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# Studies on Some Indian Chiroptera from West Bengal



PRAFULLA KUMAR DAS

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**Studies on some Indian Chiroptera from West Bengal**

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*Edited by the Director Zoological Survey of India, Kolkata.*



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**Dr. P.K. DAS**

## INTRODUCTION

The order Chiroptera of the class Mammalia constitutes an interesting group of animals, called bats. Bats are unique in the sense that they are the only group of living vertebrates, other than birds, which are bestowed with the power of true flight. Their much lengthened digits of the forelimbs, covered with double-layered sheets of skin, have formed the wings, the principal flying membranes. This volant habit has demanded even the formation of a keel on the sternum in most species to support the enormous pectoral muscles. Evolving from some insectivore stock during the early Eocene, they readily ventured to exploit the nocturnal sky full of flying insects, for feeding, their only competitor being the nocturnal flying insect-eating birds. Bats have lived for the past 60 million years. They are a successful group of animals both in terms of species diversity and the area of the earth inhabited by them. At present, nearly a thousand species of bats are known. They are cosmopolitan in distribution : found in almost all parts of the world except some remote oceanic islands and colder parts of both hemispheres beyond the limits of tree-growth.

Bats, as a rule, like to select those places which are cool and dark and maintain more or less static relative humidity and temperature, as their diurnal biotopes. Thus, cracks and crevices, caves, hollow of trees, underneath of drooping leaves, old temples, tombs and buildings, etc., are common day-time hideouts of these animals. Some species even do not hesitate to live in human dwellings. Certain species of bats use several specialised day-time roosting sites, *e.g.*, dried up wells, hollow in fallen logs, under boulders, pebbles of river-bed and cracked soil. Internode of bamboo culm and rolled leaf of banana plant are two other interesting diurnal roosts of some species. On the other hand, large fruit bats of the genus *Pteropus* do not mind roosting on the branches of trees, thereby exposing themselves to the sun and the rain.

Certain species of bats live singly or in pairs, while others live in small (family or otherwise) groups. But majority of the species prefer to live in colonies. The size of the colony may be small, large or huge, and accordingly, may consist of a mere dozen, hundreds or of several millions of individuals.

Though all bats apparently look very similar, they differ widely in respect of their feeding habits. A vast majority of bats are insectivorous, feeding mainly on flying insects. A substantial number are, however, frugivorous, subsisting either on juice of hard fruits or on pulpy fruits, still others are pollen and nectar feeders. Vampire bats of the New World have developed sanguinivorous habit, feeding entirely on blood of warm-blooded vertebrates.

The activity pattern of bats also varies. Most bats are nocturnal, *i.e.*, active only during the night. Some other species are crepuscular and become active even when the sun is setting on the western horizon, while others emerge quite late. Some bats remain active throughout the night, while others may end their activity several hours before the sunrise. The Indian Flying Fox has been observed either to be actively fanning with one wing or drinking water from a nearby source during midday of hot summer months. Most bats living in temperate climate undergo hibernation in winter to avoid extreme cold, while many others of tropical countries assume a semitorpid condition during hot days.

Bats, as a rule, have one pair of pectoral mammae. Some groups of bats have (in addition to the functional pectoral teats) a pair of false inguinal teats which are not concerned with feeding the baby. Some bats breed throughout the year, while others have a distinct breeding season. Most bats give birth to one young at a time.

Bat's relationship with man dates back to antiquity. But due to their secretive nature and nocturnal habits, they have not been able to attract much of human attention, in the past. Nevertheless, they are known to exert much influence on man's health and economy, in the positive as well as in the negative way. On the credit side : majority of microchiropteran bats feed on myriads of insects, thereby controlling a very important group of agricultural pests. They also consume mosquitoes, which carry pathogens of diseases like malaria, filaria, dengue, yellow fever, etc. Fruit bats are responsible for the dispersal of seeds of important timber-yielding trees. It has been claimed that fruit bats maintain the normal health of the tropical rain forests. Certain flowers are pollinated only by certain species of bats. These bat-pollinated flowers are nice examples of co-evolution of bats and bat-flowers. Thus, the beneficial role of fruit bats also can, perhaps, never be overemphasised. Bat guano is a very useful manure. It has been profitably explored in underdeveloped countries till recently. It had been used as a source of saltpetre (potassium nitrate) in the manufacture of gun-powder and other explosives during the American Civil War. Meat of fruit bats tastes like chicken. Fruit bats, especially those belonging to the genus *Pteropus*, are eaten throughout the Old World, but mostly by tribals.

On the debit side, bats destroy many beneficial insects as well. Fruit bats, especially those belonging to the genera *Pteropus*, *Rousettus* and *Cynopterus* cause considerable damage to such fruits of economic importance as mango, litchi, slant, guava, etc., in many countries, including India. A number of dreadful pathogens have been isolated from various species of bats which are supposed to play important roles in the maintenance and spread of several diseases like rabies, histoplasmosis, Chagas disease, etc. The blood-lapping vampire bats of tropical Americas, the only true mammalian parasite, is an ideal example in this connection. It can cause severe depletion of livestock and serious outbreak of human rabies, Chagas disease, etc. Soiling of walls and floor by their excreta and the obnoxious odour emanating from the urine of bats which take shelter in human dwelling cannot be totally ignored.

Bats are now becoming more and more popular as subjects of serious medical research. The growth of various micro-organisms in the circulating blood can be easily studied by transilluminating the wing-membrane. Wing-membrane of bats can also be used to observe the effects of drugs on blood vessels as also nerve or muscle regeneration and tissue repair. It is heartening to note that study of ecolocation in bats has provided analogues for the construction of functional ultrasonic orientation systems for the blind. Bats are more sensitive to DDT and other chlorinated hydrocarbons, and thus can be profitably used as indicators of these toxic substances in the environment.

The results of any type of study should always be properly documented. Under that condition only such results can be utilised by future workers. In order that the results of a study can be properly documented, the experiment animal (bat) must be perfectly identified, using the currently accepted nomenclature. If the experimental animal is identified either imperfectly or wrongly, or if even old and obsolete nomenclature is used for it, there is every possibility that the results will not be properly documented, and hence likely to be lost. Such is the importance of the science of identification and nomenclature, *i.e.*, taxonomy.

### SCOPE

The present project is on the taxonomy and zoogeography of Indian bats. It has been estimated by the present worker that a total of 116 species of bats belonging to two suborders, seven families and 34 genera occur within the limits of the Indian Union (including the Andaman & Nicobar Islands and the Lakshadweep). In this vast geographical area many of the species of bats are represented by more than one subspecies. If the subspecies are taken into consideration, the total number of species and subspecies of bats occurring in India goes up to 130. A detailed account of all these 130 taxa of bats would be too voluminous for the present project. Hence, it was decided that only some of the Indian bats should be included in the present study.

The State of West Bengal which is situated in the northeastern part of the Indian mainland occupies a relatively small area as compared to the total geographical area of India. It, nevertheless, is highly varied so far as habitats of bats are concerned. It has lofty mountains in the north with the Bay of Bengal forming its southern boundary. This state has both the moist evergreen and the dry deciduous types of forests. It even has a smaller semi-arid tract in its western part, while the unique mangrove forest of the Sundarban is found in its southern fringes. It is but natural that an area with such different habitats would harbour a large number of species of bats. In fact, all the families of Indian bats are represented in West Bengal by 88% of the Indian genera and 56% of the Indian species of bats. It would, therefore, be adequate to prepare an account of the Chiropteran fauna of West Bengal for the present purpose.

## REVIEW OF LITERATURE

On and from the year 1758, the date of publication of the tenth edition of *Systema Naturae* by Karl von Linne (commonly known as Carolus Linnaeus) and that of the starting of taxonomy, naturalists and zoologists of various European countries, described new taxa of Indian bats on the basis of specimens collected from India by collectors of their respective museums of those collected during various voyages and expeditions sent out by different nations of Europe. But no bat was described from India by a person working in India, till the third decade of the nineteenth century.

### Last six decades of the nineteenth century

Edward Blyth, a trained zoologist and Curator of the museum of the Asiatic Society of Bengal, Calcutta, started systematically describing Indian bats in the early part of the forties of the nineteenth century (Blyth 1841). He continued publishing papers on Indian bats till 1863 and described several new taxa, as also prepared a catalogue of mammals (including bats) present in the museum of the Asiatic Society of Bengal (Blyth 1863a).

While Blyth was working in Calcutta, B. H. Hodgson, a British naturalist, resided at Darjeeling from 1845 to 1858. Hodgson described some new taxa of bats from the present Darjeeling district (Hodgson 1847a, 1847b).

T. C. Jerdon, Surgeon-Major, Madras Army, compiled an account of the Indian bats, for the first time. This author provided synonymy, description and distribution for each of the Indian species of bats known at that time (Jerdon 1967).

G. E. Dobson, a surgeon of the Indian Army, is to be regarded as the first bat specialist in India. During the years 1871 to 1877, he published a series of papers on various taxa of Indian bats, including a revision of the genus *Taphozous* (Dobson 1872). Towards the end of this period, he published the epoch-making monographic account of the Asiatic Chiroptera together with a catalogue of bats present in the collection of the Indian Museum, Calcutta (Dobson 1876). This publication provided synonymy, description, measurements and distribution of all species of bats contained therein. It also provided some accurate illustrations of ear, head and skull of some taxa. It is quite interesting to note that the modern concept of subspecies can be traced to this quite early publication. Later on, he worked at the British Museum, London, and prepared a catalogue of the Chiroptera in the collection of that museum, which publication contained some very useful information on Indian bats as well (Dobson 1878). During this period, T. Hutton published an account of the bats of northwestern Himalaya (Hutton 1872).

W. T. Blanford of the Geological Survey of India provided the first faunal account of Indian mammals. The Second part of his Fauna of British India which contains bats was

published in 1891. For bats, Blanford (1891) primarily following Debson (1876) in this publication. The last significant publication on Indian bats during the nineteenth century is credited to R. C. Wroughton of the Indian Forest Service (Wroughton 1899)

### **The first half of the twentieth century**

At the beginning of the current century, G. S. Miller of the United States National Museum published a complete account of the mammals (including bats) of the Andaman & Nicobar Islands (Miller 1902). Five years later, the same author came out with the epoch-making publication on all the families and genera of bats of the world, wherein he gave complete synonymy and keys for the identification, characters, distribution, etc., of different genera, as also many illustrations of skulls and some other bones. This work is of paramount importance to the workers of Indian bats as well.

Much significant information on Indian bats was gathered as a result of the Mammal Survey of India, Burma and Ceylon conducted by the Bombay Natural History Society during the years 1911 to 1930. The scientific outcome of this series of systematic surveys which were carried out in different parts of the present Indian Union, besides Pakistan, Myanmar and Sri Lanka, were published from 1912 to 1929 by several authors (mostly by R. C. Wroughton, also by K. V. Ryley, M. Davidson, J. P. Mills, M. A. C. Hinton, T. B. Fry, H. M. Lindsay and O. Thomas, sometimes two of them jointly). These large number of papers were published under three principal headings, *viz*, Reports, Scientific Results and Summary of the Mammal Survey, of which the last-named serial publications need to be specially mentioned. Mid-way through the Mammal Survey, R. C. Wroughton started publishing a summary of the information gathered up to that period. Keys for the identification of families, genera, species and subspecies of all the Indian bats together with their type-specimens, type-repositories and distribution were provided in three of these publications (Wroughton 1918a, 1918b, 1921a). The publications under the principal heading Scientific Results (mostly by Thomas and Wroughton) were devoted to the descriptions of new taxa or to the revision of already known taxa; therefore, should be considered as very important.

During the Second World War. G. H. H. Tate of the American Museum of Natural History published a series of papers on bats as Results of the Archbold Expeditions (Tate 1941a, 1941b, 1941c, 1941d, 1942a, 1942b, 1943; Tate & Archbold 1939). These papers are of revisionary nature and contain a number of Indian taxa of bats. These publications are, therefore, quite significant in the study of taxonomy of Indian bats.

### **Post-Independence period**

Studies on the taxonomy and distribution of bats gradually picked up momentum in the second half of the twentieth century. J. R. Ellerman joined hands with T. C. S. Morrison-Scott of the British Museum to produce a checklist of Palaearctic and Indian mammals which

filled up the lacuna in the up-dated information on the taxonomy and geographical distribution of Indian bats (Ellerman & Morrison-Scott 1951). These authors provided synonymy and distribution of all the genera, species and subspecies of Indian bats.

H. Khajuria of the Zoological Survey of India has made substantial contributions to the field of taxonomy and geographical distribution on of Indian bats (Khajuria 1953, 1965, 1970, 1978, 1979, 1980; Khajuria *et al.* 1977; Khajuria & Ghose 1970). J. E. Hill of the British Museum (Natural History) has made significant contribution to these aspects of southeast Asian bats, including India. His large number of publications which are mostly of revisionary nature have enhanced the knowledge about the bats of this part of the world (Hill 1961, 1962, 1963a, 1963b, 1964a, 1964b, 1965, 1967, 1971, 1974, 1976, 1977a, 1977b, 1983, 1987; Hill & Harrison 1987; Hill & Thonglongya 1972; Hill & Yoshiyuki 1980; Hill *et al.* 1986). A. Brosset provided an up-dated account on the taxonomy, distribution and general biology of the bats of western and central India (Brosset 1962a, 1962b, 1962c). Y. Chaturvedi of the Zoological Survey of India also contributed to the study of Indian bats (Chaturvedi 1964, 1969, 1980; Soota & Chaturvedi 1980). Y. P. Sinha of the same department is publishing papers on the taxonomy, distribution and general biology of different taxa of Indian bats since 1969, and has already made substantial contribution towards these aspects (Sinha 1969a, 1970, 1973, 1976a, 1976b, 1977, 1980, 1981, 1986, 1990a, 1990b; Sinha & Chakraborty 1971) P. K. Das of the Zoological Survey of India has made some publications on the taxonomy, geographical distribution and biology of Indian bats (Das 1986a, 1986b, 1990a, 1990b; Das & Agrawal 1973).

G. B. Corbet of the British Museum (Natural History) Provided the much needed up-dated account on the mammals of the Palaearctic Region (Corbet 1978). The publication provided keys for the identification, distribution (with maps), detailed taxonomic discussion and subspecies recognised, but covered only a handful of Indian bats.

The eighth decade the present century saw the publication of three books which are quite useful in connection with the study of Indian bats. Corbet & Hill the (1980) supplied a systematic list of families, genera and species of the bats of the world and their distributional range, but provided no descriptions or keys. J. H. Honacki and collaborators have given information on type-locality, distribution in details and reasons for the taxonomic decisions arrived at for every species of bat (Honacki *et al.* 1982). R. M. Nowak and J. L. Paradiso in editing the fourth edition of Walker's mammals of the world, supplied a list of species under each genus with their distribution, besides giving descriptions and illustrations of every family and genus of bat (Nowak & Paradiso 1983).

### **Publications on the Chiropteran fauna of West Bengal**

European workers who described Indian bats in the later half of the eighteenth century did so also those from eastern India (*India-Orientalis*, Benghala, etc.), including Calcutta, the

then capital of British India. In the year 1800, F. Buchanan described a species of free-tailed bat from Bengal (Buckannon 1800). T. Hardwicke of Bengal Artillery described *Taphozous longimanus* based on a specimen collected from Calcutta (Hardwicke 1825). Blyth published a series of papers in the Journal of the Asiatic Society of Bengal between 1841 and 1851 wherein he described several new species of bats from West Bengal. His catalogue (Blyth 1863a) also contains descriptions of some more species of bats from this state. This publication is a source of information on other species of bats from West Bengal present in the museum of the Asiatic Society of Bengal at that time. Hodgson's two papers (Hodgson 1847a, 1847b) need to be specially mentioned as these are entirely on bats collected by him and contain the descriptions of two new taxa from Darjeeling district. Hodgson's later collection of bats from the same district was catalogued by T. Horsfield when the author described some new species as well (Horsfield 1851). Dobson published several papers on bats during 1871 - 1875, mostly in the Journal and Proceedings of the Asiatic Society of Bengal, which contained descriptions of a number of new taxa from West Bengal. His two catalogues (Dobson 1876, 1878) cater useful information on bats from this state present in the Indian Museum and in the British Museum, respectively. Several French, German and Dutch workers also published descriptions of a number of new taxa of bats from West Bengal during the first three quarters of the nineteenth century. J. Anderson of the Indian Museum has provided an up-dated list of bats date from West Bengal in the collection of that museum (Anderson 1881). Blanford (1891) gave systematic descriptions and other particulars of bats known from British India, including the present state of West Bengal.

Some very useful publications regarding the Chiropteran fauna of West Bengal appeared during the second decade of the twentieth century as an outcome of the Mammal Survey. Wroughton (1915, 1916b, 1916c, 1917a, 1917b) reported upon the collections of mammals, including bats, mostly from Darjeeling and Jalpaiguri districts, and also from Koch Bihar, Medinipur and Calcutta districts. During this period. Thomas (1916a, 1916b) published descriptions of three new species of bats from Darjeeling district and Calcutta. Inglis *et al.* (1919) published a detailed list of vertebrates of the Buxa Forest Division of Jalpaiguri district wherein the authors listed three additional species of bats from this part of West Bengal. Fry (1923) reported *Kerivoula hardwickei* from Gopaldhara of Darjeeling district Sanborn (1932) reported some species of bats from Darjeeling and Koch Bihar districts. Hill (1964b) reported the occurrence of *Tadarida teniotis* for the first time for India from Darjeeling district, while Chaturvedi (1964) examined the type-specimen of *Nyctinomus tragatus* Dobson (from Calcutta) and determined its correct taxonomic status. Khajuria & Ghose (1970) in their report on the Harvard-Yale Expedition in Darjeeling district included three species of bats. Das & Sinha (1971) published some observations on the taxonomy and biology of *Cynopterus sphinx* in Nadia district. Bhat (1974) reported *Magaderma spasma* from Darjeeling district, an addition to the Chiropteran fauna of West Bengal Chakraborty (1975) listed *Sphaerias blanfordi* for the first time for India from Darjeeling district. Koopman (1989) opined positively regarding the occurrence of *Megaerops niphanae* in Darjeeling district. Sinha

(1990b) reported *Pipistrellus peguensis* for the first time for India from Darjeeling district, while Das (1990a) studied the type-series of *Murina cyclotis* Dobson (from Darjeeling) and discussed the type-repositories.

Besides the principal contributions to the Chiropteran fauna of West Bengal, mentioned above, there exist certain other publications in which some species of bat or the other, though already known from West Bengal, has been recorded from some other parts of that state. These are (arranged chronologically) by Allen (1908), Anderson (1912), Wroughton (1918a, 1921a), Nath (1951), Ellerman & Morrison-Scott (1951), Khajuria (1953), Siddiqi (1961a), Hill (1964a), Topal (1970), Sinha (1970, 1973), Hill (1983) and Das (1986a, 1986b).

From the above review of literature, it would appear that no consolidated account on the Chiropteran fauna of West Bengal has been prepared as yet.

### HISTORY OF BAT COLLECTING IN WEST BENGAL

The history of collecting specimens of bats from West Bengal can be traced back to 1820 when Lieutenant-Colonel T. Hardwicke collected mammals, including bats, in parts of eastern India (the present state of West Bengal included) and got them painted by Indian artists. E. Blyth made extensive collecting of bats and other animals during the years 1841 to 1852 in and around Calcutta.

At about the same time, B. H. Hodgson, after returning from England, settled in Darjeeling. During his stay there (1845 to 1858), he collected birds and mammals in Darjeeling and its vicinity, as also in Siliguri. Based on the specimens of bats collected by him, a number of new species were described, mostly by T. Horsfield, two by himself. R. W. G. Frith collected bats in the Sundarban area in 1846. J. T. Pearson collected several specimens of bats from Darjeeling in 1850 of which more than one turned out to be new. Various collectors collected bat specimens during the second half of the nineteenth century, but from only two areas of West Bengal, viz Calcutta and Darjeeling. Particulars of these and earlier collectors are given in Table 1.

**Table 1.** Collectors of bats from West Bengal during the 19th Century (with periods and areas of collecting).

Collector	Period	Area
Alcock (Maj.)	1881	Calcutta
Anderson, (Dr.) J.	1866 – 1876	Calcutta, Indian Botanic Gardens (Haora district), Darjeeling
Atkinson, W. S.	1872	Darjeeling
Ball, V.	1868	Calcutta

Collector	Period	Area
Bentham, T.	1881	Calcutta
Blanford, W. T.	1857	Vicinity of Darjeeling
Blyth, E.	1841-1852	Calcutta and its vicinity
Carlyle, A. C	1863	Calcutta
Cockburn, J.	1877 – 1878	Alipur (Calcutta district)
Dillon, (Mr.)	1866	Calcutta
Dobson, (Dr.) G. E	1875	Calcutta
Elwes (Capt.) H. J.	1870 – 1871	Darjeeling
Finn, F.	1881	Calcutta
Fraser, O. L.	1872 – 1881	Dhapa (Calcutta district)
Frith, R. W. G.	1846	Sundarban (South 24-Parganas district)
Gammie, J	1872	Darjeeling
Hardwicke, (Lt.-Col.) T.	1820	Calcutta
Hodgson, B. H.	1845 – 1858	Darjeeling and its vicinity, Shiliguri (Darjeeling district)
Jerdon, (Dr.) T. C.	1865	Darjeeling and its vicinity, Shiliguri (Darjeeling district)
King (Dr.) G.	1866, 1877	Darjeeling, Calcutta
Mandelli, L.	1872	Darjeeling
Pearson, J. T.	1850	Darjeeling
Phillips, M. H.	1875	Calcutta
Richardson, J. B.	1879	Calcutta
Rutledge, W	1873	Calcutta
Sherwill, (Maj.) W. S.	1852 – 1853	Darjeeling
Stoliczka, (Dr.) F.	1871 – 1872	Darjeeling, Calcutta, Raniganj (Barddhaman district)
Swaries, C	1897	Barrackpore (North 24-Parganas district)
Theobald, W.	1851, 1854	Darjeeling and its vicinity
Tytler, (Maj.) R. C.	1852 – 1860	Barrackpore (North 24-Parganas district)
Wroughton, R. C.	1891	Darjeeling

In the second decade of the twentieth century, C. A. Crump and N. A. Baptista, both on behalf of the Mammal Survey, collected (between 1914 and 1916) quite a large number bat specimens from West Bengal. They worked mostly in Darjeeling and Jalpaiguri districts, But also did so in one locality each of Koch Bihar, Medinipur and Calcutta districts, H. V. O'Donel carried out extensive collecting of mammalian specimen in the Buxa Forest Division of Jalpaiguri district, during the years 1917 and 1918 and could collect a large number of bat specimens. H. Stevens, while collecting mammals in Darjeeling district (in 1921), managed to collect only one specimen of *Kerivoula hardwickei* from Gopaldhara. During the Suydam Cutting Sikkim Expedition (1930 – 1931), the collectors (H. Stevens and V. S. La Pearsonne), on their way to Sikkim, could collect specimens belonging to four species of bats from two localities of Darjeeling district and one of Koch Bihar district. Particulars of all these collectors and their collecting activities during the Pre-Independence period (of India) are summarised in Table 2.

**Table 2.** Collectors of bats from West Bengal during the Pre-Independence period of the 20<sup>th</sup> Century (with periods and areas of collecting).

Collector	Period	Area
Baptista, N. A.*	1915 – 1916	Darjeeling district, Jalpaiguri district
Crump, C. A.*	1914 – 1915	Darjeeling district, Jalpaiguri Haldibari (Koch Bihar district), Salbani (Medinipur district), Calcutta
O'Donel, H. V.	1917 – 1918	Buxa Forest Division (Jalpaiguri district)
Stevens, H.	1921	Gopaldhara (Darjeeling district)
Stevens, H.+&	1930 – 1931	Darjeeling district, Haldibari
La Pearsonne, V. S.†		(Koch Bihar district)

\* Collectors of the Mammal Survey of India, 'Burma and Ceylon'

+ Collectors of the 'Suydom Cutting Sikkim Expedition'

During the post-Independence period, the first systematic collecting of bats in some area of West Bengal was done during the Harvard-Yale Expedition in the higher reaches of Darjeeling district (June – August, 1958). The Zoological Survey of India, participating in the Expedition, deputed H. Khajuria who could collect specimens of three species of bats from two localities, Subsequently, R. K. Ghose and P. K. Das collected bats in that district during 1974 to 1983 and obtained many specimens from several localities. Otherwise the workers

of the Zoological Survey of India continued collecting bats mainly in Calcutta and nearby districts, viz, South 24-Parganas, North 24-Parganas, Nadia and Hugli districts till 1983. During this period, two workers of the National Institute of Virology, Pune, collected bats in Darjeeling, Jalpaiguri and Bankura districts. The details of bat collecting in West Bengal from 1948 to 1983 are provided in Table 3.

**Table 3.** Collectors of bats from West Bengal during the Post-Independence period till the beginning of the systematic survey of the state (with periods and areas of collecting).

Collector	Period	Area
Biswas, B.	1962 – 1966	Salt Lake (North 24-Parganas district)
Bhat, H. R.*	1969	Darjeeling and Jalpaiguri districts
Chakraborty, S.	1974	Jhapandanga (Hugli district)
- do -	1977	Basanti (South 24-Parganas district)
- do -	1982	Sagar I. (South 24-Parganas district)
Das, P. K.	1969	Madanpur (Nadia district)
- do -	1972	Basirhat (North 24-Parganas district)
- do -	1977 – 1978	Baruipur, Bawali, Amtala (South 24-Parganas district)
- do -	1979	Darjeeling, Maldah and Murshidabad districts
- do -	1980	Darjeeling district
Ghose, R. K.	1974 – 1983	Darjeeling
Kaul, H. N.*	1973	Bankura district
Khajuria, H.	1958	Darjeeling district
Mandal, A. K.	1967	Sajnekhali (South 24-Parganas district)
- do -	1968	Taldi (South 24-Parganas district)
- do -	1983	Sundarban Tiger Reserve (South 24-Parganas district)
Mandal, Ajoy K.	1974 – 1979	Singur (Hugli district)
Nath, B.	1948	Barakar (Bardhaman district)
Saha, S. S.	1967	Sagar I. (South 24-Parganas district)

\* Collectors from the National Institute of Virology, Pune.

From the early part of the nineteenth century till the beginning of 1983, bats were collected in West Bengal mostly from two distant areas – Darjeeling and adjoining places in the north, and Calcutta and its surroundings in the south, the intervening major portion of the state practically remained unsurveyed. To fill up this vast lacuna, several workers from the Zoological Survey of India, Calcutta, collected bats from different districts of West Bengal, during the systematic survey of that state in the years 1983 to 1988, and obtained huge number of bat specimens. The relevant particulars have been provided in Table 4.

**Table 4.** Collectors of bats from West Bengal during the systematic survey of the state (with periods and areas of collecting).

Collector	Period	Area
Agrawal V. C.	1983	Maldah and Murshidabad districts
- do -	1985	Bankura and Puruliya districts
Chakraborty, S.	1983	Jalpaiguri district
- do -	1986	Koch Bihar district
- do -	1987	West Dinajpur and Nadia districts
Das, P. K.	1984	Medinipur district
- do -	1988	Bardhaman and North 24-Parganas district
Ghose, R. K.	1985	Jalpaiguri district
Poddar, A. K.	1985	Birbhum district

Based on the collection of bats obtained during the systematic survey of West Bengal, those procured during earlier surveys and specimens of olden days already present in the Zoological Survey of India, Calcutta as also on published literature, a table (Table 5) of district-wise distribution of all the species of bats in different districts of West Bengal has been prepared.

**Table 5.** Systematic List of the Chiropteran Species from West Bengal along with their district-wise distribution (districts arranged alphabetically).

Sl. No.	Systematic list	Bankura	Bardhaman	Birbhum	Calcutta	Darjeeling	Haora	Hugli	Jalpaiguri	Koch Bihar	Maldah	Medinipur	Murshidabad	Nadia	North 24-Parganas	Purulia	South 24-Parganas	West Dinajpur
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Order CHIROPTERS																	
	Suborder MEGACHIROPTERA																	
	Family PTEROPODIDAE																	
	Subfamily PTEROPODINAE CHIROPTERS																	
1.	<i>Rousettus leschenaulti leschenaulti</i> (Desmarest)	+			+	+		+	+			+					+	
2.	<i>Pteropus giganteus giganteus</i> (Britinnich)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
3.	<i>Cynopterus sphinx sphinx</i> (Vahl)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4.	<i>Megaerops niphanae</i> Yenbutra & Felten					+												
5.	<i>Sphaerias blanfordi</i> (Thomas)					+												
	Subfamily MACROGLOSSINAE																	
6.	<i>Eonycteris spelaea spelaea</i> (Dobson)				(?)	+												
7.	<i>Macroglossus sobrinus sobrinus</i> Andersen					+				+								
	Suborder MICROCHIROPTERA																	
	Family RHINOPOMATIDAE																	
8.	<i>Rhinopama microphyllum kinneari</i> Wroughton				(?)	+												

Sl. No.	Systematic list	Bankura	Bardhaman	Birbhum	Calcutta	Darjeeling	Haora	Hugli	Jalpaiguri	Koch Bihar	Maldah	Medinipur	Murshidabad	Nadia	North 24-Parganas	Purulia	South 24-Parganas	West Dinajpur
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
9.	<i>Rhinopoma hardwickei hardwickei</i> Gray				(?)+													
10.	<i>Taphozous longimanus longimanus</i> Hardwicke		+		+	+						+		+			+	
11.	<i>Taphozous saccolaimus crassus</i> Blyth		+		+	+						+						
12.	<i>Taphozous nudiventris kochhensis</i> Dobson				+	+												
	Family MEGADERMATIDAE																	
13.	<i>Megaderma spasma horsfieldi</i> Blyth								+									
14.	<i>Megaderma lyra lyra</i> E. Geoffroy	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
	Family RHINOLOPHIDAE																	
	Subfamily RHINOLOPHINAE																	
15.	<i>Rhinolophus affinis himalayanus</i> Andersen									+								
16.	<i>Rhinolophus rouxi rouxi</i> Temminck				(?)+	+									(?)+	+		
17.	<i>Rhinolophus pusillus blythi</i> Andersen					+												
18.	<i>Rhinolophus lepidus lepidus</i> Blyth			+	+	+						+			+		+	
19.	<i>Rhinolophus luctus perniger</i> Hodgson					+												

Sl. No.	Systematic list	Bankura	Bardhaman	Birbhum	Calcutta	Darjeeling	Haora	Hugli	Jalpaiguri	Koch Bihar	Maldah	Medinipur	Murshidabad	Nadia	North 24-Parganas	Purulia	South 24-Parganas	West Dinajpur
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
20.	<i>Rhinolophus trifolius trifolius</i> Temminck					+												
21.	<i>Rhinolophus pearsoni</i> Horsfield					+												
	Subfamily HIPPOSIDERINAE																	
22.	<i>Hipposideros pomona gentilis</i> Andersen					+			+									
23.	<i>Hipposideros fulvus pollidus</i> Andersen											+						
24.	<i>Hipposideros cineraceus</i> Blyth					+												
25.	<i>Hipposideros armiger armiger</i> (Hodgson)					+			+									
26.	<i>Hipposideros lankadivo</i> Kelaart					+			+									
27.	<i>Coelops frithi frithi</i> Blyth					+												
	Family VESPERTILIONIDAE																	
	Subfamily VESPERTILIONINAE																	
28.	<i>Myotis sicarius</i> Thomas					+												
29.	<i>Myotis mystacinus nipalensis</i> (Dobson)					+			+									
30.	<i>Myotis muricola muricola</i> (Gray)					+												
31.	<i>Myotis siligorensis siligorensis</i> (Horsfield)					+												
32.	<i>Myotis annectans</i> (Dobson)					+												
33.	<i>Myotis formosus formosus</i> (Hodgson)				(?)	+												

Sl. No.	Systematic list	Bankura	Bardhaman	Birbhum	Calcutta	Darjeeling	Haora	Hugli	Jalpaiguri	Koch Bihar	Maldah	Medinipur	Murshidabad	Nadia	North 24-Parganas	Purulia	South 24-Parganas	West Dinajpur
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
34.	<i>Myotis hasseltii</i> (Temminck)				+													
35.	<i>Plecotus auritus homochrous</i> Hodgson					+												
36.	<i>Barbastella leucomelas darjelingensis</i> (Hodgson)					+			+									
37.	<i>Scotomanes ornatus ornatus</i> (Blyth)					+			+									
38.	<i>Scotophilus kuhli kuhli</i> Leach	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
39.	<i>Scotophilus heathi heathi</i> (Horsfield)		+						+	+	+	+		+				+
40.	<i>Eptesicus tateo</i> Ellerman & Morrison-Scott						+											
41.	<i>Tylonycteris pachypus fulvida</i> (Blyth)					+												
42.	<i>Pipistrellus babu</i> Thomas					+												
43.	<i>Pipistrellus peguensis</i> Sinha					+												
44.	<i>Pipistrellus coromandra coromandra</i> (Gray)				+	+				+	+		+			+		
45.	<i>Pipistrellus mimus</i> Wroughton		+		+	+	+	+	+	+	+	+	+	+	+	+	+	+
46.	<i>Pipistrellus ceylonicus indicus</i> (Dobson)				+													
47.	<i>Pipistrellus cadornae</i> Thomas					+												
48.	<i>Pipistrellus affinis</i> (Dobson)				+	+												
49.	<i>Scotozous dormeri</i> Dobson		+	+	+			+	+		+	+			+			

Sl. No.	Systematic list	Bankura	Barddhaman	Birbhum	Calcutta	Darjeeling	Haora	Hugli	Jalpaiguri	Koch Bihar	Maldah	Medinipur	Murshidabad	Nadia	North 24-Parganas	Purulia	South 24-Parganas	West Dinajpur
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
50.	<i>Scotoecus pallidus</i> (Dobson)				+													
51.	<i>Nyctalus noctula labiatus</i> (Hodgson)					+												
52.	<i>Hesperoptenus tickelli</i> (Blyth)								+									
Subfamily MINIOPTERINAE																		
53.	<i>Miniopterus schreibersi fuliginosus</i> (Hodgson)				(?)+													
Subfamily MURININAE																		
54.	<i>Murina leucogaster rubex</i> Thomas					+												
55.	<i>Munina tubinaris</i> (Scully)					+												
56.	<i>Murina huttoni huttoni</i> (Peters)					+												
57.	<i>Murina cyclotis cyclotis</i> Dobson					+												
58.	<i>Harpiocephalus harpia lasyurus</i> (Hodgson)					+			+									
59.	<i>Harpiocephalus mordax</i> Thomas					+												
Subfamily KERIVOULINAE																		
60.	<i>Kerivoulo picta picta</i> Pallas				+	+			+									
61.	<i>Kerivoula hardwickei depressa</i> Miller					+												
62.	<i>Kerivoula papillosa lenis</i> Thomas				+													
Family MOLOSSIDAE																		
63.	<i>Tadarida teniotis insignis</i> (Blyth)					+												
64.	<i>Tadarida aegyptiaca tragata</i> (Dobson)				+													
65.	<i>Tadarida plicata plicata</i> (Buchannan)				+													

## **MATERIAL AND METHODS**

The excellent collection of bats from the State of West Bengal present in the National Zoological Collections of India (NZCI) was utilised in the present study. A total of 1,203 specimens (including some type-specimens) from 135 localities of different districts (division of West Dinajpur district into two districts has not been considered) of West Bengal were examined (Table 6). Besides, 146 additional specimens from other parts of India were taken into consideration while arriving at taxonomic conclusions regarding some of the species. In spite of best efforts, specimens of 15 of the species included could not be examined, for which existing literature had to be relied upon.

Specimens were studied in the laboratories of the Zoological Survey of India (custodian of NZCI) Calcutta, while field studies were done mostly around Calcutta (repeatedly in Baruipur and Bawali), but also in several other distant localities, including Santiniketan, the campus of the Visva-Bharati University.

