what humid subtropical condition, having mammalian fauna like the Indian Flying Fox, *Pteropus giganteus* (Brünnich), Small Indian Civet, *Viverricula indica* (Desmarest), Northern Palm Squirrel, *Funambulus pennanti* Wroughton, Indian Bush Rat, *Golunda ellioti* Gray, Indian Gerbil, *Tatera indica* (Hardwicke), etc., which are common in the similar biome of the Punjab, Rajasthan and Gujarat of India.

Of the eight orders of mammals found in the state, Chiroptera and Rodentia are best represented by the larger number of genera, followed by Carnivora and Artiodactyla; but in the number of species and subspecies, Rodentia ranks highest (Table 1). Among the families Muridae, Vespertilionidae, Leporidae and Bovidae are well represented.

SYSTEMATIC ACCOUNT

Order INSECTIVORA

Family ERINACEIDAE

1. *Hemiechinus auritus* (Gmelin)

Long-eared Hedgehog

Erinaceus auritus Gmelin, 1770, *Nov. Comment. Acad. Sci. Petrop.*, 14 : 519.
(Astrakhan, South-eastern Russia).

Distribution : Within Indian limit it is widely distributed in the xeric parts of Gujarat, Punjab and Rajasthan. Sharma and Sharma (1976) recorded this species from Jammu.

Material : No specimen examined.

Family SORICIDAE

2. *Sorex* (?) *minutus planiceps* Miller

Lesser Shrew

Sorex planiceps, 1911, *Proc. biol. Soc. Wash.*, 24 : 242. (Dachin, c 2750 m., Kishtwar, Jammu and Kashmir).

Distribution : Known from the type-locality.

Material : No specimen examined.

Taxonomic remarks : Ellerman and Morrison-Scott (1951) doubtfully treated *Sorex planiceps* Miller as a subspecies of *Sorex minutus* Linnaeus. Since no additional material is available for further examination, the status of the species is maintained as such.

3. *Suncus murinus murinus* (Linnaeus)

House Shrew

Sorex murinus Linnaeus, 1766, *Syst. Nat.* 12th ed., 1 : 74. (Java).

Distribution : It is a commensal form, reported from all parts of India, occurring together with several other subspecies. Its widespread

distribution is apparently due largely to human agency. It is also recorded from different countries outside India.

Material : 1 ♀ ; Srinagar, c 1893 m., Islamabad dist.; 23 Aug 1974. 4 ♀ ; Rambon ; 2-10 Nov 1975. 2 ♂ ; Jhajjar Kotli ; 15, 21 Nov 1975. 1 ♂ , 1 ♀ ; Punch, c 978 m., Punch dist ; Undated.

Measurements :

External — 3 ♂ : Hb 118, 119, 122 ; Tl 65, 68, 72 ;
Hf 16, 18, 20 ; E 9, 10, —

6 ♀ : Hb 98—123 (109) ; Tl 64—81 (70) ;
Hf 17—20.5 (19) ; E 8—10 (8.5).

Cranial — 3 ♂ : Gl 29.5, 30.5, 31.9 ; Cb 28, 29.4, 31.2 ;
Cw 11.9, 12.6, — ; Pal 12.9, 14, — ;
Utr 13.4, 13.9, —.

3 ♀ : Gl 27.9, 29.4, 32 ; Cb 27, 28.7, 30.5 ;
Cw 10.8, 11.3, 12.7 ; Pal 12.7, 13.6, 14.7 ;
Utr 13.1, 14.6, —.

Taxonomic remarks : Fur thick, soft and long, except in the specimens from Srinagar and Punch where it is short. Dorsal fur basally State-Gray, apically Fawn or Rufescent. Ventral fur basally Smoke-Gray, apically pale Buff.

The North Indian (Jammu and Kashmir, Punjab, Kumaon) population of *Suncus murinus* (Linnaeus) was treated as *S. m. tyleri* (Blyth) by Lindsay (1929), followed by Ellerman and Morrison-Scott (1951), on the basis of a Rufescent patch across the throat and claded feet. But none of the present specimen has Rufescent throat patch, and only two have claded feet. Examination of the study skins of *S. m. murinus* present in the collection of the Z.S.I. and B.N.H.S. reveals that some of them have Rufescent throat patch irrespective of collection localities. Thus, so-called distinguishing characters of *tyleri* appear to be nothing but individual variation. Chakraborty (1975), therefore, synonymized *tyleri* with the nominate subspecies.

General remarks : This species is always found in the vicinity of human habitation and its presence can easily be recognized after evening by a very frequent importunate cry. They take refuge by day in shallow burrows, beneath the rocks, inside of rainwater or sewage

pipes, and become active immediately after dusk. Except one specimen which was caught by hand from the metal road near tourist reception centre of Srinagar at about 22.00 hours, the other specimens were captured by break-neck traps from the houses or bush jungles near houses with dry fish, meat or fried egg as bait between 20.00 hours and 6.00 hours. The contents of four stomachs examined were as follows : mucous only, 2 ; insects (mostly of Orthoptera), 1 ; flesh and hair of rodent probably of *Mus* sp., insects (Coleoptera), 1

From the analysis of stomach-contents it is obvious that this animal feeds on insects and small rodents, and thus puts a natural control for them.

None of the female carried embryos. One trapped on November 10 showed enlarged follicles in the ovaries.

4. *Suncus murinus caerulescens* (Shaw)

House Shrew

Sorex caerulescens Shaw, 1800, *Gen. Zool. Mamm.*, 1 : 533. (India).

Distribution : Bihar, West Bengal, Nepal. However, this subspecies has established in major towns all over India and neighbouring countries, being transported through human agency.

Material : Although a number of specimens were observed near Jammu Tawi railway station as well as in the open drains of Jammu city, but no specimens could be collected.

5. *Crocidura* (?) *horsfieldi myoides* (Blanford)

Sorex (Crocidura) myoides Blanford, 1875, *J. Asiat. Soc. Beng.*, 44 : 106. (Leh, Ladakh, Jammu and Kashmir).

Distribution : Known only from the type-locality.

Material : 1 ♂, (earlier Z.S.I. coll.) Leh, Ladakh ; 1873-74.

Taxonomic remarks : Based on the above specimen Anderson (1881) gave the following description of *C. myoides* : 'The teeth are white, and the front upper incisors have obscure internal process'. Ellerman and Morrison-Scott (1951) stated 'from descriptions seems nearest to *horsfieldi*' and hesitantly treated it as a subspecies of the

same. Due to lack of further specimens nothing can be said positively about the status of it.

6. *Crocidura russula pullata* Miller

Common white-toothed Shrew

Crocidura pullata Miller, 1911, *Proc. biol. Soc. Wash.*, **24** : 241. (Kotihar, c 2150 m., Jammu and Kashmir).

Distribution : Known only from the type-locality.

Material : No specimen examined.

7. *Crocidura leucodon* (Hermann)

Bicolor white-toothed Shrew

Sorex leucodon Hermann, 1780, in Zimmermann, *Geogr. Gesch. Mensch.*, **2** : 382. (Vicinity of Strasbourg, Bas Rhin, Eastern France).

Distribution : Palaearctic in distribution. The present specimen from Kashmir valley, constitutes its first record from the Indian territory.

Material : 1 ♂ ; Daksum ; 10 Sep 1974.

Measurements :

External—Hb 74 ; Tl 40 ; Hf 13.5 ; E 6.

Cranial —Gl 19+ ; Pal 9 ; Utr 9.1 ; MI 9.4.

Taxonomic remarks : Fur thick and soft. Dorsal fur basally Slate-Gray, apically dark brown ; ventral fur basally slaty, apically white. Thus, division of colour between light underparts and dark dorsum can be marked by which it differs from the preceding species. However, Ellerman and Morrison-Scott (1951) are of the opinion that the difference between the two species is not very strongly marked.

Genera remarks : The specimen was captured among the rocks bordering a maize field.

8. *Crocidura pergrisea pergrisea* Miller

Crocidura pergrisea Miller, 1913, *Proc. biol. Soc. Wash.*, **26** : 113. (Skoro Loomba, c 2900 m., Shigar, Baltistan, Jammu and Kashmir).

Distribution : Known only from the type-locality.

Material : No specimen examined.

9. *Crocidura attenuata rubricosa* (Anderson)

Pale Gray Shrew

Crocidura rubricosa Anderson, 1877, *J. Asiat. Soc. Beng.*, 46: 280. (Sibsagar, Assam).

Distribution : Assam and Northern Bengal. Hinton and Thomas (1926) recorded it from Islamabad district of Jammu and Kashmir.

Material : No specimen examined.

10. *Chimmarogale platycephala himalayica* (Gray)

Himalayan Water Shrew

Crossopus himalayicus Gray, 1842, *Ann. Mag. nat. Hist.*, 10: 261. (Chamba, Himachal Pradesh).

Distribution : Within Indian limit it is recorded from Jammu and Kashmir, Himachal Pradesh, Sikkim and Darjeeling (West Bengal).

Material : No specimen examined.

Order CHIROPTERA

Family PTEROPODIDAE

11. *Rousettus leschenaulti* (Desmarest)

Fulvous Fruit Bat

Pteropus leschenaulti Desmarest, 1820, *Encycl. Méth. Mamm.*, 1: 110. (Pondicherry, India).

Distribution : According to Ellerman and Morrison-Scott (1951), Hill and Thonglongya (1972), Chakraborty (1975) and Sinha (1977) this species is known to occur in Rajasthan, Kumaon (Uttar Pradesh), West Bengal, Peninsular India, Nepal, Bhutan, Thailand, Vietnam, Southern China, Java, Sri Lanka. Present specimen extends its range further north to Jammu.

Material : 1 ♀ ; Jhajjar Kotli ; 24 Oct 1975.

Measurements :

External—Hb 115 ; Fa 78 ; Px 27 ; Em 15 ; Mc(2) 34.7 ;
Mc(3) 49.7.

Cranial —Gl 36.1 ; Cw 16 ; Zw 21.5 ; Pw 8.5 ; Iw 7 ; M²—M² 9.9 ;
C¹—C¹ 7 ; Orn 11.9 ; C¹—M² 13.7 ; C₁—M₃ 15.2 ;
M1 20.

Taxonomic remarks : A considerable region of the inner margin of the undersurface of wing is hairy and Isabella in colour, rest of the wing almost naked and dark brown. Fur on the nape and shoulder not sparse. First upper premolar persistent.

Andersen (1912), Wroughton (1918) and Ellerman and Morrison-Scott (1951) treated *R. seminudus* (Gray) from Sri Lanka as a separate species on the basis of sparse fur on the nape and shoulder, shorter forearm (79-85.5 mm.) and deciduous first upper premolar. Sinha (1969) synonymized *seminudus* with *leschenaulti* on the basis of overlapping characters. The characters of the present specimen also support Sinha's (*loc. cit.*) treatment.

General remarks : This species feeds in the same orchard along with other two fruit bats discussed below, but its population appeared to be much less. The present specimen was caught in the mist-net at about 20.00 hours and remained very quiet till it was removed from the net. Analysis of its stomach contents revealed some vegetable matter, probably guava fruit. It was heavily infested with soft ticks (*Argus* sp.).

In its diurnal biotype it is highly gregarious and in other parts of India colonies have been observed in natural caves, vaulted roofs of temple, tomb, deserted huts, etc. In their roost they cluster together in tight bodily contact, restless, frequently flying from one part of the roost to another, and uttering a high pitched pinging call.

In Bombay, majority of youngs are born in mid-March (McCann, 1940a) with milk teeth partially erupted. The uterus of the present specimen taken in late October contained no embryo.

12. *Pteropus giganteus giganteus* (Brünnich)

Indian Flying Fox

Vespertilio gigantea Brünnich, 1782, *Dyrenes Hist.*, 1 : 45. (Bengal, India).

Distribution : According to Ellerman and Morrison-Scott (1951), Sharma and Sharma (1976) and Agrawal and Bhattacharyya (1978), this species occurs in Jammu east to Burma, and south to Peninsular India and Sri Lanka.

Material : 3 ♂, 1 sub adult ♂ ; Jhajjar Kotli ; 19, 20 Oct 1975.

Measurements :

External—3 ♂ : Hb 255, 280, — ; Fa 147, 168, 178 ; E 32, 35, 36.2 , Px 69, 71.5, 74.8 ; Mc (2) 84, 87, 89 ; Mc (3) 109, 117, 118 ; Mc (4) 115, 116, 117 ; Mc (5) 113, 119, 120.

Cranial —2 ♂ : Gl 70.4, 72.9 ; Cw 25.6, 26.5 ; Zw 41, 43 ; Pw 8.3, 8.5 ; M¹—M¹ 19, 19.8 ; C¹—C¹ 13.9, 14 ; C¹—M² 26.1, 27.8 ; C₁—M₃ 29.7, 31.6 ; M1 56, 59.2.

Taxonomic remarks : Adult specimens fit in well with the description given by Andersen (1912), but my subadult specimen (♂) is different in the following features :

Venter Burnt Umber in colour with few white tipped hairs and almost concolorous with the back. Upper first premolar present.

Baculum of two specimens examined, structure of which tallies with the description given by Agrawal and Sinha (1973).

General remarks : Though the species is known in abundance from Punch district (Sharma, 1972), but rare in other districts of Jammu region and probably totally absent in Kashmir proper.

All the specimens were collected from the feeding ground at night ; the roosting place could not be located. During October, at about 19.30 hours they came one after another flying from the south of the Jhajjar Kotli and settled in a large peepul tree within the campus of the PWD rest house. About 35 animals were observed.

Immediately after arrival, they began to feed on the fruits of the peepul. Occasionally some individual flew away, and after two or three rounds over the tree, settled again on the same tree. Shooting with .22 rifle did not disturb the feeding of others. At about 22.00 hours they gradually dispersed from the peepul tree and settled in a guava garden within the campus of the forest rest house located about 100 m. north from the peepul tree. There they fed on the fruits of higher branches and frequently emitted a very shrill cry which could be heard from a distance of about 100 m. at night. Till early morning their movements remained restricted between the campuses of the two rest houses.

All the four specimens collected by random shooting were males, indicating that in the colony the number of males was probably much higher than that of females.

During my visit in November no specimen could be seen in and around Jhajjar Kotli probably due to the fact that all the guavas were harvested by that time and the temperature was fairly low.

To find out the extent of damage, the number of guavas of a tree was counted in the afternoon of 23 October, 1975. Sixty-eight fruits were found of which six were partly damaged. Fruits on the ground were cleared off by the party members. On that night bats were allowed to feed in the garden without any disturbances. In the next morning, 58 fruits were found on that tree and three on the ground. Moreover, out of these (58+3), eight were partially damaged. However, the same orchard was also visited by *Rousettus leschenaulti* (Desmarest) and *Cynopterus sphinx* (Vahl) during night.

In different parts of India it is observed that this species is highly gregarious in its diurnal roost in some large trees, forming colonies of 60 to 600 individuals. Many authors have described such roosts and its diurnal behaviour (*vide* Jerdon 1867, Sterndale 1884, Acharya 1936).

13. *Cynopterus sphinx sphinx* (Vahl)

Short-nosed Fruit Bat

Vespertilio sphinx Vahl, 1797, *Skr. nat. Selsk. Copenhagen*, 4(1): 123.
(Tranquebar, Tamil Nadu, India).

Distribution : According to Ellerman and Morrison-Scott (1951) this subspecies in India is widely distributed from Rajasthan in the west to Assam in the east and south to Peninsular India. Chaturvedi (1969) recorded it from the Andaman Islands. The present series extends its range further north to Jammu. It is also found in Sri Lanka, Burma and Thailand.

Material : 4 ♂, 4 ♀ ; Jhajjar Kotli ; 20-22 Oct, 15 Nov 1975.

Measurements :

External—4 ♂ : Hb 75, 85, 98,—; Fa 64, 68, 68.5, 71 ; E 18, 19, 20,—; Px 26, 26, 27, 29 ; Mc (2) 27, 28, 29, 32 ; Mc (3) 40, 42, 45, 46.

4 ♀ : Hb 89, 94, 95, 95 ; Fa 68, 71, 72, 72 ; E 18, 20, 20, 21 ; Px 25, 26, 26, 30 ; Mc (2) 28, 31, 31.5, 32 , Mc (3) 45, 45.5, 45.5, 46.5.

Cranial—2 ♂ : Gl 28.5, 32.6 ; Cb 26.9, 30 ; Cw 13.5, 14.3 ; Pw 7.2, 7.5 ; Iw 5.4, 6.4 ; M¹—M¹ 8.8, 9.6 ; C¹—C¹ 6.7, 7.2 ; C¹—M¹ 10.2, 11.5 ; Ml 20.4, 24.6.

2 ♀ : Gl 30.8, 31.2 ; Cb 29.6, 30 ; Cw 13.8, 14.2 ; Pw 6.3, 6.7 ; Iw 5.8, 5.9 ; M¹—M¹ 9.2, 9.3 ; C¹—C¹ 6.3, 6.5 ; C¹-M¹ 10.2, 10.2 ; Ml 22.9, 22.9.

Weight : Varies from 32 to 56 g.

Taxonomic remarks : All the specimens fit in well with the description given by Andersen (1912), but no sexual dimorphism in colour could be detected.

Agrawal (1973) synonymized *C. sphinx gangeticus* Andersen with *C. sphinx sphinx* (Vahl) on the basis of overlapping forearm length. But all the eight specimens of the present series come within the range of *C. sphinx sphinx* without any overlap with *gangeticus*.

General remarks : This species is very common in Jammu region but not so in Kashmir proper. In the evening of October it is seen in large numbers flying 5 to 10 meters above the ground in and around guava gardens at Jhajjar Kolti. They actually emerge well before darkness, earlier than other two fruit bats. They were also observed at Jammu and Udhampur city.

It is not highly gregarious in its diurnal roost and generally found in small clusters of three to four during the daytime, roosting in concealed crevices of banyan, peepul, plam or coconut trees, or in the folds of palm leaves. It is silent in diurnal roost. From the existing literature (Brosset 1962, Prater 1965, Das and Sinha 1973) it seems that this species has a spring as well as a post monsoon rut in different parts of India. Teats of all the females of the present series were prominent and one of them was actually lactating but none of them bore any foetus.

Though it consumes a good amount of fruits, it has been suggested (McCann, 1940) that this species may be beneficial as an agent in seed dispersal and also in pollinating flowers which produce nectar at night.

Family RHINOPOMATIDAE

14. **Rhinopoma hardwickei hardwickei** Gray

Lesser Rat-tailed Bat

Rhinopoma hardwickii Gray, 1831, *Zool. misc.*, 37. (India).

Distribution : Gujarat, Jammu and Kashmir, Rajasthan, Uttar Pradesh, Madhya Pradesh, West Bengal and Peninsular India. It is also known from Sind (Pakistan), Burma and Thailand.

Material : No specimen examined.

General remarks : Jerdon (1867) stated that it frequents old ruins, caves and clefts in rocks. However, in Jammu and Kashmir, I could not find them in similar habitats, where it appeared to be rare. Observation in South India showed that there are often numerous separate but closely proximate colonies of this bat (Brosset, 1962). Similar was my observation at Kutab Minar area at Delhi.

Youngs are born mainly in June (Reuben, 1963).

Family MEGADERMATIDAE

15. **Megaderma lyra lyra** Geoffroy

Indian False Vampire

Megaderma lyra Geoffroy, 1810, *Annl. Mus. Hist. nat. Paris*, 15 : 190. (India).

Distribution : Peninsular India, north to Jammu and Kashmir, east to Sikkim and West Bengal. It is also recorded from Pakistan, Bangladesh, Burma and Srilanka.

Material 1 ♂ ; Rambon ; 8 Nov 1975.

Measurements :

External—Hb 82 ; Fa 65 ; E 37 ; Nll 11

Cranial—Gl 29.5 ; Cb 26.5 ; Zw 16.9 ; C¹—M³ 11.1 , M³—M³ 10.3 ; C¹—C¹ 6 ; Ml 20.2.

Taxonomic remarks : Colour of fur dark ashy above and whitish below. Ears very large, and their inner margin united for more than one third of the length. Nose leaf rounded in front, but with a notch on each side behind the nostrils.

General remarks : This species emerges from the roost in late evening. The present specimen was caught in a mist-net placed near a sewer of slum area. The area was full of mosquitos and other insects making it a favourite feeding ground of pipistrelle bats. It was probably trying to catch a pipistrelle on the wing. Blyth (1842) described watching this species catch a small pipistrelle bat, which it devoured after sucking its blood. The major portion of this bat's diet consists probably of insects, as the wings of grasshoppers and several species of moths have been found below their feeding places (Brosset, 1962). Prakash (1959) observed it eating the insect *Schizodactylus montromus* as well as large bats like *Rhinopoma microphyllum* and *Taphozous perforatus*. In Orissa, I have found the remains of Wall Lizard (*Hemidactylus* sp.) and Frog (*Rana* sp.) below its feeding place. However, the stomach of the present specimen (caught at about 20.00 hours) was empty.

In different parts of india colonies of 10-20 individuals have been observed in old temples, tombs, deserted rooms as well as in natural caves.

Youngs are born during March to early May (Prakash 1960, Brosset 1962).

Family RHINOLOPHIDAE

16. *Rhinolophus ferrumequinum proximus* Andersen

Greater Horseshoe Bat

Rhinolophus ferrum-equinum proximus Andersen, 1905, *Proc. zool. Soc. Lond.*, 2 : 112. (Gilgit, Kashmir).

Rhinolophus ferrum-equinum irani Cheesman, 1921, *J. Bombay nat. Hist. Soc.*, 27 : 35. (Shiraz, Iran).

Distribution : Iran to Kashmir, through Pakistan. Sharma and Sharma (1976) recorded it from Punch and Udhampur in Jammu.

Material : 1 ♂; Shar; 4 Sep 1974. 1 ♀; Shikargarh; 29 Aug 1974. 2 ♂, 2 ♀ (earlier Z. S. I. coll.); Gilgit.

Measurements :

External—3 ♂ : Hb 69, —, —; Fa 53.5, 54, 58; E 21, 21.2, 23; Nll 12, 13, —; Hs 6.5, 7, 8.

3 ♀ : Fa 53, 56, 59; E 19.5, 19.7, 21; Nll 13, 13.3, —; Hs 7, 8, —.

Cranial—1 ♂ : Gl 22.5; Cw 10.5; Zw 12.1; C¹—C¹ 6.8;

M³—M³ 8.9; C¹—M³ 8.6; C₁—M₃ 9.8; Ml 15.

2 ♀ : Gl 20, 21.6; Cb 18.8, 19; Cw 10.5, —; Zw 10.6, 11.5; M³—M³ 8.7, —; C¹—M³ 8.3, 8.6; Ml 14.7, —.

Taxonomic remarks : Colour of dorsum varies from pale Fawn to Mars Brown through Fawn. Horseshoe very narrow. Tail short. Skull small and slender, with very narrow nasal swelling and short tooth row.

Chakraborty (1978) dealt with the taxonomy and status of different subspecies of *R. ferrumequinum* and synonymized *R. f. irani* Cheesman with *R. f. proximus* Andersen.

General remarks : These bats regularly visited the campus of the forest rest house at Shar after 21.00 hours. It was often found clinging to the horizontal wooden beams of bungalows. A maximum of five individuals were noticed at a time hanging from the beams. It is very sensitive of mist-net and avoids it. Of the two specimens of recent survey

one was collected with the help of a towel while it was hanging from the beam, and another was found dead near the Shikargarh forest rest house with an injury in the neck region.

This bat prefers humid places for its roost (Brosset, 1962). In the roost they are gregarious and both sexes hang together, often in close-packed clusters.

Considering their size, teeth are weak and small, and they hunt mainly on smaller insects or spiders.

At the time of parturition the females form separate colonies (Roberts, 1977). Females are believed to be sexually mature at two years. With the rut taking place in October or November, the ovum is implanted in the spring. Gestation period is about nine weeks. A single young is born which for a considerable time remains attached to the mother's teats or false public teats (Brosset, 1962).

17. *Rhinolophus hipposideros midas* Andersen

Lesser Horseshoe Bat

Rhinolophus midas Andersen, 1905, *Proc. zool. Soc. Lond.*, 2: 138. (Jask, Persian Gulf).

Distribution : Gilgit (Kashmir) to Cyprus.

Material : 2 ♂, 1 ♀ (earlier Z. S. I. coll.) ; Gilgit, Kashmir.

Measurements :

External—2 ♂ : Fa 38.5, 38.6.

1 ♀ : Fa 38.6.

Cranial—1 ♂ : Gl 14.3 ; Cb 13 ; Cw 5.4 ; C¹ - M^s 5.5 , C¹ - C¹ 3.2 ; Iw 1.7 ; Ml 9.7.

1 ♀ Gl 14.5 ; Cb 13.1 ; Cw 6.3 ; C¹ - M^s 5.5 ;
C¹ - C¹ 3.2 ; Iw 1.8 ; Ml 9.8.

Taxonomic remarks : Ellerman and Morrison-Scott (1951) stated, 'according to Andersen (1918), who appears to treat this form as subspecies in his Key (p.378) where its status, and that of other named forms, seems not very clear'. Sinha (1973) distinguished this subspecies from *R. h. hipposideros* (Bechstein) on the basis of its smaller skull

(14-14.5 vs. 15-16) and relatively broader infra-orbital bridge (more than 3 per cent of the total length of skull). But the difference appears to be negligible.

General remarks : This species emerged and began foraging at dusk, usually along the forest edge and up and down the roads through the forest and this continued well into the night. Not very gregarious in the diurnal roost, choosing some darkened and very sheltered cave or man made tunnel for roosting. Feeding habit similar to the preceding species, but gestation period is shorter being about seven weeks.

Family VESPERTILIONIDAE

18. *Myotis mystacinus nipalensis* (Dobson)

Whiskered Bat

Vespertilio pallidiventris Hodgson, 1844, *Calcutta J. nat. Hist.*, 4 : 286. *nom. nud.*

Vespertilio nipalensis Dobson, 1871, *Proc. Asiat. Soc. Beng.*, 214. (Katmandu, Nepal).

Myotis meinertzhageni Thomas, 1926, *Ann. Mag. nat. Hist.*, (9)17 : 609. (Junction of Nubra and Shyok rivers, Ladakh, Kashmir).

Myotis mystacinus kukunoriensis Bobrinskii, 1929, *Annu. Mus. Zool. Acad. St. Petersb.*, 30 : 221. (Balekut-Gomi, Hwango Ho, South of Kukunor, North-eastern Tibet).

Distribution : According to Ellerman and Morrison-Scott (1951) this subspecies was so far known from Ladakh (Kashmir), Tibet and Nepal. The present material extends its range further west to Islamabad and Doda districts of Jammu and Kashmir.

Material : 1 ♂ ; Rambon ; 5 Nov 1975. 1 ♀ ; Shikargarh ; 30 Aug 1974.

Additional material : 1 ♀ (Type of *Vespertilio nipalensis*) ; Katmandu, Nepal.

Measurements :

External – 1 ♂ : Hb 40 ; Fa 33.

1 ♀ : Hb 42 ; Fa 38.

1 ♀ (Type) : Fa 34.3.

Cranial—1 ♂ : Gl 12.9 ; Cb 12 ; Cw 6.2 ; C¹—M³ 5 ; M³—M³ 5.5 ; Iw 3.2 ; Ml 8.7.

1 ♀ : Gl 13.9 ; Cb 12.9 ; Cw 6.9 ; C¹—M³ 5.2 ; M³—M³ 5.9.

Taxonomic remarks : Both the specimens from Jammu and Kashmir tally with the description given by Dobson (1876).

Dobson (1876) described *nipalensis* as having the ventral hairs black for basal two-thirds of their length, remaining portion to the tip white, forearm 34.3. Thomas (1926) described *M. meinertzhageni* from Ladakh as having forearm 37. Bobrinskii (1929) described *M. mystacinus kukunoriensis* from Tibet as having forearm 38. Tate (1941) inclined to believe all three are the same. Ellerman and Morrison-Scott (1951) synonymized *meinertzhageni* with *nipalensis* and treated *kukunoriensis* as a separate subspecies. From the forearm measurements of the present material and the type of *nipalensis*, it appears that all the three belong to the same subspecies in which under-surface is whitish and forearm length varies from 33-38.

General remarks : Both the specimens were caught in mist-net, one from the jungle road, the other near a sewer. It emerges just at dusk for hunting. Stomach of a specimen contained remains of lepidopteran insects.

19. *Myotis blythi blythi* (Tomes)

Vespertilio blythii Tomes, 1857, *Proc. zool. Soc. Lond.*, 53. (Nasirabad, Rajasthan).

Distribution : Ellerman and Morrison-Scott (1951) stated that this subspecies ranges from Rajasthan to Himachal Pradesh and perhaps Kashmir. According to Blanford (1891) the type-locality (Nasirabad, Rajasthan) of this subspecies requires confirmation. Tate (1941) doubtfully gave Kashmir as the type-locality of this subspecies. However, the present examples authenticate its occurrence in Kashmir. Sharma and Sharma (1973, 1976) recorded *M. blythi* from Jammu and Punch valley.

Material : 2 ♂, 2 ♀ ; Shar ; 3 to 6 Sep 1974.

Measurements :

External—2 ♂ : Hb 72, 79 ; Fa 59, 59 ; E 21, 23.

1 ♀ : Hb 72 ; Fa 63 ; E 20.

Cranial —2 ♂ : Gl 21.1, 21.3 ; Cb 20.7, 21 ; Cw 9.7, 10.2 ; C¹—C¹₂, 5, 5.3 ; C¹—M³ 8.9, 8.9 ; M³—M³ 8.7, 8.9 ; lw 5, 5.1 ; Ml 16.3, 16.3.

1 ♀ : Gl 21.4 ; Cb 20.6 ; Cw 9.5 ; C¹—C¹ 5.9 ; C¹—M³ 8.9 ; M³—M³ 9.3 ; Ml 16.2.

Taxonomic remarks : Dorsum reddish brown, venter pale brown ; base of hairs slaty throughout body. Crown of head slightly raised. First upper premolar about half the height of third, the second quite small and somewhat inside the tooth row.

In a male specimen, partial albinism is noticed in the region of shoulder.

General remarks : This species was observed late in the evening, flying 1 to 10 m. above the ground near the stream passing through Shar. All the specimens were captured in mist-net, where they remained quiet without any attempt of cutting the net. Stomachs of two specimens revealed semidigested insects (probably dipteran) and flesh (unidentifiable). None of the female was pregnant, but one was lactating.

20. *Myotis longipes* (Dobson)

Myotis theobaldi Blyth, 1855, *J. Asiat. Soc. Beng.*, 24 : 363. (Caves near Matarnag, north of Islamabad, Kashmir). [Blanford (1891) and Thomas (1915) stated that this form should be considered unidentifiable].

Vespertilio macropus Dobson, 1872, *Proc. Asiat. Soc. Beng.*, 209. Not of Gould, 1854. (Caves of Bhima Devi, 1850 m., Kashmir).

Vespertilio longipes Dobson, 1873, *Proc. Asiat. Soc. Beng.*, 110. New name for *Vespertilio macropus* Dobson, preoccupied.

Vespertilio megalopus Dobson, 1875, *Ann. Mag. nat. Hist.*, 16 : 261. [? Kashmir. Dobson gave the locality as Gaboon, West Africa, but Thomas (1915) stated that the type was identical with a 'cotype' of *longipes* and certainly did not come from Gaboon].

Distribution : Islamabad (Kashmir) ; Iran (Lay, 1967) ; Afghanistan (Gaisler, 1970) ; probably Pakistan (Roberts, 1977).

Material : 1 ♂ (Syntype) (earlier Z.S.I. coll.); Caves of Bhima Devi, 1850 m., Islamabad. 5 unsexed (earlier Z. S. I. coll.); Bumbzoo cave, about 16 km. from Matan on the Pahlgam Road, Islamabad.

Measurements :

External—1 ♂ (Syntype, from Dobson, 1876) : Hb 44 ; Tl 37 ;
Fa 37 ; E 15 ; Fc 10 ; Tr 8.

5 unsexed (from spirit specimens) : Fa 37.5—40(38.5) ;
T 16—18 (16.5) ; Fc 9—11 (9.6).

Cranial—1 ♂ (Syntype) : Gl 14.4 ; Cb 13.5 ; Cw 7.5 ; Zw 8.9 ;
C¹—C¹ 3.7 ; C¹—M³ 6 , M³—M³ 6.1 ; Ml 11

1 unsexed : Gl 15.1 ; Cb 14 ; Zw 8.6 ; C¹—C¹ 3.6 ;
C¹—M³ 5.5 ; M³—M³ 5.8.

Taxonomic remarks : The type with isabelline dorsal fur. No projection or notch on the hind margin of ear and can be distinguished from other Mouse-eared bats by relatively large feet and fringe of hairs along the outer margin of tibia. The specimens from Bumbzoo cave are similar to the type in coloration, structure of ear and skull, but appear to be slightly larger.

Blanford (1891) stated, 'it is probable that *Myotis theobaldi* obtained from caves near Matur Nag, N. of Islamabad, Kashmir, was the same as *V longipes*, for the two agree in dimensions and both are characterised by large feet ; but it is impossible to identify *Myotis theobaldi*, for the types have been lost, and it was said to be extremely close to the pipistrelle, from which *V longipes* differs considerably in structure.' Thomas (1915) also agreed with Blanford that *M. theobaldi* should be considered as unidentifiable.

Ellerman and Morrison Scott (1951) regarded *longipes* as allied to *M. capaccinii* (Bonaparte), and possibly a subspecies of it. However, Gaisler (1970) based on the material from Afghanistan regarded *longipes* as a distinct species.

21. *Vespertilio murinus murinus* Linnaeus

Particoloured Bat

Vespertilio murinus Linnaeus, 1758, *Syst. Nat.*, 10th ed., 1 : 32. (Sweden).

Distribution : Palaearctic in distribution, within Indian limit it is recorded from Jammu and Kashmir.

Material : No specimen examined.

22. *Eptesicus nilssoni kashgaricus* Bobrinskii

Northern Bat

Eptesicus nilssonii kashgaricus Bobrinskii, 1926, *C. r. Acad. Sci. Leningrad*, A, 97. (Khotan-Tegh, mountains of Russki, near Kashgar, Chinese Turkestan).

Distribution : So far this subspecies was only known from the type-locality. Present specimens extend its range to Gilgit (Kashmir). On the basis of a specimen brought by Mr. Scully, Ellerman and Morrison-Scott (1951) included Gilgit within the range of the nominate subspecies. But detailed examination of Mr. Scully's specimen revealed that it is of *Pipistrellus savii* (Bonaparte).

Material : 2 ♂ (earlier Z. S. I. coll.) ; Gilgit, c 3200 m. to 3350 m., Kashmir ; 5, 7 Aug 1879.

Measurements :

External—2 ♂ (from spirit specimens) : Fa 41, 41.5 ; E 14, 15.

Cranial —1 ♂ : Gl 15.9 ; Cb 15.1 ; Cw 7.7 ; Iw 4.1 ; C¹—C¹ 4.9 ; C¹—M³ 5.9 ; M³—M³ 7.

Taxonomic remarks : Dorsum Straw Yellow, with bases of hairs dark brown. Venter buffy white. This subspecies differs from nominate subspecies by larger forearm and paler dorsum.

23. *Eptesicus serotinus pachyomus* (Tomes)

Serotine

Scotophilus pachyomus Tomes, 1857, *Proc. zool. Soc. Lond.*, 50. (Rajputana Rajasthan, India).

Distribution : Jammu and Kashmir to Rajasthan ; Pakistan and Afghanistan. Sharma and Sharma (1976) recorded nominate subspecies from Akhnour and Bholderwah of Jammu, but subspecific identification of his specimens appears to be doubtful.

Material : 1 ♂ ; Shar ; 6 Sep 1974. 2 ♀ (earlier Z. S. I. coll.) ; Kashmir.

Measurement :

External—1 ♂ : Hb 74 ; Fa 58 ; Hf 10 ; E 21

2 ♀ (from spirit specimens) : Fa 49, 55.5.

Cranial —1 ♂ : Gl 21.7, Cb 21 ; Cw 10.1 ; Iw 4.7 ; C¹—C¹ 7 ,
C¹—M³ 8.3 ; M³—M³ 9.1 ; Ml 16.7.

1 ♀ : Gl 22 ; Cb 21.7 ; Cw 9.8 ; Iw 4.3 ; C¹—C¹ 7.1 ;
C¹—M³ 8.5 , M³—M³ 9.7 , Ml 16.9.

Taxonomic remarks : Dorsum Seal Brown with pale tips to hairs, venter Broccoli Brown. In other detail, the present series agrees with the description of *E. serotinus* (Schreber) given by Dobson (1876). So far, the length of forearm in this subspecies is known to vary from 51-55 (Tate 1942), but in the present material it varies from 49 to 58.

General remarks : During the day time it is frequently observed inside the hollows of trees roosting singly or in small numbers. Specimen from Shar was caught in the mist-net almost simultaneously with a specimen of *Myotis blythi blythi*, but in contrast to *blythi* specimen, it began to cut the net immediately after being entangled. It emerges rather early to hunt, sometimes while the sun is still shining. Its flight is rather hesitant and heavy with frequent dives to lower levels. With strongly developed teeth they are capable of tackling a variety of insect prey from larger moths to scarabid beetles and dipteran flies.

The youngs are generally born in spring or early summer and are carried by the mother for the first three weeks (Roberts, 1977).

24. *Nyctalus noctula labiatus* (Hodgson)

Common Noctule

Vespertilio labiata Hodgson, 1835, *J. Asiat. Soc. Beng.*, 4 : 700. (Nepal).

Distribution : Nepal. Currently used for the form which occurs in Kashmir, Darjeeling (West Bengal), Chin Hills (Burma) and Malaysia ; but Tate (1942) places it as *incertae sedis* and states

that he doubts whether it was based on a *Nyctalus* Bowdich. Sharma and Sharma (1973, 1976) recorded this species from Jammu, Punch and Mandi districts of Jammu.

Material : No specimen examined.

25. *Pipistrellus pipistrellus bactrianus* Satunin

Common Pipistrelle

Vespertilio lacteus Temminck, (?) 1840, *Monogr. Mamm.*, 2 : 245. (Locality unknown).

Vesperugo akokomuli var. *almatensis* Severtzov, 1873, *Mém. Soc. Amis. Sci. nat. Moscou*, 8(2) : 79 ; 1876. *Ann. Mag. nat. Hist.*, 18 : 42. *nom. nud.* (Turkestan).

Vespertilio oxianus Bogdanov, 1882, *Outline nat. Hist. Khibinskoyo*, 78. *nom. nud.*

Pipistrellus bactrianus Satunin, 1905, *Mitt. Kaukas. Mus.*, 2 : 67, 85. (Oasis of Tedzen, Transcaspia, Russian Turkestan).

Distribution : Palaearctic, range includes Gilgit and Srinagar (Kashmir). Sharma and Sharma (1973, 1976) recorded *P. pipistrellus* from Punch valley and Jammu.

Material : 1 ♂ (earlier Z. S. I. coll.) ; Kashmir ; 1874.

Taxonomic remarks : Pale smoky brown dorsal fur, slightly lighter on the belly. Wing membrane blackish and opaque. A prominent lobe below the calcar. Ear slightly tapered and rounded at the tip, tragus banana-shaped.

First premolar visible from outside toothrow.

Corbet (1980) regarded this subspecies as a synonym of *P. p. aladdin* Thomas.

General remarks : Topal (1974) caught a number of gravid females during the last week of May at Srinagar. Each female had a single embryo in the right horn of the uterus.

26. *Pipistrellus coromandra coromandra* (Gray)

Indian Pipistrelle

Scotophilus coromandra Gray, 1838, *Mag. zool. bot.*, 2 : 498. (Pondicherry, India).

Distribution : According to Ellerman and Morrison-Scott (1951), this subspecies occurs in Sri Lanka north to Kumaon (Uttar Pradesh) and east to West Bengal. Bhattacharyya (1977) recorded *P. coromandra* from Car Nicobar. Sharma and Sharma (1976) found *P. coromandra* (Gray) from Punch, Akhnoor and Bhaderwah of Jammu. In the Z. S. I. coll. there is a specimen of this subspecies from Meghalaya. The present material extends the range of this subspecies further north to Kashmir proper.

Material : 5 ♀ ; Srinagar, Islamabad, Kashmir ; 24 Aug 1974. 1 ♂ ; Shar ; 4 Sep 1974. 2 ♂ , 1 ♀ ; Rambon ; 3 to 8 Nov 1975.

Measurements :

External—3 ♂ : Hb 38,40, 43 ; Fa 30, 31.5, 32 ; E 8, 11, 12.
6 ♀ : Fa 32-34 (32.8).

Cranial —1 ♂ : Gl 11.9 ; Cb 11.2 ; Cw 6.2 ; C¹—C¹ 3.5 , C¹—M³ 4.2 ; M³—M³ 4.5.

3 ♀ : Gl 11.9, 12.1, 12.5 ; Cb 11.2, 11.7, 11.8 ; Cw 6.2, 6.4, 6.7 ; C¹—C¹ 3.5, 3.9, 3.9 ; C¹—M³ 4.2, 4.4, 4.5 ; M³—M³ 4.5, 5, 5.2.

Taxonomic remarks : Fur soft, thick and long particularly on the dorsum. Colour of fresh specimens noted as follows : Dorsal and ventral fur basally Seal Brown, apically Cinnamon, and when observed from a distance appears uniform Cinnamon. Wings and interfemoral membrane blackish, margin distinctly lighter but not white. Face black, ear chocolate brown.

Lower incisors crowded, but in one specimen from Srinagar incisors free from each other, probably due to age.

As regard the length of forearm the present series appears slightly larger than those of central and western India in which it varies from 27-31 (Brosset, 1962).

General remarks : This species was observed roosting in places very close to human habitation, namely, behind signboards, chimneys of fire places, among the tiles of huts, old buildings, outhouses, etc., rather than in woods or caves. They emerge one after another just before dusk and fly for over an hour in the neighbouring region. At

Srinagar, I observed these bats coming out from behind a large signboard of the Tourist Reception Centre around 19.30 hours. After half an hour later, my party members pressed the signboard against the wall. During the process six bats escaped and five were killed. All the five specimens thus collected were female, indicating that male members of the colony emerge first followed by the females. At Rambon, their forage was observed just before dusk over a patch of stagnant sewage amongst the surrounding huts. The area was heavily infested with insects, specially mosquitoes. During forage, much darting and turning characterised their rapid flight, and they were noticeably wary of mist-nets. Six nets were placed at their foraging ground for seven consecutive evenings, and only three bats could be netted. Moreover, they seldom remain entangled in the net longer than a minute.

Pregnant females were obtained in May and September by Brosset (1962), and in July by Sinha (1970). None of the female specimen of the present series bore any foetus.

27. *Pipistrellus kuhli lepidus* Blyth

Kuhl's Pipistrelle

Pipistrellus lepidus Blyth, 1845, *J. Asiat. Soc. Beng.*, **14** : 340. (Kandahar, Afghanistan).

Distribution : India : Jammu and Kashmir ; Pakistan and Afghanistan.

Material : No specimen examined.

28. *Pipistrellus savii tamerlani* (Bobrinskii)

Savi's Pipistrelle

Eptesicus tamerlani Bobrinskii, 1918, *Fauna and Flora Russia*, **15** : 13-16. (Baisunski Bay, Bokhara, Uzbek Rep. U. S. S. R.).

Distribution : So far, this subspecies was known only from the type-locality. The present specimen extends its range to Gilgit (Kashmir).

Material : 1 ♂ (earlier Z. S. I. coll.) ; Gilgit, Kashmir ; 1879.

Measurements :

External (from spirit specimen) — Fa 33.3.

Cranial —Gl 13.7 ; Cw 6.6 ; Iw 3.7 C¹—C¹ 4.2 ; C¹—M³ 4.6 ;
M³—M³ 6 ; MI 9.4.

Taxonomic remarks : The present specimen was collected by Mr. Scully, who identified it as *Vespertilio borealis* Nilson. Later Mr. G. M. Allen reidentified it as *Eptesicus tamerlani* Bobrinskii, which was regarded as a subspecies of *E. caucasicus* (Satunin) by Ognev (1962). Bobrinskii *et al.* (1944) and Ellerman and Morrison-Scott (1951) treated *tamerlani* as a subspecies of *Pipistrellus savii* (Bonaparte).

In the present specimen Pm² is lacking. Occasional absence of Pm² in this species was noted by Leche (1875), Miller (1912), Tate (1942), Bobrinskii *et al.* (1944) and Topal (1959). Tate (1942) questioned the validity of distinction between the genera *Pipistrellus* Kaup and *Eptesicus* Rafinesque on the basis of the presence or absence of Pm². However, the present specimen tallies exactly with the figures of *P. savii*. given by Topal (1969) in respect of the shape and structure of its ear, tragus and skull.

29. *Pipistrellus dormeri* (Dobson)

Dormer's Bat

Scotozous dormeri Dobson, 1875, *Proc. zool. Soc. Lond.*, 373. (Bellary Hills, Karnataka, India).

Distribution : According to Ellerman and Morrison-Scott (1951), within Indian limit this species ranges from Maharashtra, east to West Bengal and south to Dharwar and Bellary in the Peninsula. The present specimen extends its range further north to Jammu.

Material : 1 ♀ ; Jhajjar Kotli ; 20 Oct 1975.

Measurements :

External—Hb 48 ; Fa 35 ; E 10.

Cranial —Gl 14.4 ; Cb 14 ; Cw 7.9 ; Iw 4.3 ; C¹—C¹ 5 ; C¹—M³
5.5 ; M³—M³ 6.2 ; MI 11.

Taxonomic remarks : The present specimen agrees with the description of coloration provided by Tate (1942).

There is much controversy regarding the existence of i^2 in this species (Dobson 1876, Blanford 1891, Khajuria 1965, Agrawal 1967). Though in the present specimen I could not find the i^2 , but in a series of specimens present in the Z. S. I. collection studied by one of my colleagues, it was observed that i^2 is minute but always present in situ.

General remarks : The specimen was caught in the mist-net along with two specimens of *Cynopterus sphinx* within the campus of the forest rest house.

30. *Pipistrellus mimus mimus* Wroughton

Indian Pygmy Pipistrelle

Pipistrellus mimus Wroughton, 1899, *J. Bombay nat. Hist. Soc.*, 12 : 722.
(Mheskatri, Dangs, Surat, Gujarat)

Distribution : According to Ellerman and Morrison-Scott (1951) this subspecies occurs from Gujarat south to Sri Lanka, east to Western Burma and Assam. Sharma and Sharma (1976) recorded it from Jammu.

Material : No specimen examined.

31. *Barbastella leucomelas darjelingensis* (Hodgson)

Plecotus darjelingensis Hodgson, 1855, in Horsfield, *Ann. Mag. nat. Hist.*, 16 : 103. (Darjeeling, West Bengal. According to Tate (1942) type-locality is Nepal).

Distribution : Within Indian limit appears to be common in the Himalayas at elevation from 1500 m. to 2450 m. and recorded from Punch, Akhnoor, Bhaderwah, Gilgit (Jammu and Kashmir), Himachal Pradesh, Rajasthan, Mussoorie (Uttar Pradesh), Sikkim, northern West Bengal and Meghalaya.

Material : 2 ♂, 1 ♀ (earlier Z. S. I. coll.) ; Gilgit, Kashmir.

Measurements :

External—2 ♂ (from spirit specimens) : Fa 40.5, 41.4 ; E 16, 17.2 ;
T 21, 21.6.

1 ♀ (from spirit specimen) : Fa 43.3 ; E 16.1 ; T 22.

Taxonomic remarks : General colour blackish gray but the extreme tip of fur whitish. Ear without any projecting lobe from the base. A calcareal lobe present. Rostrum with markedly depressed medium area. Upper second premolar present.

32. *Scotophilus heathi heathi* (Horsfield)

Greater yellow Bat

Nycticejus heathii Horsfield, 1831, *Proc. zool. Soc. Lond.*, 113. (Madras, Tamil Nadu, India).

Distribution : Within Indian limit it is known from Peninsular region to Gujarat and Rajasthan in the west, Jammu and Kashmir in the north and West Bengal and Sikkim in the east.

Material : No specimen from Jammu and Kashmir could be collected.

General remarks : Fairly tolerant to bright light in their diurnal biotope and seem to like intraspecific bodily contact. Roosts of 14 to 23 individuals were observed at different localities of West Bengal, mainly in the roofs of darkened cowsheds and deserted huts. Generally they hunt fairly high up, feeding mainly on insects of different sizes.

Parturition in Central India is timed for the onset of monsoon, most young being born from mid June to early August (Brosset, 1962). Prakash (1960) observed this species in Rajasthan with two week's old young in late August.

33. *Otonycteris hemprichi hemprichi* Peters

Hemprich's Long-eared Bat

Otonycteris hemprichii Peters, 1859, *Müblers Preuss. Akad. Wiss.*, 233. (North-east Africa).

Distribution : A palaeartic species, within Indian limits recorded only from Gilgit, Nagrota and Bhaderwah of Jammu and Kashmir.

Material : 1 ♀ (earlier Z. S. I. coll.) ; Gilgit ; May 1879.

Measurements :

External—From spirit specimen. Fa 63.7 ; E 32 ; Tr 17 ; T 23.7.

Cranial —Gl 24.5 ; Cb 22.1 ; Cw 9.7 ; Iw 4.5 ; C¹—C¹ 6.1 ;
C¹—M³ 8.5 ; M³—M³ 10.1 ; MI 17.1.

Taxonomic remarks : A very large-sized species. Ear long, about double the length of head and not united at the base. Entire body pale Sepia Brown, except the wing membrane which is slightly deeper. Basal portion of hair white.