### **COLLECTING METHODS**

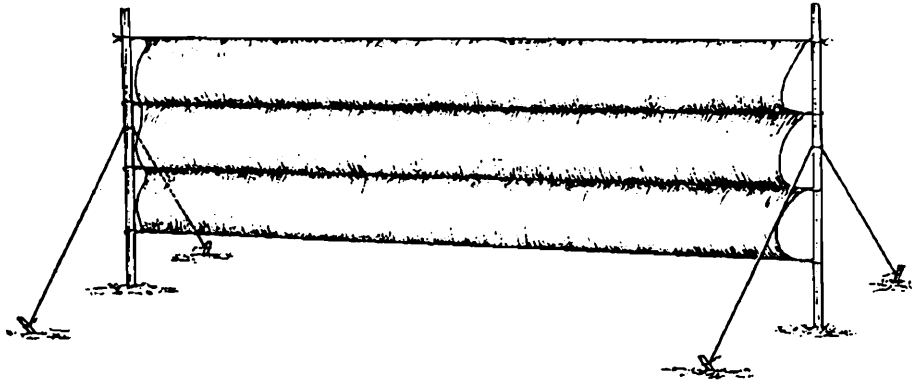
Bats were collected mostly from their nocturnal feeding grounds by using Japanese Nylon Mist Nets (Fig. 1) during evening and night hours. These nets were also set up near the exit of diurnal roosting sites of bats in the late afternoon so as to collect the bats entangled in the nets while emerging out of the roost for their nocturnal activity. In some cases, it was possible to collect bats from their day-time roosting places during any hour of the day by setting up nets in or around the roost and disturbing the resting bats. Hand nets (Fig. 2) were also used to collect some species of bats from their roosts. A pair of long forceps could be utilised to take out smaller bats hiding in cracks and crevices.

### **METHODS OF PRESERVING**

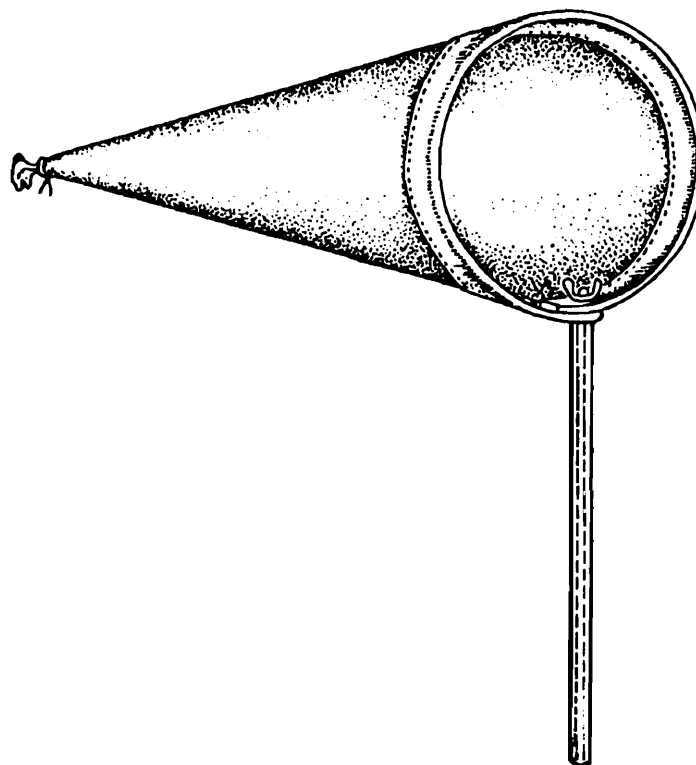
Bats thus collected were mostly preserved as whole specimens (usually) in rectified spirit but sometimes in 4% formaldehyde solution (prepared by mixing 1 volume of neutral 'formalin' with 9 volumes of water). Some examples were preserved as study skins and skulls, after noting down their external measurements. Depending upon the situation, external measurements of bats preserved as whole specimens were taken either in the field (before their preservation) or in the laboratory. Cranial measurements were taken in the laboratory, with the help of MITUTOYO dial callipers. Camera lucida drawings of skulls were prepared by using a TECHNIVAL stereomicroscope.

### **MEASUREMENTS TAKEN**

All the measurements have been expressed in millimetres. The following is a list of various measurements taken with their symbols (in parentheses) and definitions :



**Fig. 1 :** Mist Net (set in the field).



**Fig. 2 :** Hand net

**Length of the forearm (Fa) :** The distance from the elbow to the wrist (Fig. 3A).

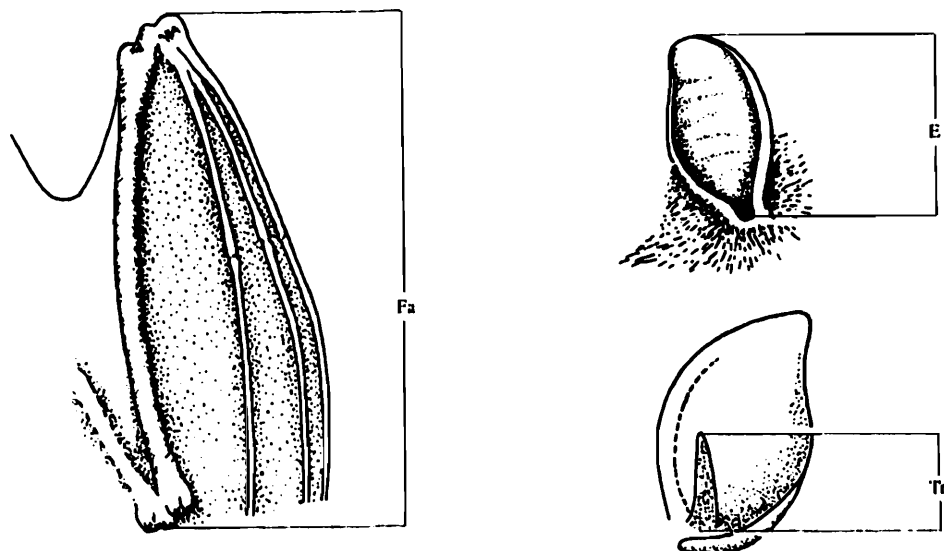
**Length of the ear (E) :** The distance from the tip of the pinna to the notch at its base (Fig. 3B).

**Length of the tragus (Tr) :** The distance from the tip of the tragus to its base (Fig. 3C).

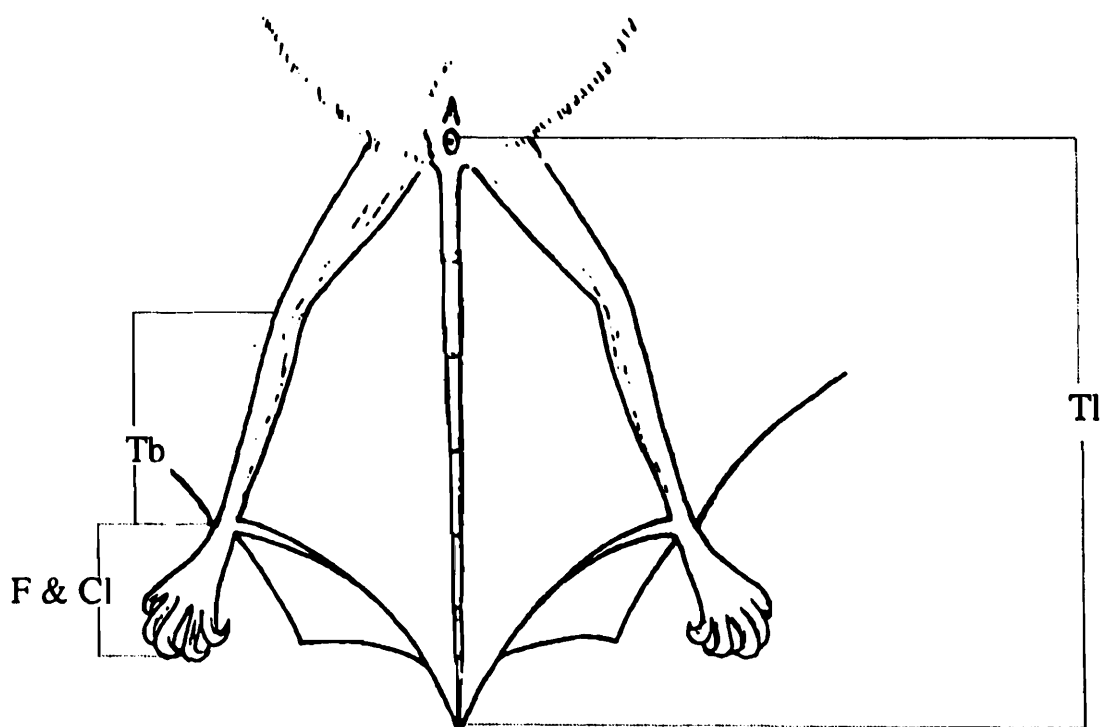
**Length of the tibia (Tb) :** The distance from the knee-joint to the wrist (Fig. 4).

**Length of the foot and claw (F & Cl) :** The distance from the heel to the tip of the longest toe with its claw (Fig. 4).

**Length of the tail (Tl) :** The distance from the posterior margin of the anus to the tip of the last caudal vertebra with its skin-cover but excluding the hairs (Fig. 4).

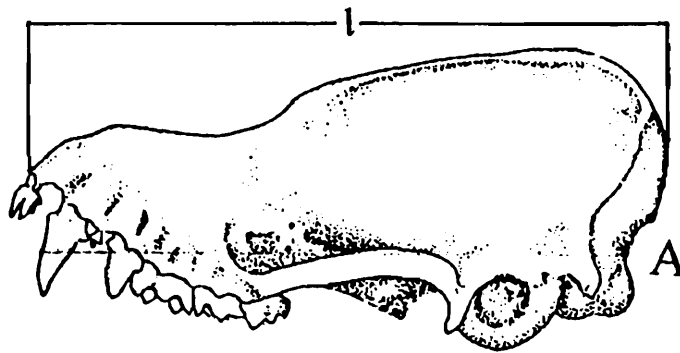


**Fig. 3 :** External measurements of bat : A. Length of forearm (Ta) ;  
B. Length of ear (E) ; C. Length of thagus (Tr).



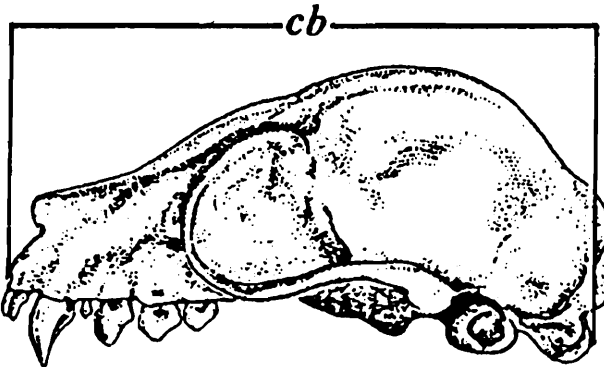
**Fig. 4 :** External measurements of bat (contined) : Lengths of tibia (Tb),  
foot and claw (F & Cl) and of tail (TI)

**Greatest length of the skull (*l*)** : Maximum length of the skull, measured from the hindermost point of the occipital surface in the middle line to the anteriormost point of the premaxillary symphysis (Fig. 5).



**Fig. 5** Cranial measurements of bat : Greatest length of skull (*l*)

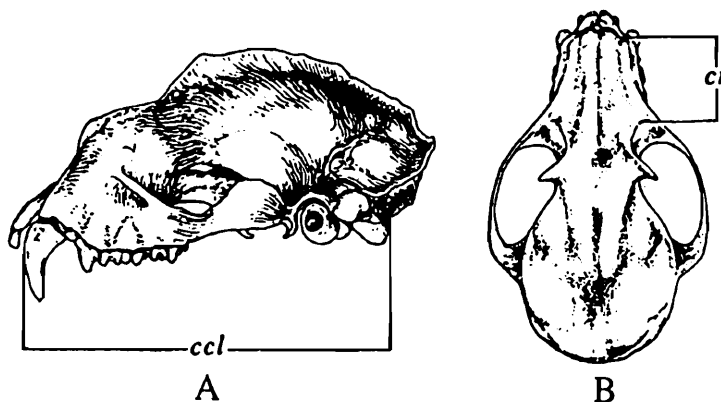
**Condylbasal length (*cb*)** : The distance between the hindermost point of the occipital condyle of one side and the anteriormost point of the premaxilla of that side (Fig. 6).



**Fig. 6** Cranial measurements of bat (continued) : Condylbasal length (*cb*).

**Condylcanine length (*ccl*)** : The distance from the hindermost point of the occipital condyle of one side to the anterior surface of the base of upper canine of that side (Fig. 7A). This measurement has been taken for bats belonging to the families Megadermatidae (premaxillae absent) and Rhinolophidae (premaxillae weak and without maxillary branch).

**Length of the cranial rostrum (*cr*)** : The distance from the front of the orbit of one side to the anterior extremity of the nasal bone of that side (Fig. 7B). This measurement has been taken for bats belonging to the family Pteropodidae.



**Fig. 7** Cranial measurements of bat (continued) A. Condylcanine length; B. Length of cranial rostrum.

**Length of the maxillary tooth-row (*mtr*)** : The distance from the anterior surface of the crown of the upper canine of one side to the posterior surface of the crown of the last upper molar of that side (Fig. 8).

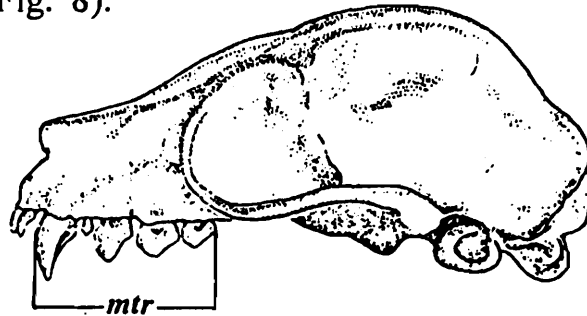


Fig. 8 : Cranial measurements of bat (continued) : Length of maxillary tooth-row (*mtr*).

**Greatest canine width ( $c^1-c^1$ )** : The external distance between the crowns of upper canines (Fig. 9A).

**Molar width ( $m^3-m^3/m^2-m^2/m^1-m^1$ )** : The maximum external distance between the crowns of the pair of upper molars whichever are widest apart (Fig. 9B).

**Least interorbital width (*iw*)** : The least distance across the inner borders of the orbits (Fig. 9C). This measurement has been taken by placing the callipers vertically.

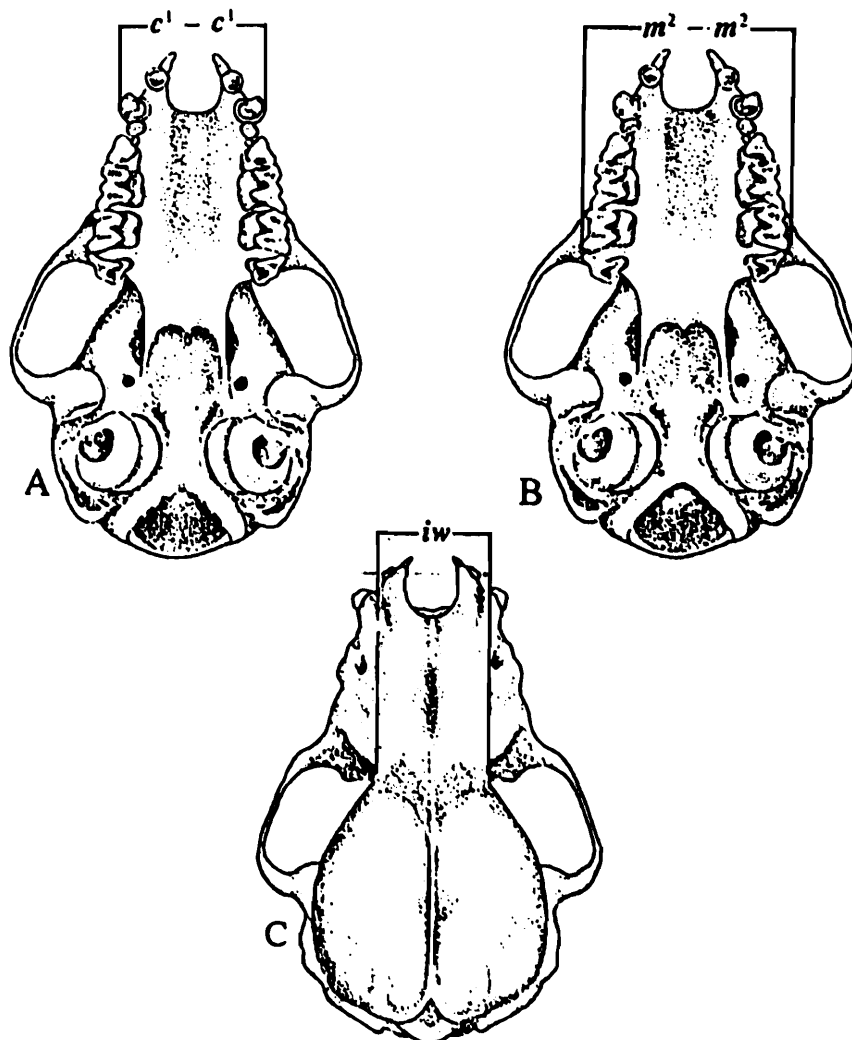


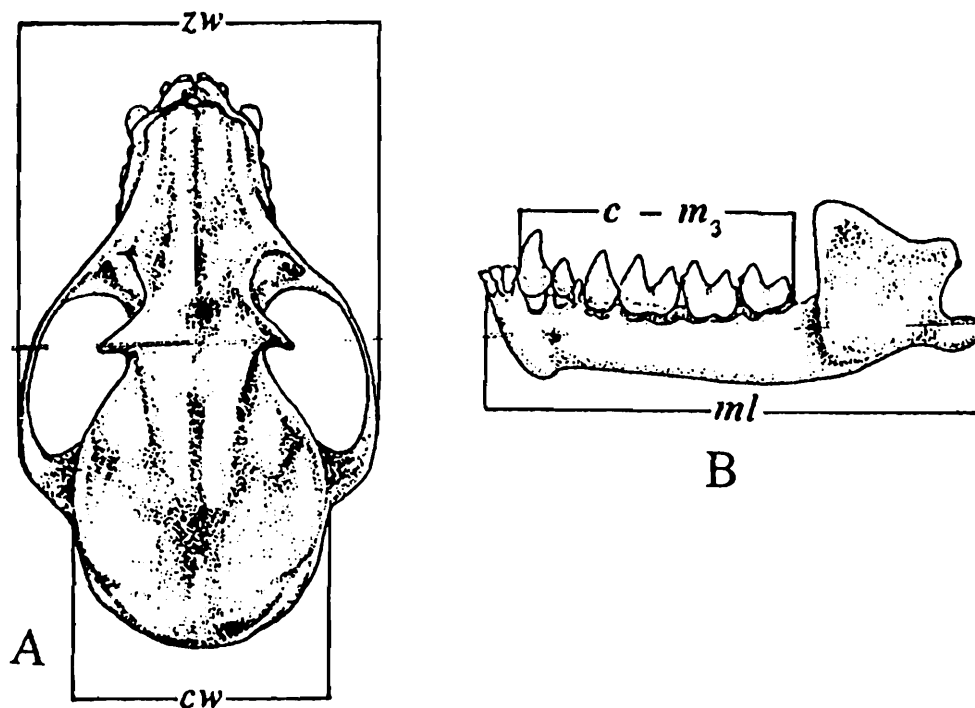
Fig. 9 : Cranial measurements of bat (continued) : A. Greatest canine width ( $c^1-c^1$ ); B. Molar width ( $m^2-m^2$ ); C. Least interorbital width.

**Zygomatic width ( $zw$ )** : The maximum distance between the outer surfaces of the zygomatic arches at right angles to the axis of the skull (Fig. 10A). This measurement has been taken by placing the callipers horizontally.

**Cranial width ( $cw$ )** : The maximum width of the cranium just above the squamosal roots of the zygomatic arches (Fig. 10A). This measurement has been taken by placing the callipers horizontally.

**Length of the lower tooth-row ( $c-m_3$ )** : The distance from the anterior surface of the crown of lower canine of one side to the posterior surface of the crown of the last lower molar of that side (Fig. 10B).

**Mandibular length ( $ml$ )** : The distance between the hindermost point of the mandibular condyle to the anteriormost point on the mandibular symphysis (Fig. 10B).



**Fig. 10** Cranial measurements of bat (continued) A. Zygomatic width ( $zw$ ) and Cranial width ( $cw$ ); B. Length of Lower tooth-row ( $c-m_3$ ) and Mandibular length ( $ml$ ).

### ARRANGEMENT

For the arrangement of the supraspecific taxa Corbet & Hill (1986) have been followed, except for the grouping of the leaf-nosed bats (genera *Hipposideros* and *Coelops*) under the subfamily Hipposiderinae of the family Rhinolophidae, for which Blanford (1891), Tate (1941a), Ellerman & Morrison-Scott (1951), Corbet (1978), Honacki *et al.* (1982) and Anderson & Jones (1984) have been followed. The classification of the subfamily Vespertilioninae proposed by Hill & Harrison (1987) has been adopted. Further, when only one of the subfamilies of a family or only one of the subgenera of a genus, as recognised

by Corbet & Hill (1986), is found in West Bengal, the name of that subfamily or subgenus has been omitted. For the arrangement of different species under different genera and subgenera, different authorities have been followed, which have been mentioned at appropriate places.

For every species or subspecies included in the Chiropteran fauna of West Bengal, besides citing the original description, all the Indian synonymies have been listed following the standard procedure.

### **OTHER METHODS**

Common English names for the different taxa have been given, as far as possible. Bengali names of three bats of West Bengal have also been added.

Under the heading 'Material examined', the districts of West Bengal have been arranged alphabetically so as to facilitate easy reference. To avoid any confusion, months (under this heading) have been expressed in Roman numerals corresponding to their sequence in the calendar.

If not otherwise mentioned, measurements of only adult specimens examined have been included. For more than two specimens, range and arithmetic mean (expressed with first place of decimal and placed in parenthesis just after the range of the measurement) have been given. A whole number in parenthesis placed just after the symbol of a measurement indicates the actual number of specimens (less than the number of specimens listed for a particular sex) available for that particular measurement.

A formal description of a species or subspecies, being redundant, has been avoided. Instead, a combination of diagnostic external and cranial characters, in addition to those enunciated in the key for its identification, has been provided for the easy and correct identification of the taxon. An allied species (or subspecies) appearing at a later sequence has often been compared with the one appearing earlier, for this purpose.

The geographical distribution of a species or subspecies in different districts of West Bengal has been placed at the beginning, followed by the same in other states and union territories of India (arranged approximately in north-south and west-east sequence, the islands coming at the end) and finally in the neighbouring countries in a west-east sequence of India. The districts of West Bengal have been arranged here in a north-south sequence to make it geographically meaningful. Authority citations for records of a species or subspecies from localities (districts of West Bengal, other parts of India and adjoining countries of India) have not been given if such localities have been mentioned by Ellerman & Morrison-Scott (1951), as this work has been taken as the base-line. Incidentally, 'Bhulan Duars' of Ellerman & Morrison-Scott (1951) and even 'Bhutan' (wrongly abbreviated for Bhutan Duars) of some authors is, in fact, in the Jalpaiguri district of West Bengal, not in Bhutan

(Das 1986b). Authority citations have also been avoided for records from the type-locality as also for localities from which a particular taxon has been recorded for the first time in the present work. Usually the first authority recording the taxon from a given locality has been cited. However, to avoid confusion as to the exact identity of the locality as it is known today, sometimes a second authority has also been cited.

All the species included in the Chiropteran list of West Bengal have been fully discussed taxonomically and zoogeographically for the entire Indian Union, i.e., subspecies other than the one occurring in West Bengal, if any, has/have been briefly characterised and its/their geographical distribution enumerated. Observations on the biology of some of the commoner species have been appended.

Literature on the taxonomy and geographical distribution of Indian bats published up to the end of 1991 has been referred to.

### ABBREVIATIONS USED

The following is a list of abbreviations used in the present work :

AMNH	=	American Museum of Natural History, New York, United States of America
Beng.	=	Bengali
BM	=	British Museum (Natural History), London, United Kingdom
BNHS	=	Bombay Natural History Society, Bombay
CMNH	=	Carnegie Museum of Natural History, Pittsburgh, United States of America
coll.	=	Collector
don.	=	Donor
E	=	East
Eng.	=	English
ERS, ZSI	=	Eastern Regional Station, Zoological Survey of India, Shillong
N	=	North
NW	=	North-West
NZCI	=	National Zoological Collections of India
S	=	South
sp	=	species
SSE	=	South South-East
W	=	West
ZSI	=	Zoological Survey of India

**Table 6.** Collecting localities of bats in West Bengal (precise location and altitude in parenthesis).

Sl. No.	Locality	District
1.	Adina *	Malda
2.	Ajodhya Hills	Purulia
3.	Alipur	Calcutta
4.	Ambari	Jalpaiguri
5.	Amlagora (near Garbeta) *	Medinipur
6.	Arrah (near Durgapur) *	Barddhaman
7.	Atiamochor	Koch Bihar
8.	Baharampur	Murshidabad
9.	Baj Baj	South 24-Parganas
10.	Balivasa (15 km SSE of Jhargram) *	Medinipur
11.	Barabagan	South 24-Parganas
12.	Barakar	Barddhaman
13.	Barduari (6 km NW of Raiganj)	West Dinajpur
14.	Barisha	South 24-Parganas
15.	Barrackpore	North 24-Parganas
16.	Barsoi (25 km NW of Raiganj)	West Dinajpur
17.	Baruipur *	South 24-Parganas
18.	Barul (near Jhapandanga)	Hugli
19.	Basantipur (near Sundarban)	North 24-Parganas
20.	Basirhat *	South 24-Parganas
21.	Bawali *	South 24-Parganas
22.	Beckbagan	Calcutta
23.	Behala	South 24-Parganas
24.	Belgachi (near Taldi)	South 24-Parganas
25.	Beliaghata	Calcutta
26.	Bhabta *	Murshidabad

Sl. No.	Locality	District
27.	Bhajna	North 24-Parganas
28.	Bharnabari (c 183 m)	Jalpaiguri
29.	Birshibpur	Haora
30.	Bowbazar	Calcutta
31.	Canning	South 24-Parganas
32.	Chandra (25 km NW of Medinipur) *	Medinipur
33.	Chandrapur (10 km NW of Siuri)	Birbhum
34.	Chilapata	Jalpaiguri
35.	Chilkigarh (12 km NW of Jhargram) *	Medinipur
36.	Chunabhati (near Kalimpong)	Darjiling
37.	Churpurni (near Katoya) *	Barddhaman
38.	Darjiling (c 2, 183 m)	Darjiling
39.	Dayapur (near Sajnekhali)	South 24-Parganas
40.	Dhadika	Medinipur
41.	Dhakuria *	South 24-Parganas
42.	Dhapa	Calcutta
43.	Falta	North 24-Parganas
44.	Ganeshpur (near Kakdwip)	South 24-Parganas
45.	Ghyabari	Darjiling
46.	Gidni *	Medinipur
47.	Goomti (c 1,356 m) *	Darjiling
48.	Gopaldhara (c 1,434 m)	Darjiling
49.	Gorubathan	Darjiling
50.	Gosaba (Sundarban Tiger Reserve)	South 24-Parganas
51.	Gour *	Maldah
52.	Haldibari (c 46 m)	Koch Bihar
53.	Hasimara (c 152 - 183 m)	Jalpaiguri
54.	Hasnabad	North 24-Parganas

Sl. No.	Locality	District
55.	Hemtabad	West Dinajpur
56.	Indian Museum Compound	Calcutta
57.	Jaldapara	Jalpaiguri
58.	Jalpaiguri (c 61 m) *	Jalpaiguri
59.	Jhilimili	Bankura
60.	Kakdwip	South 24-Parganas
61.	Kaliganj	Nadia
62.	Kalijhora (c 240 m) *	Darjiling
63.	Kalikapur	South 24-Parganas
64.	Kalimpang (c 1,250 m)	Darjiling
65.	Kamardingi (near Jhapandanga)	Hugli
66.	Kanaisole (15 km NW of Jhargram) *	Madinipur
67.	Karnajora (near Raiganj)	West Dinajpur
68.	Karsiyang (c 1,254 m)	Darjiling
69.	Katoya *	Barddhaman
70.	Khuntimari *	Jalpaiguri
71.	Koch Bihar	Koch Bihar
72.	Krishnanagar	Nadia
73.	Kshetrapur	West Dinajpur
74.	Kuilapal	Puruliya
75.	Kulik (near Raiganj)	West Dinajpur
76.	Kumani	Darjiling
77.	Lake Town	North 24-Parganas
78.	Lalbagh	Murshidabad
79.	Laljal	Medinipur
80.	Lindsay Street	Calcutta
81.	Lopchu (c 800 m) *	Darjiling
82.	Madanpur *	Nadia

Sl. No.	Locality	District
83.	Mahanadi (c 1,100 m) *	Darjiling
84.	Maldah *	Maldah
85.	Mandalpuskarini (5 km N of Garbeta) *	Medinipur
86.	Mathabhanga	Koch Bihar
87.	Medinipur	Medinipur
88.	Mitpukur (c 30 km E of Calcutta)	North 24-Parganas
89.	Muchisa	South 24-Parganas
90.	Muragacha	Nadia
91.	Nakashipara	Nadia
92.	Na'mile (15 km E of Baharampur)	Murshidabad
93.	Near Gandhar River (13 km N of Raiganj)	West Dinajpur
94.	Near Nagar River (10 km W of Raiganj)	West Dinajpur
95.	Nimbong (c 1,372 m)	Darjiling
96.	Old Maldah	Maldah
97.	Palashi	Nadia
98.	Palla Road	Bardhaman
99.	Palmajua (c 2,250 m)	Darjiling
100.	Paperkheti (c 15 km N of Gorubathan)	Darjiling
101.	Park Circus	Calcutta
102.	Parmadan *	North 24-Parganas
103.	Pashok (c 1,067 m) *	Darjiling
104.	Patharpratima	South 24-Parganas
105.	Pedong (c 1,433 m)	Darjiling
106.	Phulia	Nadia
107.	Raiganj	West Dinajpur
108.	Rajchandrapur	Haora
109.	Ramnagar	Nadia
110.	Ranibandh	Bankura

Sl. No.	Locality	District
111.	Ranichera (c 9 km S of Gorubathan)	Darjiling
112.	Raniganj	Barddhaman
113.	Sajnekhali	South 24-Parganas
114.	Salbani	Medinipur
115.	Salt Lake	North 24-Parganas
116.	Sangser (c 1,097 m)	Darjiling
117.	Santiniketan	Birbhum
118.	Shibnagar	Murshidabad
119.	Shibpur (Indian Botanic Garden)	Haora
120.	Shiliguri (c 62 m)	Darjiling
121.	Singur	Hugli
122.	Sitalkuchi	Koch Bihar
123.	Sivok (c 152 m) *	Darjiling
124.	Srikrishnapur (near Amtala) *	South 24-Parganas
125.	Sukna (c 200 m) *	Darjiling
126.	Sulka para	Jalpaiguri
127.	Susunia	Bankura
128.	Takdah (c 1,650 m)	Darjiling
129.	Taldi	South 24-Parganas
130.	Tarapur (near Jhapandanga)	Hugli
131.	Tarkhola (c 325 m)	Darjiling
132.	Thakurpukur	South 24-Parganas
133.	Tollygunge	Calcutta
134.	Tong Song (c 1,219 m)	Darjeeling
135.	Tumbani	Birbhum

\* Collection was done in these localities by the present workers.

## SYSTEMATIC ACCOUNT

### Order CHIROPTERA\*

Forelimbs modified into wings; wing-membrane (patagium) supported by elongated metacarpals and phalanges (except first) and extends to sides of body and leg; an interfemoral membrane between legs and tail; claw on first digit (also on second digit in many); knee directed outward and backward; legs weak; all digits end in curved and pointed claw; size generally small (largest with head and body length  $c$  300.0 mm, smallest  $c$  35.0 mm); eyes usually small; ears moderate to large; testes abdominal, descending into temporary scrotum during reproductive phase only.

Most sutures of adult skull obliterated; postorbital process usually absent; maximum number of permanent teeth 38, minimum 28; upper incisors never more than two pairs; pectoral girdle well-developed; first metacarpal and digit shortest, third one usually longest; pelvic girdle weak; usually a cartilagenous calcar on inner side of ankle supporting interfemoral membrane; baculum present.

The order Chiroptera is divided into two suborders, both of which are represented in West Bengal.

### Suborder MEGACHIROPTERA

Second finger bears a claw (except *Eonycteris*) and more or less independent of third finger; noseleaf absent; eyes large; margin of ear forms complete ring; tragus absent; tail rod-like and short (Fig. 11), often absent; premaxilla well-developed, but lacks palatal branch; postorbital process usually well-developed; bony palate continued behind last molars; cochlea

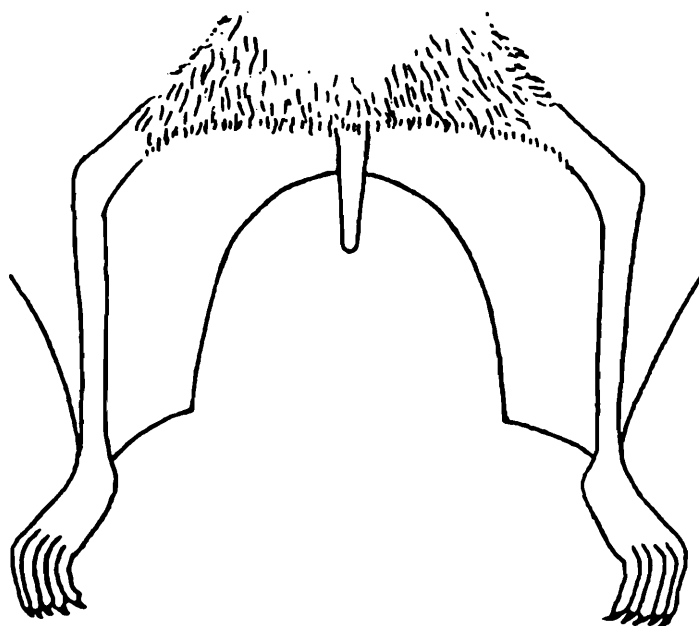


Fig. 11. Tail in Megachiroptera (Pteropodidae).

\*Characters given here and for other supraspecific taxa are applicable to forms available in West Bengal.

small, does not compress basioccipital; molars not tuberculate, with a longitudinal furrow (Fig. 12); lower incisors never more than two; frugivorous or nectarivorous; orientation by eyes.

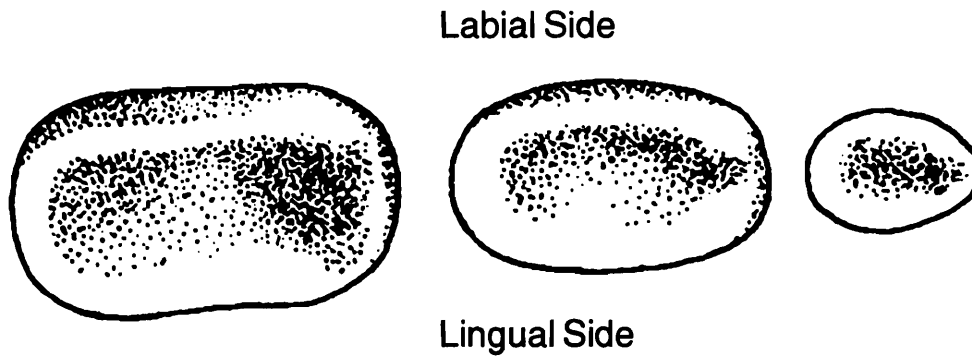


Fig. 12. Occusal view of left lower molars of a Megachiropteran (Pteropodid) bat (*Pteropus* sp.)

The largest bat of West Bengal (and India) *Pteropus giganteus giganteus* may attain a forearm length of nearly 200.0 mm, which obviously belongs to the suborder Megachiroptera. However, megachiropterans are not always the largest of bats. *Macroglossus sobrinus sobrinus*, the smallest megachiropteran bat of West Bengal (also in India) may have forearm as short as 46.7 mm, which is surpassed by forearm length of a number of microchiropterans.

### Family PTEROPODIDAE

The suborder Megachiroptera consists of the single family Pteropodidae whose characters have been enumerated above.

Two subfamilies of the family Pteropodidae occur in West Bengal.

#### Key to the subfamilies of the family *Pteropodidae*

- Inner margin of nostril projecting, muzzle moderate to short, teeth strong ..... PTEROPODINAE
- Inner margin of nostril not projecting, muzzle long and slender, teeth weak ..... MACROGLOSSINAE

#### Subfamily PTEROPODINAE

Tongue covered with well-developed papillae, but not extensible; jaws shorter and powerful; feeds on ripe hard fruits and on flowers, utilizing the juice and spitting out the fibres, if any.

Five species/species and subspecies belonging to five different genera of the subfamily Pteropodinae occur in West Bengal.