34. *Plecotus auritus puck* Barrett-Hamilton

Long-eared Bat

Plecotus puck Barrett-Hamilton, 1907, *Ann. Mag. nat. Hist.*, 20 : 521.
(Murree, c 2150 m., Pakistan).

Distribution : So far, this subspecies has been known only from the type-locality. The present specimens extend its range further north to Gilgit and east to Pahlgam in Kashmir. Sharma and Sharma (1976) recorded the species *P. auritus* Linnaeus, without identifying his material subspecifically, from Punch (Jammu).

Material : 2 ♂, 2 ♀ (earlier Z. S. I. coll.) ; Pahlgam forest hut, c 2300m., Islamabad, Kashmir ; undated. 1 ♂, 1 ♀ (earlier Z. S. I. coll.) ; Gilgit, Kashmir ; 15, 16 Sep 1879.

Measurements :

External—3 ♂ (from spirit specimens) : Fa 41.5, 42, 42 ; E 36.6, 37, 40 ; Tr 15, 16, 17 ; T 20, 21, — ; Tc 5.5, 6, 7.

3 ♀ (from spirit specimens) : Fa 40.5, 42, 42 ; E 36, 36.5, 38 ; Tr 15, 16, 16 ; T 19, 20.5, 22 ; Tc 6.5, 6.6, 7.

Cranial —3 ♂ : Gl 16.5, 16.8, 17 ; Cb 15, 15.8, 15.9 ; Cw 8.2, 8.2, 8.7 ; Iw 3.6, 3.7, 3.7 ; C¹—C¹ 3.3, 3.6, 3.7 ; C¹—M³ 5.6, 6, —.

Taxonomic remarks : Hairs basally slaty, tips Isabella or Broccoli Brown on the dorsum and whitish on the venter. Wroughton (1918) mentioned forearm length as 38, but in the present series it extends up to 42. Specimens from Gilgit were identified as *P. auritus nearwardi* Thomas. But from coloration and smaller lengths of forearm and thumb it is obvious that they belong to the present subspecies.

35. *Plecotus auritus wardi* Thomas

Long-eared Bat

Plecotus wardi Thomas, 1911, *Ann. Mag. nat. Hist.*, (8) 7: 209. (Leh, Ladakh, Kashmir).

Distribution : Palaearctic, within Indian limits known only from the type-locality.

Material : 2 ♂, 3 ♀ (topotypes, earlier Z. S. I. coll.) ; Leh, Ladakh, Kashmir ; undated.

Measurements :

External—2 ♂ (from spirit specimens) : Fa 43, 43.4 ; E 36.4, 37.7 ; Tr 15.6, 16 ; T 20.7, 21 ; Tc 7.3, 8.1.

3 ♀ (from spirit specimens) : Fa 43.5, 44.4, 46 ; E 35, 35.2 ; 37.2 ; Tr 16, 17.1, 18.2 ; T 22, 22.3 —, ; Tc 7.5, 9, —.

Cranial —2 ♂ : Gl 17.5, 17.6 ; Cb 15.8, 16.2 ; Cw 8.8, 9 ; Iw 3.3, 3.9 ; C¹—C¹ 3.7, 3.8 ; C¹—M³ 5.7, 6 ; M³—M³ 6.1, 6.4 ; Ml 11.2, 11.2.

3 ♀ : Gl 17.2, 17.6, 17.8 ; Cb 15.8, 16.5, 16.6 ; Cw 8.9, 9.3, 9.4 ; Iw 3.5, 3.8, 3.9 ; C¹—C¹ 3.6, 3.8, 3.8 ; C¹—M³ 5.8, 6, 6 ; M³—M³ 6.2, 6.5, 6.6 ; Ml 11.1, 11.7, 11.8.

Taxonomic remarks : Thomas (1911) gave the following description of the type-specimen. "A pale coloured species with large skull. Size large, fur very long and fine. General colour pale, paler than 'drab-gray' Undersurface broadly washed with greyish white (grey No. 10), lighter than any other form." Forearm and condylobasal length of the type 45.5 and 16.6 respectively. The present specimens are very similar to the above description. Thus, it is obvious that this subspecies differs from *puck* by its paler colour and larger size.

Corbet (1980) treated *wardi* as a subspecies of *P. austriacus* (Fischer).

36. *Murina huttoni* (Peters)

Harpiocephalus huttoni Peters, 1872, *Mübers. Preuss. Akad. Wiss.*, 257. (Dehra Dun, Uttar Pradesh).

Distribution : Jammu and Kashmir, Kumaon (Uttar Pradesh), Sikkim, Darjeeling (West Bengal); Pakistan; Western Burma; Fukien (China); Indo-China.

Material : 1 unsexed (earlier Z. S. I. coll.); Srinagar, Islamabad, Kashmir; undated.

Taxonomic remarks : Fur above brown, below whitish. Sub-specific identification of the present specimen is not possible. However, *M. h. tubinaris* (Scully) occurs within the present range.

37. ***Kerivoula hardwickei hardwickei*** (Horsfield)

Hardwicke's Bat

Vespertilio hardwickii Horsfield, 1824, *Zool. Res. Java.* (Java).

Distribution : According to Dobson (1876), Blanford (1891), and Ellerman and Morrison-Scott (1951) within Indian limits this subspecies was known from Punjab, Darjeeling (West Bengal), Assam and Meghalaya. However, the present specimen constitutes its first record from Jammu.

Material : 1 ♀; Patni Top, c 2060 m.; 27 Oct 1975.

Measurements :

External—Hb 44; Tl 38; Fa 35.3; E 11.

Taxonomic remarks : Fur soft and thick, dark at the base and shining greyish brown at extremities. Ear large, when laid forwards the tips extend nearly the end of the muzzle. Tragus long and attenuated. Conch covered with glandular papillae and small hairs arising from them.

Inner incisors without any second posterior cusp.

General remarks : Roosting among the tiles covering the roof of the forest bungalow at Patni Top. Come out of the roost at dusk and after some irregular flight in the open space near the bungalow, dispersed in the pine forest. Very wary of mist-nets. The only specimen taken was caught by hand while it accidentally entered into a room of the bungalow.

Order PRIMATES

Family CERCOPITHECIDAE

38. *Macaca mulatta mulatta* (Zimmermann)

Rhesus Macaque

Cercopithecus mulatta Zimmermann, 1780, *Georg. Gesch. Mensch.*, 2: 195.
(India).

Distribution: Widely distributed. According to Prater (1965), 'The Himalayas, Assam and northern and central India as far south as the river Tapti in the west and the Godavari in the east, extending thence into Burma and adjoining countries'

Material: No specimen from Jammu and Kashmir could be collected.

General remarks: No troop of this subspecies was noticed in Kashmir valley, but four troops were observed on the Jammu-Srinagar national highway in Jammu region. The troops were noticed at (i) Patni Top, (ii) about 4 km. south of Kud, (iii) about 8 km. north of Udampur and (iv) about 15 km. south of Jhajjar Kotli. Each troop consisted of 15 to 28 individuals of different ages. They come out of the jungle at about 9.00 hours to the open road for enjoying bright sunshine and could be seen up to 12.00 hours. Fights frequently erupt particularly among youngstars. They are more acquainted with human beings and less shy than *M. m. villosa* True. Studies of Southwick *et al.* (1961) indicate that they usually move regularly along a rough circuit within a particular territory, feeding as they go and sleeping in a fresh place each night.

39. *Macaca mulatta villosa* True

Kashmir Rhesus Macaque

Macacus rhesus villosus True, 1894, *Proc. U. S. natn. Mus.*, 17: 2. (Lolab, northern end of Wular Lake, about 64 km. north-west of Srinagar, Kashmir).

Distribution: Southern Kashmir; Himachal Pradesh, Kumaon (Uttar Pradesh); Pakistan.

Material: 1 ♂, 1 ♀, 1 subadult ♀; Daksum; 11, 17 Sep 1974.

Measurements :

External—1 ♂ : Hb 690 ; Tl 305 ; Hf 180 ; E 57.

1 ♀ : Hb 557 ; Tl 210 ; Hf 140 ; E 38.

Cranial —1 ♂ : Gl 135.5 ; Cb 105 ; Zw 93.5 ; Or 73.1 ; Mw 34.5 ; Utr 42.9 ; MI 97.4.

1 ♀ : Gl 112.5 ; Cb 87.2 ; Zw 77.9 ; Or 66 ; Mw 26.5 ; Utr 37.7 ; MI 79.2.

Taxonomic remarks : Entire body covered with thick, soft and very long hairs measuring 62 to 86 mm. in the region of shoulder. However, ischial callosities, lips and margin of eyes are either naked or poorly haired. Much variation in colour among the male, female and subadult specimens could be marked and thus described separately.

Adult ♂ : Facial region blackish. Eyelashes black and moderate in length. Outer surface of ear dirty white, while inner surface and margin blackish. Fur on anterior half of back basally Slate-Gray, and then alternately banded with brown and black, while fur on posterior half orange red for greater part with a small light Olive Buff basal portion. Thus posterior half is much brighter than anterior half. However, a few black tipped hairs found throughout dorsum. Chin and undersurface dirty white. Tail dorsally Olive Buff, ventrally Cream Buff. Fur on under surface of forearm annulated with black, Cream Buff and Olive Buff, while that of inner surface dirty white with Cream Buff tips. Hind limb yellowish white with a light orange tinge.

Adult ♀ : Facial region entirely Olive Buff, with a little grizzling of Cream Buff and black. Hairs on forehead longer than rest of head region and either entirely black or with Olive Buff tips. Fur on back basally Drab-Gray, apically orange red ; in anterior half of back Drab-Gray region longer, whereas, in posterior half reverse is true, thus making the posterior portion brighter. Colour of other region similar to that of male

Subadult ♀ : Very similar to the adult female, but face blackish and oliveness of anterior half of back more pronounced. Areas around eyes white,

Among the other differences between adult male and female, the following are of worth mentioning :

Males more robust and larger than the females which is also obvious from the measurements given by Pocock (1939). In the male, canine very well developed, more than double the size of the second incisor, whereas, in the female, canine though well developed but not to the extent as it is in the male, and only a little larger than the second incisor. Sagittal crest although poorly developed in both sexes, in male it is more prominent.

General remarks : This monkey is fairly common in the pine forest of Kashmir valley above 2000m., but it has been reported by local people that they come down to a much lower level during winter. They roost in the deep jungle, but regularly attack the open cultivated fields bordering the jungle. The same field is visited by them at regular intervals of three to four days during summer and spring.

In the morning of 11th September 1974 (at about 9.00 hours) a large troop of about 50 individuals of all ages was observed by the author in a maize field bordering the jungle at Daksum. Some were on the pine trees others in the ground, but all were engaged in feeding. They were taking cones of pine, maize, tubers and roots of grasses. Juvenile animals remained near their mother. All the animals were very alert and keeping a constant watch of the surrounding while feeding. Half an hour later, my party members and a local man with two pet dogs approached the troop to collect a few examples. These monkeys appeared to be very shy of human beings and as soon as they noticed us from a distance of about 100 m., they stopped feeding and ran towards the jungle. As the dogs chased, they climbed up the pine trees and fled through branches. However, in the process two females (one adult, one subadult) were shot. Three days later, the same troop was noticed at the same spot at about 15.00 hours. Opportunity was availed to study the troop from a deserted hut in the maize field. Eight males, 27 females, 8 subadults and 6 juveniles were counted. None of the juveniles was found clinging. They were not very interested in feeding, instead it appeared that they were mainly enjoying the bright sunshine. Some were engaged in pruning, others playing and occasionally taking grasses or turning the stones in search of insects. Males generally remained in the peripheral region keeping females, subadults and juveniles in the centre. A very robust male, probably troop leader, sat on a peripheral pine tree throughout the period. Just before dusk,

the troop moved into the jungle. On 17th morning the troop once more invaded the same maize field, when an adult male was collected.

Another troop of about 30 individuals was noticed on the mountain slope about 300 m. above our camp at Shikargarh, but owing to the inaccessibility of the area, they could not be approached close enough.

Teats of the female specimen collected were very prominent. The male had excessive subcutaneous fat.

40. *Presbytis entellus achilles* (Pocock)

Nepal Langur

Pithecus entellus achilles Pocock, 1928, *J. Bombay nat. Hist. Soc.*, 32 : 478.
(Satthar hill, Gorkha, c 3650 m., 80 km. northwest of Katmandu, Nepal).

Distribution : According to Roonwal and Mohnot (1977), it occurs in 'Sikkim and Nepal, at high altitudes ; probably Kashmir'

Material : No specimen from Jammu and Kashmir could be collected.

41. *Presbytis entellus ajax* (Pocock)

Kangra Langur

Pithecus entellus ajax Pocock, 1928, *J. Bombay nat. Hist. Soc.*, 32 : 480.
(Deolah, c 1830 m., Himachal Pradesh).

Distribution : Himachal Pradesh, and probably Kashmir at high altitudes ; Hazara (Pakistan). Sharma and Sharma (1976) recorded *Prebytis entellus* (Dufresne) in the high altitudinal ranges of Punch valley including the jungles of Gagrian (2100 m.) and Behramgalla (2700 m.).

Material : No specimen from Jammu and Kashmir could be collected.

General remarks : I have heard from the local people about the occurrence of Langur at Daksum and Patni Top during winter, but none could be observed during our visit. According to Roberts (1977) in summer it ascends to the limit of tree-line at 3050 m. whilst even in winter when snow is on the ground it rarely descends below 2150 m. elevation.

Order CARNIVORA

Family CANIDAE

42. *Canis lupus chanco* Gray

Woolly Wolf

Canis chanco Gray, 1863, *Proc. zool. Soc. Lond.*, 94. (Chinese Tartary).

Distribution : Gilgit and Ladakh (Kashmir), Lahul (Himachal Pradesh) ; Nepal ; Russian Pamir ; China ; Mongolia.

Material : 1 unsexed (earlier Z. S. I. coll.) ; Gilgit, Kashmir ; undated.

Taxonomic remarks : According to Pocock (1939) general colour very variable both seasonally and otherwise. Present specimen very woolly, pale yellowish gray in colour but underfur on back pale slaty.

General remarks : Ward (1928) reported that it is very rarely seen in Kashmir. None was observed by me and nothing was heard from the local people about its occurrence during the survey period.

43. *Canis aureus aureus* Linnaeus

Asiatic Jackal

Canis aureus Linnaeus, 1758, *Syst. Nat.*, 10th ed. 1 : 40 (Province of Lar, Iran).

Distribution : Gujarat, Punjab, Rajasthan, Jammu and Kashmir, Uttar Pradesh, Madhya Pradesh to West Bengal ; Saudi Arabia ; Iraq ; Iran ; Pakistan ; European part of the U. S. S. R. to the extreme south only.

Material : 1 ♀ ; Jhajjar Kotli ; 22 Oct 1975.

Taxonomic remarks : General colour of the present specimen is typical and agrees with the description given by Pocock (1941), except the head region where blackness much reduced in intensity.

General remarks : The present specimen was found dead being run over by a vehicle on the Jammu Srinagar national highway. The population of this species is abundant along the forested slopes of Jammu and Kashmir. It was observed singly or in pairs at Shikargarh, Shar, Rambon, Jhajjar Kotli and even at Jammu city. During the day time they retreat themselves to the caves and crevices among the

rocks, in bushes near nullah or in dens dug in the ground, and come out in late afternoon in search of food near human habitation. It was also noticed at noon in the paddy field at Khanabal near Anantnag city. It feeds upon various small animals, as well as on fruits. The stomach of the present specimen contained grasshoppers, crabs, maize seeds and carrion. At dawn, late afternoon and sometimes in the midnight they uttered their characteristic howl, joining in one by one until the entire area reverberated with their chorus. Vocalizations consisted of a rapidly repeated dog-like bark terminated with an initially loud but diminishing "br-ow-ow-ow.....", all of which repeated several times.

44. *Vulpes vulpes montana* (Pearson)

Hill Fox

Canis vulpes montana Pearson, 1836, *J. Asiat. Soc. Beng.*, 5 : 313. (Himalayas).

Distribution : Jammu and Kashmir to Sikkim ; Yunnan and Tibet (China). Seems to be common between c 1530 and 1830 m., however, in Tibet it ascends as high as 5000 m.

Material : 1 unsexed (earlier Z. S. I. coll.) ; Leh, Ladakh, Kashmir ; undated. 2 ♂, 3 unsexed (earlier Z. S. I. coll.) ; Gilgit, Kashmir ; 15 Nov 1878, Jan 1879, 25 Dec 1879, 4 Apr 1880, Jan 1880.

Taxonomic remarks : Back of ear dark brown to blackish, contrasting strongly with the colour of head and nape. General colour variable. Head and nape Buff to Ochraceous Buff with a small Mummy Brown patch on either side below the eye. Back varies from uniform red to pale red often with some black tinge, but underwool Fawn coloured. Sides perfectly white or with a grayish tinge particularly in the region of thigh. Fur on the chin and throat almost Drab with minute whitish tips. Rest of abdomen ashy with a cast of white except in inguinal region which is pure white. Tail tip white, rest of tail hairs also entirely white but a few with Prout's Brown, Walnut Brown or blackish tips. Study of further material from Punjab, Himachal Pradesh, Uttar Pradesh and Pakistan revealed additional variation in colour and size (both external and cranial) within the series from the same localities. Lay (1967) observed similar variation in different Iranian subspecies. Biswas and Khajuria (1957)

also stated about the variable coloration in *montana*. Thus, it becomes obvious that the criteria established for distinguishing several of the subspecies recognized by Pocock (1941), and Ellerman and Morrison-Scott (1951) require critical reappraisal.

General remarks : In Jammu and Kashmir the present population appears to have been diminished greatly due to regular poaching for its skin. Only a pair was observed near Daksum at about 17.00 hours. It frequents forests and also more open broken country, lies up in burrows, beneath rocks or in crevices between them or in thick bush. It is mainly predatory, preying upon small mammals and birds.

45. *Vulpes bengalensis* (Shaw)
Bengal fox

Canis bengalensis Shaw, 1800, *Gen. Zool. Mamm.*, 1 : 330. (Bengal).

Distribution : Whole mainland of India, Pakistan, Nepal and Bangladesh.

Material : No specimen from Jammu and Kashmir could be collected.

General remarks : Though reported to be common in Jammu and Kashmir, only two specimens were noticed by me just before dusk in a maize field at Shikargarh, and one at night on the Jammu-Srinagar national highway near Rambon. Its principal food consists of rats, land crabs, various insects and fruits.

46. *Cuon alpinus laniger* Pocock
Wild Dog

Cuon javanicus laniger Pocock, 1936, *Proc. zool. Soc. Lond.*, 50. (Kashmir).

Distribution : Astor, Gilgit and Ladakh in Kashmir ; Pakistan ; possibly in southern Tibet.

Material : No specimen examined.

General remarks : Ward (1928) reported that wild dog was fairly common in parts of upper Indus valley, but gradually becoming scarce there, and very rare in the vale of Kashmir. I could not find any trace of this species in the areas visited by me.

Family URSIDAE

47. *Ursus arctos isabellinus* Horsfield
Snow Bear

Ursus isabellinus Horsfield, 1826, *Trans. Linn. Soc.*, 15 : 334. (Mountains of Nepal).

Distribution : Within Indian subcontinent it ranges from the valley of Chitral (Pakistan) to the basin of Bhagirathi in Tehri Garhwal (Uttar Pradesh) and Nepal in the east. It is also recorded from Afghanistan and Tienshan (China).

Material : No specimen examined.

General remarks : In summer it keeps at high elevation close to the snow line ; in autumn and spring found at lower levels, frequently entering the forests, and descending to the neighbourhood of villages to feed on fruits and grain. In winter it retreats to caves and hibernate or remains in a torpid condition. I could not find any specimen of this species in the areas visited by me.

48. *Selenarctos thibetanus laniger* Pocock
Asiatic Black Bear

Selenarctos thibetanus laniger Pocock, 1932, *J. Bombay nat. Hist. Soc.*, 36 : 115. (Aru, Upper Lidder Valley, Kashmir).

Distribution : According to Pocock (1941) 'Kashmir, elsewhere not ascertained, but probably at tolerably high elevations in Himalayas eastward perhaps to Sikkim' Ellerman and Morrison-Scott (1961) included Punjab in its range.

Material : No specimen was collected. Three skins found in an animal dealer's shop at Srinagar were examined.

Taxonomic remarks : Coat very thick and long, one skin (probably of winter) furnished with abundance of underwool. Breast mark smaller than that of nominate subspecies and pure white in colour.

General remarks : Population appears to be high in Kashmir Valley, but ruthless hunting because of its depredatious habit of crops leads to rapid decline. I have noticed it at Shikargarh and Shar, where

it regularly invades the maize fields at night, thereby becoming a great nuisance to cultivation.

It is more frugivorous than the red bear and can climb trees freely in order to forage.

Family MUSTELIDAE

49. *Martes foina intermedia* (Severtzov)

Beech Marten

Mustela intermedia Severtzov, 1873, *Mém. Soc. Amis, Sci. Nat. Moscow*, 8 : 61.
(Basin of Chu, Tallas and Naryn, from 1220 to 2750 m., eastern Turkestan).

Distribution : In the Himalayas it ranges from Afghanistan, east to Nepal at elevations between *c* 1830 to 3960 m. ; Russian and Chinese Turkestan, Tienshan ; Western Iran. According to Ognev (1962) it occurs in Altai.

Material : 1 unsexed (earlier Z. S. I. coll.) ; Leh, Ladakh, Kashmir ; Undated. 1 unsexed (earlier Z. S. I. coll.) ; Gilgit, Kashmir ; Undated. 1 ♂ (earlier Z. S. I. coll.) ; Gilgit, *c* 1600 m., Kashmir ; 8 Oct 1880.

Taxonomic remarks : Specimens from Gilgit very woolly ; general body colour pale Buff ; tail uniform Buff ; hands and feet Mummy Brown ; Chin and throat almost white with some brownish patches. Specimen from Ladakh not so woolly, similar in colour to those of Gilgit but the whiteness of Chin and throat more prominent and extends up to chest.

General remarks : Frequents the vicinity of small villages and is fond of living in stacks of fire wood. I could see only one individual at about 20.00 hours on way to Kokernag from Daksum while it was crossing the road.

50. *Martes flavigula flavigula* (Boddaert)

Yellow-throated Marten

Mustela flavigula Boddaert, 1785, *Elench. Anim.*, 88. (Locality unknown, traditionally fixed as Nepal).

Distribution : From Hazara (Pakistan) east through the Himalayas to Arunachal Pradesh, southern China and upper Burma at

altitudes ranging from c 1830 to 3350 m.

Material : No specimen from Jammu and Kashmir could be collected.

General remarks : Frequents hill forests ; nocturnal but may also be seen sometimes during the day time. Lives in pairs, occasionally in families of five or six. Lives upon birds, their eggs and small mammals. Very often cicades are eaten and so also berries.

Litters are produced in the spring or early summer, two to three youngs being usual, though Prater (1965) recorded a litter of five youngs.

51. ***Mustela erminea ferghanae*** (Thomas)
Himalayan Stoat or Ermine

Putorius ermineus ferghanae Thomas, 1895, *Ann. Mag. nat. Hist.*, 15 : 452. (Mt. Kara Karyk, Ferghana, Uzbek rep., U.S.S.R.).

Distribution : High altitudes of Uzbek, southwards to Afghanistan, Chitral (Pakistan) and Jammu and Kashmir.

Material : No specimen examined.

General remarks : In Jammu and Kashmir it is mainly associated with the alpine and subalpine scrub zones. Exclusively carnivorous, living mainly on rodents such as *Alticola roylei*, *Hyperacrius fertilis*, etc. In summer it also consumes bird's eggs and insects. Lives in burrows already dug by rodents. Breeding takes place in summer and youngs are born in spring. Produces only one litter of 5 to 10 individuals in a year.

52. ***Mustela altaica temon*** Hodgson
White-footed Weasel

Mustela temon Hodgson, 1857, *J. Asiat. Soc. Beng.*, 26 : 207. (Sikkim).

Distribution : From Karakoram to Sikkim at elevations between c 2130 to 4100 m. ; Tibet.

Material : 2 ♂ (earlier Z. S. I. coll.) ; Gilgit, Kashmir ; 2 and 11 Nov 1879.

Taxonomic remarks : Above light brown with a tinge of red on back and tail. Lower part white to yellowish.

General remarks : Appears not very common in Jammu and Kashmir. Lives amongst rocks and preys upon small mammals and birds. In summer, it possibly supplements its diet with lizards which are plentiful in the mountainous region.

53. *Mustela sibirica hodgsoni* Gray
Siberian Weasel

Mustela hodgsoni Gray, 1843, *Ann. Mag. nat. Hist.*, **11** : 118. (Himalayas).

Distribution : Kashmir and western Himalayas from Chamba (Himachal Pradesh) to Garhwal (Uttar Pradesh) at elevations between *c* 2130 to 2750 m.