**Key to the genera, species and subspecies of the subfamily *Pteropodinae***

1. Upper part of one colour throughout ..... 2  
     Upper part not of one colour throughout ..... *Pteropus giganteus giganteus*
2. Five upper and six lower cheek-teeth ..... *Rousettus leschenaulti leschenaulti*  
     Four upper and five lower cheek-teeth ..... 3
3. Calcar present ..... 4  
     Calcar absent..... *Sphaerias blanfordi*
4. Two pairs of lower incisors ..... *Cynopterus sphinx sphinx*  
     One pair of lower incisor ..... *Magaerops niphanae*

**Genus *Rousettus* Gray, 1821**

*Dental formula* :  $i \frac{2}{2}, c \frac{1}{1}, pm \frac{3}{3}, m \frac{2}{3} \times 2 = 34$

Das (1986b) has shown that only one species and subspecies of the genus *Rousettus* occurs in India (and in West Bengal also).

**1. *Rousettus leschenaulti leschenaulti* (Desmarest)**

1820. *Pteropus lescheanaulti* Desmarest, *Encycl. Méth. Mammal.*, 1 : 110 (Environments of Pondicherry, India).
1835. *Pteropus pyrivorus* Hodgson, *J. Asiat. Soc. Beng.*, 4 : 700 (Nipal = Nepal).
1843. *Cynopterus marginatus* Gray, *List Specimens Mammalia Colln Br. Mus.*, : 38. Not of E. Geoffroy, 1810.
1843. *Cynopterus affinis* Gray, *List Specimens Mammalia Colln Br. Mus.*, : 39 (Himalayas = Himalaya).
1870. *Eleutherura fusca* Gray, *Cat. Monkeys Lemurs Fruit-eating Bats Colln Br. Mus.*, : 119 (? India).
1873. *Cynonycteris infuscata* Peters, *Mber. K. preuss. Akad. Wiss.* : 487 (Calcutta, Calcutta district, West Bengal, India).

*Common names* : Indian Fulvous Fruit Bat (Eng.); *Chalta badur* (Beng.).

*Material examined* : Bankura district 1♂, 1♀, Susunia, coll. V. C. Agarwal, J. M. Dasgupta, 29 vi. 1979, 7. i. 1985. Darjiling district : 2♀, Gorubathan coll. R. K. Ghose, 29. iv. 1981; 1 Juv. ♂, 1♀, Tarkhola, coll. H. Khajuria, 17, 23. viii. 1958. Hugli district : 1♂, Barul, coll. J. P. Lal, 1. ix. 1979. Jalpaiguri district : 1 subad. ♂, Khuntimari, coll. P. K. Das, 23. ii. 1979; 2♀, Sulka para, coll. S. Chakraborty, 4. ix. 1983. Medinipur district : 1♂,

Balivasa, coll. P. K. Das, 10. ix. 1984; 1♀, Chandra, coll. P. K. Das, 16. ix. 1984, 2♂, 3♀, Mandalpuskarini, coll. P. K. Das, 20. ix. 1984. South 24-Parganas district : 1♀, Baruipara, coll. P. K. Das, 5. viii. 1977; 1♂, 5♀, Bawali, coll. P. K. Das, 28. viii. 1977, 11. xi. 1977.

*Measurements* : External : 2♂ : Fa 78.5, 79.9; E 21.3, 23.2 ; Tb 35.7, 37.4; F & Cl 22.7, 23.6. 6♀ : Fa 69.3 – 81.5 (78.3); E 16.0 – 22.0 (20.0); Tb 30.0 – 36.4 (34.8); F & Cl 18.6 – 22.7 (20.3). Cranial : 3♂ : l 34.6 – 37.8 (36.4); cr 11.5 – 12.6 (12.2); mtr 14.2 – 14.9 (14.4); c<sup>1</sup> – c<sup>1</sup> 6.8 – 7.3 (7.0); iw 7.3 – 7.5 (7.4); cw 15.8 – 16.0 (16.1); zw 21.4 – 21.7 (21.5); m<sup>2</sup> – m<sup>2</sup> 11.2 – 11.4 (11.3); ml 24.3 – 28.7 (27.2). 2♀ : l 36.3, 37.0; cr 10.6, 11.8; mtr 13.7, 14.5; c<sup>1</sup> – c<sup>1</sup> 7.4 (2); iw 7.7, 8.7; cw 15.4, 15.5; zw 21.0, 22.2; ml 27.7, 29.0.

*Diagnosis* : A medium-sized (forearm around 80.0 mm) fruit bat with longish muzzle and large eyes; tail reduced and rod-like; ear with notch at lower edge; dorsal colour light brown with a rufescent tone, ventral colour lighter; back of neck and shoulders sparsely haired; last lower molar elliptical.

*Distribution* : In WEST BENGAL : Darjiling district (Anderson 1912), Jalpaiguri district (Wroughton 1917a), Bankura district, Medinipur district, Calcutta district, South 24-Parganas district. In India (other than West Bengal) : Widely distributed in the Indian mainland, east to Arunachal Pradesh (Rookmaaker & Bergmans 1981), north to Jammu & Kashmir (Chakraborty 1983) and south to Kerala (Wroughton 1921c). Outside India : Pakistan (Siddiqi 1961a), Nepal, Sri Lanka (Sinha 1969a), Bangladesh (Khan 1962), Bhutan (Chakraborty 1975), Myanmar, southern China (Andersen 1912, Allen 1938) including Tibet (Cai & Zhang 1980), Hong Kong (*ex* Allen 1938), Vietnam, Laos (Phillips 1967), possibly Cambodia (Rookmaaker & Bergmans 1981), Thailand.

*Remarks* : A specimen from Mandalpuskarini has six pairs of upper cheek-teeth.

Ellerman & Morrison-Scott (1951, 1966) have treated *Rousettus seminudus* (Kelaart, 1850) of Sri Lanka as a species distinct from *Rousettus leschenaulti*, but Sinha (1969a), finding no valid differences between the Indian population of *Rousettus leschenaulti* and the Sri Lankan *Rousettus seminudus*, has synonymised the latter with the former.

The Indian Fulvous Fruit Bat is a common bat of West Bengal. Two deserted temples and a dilapidated residential building (partly inhabited) at Bawali each contained hundreds of this bat. At Mandalpuskarini, this bat was seen to emerge from one of the four exits on the uppermost part of a small temple. The Indian Fulvous Fruit Bat causes considerable damage to guava (*Psidium guayava*) and mango (*Mangifera indica*) crops to Baruipur, a fruit-growing area. In Calcutta, it has been seen to feed on ripe fruits of *Putranjiva* tree (*Putranjiva roxburghii*).

Genus *Pteropus* Brisson, 1762

*Dental formula* :  $i \frac{2}{2}, c \frac{1}{1}, pm \frac{3}{3}, m \frac{2}{3} \times 2 = 34.$

2. *Pteropus giganteus giganteus* (Brünnich)

1782. *Vespertilio gigantea* Brünnich, *Dyrenes Hist. Dyre-Saml. Univ. Natur-Theater*, 1 : 45 (Bengal = West Bengal, India).
1825. *Pteropus medius* Temminck, *Monogr. Mammal.*, 1 : 176 (Calcutta, Calcutta district, West Bengal, and Pondicherry, India).
1828. *Pteropus edwardsi* I. Geoffroy, *Dict. Class. Hist. nat.*, 14 : 699 (Bengal = West Bengal, India). Not of E. Geoffroy, 1810.
1835. *Pteropus leucocephalus* Hodgson, *J. Asiat. Soc. Beng.*, 4 : 700 (Central region of Nipal [= Nepal]).
1839. *Pteropus assamensis* McClelland, *Proc. Zool. Soc. Lond.*, 7 : 148 (Assam, India).
1840. *Pteropus rubicollis* [sic.] Ogilby, *Madras J. Litt. Sci.*, 12 : 146 (Assam, India). *Nomen nudum*. Not *Pteropus rubicollis* E. Geoffroy, 1810.

*Common names* : Indian Flying Fox (Eng.), *Badur* (Beng.).

*Material examined* : Bankura district : 2♀, Jhilimili, coll. V. C. Agarwal, 20. i. 1985. Bardhaman district : 2♀, Barakar, coll. B. Nath, 17. ix. 1949. Calcutta district : 2♂, 2♀, Calcutta, coll. —, 1842, 1843. Darjiling district : 1♂, Shiliguri, coll. C. A. Crump, 1. iv. 1915. Hugli district : 2♀, Barul, coll. S. Chakraborty, 19. ii. 1974. Jalpaiguri district : 1♀, Ambari, coll. R. K. Ghose, 23. iii. 1985; 1 juv. ♂, Hasimara, coll. N. A. Baptista, 23. x. 1915; 2♂, Sulka para, coll. S. Chakraborty, 5. ix. 1983. Koch Bihar district : 1♂, Sitalkuchi, coll. S. Chakraborty, 10. iv. 1984. Nadia district : 1♀, Phulia, coll. D. K. Ghosal, 3. xi. 1964. North 24-Parganas district : 1♂, Barrackpore, coll. C. Swaries, 2. ix. 1897. West Dinajpur district : 1♀, Kulik, coll. S. Chakraborty, 11. x. 1987.

*Measurements* : External : 1♂ : Fa 172.0; E 31.0; F & Cl 58.0. 4♀ : Fa 161.0 – 194.0(178.0); E 28.0 – 38.0(35.0); F & Cl(1) 56.0. Cranial : 1♂, *l* 64.3; *cr* 22.9; *mtr* 25.0; *c*<sup>1</sup> – *c*<sup>1</sup> 11.5; *iw* 9.5; *cw* 23.8; *zw* 34.7; *ml* 52.6. 4♀ : *l* 67.0 – 72.3(70.1); *cr* 23.3 – 24.4(24.6); *mtr* (3) 24.5 – 27.8(26.6); *c*<sup>1</sup> – *c*<sup>1</sup> (3) 12.3 – 14.3(13.3); *iw* 8.5 – 10.2(9.6); *cw* 24.1 – 25.8(24.8); *zw*(2) 35.3, 38.3; *ml* 52.3 – 57.3 (55.1).

*Diagnosis* : Largest bat of West Bengal; rufous-brown around head and neck; a conspicuous orange or honey-coloured band across upper back; lower back blackish brown; ventral parts dark chestnut brown; naked skin of wings, uropatagium, ears and muzzle jet black; no external tail; a narrow flap of skin inside each leg.

*Distribution* : In West Bengal : Darjiling district (Wroughton 1916b). Jalpaiguri district (Wroughton 1916b), Koch Bihar district, West Dinajpur district, Maldah district, Murshidabad district, Nadia district, Bardhaman district (Nath 1951), Birbhum district, Puruliya district (Dobson 1876), Bankura district, Medinipur district (Wroughton 1915), Hugli district, Haora district (Anderson 1881), Calcutta district, North 24-Parganas district (Anderson 1912), South 24-Parganas district. In INDIA (other than West Bengal) : Widely distributed throughout the Indian Union, including Andaman Islands (Mason 1908). Outside India : Pakistan (Blanford 1891), Nepal, Sri Lanka, Bangladesh (Blyth 1863a) and Myanmar.

*Remarks* : Ellerman & Morrison-Scott (1951, 1966) have treated Nepal, Assam and Manipur populations as *Pteropus giganteus leucocephalus*. But most of earlier workers (Blyth 1863a; Hutton 1872; Dobson 1876, 1878; Blanford 1891) have considered both the Nepal and Assam populations of the Indian Flying Fox not different from those of other parts of India. Hutton (1872) has discussed colour variation in this species and has concluded that there is 'an almost endless variety of colouring' Also, Siddiqi (1961a) has identified *Pteropus giganteus giganteus* from Shillong, Meghalaya (part of undivided Assam). Recently, Agarwal & Bhattacharyya (1977) have found overlapping characters between *leucocephalus* and the nominate subspecies, and, therefore, have questioned the validity of *leucocephalus*. On the basis of the above-mentioned findings, *Pteropus giganteus leucocephalus* is hereby treated as a synonym of the nominate subspecies.

The Indian Flying Fox is the most conspicuous and a common bat of West Bengal. This bat has been observed to feed on the upper tiers of fruiting guava trees in Baruipur, thereby causing considerable damage to the guava crop.

#### Genus *Cynopterus* F. Cuvier, 1824

*Dental formula* :  $i \frac{2}{2}$ ,  $c \frac{1}{1}$ ,  $pm \frac{3}{3}$ ,  $m \frac{1}{2} \times 2 = 30$ .

#### 3. *Cynopterus sphinx sphinx* (Vahl)

1797. *Vespertilio sphinx* Vahl. *Skr. Naturh-Selsk. Copenhagen*, 4 : 123 (Tranquebar, Thanjavur district, Tamil Nadu, India).
1797. *Vespertilio fibulatus* Vahl. *Skr. Naturh-Selsk. Copenhagen*, 4 : 124 (Tranquebar, Thanjavur district, Tamil Nadu, India).
1803. *Pteropus pusillus* E. Geoffroy, *Cat. Mammifères Mus. Hist. nat.*, : 49 (India).
1810. *Pteropus marginatus* E. Geoffrey, *Annl. Mus. Hist. nat. Paris*, 15 : 97, pl. iv (Bengal = West Bengal, India).
1837. *Pachysoma brevicaudatum* Temminck, *Monogr. Mammal.*, 2 : 92, pl. 35 (Calcutta, Calcutta district, West Bengal, India). Not of I. Geoffroy, 1828.
1870. *Cynopterus marginatus var. ellioti* Gray, *Cat. Monkeys Lemurs Fruit-eating Bats Colln Br. Mus.*, : 122 (Madras, Madras district, Tamil Nadu, India).

*Common names* : Short-nosed Fruit Bat (Eng.), *Kala badur* (Beng.).

*Material examined* : Bankura district : 1 ♀, Susunia, coll. V. C. Agrawal, 7. I. 1985 ; 16 ♂, 11 ♀, Ranibandh, coll. B. C. Saha, 6, 7. ii. 1979. Bardhaman district : 1 ♂, 4 ♀, Arrah, coll. P. K. Das, 21, 22. iv. 1988; 1 ♀, Raniganj, —, —. Birbhum district : 3 ♂, Santiniketan, —, 28, 29. iii. 1971; 3 ♂, 1 ♀, Tumbani, coll. A. K. Poddar, 9, 10, xii. 1985. Calcutta district : 5 ♂, 10 ♀, Calcutta, coll. B. Prasad, R. C. Ram, B. C. Saha, S. S. Saha, purchased (one

specimen), 27. xi. 1914, 16. xii. 1969, 17. vii. 1964, 10. xi. 1964, 10. xi. 1969, 25. ii. 1979. Darjiling district : 11♂, 8♀, Chunabhati, coll. R. L. Choudhury, R. K. Ghose, 20. viii. 1978, 22 – 29. xi. 1980; 1♂, 1♀, Darjiling, coll. J. Anderson, 1866; 1♂, 1♀, Gorubathan, coll. R. K. Ghose, 29. iv. 1981; 4♂, 7♀, Kumani, coll. R. K. Ghose, 18 – 20, iii. 1985; 1♀, Sukna, coll. P. K. Das, 22. v. 1980. Haora district : 1♂, 1♀, Rajchandrapur, coll. D. K. Biswas, 7. viii. 1979. Hugli district : 3♀, Barul, coll. J. P. Lal, 1, 3. ix. 1978 ; 2♂, 2♀, Kamardingi coll. S. Chakraborty, 20, 21, ii. 1974 ; 13♂, 8♀, 1 subad. ♀, Singur, coll. Ajoy Kumar Mandal, P. K. Das, 27. ix. 1967, 27, 28. ix. 1974, 3. x. 1974, 17, 18. x. 1974, 30. x. 1974, 7. xi. 1975, 23. ii. 1982. Jalpaiguri district : 3♂, 4♀, Ambari, coll. R. K. Ghose, 23. iii. 1985; 2♂, 1♀, Chilapata, coll. R. K. Ghose, 7 – 10. iii. 1985 ; 3♂, Hasimara, coll. N. A. Baptista, 15. xi. 1915; 6♂, 4♀, Jaldapara, coll. A. K. Mandal, 26 – 28. viii. 1983 ; 1♂, 1♀, 1 subad.♀, Jalpaiguri, coll. P. K. Das, 23. ii. 1979 ; 13♂, 6♀, 1 subad. ♀, Khuntimari, coll. S. Chakraborty, P. K. Das, R. K. Ghose, 23. ii. 1979, 8, 9, ix. 1983, 13, 14. iii. 1985; 12♂, 1 subad. ♂, 5♀, Sulka para, coll. S. Chakraborty, 4, 5. ix. 1983. Koch Bihar district : 6♂, 12♀, Atiamochor, coll. A. K. Mandal, S. Chakraborty, 1, 2, ix. 1983, 3, 5. iv. 1986; 2♀, Koch Bihar, coll. S. Chakraborty, 17. ix. 1986; 1♂, 2♀, Sitalkuchi, coll. S. Chakraborty, 10. iv. 1986. Maldah district : 1♂, Maldah, coll. P. K. Das, 25. ii. 1979. Medinipur district : 1♂, 1♀, Amlagora, coll. P. K. Das, 21. ix. 1984; 4♂, 9♀, Balivasa, coll. P. K. Das, 10 – 15. ix. 1984; 2♂, 1♀, Chandra, coll. P. K. Das, 16, 17. ix. 1984; 1♂, 2♀, Gidni, coll. P. K. Das, 9. ix. 1984. Murshidabad district : 2♀, Baharampur, coll. S. Chakraborty, 15. x. 1987 ; 2♂, Bhabta, coll. P. K. Das, S. Chakraborty, 2. iii. 1979, 17. x. 1987 ; 2♂, 2♀, Lalbagh, coll. S. Chakraborty, 18, 19. x. 1987; 2♀, Na'mile, coll. S. Chakraborty, 16. x. 1987. Nadia district : 3♂, 2♀, Kaliganj, coll. S. Chakraborty, 20, 22. x. 1987; 14♂, 9♀, Madanpur, coll. P. K. Das, 15 – 18. vii. 1969; 3♂, Muragacha, coll. S. Chakraborty, 21. x. 1987; 3♂, Nakashipara, coll. S. Chakraborty, 21. x. 1987; 4♂, Phulia coll. D. K. Ghosal, S. S. Saha, 4. xi. 1964, 13. viii. 1969; 2♂, 1♀, Palashi, coll. S. Chakraborty, 21. x. 1987; 3♂, 1♀, Ramnagar, coll. S. Chakraborty, 21. x. 1967. North 24-Parganas district : 15♂, 3 subad. ♂, 12♀, 3 subad. ♀, Basirhat, coll. P. K. Das, 10 – 14. xi. 1972; 3♂, 4♀, Hasnabad, coll. S. S. Saha, 22 – 24. vii. 1973; 4♂, 3♀, 1 subad. ♀, Parmadan, coll. P. K. Das, S. S. Saha, 27. xii. 1969, 3 – 4. v. 1988. Puruliya district : 4♂, 3♀, Ajodhya Hills, coll. A. K. Mukherjee, 22 – 24. ii. 1982. South 24-Parganas district : 1♂, 1♀, Barisha, coll. Ajoy Kumar Mandal, 26. x. 1976. 9♂, 9♀, Baruipur, coll. B. Biswas, P. K. Das, 7. iii. 1965, 5, 8, 19 – 20. viii. 1977, 23. ix. 1977; 4♂, 1♀, Bawali, coll. P. K. Das, 17. iv. 1978, 5. vi. 1978; 2♂, 2♀, Baj Baj, coll. S. S. Saha, 1. xi. 1975; 1♀, Ganeshpur, coll. G. Topal, 10. i. 1980; 2♂, Muchisa, coll. J. P. Lal, 2. xi. 1985, 24. i. 1986; 1♂, 4♀, Srikrishnapur, coll. P. K. Das, 20, iii. 1982 ; 7♂, 1 subad. ♂, 7♀, 1 subad. ♀, coll. A. K. Nag, —. West Dinajpur district : 1♂, Barsoi coll. S. Chakraborty, 14, x. 1987; 1♂, 3♀, Hemtabad, coll. S. Chakraborty, 12 – 14. x. 1987, 1♀, Karnajora coll. S. Chakraborty, 10. x. 1987; 1♀, Kheshtapur, coll. S. Chakraborty, 14. x. 1987; 2♂, 1♀, Kulik, coll. S. Chakraborty, 11, 14. x. 1987; 1♀, Near Nagar River, coll. S. Chakraborty, 11. x. 1987; 1♂, Nagar Gandhar River, coll. S. Chakraborty, 14. x. 1987.

*Measurements* External 81 ♂ : Fa 63.0 – 76.1(70.5) , E 15.3 – 24.9(20.2); Tb 21.0 – 31.2(26.1); F & Cl 13.0 – 18.6(16.0). 82♀ : Fa 61.8 – 76.7(74.7); E 15.1 – 25.3(20.7);

Tb(76) 20.8 – 31.1(27.0); F & Cl 12.8 – 19.7(15.9). Cranial : 40♂ : *l* 29.0 – 36.0(32.7); *cr* 7.6 – 11.0(9.3); *mtr* 9.7 – 12.5(19.7); *c*<sup>1</sup> – *c*<sup>1</sup> 5.7 – 7.9(6.7); *iw* 5.1 – 7.0(6.2); *cw* 11.4 – 16.0(13.8); *zw* 17.4 – 24.1(20.7); *m*<sup>1</sup> – *m*<sup>1</sup> 8.4 – 11.2(9.8); *ml* 22.0 – 27.1(24.7). 39♀ : *l* 27.6 – 37.5(32.5); *cr* 7.3 – 11.2(9.4); *mtr* 9.3 – 12.7(10.9); *c*<sup>1</sup> – *c*<sup>1</sup> 5.6 – 8.0 (6.7); *iw* 5.2 – 7.2(6.2); *cw* 11.5 – 15.6(13.7); *zw* 16.0 – 24.0(20.7); *m*<sup>1</sup> – *m*<sup>1</sup> 8.3 – 11.2(10.0); *ml* 20.3 – 27.2(24.4).

**Diagnosis** : Medium-sized (forearm around 70.0 mm) fruit bat with white margin to ears; metacarpals and phalanges whitish; nostrils divergent with deep internarial groove; dorsal colour grey or greyish brown, paler ventrally (often with a broad rufescent or chestnut area around shoulders and throat); naked skin of wings, nuzzle, etc., blackish brown; tail reduced and rod-like.

**Distribution** : In WEST BENGAL : Darjiling district (Dobson 1876), Jalpaiguri district (Wroughton 1917a), Koch Bihar district, West Dinajpur district, Maldah district, Murshidabad district, Nadia district (Das & Sinha 1971), Barddhaman district, Birbhum district, Puruliya district, Bankura district, Medinipur district (Wroughton 1915), Hugli district, Haora district, Calcutta district, North 24-Parganas district (Anderson 1912), South 24-Parganas district. In INDIA (other than West Bengal) : Widely distributed throughout the mainland of the Indian Union. Outside India : Pakistan (Anderson 1881), Nepal (Fry 1925), Sri Lanka, Bangladesh and Myanmar.

**Remarks** : The Short-nosed Fruit bat is one of the commonest bats in West Bengal. It is found practically everywhere. This bat roosts in small groups (about half-a-dozen or so) and has been observed hanging from underneath the drooping fronds of palmyrah palm (*Borassus flabellifer*) in Bawali and from the ceiling of an old deserted building in Sikharabali, a village near Baruipur. The Short-nosed Fruit Bat was also seen to roost in the same old temples in Bawali in which *Rousettus leschenaulti leschenaulti* was roosting. This fruit bat also is responsible for considerable damage to the guava crop. They were seen to feed on the lowermost tiers of guava trees, in Baruipur.

#### Genus *Megaerops* Peters, 1865

**Dental formula** :  $i \frac{2}{1}, c \frac{1}{1}, pm \frac{3}{3}, m \frac{1}{2} \times 2 = 28.$

#### 4. *Megaerops niphanae* Yenbutra & Felten

1983. *Megaerops niphanae* Yenbutra & Felten, *Senckenberg. biol.*, 64 : 2 (Sakaerat Environmental Research Station (14°30' N – 101°56' E), Amphoe Pak Thong Chai, Nakhon Ratchasima Prov., Thailand).

**Common name** : Niphan's Fruit Bat (Eng.).

**Material examined** : None.

*Additional material examined* : Arunachal Pradesh : Tirap district : 28♂, 36♀. Manipur : Imphal district : 1♀, Tamenglong district : 1♂

*Measurements* : Nil.

*Measurements of additional material* : External : 29♂ : Fa 54.0 – 61.0(57.8); E 14.7 – 19.4(18.2); Tb 21.2 – 25.4(23.2); F & Cl 12.0 – 16.0(13.7). 32♀ : Fa 55.4 – 64.6(60.1); E 14.4 – 20.1(17.5); Tb 20.9 – 27.2(24.6); F & Cl 11.0 – 14.4(12.5). Cranial : 13♂ : *l* 26.6 – 28.7(27.7); *cr* 5.5 – 6.9(6.0); *mtr* 8.0 – 9.0(8.6); *c*<sup>1</sup> – *c*<sup>1</sup> 3.1 – 5.8(3.9); *iw* 4.8 – 5.7(5.1); *cw* 11.7 – 12.4(12.1); *zw* 16.6 – 18.8(17.8); *m*<sup>1</sup> – *m*<sup>1</sup> 7.6 – 8.5(8.2); *ml* 18.4 – 19.9(19.0). 22♀ : *l* 26.7 – 29.7(27.8); *cr* 5.2 – 6.4(5.8); *mtr* 8.0 – 9.5(8.7); *c*<sup>1</sup> – *c*<sup>1</sup> 3.0 – 5.2(3.8); *iw* 4.7 – 5.6(5.2); *cw* 11.6 – 13.1(12.3); *zw* 16.3 – 19.5(18.0); *m*<sup>1</sup> – *m*<sup>1</sup> 7.7 – 8.9(8.4); *ml* 17.7 – 20.2(19.1).

*Diagnosis* : Looks much like *Cynopterus sphinx sphinx*, but nostrils more subtubular; no external tail; ears without white edge; interfemoral membrane well-developed along tibia, but very narrow medially; wing-membrane attached to second phalanx of first toe; pelage dusky brown above, light greyish brown below.

*Distribution* : In West Bengal : Darjiling district (Hill 1983, Koopman 1989). In India (Other than West Bengal) : Possibly Sikkim (Mistry 1991), Mizoram (specimens in ZSI), Manipur (specimens in ZSI), Arunachal Pradesh (Saha 1985, reported as *Megaerops ecaudatus*). Outside India : Thailand, Vietnam (Koopman 1989).

*Remarks* : Hill (1983) identified a specimen collected from Pashok, Darjiling district, as belonging to *Megaerops ecaudatus* (Temminck, 1837), with some hesitation. Koopman (1989) considered obviously this specimen as *Megaerops niphanae*, and also referred specimens of *niphanae* from Vietnam in the American Museum of Natural History. Saha's (1985) specimens (examined) are, in fact, wrongly identified examples of *Megaerops niphanae*.

The Indian specimens are morphologically similar to *niphanae*, but are decidedly larger, and would better be recognised as a separate subspecies. However, further analysis of available data would be necessary to establish the same.

On the basis of the material listed above, *Megaerops niphanae* is hereby reported for the first time from Mizoram, Manipur and Arunachal Pradesh.

#### Genus *Sphaerias* Millar, 1906

*Dental formula* :  $i \frac{2}{2}$ ,  $c \frac{1}{1}$ ,  $pm \frac{3}{3}$ ,  $m \frac{1}{2} \times 2 = 30$ .

#### 5. *Sphaerias blanfordi* (Thomas)

1891. *Cynopterus blanfordi* Thomas, *Ann. Mus. civ. Stor. nat. Giacoma Doria*, 10 : 884, 921 – 922, pl. xi, figs. 1 – 2 (Leito, Cheba, Karen Hills, 1,000 m., Burma = Myanmar).

**Common name** : Blanford's Fruit Bat (Eng).

**Material examined** : Darjiling district : 1 subad. ♀, Darjiling, coll. G. King, 6. iii. 1877; 1♂, 1♀, Goomti, coll. P. K. Das, 22, 26. v. 1980; 1♂, Palmajua, coll. R. K. Ghose, 4. vii. 1974.

**Additional material examined** : Arunachal Pradesh : Tirap district : 6♂, 12♀.

**Measurements** : External : 2♂ : Fa 53.0, 53.2; E 15.0, 18.5; Tb 17.9, 20.1; F & Cl 12.0, 14.2. 1♀ : Fa 52.4; E 18.7; Tb 19.2; F & Cl 12.1. Cranial : 2♂ : *l* 27.2, 27.5; *cr* 6.3, 6.4; *mtr* 8.1, 8.2; *iw* 5.4, 5.6; *cw* 12.5, 12.6; *zw* 17.0, 17.3; *m*<sup>1</sup> – *m*<sup>1</sup> 8.2, 8.3; *ml* 19.3; 19.5.

**Measurements of additional material** : External : 6♂ : Fa 52.2 – 59.7(56.9); E 15.3 – 18.2(16.8); Tb 16.6 – 26.2(21.6); F & Cl 11.5 – 13.9(12.5). 12♀ : Fa 50.8 – 61.9(54.9); E 14.0 – 18.3(16.5); Tb 19.4 – 26.2(20.9); F & Cl 11.3 – 14.1(12.7). Cranial : 5♂ : *l* 27.1 – 28.1(27.5); *cr* 5.7 – 6.5(6.2); *mtr* 8.0 – 8.8(8.3); *c*<sup>1</sup> – *c*<sup>1</sup>(2) 3.7, 3.8; *iw* 4.8 – 5.9(5.2); *cw* 12.0 – 12.5(12.2); *zw* 16.4 – 18.0(17.0); *m*<sup>1</sup> – *m*<sup>1</sup> 8.1 – 8.6(8.3); *ml* 18.8 – 19.8(19.2). 7♀ : *l* 26.8 – 29.2(27.8); *cr* 6.1 – 7.0(6.4); *mtr* 7.9 – 8.9(8.4); *c*<sup>1</sup> – *c*<sup>1</sup>(2) 3.9, 4.4; *iw* 4.9 – 5.7(5.2); *cw* 11.8 – 12.4(12.1); *zw* 16.2 – 19.2(17.4); *m*<sup>1</sup> – *m*<sup>1</sup> 7.8 – 8.6(8.1); *ml* 18.6 – 20.4(19.5).

**Diagnosis** : A small (forearm around 50.0 mm) fruit bat without external tail and calcar; anterior margin of ears white; dull greyish brown above, a shade paler below; interfemoral membrane covered with soft, fine, dense hairs and extends along femur and upper part of tibia, as a narrow stripe.

**Distribution** : In West Bengal : Darjiling district (Chakraborty 1975). In India (other than West Bengal) : Mizoram (specimens in ZSI), Arunachal Pradesh (Saha 1985), Sikkim (specimens in ZSI), Uttar Pradesh (Bhat 1968b). Outside India : Nepal (Lekagul & McNeely 1977), Bhutan (Chakraborty 1975), southwestern China (Honacki *et al.* 1982) including Tibet (Cai & Zhang 1980), Myanmar, Thailand.

**Remarks** : On the basis of two male specimens from Tibet, Cai & Zhang (1980) described *Sphaerias blanfordi motuoensis*, new subspecies, characterising it as not having odontoid papillae on the inner side of lips and having two rounded greyish yellow patches on the undersurface of the neck, besides minor differences in colour. The patches in question are also present in adult males of the Indian population. Further, there are no differences in measurements of these two populations. Thus, the Tibetan population of *Sphaerias blanfordi* does not appear to be distinct enough to warrant recognition as a separate subspecies.

On the basis of the specimens mentioned above, *Sphaerias blanfordi* is hereby reported for the first time from Mizoram and Sikkim.

In West Bengal, Blanford's Fruit Bat is known only from the montane regions of Darjiling district, between 1,350 to 2,250 metres.

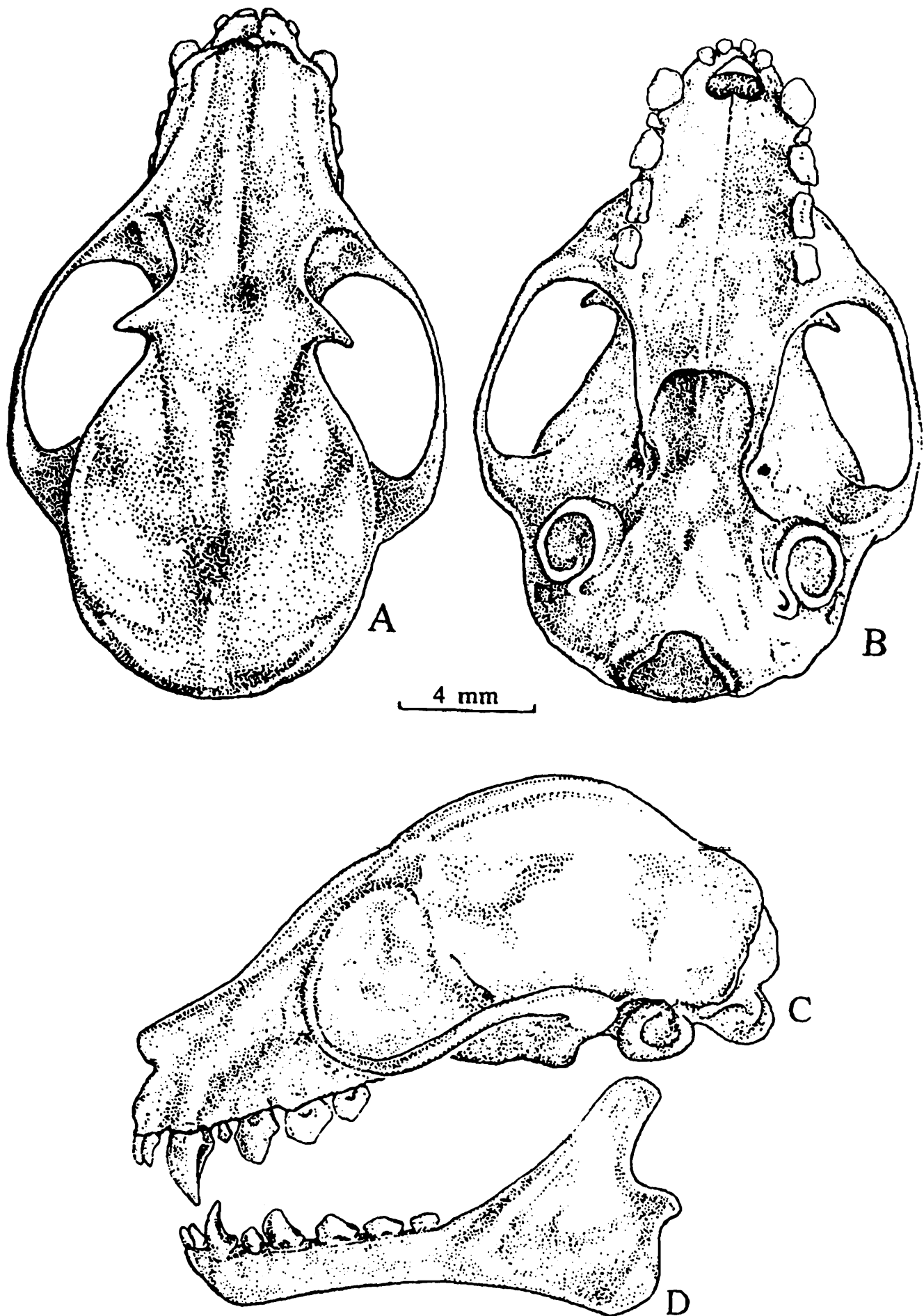


Fig. 13. Skull of *Sphaerias blanfordi* : A. Dorsal view; B. Ventral view; C. Lateral view; D. Lateral view of lower jaw.

## Subfamily MACROGLOSSINAE

Tongue covered with well-developed papillae (specialised papillae toward tip) and highly extensible, a centimetre or more of tip remains out of mouth in dead specimen; jaws longer and weaker; feeds on nectar and pollen.

Two species and subspecies belonging to two genera of the subfamily Macroglossinae occur in West Bengal.

**Key to the genera, species and subspecies of the family *Macroglossinae***

- Size large (forearm around 70.0 mm), no claw on second finger of wing.....  
 .....*Eonycteris spelaea spelaea*
- Size small (forearm around 50.0 mm), claw on second finger of wing.....  
 .....*Macroglossus sobrinus sobrinus*

Genus *Eonycteris* Dobson, 1873

*Dental formula* :  $i \frac{2}{2}$ ,  $c \frac{1}{1}$ ,  $pm \frac{3}{3}$ ,  $m \frac{2}{3} \times 2 = 34$ .

**6. *Eonycteris spelaea spelaea* (Dobson)**

1871. *Macroglossus spelaeus* Dobson, *Proc. Asiat. Soc. Beng.* : 105, 106 (Farm Caves, Moulmein, Tenasserim, Myanmar).
1871. *Macroglossus spelaeus* Dobson, *J. Asiat. Soc. Beng.*, 40 : 261 (Farm Caves, Moulmein, Tenasserim, Myanmar).

*Common name* : Dobson's Long-tongued Fruit Bat (Eng.).

*Material examined* : Darjiling district : 1 ♂, Pashok, coll. P. K. Das, 3. vi. 1980; 1 ♂, Sivok, coll. P. K. Das, 6. vi. 1980; 3♂, 1♀, Sukna, coll. P. K. Das, 22. v. 1980 [one of the males and the female collected from Sukna are in the Hungarian Natural History Museum, Budepest]. (?) Calcutta district : 1♀, (?) Calcutta, don F. Stoliczka, before 1875.

*Additional material examined* : Karnataka : 2♂, 2♀; Andhra Pradesh : 5♂, 1♀ ; Sikkim : 1 Subad. ♂; Assam : 3♂; Meghalaya : 1♀ : Manipur : 3♂, 2♀; Arunachal Pradesh : 2♀ : Andaman & Nicobar Islands (South and North Andaman Island) : 12♂, 11♀.

*Measurements* : External : 5 ♂, Fa 68.5 – 74.6(71.5); E 20.3 – 22.0(21.1); Tl 10.6 – 19.0(15.1); Tb 29.6 – 34.5(32.6); F & Cl 15.4 – 19.0(17.7). 1 ♀ : Fa 73.2; E 21.0, 21.4; Tb 33.0; F & Cl 19.0. 2♀ : Fa 73.2, 74.6; E 21.0, 21.4; Tl 13.6, 19.7; Tb 33.0, 33.2; F & Cl 17.8. 19.0. Cranial : 4 ♂ : l 34.3 – 36.6(35.2); cr 10.3 – 11.8(10.8); mtr 11.6

13.0(12.5);  $c^1 - c^1$  7.2 – 7.3(7.3);  $iw$  6.5 – 7.3(6.9);  $cw$  14.8 – 15.0(14.9);  $zw$  20.3 – 21.5(20.9);  $m^2 - m^2$  8.5 – 9.0(8.7);  $ml$  24.2 – 26.8(25.2). 1♀ :  $l$  - ;  $cr$  11.0;  $mtr$  -;  $c^1 - c^1$  6.6;  $iw$  6.6;  $cw$  14.3;  $zw$  19.1;  $m^2 - m^2$  - ;  $ml$  25.8. Weight : 5♂ : 54.5 – 72.0 g (59.5 g); 1♀ : 53.0 g.

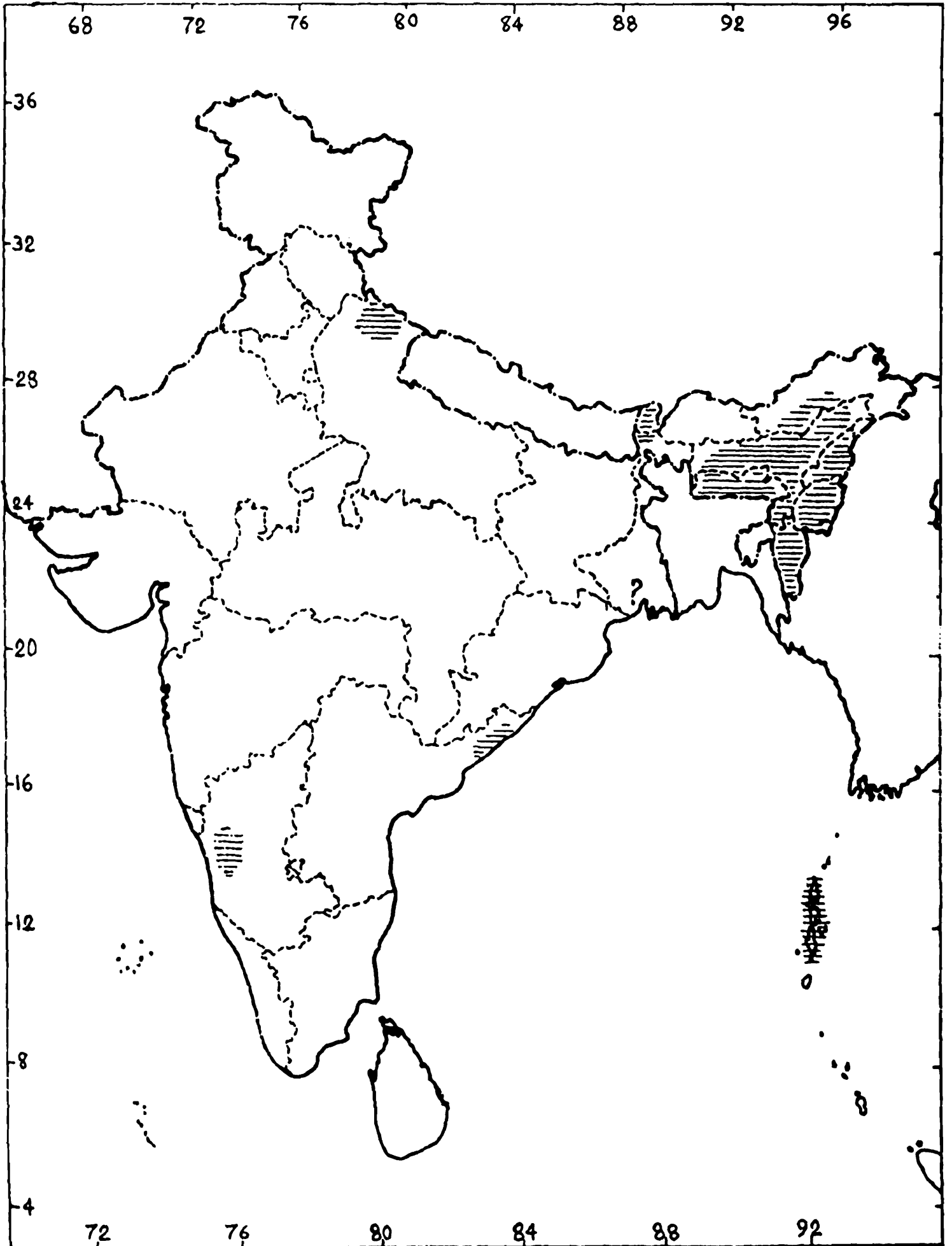
*Measurements of additional material* : Karnataka : Cranial : 1♂ :  $l$  33.4;  $cr$  12.0;  $mtr$  12.5;  $c^1 - c^1$  7.4;  $iw$  7.0;  $cw$  14.9;  $zw$  19.8;  $m^2 - m^2$  9.1;  $ml$  26.3 1♀ :  $l$  33.3;  $cr$  11.7;  $mtr$  12.2;  $iw$  7.0;  $cw$  14.4;  $zw$  18.7;  $m^2 - m^2$  8.6;  $ml$  25.7. Andhra Pradesh : External : 5♂ : Fa 68.4 – 69.6(69.0); TI(3) 16.0 – 16.6(16.3); E 19.0 – 21.2(19.9); Tb 28.6 – 31.3(30.0); F & Cl 16.8 – 20.8(18.8). 1♀ : Fa 64.5; E 17.9; Tb 28.0; F & Cl 16.0. Cranial : 4♂ :  $l$  33.0 – 35.7(35.2);  $cr$  10.4 – 11.0(10.7);  $mtr$  12.2 – 12.7(12.4);  $c^1 - c^1$  6.5 – 7.4(6.9);  $iw$  6.2 – 6.8(6.5);  $cw$  14.0 – 14.8(14.3);  $zw$ (3) 19.7 – 21.6(20.8);  $m^2 - m^2$  8.4 – 8.7(8.5);  $ml$  24.9 – 25.9(25.6). 1♀ :  $l$  33.0;  $cr$  9.6;  $mtr$  11.8;  $c^1 - c^1$  11.9 :  $iw$  6.5;  $cw$  13.7;  $m^2 - m^2$  8.6;  $ml$  23.8. Assam : External 3♂ : Fa 70.0 – 76.0(72.3); TI 9.8 – 16.0(13.3); E 17.5 – 22.0(19.4); Tb 32.5 – 37.0(34.5); F & Cl 18.0 – 19.5(18.8). Cranial : 3♂ :  $l$  35.2 – 37.3(36.0);  $cr$  11.9 – 12.9(12.3);  $mtr$ (1) 13.7;  $c^1 - c^1$  7.6 – 7.7(7.6);  $iw$  6.8 – 7.3(7.1);  $cw$  15.0 – 16.0(15.3);  $zw$  21.7 – 22.2(21.9);  $m^2 - m^2$ (1) 9.4;  $ml$  25.6 – 28.3(26.8). Meghalaya : External : 1♀ : Fa 70.5. Cranial : 1♀ :  $l$  35.5;  $cr$  11.0;  $mtr$  12.4;  $c^1 - c^1$  7.2;  $iw$  7.1;  $cw$  14.9;  $m^2 - m^2$  8.9;  $ml$  26.4. Andaman & Nicobar Islands : External : 7♂ : Fa 71.5 – 78.3(74.5). 2♀ : Fa 69.1, 74.5. Cranial : 8♂ :  $l$  35.2 – 37.0(36.0);  $cr$  10.5 – 12.7(12.1);  $mtr$  12.5 – 13.2(13.0);  $c^1 - c^1$  7.0 – 7.6(7.4);  $iw$  6.8 – 7.6(7.3);  $cw$  14.1 – 15.3(14.5);  $zw$  18.8 – 23.3(21.4);  $m^2 - m^2$  9.0 – 9.8(9.4);  $ml$  24.3 – 28.5(27.0). 3♀ :  $l$  29.5 – 34.1(32.5);  $cr$  9.8 – 11.5(10.9);  $mtr$ (2) 12.3, 12.8;  $c^1 - c^1$  6.1 – 6.9(6.6);  $iw$  6.4 – 6.7(6.6);  $cw$  13.6 – 14.6(14.1);  $zw$ (2) 18.5, 20.0;  $m^2 - m^2$  8.1 – 9.2(8.7);  $ml$ (2) 25.2, 26.2.

*Diagnosis* : Very much like the Indian Fulvous Fruit Bat, but second finger lacks a claw; small reniform perianal gland on either side of anus; fur short and scanty; back brownish, head darker, ventral surface rather greyish; back of neck more thinly haired; adult males with yellowish red ruff on neck.

*Distribution* : In West Bengal : Darjiling district (?) Calcutta district. In India (Other than West Bengal) : Uttar Pradesh (Bhat 1968a), Karnataka (Bhat *et al.* 1980), Andhra Pradesh, Sikkim (Mistry 1991), Assam (Ghose & Bhattacharyya 1976), Meghalaya (Sinha 1990a), Mizoram (specimens in ZSI), Manipur, Nagaland (specimen in ERS, ZSI), Arunachal Pradesh, Andaman & Nicobar Islands (Bhattacharyya 1975). Outside India : Myanmar, southern China (Honacki *et al.* 1982), Vietnam, Laos, Cambodia, Thailand, Malay Peninsula and nearby islands, Sumatra, possibly Borneo.

*Remarks* : On the basis of specimens listed and mentioned above, *Eonycteris spelaea spelaea* (Dobson) is hereby reported for the first time from West Bengal, Andhra Pradesh, Mizoram, Manipur, Nagaland, Arunachal Pradesh and North Andaman Island. Bhattacharyya's (1975) specimens being all from the South Andaman Island.

Within the Indian Union, therefore, the distributional range of *Eonycteris spelaea spelaea*



Distribution map 1 : Distribution of *Eonycteris spelaea spelaea* in India

extends to the Eastern Ghats of Andhra Pradesh (in the mainland) and to the North Andaman Island (in the Andaman group of Islands).

*Eonycteris spelaea spelaea* being essentially a cave-dweller in India and there being no caves in and around Calcutta, the specimen listed from Calcutta appears to be of doubtful origin. It might have actually been procured from Darjiling area where Dr. F. Stoliczka, the donor of the specimen, collected during 1871. The specimen (along with many others) was bequeathed to the Asiatic Society of Bengal and was received by the Society on 15<sup>th</sup> December 1875.

Males had well-developed testes and the female from Sukna was lactating, indicating that *Eonycteris spelaea* was breeding in Darjiling district during May-June. Bhat *et al.* (1980) found the Uttara Kannada (Karnataka) population of this species breeding throughout the year.

#### Genus *Macroglossus* F. Cuvier, 1824

*Dental formula* :  $i \frac{2}{2}$ ,  $c \frac{1}{1}$ ,  $pm \frac{3}{3}$ ,  $m \frac{2}{3} \times 2 = 34$ .

#### 7. *Macroglossus sobrinus sobrinus* (Andersen)

1911. *Macroglossus minimus sobrinus* Andersen, *Ann. Mag. nat. Hist.*, 7 : 642 (Gunong Igari, 2000' = c 610 m, Perak, peninsular Malaysia).

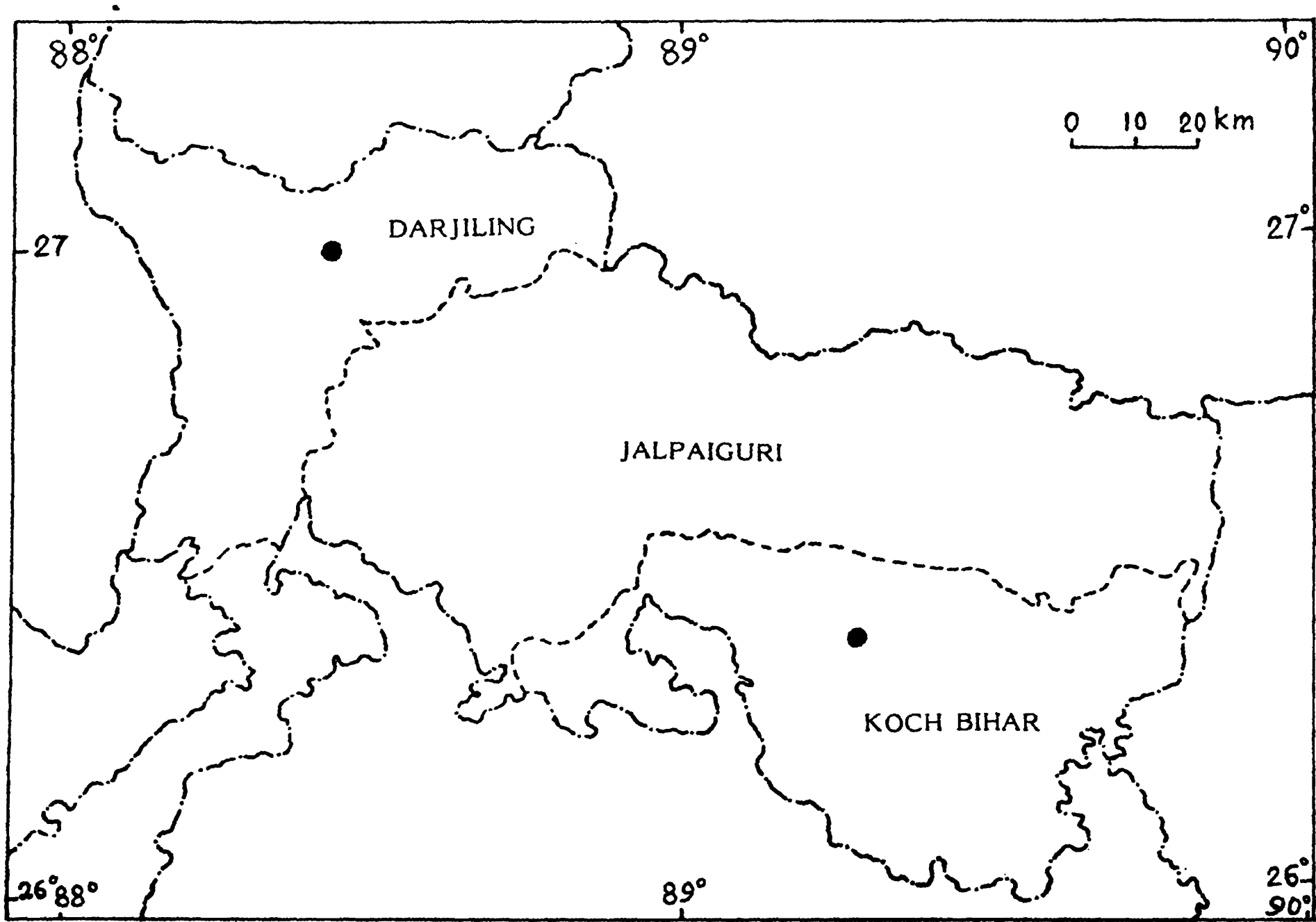
*Common name* : Greater Long-tongued Fruit Bat (Eng.).

*Material examined* : Darjiling district : 1 unsexed subad., Darjiling, coll. F Stoliczka, 1871. Koch Bihar district : 1♂, 1♀, Atiamochor, coll. S. Chakraborty, 3, iv. 1986.

*Additional material examined* : Arunachal Pradesh : Tirap district : 6♂, 9♀; Meghalaya : Jaintia Hills district : 1♂; Tripura : North district : 1♀.

*Measurements* : External : 1♂ : Fa 46.7 ; Tb 18.0; F & Cl 12.0. 1♀ : Fa 48.5; Tb 17.0; F & Cl 13.3. Cranial : 1♂ : *l* 30.5; *cr* 11.6; *mtr* 10.0; *c*<sup>1</sup> – *c*<sup>1</sup> 5.2; *cw* 11.7; *zw* 15.3. 1♂ : *l* 30.3; *cr* 11.9; *mtr* 11.0; *c*<sup>1</sup> – *c*<sup>1</sup> 5.2; *cw* 11.7; *zw* 15.3. 1♂ : *l* 30.3; *cr* 11.9; *mtr* 11.0; *c*<sup>1</sup> – *c*<sup>1</sup> 5.0; *cw* 12.2; *zw* 15.5.

*Measurements of additional material* : External : 7♂ : Fa 43.9 – 51.0(47.4); E 12.9 – 17.3(15.4); Tb 11.4 – 19.7(17.3); F & Cl 11.0 – 13.8(12.0). 10♀ : Fa 43.6 – 49.5(47.2); E 13.0 – 16.9(15.1) Tb 14.0 – 19.5(17.9); F & Cl 10.4 – 12.8(11.6). Cranial : 6♂, *l* 30.3 – 30.8(30.5); *cr* 9.5 – 11.3(10.6); *mtr*(3) 9.4 – 9.6(9.5); *c*<sup>1</sup> – *c*<sup>1</sup> 4.4 – 6.1(5.4); *iw* 4.6 – 5.5(4.9); *cw* 11.6 – 12.9(12.1); *zw* 14.2 – 16.4(15.8); *m*<sup>2</sup> – *m*<sup>2</sup> 6.2 – 6.8(6.5); *ml* 20.4 – 23.2(21.9). 9♀, *l* 28.0 – 31.0(29.7); *cr* 9.9 – 11.4(10.6); *mtr* 9.0 – 10.1(9.5); *c*<sup>1</sup> – *c*<sup>1</sup> 4.8 – 5.6(5.1); *iw* 4.6 – 5.1(4.8); *cw* 11.7 – 12.6(12.0); *zw* 13.9 – 15.7(14.8); *m*<sup>2</sup> – *m*<sup>2</sup> 6.0 – 7.0(6.4); *ml* 20.5 – 23.1(22.3).



Distribution map 2 : Distribution of *Macroglossus sobrinus sobrinus* in Northern West Bengal

**Diagnosis** : A small (forearm around 50.0 mm) fruit bat (smallest of fruit bats of West Bengal) with very long head; pelage longish and light reddish brown, chest more brown; tail rod-like and short; interfemoral membrane narrow; muzzle long and cylindrical; nostrils upward-pointing and separated by an ill-defined groove; tongue quite long with feathery tip.

**Distribution** : In West Bengal : Darjiling district (Dobson 1876, as *Macroglossus minimus*), Koch Bihar district. In India (other than West Bengal) : Possibly Sikkim (Mistry 1991), Meghalaya, Tripura, Arunachal Pradesh (Saha 1985, as *Macroglossus minimus*). Outside India : Myanmar and Thailand to Sumatra, Nias Island, Krakatoa Island and Java (Hill 1983).

**Remarks** : Ellerman & Morrison-Scott (1951, 1966) have maintained *sobrinus* as a subspecies of *Macroglossus minimus* (E. Geoffroy, 1810). Most of recent authors (Lekagul & McNeely 1977, Honacki *et al.* 1982, Hill 1983, Corbet & Hill 1986), however, consider *minimus* and *sobrinus* as distinct species.

On the basis of specimens listed above, *Macroglossus sobrinus sobrinus* is hereby reported for the first time from Meghalaya, Tripura and Arunachal Pradesh, Saha's (1985) specimens being *M. sobrinus*, and not *M. minimus*.

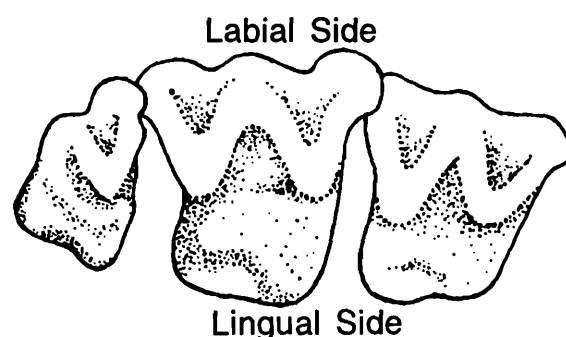
The male from Atiamochor had enlarged testes and the female had two well-developed foetuses, signifying that they were breeding in April, in northern West Bengal.

#### Suborder MICROCHIROPTERA

Second finger does not bear a claw and closely associated with third finger; noseleaf present in many; eyes small ; margin of ear not forming complete ring; tragus (Fig. 3C) usually present; tail partly or wholly associated with interfemoral membrane, often quite long, absent in some; premaxilla with or without maxillary branch; postorbital process usually reduced or absent; bony palate does not continue laterally behind last molars; cochlea large, usually compresses basioccipital; molars with sharp cusps (Fig. 14); lower incisors usually three; usually insectivorous, few also carnivorous; orientation by ecolocation.

*Hipposideros armiger armiger* (forearm as long as 96.5 mm) and *Tylonycteris pachypus fulvida* (forearm 25.0 mm or so) are the largest and smallest microchiropteran bats of West Bengal (and India).

The suborder Microchiroptera in West Bengal consists of six families.



**Fig. 14.** Occlusal view of right upper molars of a Microchiropteran bat (*Myotis* sp.).

### Key to the families of the Order *Microchiroptera*

- 1 Both noseleaf and tragus present ..... *Megadermatidae*  
 Either noseleaf or tragus present, but not both ..... 2
2. A noseleaf, but no tragus present ..... *Rhinolophidae*  
 No noseleaf, but tragus present ..... 3
3. Tail entirely enclosed in interfemoral membrane ..... *Vespertilionidae*  
 Distal portion of tail free from interfemoral membrane ..... 4
4. Tail emerging from upper surface of interfemoral membrane ..... *Emballonuridae*  
 Tail emerging from end of interfemoral membrane ..... 5
5. Tail very long and slender ..... *Rhinopomatidae*  
 Tail comparatively short and stout ..... *Molossidae*

#### Family RHINOPOMATIDAE

Muzzle with dermal outgrowth (narial pad); oblique slit-like nostril; ears large and united at bases; tragus large but simple; tail (Fig. 15) very long (length around that of forearm) and thin, emerges from distal free margin of interfemoral membrane; narrow interfemoral membrane (uropatagium) inguinal false teats present; face, rump and part of abdomen naked; accumulation of fat beneath skin at base of tail; premaxillae free, not fused with surrounding bones, nasal branch well-developed, palatal branch shortened; lachrymal region distinctly swollen; upper incisors minute; postorbital process absent; palate ends in place of last molars; auditory bulla

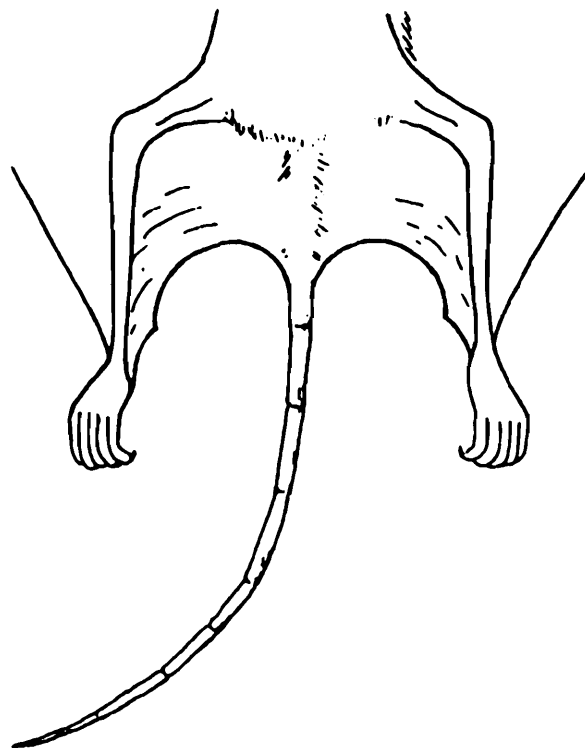


Fig. 15. Tail in Rhinopomatidae (*Rhinopoma* sp.).

large; keel of sternum rudimentary; second digit of wing with two bony phalanges; calcar absent.

The family Rhinopomatidae consists of a single genus.

Genus *Rhinopoma* E. Geoffroy, 1818

Dental formula :  $i \frac{1}{2}$ ,  $c \frac{1}{1}$ ,  $pm \frac{1}{2}$ ,  $m \frac{3}{3} \times 2 = 28$ .

Two species of the genus *Rhinopoma* occur in India. Either of these occurs in West Bengal. The possibility of occurrence of both the species in West Bengal cannot be ruled out entirely.

#### Key to the species and subspecies of the genus *Rhinopoma*

Larger, length of forearm more than 64.0 mm; tail usually shorter than forearm; sagittal crest prominent; rostrum with narial swellings not especially pronounced .....  
.....*Rhinopoma microphyllum kinneari*

Smaller, length of forearm less than 63.0 mm; tail usually longer than forearm; sagittal crest low; rostrum with prominent globose narial swellings .....  
.....*Rhinopoma hardwickei hardwicki*

The arrangement of species is after Hill (1977).

#### 8. *Rhinopoma microphyllum kinneari* (Wroughton)

1912. *Rhinopoma kinneari* Wroughton, *J. Bombay nat. Hist. Soc.*, 21 : 767 (Bhuj, Cutch = Bhuj, Kachchh district, Gujarat, India).

*Common name* : Larger Rat-tailed Bat (Eng.).

*Material examined* : None.

*Measurements* : Nil.

*Diagnosis* : A medium-sized (forearm 64.5 – 75.0 mm) bat with long, mouse-like tail emerging from edge of narrow uropatagium; muzzle with thick narial pad; tragus simple; tail usually shorter than forearm.

*Distribution* In West Bengal : (?) Calcutta district. In India (other than West Bengal)

Delhi (Brosset 1962a), Rajasthan (Prakash 1956a), Uttar Pradesh (Brosset 1962a), Madhya Pradesh (Wroughton 1912b), Gujarat, Maharashtra (Khajuria 1953), Orissa (Kharparde 1980), Bihar (Wroughton 1915). Outside India : Possibly Bangladesh (Khan 1982). Specimens from the Punjab, Pakistan, reported as *Rhinopoma kinneari* by Hinton & Thomas (1926) and Lindsay (1926d), were identified simply as *Rhinopoma microphyllum* by most recent authors (Aellen 1959, Felten 1962, Hill 1977a). However, no specimen (skin of an unsexed adult) from Calcutta listed by Dobson (1878) under *Rhinopoma microphyllum*. Since this author considered *Rh. hardwickei* as a synonym of *Rh. Microphyllum*, the said specimen could be an example of *Rhinopoma hardwickei* as well. Therefore, *Rhinopoma microphyllum kinneari* is here included in the fauna of West Bengal with some element of doubt.

### 9. *Rhinopoma hardwickei hardwickei* (Gray)

1831. *Rhinopoma hardwickei* Gray, Zool. Miscny., : 37 (India).

*Common name* : Lesser Rat-tailed Bat (Eng.).

*Material examined* : None.

*Measurements* : Nil.

*Diagnosis* : Similar to *Rhinopoma microphyllum kinneari* but smaller (forearm 53.3 - 62.7 mm); tail usually longer than forearm.

*Distribution* : In West bengal : (?) Calcutta district. In India (other than West Bengal) : Jammu & Kashmir (Dobson 1878), Delhi (Brosset 1962a), Rajasthan, Uttar Pradesh, Madhya Pradesh, Gujarat, Karnataka, Kerala (Wroughton 1921c), Tamil Nadu (Jerdon 1867), Andhra Pradesh (specimens in ZSI), Orissa (Das & Agrawal 1973), Bihar (Wroughton 1915). Outside India : Afghanistan (Gaisler 1970), Pakistan (Siddiqi 1961a), possibly Bangladesh (Khan 1982), Myanmar (Jerdon 1867), Thailand.

*Remarks* : Hill (1977a) in his revisionary study included both Afghanistan and Pakistan in the distributional range of *Rhinopoma haedwickei* and seated that records of *Rhinopoma* from Barma and Thailand were problematical. However, Corbet (1980) thought that the nominate subspecies extended to Thailand. Ellerman & Morrison-Scott (1951) included 'Bengal' within the range of distribution of *Rhinopoma h. hardwickei*. But no specimen of *Rhinopoma* can be traced from West Bengal, excepting a specimen (skin of an unsexed adult) from Calcutta listed by Dobson (1878) under *Rhinopoma microphyllum*. Since this author considered *Rhinopoma hardwickei* as a synonym of *Rh. microphyllum*, the said specimen could be of *Rh. microphyllum* as well, though the possibility of its being an example of *Rh. h. hardwickei* is greater, as is evident from its range of distribution. Thus, *Rh. h. hardwickei* is included in the faunal list of West Bengal with some hesitation.

Family EMBALLONURIDAE

Lower lip terminating anteriorly in naked area; noseleaf absent; tragus short and rounded; tail longish (more than one-third to less than half the length of forearm) and stout, distal portion free, piercing upper surface of interfemoral membrane (Fig. 16A); interfemoral membrane long; premaxillae scale-like, have nasal branches only, not fused with each other or with maxillae; upper incisors minute, often absent in old individuals; postorbital process like curved spine; palate ends in plane of last molars; auditory bulla large, emarginate on inner side; second finger does not have phalanges; third finger with two phalanges, proximal one flexed on dorsal aspect of metacarpal in resting animal (Fig 16B); hind limb slender.

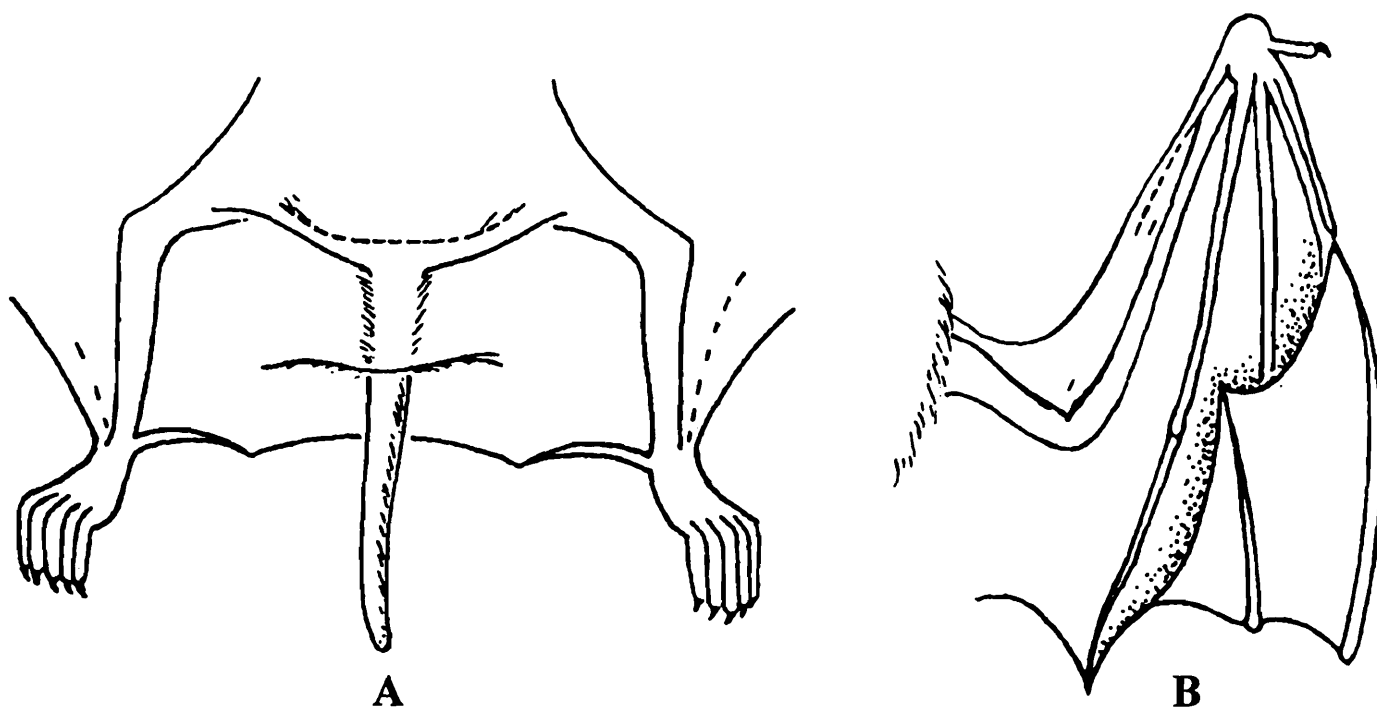


Fig. 16 : Characters of Emballonuridae : A. Tail; B. Wing.

Only One genus of the family Emballonuridae occurs in west Bengal (and India).

Genus *Taphozous* E. Geoffroy, 1818

Dental formula :  $i \frac{1}{2}$ ,  $c \frac{1}{1}$ ,  $pm \frac{2}{2}$ ,  $m \frac{3}{3} \times 2 = 30$ .

Key to the species and subspecies of the genus *Taphozous*

1. Irregular white spots or blotches on dorsal pelage ..... *Taphozous saccolaimus crassus*  
 No white spots or blotches on dorsal pelage ..... 2
2. Smaller (forearm less than 65.0 mm) ..... *Taphozous longimanus longimanus*  
 Larger (forearm more than 70.0 mm) ..... *Taphozous nudiventris kachhensis*

10. *Taphozous longimanus longimanus* Hardwicke

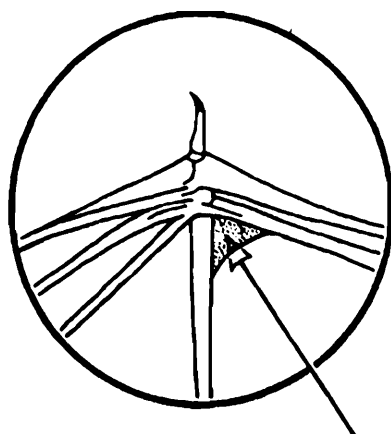
1825. *Taphozous longimanus* Hardwicke, *Trans. Linn. Soc. Lond.*, 14 : 525 (Calcutta, Calcutta District, West Bengal, India).
1841. *Taphozous bicolor* Temminck, *Monogr. Mammal.*, 2 : 290 (Calcutta, Calcutta district, West Bengal, India).
1841. *Taphozous fulvidus* Blyth., *J. Asiat. Soc. Beng.*, 10 : 975 (Darjeeling = Darjiling district, West Bengal, India).
1841. *Taphozous brevicaudus* Blyth, *J. Asiat, Soc. Beng.*, 10 : 976 (Travancore = southern Kerala, India).
1842. *Taphozous cantori* Blyth, *J. Asiat, Soc. Beng.*, 11 : 784 (Calcutta, Calcutta district, West Bengal, India).

*Common name* : Long-armed Sheath-tailed Bat (Eng).