Material : 1 unsexed (earlier Z. S. I. coll.) ; Badarwa, *c* 2440 m., Kashmir ; Apr 1902.

Taxonomic remarks : Entire dorsum foxy-red, venter pale foxy-red but chin and throat whitish. Muzzle white, a small area around the eye darkish. Pocock (1941) stated, 'dark hue of the head extending all round the eye and to a considerable distance half-way along the muzzle in front of it laterally' In the present specimen no such dark hue in the region of head.

Blanford (1888) treated *M. hodgsoni* as a synonym of *M. canigula* (Hodgson). However, Pocock (1941) treated both *canigula* and *hodgsoni* as separate subspecies of *M. sibirica* Pallas, which action was supported by Ellerman and Morrison-Scott (1951).

General remarks : Ward (1928a) had seen scores of this animal in various parts of Kashmir, but now its number is reduced greatly. It frequently damages the poultry particularly in winter.

54. *Mustela putorius larvatus* (Hodgson)
Tibetan Polecat

Putorius larvatus Hodgson, 1849, *J. Asiat. Soc. Beng.*, **18** : 447. (Utsang, southern Tibet).

Distribution : Kashmir ; Tibet (China).

Material : No specimen examined.

55. *Lutra lutra kutab* Schinz
Himalayan Otter

Lutra kutab Schinz, 1844, *Syn. Mamm.*, 354. (Kashmir).

Distribution : Kashmir ; Tibet (China).

Material : 1 ♂, 1 ♀ (earlier Z.S.I coll.) ; Kashmir ; 16 Jun 1879, 10 Feb 1880.

Taxonomic remarks : Contour hairs of back drab to grayish brown, Paws white.

Detailed taxonomic study of this subspecies was made by Pocock (1941) and according to him it differs from other Indian subspecies by larger size (head and body length over 61 cm.), darker and duller coloration of the upper side.

General remarks : In summer it migrates from low elevations to the streams at high altitudes, often travelling a good deal by land. Ward (1928a), who identified it as *L. l. nair* Cuvier, saw it playing in snow during summer at about 3650 m. Usually makes its home on 'holt' near a deep pool where fish congregate, the entrance to the 'holt' being usually under water.

Family VIVERRIDAE

56. *Viverricula indica indica* (Desmarest)
Small Indian Civet

Viverra indica Desmarest, 1817, *Nouv Dict. Hist. Nat.*, 7 : 170. (India).

Viverra bengalensis Gray, 1830, *Ill. Indian Zool.*, 1 : pl 4. (Calcutta, West Bengal).

Viverricula indica mayori Pocock, 1933, *J. Bombay nat. Hist. Soc.*, 36 : 632. (Maha Oya, Eastern Province, Sri Lanka).

Viverricula indica wellsi Pocock, 1933, *J. Bombay nat. Hist. Soc.*, 36 : 640. (Kangra, c 600 m., Himachal Pradesh).

Viverricula indica baptistae Pocock, 1933, *J. Bombay nat. Hist. Soc.* 36 : 643. (Hasimara, Bhutan Duars, West Bengal).

Distribution : Peninsular India, north to Jammu (except Rajasthan), east to Manipur ; Sri Lanka.

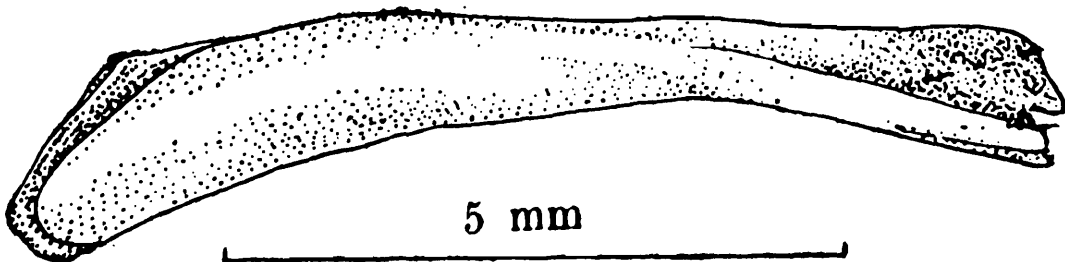
Material : 3 ♂ ; Jhajjar Kotli ; 22 Oct, 17 and 22 Nov 1975.

Measurements :

Given in Table 2.

Taxonomic remarks : General colour Buff, pattern distinct in one but obscured in other two where some black patches can be marked at the posterior half of the body.

Bacula of two specimens examined : length very variable (8.5 mm., 13 mm.). Proximal portion thick and swollen ; medial portion long, narrow and cylindrical ; distally flattened, grooved and forked at the tip ; prongs of the fork small forming a U-shaped structure (Text-fig. 2).



Text-fig. 2. Showing the baculum of *Viverricula indica*.

Based on the external and cranial features, altogether seven subspecies, namely, *V i. indica* (Desmarest), *V i. bengalensis* (Gray), *V i. mayori* Pocock, *V i. wellsi* Pocock, *V i. baptistae* Pocock, *V i. deserti* Bonhote and *V i. thai* Kloss were recognised within the Indian subcontinent by Pocock (1939) and this action was supported by Ellerman and Morrison-Scott (1951).

I had the opportunity to study the material of the first five subspecies listed above from different parts of India and Sri Lanka. A summary of my findings is given below :

Body colour :

V i. wellsi

Material — 1 ♀ ; Kangra, Himachal Pradesh ; 22 Nov 1913.

1 ♂ ; Ramnagar, Kumaon, Uttar Pradesh ; 9 Jan 1914.

General colour Buff, body pattern very obscure as the Ochraceous tinge blends with ground-colour. Out of 17 skins (five from Kangra,

12 from Ramnagar) studied by Pocock (1939), 15 are similar to the present specimens and two (from Kangra) are different ; in one the pattern distinct with some black in it, in another ground colour bleached gray.

V i. indica

Material — 3 ♂ ; Dharwar, Karnataka ; 15 Nov 1911, 4 Jan 1912, 11 Nov 1918. 3 ♂ ; Colem, Goa ; 5 to 7 Jan 1969. 1 ♀ ; Palkonda Hills, Andhra Pradesh ; 2 Aug 1930.

General colour varies from light Buff to Buff or even silvery ; pattern distinct in four but in others obscured. Blackness present in all specimens from Goa and absent in others. One specimen from Dharwar practically indistinguishable from *wellsi* specimens at my disposal.

Pocock (1930) stated that the colour of specimens from the same locality and taken approximately at the same time vary considerably.

V i. mayori

Material—1 ♂ ; Tammanewa, Sri Lanka ; 30 May 1914. 1 ♂ ; Chedi Kulum, Sri Lanka ; 22 Nov 1913. 1 unsexed ; Sri Lanka ; Undated.

In two specimens the general colour Buff and pattern very distinct by the presence of blackish brown longitudinal stripes. In another specimen general colour paler, blackness reduced and pattern diffused.

According to Pocock (1939) the colour is on the whole tolerably uniform varying from gray to buffish gray ; pattern distinct with blackish brown or black stripes, but vary considerably in boldness. He also stated that no two examples are exactly alike ; two from the same locality may be dissimilar and each may closely match another from a remote part of the Island.

V i. bengalensis

Material — 3 ♂ , 2 ♀ ; Calcutta, West Bengal ; 8 May 1870, 30 Jan 1919, 17 Feb 1920 and 19 Mar 1920.

General colour variable and similar to that of *V i. indica*. Pattern distinct in two and obscure in the rest.

V i. baptistae

Material — 1 ♂, 1 unsexed juv; Assam; 7 Jan 1920. 1 subad. ♀; Manipur; 4 Dec 1945. 2 ♂, 1 ♀; Tripura; 17 Jan 1971, 21, 26 Dec 1972.

General colour very variable; in six specimens at my disposal, it varies from gray, pale Buff to Buff and pale Ochraceous to Ochraceous. All with a well defined pattern which may be blackish or dark brown.

Colour of tail :

Colour of tail very variable irrespective of collecting localities. Number of black bands of the tail varies from seven to nine. Tail tip white to whitish gray or Ochraceous mixed with gray or entirely dark brown.

Length of dorsal fur :

There is no clear cut geographical difference in the length of dorsal fur which varies from 12 to 45 mm., but specimens from Jammu tend to have slightly longer fur.

Length of head and body, and tail :

From the Table 2, it is obvious that specimens of *wellsi* are slightly larger on average in head and body length and *mayori* are smaller than the other subspecies, but there is much overlap, and so that this character cannot be regarded as important for subspecific differentiation. As regards the length of tail, no difference among the different subspecies could be detected.

Cranial characters :

Structurally the skull is similar in all the five subspecies discussed above and agrees well with the description given by Pocock (1939). As regards the various cranial measurements no difference among the five subspecies could be detected (Table 2). However, in the specimens of *wellsi* and those from Jammu the skull is slightly larger on average.

It is found that in the adult and subadult specimens, the postorbital region is well-developed and wider than the interorbital region, whereas, in the very old specimens the reverse is true.

This study reveals that the ground coloration, pattern, length of

fur, number of black bands on tail and external and cranial measurements vary widely irrespective of localities, so that, the apparent differences among the above five subspecies regarding these characters mentioned by Robinson and Kloss (1920), Pocock (1933, 1939) are nothing but individual variations. Therefore, I am inclined to treat *mayori*, *baptistae*, *wellsi* and *bengalensis* as synonyms of *V. i. indica*. However, a detailed study with more material taken in all the seasons from different parts of the country will help in finding out the intra-specific geographical variations.

I was unable to examine the specimens of *deserti* and *thai*. However, from the measurements given by Pocock (1939), it is obvious that the waist or postorbital area of *deserti* is much narrower than other subspecies.

General remarks :

This species is very common in Jammu, both in the hills and in the plains, particularly in the outskirts of forests. One animal was shot on a tree about 3 m. high, another on the roadside and third was trapped in wire cage with meat-bait. Stomach analysis of two specimens reveals : feathers (unidentified) and blood in one, while seed (unidentified), insects (Orthoptera) and hairs (rat) in the other. It is strictly nocturnal, excavates its own burrows among the bushes, rocks and in deserted huts and spends most of the day sleeping in burrow. Prater (1965) stated that the youngs are born at all seasons with litter sizes varying from 3 to 5.

57. *Paradoxurus hermaphroditus vellerosus* Pocock

Common Palm Civet or Toddy Cat

Paradoxurus hermaphroditus vellerosus Pocock, 1934, *J. Bombay nat. Hist. Soc.*, 37 : 181. (Kashmir).

Distribution : Kashmir, on the evidence of the only known specimen (the holotype).

Material : No specimen examined.

General remarks : Ward (1926) recorded *Viverra zibetha* Linnaeus from Kashmir and stated that it lives under thatched roofs. Pocock (1939) regarded that Mr. Ward was mistaken and confused it with *P. h.*

vellerosus as thatched roof is a very unlikely habitat for *V zibetha* to choose, but precisely agrees with that of the Toddy Cat.

58. *Paguma larvata wroughtoni* Schwarz
Masked Palm Civet

Paguma grayi wroughtoni Schwarz, 1913, *Ann. Mag. nat. Hist.*, **12** : 289.
(Gharial, near Murree, Pakistan).

Distribution : Jammu and Kashmir to Kumaon (Uttar Pradesh) ;
Pakistan.

Material : No specimen examined.

General remarks : Inhabits mountain forests. Omnivorous, but
prefers fruits.

This animal was noticed at Shikargarh on a walnut tree ; when
approached, it jumped and hid in a nearby bush.

59. *Herpestes auropunctatus auropunctatus* (Hodgson)
Small Indian Mongoose

Mangusta auropunctata Hodgson, 1836, *J. Asiat. Soc. Beng.*, **5** : 235. (Nepal).

Distribution : Jammu and Kashmir, east to Manipur and south
of the Ganga as far south as the Chilka Lake in Orissa ; Bhutan ;
Bangladesh.

Material : 1 subad. ♀ ; Shar ; 5 Sep 1974.

Measurements :

External—Hb 209 ; Tl 104 ; Hf 41 ; E 10.

Cranial —Cb 48.2 ; Zw 24.6 , Pw 14.2 ; Iw 10 ; Mw 9.9 ; Pm⁴
4.9 ; M₁ 4.5.

Taxonomic remarks : The general tinge dark brown, with minute,
nearly Ochraceous speckling. The contour hairs short (12mm.), wool
scanty and brownish.

General remarks : This species is very common in the valley of
Kashmir and frequently noticed in the outskirts of villages and towns.
At Shar a colony was observed in a burial ground. The Local people

reported that they feed on the flesh of buried bodies. From about 9.00 hours to afternoon they hunt in the paddy and maize fields, and in the bushes in search of insect, molluscs, fishes, amphibians, small birds, rats and mice.

The present specimen was trapped in a paddy field near burial ground in Japanese wire trap with dry fish bait.

Most records of its breeding in the wild seem to be around the end of the summer, coinciding with the monsoon when not only insects but also amphibians and reptiles are abundant. Gestation period is about six weeks.

Roberts (1977) stated that it avoids mountainous areas, but in Kashmir it is noticed at elevations of about 1900 m.

60. *Herpestes edwardsi ferrugineus* Blanford Indian Gray Mongoose

Herpestes ferrugineus Blanford, 1874, *Proc. zool. Soc. Lond.*, 661, pl. 81.
(Larkana, Sind, Pakistan).

Distribution : Desert districts of north-west India, south to Rajasthan ; Saudi Arabia ; Iraq ; Iran , Pakistan.

Material : 1 ♂, 2 ♀ ; Jhajjar Kotli ; 16 to 18 Nov 1975.

Measurements :

External—1 ♂ : Hb 368 ; Tl 400 ; Hf 75 ; E 18.

2 ♀ : Hb 356, 380 ; Tl 364, 382 ; Hf 69, 70 ; E 13, 18.

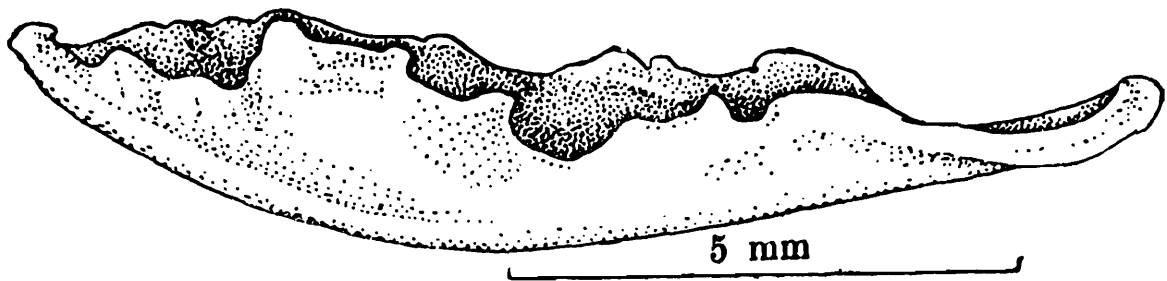
Cranial —1 ♂ : Cb 76.2 ; Zw 38 ; Pw 16.4 ; Iw 14.4 ; Mw 13.5 ;
Pm⁴ 7.2 ; M₁ 6.8.

2 ♀ : Cb 71.7, 74.7 ; Zw 34.5, 37.3 ; Pw 12.8, 15.8 ;
Iw 13, 14.5 ; Mw 11.8, 12.7 ; Pm⁴ 7.2, 7.8 ; M₁ 6.1,
6.3.

Taxonomic remarks : Contour hairs long (32-54 mm.), speckled with 8-10 alternating blackish brown and dirty white bands. Wool plenty and olivaceous in colour. Tail-tip whitish. Facial region covered with short hairs having alternating white, black and Ferruginous bands. Ear Liver Brown. Venter covered with thin, short hairs of Smoke Gray colour.

From a study of the skulls of the present series and those present in the Z. S. I. collection, it is found that in the older specimens the postorbital constriction is much more than those of the not so old specimens.

Baculum is a small (11.4 mm.), thin, boat-like structure with serrated margin (Text-fig. 3).



Text-fig. 3. Showing the baculum of *Herpestes edwardsi ferrugineus*

General remarks A colony of eight individuals was observed at Jhajjar Kotli. At night they roost in a dry ditch of about 80 square metres, covered with thick bush jungle mainly of acacias and *Lantana*. In the morning at about 9.30 hours they come out of the ditch almost all at a time and spread out in the neighbouring fields and bushes. During feeding they segregate but do not move far from their roosting place. It is found that the same area was used as feeding ground by this species and also *Viverricula indica indica* but the latter fed during night. Analysis of the stomach contents revealed feather (unidentified), residue of *Golunda ellioti* Gray (Rodentia) and plenty of vegetable matters such as seeds of *Lantana*, plum, etc. However, it is reported to feed on toads and frogs, monitor lizard, snakes, house crow, gray partridges as well as scorpions and termites. During feeding when alarmed, long hairs of the tail stand erect giving it a bushy appearance. It regularly marks its territory by rubbing the anal gland on prominent projections of the ground. Just before dusk they (*H. e. ferrugineus*) congregate and return to their roost all at a time.

Breeding takes particularly in summer and monsoon. The gestation period is a little over eight weeks. Mammary glands of both the females were prominent. Blood clots in two small uterine swellings were observed in one specimen but no embryo was visible.

Individual of this species can easily be trapped in large Japanese

wire trap (50 cm. x 20 cm. x 20 cm.) with fish or meat as bait. All the three present specimens were also trapped in Japanese wire trap. In trap, it becomes restless, furious and wound itself in attempts to escape by cutting through the wire of the trap.

Family HYAENIDAE

61. ***Hyaena hyaena hyaena*** (Linnaeus)

Striped Hyaena

Canis hyaena Linnaeus, 1758, *Syst. Nat.*, 10th ed. 1 : 40. (Benna Mountains, Laristan, Southern Iran).

Distribution : Widely distributed. Transcancasia, southern Russian Turkestan, Kopet-Dag, Tedshen and Atrek valleys, south of Uzbek rep., south-east of Tadjikistan, Iraq, Iran, Afghanistan and Pakistan ; Jammu and Kashmir to Nepal Terai, southwards about to Nilgiri Hills (Tamil Nadu) and perhaps further.

Material : No specimen from Jammu and Kashmir could be collected.

General remarks : In Jammu and Kashmir it is reported to be common, living in rocky scrub-covered hills and nullahs, grass or open jungles. The principal food consists of caracases of animal.

An individual was noticed from a considerable distance on the Jammu-Srinagar national highway near Rambon while it was taking the caracases of a run over street dog.

Family FELIDAE

62. ***Felis chaus affinis*** Gray

Jungle Cat

Felis affinis Gray, 1830, *Ill. Indian Zool.*, 1, pl. 3. (Gangotri in Tehri Garhwal, Uttar Pradesh).

Distribution : Jammu and Kashmir to Sikkim ; Yunnan (China).

Material : No specimen examined.

Taxonomic remarks : Pocock (1939) reported having examined two specimens from Kashmir (One from Arapul, c 1920 m. and other from Tral, c 1830 m.) which are exceptionally dark and larger sex for sex than those from Himachal Pradesh, Uttar Pradesh, West Bengal and

Nepal. Fresh material from Kashmir is necessary for critical reappraisal of the status of the population of *F. chaus* Gldenstaedt in Kashmir.

General remarks : Found among the bush and grass jungles, reed bed near rivers, lakes and marshes. According to Ward (1926) in Kashmir it was plentiful up to about 1830 m. and taking shelter in rocks and in deserted building. At present its number appears to have been greatly reduced.

Only single individual was observed by one of my party members in a forest road near Shikargarh at about 11.00 hours while it was feeding on an Indian Hoopoe. When approached for shooting, it ran away with its prey to the neighbouring jungle.

63. ***Felis manul nigripecta*** Hodgson
Pallas's Cat

Felis nigripectus Hodgson, 1842, *J. Asiat. Soc. Beng.*, 11 : 276. (Tibet).

Distribution : Eastern part of Ladakh (Kashmir) ; Tibet (China).

Material : No specimen was collected from Jammu and Kashmir.

Taxonomic remarks : The single skin so far collected from Ladakh was examined by Pocock (1939), which differs from those of Tibet by its fuller coat, deeper Ochraceous wool and absence of stripes on the loins.

64. ***Felis lynx isabellina*** Blyth
Tibetan Lynx

Felis isabellina Blyth, 1847, *J. Asiat. Soc. Beng.*, 16 : 1178. (Tibet).

Distribution : Kashmir ; Tibet north to Tianshan and Altai mountains ; mountains of Russian Central Asia, Mongolia.

Material : 1 unsexed (earlier Z. S. I coll.) , Bagrot, c 1524 m., Gilgit, Kashmir ; 10 Apr 1879. 1 unsexed (earlier Z. S. I. coll.) ; Bargo, Gilgit, Kashmir ; 1 Apr 1880.

Taxonomic remarks : The long tuft of blackish hairs on the tip of the ear along with the short tail (180 to 230 mm.) distinguish this species from other cats. In the present specimens, the upper side rufous fawn with some patches of black particularly in the midregion.

Tail with distinct black tip. Undersurface white. Pocock (1939) described two skins (November and December) from Gilgit as having the upper side silvery gray, varied by buffy patches, and the pattern consisting of black stripes dorsally and of black spots on the flanks and legs. In another December specimen from Gilgit described by Pocock (1939), "the pattern is not black, is scarcely traceable dorsally, and is fuscous or brown on the legs" Pocock (1939) also described some more variation, from which it is obvious that colour is variable seasonally as well as independently of the season.

General remarks : It has been stated to inhabit open and rocky districts. However, Col. C. H. S. Stockley (in Pocock, 1939) stated that it is 'nearly always found in country where cover of dense vegetation is available'

65. *Felis bengalensis horsfieldi* (Gray)

Horsfield's Leopard Cat

Leopardus horsfieldii Gray, 1842, *Ann. Mag. nat. Hist.*, 10 : 260. (Bhutan).

Distribution Islamabad (Kashmir), east to Bhutan, Meghalaya and Nagaland ; northern and eastern range uncertain.

Material : No specimen from Jammu and Kashmir could be collected.

General remarks : Though reported to be fairly common, but none could be seen, probably owing to its liking for dense cover.

66. *Felis bengalensis trevelyani* (Pocock)

Trevelyan's Leopard Cat

Prionailurus bengalensis trevelyani Pocock, 1939, *Fauna Brit. India, Mamm.*, 1 : 273. (Near Gilgit, c 1524 m., Kashmir).

Distribution : Northern Kashmir and drainage area of Indus and Jhelum, approximately long. 74°E ; also southern Baluchistan.

Material : No specimen examined.

Taxonomic remarks : According to Pocock (1939) coat very soft and longer than that of *horsfieldi* ; typically paler and grayer, sometimes the upper side has almost silvery ground colour

General remarks : According to Pocock (1939) it is possibly less addicted to dense jungle and forest than other Indian subspecies, and it lives in somewhat rocky areas.

67. ***Felis rubiginosa rubiginosa*** I. Geoffroy
Rusty-spotted Cat

Felis rubiginosa I. Geoffroy, 1831, *Belanger, Voy. Ind. Orient. zool.*, p. 140. (Pondicherry, India).

Distribution : Tamil Nadu (Madras), Andhra Pradesh (Nellore), Maharashtra (Khandala south Gujarat). On the basis of the present specimen Chakraborty (1979) extended its range to as far north as Jammu.

Material 1 ♀ ; Jhajjar Kotli ; 16 Nov 1975.

Measurements :

External — Hb 370 ; Tl 200 ; Hf 86 , E 32.

Cranial — Gl 67.8 ; Zw 47 ; Iw 11.7 ; Mw 17.3 ; Ml. 43.7 ; Pm⁴ 7.8 ; M₁ 5.5.

Taxonomic remarks : Distinguished by small size and indistinct pattern of tail. Detailed taxonomic study of the present specimen was made by Chakraborty (1979).

General remarks : My specimen was first noticed at about 23-00 hours in an open scrub forest, with low thorny bushes and stunted trees, about a Kilometre and half from the nearest human habitation. When chased it ran for a certain distance and then climbed very quickly up a tree from where it was shot down. No further specimen could be seen, inspite of serious attempts made during the next five days.

68. ***Panthera pardus fusca*** (Meyor)
Common Indian Leopard or Panther

Felis fusca Meyor, 1794, *Zool. Ann.*, 1 : 394. (Bengal).

Distribution : Whole of India except Sikkim ; Sri Lanka, Burma and China.

Material : No specimen examined.

General remarks : In Jammu and Kashmir its number appeared to be greatly reduced. Nowhere could I see this leopard, nor did the local

people report on its occurrence except at Shikargarh and Daksum. At Daksum, a few pug marks were noticed near a nullah just outside the village, which might as well be of next subspecies.

69. ***Panthera pardus millardi* Pocock**
Millard's Leopard

Panthera pardus millardi Pocock, 1930, *J. Bombay nat. Hist. Soc.*, 34 : 316, pl. 8. (Kashmir).

Distribution : Kashmir. Pocock (1939) stated, 'From the thickness of the coat it may be inferred that *millardi* occurs at much higher altitudes in Kashmir than the other race'

70. ***Panthera uncia* (Schreber)**
Snow Leopard or Ounce

Felis uncia Schreber, 1776, *Säugeth.* 3 : pl. 100 (1776) and text 386, 586 (1777). (Locality not known).

Distribution : India—Ranges in the highlands along whole Himalayan chain from Kashmir to Sikkim. U.S.S.R.—Limited to the mountains of Central Asia and southern Siberia. China—Several points around the mountainous periphery of Sinkiang, notably on the northern central Tienshan, the Pamirs and Asian Tagh. The range extends across the Tibetan Plateau to extreme western Szechwan. Pakistan—Himalayan chain. Afghanistan—Hindu Kush.

Material : 1 ♂ (earlier Z. S. I. coll.) ; Chaprot, Gilgit ; 4 Apr, 1879.

Taxonomic remarks : Ground colour soft grey paleing to pure white on the underside. Blackish spots unbroken and distinct on the head, nape and lower parts of the limbs. On the body they break up into larger paler rosettes. This species is distinctive in the shortness of muzzle, high forehead and vertical chin.

General remarks : Endangered species. It is found on rocky hillsides between the tree-line and the permanent snow but descends at altitude as low as 1850 m. in winter. In Kashmir, according to Ward (1926), when the upland grazing grounds are open to flocks it takes the goats, sheep and occasionally ponies of the herdsmen. Its number has been very seriously depleted by overhunting for furs and stock thefts, although depletion of prey species has been a factor in the decline.

Order PERISSODACTYLA

Family EQUIDAE

71. *Equus hemionus kiang* Moorcroft
Kiang

Equus kiang Moorcroft, 1841, Travels in the Himalayan provinces, 1 : 312.
(Eastern Ladakh).

Distribution : India—Ladakh, Sikkim. Nepal. China—Tibet to Kukunor district.

Material : No specimen examined.

Taxonomic remarks Groves and Mazak (1967) treated *kiang* as a distinct species.

Order ARTIODACTYLA

Artiodactylan fauna was apparently rich in Jammu and Kashmir, but the increased human activities in this strategic frontier region, have resulted in a rapid decline in their populations.

Family SUIDAE

72. *Sus scrofa cristatus* Wagner
Indian Wild Boar

Sus cristatus Wagner, 1839, *Münch. Gelehrt. Anz.*, 9 : 435. (Probably Malabar Coast, India).

Distribution Widely distributed, ranges over nearly the whole mainland of India, Pakistan, Sri Lanka, Bangladesh, Burma, Thailand and a part of Malaysia.

Material : No specimen collected.

General remarks : Some thirty years ago this species was said to be abundant in Jammu and Kashmir, living in grass or scanty bush jungles, sometimes in forests, quite commonly in high crops. At present the number of wild boar is greatly reduced in the state due to random killing, but still it is not very uncommon. Its occurrence was noticed at Shikargarh, Shar, Rambon and Jhajjar Kotli. It is omnivorous, living on crops, roots, tubers, insects and snakes. In Jammu and Kashmir it is highly destructive to crops specially of roots and tubers and it is impossible to make a plea for its protection.

Family CERVIDAE

73. **Moschus moschiferus moschiferus** Linnaeus

Musk Deer or Kastura

Moschus moschiferus Linnaeus, 1758, *Syst. nat.*, 10th ed., 1 : 66. (Tartary, approaching china).

Distribution : Within Indian limits it ranges from Jammu and Kashmir east wards to Sikkim (? Assam).

Material : 1 ♂ (earlier Z. S. I. coll.); Ladakh; 1877. 1 juv., unsexed (earlier Z. S. I. coll.); Basalgah, Gilgit; Jul 1879.

Additional material examined : 3 ♀, 1 unsexed; Zool. Garden specimens; 27 Jan 1899, 17 Jan 1903, 31 Jan 1906. 1 ♂; Tibet, China; 26 Nov 1903. 1 ♂; Thangu, Sikkim; 3 Jan 1915. 1 ♂, 1 ♀; Khumbu, Nepal; Mar, Apr 1954. 1 ♂; Garhwal, Uttar Pradesh; 5 Aug 1951.

Taxonomic remarks : Coat of thick and bristly hairs, almost pithy in structure. General colour light brown in juvenile to rich dark brown in adult, speckled with grey. Tail completely baried in long hairs of anal region, and its lateral surface bears a narrow slit-opening of caudal gland. Musk gland situated beneath skin of abdomen of male.

Recently, Groves (1976) revised the genus *Moschus* Linnaeus and instead of *M. moschiferus* recognized two species within the Indian subcontinent, namely, *M. chrysogaster* Hodgson and *M. sifanicus* Büchner. However, from the examination of the above material, I think further study with fresh material of different seasons is necessary before any definite conclusion is arrived at.

General remarks : It lives singly or in pairs and is generally met with in birch forest above the zone of pines. At times it comes down to lower levels, but always keeps in thick cover. I could not see any specimen in Kashmir, where it appears to be rare now a days.

74. **Cervus elaphus hanglu** Wagner

Hangul or Kashmir Barasingha

Cervus hanglu Wagner, 1844, *Schreb. Säügeth. Suppl.*, 4 : 352. Foot note. (Kashmir).

Distribution : Its distribution formerly described as an arc of some

65 km. in width to the north and east of the Jhelum and lower Chenab rivers, from Shalurah in the north to Ramnagar in the south, in the vale of Kashmir. Unconfirmed reports in recent years suggest that small remnant groups still occur within the former range, particularly in the north. Gamgul Siya-behi sanctuary in Himachal Pradesh on the state border, is the only area outside Jammu and Kashmir that probably retains a few hanguls. The deer still survives in Desu Sanctuary, some 115 km. to the south-east of Srinagar. The only area in which a truly viable population has been confirmed, however, is Dachigam Sanctuary in the Kashmir Valley.

Material : 1 ♂ (earlier Z. S. I. coll.) ; Kashmir.

Live specimens of this deer were observed at Dachigam.

Taxonomic remarks Coat ranges from light to dark brown, fading to dingy white on the lips, chin, underparts and buttocks. The white rump patch does not extend much above the tail and is divided by a broad median stripe extending down to the base of the tail. It is said that colour fades during the summer.

General remarks : This is an endangered species living in montane coniferous forest. Its number in Dachigam Sanctuary gives some indication of the trend and overall decline in recent years.

Family BOVIDAE

75. *Bos grunniens* Linnaeus

Yak

Bos grunniens Linnaeus, 1766, *Syst. nat.*, 12th ed., 1 : 99. ('In Asia boreali'
The species was based on a domestic breed.)

Distribution : Tibet and adjacent areas of Jammu and Kashmir. According to Prater (1965), within Indian limits it occurs only in the Chang Chen Mo Valley in Ladakh, and sometimes strays into the Sutlej Valley and some of the passes in east Kumaon. There have also been sightings reported from remote areas of Nepal and Sikkim (Shou Chen Huang, 1962).

Material : No specimen examined.

General remarks This is an endangered species. Its population has undergone a marked reduction from hunting.

It is an inhabitant of the coldest, wildest and desolate mountains, where both arctic and desert condition prevail. In summer found at elevations ranging from 4270 to 6100 m. and even in winter they do not descend much below this level.

76. *Procapra picticaudata picticaudata* Hodgson
Tibetan Gazelle or Goa

Procapra picticaudata Hodgson, 1846, *J. Asiat. Soc. Beng.*, 15 : 334, pl. 2.
(Hundes, Tibet).

Distribution : Tibet, south to Ladakh and the north of Kumaon (Uttar Pradesh) ; Sikkim.

Material : 1 ♂ (earlier Z. S. I. coll.) ; Kukchu, c 4500 m., Ladakh ; 1879.

Taxonomic remarks : Colour of the present specimen is bleached. According to Prater (1965) coat short, slaty grey in summer, dense and pale fawn in winter. White rump patch distinctive. Horns rise vertically and curve sharply backwards.

77. *Pantholops hodgsonii* (Abel)
Chiru or Tibetan Antelope

Antelope hodgsonii Abel, 1826, *Calcutta Govt. Gaz. Phil. Mag.*, 68 : 234.
(Arrun Valley, Kooti Pass, Tibet).

Distribution : According to Prater (1965), "Chiru inhabit the great desert of northern Tibet. The only spot in Indian territory in which they are found is the Chang Chen Mo Valley, into which they cross from Tibet by way of the Lanak La pass at the head of the valley."

Material : No specimen examined.

General remarks : Live in herds, but they are not found in northern Ladakh in any numbers till mid-summer, when their favourite haunts are the grassy flats bordering the plains of the Chang Chen Mo river, and also the ravines which lead from the higher ground to river valley.

78. *Capricornis sumatraensis humei* Pocock
Kashmir Serow

Capricornis sumatraensis humei Pocock, 1908, *Proc. zool. Soc. Lond.*, 178.
(Kashmir).

Distribution : Jammu an Kashmir. favours and elevation between 1850 to 3050 m.

Material No specimen examined.

General remarks More or less solitary creature, lives in the thickly-wooded gorges whose boulder-strewn slopes and shallow caves give shelter from the weather.

79. *Naemorhedus goral goral* (Hardwicke)

Grey Goral

Antelope goral Hardwicke, 1825, *Trans. Linn. Soc. Lond.*, 14 : 518. (Nepal Himalaya).

Distribution : Apparently Jammu and Kashmir, Himachal Pradesh and Kumaon (Uttar Pradesh).

Material : 1 unsexed (earliar Z. S. I. coll.) ; Kashmir ; undated.

Additional matarial examined : 1 ♂ ; Tehri, Uttar Pradesh ; 21 Apr 1958. 1 ♀ ; Garhwal, Uttar Pradesh ; 6 Jun 1958.

Taxonomic remarks : Hair coarse, forming a small crest on the neck, colour grey, suffused with black. The dark spinal stripe does not pass beyond the withers. Horns short, diverge slightly, curved backwards, marked with rings or ridges.

General remarks : Goral favour an elevation of 900 to 2700 m., feeding on rugged grassy hill-sides, or rocky ground in forest during morning and evening. Local people reported it to be very common in Kashmir, but I could not see any, and it appeared that they are very shy.

Prater (1965) stated that the youngs are born in May and June but according to available evidence, the western Himalayan population seems to breed earlier (Roberts, 1977).

80. *Hemitragus jemlahicus jemlahicus* (H. Smith)

Himalayan Tahr

Capra jemlahica H. Smith, 1826, Griffith's Cuvier Anim. Kingdom, pl. opposite p. 308. (Jemla Hills, Nepal).

Distribution : Throughout the Himalayas from Jammu and Kashmir to Bhutan.

Material : No specimen examined.

General remarks : Tahr perhaps select most inaccessible ground to live but not above the tree line. It favours precipitous terrain of towering cliffs, dense scrub and forest.

81. ***Capra ibex sibirica* (Pallas)**
Siberian Ibex

Ibex sibiricus Pallas, 1776, *Spic. zool.*, 11 : 52. (Northern slope of Sayan Mountains, West of Lake Baikal, Siberia).

Distribution : Mountains of Russian Turkestan, Central Siberia, Mongolia, Chinese Turkestan; Afghanistan; within Indian limits throughout the Himalayas from Kashmir to Nepal.

Material : 1 ♂ (earlier Z. S. I. coll.); Kashmir; undated.

Taxonomic remarks : According to Roberts (1977) colour variable, in general winter coat yellowish white more or less tinged with brown and grey. Summer coat dark brown with irregular white patches. The colour of present specimen agrees with that of summer coat. Horns of the buck flat, scimitar-shaped, and bossed with bold ridges in front. Record horn length from Gilgit measured 140 cm. (Ward, 1924 b).

General remarks : An endangered species. Ibex live in high elevation above the tree line. In the spring they are found below the snowline attracted by the new grass on the steep slope of the nullahs.

82. ***Capra falconeri falconeri* (Wagner)**
Astor Markhor

Aegoceros (capra) falconeri Wagner, 1839, *Münch. Gelehrt. Anz.*, 9 : 430.
(Kashmir, restricted to Astor by Lydekker, 1913).

Distribution : Astor, Gilgit, Baltistan (Kashmir); Pakistan.

Material : 1 unsexed (earlier Z. S. I. coll.); Gilgit; undated.
1 ♂, 1 unsexed (earlier Z. S. I. coll.); Kashmir; undated.

Taxonomic remarks : All the present specimens have thick coat of

rusty iron grey colour and probably belong to winter season. According to Prater (1965) summer coat is short and reddish brown in tinge. Horns diverge widely and form an open spiral.

General remarks : An endangered species. Lives where there is much forest keeps mainly to the open.

83. **Capra falconeri cashmiriensis** Lydekker
Pir Panjal Markhor

Capra falconeri cashmiriensis Lydekker, 1898, Wild Oxen, Sheep and Goats.
290. (Pir Panjal Range, Kashmir).

Distribution : Pir Panjal and Kaj-i-nag mountains (Kashmir).

Material : No specimen examined.

Taxonomic remarks : According to Prater (1965) in this subspecies horns less diverge, and in fine heads show two complete twists or spirals, however, this type is also common in Baltistan, Gilgit and Chitral.

General remarks : An inhabitant of dense pine and birch forest. It is also endangered like nominate subspecies.

84. **Pseudois nayaur nayaur** (Hodgson)
Bharal or Blue Sheep

Ovis nayaur Hodgson, 1833, *Asiatick. Res.*, 18, 2 : 135. (Tibetan frontier of Nepal).

Distribution : Baltistan and Ladakh (Kashmir), Himachal Pradesh, Sikkim ; Tibet.

Material : No specimen examined.

General remarks Lives in higher altitudes, neighbouring 4880 m. in summer and rarely below 3660 m. in winter. In Ladakh, the slope above the tree line are bare, and they find food in occasional patches of coarse grass, moss and dwarf shrubs.

85. **Ovis ammon hodgsoni** Blyth
Great Tibetan Sheep

Ovis hodgsonii Blyth, 1841, *Proc. zool. Soc. Lond.*; 1840 : 65. (Tibet, probably on Nepal frontier).

Distribution : Tibet and Himalayas from Ladakh to the country north of Sikkim. In quest of grazing they occasionally cross into Spiti (Himachal Pradesh), Kumaon (Uttar Pradesh), Nepal and neighbourhood of Tso Lhama in the extreme north of Sikkim.

Material : No specimen examined.

General remarks : An endangered species. Frequents the boulders of the snowline or enters the ravines, some of which hold trickling streams whose banks are covered with low bushes and herbage. It spends summer in the higher levels (c 4570 m.) and in winter descends to the shelter of the lower valleys. As per local report number of Nayan is greatly reduced in Ladakh.

86. **Ovis ammon polii** Blyth
Marco Polo Sheep

Ovis polii Blyth, 1841, *Proc. zool. Soc. Lond.*, 1840 : 62. (Near sources of the Syr Daria, Pamir Plateau, Russian Turkestan).

Distribution : Within Indian limits exists only in Hunza (Kashmir). In reduced number found in most of the side valleys of the Tagdumbash Pamirs. In the Russian Pamirs it still seems to be plentiful.

Material : No specimen examined.

General remarks : Endangered in India. Lives in a dead and desert region of rolling boulder-strewn plateaux, cut up by broad and stony nullahs, set against a sky-line of snow capped mountains.

87. **Ovis orientalis vignei** Blyth
Urial or Shapo

Ovis vignei Blyth, 1841, *Proc. zool. Soc. Lond.*, 1840 : 70. (Astor, Kashmir).

Distribution Ranges from Gilgit area through Ladakh and Zasker to further east in Tibet at elevations of about 3650 to 4260 m.

Material : 1 unsexed (earlier Z. S. I. coll.) , Gilgit ; undated.

Taxonomic remarks : Dorsum light greyish brown. Lower part, limbs, buttock and tail whitish. From colour, present specimen

appears to be of winter. A blackish patch present behind the shoulder. Horns strongly wrinkled, set close together and curve round in a circular sweep.

General remarks : In Ladakh, it lives in open valleys ; in Astor and Gilgit it keeps in grassy ground at moderate elevations below forest.

Order LAGOMORPHA

Family LEPORIDAE

88. *Lepus capensis tibetanus* Waterhouse Afghan Hare

Lepus tibetanus Waterhouse, 1841, *Proc. zool. Soc. Lond.*, 7. (Upper Indus Valley, Kashmir).

Distribution : Afghanistan, Pakistan and Kashmir.

Material : 1 unsexed (earlier Z. S. I. coll.); Nubra Valley, Ladakh ; undated.

Measurements :

Cranial — On 82 ; Pal 32 ; Nas 33.7 ; Bul 11.5 ; Wms 8.7 ; Pb 6.3.

Taxonomic remarks : Colour of the present specimen is bleached. According to Blanford (1891), 'Colour above varying from light greyish to light rufescent brown mixed with black, lower parts white, except the breast which is light brown. Tail with a broad band above.' Bullae small, on average less than 16 per cent of occipitonasal length.

General remarks : According to Roberts (1977), it is non-social, largely crepuscular in activity and lives within relatively distinct defined territories. There is evidence of some seasonal altitudinal migration as they will ascend to the alpine meadows during the summer months and in winter come down to the valley bottoms where there is less snow or none at all.

89. *Lepus arabis* Ehrenberg Arabian Hare

Lepus arabis Ehrenberg, 1833, *Symb. Phys. Mamm.*, 2 : Sig. r. (Quinfidha, Arabia).

Distribution : Baluchistan, Arabia, Libiya. Chakraborty (1977) recorded it for the first time from Jammu in Indian territory.

Material : 1 subad. ♂ ; Jhajjar Kotli ; 13 Nov 1975.

Measurements :

External — Hb 352 ; Tl 112 ; Hf 91 ; E 123.

Cranial — Gl 74.4 ; On 69 ; Cb 64.3 ; Nas 29.6 ; Bul 12 ;
Utr 12.7 ; Fr 15.7 ; Zw 36.4 ; Wms 6.2.

Taxonomic remarks : Detail of its colour has already been discussed by Chakraborty (loc. cit). Tail with a broad black band above. Bullae unusually enlarged, more than 16 per cent of the occipitonasal length.

General remarks : This species was observed only at Jhajjar Kotli area, where its number appeared to be high. In the moonlit night it could easily be seen singly or in pairs in the harvested fields, feeding on the grasses or grains left. The present specimen was noticed along with a larger individual (probably mother).

90. **Lepus oiostolus oiostolus** Hodgson
Woolly Hare

Lepus oiostolus Hodgson, 1840, *J. Asiat. Soc. Beng.*, 9 : 1186. (unknown locality in southern Tibet).

Distribution : Ladakh and upper Indus Valley (Kashmir), Nepal, Sikkim, Tibet and Szechuan (China).

Material : No specimen examined.

91 **Lepus oiostolus hypsibius** Blanford
(Upland Hare)

Lepus hypsibius Blanford, 1875, *J. Asiat. Soc. Beng.*, 44, 2 : 214. (Kium, Chang Chen Mo Valley, c 4560 m., northern Ladakh).

Distribution : Ladakh, above 4260 m., upper Sulej Valley (Kashmir).

Material : 2 unsexed (Syntypes) (earlier Z. S. I. coll.) ; Chang Chen Mo Valley, c. 4560 m., northern Ladakh. 1 ♂ (earlier Z. S. I. coll.) ; Chusul, c 4260 m., Ladakh ; Jun 1925.

Measurements :

External — 1 ♂ : Hb 485 ; Tl 94 ; Hf 122 ; E 108.

Cranial — 1 ♂ : On 83.3 , Pal 37 ; Nas 36 ; Bul 10.7 , Wms 8 ;
Pb 7.5.

General remarks : In the label of the specimen from Chusul the following note by the collector is given, 'inhabits open rocky ground'

Family OCHOTONIDAE

92. **Ochotona (?) pusilla nubrica** Thomas
Steppe Pika

Ochotona nubrica Thomas, 1922, *Ann. Mag. nat. Hist.*, 9 : 187. (Tugger, Nubra Valley, c 3050 m., Ladakh).

Distribution : Ladakh along the Nubra Valley, down to the Pang-yong Lake.

Material : No specimen examined.

Taxonomic remarks : Ellerman and Morrison-Scott (1951) provisionally treated *nubrica* as a subspecies of *O. pusilla* (Pallas) with a question mark. As I am unable to examine any specimen, it is treated as such.

93. **Ochotona roylei roylei** (Ogilby)
Himalayan Mouse Hare or Royle's Pika

Lagomys roylei Ogilby, 1839, *Royle's Ill. Botany Himalaya*, p. 74, pl. 4.
(Choor Mountain, 97 km. north of Saharanpur, Uttar Pradesh).

Distribution : Jammu and Kashmir, Punjab, Himachal Pradesh, Uttar Pradesh ; Nepal.

Material : No specimen from Jammu and Kashmir examined.

General remarks : Chiefly found in the rocky grounds, burrowing and hiding amongst rocks and coarse stones. Gregarious and feed on vegetable near their burrows.

94. **Ochotona roylei wardi** Bonhote
Himalayan Mouse Hare or Royle's Pika

Ochotona wardi Bonhote, 1904, *Abstr. Proc. zool. Soc. Lond.*, No. 10 : 13.

1905, *Proc. zool. Soc. Lond.*, 1904, 2 : 214. (Tullian, c 3350 m., Lidder, Kashmir).

Distribution : Gilgit to Ladakh (Kashmir); higher region of Pakistan.

Material : 1 unsexed (earlier Z. S. I. coll.); Deosai, c 3350 m., Kashmir. 1 ♀ (earlier Z. S. I. coll.); Tullian, c 3350 m., Lidder, Kashmir; 23 Aug 1905. 1 unsexed (earlier Z. S. I. coll.); Kashmir.

Measurements :

External—1 ♀ : Hb 150 ; Hf 28 ; E 23.

Taxonomic remarks : As regard colour no definite difference from the winter specimens of the nominate subspecies could be detected. Palatal and incisive foramina combined and constricted in the centre.

95. *Ochotona roylei baltina* Thomas

Himalayan Mouse Hare or Royle's Pika

Ochotona roylei baltina Thomas, 1922, *Ann. Mag. nat. Hist.*, (9) 9 : 118.
(Nurh, east of Skardo, c 3962 m., Baltistan, Kashmir).

Distribution : Baltistan, north-west of Ladakh (Kashmir).

Material : No specimen examined.

96. *Ochotona macrotis macrotis* (Günther)

Large-eared Mouse Hare

Lagomys macrotis Günther, 1875, *Ann. Mag. nat. Hist.*, 16 : 231. (Doba, Kuenlum Mountains, extreme southern Chinese Turkestan).

Distribution : Gilgit to Ladakh including Kishanganga valley (Kashmir); Russian Central Asia; Southern Chinese Turkestan.

Material : 2 unsexed (earlier Z. S. I. coll.); Leh, Ladakh; Aug 1873. 1 unsexed (earlier Z. S. I. coll.); above Kharbu, c 4260 m., Ladakh; 22 Aug 1873. 1 unsexed (type of *Lagomys auritus*) (earlier Z. S. I. coll.); Lukong, Ladakh; 19 Sep 1873. 2 unsexed (earlier Z. S. I. coll.); Gilgit, c 3048 m. and 2300 m. 1 ♀ (earlier Z. S. I. coll.), Kishanganga Valley, c 2300 m., Kashmir; 21 May 1876.

Measurements :

External—3 unsexed (from dry skin) : E 32, 35, 38.

Cranial —1 unsexed : On 42 + , Pal 16 ; Nas 14 ; Utr 7 ; Bul 10.5 ; Fr 5.5.

Taxonomic remarks : General colour agrees with the description given by Blanford (1891), but the region of head distinctly Rufous. This species is distinguished by its grayness on the back, enlarged ear, broad frontal, confluent palatal and incisive foramina.

General remarks : According to Scully (quoted by Blanford, 1891), 'this species frequents open, stony ground near the snow line'

97. *Ochotona ladacensis* (Günther)

Ladakh Pika

Lagonys ladacensis Günther, 1875, *Ann. Mag. nat. Hist.*, **16** : 231. (Changra Lake, c 4260 m., Ladakh).

Distribution : Upper Suttlej, Ladakh (Kashmir) ; Tibet, Chinese Turkestan.

Material : 3 ♂, 2 ♀ ; Luksang, Ladakh ; Jun, Jul 1870. 3 unsexed ; Rimdi, c 5200 m., Ladakh ; 22 Sep 1873. 1 unsexed ; Gogra, Ladakh. 4 ♂, 1 unsexed ; Chagra, Ladakh, 15 Jul 1870 and 21 Sep 1873. 2 unsexed ; Ladakh. 1 unsexed ; Leh, Ladakh ; 27 Aug 1878. 1 unsexed ; Kazilga, Ladakh. All the specimens belong to earlier Z. S. I. collection.

Measurements :

Cranial —1 ♂, 2 unsexed : On 44.5, 44.6, 46.7, Pal 18.2, 18.7, 20 ; Nas 14.8, 15.2, 15.7 ; Utr 8.5, 8.5, 8.9 ; Bul 11.2, 13.7, 14.2 ; Fr 3.2, 3.5, 4.1.