*Material examined* : Bardhaman district : 1♂, 8♀, Churpurni. coll. P. K. Das. 27-29. iv. 1988. Calcutta district : 3♂, 1 subad. ♂, 2 ♀, Calcutta, coll. Major Alcock, T. Bentham, F. Finn, O. L. Fraser, F. Stoliczka, 15. xii. 1875, 22. ii. 1881. Nadia district : 1♀, Krishnanagar, coll. P. K. Das, 10. iv. 1978. South 24-Parganas district : 1♂, 1♀, Canning, coll. N. Annandale, 21. vii. 1907; 1♀, Kakdwip, coll. G. Topal, 10. i. 1980; 1♂, Thakurpukur, coll. A. K. Nag, 31. i. 1975.

*Measurements* : External : 3♂, : Fa 58.8-61.2(60.0); E 11.2-13.1 (11.9); Tb 24.0-25.0(24.3); F & Cl 10.9 -13.1(11.6). 10♀ : Fa 57.2-61.6(59.6); E 13.5-15.7(14.0); Tb 22.0-25.8(24.5); F & Cl 11.5-13.8(12.5). Cranial : 2♂ : l 20.8, 21.0; c<sup>1</sup> - c<sup>1</sup> 4.5, 4.8; iw 5.0, 5.3; cw 10.7, 11.0; zw 12.8(2); ml 15.3, 15.6 5♀ : l 21.6-22.0(21.9); c<sup>1</sup>-c<sup>1</sup> 3.7-4.0(3.9); iw 4.8-5.0(4.9); cw 10.0-10.4(10.2); zw 12.5-12.8(12.7); iw 4.8-5.0(4.9); mtr 8.6-9.2(9.0); m<sup>3</sup>-m<sup>3</sup> 8.6-8.8(8.7).

*Diagnosis* : A dark brown (adult males usually lighter brown), medium-sized bat with broad tragus, gular sac moderately developed in males, and in females represented by a rudimentary fold of naked skin; radio-metacarpal pouch (Fig. 17) moderately developed; inner margin of ear smooth (not papillate); lower lip scarcely grooved.



Radio-metacarpal pouch

Fig. 17 : Radiometacarpal pouch to *Tophozous longimanus*.

**Distribution** : In West Bengal : Darjilling district, Nadia district, Bardhaman district, Medinipur district (Wroughton 1915), Calcutta district, South 24-Parganas district. In India (other than West Bengal) : Widely distributed in the Indian Peninsula northward to Gujarat and Rajasthan (Sinha 1976b) on the west, and Tripura (Agrawal & Bhattacharyya 1977) on the east. Outside India : Nepal (Worth & Shah 1969), Sri Lanka, Bangla Desh (Ahmed & Hussain 1982), Myanmar. Cambodia (Hill & Thonglongya 1972), possibly Thailand (Lekagul & McNeely 1977).

**Remarks** : Ellerman & Morrison-Scott (1951) placed *Taphozous bicolor* Temminck, 1841 in the synonymy of *Taphozous melanopogon* Temminck, 1841. Several specimens of *Taphozous bicolor* were sent from Calcutta, as mentioned by Dobson (1872) according to which author, young females of *T. longimanus* and *T. melanopogon* agree with the description of *T. bicolor*. Since no specimen of *T. melanopogon* was obtained at Calcutta and *T. longimanus* was the only *Taphozous* common about Calcutta, Dobson (1872) synonymised *bicolor* with *longimanus*. No specimen of *T. melanopogon* collected from Calcutta can be traced. Thus, Dobson's (*loc.cit.*) view appears to be more plausible.

Of the three species of *Taphozous* in West Bengal, *T. longimanus* is easily met with. The Long-armed Seath-tailed Bat rests on horizontal surface on all fours. In Bawali, a group of this bat was found to roost on the upper part of the trunk (the portion concealed by dry drooping fronds) of a palmyra palm tree, while in Krishnanagar, a couple of this bat was seen on the outer wall of an old building, on one side of its main entrance, behind a pillar. In Churpurni, they were seen roosting on the eaves of several thatched houses. All the eight females were collected from an all female breeding colony of about one hundred individuals, almost all of them carrying a baby each. The male was collected from another roost consisting of about half-a-dozen individuals.

### 11. *Taphozous saccolaimus crassus* Blyth

1844. *Taphozous crassus* Blyth, *J. Asiat. Soc. Beng.*, 13 : 491 (Mirzapur, Mirzapur district, Uttar Pradesh, India).

1844. *Taphozous pulcher* Blyth, *J. Asiat. Soc. Beng.*, 13 : 492 (Madras, Madras district, Tamil Nadu, India).

**Common name** : Pouch-bearing Bat (Eng.).

**Material examined** : Bardhaman district 1♂, Churpurni, coll. P. K. Das, 28. iv. 1988. Medinipur district : 3♂, 2♀, Chandra, coll. P. K. Das, 18. ix. 1984.

**Measurements** : External : 4♂ : Fa 67.5-73.0(69.2); Tl 21.5-27.0(24.4); E 18.4-19.5(19.0); Tb 25.9-29.6(27.1); F & Cl 14.5-18.4(16.6); Tr 6.5-8.8(7.4). 2♀ : Fa 67.7, 72.6; Tl 25.2, 32.0; E 20.0, 20.4; Tb 26.7, 28.6; F & Cl 15.5, 18.4; Tr 6.8, 7.1. Cranial : 3♂ : l 22.8-23.7(23.3); mtr 9.6-10.0(9.8); c<sup>1</sup>-c<sup>1</sup> 4.4-4.7(4.5); iw 5.1-5.2(5.1); cw 10.7-11.3(11.0); zw 15.0-16.1(15.5); m<sup>1</sup>-m<sup>1</sup> 10.0-10.2(10.1); ml 16.8-17.9(17.2). 2♀ : l 23.0(2); mtr 9.5, 10.3; c<sup>1</sup>-c<sup>1</sup> 4.5, 4.6; iw 5.0(2); cw 11.0(2); zw 15.7, 15.9; m<sup>3</sup>-m<sup>3</sup> 10.4(2); ml 17.3, 18.0.

*Diagnosis* : A large, dark brown *Taphozous* with some small, irregular white blotches or spots on dorsal surface; lower lip divided by a deep, narrow groove; legs and feet naked; interfemoral membrane naked except near point of origin of tail; radio-metacarpal pouch absent; gular sac present, larger in males; margin of ear smooth.

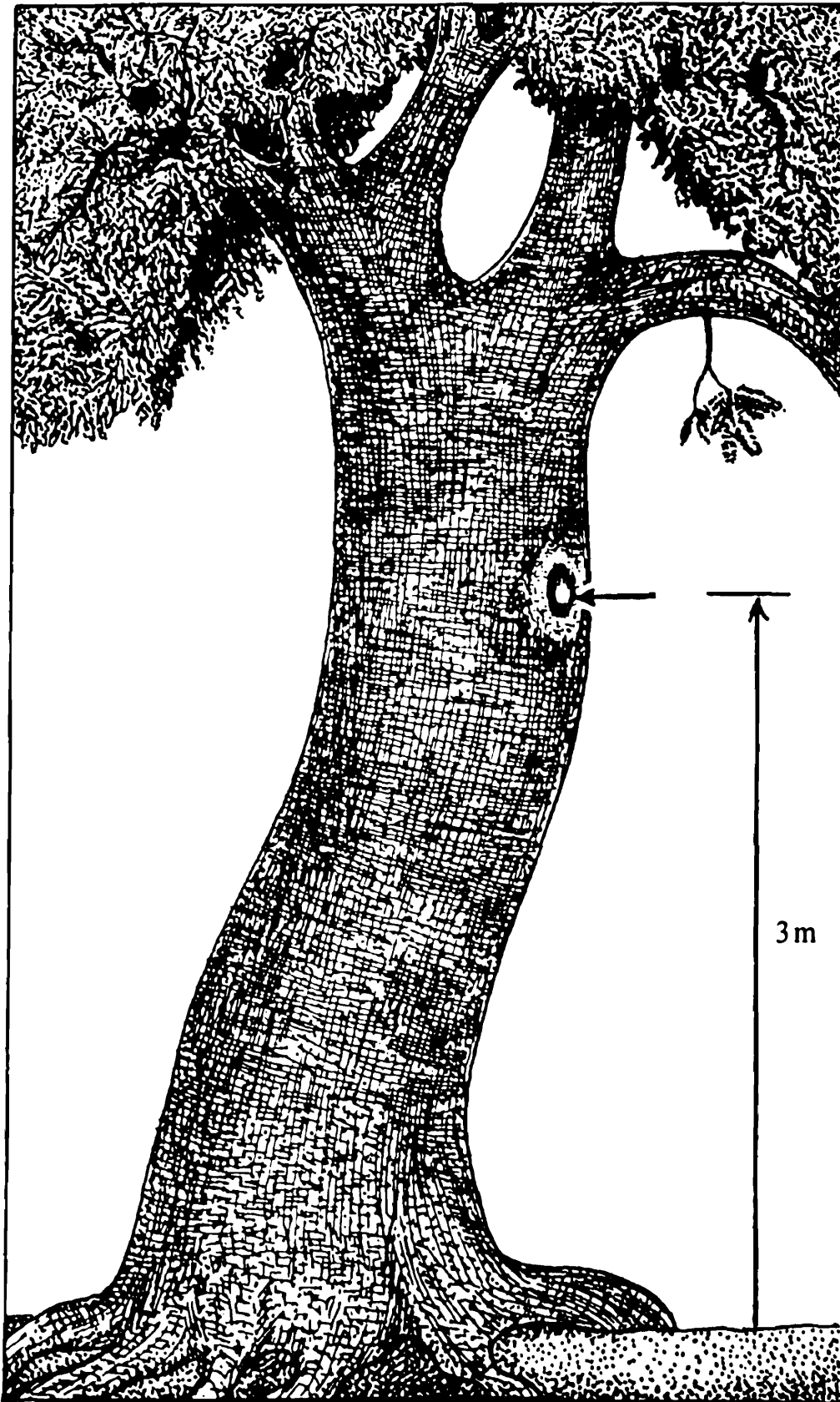
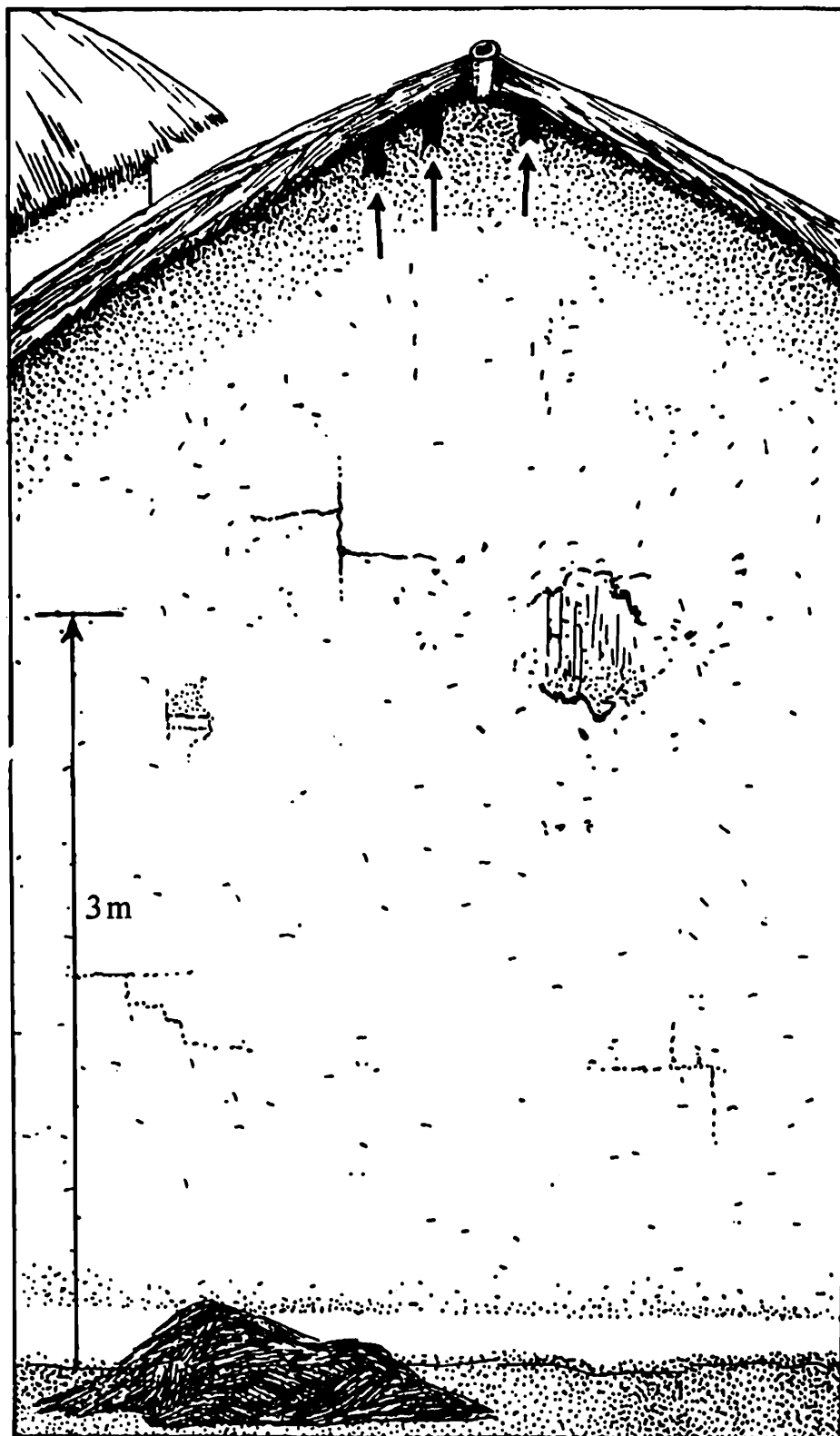


Fig. 18 Habitat of *Taphozous saccolaimus crassus* in West Bengal (hollow of a tamarind tree).

*Distribution* : In West Bengal : Bardhaman district, Medinipur district, Calcutta district (specimen in AMNH). In India (other than West Bengal) : Uttar Pradesh, Gujarat (Brosset 1962a), Maharashtra (Brosset 1962a), Karnataka (Wroughton 1913b), Kerala (specimen in ZSI), Tamil Nadu, Orissa (Wroughton 1915), Andaman & Nicobar Islands (Hill 1967). Outside India : Sri Lanka, Bangladesh (Dobson 1876), Myanmar (Lekagul & McNeely 1977), Thailand (Lekagul & McNeely 1977), Malaya Peninsula and nearby islands, Sumatra.



**Fig. 19** : Habitat of *Taphozous saccolaimus crassus* in West Bengal (eaves of a thatched house).

*Remarks* : Ellerman & Morrison-Scott (1966) have included 'Bengal' in the distribution range of *Taphozous saccolaimus crassus*. But till that time, no specimen of this bat was collected from West Bengal (Blyth 1863a; Jerdon 1867; Dobson 1876, 1878; Anderson 1881; Blanford 1891; Siddiqi 1961a). The basis of this may either be a specimen from Sylhet (then in eastern Bengal, now in Bangladesh) listed by Dobson (1876) or the specimen from Koira, Sundargarh district, Orissa, mentioned by Wroughton (1915) while reporting on a collection of mammals from 'Bengal, Bihar and Orissa'. However, on the basis of the specimens listed above, *Taphozous saccolaimus crassus* is hereby reported for the first time from West Bengal, and also from Kerala.

The only positive information about the diurnal roosting site of the Pouch-bearing Bat in India has been provided by Brosset (1962a) who has stated that a specimen of this bat collected from Anand, Gujarat, was discovered along with two others in a hole in a palm tree. The present worker could discover two other types of roosting sites of this bat at two different localities of West Bengal.

In a small village near Chandra, these bats were roosting in the hollow trunk of a medium-sized tamarind tree (*Tamarindus indica*). At the upper part of the trunk (approximately three metres above the ground) there was a circular opening of about 30 cm in diameter through which the whitish ventral surface of a bat could be seen (Fig.18). A nylon mist net was set up to collect the same. Two bats emerged through the opening just when the sun was setting. Six more of them came out subsequently. Of these, five could be netted, while the remaining three flew away. In Churpurni, three individuals of this bat were seen (at about 9.30 hours) resting on the mud wall of a thatched house near the eaves at a height of approximately five metres from the ground (Fig 19). Only one of these could be netted.

## 12. *Taphozous nudiventris kachhenis* Dobson

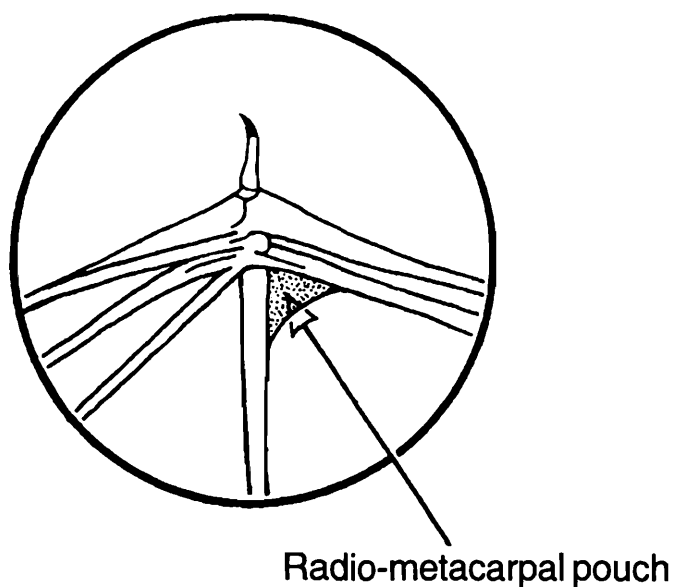
1872. *Taphozous kachhenis* Dobson, *J. Asiat. Soc. Beng.*, 41 (Pt. 2) : 221 (Kachh = Kachchh district, Gujarat, India).

*Common name* : Naked-bellied Tomb Bat (Eng.)

*Material examined* : Calcutta district : 1 unsexed, Calcutta, coll. H. A. Hafiz, 21. iv. 1939. Darjiling district : 2♂, Sivok, coll. C. A. Crump, 10, 20. iii. 1915.

*Measurements* : External : 2♂ : Fa 74.7, 78.5; Tl 35.0(2); E 22.0, 23.0; Tb 30.9, 32.7; F & Cl 18.1, 18.4. Cranial : 2♂ : l 27.6, 28.2; mtr 11.2, 11.5; c<sup>1</sup>-c<sup>1</sup> (1) 5.4; iw 5.3, 5.4; cw 12.4, 13.0; zw 16.8, 17.0; m<sup>3</sup>-m<sup>3</sup> 11.2, 11.3; ml 20.0, 20.2.

*Diagnosis* : A large blackish grey *Taphozous*; gular sac present in both sexes, but reduced in female (position marked by a semicircular fold of skin); muzzle and throat seminaked; ears papillate along margin : radio-metacarpal pouch very small (Fig. 20); wings from tibiae above ankles.



**Fig. 20** : Radiometacarpal pouch of *Taphozous nudiventris*.

**Distribution** : In West Bengal : Darjiling district (Wroughton 1916b), Calcutta district (Khajuria 1953). In India (other than West Bengal) : Jammu & Kashmir (Sharma & Sharma 1976), Delhi (Brosset 1962a), Rajasthan (Prakash 1956a), Uttar Pradesh (Brosset 1962a), Madhya Pradesh (Lindsay 1926a), Gujarat, Maharashtra, Karnataka, Andhra Pradesh (specimens in ZSI), Bihar (Wroughton 1915), Sikkim. Outside India : Afghanistan (Gaisler 1970), Pakistan, possibly Bangladesh (Siddiqi 1961a).

**Remarks** : Ellerman & Morrison-Scott (1951) considered *kachhensis* as a distinct species. Felten (1962) reviewed the group and concluded that *kachhensis* should be treated as a subspecies of the widely distributed species *Taphozous nudiventris* Cretzschmar, 1830-1831, a view held by most of recent authors (Gaisler 1970, Corbet 1980, Honacki *et al.* 1982, Corbet & Hill 1986, etc.). However, Sinha (1970, 1980, 1986), Roberts (1977) and Khajuria (1979) still prefer to maintain *kachhensis* as a species distinct from *Taphozous nudiventris*. Incidentally, Dobson (1876) also considered *kachhensis* only as a subspecies of *nudiventris*.

On the basis of specimens mentioned above, *Taphozous nudiventris kachhensis* is hereby reported for the first time from Andhra Pradesh.

#### Family MEGADERMATIDAE

Long, leaf-like noseleaf (Fig. 21A) ; ears quite large, joined to form a high band across forehead; tragus bifid; tail absent; well-developed interfemoral membrane (Fig. 21B); inguinal false teats present; premaxillae absent; postorbital process rudimentary; upper incisors absent; upper canines quit large, projecting forward and each with a secondary cusp; auditory bulla small; keel of sternum only moderately developed; second fingerr with one phalanx; insectivorous as well as carnivorous, feeding on larger insects and small frogs, birds, mice and other bats.

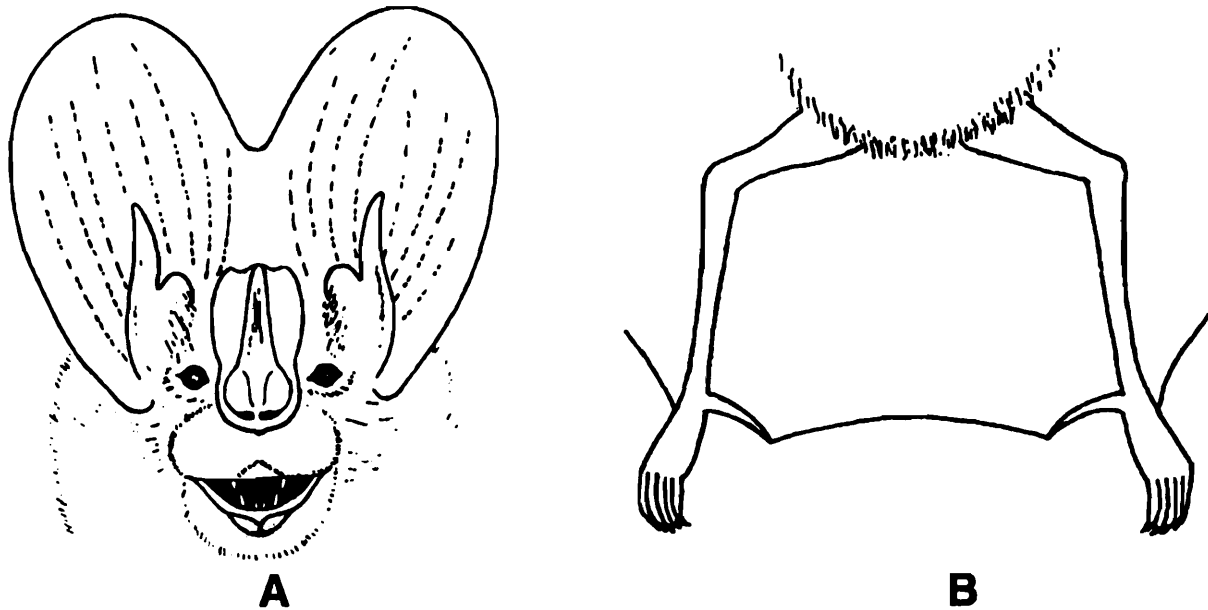


Fig. 21 : Characters of Megadermatidae : A. Head (*Megaderma lyra*); B. Interfemoral membrane.

The family Megadermatidae is represented in West Bengal by a single genus.

Genus *Megaderma* Geoffroy, 1810

Dental formula :  $i \frac{0}{2}$ ,  $c \frac{1}{1}$ ,  $pm \frac{2}{2}$ ,  $m \frac{3}{3} \times 2 = 28$ .

The genus *Megaderma* consists of two species, both of which occur in West Bengal.

#### Key to the species and subspecies of the genus *Megadarma*

Posterior termination of noseleaf round ..... *Megaderma spasma horsfieldi*

Posterior termination of noseleaf truncated ..... *Megaderma lyra lyra*

The arrangement of species is after Ellerman & Morrison-Scott (1951) and Sinha (1977).

#### 13. *Megaderma spasma horsfieldi* Blyth

1863. *Megaderma horsfieldii* Blyth, *Cat. Mammalia Mus. Asist Soc.* : 23 (India).

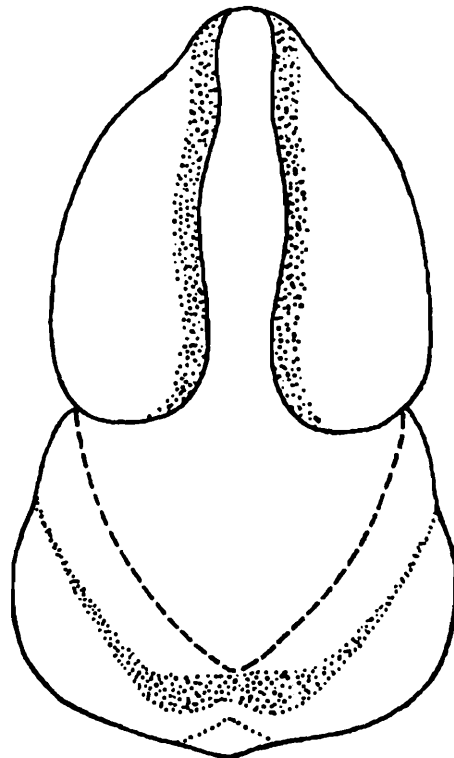
*Common name* : Malay False Vampire (Eng.).

*Material examined* : South 24-Parganas district : 5♂, 7♀, Gosaba, coll. A. K. Mandal, C. K. Misra, S. S. Saha, 12-19. ix. 1983.

*Measurements* : External : 4♂ : Fa 56.3-58.3 (57.2); E 33.8-39.7(36.3); Tb 30.0-34.0(32.0);

F & CI 14.7-16.7 (16.0); Tr 15.5-19.3(17.5). 3♀ : Fa 54.8-58.6(57.0); E 33.9-38.6(36.3); Tb 30.6-31.5(31.0); F & CI 15.3-16.4(15.8); Tr 18.2-18.6(18.4). Cranial : 2♂ : *ccl* 21.4, 21.6; *mtr* 9.9(2); *c<sup>1</sup>-c<sup>1</sup>* 4.8, 4.9; *iw* 3.8, 3.9; *cw* 10.7, 10.8; *zw* 14.1, 14.2; *m<sup>3</sup>-m<sup>3</sup>* 8.5, 8.8; *ml* 16.4, 16.6. 2♀ : *ccl* 21.0, 22.7; *mtr* 9.5, 10.2; *c<sup>1</sup>-c<sup>1</sup>* 4.7, 4.9; *iw* 3.8, 3.9; *cw* 10.7, 10.9; *zw* (1) 14.4; *m<sup>3</sup>-m<sup>3</sup>* 8.8; *ml* 16.5, 17.5.

**Diagnosis** : A medium-sized (forearm 52.0 mm) bat with large ears, noseleaf and large tragus but without externally visible tail; dorsal colour bluish slaty, ventral colour paler (dirty white); ears conjoined for nearly half the length of inner margin; tragus bifid, posterior portion long, narrow and acutely pointed; tip of noseleaf pointed (Fig. 22).



**Fig. 22** : Noseleaf of *Megaderma spasma* (after Sinha 1977).

**Distribution** : In West Bengal : Jalpaiguri district (Bhat 1974), South 24-Parganas district. In India (other than West Bengal) : Gujarat (specimen in AMNH), Goa (Agrawal 1973), Karnataka (Wroughton 1912c), Kerala (Blanford 1891, Lindsay 1926b), Tamil Nadu (Wroughton 1921b), Andhra Pradesh (specimens in ZSI), Assam (Hinton & Lindsay 1926). Hill (1967) could not allocate the only specimen of *megaderma spasma* (Linnaeus, 1758) from the South Andaman Island to any of the described subspecies. Outside India : Not known.

**Remarks** : Ellerman & Morrison-Scott (1951) recognised a number of subspecies of *Megaderma spasma* in the Indian Subregion. Sinha (1977) reviewed the species and considered only two subspecies valid, viz, *M. s. kinabalu* Chasen, 1940 from Mount Kinabalu, Borneo and the nominate subspecies in most of the remaining parts of the distributional range of the species. Sinha (*loc. cit*), however, did not examine specimens from a number of small islands from where several subspecies of *Megaderma spasma* have been described. Subsequent authors (Medway 1978, Hill 1983, Payne *et al.* 1985) did not accept Sinha's (1977) view.

Pending a more comprehensive revision of the species, the name *Megaderma spasma horsfieldi* has been used for the Indian mainland population only.

The distribution of *Megaderma spasma* in West Bengal is patchy. It is rare and restricted to forested tracts.

On the basis of the specimens mentioned above, *Megaderma spasma horsfieldi* is hereby reported for the first time from Gujarat and Andhra Pradesh, the specimen from Gujarat forming the basis of the extension of distributional range of this taxon northward.

#### 14. *Megaderma lyra lyra* E. Geoffroy

1810. *Megaderma lyra* E. Geoffroy, *Annls Mus. Hist. nat. Paris*, 15 : 190 (India, probably Madras, Madras district, Tamil Nadu).
1839. *Vespertilio (Megaderma) carnatica* Elliot, *Madras J. Litt. Sci.*, 10 : 96 (Southern Mahratta country = Dharwad district, Karnataka, India).
1844. *Megaderma spectrum* Wagner, *In Huegel. Kaschmir Reich Siek.*, 4 : 569, pl. (Kashmir, Jammu & Kashmir, India).
1847. *Megaderma schistacea* Hodgson, *J. Asiat. Soc. Beng.*, 16 : 889, pl. (Siligori, Northern Bengal towards Tarai = Shiliguri, Darjiling district, West Bengal, India).
1907. *Eucheira lyra caurina* Andersen & Wroughton, *Ann. Mag. nat. Hist.*, 19 : 136 (Surat district, Gujarat, India).

*Common name* : Indian False Vampire (Eng.)

*Material examined* : Bankura district : 3♂, 1♀, Susunia, coll. V. C. Agrawal, B. C. Saha, 7. ii. 1979, 7. i. 1985. Bardhaman district : 1♂, 2♀, Katoya, coll. P. K. Das, 2. v. 1988; 1♂, Palla Road, coll. J. P. Lal, 7. iv. 1980; 1♂, 1♀, 1 foetus, Raniganj, coll. F. Stoliczka, 15. xii. 1875. Birbhum district : 1♂, 2♀, Chandrapur, coll. A. K. Mukherjee. A. K. Poddar, 30. xii. 1980, 12, 14. xii. 1985. Calcutta district : 1♂, Alipur, coll. J. Cockburn, 1877; 2♂, 1♀, Calcutta, coll. —, —. Darjiling district : 1 unsexed, Ghyabari, coll. W. Patridge, 4. v. 1982; 1♂, Lopchu, coll. P. K. Das, 2. vi. 1980; 1♂, Shiliguri, coll. C. A. Crump, 30. iii. 1915; 1♀, Sukna, coll. P. K. Das, 21. v. 1980. Haora district; 2♂, 3♀, Birshibpur, coll. S. S. Saha, 13. i. 1966; 3♂, 1♀, Shibpur, coll. S. S. Saha, 21. vi., 1967. Hugli district : 1♂, 4♀, Barul, coll. J. P. Lal, 28, xi. 1978, 19. i. 1979, 6, xi. 1979; 1♂, 1♀, Kamardingi, coll. S. Chakraborty, J. P. Lal, 22, ii. 1974; 4♂, 2♀, Singur, coll. P. K. Das, Ajoy Kumar Mandal, 28. ix. 1974, 17, x. 1974, 9. xi. 1974, 7. xii. 1974. Jalpaiguri district : 2♂, 2♀, Chilapata, coll. S. Chakraborty, 19, 20, xi. 1983; 2♀, Khuntimari, coll. P. K. Das, R. K. Ghose, 20. ii. 1979, 13. iii. 1985. Koch Bihar district : 6♂, 6♀, Atiamochor, coll. S. Chakraborty, A. K. Mandal, 31. viii. 1983, 1. ix. 1983, 2, 3. iv. 1986; 1♀, Mathabhanga, coll. S. Chakraborty, 17. iv. 1986. Maldah district : 7♂, 1♀, Old Maldah, coll. V. C. Agrawal, 2. i. 1983. Medinipur district : 1♀, Balivasa, coll. P. K. Das, 13, ix. 1984; 2♀, Kanaisole, coll. P. K. Das 8. ix. 1984; 1♂,

Mandalpuskarini, coll. P. K. Das, 20, ix. 1984; 3♀, Medinipur, coll. C. A. Crump, 17, ix. 1914; 1♂, Salbani, coll. C. A. Crump, 14, ix. 1914; Nadia district : 1♂, Krishnanagar, coll. P. K. Das, 10, iv. 1978; 1♂, Madanpur, coll. P. K. Das, 17, vii. 1969; 1♀, Phulia, coll. D. K. Ghosal, 4, xi. 1964. North 24-Parganas district : 2♂, 1♀, 1 young ♀, Barrackpore, coll. G. Topal, — ; 3♂, 2♀, Basirhat, coll. P. K. Das, 10, 14, xi. 1972; 1♂, Falta, coll. G. Topal, 12, i. 1980; 1?, Parmadan, coll. S. S. Saha, 27, xii. 1969; 1♂, Salt Lake, coll. B. Biswas, 9, i. 1969. Puruliya district : 2♀, Ajodhya Hills, coll. A. K. Mukherjee, 25, 26, ii. 1986. South 24-Parganas district : 1♀, Bawali, coll. P. K. Das, 5, vi. 1978. West Dinajpur district : 1♀, Barduari coll. S. Chakraborty, 10, x. 1987; 1♂, 1♀, Kulik, coll. S. Chakraborty S. S. Saha, 14, vii. 1975, 9, x. 1987.

*Measurements* : External : 22♂, Fa 63.4-68.0(65.5); E 32.3-41.4(36.5); Tb 31.5-35.7(33.8); F & Cl 17.5 - 20.6(18.7); Tr 12.9-20.0(17.3). 23♀ : Fa 65.0-71.0(67.1); E 32.2-44.5(37.7); Tb 32.0-36.4(34.6); F & Cl 17.0-20.0(18.5). Cranial : 14♂ : *ccl* 23.0-24.9(24.3); *mtr* 9.5-11.3(10.6); *c<sup>1</sup>-c<sup>1</sup>* 5.2-5.8(5.6); *iw* 4.6-6.6(5.3); *cw* 11.9-12.7(12.3); *zw* 16.3-16.5 (16.4); *m<sup>3</sup>-m<sup>3</sup>* 9.4-10.0(9.7); *ml* 18.5-20.2(19.4). 10♀; *ccl* 24.7-25.6(24.6); *cw* 12.1-12.7 (12.4); *zw* 16.6-17.0(16.8); *m<sup>3</sup>-m<sup>3</sup>* 10.2-11.2(10.7); *ml* 18.7-20.2 (19.8).

*Diagnosis* : Similar to *Megaderma spasma horsfieldi* but larger (forearm 60.0-70.0 mm); posterior termination of noseleaf truncated (Fig. 23); dorsal colour slaty grey.

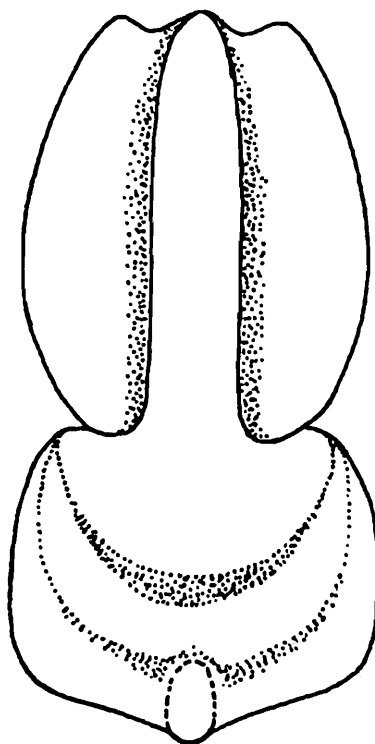


Fig. 23 : Noseleaf of *Megaderma lyra* (after Sinha 1977).

*Distribution* : In West Bengal : Darjiling district, Jalpaiguri district (Wroughton 1916b), Koch Bihar district, West Dinajpur district, Maldah district, Nadia district, Bardhaman district (Dobson 1876), Birbhum district, Puruliya district, Bankura district, Medinipur district (Wroughton 1915), Hugli district, Haora district, Calcutta district (Blyth 1863a), North 24-Parganas district, South 24-Parganas district. In India (other than West Bengal) : Widely

distributed throughout the Indian mainland from Jammu & Kashmir to Cape Camorin (Dobson 1876) and from Gujarat to Assam (Hinton & Lindsay 1926). Outside India : Afghanistan (Aellen 1959), Pakistan, Nepal (Anderson 1881), Sri Lanka, Bangladesh (Dobson 1876), Myanmar.

*Remarks* : Females are slightly larger on average for certain external and cranial measurements.

Ellerman & Morrison-Scott (1951) considered the western Indian population of the species as *Megaderma lyra caurina*, but Sinha (1977), after reviewing the species, concluded that the entire Indian population belonged to the nominate subspecies. According to Ellerman & Morrison-Scott (1951), the Myanmarese population belongs to the nominate subspecies, but Sinha (1977) allocated this population to *M. l. sinensis* (Andersen & Wroughton, 1907) which view has received little support in recent years.

*Megaderma lyra* is one of the commonest bats of West Bengal. In Bawali, the Indian False Vampire was seen roosting in small numbers (about a dozen) in a room of a dilapidated building, and in the ruins of another big building. In Bishnupur, Bankura district, these bats were seen occupying all the corridors of the famous *dolmancha*. In Katoya, a couple of these bats were seen resting in a small cow-shade, while in Balivasa about a dozen of them were found roosting in the attic of a two-storied residential building with tiled roof. In Krishnanagar, four individuals of this bat occupied the basement of a deserted service-privy. Legs of smaller frogs (*Rana* sp.), wings and feathers of the House Sparrow (*Passer domesticus*) and wings of odonates were found on the floor lying in a row just below a bar supporting the ceiling of a small garage in Kanaisole, on the night of 8 September 1984. Obviously, these were remnants of animals on which *Megaderma lyra* was feeding on that night, because two of these bats were netted afterwards while they were entering the garage.

#### Family RHINOLOPHIDAE

Noseleaf well-developed and most complicated; ears rather large; tragus absent; eyes quite small; tail long (longer than femur) and mostly included in interfemoral membrane (except *Coelops*); inguinal false teats present; premaxillae partly cartilagenous and have palatal branches only, the two neither fusing with each other nor with maxillae; upper incisors minute; nasal region inflated; postorbital process absent; palate deeply emarginate both anteriorly and posteriorly; auditory bulla small; ischium and pubis much reduced; second digit of wing has no phalanges.

The noseleaf consists of three main parts; viz—(i) anterior horizontal portion, (ii) median perpendicular portion and (iii) posterior erect portion.

The family Rhinolophidae has been divided into two subfamilies, viz, Rhinolophinae and Hipposiderinae.

Subfamily RHINOLOPHINAE

The anterior portion of the noseleaf (Fig. 24) is a thin, horse-shoe-shaped disc of naked skin with an angular deep median notch on its lower margin, which partially or completely covers the muzzle. This anterior horizontal part of the noseleaf is called the horseshoe. The

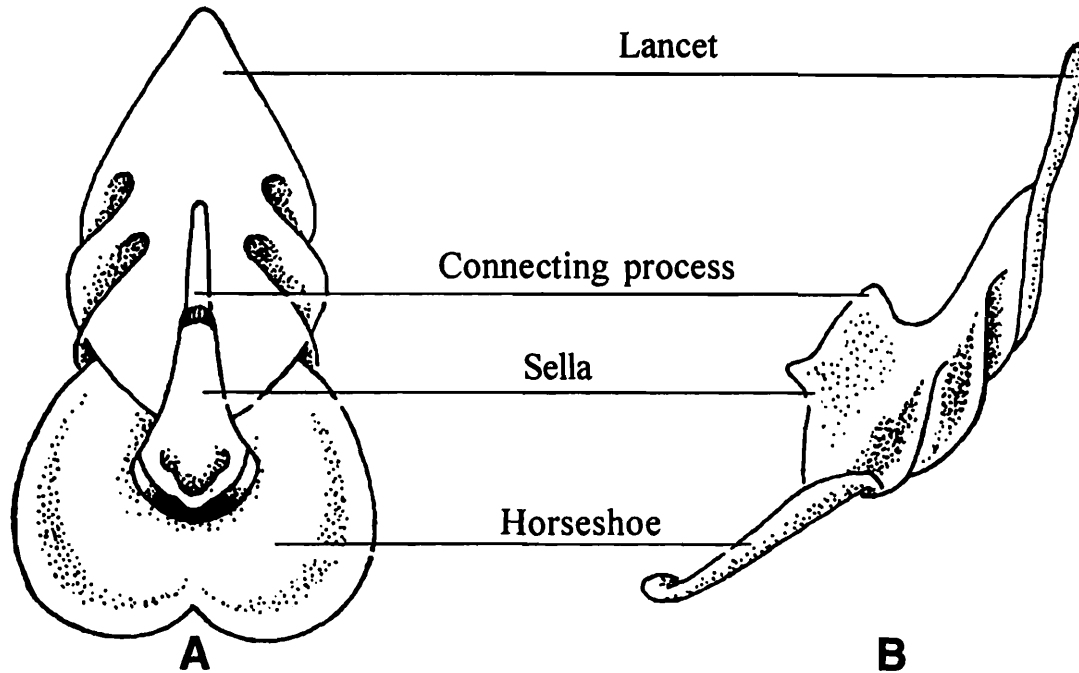


Fig. 24 : Noseleaf of Rhinolophine bat (*Rhinolophus* sp.) : A. Anterior view; B. Lateral view.

nostrils lie recessed in the middle of this part. The median portion of the noseleaf is called the sella. It is an upright thickened structure. Behind the sella and between the eyes lies the third portion of the noseleaf, known as the lancet. It is a narrow triangular structure whose distal part bends slightly forward. The base of the lancet is divided into cells by horizontal septa. A posterodorsal connecting process connects the sella with the lancet.

No frontal sac; basal portion of outer margin of ear deeply notched to form a distinct antitragus (Fig. 25); sagittal crest well-developed; cochlea large; hallux with two but other toes with three phalanges.

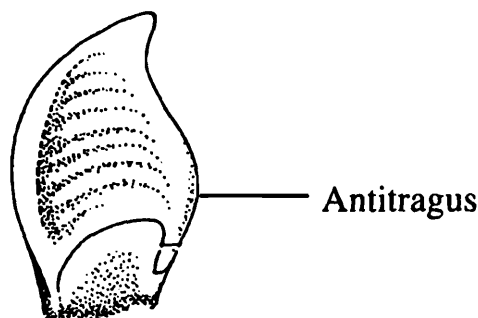


Fig. 25 : Ear of Rhinolophine bat (*Rhinolophus* sp.)

The subfamily Rhinolophinae consists of the genus *Rhinolophus* only.

Genus *Rhinolophus* Lacepede, 1799

Dental formula :  $i \frac{1}{2}, c \frac{1}{1}, pm \frac{2}{3}, m \frac{3}{3} \times 2 = 32.$

Seven species and subspecies of the genus *Rhinolophus* occur in West Bengal.

**Key to the species and subspecies of the genus *Rhinolophus***

- 1 Base of sella expanded, making a trifolium-shaped structure, frontal depression very deep ..... 2  
 Base of sella not expanded and does not make a trifolium-shaped structure, frontal depression shallow ..... 3
2. Frontal sac present ..... *Rhinolophus luctus perniger*  
 Frontal sac absent ..... *Rhinolophus trifolius trifolius*
3. Connecting process beneath top of sella ..... *Rhinolophus pearsoni*  
 Connecting process as high as or higher than top of sella ..... 4
4. Connecting process level with top of sella forming a shallow notch between them..5  
 Connecting process higher than top of sella forming a deep notch between them .. 4
5. Sides of internarial expansion parallel ..... *Rhinolophus rouxi rouxi*  
 Sides of internarial expansion arched ..... *Rhinolophus affinis himalayanus*
6. Zygomatic width less than 8.0 mm, maxillary tooth-row less than 6.0 mm.....  
 ..... *Rhinolophus pusillus blythi*  
 Zygomatic width more than 8.0 mm, maxillary tooth-row more than 6.0 mm .....  
 ..... *Rhinolophus lepidus lepidus*

The arrangement of species is after Sinha (1973).

**15. *Rhinolophus affinis himalayanus* Andersen**

1905. *Rhinolophus affinis himalayanus* Andersen, *Proc. Zool. soc. Lond.*, 2 : 103, pl. 3 (Masuri = Mussoorie, Dehra Dun district, Uttar Pradesh, India).

*Common names* : Intermediate Horseshoe Bat, Allied Horseshoe Bat (Eng.).

*Material examined* : Darjiling district : 1 ♂, 1 ♀, Pashok, coll. N. A. Baptista, i. & viii. 1915.

**Measurements** : External : 1 ♂ : Fa 50.0; E 17.7; Tb 24.1; F & Cl 11.6. 1 ♀ : Fa 48.8; E 16.6; Tb 22.4; F & Cl 10.9. Cranial : 1 ♀ : *ccl* 18.0; *mtr* 8.2;  $c^1 - c^1$  6.2; *iw* 2.7; *cw* 9.7; *zw* 10.1;  $m^3 - m^3$  8.1; *ml* 14.5.

**Diagnosis** : A medium-sized (forearm around 50.0 mm) horseshoe bat with moderate ears (around 17.0 mm) and noseleaf; frontal sac absent; lower lip with three prominent mental grooves.

**Distribution** : In West Bengal : Darjiling district, Jalpaiguri district. In India (other than West Bengal) : Uttar Pradesh, Tamil Nadu (specimen in ZSI), Meghalaya (Hinton & Lindsay 1926). Outside India : Nepal, Sri Lanka (Blyth 1863a, Sinha 1973), Bangladesh (Dobson 1876), Bhutan (Saha 1980), northern Myanmar, southern China.

**Remarks** : In West Bengal, the Intermediate Horseshoe Bat occurs only in the northern area.

On the basis of the specimen mentioned above, *Rhinolophus affinis himalayanus* is hereby reported for the first time from Tamil Nadu. Incidentally, within the Indian Union, this subspecies has so far been reported from the montane and submontane areas of northern India only. The present record from Tamil Nadu shows that it occurs in the hill ranges of southern India as well.

Another subspecies of the present species, *Rhinolophus affinis andamanensis* Dobson, 1872 occurs in the Andaman Islands (Sinha 1973).

### 16. *Rhinolophus rouxi rouxi* Temminck

1835. *Rhinolophus rouxi* Temminck, *Monogr. Mammal.*, 2 : 30b (Pondicherry, and Calcutta, Calcutts district, West Bengal, India).

1872. *Rhinolophus petersii* Dobson, *J. Asiat. Soc. Beng.*, 41 (Pt. 2) : 337 (Type-locality unknown, possibly India).

**Common name** : Rufous Horseshoe Bat (Eng.).

**Material examined** : Darjiling district : 1 ♂, Kumani, coll. R. K. Ghose, 20. iii. 1985; 2♂, Nimbong, coll. N. A. Baptista, 12. vi. 1916, 9. vii. 1916. Puruliya district : 1 ♂, Ajodhya Hills, coll. A. K. Mukherjee, 23. ii. 1982.

**Measurements** : External 4 ♂ : Fa 48.8 – 54.0(51.3); E 17.9 – 20.0(19.8); Tb(2) 24.5, 26.0; F & Cl(2) 10.3, 10.5. Cranial : 2 ♂ *ccl* 18.4, 19.6; *mtr* 8.6, 8.8;  $c^1 - c^1$  6.0, 6.2; *iw* 2.4, 2.5; *cw* 10.0, 10.2; *zw* 11.2, 11.5;  $m^3 - m^3$  8.6, 8.7; *ml* 14.7, 15.0.

**Diagnosis** : Slightly smaller than *Rhinolophus affinis himalayanus*, on average : margins of horizontal base of sella straight; colour varies from brown to orange-yellow.

**Distribution** : In West Bengal : Darjiling district, Puruliya district (Das 1986b), (?)Calcutta district, (?)North 24-Parganas district. In India (Other than West Bengal) : Himachal Pradesh (Das 1986b), Uttar Pradesh (Hutton 1872), Madhya Pradesh (Das 1986b), Maharashtra (Brosset 1962b), Goa (Agrawal 1973), Karnataka, Kerala (Jerdon 1867), Tamil Nadu, Pondicherry, Andhra Pradesh (Sinha 1973), Orissa (Das & Agrawal 1973), Sikkim (specimens in ZSI), Mizoram (specimens in ZSI), Arunachal Pradesh (specimens in ZSI). Outside India : Nepal, Sri Lanka, Myanmar (Lal 1981).

**Remarks** : Sinha (1973) has synonymised *Rhinolophus petersii* with *Rhinolophus rouxi*.

Calcutta has been stated to be one of the type-localities of *Rhinolophus rouxi*. Also, Blyth (1863a) has listed three stuffed specimens (Catalogue Numbers 68 A, B, C) of this taxon from Barrackpore (near Calcutta), North 24-Parganas district, West Bengal. Blyth (1863a) has, however, considered *Rhinolophus rouxi* and *Rhinolophus lepidus* Blyth, 1844 as synonymous. Dobson (1876) and Anderson (1881), on the other hand, have listed Blyths above-mentioned specimens under *Rhinolophus affinis* Horsfield, 1823. These very old specimens cannot be located now. Since no other specimen of *Rhinolophus rouxi/affinis* can be traced which has actually been collected from the neighbourhood of Calcutta and since *Rhinolophus lepidus* is the only species of the genus *Rhinolophus* which has ever been collected from the vicinity of Calcutta (Das 1986b), it is quite likely that the specimens under discussion are examples of *Rhinolophus lepidus*. The specimen(s) of the type-series of *Rhinolophus rouxi* alleged to have been collected from Calcutta was most probably only despatched from the Calcutta port, but have originated from some other place. It is interesting to note that Tate & Archbold (1939) have cited Darjiling as the type-locality of *Rhinolophus rouxi*.

Lal (1983) reported a specimen of *Rhinolophus rouxi sinicus* Andersen, 1905 from Arunachal Pradesh (specimen in ZSI, examined). The specimen is, in fact, an immature one of the nominate subspecies. Also, there is a second (partly damaged) specimen of this taxon in the Zoological Survey of India.

On the basis of the specimens mentioned above, *Rhinolophus rouxi rouxi* is hereby reported for the first time from Sikkim, Mizoram and Arunachal Pradesh.

### 17. *Rhinolophus pusillus blythi* Andersen

1918. *Rhinolophus blythi* Andersen, *Ann. Mag. nat. Hist.*, 2 : 376, 377 (Almora, Kumaon, 5500' = Almora, c 1,676 m, Almora district, Uttar Pradesh, India).

**Common name** : Least Horseshoe Bat (Eng.).

**Material examined** : Darjiling district : 1 unsexed, Darjiling, don. W. T. Blanford, 1857; 2 ♂, 5 ♀, Nimbong, coll. N. A. Baptista, 1 – 14, vii. 1916; 1 ♀, Pashok, coll.—, vii – viii. 1915; 2 ♂, Sangser, coll. N. A. Baptista, 27, 31. viii. 1916.

**Measurements** : External : 2 ♂ : Fa 36.9, 37.5; E 16.0, 17.0; Tb 13.5, 14; F & Cl 6.0, 7.0. 2 ♀ : Fa 36.8, 39.0; E 17.0(2); Tb 14.5, 15.6; F & Cl 7.0(2). Cranial : 2 ♂ : *ccl* 12.4(2); *mtr*(1) 5.5;  $c^1 - c^1$  3.3, 3.5; *cw* 6.2, 6.5; *zw* 7.5, 7.6;  $m^3 - m^3$  6.0, 6.5; *ml* 9.5, 9.6. 2 ♀ : *ccl* 12.6, 12.7; *mtr* 5.7, 5.8; *zw*(1) 13.8 : *ml*(1) 9.7.

**Diagnosis** : Small (forearm nearly 40.0 mm) horseshoe bat with horizontal base of sella arched and equal in width to vertical part; connecting process triangular in lateral view; tibia shorter (16.0 mm or less).

**Distribution** : In West Bengal : Darjiling district (Sinha 1973). In India (other than West Bengal) : Uttar Pradesh, Sikkim (specimen in ZSI), Assam (Hinton & Lindsay 1926, Sinha 1973), Meghalaya (Sinha 1973). Outside India : Nepal (Sinha 1973).

**Remarks** : Ellerman & Morrison-Scott (1951, 1966) considered *Rhinolophus blythi* Andersen and *Rhinolophus blythi szechwanus* Andersen, 1918 as two separate subspecies of *Rhinolophus cornutus* Temminck, 1835. Hill & Yoshiyuki (1980) have treated *Rhinolophus pusillus* Temminck, 1834 as a species distinct from the Japanese species *Rhinolophus cornutus*. Sinha (1973) has synonymised *szechwanus* with *blythi*. However, authors like Lekagul & McNeely (1977). Hill & Yoshiyuki (1980) have maintained these two as separate subspecies. Hill & Yoshiyuki's (1980) view that *blythi* is distributed in northern India and *szechwanus* in Sichuan, China, has been accepted here.

Another subspecies of the present species, *Rhinolophus pusillus gracilis* Andersen, 1905 occurs in the Malabar Coast, southwestern India (Sinha 1973, Hill & Yoshiyuki 1980).

On the basis of the specimen mentioned above, *Rhinolophus pusillus blythi* is hereby reported for the first time from Sikkim.

The specimen from Darjiling listed above is the basis of *Rhinolophus brevitarsus* Blyth, 1863 (*nomen nudum*) which was listed under *Rhinolophus ferrumequinum* (Schreber, 1774), with some doubt, by Dobson (1876) who also commented that it could perhaps be *Rhinolophus minor* Horsfield, 1828 (with *Rhinolophus pusillus* and *R. cornutus* as synonyms). Ellerman & Morrison-Scott (1966) placed *Rhinolophus brevitarsus* in the synonymy of *Rhinolophus ferrumequinum tragatus* Hodgson, 1835. The specimen (in ZSI, examined) is too small (forearm 39.0 mm) to be *ferrumequinum*, and, in fact, belongs to the present taxon. No other specimen of *Rhinolophus ferrumequinum* can be traced from West Bengal, though it is likely to occur in the Darjiling area. Till then *Rhinolophus ferrumequinum* should be excluded from the faunal list of West Bengal.

### 18. *Rhinolophus lepidus lepidus* Blyth

1844. *Rhinolophus lepidus* Blyth, *J. Asiat. Soc. Beng.*, 13 : 486 (Vicinity of Calcutta, West Bengal, India, according to Das 1986b).

*Common name* : Little Indian Horseshoe Bat (Eng.).

*Material examined* : Birbhum district : 1 ♀, Chandrapur, coll. A. K. Poddar, 11. xii. 1985. Medinipur district : 1 ♂, 1 ♀, Salbani, coll. C. A. Crump, 17. ix. 1914. South 24-Parganas district : 1 ♂, Falta, coll. G. Topal, 12. i. 1980.

*Measurements* : External : 1 ♂ : Fa 40.2; E 16.0; Tb 17.8; F & Cl 9.0. 1 ♀ : Fa 40.1 ; E 15.0; Tb 17.2; F & Cl 9.2. Cranial : 1 ♀ : *ccl* 14.9; *mtr* 6.5;  $c^1 - c^1$  4.6; *iw* 2.7; *cw* 8.4; *zw* 8.7;  $m^3 - m^3$  7.0; *ml* 11.5.

*Diagnosis* : Very much similar to *Rhinolophus pusillus blythi*, but slightly larger (forearm around 40.0 mm, on average) with relatively larger ears and noseleaf.

*Distribution* : In West Bengal : Darjiling district (Wroughton 1917b), Birbhum district, Medinipur district (Wroughton 1915), Calcutta district, North 24-Parganas district (Blyth 1863a), South 24-Parganas district. In India (other than West Bengal) : Delhi (Brosset 1962b), Rajasthan (Prakash 1956b), Uttar Pradesh, Madhya Pradesh, southern Gujarat (specimen in ZSI), Maharashtra (Wroughton 1916a), Karnataka (Wroughton 1913b), Kerala (Blanford 1891), Tamil Nadu (Das 1986b), Andhra Pradesh (Das 1986b), Orissa (Das & Agrawal 1973), Bihar (Blyth 1863a, Wroughton 1915), Meghalaya (Hinton & Lindsay 1926), Mizoram (specimens in ZSI). Outside India : Nepal (Mitchell 1980), possibly Bangladesh (Siddiqi 1961a).

*Remarks* : In recent years, there has been much discussion on the limits and different subspecies of *Rhinolophus lepidus*. Das (1986b) has summarised relevant details on these aspects and agreed in principle to Hill & Yoshiyuki's (1980) view that *Rhinolophus monticola* Andersen, 1905 should better be treated as a subspecies of *Rhinolophus lepidus*, but has also suggested that crucial specimens need to be studied to finalize the taxonomic status of *monticola*.

On the basis of the specimens mentioned above, *Rhinolophus lepidus lepidus* is hereby reported for the first time from Gujarat and Mizoram.

Four individuals of the Little Indian Horseshoe Bat were seen in a small temple in Bawali.

### 19. *Rhinolophus Luctus perniger* Hodgson

1843. *Rhinolophus perniger* Hodgson, *J. Asiat. Soc. Beng.*, 12 : 414 (Nepal).

*Common name* : Great Eastern Horseshoe Bat (Eng.).

*Material examined* : 1 ♂ (material in the Darjiling Government College), 1 ♀, 1 unsexed, 1 foetus, Darjiling, coll. J. Gammie, W. S. Sherwill, —, 1852, 1872, — ; 1 ♂, Nimbong, coll. N. A. Baptista, 23. v. 1922.

**Measurements** : External : 1 ♂ : Fa 67.5; E 40.0; Tb 33.0; F & Cl 17.0. 1 ♀ : Fa 71.8; E 34.2; Tb 37.6; F & Cl 15.8; Cranial : 1 ♂ : *ccl* 25.4; *mtr* 12.0;  $c^1 - c^1$  8.3; *cw* 11.8; *zw* 15.5;  $m^3 - m^3$  10.8; *ml* 21.5. 1 ♀ : *ccl* 25.1; *mtr* 11.8;  $c^1 - c^1$  8.1; *iw* 3.2; *cw* 12.5; *zw* 14.7;  $m^3 - m^3$  10.6; *ml* 22.0.

**Diagnosis** : Largest (forearm up to 78.0 mm) horseshoe bat of West Bengal; horseshoe broad; sella trifoliate; lower lip with one mental groove; tip of tail included in interfemoral membrane; frontal sac present, smaller in females; fur dense and wooly, usually blackish.

**Distribution** : In West Bengal : Darjiling district (Blyth 1863a). In India (other than West Bengal) : Uttar Pradesh, Madhya Pradesh (Sinha 1973), Andhra Pradesh (specimen in ZSI), Sikkim, Assam (Sinha 1973), Meghalaya (Blyth 1963a), Nagaland (Sinha 1973). Outside India : Nepal, Myanmar, possibly Thailand (Lekagul & McNeely 1977).

**Remarks** : The Great Eastern Horseshoe Bat has been obtained from West Bengal only in the Darjiling district. However, it is not uncommon in that district, in suitable habitats.

Another (smaller) subspecies, *Rhinolophus luctus beddomei* Andersen, 1905 (type-locality : Waynad district, Kerala, India) occurs in the Western Ghats of Maharashtra (Brosset 1962b), Karnataka (Brosset 1962b), Kerala, and in southern Tamil Nadu (specimen in ZSI), and according to Brosset (*loc. cit.*), in Sri Lanka.

On the basis of specimens mentioned above, *Rhinolophus luctus perniger* and *Rhinolophus luctus beddomei* are hereby reported for the first time from Andhra Pradesh and Tamil Nadu, respectively.

## 20. *Rhinolophus trifoliatum trifoliatum* Temminck

1834. *Rhinolophus trifoliatum* Temminck, *Tijdschr. Natural. Gesch. Physiol.*, 1 : 24, pl. 1, fig. 6 (Bantam, western Java).

1835. *Rhinolophus trifoliatum* Temminck, *Monogr. Mammal.*, 2 : 27, pl. 31.

**Common name** : Trefoil Horseshoe Bat (Eng.).

**Material examined** : None.

**Measurements** Nil.

**Diagnosis** : Much like *Rhinolophus luctus perniger* in respect of noseleaf, mental groove and pelage, but smaller (forearm around 50.0 mm); frontal sac absent; tip of tail free from interfemoral membrane.

**Distribution** : In West Bengal : Darjiling district. In India (other than West Bengal) : Assam (Anderson 1881). Outside India : Myanmar, Thailand, Malaya Peninsula, Sumatra, Java, Borneo, and adjacent islands.

*Remarks* : The Trefoil Horseshoe Bat is quite rare in West Bengal. It has been recorded from Darjiling district only.

### 21. *Rhinolophus pearsoni* Horsfield

1851. *Rhinolophus pearsonii* Horsfield., *Cat. Mammalia Mus. Hon. East-India Co.*, : 33 (Darjiling, Darjiling district, West Bengal, India).

*Common name* : Pearson's Horseshoe Bat (Eng.).

*Material examined* : Darjiling district : 1 ♀, Darjiling, coll. G. King, 6. iii. 1878; 1 ♂, Mahanadi, coll. P. K. Das, 25. iii. 1980; 2 ♂, Pashok, coll. —, 7. iv. 1920.

*Measurements* : External : 2 ♂ : Fa 54.0, 54.6; E 23.5, 25.5; Tb 26.2, 28.0; F & Cl 11.4, 12.2. 1 ♀ : Fa 53.1; E 24.1; Tb 26.7; F & Cl 11.5. Cranial : 1 ♂ : *ccl* 19.2; *mtr* 9.9; *c*<sup>1</sup> – *c*<sup>1</sup> 6.1; *iw* 2.8; *cw* 9.3; *zw* 11.8; *m*<sup>3</sup> – *m*<sup>3</sup> 8.6.

*Diagnosis* : A medium-sized (forearm 48.0 – 57.0 mm) horseshoe bat with broad horseshoe completely covering muzzle; sella not trifoliate; base of sella broader than vertical part; lower lip with a single mental groove.

*Distribution* : In West Bengal : Darjiling district. In India (other than West Bengal) : Uttar Pradesh, Sikkim (Hill 1987), Maghalaya (Dobson 1876, Hinton & Lindsay 1926). Outside India : Nepal (Hinton & Fry 1923), possibly Bangladesh (Khan 1982), Bhutan (Saha 1980), Myanmar (Hill 1987), southern China (Corbet & Hill 1986) including Tibet (Dobson 1876, Cai & Zhang 1981), Vietnam, Thailand (Lekagul & McNeely 1977), Malaya (Honacki *et al.* 1982).

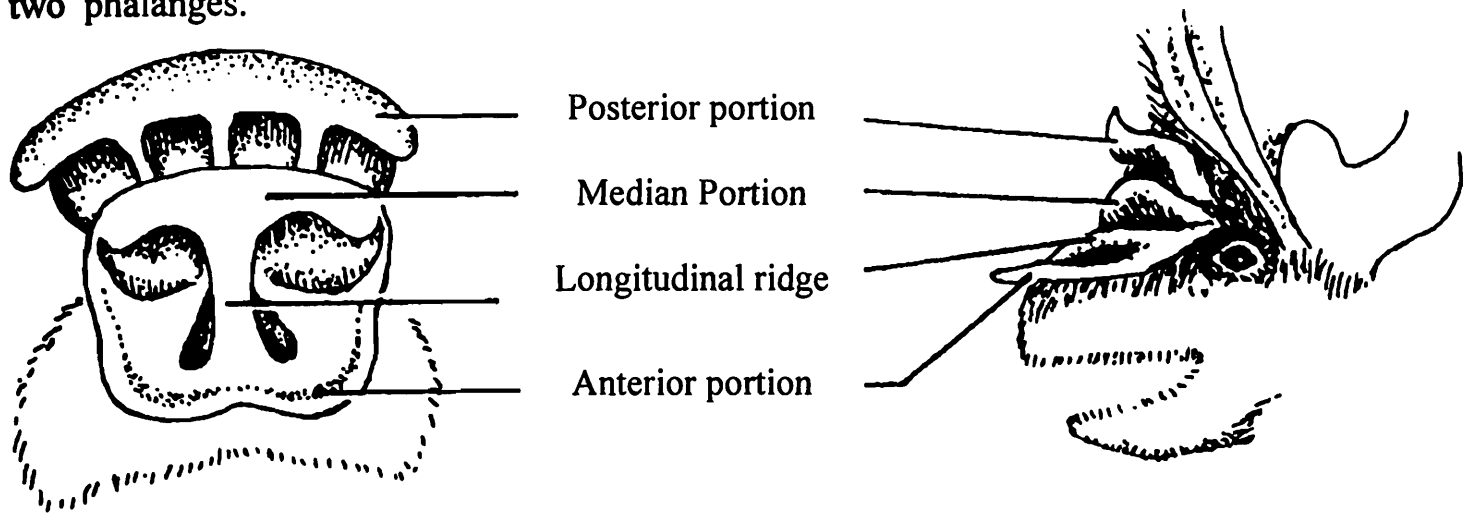
*Remarks* : Hill (1987) considers the validity of *chinensis* Andersen, 1905 as a subspecies of *Rhinolophus pearsoni* doubtful due to overlapping measurements of *pearsoni* and *chinensis*.

### Subfamily HIPPOSIDERINAE

The noseleaf (Fig. 26) is more or less an oblong naked pad. Its anterior portion is not deeply notched in the middle (except *Coelops*). The nostrils are situated in the middle of this part and are separated by a longitudinal ridge. The median portion of the noseleaf consists of a prominent transverse bar behind the nostrils. The posterior portion of noseleaf is never triangular, its hinder margin is most usually rounded and curved forward. It is divided into cells by vertical septa. Some species have supplementary leaflets ventrolateral to the anterior portion of the noseleaf.

A glandular frontal sac present in some species, whose pore opens behind posterior portion of noseleaf; no distinct antitragus; sagittal crest low; cochlea only moderately large;

pectoral girdle more highly modified; ischium and pubis much more reduced; all toes with two phalanges.



**Fig. 26.** Noseleaf of Hipposiderine bat (*Hipposideros* sp.) : A. Anterior view; B. Lateral view.

In West Bengal, two genera of the subfamily Hipposiderinae, viz— *Hipposideros* and *Coelops* are found.

**Key to the genera, species and subspecies of the subfamily *Hipposiderinae***

1. Anterior noseleaf not divided ..... 2
  - Anterior noseleaf divided into distinct lappets ..... *Coelops frithi frithi*
2. Size large (forearm more than 82.0 mm) ..... 3
  - Size small (forearm less than 42.5 mm) ..... 4
3. Posterior noseleaf narrower than anterior noseleaf; frontal sac present .....
  - ..... *Hipposideros armiger armiger*
  - Posterior noseleaf not narrower than anterior noseleaf; frontal sac absent.....
  - ..... *Hipposideros lankadiva*
4. Anterior lower premolar less reduced (length  $\frac{1}{2}$  or more than  $\frac{1}{2}$  the length of, and height  $\frac{2}{3}$  the height of posterior lower premolar) ..... 5
  - Anterior lower premolar much reduced (length  $\frac{1}{4}$  -  $\frac{1}{3}$  the length of, and height  $\frac{1}{4}$  -  $\frac{1}{2}$  the height of posterior lower premolar) ..... *Hipposideros fulvus pallidus*
5. Forearm less than 37.0 mm ..... *Hipposideros cineraceus*
  - Forearm more than 38.5 mm ..... *Hipposideros pomona gentilis*

**Genus *Hipposideros* Gray, 1831**

*Dental formula* :  $i \frac{1}{2}, c \frac{1}{1}, pm \frac{2}{2}, m \frac{3}{3} \times 2 = 30$

Five species and subspecies of the genus *Hipposideros* are known from West Bengal, the key for which has been given above.

The arrangement of species is after Hill (1963a).

**22. *Hipposideros pomona gentilis* Andersen**

1918. *Hipposideros gentilis* Andersen, *Ann. Mag. nat. Hist.*, (9) 2 : 380, 381 (Thayetmyo, Burma = Thayetmyo, east-central Myanmar).

*Common name* : Indian Bicoloured Leaf-nosed Bat (Eng.).

*Material examined* : Darjiling district : 8 ♂, 13 ♀, 2 unsexed, Pashok, coll. N. A. Baptista, C. A. Crump, 26, 29. vi. 1915, 17, 24. vii. 1915, vi – viii. 1915.

*Measurements* : External : 3 ♂; Fa 40.0 – 41.3(40.8); E 22.0 – 25.0(23.0); Tb 18.0 – 19.3(18.6); F & Cl 6.9 – 7.0(7.0). 3 ♀ : Fa 40.2 – 42.3(41.4); E 17.8 – 21.0 (19.3); Tb 18.5 – 19.6(19.1); F & Cl 7.3 – 8.5(7.8). Cranial : 3 ♂ : *ccl*(2) 15.2, 15.4; 6.4; *mtr* 6.0 – 6.3(6.1); *c<sup>1</sup> – c<sup>1</sup>* 3.1 – 3.6(3.3); *iw* 2.1 – 2.8(2.5); *cw*(2) 8.3, 9.0; *zw*(2) 8.7, 8.8; *m<sup>3</sup> – m<sup>3</sup>* 6.0 – 6.5(6.2); *ml* 10.1 – 10.9(10.4). 3 ♀ : *ccl* 15.1 – 15.2(15.1); *mtr* 6.2(3); *c<sup>1</sup> – c<sup>1</sup>* 2.5 – 3.2(2.9); *iw* 2.5 – 2.8(2.6); *cw* 8.2 – 8.5(8.3); *zw*(2) 8.2, 8.6; *m<sup>3</sup> – m<sup>3</sup>* 5.8 – 6.1(5.9); *ml* 10.1 – 10.3(10.2).

*Diagnosis* : A medium-sized (forearm 40.0 mm or more) leaf-nosed bat with large, rounded ears; anterior margin of ear strongly convex, posterior margin lacking concavity just behind tip; noseleaf lacks lateral supplementary leaflets; internarial septum more or less triangular; posterior noseleaf supported by three speta; dorsal pelage brownish, ventral parts paler; posterior projecting portion of vomer thickened; anterior lower premolar less reduced (length about half the length of, height two-third that of last lower premolar).

*Distribution* : In West Bengal : Darjiling district, Jalpaiguri district. In India (other than West Bengal) : Uttar Pradesh (Andersen 1918), Sikkim (Hill) *et al.* 1986), Assam (Hinton & Lindsay 1926), Meghalaya (Hinton & Lindsay 1926), Mizoram (specimen in ZSI), Arunachal Pradesh (Hinton & Lindsay 1926). Outside India : Nepal (specimen in ZSI), Bangladesh (specimen in ZSI), Myanmar (specimens in ZSI), southern Thailand (Lekagul & McNeely 1977, Hill *et al.* 1986) and northern Malay Peninsula (Hill *et al.* 1986).

*Remarks* : Hill (1963a) in his review of the genus *Hipposideros*, considered *Hipposideros bicolor* (Temminck, 1834) of Java, *Hipposideros pomona* Andersen, 1918 (type-locality : Haleri, N. Coorg = Haleri, Kodagu district, Karnataka, India) and *Hipposideros gentilis* as conspecific, with *pomona* and *gentilis* as subspecies. Hill *et al.* (1986) have, however,

shown that *H. bicolor* and *H. pomona* are distinct species, the former does not occur in India and that the latter is represented in India by two subspecies, the nominate sub-species occurring in the southern areas and *H. p. gentilis* in northeastern parts. Incidentally, Ellerman & Morrison-Scott (1951) also considered *gentilis* as a subspecies of *pomona*.

The specimens listed above from Darjiling district were originally reported as *Hipposideros fulvus* (Wroughton 1916b, 1916c). Following Hill *et al.* (1986), these have been identified as *Hipposideros pomona gentilis*. A male specimen collected from Hasimara, Jalpaiguri district was reported by Wroughton (1917a), as *Hipposideros fulvus*. This specimen is presumably in the British Museum (Natural History), London. Hill *et al.* (1986) did not find any specimen of *H. fulvus*, and found only *Hipposideros pomona gentilis*, from northeastern India, in that Museum. On this basis, Jalpaiguri district (adjacent to Darjiling district in northern West Bengal) has been included in the distributional range of *H. pomona gentilis*. Specimens (present in ZSI) reported from Nepal by Scully (1888), as *Phyllorhina fulva* and referred to *Hipposideros fulvus* by Hinton & Fry (1923), are actually examples of *H. pomona gentilis*. A female specimen (examined) collected by Major Godwin-Austen from 'Khasia Hills' (= Cherra Punji, East Khasi Hills district, Meghalaya), was reported by Dobson (1874), as *Ph. Fulva* and subsequently listed by the same author (Dobson 1876), as *Phyllorhina fulva*, is, in fact, an example of *H. pomona gentilis*. Similarly, specimens from Assam, Bangladesh and Myanmar listed by Dobson (1876) as *Phyllorhina fulva* are all (present in ZSI) examples of *Hipposideros pomona gentilis*. On the other hand, while referring specimens from Vietnam to *H. gentilis*, Osgood (1932) doubted the validity of *sinensis* as a subspecies. It is quite possible, even probable that *sinensis* may ultimately have to be considered as a synonym of the *H. p. gentilis*, but the same need to be formally established by studying sufficient material. Till then, Vietnam should better be excluded from the distributional range of *H. pomona gentilis*.