Taxonomic remarks : Colour not very variable and more or less agrees with the description given by Blanford (1891). Above pale Rufescent Fawn with a greyish tinge varying to Rufous, below pale Buff or whitish. Face and outside of ears more Rufous than the back. Coat thicker and longer in the specimens of September than of June, July or August. Palatal and incisive foramina practically distinct from each other. Frontal very narrow.

Ellerman and Morrison-Scott (1951) stated that bullae small, averaging 21 per cent of the occipitonasal, but in the present series it reaches up to 30 per cent.

General remarks : Nothing has been recorded about its habit.

Order RODENTIA

Family SCIURIDAE

98. ***Petaurista petaurista albiventer*** (Gray)

Large Red Flying Squirrel

Pteromys albiventer Gray, 1834, *Ill. Indian Zool.*, pl. 18. (Nepal).

Distribution : Jammu and Kashmir ; Himachal Pradesh, Uttar Pradesh, Nagaland ; Pakistan and Nepal.

Material : 1 ♂ ; Jammu. 1 unsexed (earlier Z. S. I. coll.) ; Ladakh. 1 unsexed (earlier Z. S. I. coll.) ; Kashmir.

Measurements :

External —1 ♂ : Hb 380 ; Tl 490 ; Hf 68 ; E 42.

Cranial —1 ♂ : On 70.5 ; Pal 34 ; Nas 22.7 ; Utr 16.4 ; Bul 12.6 ; Fr 16.7.

Taxonomic remarks : Fur thick and soft. Dorsum reddish, without any dark saddle patch. Feet dark. Tail with a clear dark brown tip. Underpart whitish with a Rufous tinge.

General remarks : In Kashmir, it lives in holes of fir-trees during the day and comes out to feed in the dusk.

99. ***Hylopetes fimbriatus*** (Gray)

Smaller Kashmir Flying Squirrel

Sciuropterus fimbriatus Gray, 1837, *Ann. Mag. nat. Hist.*, 1 : 584. (Simla, Himachal Pradesh).

Distribution : Jammu and Kashmir, Himachal Pradesh, Kumaon (Uttar Pradesh) ; Pakistan.

Material : 1 ♂ (earlier Z. S. I. coll.) ; Sardalla, 2653m., Islamabad ; 17 Oct 1927. 1 unsexed (earlier Z. S. I. coll.) ; Gilgit, c 1800 m. 3 unsexed (earlier Z. S. I. coll.) ; Kashmir.

Measurements :

External —1 ♂ : Hb 270 , Tl 280 ; Hf 60 ; E 44.

Cranial —1 ♂ : On 59 ; Pal 31.7 ; Nas 19.8 ; Utr 11.4 ; Bul 12 ;
Fr 13.1 ; Or 21.8.

Taxonomic remarks Basal three-fourth or more of the dorsal hair dark ashy, terminal portion light brown but extreme tip of the longer hairs black, particularly on the back. Underpart white, but brownish beneath the parachute. Tail brownish but the hairs ashy at the bases.

Bullae not specially flattened and rising well above the general level of base of skull. Distinguished from the next species by the smaller skull (less than 61 mm.) and smaller fourth premolar.

100. *Hylopetes baberi* (Blyth)

Larger Kashmir Flying Squirrel

Sciuropterus baberi Blyth, 1847, *J. Asiat. Soc. Beng.*, 16 : 886 (Kohistan, Afghanistan).

Distribution : Kashmir ; Pakistan and Afganistan.

Material : 1 ♂, 2 ♀ ; Shikargarh ; 25-27 Aug 1974. 1 ♂, 1 ♀ ; Daksum ; 12, 15 Sep 1974.

Measurements

External —2 ♂ Hb 282, 290 ; Tl 329, 350 ; Hf 58, 59 ; E 40, 48.

3 ♀ : Hb 288, 291, 318 ; Tl 350, 352, 384 ; Hf 55, 61, 62 ; E 41, 43, 44.

Cranial —2 ♂ : On 61.2, 63.7 ; Pal 30.6, 32.6 ; Nas 19.7, 21.3 ; Utr 11.5, 12.3 ; Bul 11.6, 12.9 ; Fr 12.2, — ; Or 22, 23.7.

3 ♀ : On 62.3, 63.3, 64.6 ; Pal 31.8, 33.8, — ; Nas 21.3, 21.6, 22 ; Utr 11.6, 12.2, 12.5 ; Bul 12.7, 12.8, 13 ; Fr 12.7, 12.9, 14.7 ; Or 22.7, 23.2, 23.7.

Mammae : 1+3=8

General remarks : Detail on its status and habits were discussed by Chakraborty (1982).

101. **Eupetaurus cinereus** Thomas
Woolly Flying Squirrel

Eupetaurus cinereus Thomas, 1888, *J. Asiat. Soc. Beng*, 57, 2 (3) : 251.
(Gilgit valley, Kashmir).

Distribution : North Sikkim, Kashmir ; Pakistan.

Material : 3 unsexed including a syntype (earlier Z. S. I. coll.) ; Gilgit ; Syntype undated, others two are of May, 1924.

Additional material examined : 1 unsexed (B. N. H. S. coll.) ; Chitral, Pakistan. 1 unsexed ; North Sikkim, c 3000 m.

Taxonomic remarks : Fur exceptionally thick, long and soft ; sole heavily haired. All the three specimens from Gilgit are similar in colour and agree with the original description, but differ from the specimens of North Sikkim and Chitral as discussed by Agrawal and Chakraborty (1970), and Chakraborty and Agrawal (1978).

Cheekteeth strongly hypsodont.

102. **Funambulus pennanti** Wroughton
Northern Palm Squirrel

Funambulus pennantii Wroughton, 1905, *J. Bombay nat. Hist. Soc*, 16 : 411.
(Mandvi Taluka, Surat, Gujarat).

Funambulus pennantii argentescens Wroughton, 1905, *J. Bombay nat. Hist. Soc.*, 16 : 413. (Rawalpindi, Pakistan).

Funambulus pennantii lutescens Wroughton, 1916, *J. Bombay nat. Hist. Soc.*, 24 : 430. (Deesa, Palanpur, Gujarat).

Distribution : Widely distributed in the whole of northern India, south to about 20°N latitude and east to Khasi Hills (Meghalaya).

Material : 1 ♂, 1 ♀ ; Jhajjar Kotli ; 15 Nov 1975.

Measurements :

External —1 ♂ : Hb 130 ; Tl 156 ; Hf 38 ; E 14.

1 ♀ : Hb 155 ; Tl 156 ; Hf 40 ; E 16.

Cranial —1 ♂ : On 35.6 ; Pal 16.7 ; Nas 10.6 ; Utr 6.7 ; Bul 7.6 ; Fr 10.3 ; Or 11.7.

1 ♀ : On 37.5 ; Pal 17.4 ; Nas 11.6 ; Utr 6.9 ; Bul 7.8 ; Fr 10.9 ; Or 12.7.

Mammae One pair, abdominal.

Taxonomic remarks : Back with five light stripes. Underside of the tail without any red line.

Coronoid process of mandible low and reduced.

Wroughton (1905, 1916) recognised three subspecies based on the colour characters. Ellerman (1963) treated those colour characters as highly variable and synonymised the three subspecies. Moore and Tate (1965) maintained all the three, based on the original description. Agrawal and Chakraborty (1979) studied a large number of specimens from different parts of the country and found that the supposed colour characters of the three subspecies are really variable irrespective of localities and thus supported Ellerman's (loc. cit.) view.

General remarks : Except in Jammu city and areas adjacent to Punjab, the population of this species appears to be very small in this state. Scattered individuals were observed only at Srinagar and Jhajjar Kotli. Both the present individuals were shot from a peepul tree by the side of the Jammu-Srinagar national highway at about 11-00 hours.

Teats of the female specimen were very prominent but uterus contained no foetus.

103. *Marmota bobak himalayana* (Hodgson)

Himalayan Marmot

Arctomys himalayanus Hodgson, 1841, *J. Asiat. Soc. Beng.*, **10** : 777. (Nepal).

Distribution : Higher regions of Kashmir, Himachal Pradesh, Sikkim ; Nepal ; Tibet, Kansu, Szechuan, Yunnan in western China.

Material : No specimen from Kashmir could be collected.

General remarks : Live at elevations from about 3960 m. to 5500 m. According to Lydekker (quoted by Blanford, 1891) the alarm cry is 'a short chirping bark'

104. **Marmota caudata caudata** (Jacquemont)
Long-tailed Marmot

Arctomys caudatus Jacquemont, 1844, *Voy. dans L'Inde*, 4, Zool., 66. (Kashmir).

Distribution : The north-western parts of Kashmir in the Deosai, Dras and Astor. Kaghan valley and Hazara in Pakistan.

Material : No specimen from Kashmir could be collected.

General remarks : Inhabits comparatively fertile localities on the border of the dry region. Makes a loud wailing cry.

Family HYSTRICIDAE

105. **Hystrix indica** Kerr
Indian Crested Porcupine

Hystrix cristata var. *indica* Kerr, 1792, *Anim. Kingd.*, 213. (India).

Distribution : The Himalayas to Cape Comorin ; westwards to Syria through Pakistan and Iran ; Sri Lanka.

Material : No specimen from Jammu and Kashmir could be collected.

General remarks : Strictly nocturnal, feeds on vegetable, principally on roots. Highly destructive to crops. During the day remains in caves amongst rocks, or in burrows in the hillsides, river banks, etc. It is said to be common in Jhajjar Kotli area, but author did not come across any there.

Family DIPODIDAE

106. **Sicista concolor leathemi** (Thomas)
Kashmir Birch-Mouse

Sminthus leathemi Thomas, 1893, *Ann. Mag. nat. Hist.*, 11 : 184. (Krishnye valley, Warden, Kashmir).

Distribution : Warden, Rupal, Astor, Gilgit, Ladakh and Kagnarg Mountains (Kashmir) ; Kaghan Valley (Pakistan).

Material : No specimen examined.

Taxonomic remarks : I did not get the opportunity to examine the examples of the genus *Sicista* Gray. There are two named forms of *Sicista* in the region of the present study, the precise status of which are not clearly known. According to Roberts (1977), *S. concolor* (Büchner)

is uniformly greyish-drab fawn coloured, tail nearly one and a half times the head and body length and tends to be bicoloured being whitish on its ventral surface and darker grey dorsally. According to Ellerman (1963) present subspecies has very long tail, being over 160 per cent of head and body length.

General remarks : According to Roberts (1977) this mouse may be found in the alpine and subalpine scrub zones in the Himalayas, as well as in artemisia steppe, and descending to grassy slopes on the edge of forests in moister mountain region. It inhabits fields of terraced cultivation in the upper slopes of valleys in Gilgit.

Being confined to high altitudes where there is marginal cultivation, it is not of great economic importance. However, it may inflict slight damage to potato and maize crops. It is preyed upon by Stoats (*Mustela erminea*), Altai Weasels (*Mustela altaica*) and presumably by Stone Martens (*Martes foina*) and Rockhorned Owl (*Bubo bubo turcomanus*).

107. **Sicista concolor flavus** (True)

Sminthus flavus True, 1894, *Proc. U. S. natn. Mus*, 17 : 341. (Central Kashmir, c 3305m.).

Distribution : Known from the type locality only.

Material : No specimen examined.

Taxonomic remarks : From the measurements of the type specimen (Hb 69.8, Tl 107.9), it appears that the present subspecies differs from *leathemi* by relatively shorter tail (155 per cent of head and body length).

Family MURIDAE

108. **Millardia meltada pallidior** Ryley

Soft-furred Field Rat or Metad

Millardia meltada pallidior Ryley, 1914, *J. Bombay nat. Hist. Soc.*, 22 : 659. (Lunwa, Palanpur, Gujarat).

Distribution : Gujarat, Punjab, Uttar Pradesh ; Pakistan. Ward (1905) reported *M. meltada* (Gray) from eastern Kashmir at elevations varying from 2150 m. to 2450 m., which from the distributional point of view appears to be of this subspecies.

Material : No specimen from Jammu and Kashmir could be collected.

General remarks : Inhabits quite dry rocky hills as well as flat alluvial plains on the borders of cultivation.

109. ***Apodemus flavicollis wardi*** (Wroughton)
Wroughton's Yellow-necked Field Mouse

Micromys sylvaticus wardi Wroughton, 1908, *J. Bombay nat. Hist. Soc.*, **18** : 282. (Saspul, Ladakh).

Distribution : Ladakh, Gulmarg, Astor, Kishtwar and some other localities of Jammu and Kashmir generally above 2440 m.

Material : 2 ♀ (earlier Z. S. I. coll.) ; Leh, c 3560 m., Ladakh.

Taxonomic remarks : Dorsum pale gray. Tail usually shorter than head and body length. Palate more than half of the occipitonasal length.

General remarks : Live in the field and scrub jungle particularly under roots of trees and come into the houses in winter. Litter size varies from five to seven. This is one of the most important pests of crops in Kashmir.

110. ***Apodemus flavicollis rusiges*** Miller
Miller's Yellow-necked Field Mouse

Apodemus flavicollis rusiges Miller, 1913, *Proc. biol. Soc. Wash.*, **26** : 81. (Central Kashmir).

Distribution : Jammu and Kashmir, Himachal Pradesh, Kumaon (Uttar Pradesh) ; Pakistan. Generally found below 2440 m.

Material : 2 juv. ♂, 2 juv. ♀ (earlier Z. S. I. coll.) ; Sardalla, Islamabad district ; 14, 16 Oct 1923.

Measurements :

External —2 juv. ♂ : Hb 77, 79 ; Tl 83, 84 ; Hf 23, 23 ; E 16, 16.

2 juv. ♀ : Hb 76, 78 ; Tl 86, 86 ; Hf 23, 24 ; E 16, 17.

Cranial —1 juv. ♂ : On 27.4 ; Pal 12.2 ; Apf 4.4 ; Nas 9.2 ; Utr 3.7 ; Bul 5.

Taxonomic remarks : Dorsal colour cold gray. Tail much longer than head and body. Palate less than half of the occipitonasal length.

According to Ellerman (1963), ear relatively small in this subspecies, rarely as much as 19 per cent of head and body length. However, in the present series of juvenile specimens ear more than 20 per cent of head and body length.

General remarks : It is also much destructive to the crops in the field.

111. *Rattus rattus alexandrinus* (Desmarest)

Mus alexandrinus Desmarest, 1817, *Nouv. Dict. Hist. nat.* (ed. 2), 29 : 47. (Alexandria, Egypt).

Distribution : Ellerman and Morrison-Scott (1951) regarded this subspecies as a commensal form, distributed widely throughout the world, but except a few specimens collected by Mr. J. Biddulph and Mr. J. Scully during the years 1878-79 (Sclater, 1891) from Gilgit, so far, no specimen was recorded from the Indian territory. Thus, the present series from Jammu makes its range further wide.

Material : 7 ♂, 2 juv. ♂, 7 ♀; Rambon; 3-10 Nov 1975.

Measurements :

External — 7 ♂ : Hb 135—182 (164) ; Tl 154—190 (177) ; Hf 29—37 (32) ; E 19—23 (21).

7 ♀ : Hb 149—185 (168) ; Tl 175—209 (189) ; Hf 29—34 (31) ; E 19—24 (21).

Cranial — 5 ♂ : On 36.5—42 (39.3) ; Pal 19—21.7 (20.5) ; Apf 6.9—8.1 (7.4) ; Nas 12.9—14.8 (14) ; Utr 5.8—6.8 (6.2) ; Bul 6.6—7.1 (6.9) ; Dia 9.4—11.7 (10.6).

7 ♀ : On 37.2—43.6 (40.5) ; Pal 19.1—23.4 (21.4) ; Apf 6.7—8.1 (7.5) ; Nas 14—16 (15.1) ; Utr 5.8—6.3 (6.1) ; Bul 6.3—7.9 (7) ; Dia 10.1—12.1 (11).

Mammae : 3+1+2=12 or 2+1+2=10.

Taxonomic remarks : Ellerman and Morrison-Scott (1951) regarded *alexandrinus* as rather colour phase or “form” of the nominate subspecies than a subspecies as usually understood. Ellerman (1963) distinguished *alexandrinus* from *R. r. rufescens* (Gray) on the basis of the absence of rufous dorsal colour and rusty tinge on the belly. However, he also stated that there is no constant difference of colour between the series of *alexandrinus* and *rufescens* specimens examined by him.

In the present series dorsum greyish brown, hindfoot white, under-surface dark except in one where it is dirty white, but all without any rusty tinge. In three specimens, tail slightly smaller than head and body and in the rest it ranges from just over 100 per cent to 130 per cent of head and body length. From the analysis of the measurements of the present series as well as those given by Ellerman (1963), it appears that females are slightly larger than the males at least on average.

General remarks : All the specimens were trapped either from houses or shops at Rambon, where they might have been transported through human agency. Some very dark specimens of *Rattus* were also observed in the hotels and shops of Jammu city during day time but none of them could be collected. At Rambon, these animals heavily depend upon stored food grains as well as on the refuse and garbage.

Mammae of all the females were prominent and uterus of one contained eight foetuses in early stage of development. Each foetus was about 15 mm. in length, and indication of hindlimb, tail and eyes could be noticed.

112. *Rattus rattus brunneusculus* (Hodgson) Nepal House Rat

Mus brunneusculus Hodgson, 1845, *Ann. Mag. nat. Hist.*, 15 : 267. (Nepal).

Distribution : According to Ellerman (1963) this subspecies is known to occur in Sikkim, Meghalaya, Manipur and Nepal. Chakraborty (1975) recorded it from Bhutan. The present series extends its range very much farther west to Jammu.

Material : 8 ♂, 10 juv. ♂ 11 ♀, 4 juv. ♀; Jhajjar Kotli; 20-24 Oct, 13-25 Nov 1975.

Measurements :

External — 8 ♂ : Hb 139—182 (157); Tl 175—225 (190); Hf 31—35 (33); E 19—26 (22).

11 ♀ : Hb 149—185 (160); Tl 175—232 (195); Hf 29—34 (31); E 21—24 (22).

Cranial — 7 ♂ : On 36—44.5 (39.5); Pal 18.1—23.4 (20.4); Apf 6.6—8.5 (7.3); Nas 12.1—16.1 (13.9); Utr 6.1—7.1 (6.7); Bul 5.9—7.3 (6.6); Dia 9—12.3 (10.2).

9 ♀ : On 36.7—43 (39.5); Pal 19.2—22.7 (20.6);

Apf 6.8—8.2 (7.3) ; Nas 12.4—16.2 (14.2) ; Utr 6.2—6.8 (6.5) ; Bul 6.1—6.7 (6.4) ; Dia 9—11.8 (10.3).

Mammae : $3+2+1=12$ or $2+2+1=10$.

Taxonomic remarks : Based on the material present in the Z. S. I. and measurements given by Ellerman (1963), it was pointed out by Chakraborty (1975) that this subspecies is distinguishable from all other Indian subspecies of *Rattus rattus* (Linnaeus) by the length of toothrow which is greater than the length of bulla except in five specimens.

Undersurface white, but in five specimens there is a dark patch in the region of the chest. Juveniles are much darker than adults.

General remarks : This is the most common rat of Jammu and Udhampur districts, found in large number in the houses, shops as well as in the fields, causing maximum damage to crops (both in the field and in the store) and valuable articles of merchandise. Analysis of stomach contents revealed seeds of maize and wheat, some unidentified green vegetable, insects, leather and candle wax. Under some circumstances it becomes carnivorous, which is obvious from the following experience. A wonder trap was placed in a *Lantena* bush bordering a cultivated field near the Rest House of Jhajjar Kotli in the morning of 22nd November with bread as bait. Due to some unavoidable reasons the trap could not be visited in the afternoon of the same day. Next morning when the trap was recovered, a live specimen of *brunneusculus* was found along with the remnants of a specimen of *Golunda ellioti* Gray. Almost the entire flesh of the latter specimen was eaten away by the specimen of *brunneusculus* leaving only the skin.

Only one pregnant female could be found. Its uterus contained four fetuses in early stage of development, showing indications of eyes and forelimbs. Testes of all the adult male specimens were scrotal, measuring 11 to 20 mm. in length.

113. *Rattus turkestanicus shigaricus* Miller Turkestan Rat

Rattus rattus shigaricus Miller, 1913, *Proc. biol. Soc. Wash.*, **26** : 198.
(Shigar, Baltistan).

Distribution : Schlitter and Thonglongya (1971) stated that this subspecies is restricted to the extremely xeric parts of northern Kashmir and Northern Pakistan. However, the present material shows that it is also widely distributed in the valley of Kashmir.

Material : 1 subadult ♀ ; Shikargarh ; 30 Aug 1974. 1 ♀ ; Shar ; 2 Sep 1974. 1 ♀ ; Daksum ; 12 Sep 1974. 1 ♀ (earlier Z. S. I. coll.) ; Hajin, c 2200 m., Kashmir ; 6 Oct 1908.

Measurements :

External — 3 ♀ : Hb 155, 167, 170 ; Tl 174, 176, 177 ; Hf 29, 32, 34 ; E 18, 19, 21

Cranial — 2 ♀ : On 40.8, 41.1 , Pal 21.1, 21.7 ; Apf 6.5, 6.9 ; Nas 15, 15.3 ; Utr 6.3, 6.3 ; Bul 6.7, 7.

Mammae : 3+1+2=12.

Taxonomic remarks : Dorsum greyish brown; subadult specimen slightly darker. Feet white. Tail bicolored, dark above and pale below. Hairs spiny. Tail longer than head and body.

General remarks : At Shar and Shikargarh it was found in the cultivated fields, but at Daksum it was observed feeding on the plum fruits in the rocky river beds during morning and afternoon and taking shelter below the rocks. None of the female was pregnant. In the label of the specimen from Hajin following remark was given, 'Trapped in Jungle'.

114. ***Rattus vicerex*** (Bonhote)

Mus vicerex Bonhote, 1903, *Ann. Mag. nat. Hist.*, (7) 11 : 473. (Simla, Himachal Pradesh).

Distribution : Kashmir, Himachal Pradesh.

Material : 2 ♂, 1 subadult ♂ ; Shikargarh ; 26, 29 Aug 1974. 1 ♂ ; Shar ; 5 Sep 1974. 2 ♂, 1 subadult ♂, 5 ♀ ; Daksum ; 12—19 Sep 1974. 1 ♀ (earlier Z. S. I. coll.) ; Bhaderwah, c 1750 m., Kashmir ; 15 May 1907.

Measurements :

External — 5 ♂ : Hb 158—206 (178) ; Tl 154—173 (164) ; Hf 31—35 (33) ; E 20—24 (21.8).

6 ♀ : Hb 130—190 (148.5) ; Tl 128—181 (142) ; Hf 29—33 (30.4) ; E 16—25 (18.6).

Cranial — 5 ♂ : On 36.5—44.9 (40.8) ; Pal 18.6—24 (21.4) ; Apf 7—7.8 (7.4) ; Nas 12.6—16.7 (14.6) ; Utr 6.1—6.6 (6.4) ; Bul 6.3—7.4 (6.9).

4 ♀ : On 34.3—37.4 (35.2) ; Pal 18—19.2 (18.6) ; Apf 5.8—6.7 (6.2) ; Nas 11.8—13.5 (12.2) ; Utr 6.2—6.5 (6.3) ; Bul 6.3—6.6 (6.4).

Mammae : 1+2+1=8.

Taxonomic remarks : Above greyish or greyish brown, under-surface white. Tail shorter than head and body length, distinctly bicolored—dark above, white below with a clear line of demarcation. Hairs soft but tend to be spiny in four specimens. Males are robust and larger than the females.

Based on a series of eleven specimens from Simla, Bonhote (1903) described *Mus vicerex* on the basis of tail characters as mentioned above. Hinton (1918), Wroughton (1919) and Ellerman (1941) maintained *vicerex* as a distinct species under the genus *Rattus* Fischer. Later, Ellerman (1947) synonymized *vicerex* with *R. rattoides turkestanicus* (Satunin). Schlitter and Thonglongya (1971) pointed out that the name '*Mus rattoides*' is preoccupied and the next available name for this species is *Rattus turkestanicus*. They treated *vicerex* as subspecies of *turkestanicus*. From the original descriptions of *rattoides* and *turkestanicus* it is revealed that tail is longer than head and body in both the cases, which at once separates *vicerex* from them. The present study reveals that there are two species of *Rattus* with bicolored tail occurring sympatrically in the Kashmir region, of which *turkestanicus* has tail longer than head and body and in *vicerex* the reverse is true. Moreover, bicoloredness of tail appears to be more uniform and distinct in *vicerex*. In addition, *vicerex* is a house dwelling form and nocturnal in habit, whereas, *turkestanicus* is found mainly in the field where it actively feeds in the daytime.