Again, practically nothing is known about the distribution of *Hipposideros pomona pomona* beyond the type-locality, except that Agrawal & Bhattacharyya (1976) have reported a specimen from Andhra Pradesh, as *Hipposideros bicolor pomona* (specimen in ZSI, examined). The Zoological Survey of India has specimens of this taxon also from the hilly areas of Kerala (reported as *Phyllorhina fulva* by Anderson 1881) and Tamil Nadu, besides the holotype (adult male, specimen in spirit, skull extracted but missing\*) from Karnataka.

On the basis of the above discussion, *Hipposideros pomona gentilis* is hereby reported for the first time from West Bengal, Mizoram, Nepal and Bangladesh, and *Hipposideros pomona pomona* from Kerala and Tamil Nadu, extending its range of distribution southward.

### 23. *Hipposideros fulvus pallidus* Andersen

1918. *Hipposideros fulvus pallidus* Andersen, *Ann. Mag. nat. Hist.*, (9) 2 : 381 (Junagadh, Kathiawar = Junagadh, Junagadh district, Gujarat, India).

\* According to Hill *et al.* (1986), this skull (damaged) is in the British Museum (Natural History), London.

*Common name* : Fulvous Leaf-nosed Bat (Eng.).

*Material examined* : Medinipur district : 1 ♂, 3 ♀, Laljal, coll. V. C. Agrawal, 21. i. 1985.

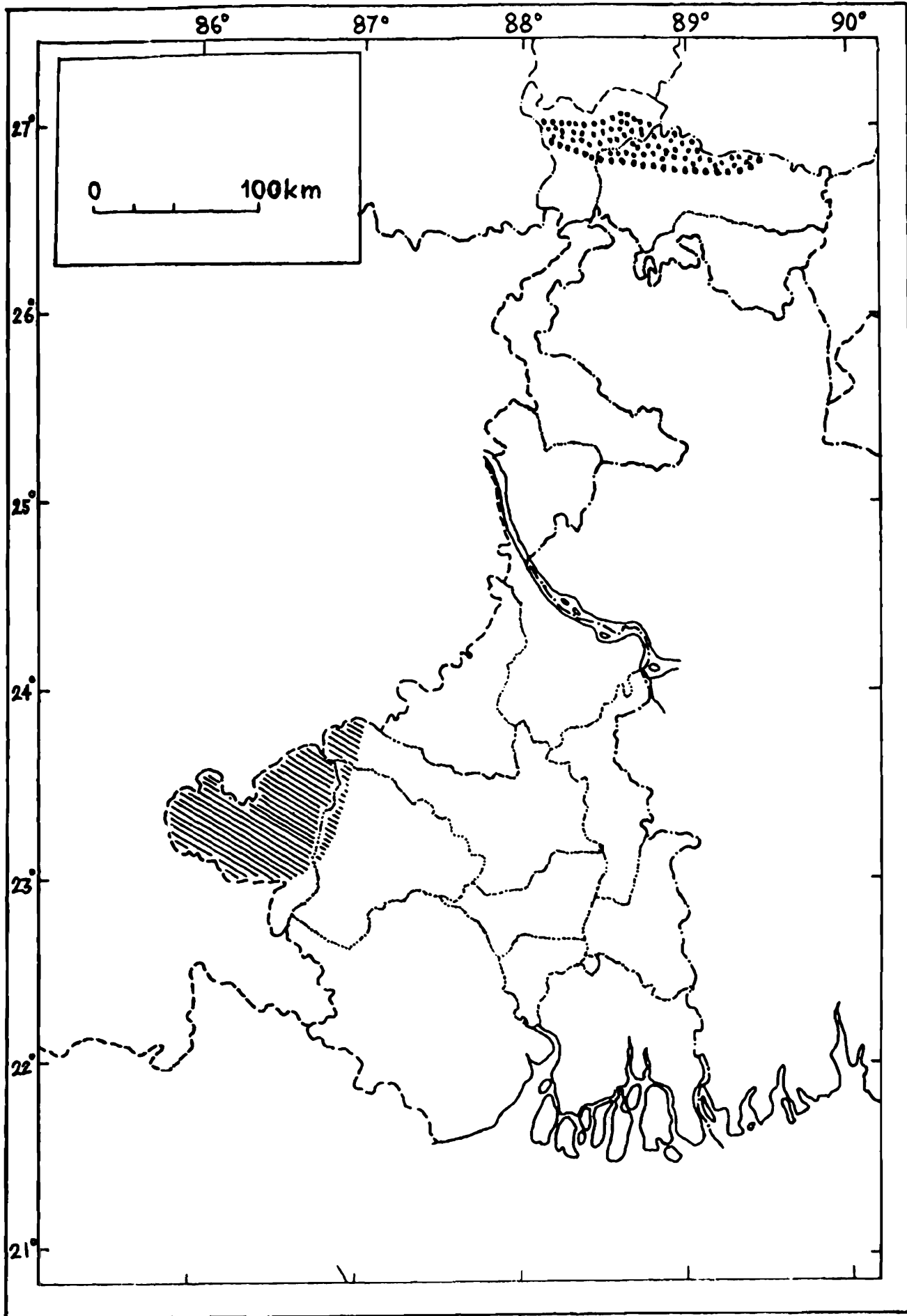
*Measurements* : External : 1 ♂ : Fa 40.2; E 17.7; Tb 17.8; F & Cl 7.4. 3 ♂ : Fa 40.0 – 41.8(40.9); E 17.7 – 19.0(18.4); Tb 18.2 – 19.5(18.9); F & Cl 7.7 – 8.2(8.0). Cranial : 1 ♂ : *ccl* 15.7; *mtr* 6.4; *c*<sup>1</sup> – *c*<sup>1</sup> 3.4; *iw* 2.6; *zw* 9.0; *m*<sup>3</sup> – *m*<sup>3</sup> 6.1; *ml* 11.0. 3 ♀ : *ccl* 15.1 – 15.2(15.1); *mtr* 6.1 – 6.3(6.2); *c*<sup>1</sup> – *c*<sup>1</sup> 3.4 – 3.6(3.5); *iw* 2.5 – 2.6(2.5); *zw* 9.0 – 9.5(9.3); *m*<sup>3</sup> – *m*<sup>3</sup>(2) 6.2, 6.3; *ml* 10.6 – 10.8(10.7).

*Diagnosis* : Ears very large, rounded, longer than head, upper third of posterior margins very slightly flattened; internarial septum narrow, uninflated, broadened at base, narrowed between nostrils; narial margins of anterior noseleaf not expanded; dorsal colour pale grey, ventral colour whitish; posterior projecting portion of vomer narrow and slender (blade-like); anterior lower premolar much reduced (length one-third or less the length of, height half or less the height of last lower premolar).

*Distribution* : In West Bengal : Medinipur district. In India (other than West Bengal) : Rajasthan (Hill 1963a), Uttar Pradesh (specimens in ZSI), Madhya Pradesh (Hill 1963a), northern Gujarat, eastern Maharashtra (Brosset 1962b), eastern Karnataka (specimen in ZSI), Tamil Nadu (specimens in ZSI), Orissa (specimens in ZSI), Bihar (Hill 1963a). Outside India : Afghanistan (Gaisler 1970), Pakistan (Wroughton 1920).

*Remarks* : Ellerman & Morrison-Scott (1951, 1966) have considered *Hipposideros fulvus* Gray, 1838, as a subspecies of *H. bicolor* (Temminck, 1834). Hill (1963a), in his review of the genus *Hipposideros*, has treated *fulvus* and *bicolor* as distinct species.

With reference to Hill *et al.*'s (1986) contention that *Hipposideros fulvus* is perhaps not to be found in northeastern India, the excellent collection of *Hipposideros fulvus* and *Hipposideros pomona* present in the Zoological Survey of India was critically examined. As a result, it has been found out that specimens listed as *Phyllorhina fulva* (= *Hipposideros fulvus*) by Dobson (1876) from present Assam, Meghalaya, Bangladesh and Myanmar are all, in fact, examples of *Hipposideros pomona gentilis*, and not *H. fulvus*. Specimens from the Nepal Valley have also turned out to be those of *H. pomona gentilis*, and not *Phyllorhina fulva* as reported by Scully (1988). The Bombay Natural History Society's Mammal Survey of India, Burma and Ceylon could not obtain a single specimen of *H. fulvus*, but could obtain as many as 52 examples of *H. pomona gentilis* (reported as *H. gentilis gentilis* by Hinton & Lindsay 1926) from nine different localities of Assam, Meghalaya and Arunachal Pradesh. Further, quite a good number of specimens obtained by the Mammal Survey from Darjiling district of northern West Bengal and Myanmar (originally reported as *H. fulvus*) are also present in the Zoological Survey of India. These are all *H. pomona gentilis*. A recent addition to the collections of the Zoological Survey of India is an example of *H. pomona gentilis* from Mizoram, one of the northeastern states of India. Thus, there is not a single specimen of *H. fulvus* in the Zoological Survey of India from northern West Bengal eastward to Myanmar.



Distribution map 3 : Distribution of *Hipposideros pomona gentilis* (bold dots) and *Hipposideros fulvus pallidus* (parallel lines) in West Bengal

The present findings, therefore, strongly support the view that *H. fulvus* does not occur in northeastern India (and further east), the northeastern most limit of the distributional range of which species appears to be southwestern part of West Bengal.

*Hipposideros fulvus pallidus* occurs in the arid, semi-arid and not-so-humid areas of India, Pakistan and Afghanistan. On the basis of specimens mentioned above, *H. fulvus pallidus* is hereby reported for the first time from West Bengal, Orissa\*, Tamil Nadu, Karnataka and Uttar Pradesh.

*Hipposideros fulvus fulvus*, on the other hand, is restricted to humid areas of western India, viz—southern Gujarat (Brosset 1962b) and Western Ghats of Maharashtra and Karnataka. It also occurs in Sri Lanka (Hill 1963a).

Blyth (1846) lists *Hipposideros murinus* (Elliot) (= *Hipposideros fulvus*) in the faunal list of Nicobar Islands. The specimens in question no more exist (Blyth 1863a, footnote on p. 36). Hill (1967) suggests that this record may refer to *Hipposideros ater nicobarulae* Miller, 1902 which externally resembles *H. fulvus*. This seems highly probable, because Blyth (1863a) considers *H. ater* Templeton, 1848 as a synonym of *H. murinus* and the only other specimens of *H. murinus* and the only other specimens of *Hipposideros bicolor* group known from different islands (Great Nicobar, Little Nicobar, Camorta, Nancowry and Car Nicobar Island) of the Nicobar group are all *H. ater nicobarulae* (Miller 1902, Hill 1967, specimens in ZSI). Thus, till authentic specimens are obtained, Nicobar Islands should be excluded from the distributional range of *H. fulvus*.

#### 24. *Hipposideros cineraceus* Blyth

1853. *Hipposideros cineraceus* Blyth, *J. Asiat. Soc. Beng.*, **22** : 410 (Bhera, near Pind Dadan Khan, Punjab Salt Range = Bhera, c 32 km SW of Pind Dadan Khan, Salt Range, The Punjab, Pakistan).

1872. *Phyllorhina micropus* Peters, *Mber. K. preuss. Adad. Wiss.* : 256 (Dehra Doon = Dehra Dun, Dehra Dun district, Uttar Pradesh, India). Ascribed to Hutton.

1872. *Phyllorhina micropus* Hutton, *Proc. zool. Soc. Lond.* : 703 (Dehra Doon = Denra Dun, Dehra Dun district, Uttar Pradesh, India).

*Common name* : Least Leaf-nosed Bat, Blyth's Leaf-nosed Bat (Eng.).

*Material examined* : Darjiling district : 1 ♂, 1 ♀, Nimbong, coll. N. A. Baptista, 1, 10. vii. 1916; 1 ♀; Pashok, coll. N. A. Baptista, —. vii – viii. 1915; 1 ♂, 1 ♀, Sangser, coll. N. A. Baptista, 27. viii. 1916.

*Measurements* External : 2 ♂ : Fa 35.0(2); Tl 19.0, 25.0; E 16.0, 17.0; Tb 15.6, 16.2; F & Cl 6.4, 6.8. 3 ♀ : Fa 35.0 – 35.6(35.2); Tl(2) 29.0, 30.0; E(2) 16.0, 17.0; Tb 14.5 –

\* Hill (1963a) included Bihar and Orissa in the range of distribution on the basis of material obtained only from the present State of Bihar part of east while combined State of Bihar and Orissa

15.5(15.0); F & Cl 6.5 – 7.5(7.1). Cranial : 1 ♂ : *ccl* 13.8; *mtr* 5.8;  $c^1 - c^1$  3.6; *iw* 2.1; *cw* 6.6; *zw* 7.0;  $m^3 - m^3$  5.5;  $c - m^3$  5.9; *ml* 10.0. 2 ♀ : *ccl*(1) 12.9; *mtr* 5.0, 5.2;  $c^1 - c^1$  2.4, 2.7; *iw* 2.6(2); *cw*(1) 7.2; *zw* — ;  $m^3 - m^3$  5.0, 5.3;  $c - m^3$  5.5, 5.8; *ml*(1) 8.7.

**Diagnosis** : Smallest *Hipposideros* of West Bengal; externally similar to *Hipposideros pomona gentilis* and *H. fulvus pallidus*, but smaller (forearm around 35.0 mm); dosal colour dusky grey, basal three-fourth of hairs greyish-white which show through, especially on head and neck; ventral parts greyish-white; internarial septum more or less parallel-sided and inflated; zygomatic arch narrow and delicate; anterior upper premolar small, compressed between canine and posterior upper premolar, not extruded from toothrow (canine does not touch posterior premolar at any point).

**Distribution** : In West Bengal : Darjiling district (Siddiqi 1961a). In India (other than West Bengal) : Haryana (Hinton & Thomas 1926), Uttar Pradesh, Assam (Hinton & Lindsay 1926), Meghalaya (Hinton & Lindsay 1926), Arunachal Pradesh (Hinton & Lindsay 1926). Outside India : Pakistan, Nepal (Hinton & Fry 1923), Myanmar, Vietnam, Laos (Phillips 1967), Thailand, Malaya Peninsula, Rhio Archipelago, Anamba Islands, Borneo, (?) Philippine Islands (Hill & Francis 1984).

**Remarks** : Ellerman & Morrison-Scott (1951, 1966) have recognized two subspecies of *Hipposideros cineraceus*, viz— the nominate one and *H. c. micropus*. Hill & Francis (1984) have, however, synonymised *micropus* with the nominate subspecies. These authors (Hill & Francis 1984) have also tentatively considered *Hipposideros wrighti* Taylor, 1834 of Philippine Islands as a synonym of *H. cineraceus*.

## 25. *Hipposideros armiger armiger* (Hodgson)

1835. *Rhinolophus armiger* Hodgson, *J. Asiat. Soc. Beng.*, 4 : 699 (Nepal).

**Common names** : Great Himalayan Leaf-nosed Bat (Eng.).

**Material examined** : Darjiling district : 1 ♂, Darjiling, coll. W. S. Sherwill, 1852; 1 ♀, Goomti, coll. P. K. Das, 25. v. 1980; 1 ♂, 1 ♀, Gopaldhara, coll. N. A. Baptista, 9. v. 1916; 1 ♂, Lopchu, coll. P. K. Das, 2. vi. 1980; 2 ♂, 3 ♀, Mahanadi, coll. P. K. Das, 26, 27. v. 1980; 1 ♀, Nimbong, coll. N. A. Baptista, 22. vi. 1916; 7 ♂, 8 ♀, Pashok, coll. N. A. Baptista, 4. viii. 1915, 5. ix. 1915, 7. x. 1915, 8, 10, 24, 25. vii. 1916; 3 ♂, 1 ♀, Tongsong, coll. N. A. Baptista, 9, 12. vi. 1916.

**Measurements** : External : 5 ♂ : Fa(4) 82.4 – 96.5(90.1); E 32.0 – 35.2(33.7); Tb 40.0 – 43.0(40.9); F & Cl 16.0 – 19.3(17.5). 5 ♀ : Fa 88.7 – 91.2(89.6); E 30.0 – 32.0(30.8); Tb 36.3 – 39.2(38.0); F & Cl 14.8 – 16.0(15.5). Cranial : 9 ♂ : *ccl*(7) 21.3 – 22.3(21.8); *mtr* 12.0 – 12.6(12.2);  $c^1 - c^1$  6.5 – 8.3(7.5); *iw* 3.9 – 4.7(4.2); *zw*(7) 16.9 – 18.6(17.8);

*ml*(5) 20.9 – 21.9(21.4). 5 ♀ : *ccl* 21.3 – 21.9(21.5); *mtr*(4) 12.0 – 12.1(12.1); *c*<sup>1</sup> – *c*<sup>1</sup>(3) 5.7 – 6.7(6.3); *iw* 4.0 – 4.5(4.3); *zw*(3) 17.5 – 17.8(17.6); *ml*(2) 20.6, 21.5.

**Diagnosis** : Largest (forearm may reach 96.0 mm or even more) leaf-nosed bat of West Bengal; ears large, broad and acutely pointed, posterior margins concave behind tip, slight thickening at antiragial region; noseleaf with four supplementary leaflets, fourth rudimentary; median portion of noseleaf slightly inflated with a prominent eminence at middle; upper edge of posterior noseleaf flattened, thickened and trilobate, and supported by one prominent median and two less evident lateral septa; frontal sac prominent in males, small in females.

**Distribution** : In West Bengal : Darjiling district (Blyth 1863a), Jalpaiguri district (Inglis *et al.* 1919). In India (other than West Bengal) : Uttar Pradesh, Sikkim (Blanford 1891), Assam (Hinton & Lindsay 1926), Meghalaya (Dobson 1874), Manipur (specimen in ZSI). Outside India : Nepal, Myanmar, southeastern China (Sichuan, Yunan, Fujian, etc.), Hong Kong (Phillips & Wilson 1968), Vietnam, Thailand (Ledagul & McNeely 1977), Malaya Peninsula, and nearby islands (Anderson 1881).

**Remarks** : Ellerman & Morrison-Scott (1951) recognised a number of subspecies of *Hipposideros armiger* of which Hill (1963) has synonymised *swinhoii* Peters, 1871 (type-locality : Amoy, Fujian, China) and *debilis* Andersen, 1906 (type-locality : Province Wellesley, Federation of Malaya) with the nominate subspecies. The distribution of *H. a. armiger*, as given above, is based on Hill's (*loc. cit.*) concept.

On the basis of the specimen mentioned above, *Hipposideros armiger armiger* is hereby reported for the first time from Manipur.

## 26. *Hipposideros lankadiva* Kelaart

1850. *Hipposideros lankadiva* Kelaart, *J. Ceylon Brch R. Asiat. Soc.*, 2 : 216 (Kornegalle Tunnel, Kandy, Ceylon = Sri Lanka).

**Common name** : Sri Lanka Gigantic Leaf-nosed Bat or Kelaart's Leaf-nosed Bat (Eng.).

**Material examined** : Darjiling district : 1 ♀, Darjiling, coll. J. Anderson, 1867, Jalpaiguri district : 5 ♂, 1 ♀, Khuntimari, coll. S. Chakraborty, S. S. Saha, 19. vii. 1975, 8, 9. ix. 1983.

**Measurements** : External 3 ♂ : Fa 86.6 – 93.4(90.8); E 18.0 – 26.7(21.0); Tb 35.0 – 36.7(35.8); F & Cl(2) 15.8, 16.0. 1 ♀ : Fa 87.0 : E 18.0; Tb 32.2; F & Cl 16.1. Cranial : 2 ♂ : *ccl* 26.5, 27.2; *mtr* 14.3, 14.5; *c*<sup>1</sup> – *c*<sup>1</sup> 8.7, 8.9; *iw* 3.5(2); *cw* 15.2, 15.7;

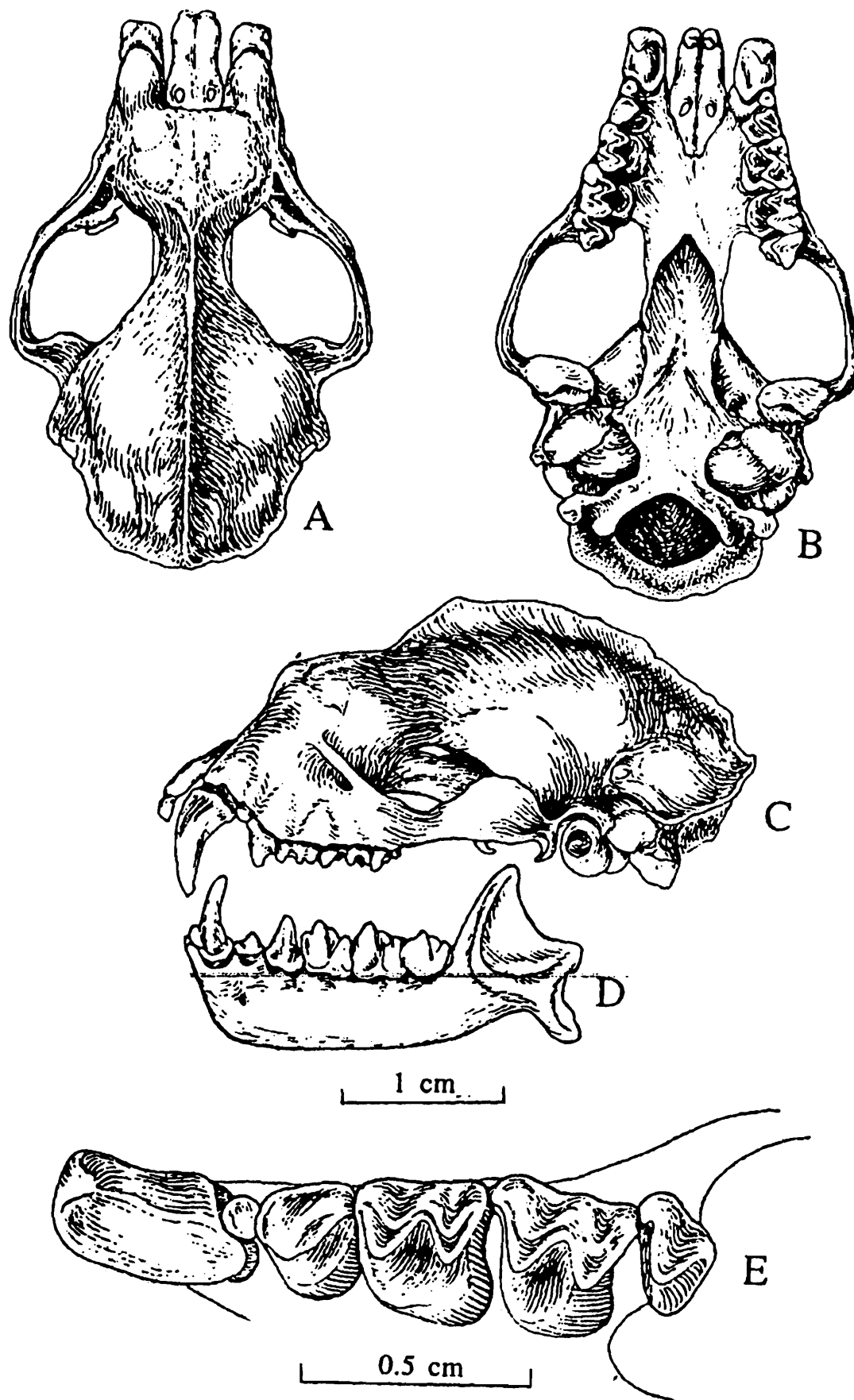
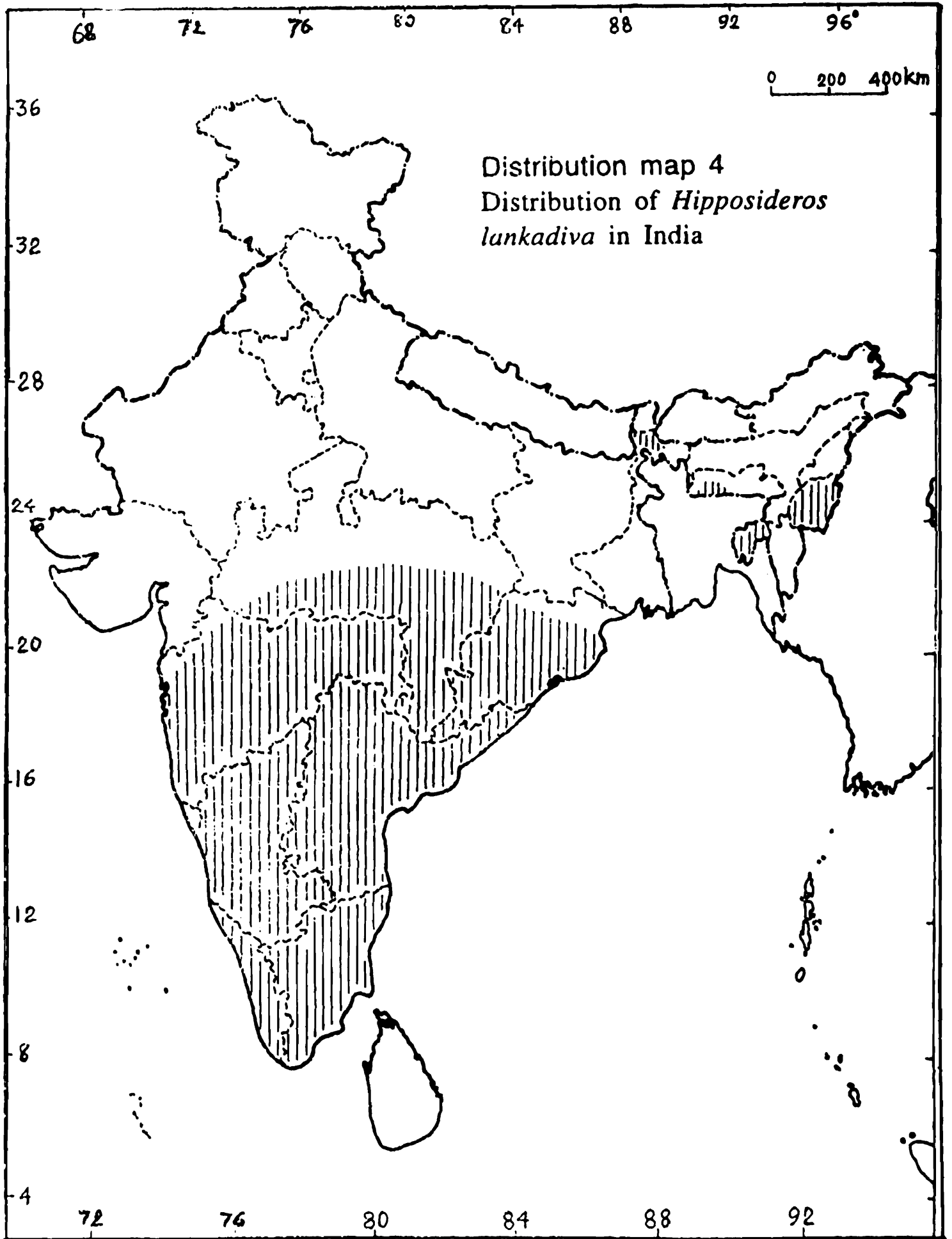


Fig. 27 : Skull of *Hipposideros lankadiva* : A Dorsal view; B. Ventral view; C. Lateral view; D. Lateral view of lower jaw; E. Occlusal view of upper maxillary tooth-row.



Distribution map 4 Distribution of *Hipposideros lankadiva* in India.

zw 19.9, 0.6;  $m^3 - m^3$  12.6, 13.4; ml 24.7, 25.4. 2 ♀ : ccl 26.9, 27.0; mtr 13.3, 13.8;  $c^1 - c^1$  7.0, 9.8; iw 3.5, 3.9; cw 14.0, 15.0; zw(1) 19.8;  $m^3 - m^3$  12.8, 13.4; ml(1) 24.5.

**Diagnosis** : Ears large, acutely pointed, posterior margins slightly concave behind tip; noseleaf with four supplementary leaflets, fourth much reduced, often absent; posterior portion of noseleaf high and broad, upper margin semicircular and supported by three septa.

**Distribution** In West Bengal : Darjiling district, Jalpaiguri district. In India (other than West Bengal) Karnataka, Andhra Pradesh (specimens in ZSI), Maharashtra (Sapkal & Bhandarkar 1984), Madhya Pradesh, Orissa (specimens in ZSI), Meghalaya (Kemp 1924), Tripura (specimen in ZSI), Manipur (specimen in ZSI). Outside India : Sri Lanka, northern Myanmar (Andersen 1907).

**Remarks** : The specimen listed above from Darjiling was entered under *Phyllorhina diadema* (E. Geoffroy, 1813) by Anderson (1881). It is, indeed, an example of the present species.

Ellerman & Morrison-Scott (1951) have recognised three subspecies of *Hipposideros lankadiva* from the Indian mainland, viz.—*H. l. indus*, *H. l. mixtus* and *H. l. unitus*, and *H. schistaceus* as a separate species. Brosset (1962b) has studied *H. lankadiva* from several localities of western and central India and has found that colour variation is a rule rather than an exception in this species. He (Brosset 1962b), therefore, has not recognised any of the above-named subspecies (as also *schistaceus*, which he erroneously mentioned as a subspecies). Hill (1963a), in his review of the genus *Hipposideros*, has maintained all these subspecies (and *schistaceus* as a separate species), but has also stated that *indus* and *mixtus* are likely to prove synonymous. A tentative examination of the good collection of *Hipposideros lankadiva* present in the Zoological Survey of India, as also those in the Bombay Natural History Society and the American Museum of Natural History, U.S.A. (brought on loan for study) has revealed that though the peninsular Indian population is rather smaller as compared to that of Sri Lanka, at least some of the specimens from northeastern India are as large as those from Sri Lanka. A thorough analysis of the data is, therefore, necessary to resolve the problem of subspecies in *H. lankadiva vis-à-vis* the taxonomic status of *Hipposideros schistaceus*.

On the basis of the specimens listed and mentioned above, *Hipposideros lankadiva* is hereby recorded for the first time from Andhra Pradesh, Orissa, West Bengal, Tripura and Manipur. This not only extends the distributional range of the species to further northeastern areas in India, but also fills up the lacuna in the same (northeast up to Bhamo in northern Myanmar).

Genus *Coelops* Blyth, 1848

Dental formula :  $i \frac{1}{2}, c \frac{1}{1}, pm \frac{2}{2}, m \frac{3}{3} \times 2 = 30.$

One species and subspecies of the genus *Coelops* had been recorded from West Bengal.

27. *Coelops frithi frithi* Blyth

1848. *Coelops frithii* Blyth, *J. Asiat. Soc. Beng.*, 17 : 251 (Sundarbans, Bengal, India = Sundarban, (?) South 24-Parganas district, West Bengal, India\*).

*Common name* : Tailless Leaf-nosed Bat (Eng.).

*Material examined* : None.

*Measurements* : Nil.

*Diagnosis* : A small (forearm around 35.0 mm), rather unusual looking leaf-nosed bat with no visible external tail; ears funnel-shaped, whole surface hairy, antitragal lobe very broad (Fig. 28); supplementary lappets of anterior noseleaf come forward beyond end of muzzle; face and sides of noseleaf covered with long hairs; thumb included in wing almost to base of claw; wing from tarsus close to ankle; tail about 2.0 mm, concealed under hairs; colour of fur shining brown above and below, bases of hairs much paler.

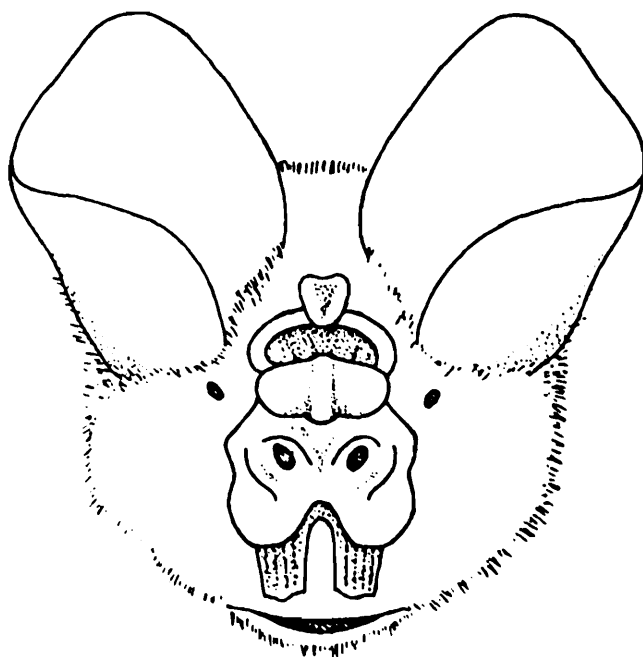


Fig. 28 : Head of *Coelops frithi*.

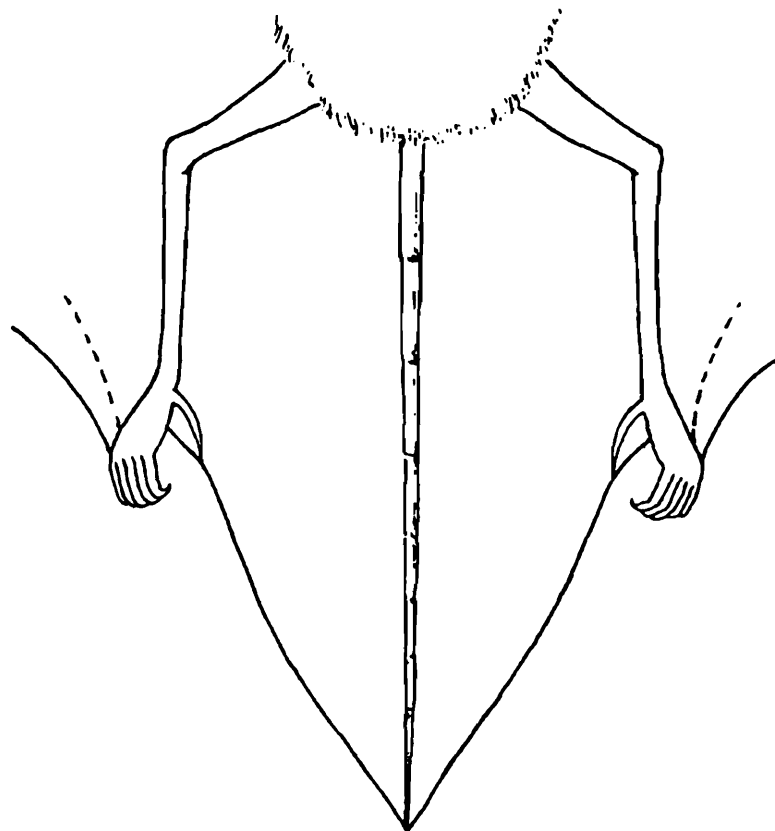
*Distribution* : In West Bengal : Darjiling district (Blanford 1891), (?)South 24-Parganas district. In India (other than West Bengal) : Meghalaya (Hinton & Lindsay 1926). Outside India : Probably Bangladesh (Khan 1982), Myanmar (Hill 1962), Thailand (Lekagul & McNeely 1977).

\* The type-specimen possibly or even probably came from Bangladesh part of Sundarban, because Mr. R. W. G. Frith, the collector, was posted at Mymensingh, part of erstwhile eastern Bengal, now in Bangladesh.

**Remarks :** The Tailless Leaf-nosed Bat is one of the rarest bats of West Bengal. It has been collected only on two occasions from this state, during the last century.

Family VESPERTILIONIDAE

Noseleaf absent; inner margin of ear arises from side of head (not forehead); tragus well-developed; eyes minute; tail (Fig. 29) long (about as long as forearm) and included in interfemoral membrane from base to tip or to penultimate joint; interfemoral membrane wide; premaxillae separate, without palatal branches; upper incisors usually small, separated medially; no postorbital process; palate widely emarginate anteriorly, abruptly narrowed behind last molars; sternum scarcely keeled; second finger with one phalanx; third finger with three phalanges, distal phalanx mostly cartilagenous.