General remarks : This is the most prevalent house dwelling rodent of Kashmir valley, living with *Bandicota bengalensis* (Gray) and *Mus musculus* Linnaeus in the same cottages. This rat is partially

social, and lives in interconnected burrow system dug in the floor, wall and roof of cottage. It is captured from the kitchen, godown, shop and the field adjacent to the cottage. It is one of the most important pests of stored grains and fruits in Kashmir. People reported that it damages large quantities of stored apples and walnuts than what it actually consumes.

Testes of all the males were scrotal, but none of the female was pregnant.

115. ***Rattus norvegicus*** (Berkenhout)
Norway Rat or Brown Rat

Mus norvegicus Berkenhout, 1769, *Outlines nat. Hist. Gt. Britain and Ireland*, 1 : 5. (Great Britain).

Distribution : Commensal and distributed throughout the greater part of the world owing to accidental human agency. It is certainly not indigenous in India, though now found in all large towns and villages, along the banks of navigable rivers and on high roads. Ward (1905) reported it from Punch area of Kashmir. Mr. MacMahon collected two specimens of it from Gilgit towards the end of 19th century.

Material : No specimen from Jammu and Kashmir could be collected.

General remarks : No specimen was seen during the period of recent surveys. This species has been introduced probably via grain shipments but could not establish in the cities of Jammu and Kashmir due to competition with *Bandicota bengalensis* (Gray). This is the most efficient burrower and excavates tunnels under the foundations of food grain godowns. It also occupies drains and underground sewers of the cities.

116. ***Mus musculus ? castaneus*** Waterhouse

Material : 1 ♂ : Daksum ; 16 Sep 1974.

Measurements :

External — Hb 85 ; Tl 75 ; Hf 16 ; E 10.5.

Cranial — On 21.2 ; Pal 11.2 ; Apf 5 ; Nas 8.1 ; Utr 3.9 ;
Dia 5.4.

Taxonomic remarks Dark bellied. Incisors unusually small, probably their continuous growth was stopped. Definite subspecific identification of the specimen not possible.

General remarks : The present specimen was trapped in the morning from the Kitchen of forest hut. Testes prominent.

117. **Mus musculus homourus** Hodgson
Dark House Mouse

Mus homourus Hodgson, 1845, *Ann. Mag. nat. Hist.*, 15 : 268. (Nepal).

Distribution : According to Ellerman and Morrison-Scott(1951), 'southern slope Himalayas, from roughly Indus river to Burma, Formosa, Siam, Indo-China, Southern China ; Nilgiri Hills, India ; Java.'

Material : 1 ♂ ; Shikargarh ; 28 Aug 1974. 2 ♂, 1 ♀ ; Shar ; 5-6 Sep 1974. 1 ♀ ; Daksum ; 14 Sep 1974. 2 ♂ ; Jammu.

Measurements :

External — 5 ♂ : Hb 65—86 (72) ; Tl 63—90 (75) ; Hf 16—17.5 (16.5) ; E 10—13 (11).

2 ♀ : Hb 71, 85 ; Tl 68, 74 ; Hf 15, 17 ; E 10, 14.

Cranial — 3 ♂ : On 20, 20.4, 21.6 ; Pal 9.6, 10, 11.4 ; Apf 4.4, 4.4, 5.1 ; Nas 6.8, 6.8, 7.5 ; Utr 3.4, 3.5, 3.6 ; Bul 3.7, 3.8, — ; Dia 4.7, 5, 5.3.

2 ♀ : On 20.8, 23.6 , Pal 10, 14.4 , Apf 4.5, 6 ; Nas 7, 8.7 ; Utr 3.5, 3.5 ; Bul 3.9, 4 ; Dia 5.1, 5.7.

Mammae : 1+2+2=10.

Taxonomic remarks : Dorsum dark gray, undersurface whitish. Tail poorly bicolored, being slightly paler on the ventral surface.

Diastema short, less than one-quarter of the occipitonasal length. Upper incisors bear a very fine notch or step near the tip on the inner surface.

General remarks : Found in the field as well as in the houses, living in burrows, below rocks or in crevices. Seeds of paddy are found in the burrows as stored food. Nest chamber is made up mainly of chewed paper, jute, cotton, grass and old bits of rag. Omnivorous in

feeding habit, damaging seeds and vegetable, cloth, paper, leather, soap, etc. A female contained six foetuses in advanced stage of development.

Among its natural predator, Scully's Wood Owl (*Strix aluca*), Indian Barn Owl (*Tyto alba*) and Mongooses (*Herpestes sp.*) are important.

118. **Mus musculus bactrianus** Blyth
Persian House Mouse

Mus bactrianus Blyth, 1846, *J. Asiat. Soc. Beng.*, 15 : 140. (Kandahar, Afghanistan).

Distribution : According to Ellerman and Morrison-Scott (1951), 'Persia, Afghanistan, to Kashmir, Punjab, Baluchistan, Sind and Aden district'.

Material : 8 ♂, 3 ♀; Jhajjar Kotli; 21—24 Oct, 14—24 Nov 1975. 2 ♂; Rambon; 4, 7 Nov 1975. 1 ♂; Kokernag, Islamabad; 30 Sep 1976.

Measurements :

External — 9 ♂ : Hb 57—83 (74); Tl 64—86 (74); Hf 17—19 (18); E 11—13 (12).

3 ♀ : Hb 77, 89, 90; Tl 84, 88, 99; Hf 18, —, —; E 12, 12, 14.5.

Cranial — 6 ♂ : On 20—23.5 (21.5); Pal 10—12.3 (10.9); Apf 4.3—5.4 (4.8); Nas 7.1—8.9 (7.9); Utr 3.3—4.2 (3.5); Bul 3.8—4.6 (4); Dia 5—6.4 (5.5).

3 ♀ : On 22, 22, 22.7; Pal 11.4, 11.4, 11.5; Apf 4.9, 5.5, 5.6; Nas 8.1, 8.2, 9; Utr 3.3, 3.3, 3.7; Bul 3.7, 3.9, 3.9; Dia 5.4, 5.5, 5.6.

Taxonomic remarks : Dorsum sandy with fine grizzling of black. Venter perfectly white, except in three specimens where ventral hairs slaty at their basal parts. Tail bicolored—dark above, pale below. Hands and feet white.

In three specimens, diastema a little more than one-quarter of the occipitonasal length. According to Ellerman (1963), the length of upper toothrow varies from 3.1—3.5, but in the present series it reaches up to 4.2.

General remarks : Lives in the field as well as in the nearby houses in comparatively arid regions. Burrow system similar to that of the *M. m. homourus*. It was found active in the day as well as in the night. Omnivorous, causing a great damage of grains and merchandise. It was found attacking the specimen of *Golunda ellioti* Gray when caught in the same wonder trap.

A female specimen contained nine foetuses in very early stage of development. Testes of four specimens were prominent.

119. **Mus booduga booduga** (Gray)
Common Indian Field Mouse

Leggada booduga Gray, 18.7, *Charlesworth's Mag. nat. Hist.*, 1 : 586. (South Mahratta, India).

Distribution : According to Ellerman and Morrison-Scott ((1951) this subspecies occurs in Punjab, Uttar Pradesh, Bihar, Orissa, Tamil Nadu, Karnataka, Maharashtra and Gujarat. Sharma and Sharma (1976) and Lal (1976) recorded it from different parts of Jammu. It is also recorded from Pakistan (Roberts, 1977).

Material : 1 unsexed ; Punch, Jammu. 1 ♂ ; Jhajjar Kotli ; 13 Nov. 1975.

Measurements :

External — 1 ♂, 1 unsexed : Hb 50, 57 ; Tl 54.5, 55 ; Hf 14, 15 ; E 10, 12.

Cranial — 1 ♂, 1 unsexed : On 17.5, 17.6 ; Pal 9.1, — ; Apf 3.9, 4 ; Nas 6, — ; Utr 3.1, 3.3 ; Bul 3,5, — ; Dia 4.6, 4.6.

Taxonomic remarks : A very small-sized species. Dorsum pale grayish buff. Undersurface perfectly white in the specimen from Jhajjar Kotli but somewhat darker in the specimen from Punch. Tail not noticeably bicolored.

Occipitonasal length less than 20 and diastema exceeds one quarter of the occipitonasal length.

General remarks : Inhabits crop land or patches of thorny scrub on the edges of cultivation and does not show any commensal tendencies, but may live in the close vicinity of houses.

Though it is widespread and does some damage in crops, due to its small size and non-colonial habits, it does not appear to be a serious pest.

120. **Mus cervicolor** Hodgson
Fawn-coloured Mouse

Mus cervicolor Hodgson, 1845, *Ann. Mag. nat. Hist.*, 15 : 268. (Nepal).

Distribution : According to Ellerman (1963), within Indian limits this species occurs in part of Peninsular India, north to about south Rajasthan ; Assam. Mandal (1976) recorded it from West Bengal. The present series from Kashmir indicates that it is distributed almost throughout India. Outside Indian limits, it ranges to Pakistan (Taber *et al.*, 1967), Nepal, Burma, Liukiu Island, Indo-China, Thailand and Sri Lanka.

Material : 1 ♂, 1 ♀, Daksum ; 18, 19 Sep 1974. 2 ♂, 2 ♀ ; Shar ; 4 Sep 1974.

Measurements :

External — 3 ♂ : Hb 73, 76, 84 ; Tl 66, 69, 72 ; Hf 15, 16, 17 ;
E 10, 10, 13.

3 ♀ : Hb 80, 82, 98 ; Tl 77, 78, 78 ; Hf 16, 17, 19 ;
E 11, 13, 14.

Cranial — 2 ♂ : On 21.2, 22.4 ; Pal 11.1, 11.5 ; Apf 4.4, 4.7 ;
Nas 7, 8.4 ; Utr 3.1, 3.3 ; Bul 3.7, — ; Dia 5.5, 5.9.

3 ♀ : On 22.1, 22.3, 22.8 ; Pal 11.3, 11.3, 11.7 ; Apf
4.9, 5.4, 5.6 ; Nas 7.7, 7.9, 8.4 ; Utr 3.3, 3.4, 3.4 ;
Bul 3.8, 3.8, — ; Dia 5.8, 5.9, 6.1

Mammae : 1+1+2=8 or 1+2+2=10.

Taxonomic remarks : Dorsum dark gray, venter white. Tail slightly paler on the undersurface.

Occipitonasal length more than 20 and diastema exceeds one-quarter of the occipitonasal length.

The present series does not agree with any of the subspecies of *cervicolor* recognised by Ellerman (1963). A comparative summary of some important characters of the different subspecies and the present series is given (Table 3). However, recently Marshall (1977) based on

the structure, color, external and cranial measurements, breeding experiments (Chariyavidhayawat 1973), gross Karyology (Markvong et al. 1973 ; Gropp et al. 1973 ; Marshall 1975 ; Dhanda et al. 1973), and ectoparasites (Kim 1966 ; Mishra et al. 1972) made a detailed study of the Asian species of *Mus* with several noteworthy revisions. Thus, without a detailed study, I think it is not wise to propose a new name for the Kashmir population of this species.

General remarks : This species occurs along with *M. m. homourus* in the crop fields as well as in the houses and godown. None of the female contained foetuses.

121 *Mus sublimis* Blanford Upland Mouse

Mus sublimis Blanford, 1879, *Yarkand. Miss. Mamm.*, 51. (Tankse, c 3960 m, West of Pangyong Lake, Ladakh).

Distribution : Known from the type-locality. Another specimen was recorded from Astor, c 3350 m., Kashmir.

Material : 1 ♀ (Holotype) ; Tankse, c 3960 m., west of Pangyong Lake, Ladakh ; 17 Sep 1873 ; skin only.

Measurements :

From spirit specimen : Hb 64 ; Tl 68 , Hf 21 , E 13.

Taxonomic remarks : Dorsum light brown, undersurface whitish. Hands and feet white with a little brownish tinge. Blanford (1891) thought, it might be a variety of *M. musculus*, but hindfoot is longer than any other Indian species of the subgenus *Mus* Linnaeus and comes nearer to the species of the subgenus *Coelomys* Thomas. Wroughton (1920) treated this form as a species of the genus *Apodemus* Kaup. As the skull of the type-specimen is not available, nothing could be said positively about its status.

122. *Golunda ellioti* Gray Indian Bush Rat

Golunda ellioti Gray, 1837, *Charlesworth's Mag. nat. Hist.*, 1 : 586. (Dharwar, Karnataka).

Distribution : According to Ellerman and Morrison-Scott (1951), approximate distribution of this species : 'Sri Lanka, Peninsular India

northwards to Cutch, Sind, North-West Frontier, Punjab, Nepal, Bhutan Duars and Kamrup.' The present series extends its range to Jammu.

Material : 10 ♂, 1 subad. ♂, 2 ♀, 1 subad. ♀ ; Jhajjar Kotli ; 15-24 Nov 1975.

Measurements :

External —10 ♂ : Hb 110-140 (121) ; Tl 80-108 (97) ; Hf 22-27 (25) ; E 15-17 (16).

2 ♀ : Hb 105, 135 ; Tl 80, 95 ; Hf 26, 26 ; 15, 17.

Cranial —7 ♂ : On 30-33.4 (31.4) ; Pal 15.2, 17.1 (15.8) ; Apf 4.9-5.8 (5.2) ; Nas 10.3-11.8 (11.1) ; Utr 6.4-6.7 (6.5) ; Bul 5.1-5.8 (5.4).

Taxonomic remarks : Dorsal fur dark yellowish-brown varying to grayish-brown, intermixed with black-tipped and reddish fawn hairs giving the pelage a speckled effect. Belly slaty with paler tips to the hairs. Tail hairy ; noticeably bicolored, dark brownish above and yellowish gray below. Eyes large. Ear almost circular in outline, being well covered both inside and outside with short Buff hairs. Soles of the hindfoot dusky gray.

Incisors coated with reddish-orange enamel, bearing a very conspicuous longitudinal groove on the outer surface of the upper incisors. Molar columar in appearance.

Based on coloration and size, Ellerman (1963) recognized six subspecies of *G. ellioti* within the Indian limits. From a cursory examination of the material present in the Z. S. I. and B. N. H. S., it becomes obvious that there is much overlap among the different subspecies in respect of the distinguishing characters mentioned by Ellerman (loc. cit.). It would, therefore, appear that a thorough revision of the species is necessary.

General remarks : A very thick population of this species exists in and around Jhajjar Kotli and opportunity was availed to observe this animal in the field as well as in captivity. It lives in the bush or scrub jungle bordering crop field or gardens. Very timid and sluggish animal, captive specimen can be handled without any resistance. It

is strictly diurnal in habit, becomes most active during 9.00 to 11.00 hrs. and 15.00 to 17.00 hrs. Home range very small, not more than 15 metres away from the bush jungle in which it lives. Its nest is made up of fibres, stalks, dried leaves and grasses, and found on the surface or in simple burrow which is only 5 to 12 cm. in deep. Strictly herbivorous, analysis of stomach revealed seeds of *Lantena*, plum and some unknown grasses. In captivity, it did not accept food and drinks and thrived for 37 hours. Whenever, a little amount of jute or cotton was provided in the cage, it wove the same with incisors and forelimbs and hid himself in the woven mass.

Though a good number of specimens was collected, none was found in breeding condition, which indicates that this species may not be as prolific breeder as other muried rodents are.

It is the most favourite prey of mongooses (*Herpestes* sp.) during the day and civets (*Viverricula* sp.) during the night. In captivity it was also attacked by species of *Rattus* and *Mus*.

It did not appear to be a serious pest of crop in Jammu as it mainly feeds on wild seeds.

123. *Bandicota bengalensis bengalensis* (Gray)

Indian Mole-Rat or Lesser Bandicoot Rat

Arvicola bengalensis Gray, 1833, *Ill. Indian Zool.*, 2, pl. 21. (Bengal).

Distribution: Widely distributed through human agency. India, Pakistan, Sri Lanka, eastwards to west of Chindwin in Burma.

Material: 2 unsexed (earlier Z. S. I. coll.); Srinagar, Islamabad. 1 ♂ (earlier Z. S. I. coll.); Panarittan, Islamabad; 10 Nov 1908. 1 ♂, 1 ♀; Shar; 2, 5 Sep 1974. 1 ♀; Rambon; 8 Nov 1975.

Measurements:

External — 2 ♂ : Hb 196, 200 ; Tl 132, 160 ; Hf 33, 35 ; E 20, 23.

2 ♀ : Hb 197, 213 ; Tl 168, 180 ; Hf 34, 34 ; E 22, 24.

Cranial — 1 ♂ : On 40.5 ; Cb 43 ; Pal 23.1 ; Apf 8.7 ; Nas 13.2 ; Utr 7.3 ; Bul 8.6.

2 ♀ : On 41, 47.5 , Cb 44.7, 50.8 ; Pal 24.1, 27.2 ; Apf 8.9, 9.3 ; Nas 12.7, 14.5 ; Utr 7.4, 7.5 ; Bul 8.9, 9.6.

Mammae : $2+4+2=16$.

Taxonomic remarks : Size large. Fur rather coarse and harsh. Dorsum dark olive-brown with few longer black hairs. Feet dark but digits paler. Undersurface grayish. Tail wholly dark. Ear pinkish, almost round in outline.

Upper incisors broad, proodont, covered with orange enamel. Bullae large, more than one-fifth of the occipitonasal length. Nasal short, less than one-third of the occipitonasal length.

General remarks : Rambon, Shar and Srinagar are important business centres and *B. b. bengalensis* has probably been transported there through human agencies. In all the places it has been established well in the fields as well as in the houses.

It excavates extensive burrow system with a number of openings and store chambers, and occasionally with one nest chamber. It is quite fierce and aggressive, capable of a number of vocalizations and emits a grunting noise when angry. Breeds throughout the year and females bear large litters. An old female from Rambon with all the teeth worn out was lactating. This indicates that it can reproduce even at very old age.

Paddy, wheat and maize are the principle foods. It not only eats the grains, but also the sacculant shoots. In food godowns it consumes a large quantities of stored grains. Thus, it appeared to be the most destructive pest. Among the predators, cats (*Felis* sp.), Foxes (*Vulpes* sp.), Barn Owl (*Tyto alba*), Rock Python (*Python molurus*), and the Cobra (*Naja naja*) are important.

124. *Bandicota bengalensis wardi* (Wroughton)

Kashmir Mole-Rat

Gunomys wardi Wroughton, 1908, *J. Bombay nat. Hist. Soc.*, **18** : 745.
(Pandritton, c 1670 m., Kashmir).

Distribution : Jammu and Kashmir, Punjab, and Himachal Pradesh.

Material : 2 ♂, 1 ♀ ; Jhajjar Kotli ; 24 Oct, 19, 23 Nov 1975.
2 ♀ ; Rambon ; 6, 8 Nov 1975.

Measurements :

External — 2 ♂ : Hb 119, 140 , Tl 91, 95 ; Hf 30, 35 ; E 17, 24.
 3 ♀ Hb 140, 149, 173 ; Tl 111, 112, 136 ; Hf 33, 33,
 33 ; E 19, 19, 19.

Cranial — 2 ♂ : On 33.3, 33.5 ; Pal 18.5, 20 ; Apf 5.4, 7.2 ;
 Nas 9.4, 9.8 , Bul 8, 8.5 ; Utr 6.9, 7.4.

Mammae 2+3+2=14.

Taxonomic remarks : Distinguished by very soft and thick fur. Incisors white in all the five specimens.

General remarks : Found mainly in the cultivated fields or huts adjacent to the fields. Otherwise its habit is similar to that of the nominate subspecies:

125. ***Cricetulus migratorius fulvus*** (Blanford)

Fulvous-grey Hamster

Cricetus (Cricetulus) fulvus Blanford, 1875, *J. Asiat. Soc. Beng.*, 46 : 108.
 (Plains of eastern Turkestan, Pamir and Wakhan).

Distribution : According to Ellerman and Morrison-Scott (1951), 'Chinese Turkestan, and Kashmir. Quoted by Kuznetzov also from Eastern Tianshan'

Material : 3 ♂, 1 ♀ ; (earlier Z. S. I. coll.) ; Gilgit. A litter of four ; near Gilgit, c 4100 m.

Additional material examined : 1 unsexed (Syntype) ; Kashgar, China ; 17 Dec 1873.

Measurements :

External (from spirit specimens) — 3 ♂ : Hf 15.5, 17, 17 ; E 14, 14.5, 15.

1 ♀ : Hf 15 ; E 16.

Cranial — 1 ♂ : On 31.4 ; Pal 15 ; Apf 5.7 ; Nas 11.4 ; Utr 4.4 ; Bul 5.7.

1 ♀ : On 31.1 ; Pal 15.3 ; Apf 5.7 ; Nas 11.3 ; Utr 4.3 ; Bul 5.5.

Taxonomic remarks : Fur thick and soft. Dorsal fur basally

slaty, apically sandy brown. Ventral surface pure white or with a slaty tinge at the base of fur particularly at the sides. Tail fully furred, short and often less than one-third of the head and body length. In the label of syntype the following remark was given. "Iris dark brown. Lives in holes in sandy places."

Bullae large, well inflated and usually over 17 per cent of occipitonasal length. Cheek teeth have bi-serially cuspidate crowns.

General remarks : Ellerman (1963) mentioned about a gravid female with eight foetuses. From the present material it appears that litter size varies from four to eight.

Largely graminivorous in feeding, also take any small vertebrate and insects which they can overcome (Roberts 1977). There is no evidence of their doing any damage to agricultural crops.

126. *Cricetulus alticola* Thomas

Ladak Hamster

Cricetulus alticola Thomas, 1917, *Ann. Mag. nat. Hist.*, (8) 19 : 455. (Chusul, c 4100 m., Ladakh).

Distribution : Ladakh (Kashmir) ; Tibet.

Taxonomic remarks : No specimen was examined. According to Ellerman (1963), very similar to the last named species, but underparts mainly light gray. Bullae small and generally not more than 14 per cent of the occipitonasal length.

127. *Tatera indica indica* (Hardwicke)

Indian Gerbil or Antelope Rat

Dipus indicus Hardwicke, 1807, *Trans. Linn. Soc. Lond.*, 8 : 279. (Between Varanasi and Hardwar, Uttar Pradesh).

Distribution : Widely distributed throughout the drier region of India including parts of West Bengal in the east and Karnataka in the south. It is also distributed in Nepal, Pakistan, Afganistan and Iran.

Material : 3 ♂, 1 ♀ ; Jhajjar Kotli ; 21, 25 Nov 1975.

Measurements :

External — 3 ♂ : Hb 143, 149, 160 ; Tl 151, 155, 175 ; Hf 37, 37, 38 ; E 22, 23, 23.

1 ♀ : Hb 163 ; Tl 186 ; Hf 38 ; E 22.

Cranial —2 ♂ : On 38.7, 39.5 ; Pal 21, 21 ; Apf 7, 7.3 ; Nas 16.3, 16.6 ; Utr 5.7, 5.9 , Bul 9.9, 10.7 ; Fr 6.5, 6.5 ; Or 13.3, 13.5.

1 ♀ : On 42.5 ; Pal 22.5 ; Apf 7.8 ; Nas 18.1 ; Utr 5.9 ; Bul 12 ; Fr 7 ; Or 14.

Taxonomic remarks : Fur long and silky. Dorsum reddish fawn to light fawn. Abdomen, throat and inside of limbs perfectly white. Dorsal and ventral surface of tail dark grayish buff, but sides pale cream buff. Distal one-third of the tail bears a dorsal crest of longish hairs terminating in a tuft. Ears sparsely haired and upstanding. Hindfoot strongly developed but less than a quarter of the head and body length except in one specimen.

Nasal very elongated, extending well in front of the upper incisors. Bullae more than a quarter of the occipitonasal length.

General remarks : Though this is the most abundant rodent species in the drier regions of India, its population in Jammu is not very high and is totally absent in Kashmir valley. It is probably a recent introduction to Jammu from Punjab.

It is gregarious, living in close association or colonies. Most generally associated with cultivated tracts, but also occur in extensive desert regions and low hilly areas. Individuals live in separate burrows. Typically these burrows are excavated in embankments or hillocks with bushes. Burrows are usually complicated in structure but short, simple burrows are also made in crop land.

Omnivorous, insects contribute a significant proportion to their diet. In captivity, females frequently eat their young. Roberts (1977) observed that two males when placed in the same cage, at once start fighting. But all the three present male specimens trapped in the same wonder trap in a night, did not show any sign of fighting.

The present female specimen was kept in the cage for two days. It was very timid and accepted bread, potato and water.

Because of the numerical abundance it is responsible for considerable damage to agricultural crop in different parts of the country, but at Jammu it has not yet become so destructive.

It is one of the most important food sources of the small carnivores and a number of snakes.

128. *Alticola roylei blanfordi* (Scully)

Gilgit Vole

Arvicola blanfordi Scully, 1880, *Ann. Mag. nat. Hist.*, 6 : 399. (Gilgit, c 2700-3000 m.).

Distribution : Darkot and Gilgit (Kashmir), Lahul (Himachal Pradesh) at elevation between 2700 and 4270 m.

Material : 1 ♂, 1 ♀ (Syntypes) (earlier Z. S. I. coll.) ; Gilgit, c 2700—3000 m. ; Jul 1879 ; skin only. 1 ♂, 1 unsexed (earlier Z. S. I. coll.) ; Nultan Valley, Gilgit, c 2700 m. ; 18 Jul 1879 ; skin only. 1 ♀ (earlier Z. S. I. coll.) ; Darkot, N. W Kashmir, c 3000 m. ; Jul 1895 ; skin only.

Taxonomic remarks : Thick-furred voles, not specially modified for underground life. Grayish brown above, with a slight Rufous tinge. Underparts grayish white, darkened by slaty bases of hairs. Tail bicolored, dark above and pale below, more than 40 per cent of the head and body length.

No skull was examined, but according to Ellerman (1963), bullae approximating to one-quarter of occipitonasal length, palate 13.3 mm. or less (one exception in a series of five), upper toothrow less than 6 mm.

129. *Alticola roylei montosa* (True)

Central Kashmir Vole

Arvicola montosa True, 1894, *Proc. U. S. natn. Mus.*, 17 : 11. (Central Kashmir, c 3350 m.).

Distribution : Parts of Jammu and Kashmir ; Pakistan ; Afghanistan.

Taxonomic remarks : No specimen was examined. According to Ellerman (1963) it differs from *blanfordi* by average cranial characters, such as, longer palate (14.4 mm. or more) and upper tooth row (more than 6 mm.).

130. **Alticola roylei glacialis** Miller
Baltistan Vole

Alticola glacialis Miller, 1913, *Proc. biol. Soc. Wash.*, **26** : 197. (Baltistan, c 3350 m., Kashmir).

Distribution : Known only from the type-locality.

Taxonomic remarks : No specimen was examined. According to Ellerman (1963) it is distinguished from other Indian subspecies by short tail, which is less than one-third of the head and body length.

131 **Alticola stoliczkanus stoliczkanus** (Blanford)
Stoliczka's Vole

Arvicola stoliczkanus Blanford, 1875, *J. Asiat. Soc. Beng.*, **44** : 107. (Kuenlum Mountains, northern Ladakh).

Distribution : Plateaus of northern Ladakh (Kashmir) ; Yarkand (China).

Material : 1 unsexed (Syntype) (earlier Z. S. I. coll.) ; Nubra Valley, Ladakh ; 13 Oct 1873.

Taxonomic remarks Dorsum bright Ferruginous brown, venter whitish but base of the hairs slaty.

Third molar reduced having only two clear salient angles.

132. **Alticola stoliczkanus stracheyi** (Thomas)
Stoliczka's Ladakh Vole

Arvicola stracheyi Thomas, 1880, *Ann. Mag. nat. Hist.*, **6** : 332. (Ladakh).

Distribution : Kashmir, Himachal Pradesh , Tibet ; Nepal.

Material : No specimen was examined.

133. **Alticola stoliczkanus acrophilus** (Miller)
Stoliczka's Karakorum Vole

Microtus acrophilus Miller, 1899, *Proc. Acad. nat. Sci. Philad.*, 296. (Ladak side of Karakorum Pass, c 5200 m.).

Distribution : Known only from the type-locality.

Taxonomic remarks No specimen was examined. It is known

only by the type-specimen, which according to Ellerman (1963) is distinguished by shorter tail and much paler coloration.

134. **Hyperacrius wynnei** (Blanford)

Murree Vole

Arvicola wynnei Blanford, 1881, *J. Asiat. Soc. Beng.*, 49 : 244. (Murree, c 2150 m., Pakistan).

Distribution : Kashmir ; Pakistan.

Material : 1 ♀ (earlier Z. S. I. coll.) ; Kashmir ; damaged skull only. 1 ♀ ; (earlier Z. S. I. coll.) ; Kashmir ; damaged skin only.

Measurements :

External — Hf 16 ; E 9.

Cranial — Pal 12.4 ; Apf 3.8 ; Utr 5.6.

Taxonomic remarks : Fur soft and velvety. Above dark brown, underparts grayish. Ear very small, rounded, almost concealed in the long body fur.

General remarks : Typically associated with the Himalayan moist temperate forest and is found from about 1850 m. elevation up to 3050 m., both in the forest and in open grassy slopes. It excavates an extensive network of comparatively shallow tunnels as well as of much deeper tunnels descending almost vertically into the ground. Exclusively herbivorous.

135. **Hyperacrius fertilis fertilis** (True)

True's Vole

Arvicola fertilis True, 1894, *Proc. U. S. natn. Mus.*, 17 : 10. (Pir Panjal Mountains, c 2600 m., Kashmir).

Distribution : Jammu and Kashmir ; Pakistan.

Material : 1 ♂ (earlier Z. S. I. coll.) : Pyas, Kishtwar, Jammu ; 3 Jul 1909.

Measurements :

External — Hb 99 ; Tl 31 ; Hf 15.5 ; E 10.5.

Taxonomic remarks : Fur dense and harsh. Above dark brown,

but tips of the hairs with a reddish tinge. Underparts have the hairs dark gray basally with pale Ochraceous-Buff tips. Tail bicolored, dark gray dorsally, paler below. Ear more conspicuous than the last-named species and more than one-tenth of the head and body length.

According to Roberts (1977) its baculum has a longer and narrow stalk with the proximal tuberosities weakly developed and the distal tip triangular in shape.

General remarks : Typically associated with the subalpine scrub zone and alpine meadows, and normally found well above the tree line. Excavates deep tunnels for shelter and breeding. Exclusively herbivorous.

136. *Hyperacrius fertilis brachelix* (Miller)

Miller's Vole

Microtus (Hyperacrius) brachelix Miller, 1899, *Proc. Acad. nat. Sci. Philad.*, 290. (Nagmarg, c 2750 m., Kashmir).

Distribution : Jammu and Kashmir, somewhat overlapping with the nominate subspecies.

Taxonomic remarks : No specimen was examined. According to Ellerman (1963) it is distinguished from the nominate subspecies by relatively short ear (less than one-tenth of the head and body length).

137. *Hyperacrius aitchisoni* (Miller)

Microtus (Hyperacrius) aitchisoni Miller, 1897, *Proc. biol. Soc. Wash.*, 11 : 141. (Gulmarg, c 2750 m., Kashmir).

Distribution : Known only from the type-locality.

Taxonomic remarks : This species is known only by the type-specimen, the skull of which is damaged. According to Hinton (1926), 'outwardly resembling *fertilis* but distinguished by its larger size, hind-foot 18 mm.' But among the specimens of *fertilis* studied by Ellerman (1963), there are at least three with hindfoot 18 mm. or more. Thus, he stated 'it is most likely a race of *fertilis*, but might perhaps be a race of *wynnei*'

138. *Pitymys leucurus leucurus* (Blyth)

Blyth's Vole

Phaiomys leucurus Blyth, 1863, *J. Asiat. Soc. Beng.*, 32 : 89. (Near Tso Morari, Ladakh).

Arvicola blythi Blanford, 1875, *J. Asiat. Soc. Beng.*, 44 : 107. Renaming of *leucurus* but inadmissible because, unlike what Blanford supposed, *P. leucurus* Blyth, is not preoccupied by *Arvicola leucura* Gerbe [*Rev. Mag. Zool.*, (2) 4 : 260. (1852)], the two genera being different.

Microtus strauchi Büchner, 1889, *Wiss. Res. Przewalski cent. Asian, Reisen Zool.*, (1, Säügeth.), 121. (Dynssy-obo district in Burcha-Buddha Range, Tibet).

Distribution : Ladakh (Kashmir), Lahul and Spiti (Himachal Pradesh) ; Tibet, Chinese Turkestan.

Material : 1 ♂ (Holotype) (earlier Z. S. I. coll.) ; Tso Morari, c 4267 m., Western Ladakh ; 17 Aug 1861 ; Skin only. 1 ♂ (earlier Z. S. I. coll.) ; Tanktze, c 3962 m., north-eastern Ladakh ; 17 Sep 1873. 1 ♂ (earlier Z. S. I. coll.) ; North Chusul, c 4420 m., Ladakh.

Measurements :

External — 2 ♂ : Hb 125, — ; Tl 27, — ; Hf 20, 20 ; E 11.7, 12.

Cranial. — 1 ♂ : On 26.8 ; Pal 16.3 ; Apf 5.2 ; Utr 5.2 ; Bul 7.6.

Taxonomic remarks : Dorsal fur long and thick slaty, basally, apically Ochre Yellow. Ventral fur almost Slate-Gray with light Cream-Buff tips.

First lower molar with five inner and four outer angles, third with three inner and only two outer angles.

General remarks : An inhabitant of high mountain steppe regions at elevation above 3500 m.

SUMMARY

An account of the mammalian fauna of Jammu and Kashmir based mainly on the collections made during the years 1974 and 1975 along with those present in the Z. S. I., and B. N. N. S. collection is given. Altogether 138 species and subspecies have been dealt with, of which 13 are recorded for the first time from this territory. Distribution, taxonomy, ecology and economic importance of the several species and subspecies have been discussed. An analysis of the mammalian fauna of the state was made and their affinities studied. Physiography and important ecological divisions of the state have been described.

TABLE 1. List of species and subspecies of mammals occurring in Jammu and Kashmir with their affinities.

Order	Families	Species and subspecies	Affinities		
1 Insectivora	1. Soricidae	1. <i>Hemiechinus auritus</i>	Palaeartic		
		2. <i>Sorex (?) minutus planiceps</i>	Palaeartic		
		3. <i>Suncus murinus murinus</i>	Oriental		
		4. <i>Suncus murinus caerulescens</i>	Oriental		
		5. <i>Crocidura (?) horsfieldi myoides</i>	Oriental		
		6. <i>Crocidura russula pullata</i>	Palaeartic		
		7. <i>Crocidura leucodon</i>	Palaeartic		
		8. <i>Crocidura pergrisea pergrisea</i>	Palaeartic		
		9. <i>Crocidura attenuata rubricosa</i>	Oriental		
				10. <i>Chimmarogale platycephala himalayica</i>	Palaeartic
2. Chiroptera	2. Pteropodidae	11. <i>Rousettus leschenaulti</i>	Oriental		
		12. <i>Pteropus giganteus giganteus</i>	Oriental		
		13. <i>Cynopterus sphinx sphinx</i>	Oriental		
		14. <i>Rhinopoma hardwickei hardwickei</i>	Ethiopian		
		15. <i>Megadarma lyra lyra</i>	Oriental		
		16. <i>Rhinolophus ferremequinum proximus</i>	Palaeartic		
	3. Rhinopomatidae	4. Megadermatidae	17. <i>Rhinolophus hipposideros midas</i>	Palaeartic	
			18. <i>Myotis mystacinus nipalensis</i>	Palaeartic	
	5. Rhinolophidae	6. Vespertilionidae	19. <i>Myotis blythi blythi</i>	Palaeartic	
			20. <i>Myotis longipes</i>	Endemic	
			21. <i>Vespertilio murinus murinus</i>	Palaeartic	
			22. <i>Eptesicus nilssoni khasgaricus</i>	Palaeartic	
			23. <i>Eptesicus serotinus pachyomus</i>	Palaeartic	
					(Contd.)

		24. <i>Nyctalus noctula labiatus</i>	Palaeartic
		25. <i>Pipistrellus pipistrellus bactrianus</i>	Palaeartic
		26. <i>Pipistrellus coromandra coromandra</i>	Oriental
		27. <i>Pipistrellus kuhli lepidus</i>	Palaeartic
		28. <i>Pipistrellus savii</i>	Palaeartic
		29. <i>Pipistrellus dormeri dormeri</i>	Oriental
		30. <i>Pipistrellus mimus mimus</i>	Oriental
		31. <i>Barbastella leucomelas darjelingensis</i>	Palaeartic
		32. <i>Scotophilus heathi heathi</i>	Oriental
		33. <i>Otonycteris hemprichi hemprichi</i>	Palaeartic
		34. <i>Plecotus auritus puck</i>	Palaeartic
		35. <i>Plecotus auritus wardi</i>	Palaeartic
		36. <i>Murina huttoni</i>	Palaeartic
		37. <i>Kerivoula hardwickei hardwickei</i>	Oriental
3. Primates	7. Cercopithecidae	38. <i>Macaca mulatta mulatta</i>	Oriental
		39. <i>Macaca mulatta villosa</i>	Oriental
		40. <i>Presbytis entellus achilles</i>	Oriental
		41. <i>Presbytis entellus ajax</i>	Oriental
4. Carnivora	8. Canidae	42. <i>Canis lupus chanco</i>	Palaeartic
		43. <i>Canis aureus aureus</i>	Palaeartic
		44. <i>Vulpes vulpes montona</i>	Palaeartic
		45. <i>Vulpes bengalensis</i>	Oriental
		46. <i>Cuon alpinus laniger</i>	Palaeartic
	9. Ursidae	47. <i>Ursus arctos isabellinus</i>	Palaeartic
		48. <i>Selenarctos thibetanus laniger</i>	Palaeartic
	10. Mustelidae	49. <i>Martes foina intermedia</i>	Palaeartic
		50. <i>Martes flavigula flavigula</i>	Oriental
		51. <i>Mustela erminea ferghanae</i>	Palaeartic
		52. <i>Mustela altaica temon</i>	Palaeartic
		53. <i>Mustela sibirica hodgsoni</i>	Palaeartic
			(Contd.)

		54. <i>Mustela putorius larvatus</i>	Palaeartic
		55. <i>Lutra lutra kutab</i>	Palaeartic
	11 Viverridae	56. <i>Viverricuļa indica indica</i>	Oriental
		57. <i>Paradoxurus hermaphroditus vellerosus</i>	Oriental
		58. <i>Paradoxurus hermaphroditus wroughtoni</i>	Oriental
		59. <i>Herpestes auropunctatus auropunctatus</i>	Oriental
		60. <i>Herpestes edwardsi ferrugineus</i>	Oriental
	12. Hyaenidae	61. <i>Hyaena hyaena hyaena</i>	Palaeartic
	13. Felidae	62. <i>Felis chaus affinis</i>	Ethiopian
		63. <i>Felis manul nigripecta</i>	Palaeartic
		64. <i>Felis lynx isabellina</i>	Palaeartic
		65. <i>Felis bengalensis horsfieldi</i>	Oriental
		66. <i>Felis bengalensis trevelyani</i>	Oriental
		67. <i>Felis rubiginosa rubiginosa</i>	Oriental
		68. <i>Panthera pardus fusca</i>	Palaeartic
		69. <i>Panthera Pardus millardi</i>	Palaeartic
		70. <i>Panthera uncia</i>	Palaeartic
5. Perissodactyla	14. Equidae	71. <i>Equus hemionus kiang</i>	Palaeartic
6. Artiodactyla	15. Suidae	72. <i>Sus scrofa cristatus</i>	Palaeartic
	16. Cervidae	73. <i>Moschus moschiferus moschiferus</i>	Palaeartic
		74. <i>Cervus elaphus hanglu</i>	Palaeartic
	17 Bovidae	75. <i>Bos grunniens</i>	Palaeartic
		76. <i>Procapra picticaudata picticaudata</i>	Palaeartic
		77. <i>Pantholops hodgsoni</i>	Palaeartic
		78. <i>Capricornis sumatraensis humei</i>	Oriental
		79. <i>Naemorhedus goral goral</i>	Oriental
		80. <i>Hemitragus jemlahicus jemlahicus</i>	Palaeartic
		81. <i>Capra ibex sibirica</i>	Palaeartic
		82. <i>Capra falconeri falconeri</i>	Palaeartic
		83. <i>Capra falconeri cashmiriensis</i>	Palaeartic

(Contd.)

		84. <i>Pseudois nayaur nayaur</i>	Palaeartic
		85. <i>Ovis ammon hodgsoni</i>	Palaeartic
		86. <i>Ovis ammon polii</i>	Palaeartic
		87. <i>Ovis orientalis vignei</i>	Palaeartic
7. Lagomorpha	18. Leporidae	88. <i>Lepus capensis tibetanus</i>	Ethiopian
		89. <i>Lepus arabeus</i>	Palaeartic
		90. <i>Lepus oiostolus oiostolus</i>	Palaeartic
	19. Ochotonidae	91. <i>Lepus oiostolus hypsibius</i>	Palaeartic
		92. <i>Ochotona (?) pusilla nubrica</i>	Palaeartic
		93. <i>Ochotona roylei roylei</i>	Palaeartic
		94. <i>Ochotona roylei wardi</i>	Palaeartic
		95. <i>Ochotona roylei baltina</i>	Palaeartic
		96. <i>Ochotona macrotis macrotis</i>	Palaeartic
		97. <i>Ochotona ladacensis</i>	Palaeartic
		98. <i>Petaurista petaurista albiventer</i>	Oriental
		99. <i>Hylopetes fimbriatus</i>	Oriental
		100. <i>Hylopetes baberi</i>	Palaeartic
		101. <i>Eupetaurus cinereus</i>	Palaeartic
		102. <i>Funambulus pennanti</i>	Oriental
		103. <i>Marmota bobak himalayana</i>	Palaeartic
		104. <i>Marmota caudata caudata</i>	Palaeartic
	21. Hystricidae	105. <i>Hystrix indica</i>	Oriental
	22. Dipodidae	106. <i>Sicista concolor leathemi</i>	Palaeartic
		107. <i>Sicista concolor flavus</i>	Palaeartic
		108. <i>Millardia meltada pallidior</i>	Oriental
	23. Muridae	109. <i>Apodemus flavicollis wardi</i>	Palaeartic
		110. <i>Apodemus flavicollis rusiges</i>	Palaeartic
		111. <i>Rattus rattus alexandrinus</i>	Oriental
		112. <i>Rattus rattus brunneusculus</i>	Oriental
		113. <i>Rattus turkestanicus shigaricus</i>	Palaeartic

(Contd.)

114.	<i>Rattus vicerex</i>	Palearctic
115.	<i>Rattus norvegicus</i>	Palearctic
116.	<i>Mus musculus ? castaneus</i>	Palearctic
117.	<i>Mus musculus homburus</i>	Palearctic
118.	<i>Mus musculus bactrianus</i>	Palearctic
119.	<i>Mus booduga booduga</i>	Oriental
120.	<i>Mus cervicolor</i>	Oriental
121.	<i>Mus sublimis</i>	Endemic
122.	<i>Golunda ellioti myothrix</i>	Oriental
123.	<i>Bandicota bengalensis bengalensis</i>	Oriental
124.	<i>Bandicota bengalensis wardi</i>	Oriental
125.	<i>Cricetulus migratorius fulvus</i>	Palearctic
126.	<i>Cricetulus alticola</i>	Palearctic
127.	<i>Tatera indica indica</i>	Palearctic
128.	<i>Alticola roylei blanfordi</i>	Palearctic
129.	<i>Alticola roylei montosa</i>	Palearctic
130.	<i>Alticola roylei glacialis</i>	Palearctic
131.	<i>Alticola stoliczkanus stoliczkanus</i>	Palearctic
132.	<i>Alticola stoliczkanus stracheyi</i>	Palearctic
133.	<i>Alticola stoliczkanus acrophilus</i>	Palearctic
134.	<i>Hyperacrius wynnei</i>	Palearctic
135.	<i>Hyperacrius fertilis fertilis</i>	Palearctic
136.	<i>Hyperacrius fertilis brachelix</i>	Endemic
137.	<i>Hyperacrius aitchisoni</i>	Endemic
138.	<i>Pitymys leucurus leucurus</i>	Palearctic

TABLE 3. Summary of characters of the different subspecies and Kashmir population of *M. cervicolor*.

Characters	Populations							Kashmir Population
	<i>palnica</i>	<i>cervicolor</i>	<i>nagarum</i>	<i>fulvidiventris</i>	<i>nitidulus</i>	<i>phillipsi</i>	<i>imphalensis</i>	
1. Nature of fur	Soft, few specimens with fine spines	Soft	Soft	Soft	Soft	Spiny	Soft	Soft
2. Tail length	60-90 (77)	61-76 (69)	55-81 (69)	58-81.5 (65)	59-73 (65)	58.5-67 (61)	56-64 (60)	66-78 (73)
3. Tail length as per cent of head and body length	90-115 (105)	87-119 (101)	77-109 (95)	79-112 (85)	76-93 (83)	76-96 (83)	80-99 (90)	69-70 (68)
4. Occipitonasal length	21-22.9 (21.9)	20.6-22.5 (21.4)	18.2-23.1 (21.4)	19.7-21.1 (20.4)	20.4-22.9 (21.9)	21.2-23.2 (21.7)	20.6-22.3 (21.4)	21.2-22.8 (22.3)
5. Colour of undersurface	Gray	Dull gray	Dull gray	Whitish gray	Dull gray	White	Silvery gray	White

TABLE 2. External and cranial measurements in different populations of *Viverricula indica*

Name	Sex	Head & Body	External		
			Tail	Hindfoot	Length of fur
<i>V. i. indica</i>	Male	551—640 (581) n=9 S.D.=10.54	350—426 (380.5) n=9 S.D.=7.43	82—102 (95) n=8 S.D.=1.68	26—39 (31) n=5 S.D.=2.1
	Female	530—604 (573) n=5 S.D.=11.28	365—416 (385.5) n=5 S.D.=7.72	91—96 (93.5) n=4	23.5 n=1
<i>V. i. wellsi</i>	Male	625—650 (635) n=3	375—376 (375.6) n=3	96—102 (100) n=3	—
	Female	558—650 (592) n=3	365—390 (373.3) n=3	88—97 (91) n=3	36 n=1
<i>V. i. bengalensis</i>	Male	548—610 (585) n=5 S.D.=9.78	330—501 (397) n=5 S.D.=27.15	91—102 (97.5) n=4	21, 31 n=2
	Female	543—609 (570.6) n=5 S.D.=10.28	340—413 (376) n=5 S.D.=11.43	91—101 (95) n=5 S.D.=2.09	32 n=1
<i>V. i. baptistae</i>	Male	513—600 (554) n=5 S.D.=17.28	335—420 (360) n=5 S.D.=14.28	91—102 (95) n=5 S.D.=2.31	26, 31 n=2
	Female	513—585 (538) n=3	289—340 (314) n=3	86—90 (87.4) n=3	30 n=1
<i>V. i. deserti</i>	Male (Type)	584	406	102	—
<i>V. i. mayori</i>	Male	445—604 (534) n=6 S.D.=21.96	307—380 (349) n=6 S.D.=9.89	87—101 (90) n=6 S.D.=2	21, 26.5
	Female	520, 564 n=2	360 n=1	88, 90 n=2	—
Population from Jammu	Male	530—600 (563) n=3	346—360 (355) n=3	99—100 (99.6) n=3	34—45 (38.6) n=3

(Desmarest) with range, mean in parentheses, Standard Deviation (S.D.) and sample size (n).

	Cranial			
Total length	Condylbasal	Zygomatic width	Post orbital	Interorbital
93.7—104 (97.9) n=8 S.D.=1.65	92.3—101 (96.4) n=7 S.D.=1.11	42.2—46.5 (44.4) n=8 S.D.=0.53	12—14.5 (13.4) n=8 S.D.=0.29	12.7—13.8 (13.2) n=8 S.D.=0.15
90—99 (95.5) n=4	89.2—96 (93.5) n=4	38.3—46 (43.3) n=4	11.2—12.5 (12) n=4	11.6—13 (12.3) n=4
101—105 (102.3) n=3	99—102 (100.3) n=3	45—48 (46.6) n=3	11—11 (11) n=3	12—15 (13.6) n=3
100, 100 n=2	97, 98 n=2	45, 46 n=2	11, 11.5 n=2	11, 12 n=2
90—102.9 (97.6) n=6 S.D.=1.8	83—99.8 (94.1) n=6 S.D.=2.24	41—48.2 (45.4) n=6 S.D.=1.15	10—12 (11) n=6 S.D.=0.3	11—13 (12.1) n=6 S.D.=0.36
94—96 (95.2) n=3	92.5—95 (93.8) n=3	42.5—47 (44.5) n=3	12.2—13 (12.7) n=3	11—13 (12.1) n=3
89—101.2 (94.9) n=7 S.D.=1.53	88—98 (93.6) n=7 S.D.=1.29	40—45 (43) n=7 S.D.=0.57	8.5—14 (11.3) n=7 S.D.=0.74	10—12.2 (10.9) n=7 S.D.=0.32
92, 97.9 n=2	91, 96.5 n=2	42.5, 43.1 n=2	9, 12.6 n=2	10, 12 n=2
99	99	45	8.5	11
92.8—101 (95.6) n=6 S.D.=1.16	91—98 (94.1) n=5 S.D.=1.06	42.2—48 (44.8) n=6 S.D.=0.85	11—14 (12.6) n=6 S.D.=0.49	12—15 (13.4) n=6 S.D.=0.4
95 n=1	92 n=1	42 n=1	11.5 n=1	12 n=1
99.6—102.8 (101) n=3	95.2—101.1 (98.2) n=3	44.2—48.6 (46.8) n=3	11—14.6 (12.3) n=3	12.4, 13.5 n=2

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