**Fig. 29** Tail of Vespertilionid bat (*Myotis* sp.).

The family Vespertilionidae is the largest family of bats. It is equally true for West Bengal (and India). Four subfamilies of the family Vespertilionidae are known from India. All these four subfamilies are also represented in West Bengal.

**Key to the subfamilies of the family *Vespertilionidae***

- 1 Nostrils laterally elongated and tubular (Fig. 30B) ..... MURININAE
- Nostrils not elongated (Fig. 30A) ..... 2

- 2. Ears funnel-shaped ..... KERIVOUlinae
- Ears not funnel-shaped ..... 3
- 3. Second phalanx of third finger much elongated, nearly three times as long as first ..... MINIOPTERinae
- Second phalanx of third finger not elongated ..... VESPERTILIONinae

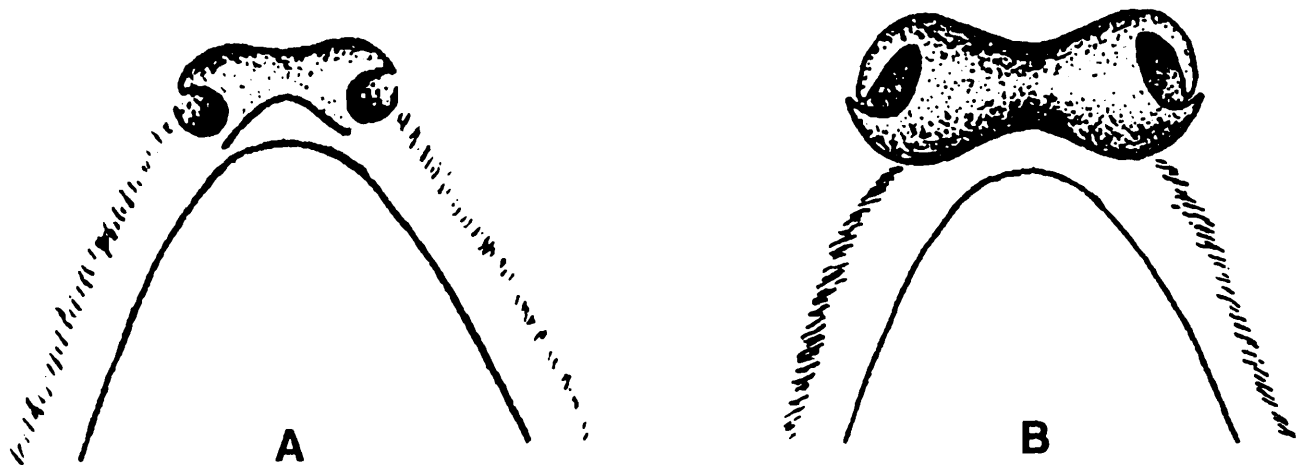


Fig. 30 Nostrils in Vespertilionid bats : A. Non-Murinine bat (*Pipistrellus* sp.); B. Murinine bat (*Murina* sp.).

Subfamily VESPERTILIONinae

Key to the genera of the subfamily *Vespertilioninae*

- 1 Cheek-teeth six on each side of upper and lower jaw ..... *Myotis*
- Cheek-teeth less than six on each side of upper and lower jaw ..... 2
- 2. Upper premolars 2 – 2 ..... 3
- Upper premolars 1 – 1 ..... 7
- 3. Lower premolars 3 – 3 ..... *Plecotus*
- Lower premolars 2 – 2 ..... 4
- 4. Outer upper incisor not extending beyond cingulum of inner ..... *Scotozous*
- Outer upper incisor extending distinctly beyond cingulum of inner ..... 5
- 5. Fifth finger only a little longer than metacarpal of fourth and third ..... *Nyctalus*

- Fifth finger longer than metacarpal and first phalanx of fourth and third ..... 6
6. Ears joined ..... *Barbastella*  
 Ears separate ..... *Pipistrellus*
7. Upper incisors 2 – 2 ..... 8  
 Upper incisors 1 – 1 ..... 10
8. Skull noticeably flattened ; soles of feet expanded into fleshy pads ..... *Tylonycteris*  
 Skull not noticeably flattened; soles of feet normal ..... 9
9. Outer upper incisor large, crowded inward between inner incisor and canine .....  
 ..... *Hesperoptenus*  
 Outer upper incisor small, on outer side of inner incisor and separated from canine .....  
 ..... *Eptesicus*
10. First and second upper molars with ‘W’ pattern distorted or nearly absent .....  
 ..... *Scotophilus*  
 First and second upper molars with ‘W’ pattern not distorted ..... 11
11. Larger (forearm more than 55.0 mm) ..... *Scotomanes*  
 Smaller (forearm less than 40.0 mm) ..... *Scotoecus*

Genus *Myotis* Kaup, 1829

Dental formula :  $i \frac{1}{2}, c \frac{1}{1}, pm \frac{3}{3}, m \frac{3}{3} \times 2 = 38$ . (pm  $\frac{2}{2}$  in *My. annectans*).

Seven species and subspecies of the genus *Myotis* occur in West Bengal.

**Key to the species and subspecies of the genus *Myotis***

1. Length of foot and claw less than half the length of tibia ..... 2  
 Length of foot and claw equal to, or more than half the length of tibia .....  
 ..... *Myotis hasseltii*
2. Forearm more than 40.0 mm ..... 3  
 Forearm less than 40.0 mm ..... 5
3. Forearm less than 50.0 mm ..... *Myotis annectans*

- Forearm 50.0 mm or more ..... 4
4. Both dorsal and ventral pelage orange coloured ..... *Myotis formosus formosus*  
 Both dorsal and ventral pelage dark brown ..... *Myotis sicarius*
5. Braincase domed ..... *Myotis siligorensis siligorensis*  
 Braincase not domed ..... 6
6. Dorsal pelage brownish, ventral pelage whitish ..... *Myotis mystacinus nipalensis*  
 Dorsal pelage blackish brown, ventral pelage ochraceous brown .....  
 ..... *Myotis muricola muricola*

The arrangement of species is essentially after Ellerman & Morrison-Scott (1951). However, *Myotis sicarius* belonging to the subgenus *Myotis* has been placed first. Other deviations from these authors' arrangement are due to acceptance of results of subsequent revisionary studies.

### 28. *Myotis sicarius* Thomas

1915. *Myotis sicarius* Thomas, *J. Bombay nat. Hist. Soc.*, 23 : 608 (Northern Sikkim, India).

*Common name* : Sikkim Bat (Eng.).

*Material examined* : None.

*Measurements* : Nil.

*Diagnosis* : A rather large-sized (forearm 53.0 mm or more) *Myotis*; dark brown above and below, extreme tips of hairs of belly whitish; inner margin of ear convex below, nearly straight above, tip narrowly rounded off, outer margin slightly concave above, convex below, basal lobe narrow; tragus rather short, basal lobule large and rounded; wings from metatarsus near base of toes; post-calcariol lobe narrow.

*Distribution* : In West Bengal : Darjiling district (Wroughton 1916c). In India (other than West Bengal) : Sikkim. Outside India : Nepal (Fry 1925).

*Remarks* : *Myotis sicarius* appears to be one of the rarest bats of West Bengal. So far, only three specimens have been collected from Pashok, Darjiling district, in the year 1915.

### 29. *Myotis mystacinus nipalensis* (Dobson)

1844. *Vespertilio pallidiventris* Hodgson, *Calcutta J. nat. Hist.*, 4 : 286, *Nomen nudum*.

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

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

*Common name* : Nepal Bat (Eng.).

*Material examined* : Darjiling district : 1 unsexed, Darjiling, coll. H. J. Elwes, 1871. Jalpaiguri district : 2 ♂, 2 ♀, Hasimara, coll. N. A. Baptista, 17, 19. iii. 1916.

*Measurements* : External : 1 ♂ : Fa 34.0; E 12.0; Tb 13.0; F & Cl 6.0. 1 ♀ : Fa 35.5; E 13.0; Tb 12.4; F & Cl 6.1. Cranial : 2 ♂ : *l* 13.6, 14.0; *mtr* 5.0, 5.2; *c*<sup>1</sup> – *c*<sup>1</sup> 3.3, 3.7, *iw* 3.5(2); *cw* 6.8, 7.0; *m*<sup>3</sup> – *m*<sup>3</sup> 5.4, 5.5; *ml*(1) 9.5. 2 ♀ : *l* 12.9, 13.5; *mtr* 5.1(2); *c*<sup>1</sup> – *c*<sup>1</sup> 3.3, 3.5; *iw* 3.4, 3.5; *cw* 6.5, 6.8; *zw*(1) 8.6; *m*<sup>3</sup> – *m*<sup>3</sup> 5.6, 5.7.

*Diagnosis* : A small-sized (forearm around 35.0 mm) *Myotis*; ears moderately long, narrow and pointed, outer margin below tip deeply emarginated, lower portion slightly convex; tragus long, narrow and pointed, lobule at base; dorsal hair blackish brown with shiny, paler ochraceous tip; ventral colour whitish, individual hairs blackish at base, tipped with silvery white or creamy white; wing from base of toes.

*Distribution* : In West Bengal : Darjiling district Jalpaiguri district (Hill 1983). In India (other than West Bengal) : Jammu & Kashmir; Himachal Pradesh (Hill 1983), Assam (specimen in ZSI). Outside India : Possibly Pakistan (Roberts 1977), Nepal.

*Remarks* : Ellerman & Morrison-Scott (1951) have treated *muricola* (Gray) and *nipalensis* (Dobson) as subspecies of *Myotis mystacinus* (Kuhl, 1819). Corbet (1980) has shown that *muricola* is not *mystacinus*. Hill (1983) has concluded that the specimens reported from Hasimara by Wroughton (1917a) and from Himachal Pradesh by Lindsay (1926c) as *muricola*, as also some specimens from Kashmir are to be regarded as *Myotis mystacinus nipalensis*.

The specimen (a male) from Assam, mentioned above, was collected by Dr. S. L. Hora and Dr. M. L. Roonwal on 7 November 1939 from the bed of the River Bhareli at Lokra, near Balipara of Sonitpur district. As per field notes by the collectors, two or three of these bats were seen flying along the river bank and were occasionally hiding beneath the pebbles on the river bed. The bat was caught in broad daylight, at 11.00 hrs. A similar habitat (under stones in the bed of Torsa River, Jalpaiguri district) was reported by Inglis *et al.* (1919) for a bat which they identified as *Myotis muricola*. This bat should, obviously, be referred to *M. mystacinus nipalensis*, as the place from where it was collected is very near to Hasimara from where specimens reported earlier as *M. muricola* have been identified as *M. mystacinus nipalensis*. Incidentally, the type-specimen of *M. meinertzhagni* was collected from the junction of two rivers. The specimen from Chirot, Pattan Valley, Himachal Pradesh was also collected from a place near the junction of River Chandra and River Bhaga (Lindsay 1926c). Thus, it would appear that *Myotis mystacinus nipalensis* prefers to select river beds with pebbles as its habitat.

### 30. *Myotis muricola muricola* (Gray)

1841. *Vespertilio muricola* Hodgson, *Calcutta J. nat. Hist.*, 2 : 212. *Nomen nudum*.

1846. *Vespertilio muricola* Gray, *Cat. Specimens Drawings Mammalia Birds Nepal Thibet Hodgson Br. Mus.*, : 4 (Nepal).

1859. *Vespertilio caliginosus* Tomes, *Proc. Zool. Soc. Lond.* : 73 (India).

1871. *Vespertilio blanfordi* Dobson, *Proc. Asiat. Soc. Beng.* : 214 (Lachung, c 2,438 m. Sikkim, India).

*Common name* : Wall Bat, Hodgson's Whiskered Bat (Eng.).

*Material examined* : Darjiling district : 1 unsexed, Darjiling, coll. H. J. Elwes, 1871 (skin in very bad condition, head and skull missing).

*Measurements* : External : 1 unsexed : Fa 35.3.

*Diagnosis* : Very much similar to *Myotis mystacinus nipalensis*, but dorsal pelage darker and blacker, ventral pelage ochraceous brown rather than whitish.

*Distribution* : In West Bengal : Darjiling district (Anderson 1881). In India (other than West Bengal) : Jammu & Kashmir (Hill 1983), Himachal Pradesh, Uttar Pradesh (Hill 1983), Sikkim (Hill 1983). Outside India : Afghanistan (Honachi *et al.* 1982) Pakistan, Nepal, Bhutan, Myanmar, Vietnam, Laos (Osgood 1932), Thailand, Malay Peninsula and nearby islands, Sumatra, Java, Bali (Oei 1960), Borneo, and many islands of this area (except Nias Island).

*Remarks* : Ellerman & Morrison-Scott (1951) have treated *muricola*, *nipalensis* and *caliginosus* as subspecies of *Myotis mystacinus*. Hill (1983) has briefly reviewed these forms and has concluded that *mystacinus* and *muricola* are separate species and that *caliginosus* is the westernmost subspecies of *Myotis muricola* which extends east to Sikkim, while the nominate subspecies ranges from Nepal east and southeast to Borneo. Zoogeographically, this is improbable, for Nepal, the type-locality of *muricola*, is situated on the west of Sikkim (from where *caliginosus* has been recognised). Hence, *caliginosus* is synonymised with *muricola*. The specimen reported from Bhutan (Lindsay 1926d) as *Myotis moupinensis* (Milne-Edwards, 1872) should belong to *M. m. muricola* on zoogeographical grounds.

### 31. *Myotis siligorensis siligorensis* (Horsfield)

1855. *Vespertilio siligorensis* Horsfield, *Ann. Mag. nat. Hist.*, 16 : 102 (Siligori = Shiliguri, Darjiling district, West Bengal, India).

1855. (?) *Vespertilio darjilingensis* Horsfield, *Ann. Mag. nat. Hist.*, 16 : 102.

*Common name* : Tarai Bat or Siliguri Whiskered Bat (Eng.).

*Material examined* : None.

*Measurements* : Nil.

*Diagnosis* : Similar in many ways to *Myotis mystacinus nipalensis* and *M. muricola muricola*, but rather smaller and differs in coloration; upperparts dark brown; underparts paler, tinged with cinnamon or buff; ears long, antitragal lobe distinct; tragus long (about half the length of ear), narrow and pointed; wing from base of toes; tip of tail free; lower canine about equal in height to posterior lower premolar.

*Distribution* : In West Bengal : Darjiling district. In India (other than West Bengal) : Sikkim (specimens in ZSI), Meghalaya (Hinton & Lindsay 1926a). Outside India : Nepal (Hinton & Fry 1923).

*Remarks* : Opinions differ as to the exact location of 'Siligori', the type-locality of *Vespertilio siligorensis*. Most authors, including Tate (1941c) think that this is in Nepal, while others such as Wroughton (1918) consider the place as a part of Darjiling district. Hodgson (1847a), however, states, 'Siligori, on the verge of Sikim Tarai' which clearly indicates that 'Siligori' (= Shiliguri) is in the Tarai region of Darjiling district, West Bengal, and not any place in Nepal.

On the basis of the specimens mentioned above, *Myotis siligorensis siligorensis* is hereby reported for the first time from Sikkim.

### 32. *Myotis annectans* (Dobson)

1871. *Pipistrellus annectans* Dobson, *Proc. Asiat. Soc. Beng.* : 213 (Naga Hills, Assam = Naga Hills, Nagaland, India).

1920. *Myotis primula* Thomas, *J. Bombay nat. Hist. Soc.*, 27 : 248 (Pashok, Darjiling, 3,500 = Pashok, 1,067 m, Darjiling district, West Bengal, India).

*Common name* : Intermediate Bat or Hairy-faced Bat (Eng.).

*Material examined* : None.

*Measurements* : Nil.

*Diagnosis* : Face densely hairy ; pelage long and woolly ; ears pointed, tips rounded, outer margin deeply hollowed out below tip, then convex, again slightly concave, antitragal lobe small; tragus long, subacutely pointed, tip rounded; no post-calcarial lobe; extreme tip of tail free; dorsal colour rich dark chestnut brown, individual hairs dark brown at base, paler brown at tip; ventral surface greyish, hairs dark brown at base, heavily tipped with greyish white; hair tips on belly ochraceous or orange, producing an orange yellow median patch.

*Distribution* : In West Bengal : Darjiling district (Topal 1970). In India (other than West Bengal) : Assam (Topal 1970), Nagaland. Outside India : Myanmar (Dr. G. W. H. Davison, *in litt.*), Thailand (Hill & Thonglongya 1972).

*Remarks* : Topal (1970) has shown that *Pipistrellus annectans* is nothing but an abnormal (pm 2/2) *Myotis* and that *Myotis primula* is its synonym.

Lekagul & McNeely (1977) include Bangladesh in the range of distribution of *Myotis annectans*. Honacki *et al.* (1982) and Nowak & Paradiso (1983) give the distributional range of this species as Assam to Thailand and Bangladesh to Thailand, respectively. But no specimens can be traced from Bangladesh (Siddiqi 1961a, 1969; Ahmed & Hussain 1982; Khan 1982; Rashid *et al.* 1990), even though there is a strong possibility of its occurrence in northern part of that country. Incidentally, Hill & Thonglongya (1972) list the holotype of *Myotis primula* inadvertently from Assam. Obviously, the same is from Pashok, Darjiling district, northern West Bengal (Wroughton 1916c, Thomas 1920, Topal 1970). The known westernmost limit of distributional range of *Myotis annectans* is northern West Bengal, neither Bangladesh, nor Assam.

### 33. *Myotis formosus formosus* (Hodgson)

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

1863. *Kerivoula pallida* Blyth, *Cat. Mammalia Mus. Asiat. Soc.* : 34 (Chaibassa = Chaibasa, Singbhum district, Bihar, India).

1871. *Vespertilio auratus* Dobson, *J. Asiat. Soc. Beng.*, 40 (Pt 2) : 186 (Darjiling, Darjiling district, West Bengal, India).

1881. *Vespertilio dobsoni* Anderson, *Cat. Mammalia Indian Mus. Calcutta* : 143 (Purnea, Bengal = Purnia, Purnia district, Bihar, India). Preoccupied by *Vespertilio dobsoni* Trouessart, 1878.

1897. *Vespertilio andersoni* Trouessart, *Cat. Mammalium* : 129. *Nomen novum* for *Vespertilio dobsoni* Anderson.

*Common name* : Hodgson's Bat (Eng.).

*Material examined* : Darjiling district : 2 unsexed (skull of one not available, that of the other badly damaged), Darjiling, coll. H. J. Elwes, F. Stoliczka (holotype of *Vespertilio auratus*), 1870, 1871.

*Measurements* : External : 2 unsexed : Fa 48.6, 50.5; Tb 22.6, 28.9; F & Cl 9.3, 11.3.

*Diagnosis* : Slightly smaller than *Myotis sicarius* (forearm may reach up to 53.0 mm); fur thick and woolly; dorsal colour fawn to golden brown, often tinted with rusty red; ventral colour slightly paler; wing-membrane variegated with orange and blackish brown; wing from base of toes.

*Distribution* : In West Bengal : Medinipur district, (?) Calcutta district (Blanford 1891). In India (other than West Bengal) : Jammu & Kashmir (specimens in ZSI), Himachal Pradesh (Sinha 1986), Punjab, Uttar Pradesh, Maharashtra (D'Abreu 1925), Bihar, Sikkim (Jerdon 1867), Assam (Blanford 1891, Sinha 1986), Meghalaya (Dobson 1876). Outside India : Eastern Afghanistan (Meyer-Öehme 1965), Nepal, possibly Bangladesh (Khan 1982).

**Remarks** : Blanford (1891) has included Calcutta in the range of distribution of this species. But no specimens of *M. formosus* can be located from Calcutta. Since then it has also not been collected from Calcutta.

Ellerman & Morrison-Scott (1951) have regarded the Darjiling and Chaibasa (Bihar) populations as belonging to the nominate subspecies, while the Purnia (Bihar) population has been regarded by them as *Myotis (?) formosus andersoni* Trouessart. Blanford (1891) has stated that *V. dobsoni* Anderson is founded on a very large individual of *V. formosus*. Sinha (1986). However, has used the name *M. f. andersoni* for the Darjiling and Purnia populations, and *M. f. formosus* for other Indian populations. Sinha's (*loc. cit.*) sample-size, especially that of *andersoni*, is too small to accept his view with certainty.

On the basis of the specimen listed above. *Myotis formosus formosus* is hereby reported for the first time from Jammu & Kashmir.

### 34. *Myotis hasseltii* (Temminck)

1840. *Vespertilio hasseltii* Temminck, *Monogr. Mammal.*, 2 : 225 (Bantam, western Java).

**Common name** : Van Hasselt's Bat (Eng.).

**Material examined** : Calcutta district : 1 ♂, Dhakuria, coll. P. K. Das, 5. x. 1978, 1 ♂, 1 ♀, Indian Museum Compound, coll. S. S. Saha, 20. xii. 1966, 8, v. 1967; 1 ♂, Park Circus, coll. T. K. Chakraborty, 25. x. 1977; 1 unsexed, Park Street, coll. E. Blyth, 1844. North 24-Parganas district : 1 ♂, Hasnabad, coll. S. S. Saha 20. viii. 1973.

**Measurements** : External : 4 ♂ : Fa 39.9 – 40.3(40.0); E 14.2 – 16.0(14.9); Tb 17.9 – 18.9(18.3); Tl 40.6 – 43.1(42.2); Tr 4.6 – 6.4(5.3); F & Cl 9.1 – 12.5(10.9). 1 ♀ : Fa 42.2; Tl 45.5; E 14.6; Tb 18.0; Tr 4.9; F & Cl 11.0. Cranial : 4 ♂ : *l* 16.0 – 16.4(16.3); *iw* 4.0 – 4.2(4.1); *cw* 8.1 – 8.6(8.4); *zw*(2) 10.0, 10.5; *m*<sup>3</sup> – *m*<sup>3</sup> 6.5 – 6.7(6.6); *mtr* 6.0 – 6.2(6.1); *c*<sup>1</sup> – *c*<sup>1</sup> 4.4 – 4.8(4.5); *ml* 11.1 – 11.3(11.2). 1 ♀ : *l* 16.4; *iw* 4.2; *cw* 8.3; *zw* 10.8; *m*<sup>3</sup> – *m*<sup>3</sup> 6.9; *mtr* 6.3; *c*<sup>1</sup> – *c*<sup>1</sup> 4.8; *ml* 12.4.

**Diagnosis** : A medium-sized (forearm around 40.0 mm) *Myotis*; fur short and velvety; upperparts greyish brown, hairs with dark bases and pale grey tips; underparts greyish white; wing from ankle; second upper premolar very small and intruded.

**Distribution** : In West Bengal : Calcutta district, North 24-Parganas district. In India (other than West Bengal) : Not recorded yet. Outside India : Sri Lanka (wroughton 1918a), Myanmar (Dobson 1878). Vietnam (Honacki *et al.* 1982), Cambodia (Honacki *et al.* 1982), Thailand (Dobson 1876), Malay Peninsula (Dobson 1876), and nearby islands (Medway 1978), Rhio Archipelago (Chasen 1940), Sumatra (Dobson 1876), Mentawai Islands (Koopman 1989), Java, possibly Sulawesi (Hill 1983), Borneo (Honacki *et al.* 1982)

**Remarks** The specimen collected from Park Street was listed by Blyth (1863a) as *Vespertilio*

*adversus*, with some element of doubt, along with another from Sri Lanka. Jerdon (1867) has mentioned this specimen as *Vespertilio adversus*. Both Dobson (1876) and Anderson (1881) have listed the same as *vespertilio muricola*. Blanford (1891) has included Calcutta in the distributional range of *Vespertilio formosus*. Most probably on the basis of this specimen. Subsequent literature is silent about the occurrence of any species of *Myotis* in Calcutta. In 1966, some examples of the present species were collected from the Indian Museum compound, a place very close to the collecting site of Blyth's specimen.

The specimens from West Bengal are larger as compared to those from other areas. These are even larger than the Sri Lankan specimens, the largest ones among those measured by Hill (1983). Perhaps a new subspecies has to be recognised for the West Bengal population. The Sri Lankan population also may have to be accommodated in it.

The specimens listed above provide the basis for the first record of *myotis hasseltii* for India, from West Bengal.

The specimens from Park Circus, Dhakuria and Hasnabad were either collected from or roosting in ventilators in residential buildings. Those collected from the Indian Museum Compound were roosting in the narrow space between a large wooden beam and the ceiling. Thus, residential buildings appear to be the favoured roosting sites of *Myotis hasseltii* in West Bengal.

#### Genus *Plecotus* E. Geoffroy, 1818

Dental formula :  $i \frac{2}{3}, c \frac{1}{1}, pm \frac{2}{3}, m \frac{3}{3} \times 2 = 36.$

One species and subspecies of the genus *Plecotus* has been recorded from West Bengal.

#### 35. *Plecotus auritus homochrous* Hodgson

1847. *Plecotus homochrous* Hodgson, *J. Asiat Soc. Beng.*, 16 : 895 (Central region of sub-Himalayas = Darjiling, Darjiling district, West Bengal, India).

*Common name* : Long-eared Bat (Eng.).

*Material examined* : Darjiling district : 1 ♂ (skull damaged), Darjiling, coll. W. S. Sherwill, 1853.

*Measurements* : External : 1 ♀ : Fa 38.4; E 32.7; Tb 16.0; F & Cl 8.0.

*Diagnosis* : A medium-sized (forearm around 38.0 mm) vespertilionine bat with very large ears, nearly as long as forearm, joined by low band across forehead at bases of inner margins; tragus very long; upper parts greyish; lower parts dirty white.

*Distribution* : In West Bengal : Darjiling district. In India (other than West Bengal) : Jammu

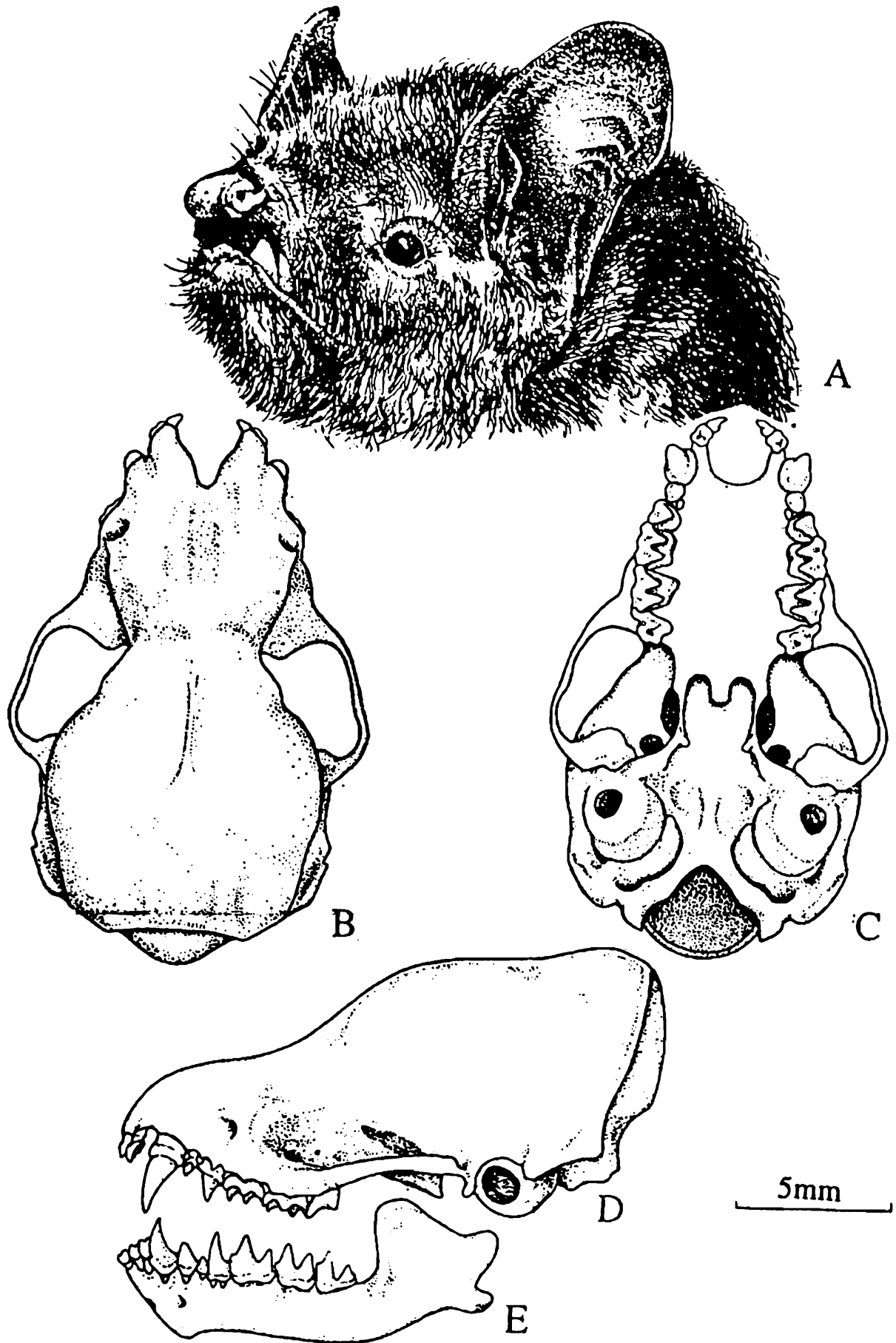


Fig. 31. Head and skull (B to E) of *Myotis hasseltii* : A. Lateral view of head; B. Dorsal view; C. Ventral view; D. Lateral view; E. Lateral view of lower jaw.



**Distribution map 5** Distribution of *Myotis hasselti* in southern West Bengal

& Kashmir (Sharma & Sharma 1976, Chakraborty 1983), Himachal Pradesh (Hutton 1872), Uttar Pradesh, Sikkim (Ali 1981), Meghalaya (Dobson 1876). Outside India : Pakistan (Dobson 1876), Nepal (Sanborn 1950).

*Remarks* : Ellerman & Morrison-Scot (1951) have treated *homochrous*, *puck* Barrett-Hamilton, 1907 (type-locality : Murree, The Punjab, Pakistan) and *wardi* Thomas, 1911 (type-locality : Leh, Ladakh district, Jammu & Kashmir, India) as subspecies of *Plecotus auritus* (Linnaeus, 1758). Most of recent authorities, however, consider *Puck* as a synonym of *homochrous*, while *wardi* is a subspecies of the allied species *P. austriacus* Fischer, 1829. Incidentally, Tate (1942) also indicated that *puck* might be the same as *homochrous*. It is quite interesting to note that Dobson (1876) also considered *homochrous* nothing but a subspecies of *P. auritus*.

Opinions differ as to the type-locality of *Plecotus homochrous*. Wroughton (1918a) and Ellerman & Morrison-Scott (1951) have stated Nepal as the type-locality. But Hinton & Fry (1923) have doubted the same and concluded the type-specimen might have come from Sikkim. Hodgson spent the years 1845 to 1858 at Darjiling (Sanborn 1950). According to Jerdon (1967). Hodgson collected the type-specimen of *Noctilinia lasyura* from a place near his house at Darjiling. The type-specimen of *P. homochrous* was also collected from 'a dwelling house' and these two taxa were described in the same paper (Hodgson 1847b). thus, the type-locality of *P. homochrous* should be taken as Darjiling, not Nepal.

#### Genus *Barbastella* Gray, 1821

*Dental formula* :  $i \frac{2}{3}, c \frac{1}{1}, pm \frac{2}{2}, m \frac{3}{3} \times 2 = 34$ .

A single species and subspecies of the genus *Barbastella* is found in West Bengal.

#### 36. *Barbastella Leucomelas darjelingensis* (Hodgson)

1855. *Plecotus darjelingensis* Hodgson, in Horsfield, *Ann. Mag. nat. Hist.*, (2) 16 : 103 (Darjiling = Darjiling, Darjiling district, West Bengal, India).

1875. *Barbastellus dargelingensis* Dobson, *Proc. Asiat. Sac. Beng.* : 85.

1916. *Barbastella blanfordi* Bianchi, *Ezheg. zool. Muz.*, 21 : 75. Renaming of *Plecotus darjelingensis* Hodgson.

*Common name* : Eastern Barbastelle (Eng.).

*Material examined* : Darjiling district : 1 ♀, Darjiling, coll. J. Anderson, 1869 : 1 ♂, 3 ♀, Nimbong, coll. N. A. Baptista, 22 vi. 1916, 4 – 9. vii. 1916.

*Measurements* : External : 1 ♂ : Fa 40.7; E 16.0; Tb 20.0; F & Cl 8.0. 2 ♀ : Fa 39.9, 40.8; E 17.0, 17.2; Tb 19.1, 21.1; F & Cl 7.2, 8.0. Cranial : 1 ♂ : l 16.0; mtr 5.0; c1 – c1 3.8; iw 4.5; cw 8.8; m<sup>3</sup> – m<sup>3</sup> 6.0; ml 9.7. 1 ♀ : l 14.8; mtr 4.9; c<sup>1</sup> – c<sup>1</sup> 4.0; iw 3.9; cw 8.4; m<sup>3</sup> – m<sup>3</sup> 4.5; ml 9.5.

**Diagnosis** : A medium-sized (forearm around 40.0 mm) bat; ears large, joined across forehead, squarish and forward-slanting, posterior margin lacks projections or notches; tragus half the length of ear and strangular; two dark lines on interfemoral membrane from heel to base of pelvis : dorsal fur long, silky with blackish grey base and pale golden brown tips; underparts paler greyish brown.

**Distribution** : In West Bengal : Darjiling district, Jalpaiguri district (Wroughton 1917a). In India (other than West Bengal) : Jammu (Sharma & Sharma 1976) & Kashmir (Scully 1881), Himachal Pradesh (Dobson 1876), Rajasthan, Uttar Pradesh (Blyth 1863a), Sikkim, Meghalaya (Dobson 1874), Mizoram (specimens in ZSI). Outside India : Southern Russia, Afghanistan (Meyer-Öehme 1965), Pakistan (Roberts 1977), Nepal, western China, possibly erstwhile Indo-China, Japan.

**Remarks** : The subspecific limits of the Eastern *Barbastella* is not quite clear. It is most likely that the populations western to the areas mentioned above, belong to the nominate subspecies, as has been suggested by Corbet (1980).

On the basis of specimens mentioned above, *Barbastella leucomelas darjilingensis* is hereby reported for the first time from Mizoram.

#### Genus *Scotomanes* Dobson, 1985

**Dental formula** :  $i \frac{1}{3}, c \frac{1}{1}, pm \frac{1}{2}, m \frac{3}{3} \times 2 = 30$ .

The genus *Scotomanes* is represented in West Bengal by a single species and subspecies.

#### 37. *Scotomanes ornatus ornatus* (Blyth)

1851. *Nycticejus ornatus* Blyth, *J. Asiat. Soc. Beng.*, **20** : 517 (Chérra Punji = Cherra Punji, East Khasi Hills district, Meghalaya, India)

1855. *Nycticejus nivicolus* Hodgson, in Horsfield, *Ann. Mag. nat. Hist.*, **16** : 104 (Northern region of Sikkim Himalaya, India).

1871. *Nycticejus emarginatus* Dobson, *Proc. Asiat. Soc. Beng.* : 211 (? = India, precise locality unknown).

1921. *Scotomanes ornatus imbrensis* Thomas, *J. Bombay nat. Hist. Soc.*, **27** : 772 (Konshnong, Jaintia Hills, 3,000' = Khonshnong, c 914 m. Jaintia Hills district, Meghalaya, India).

**Common name** : Harlequin Bat (Eng.).

**Material examined** : Darjiling district : 3 unsexed, 1 young unsexed, Darjiling, coll. W. S. Atkinson, H. J. Elwes. F. Stoliczka, 1870, 1872; 1 ♂, Pashok, coll. N. A. Baptista, 3. ix. 1915; 3 ♀, Sivok, coll. C. A. Crump, 19, 23, iii. 1915.

**Measurements** : External 1 ♂ : Fa 55.3; E 22.0; Tb 25.6; F & Cl 15.0. 2 ♀ : Fa 57.3. 63.0 : E

20.0, 22.0; Tb 27.0, 27.1; F & Cl 12.0(2). Cranial : 1 ♂ : l 21.5; mtr 8.0;  $c^1 - c^1$  7.5; iw 4.5; cw 11.9; zw 16.8;  $m^3 - m^3$  9.8; ml 17.8. 1 ♀ : l 21.3; mtr 8.3;  $c^1 - c^1$  17.5; iw 4.5; cw 6.1; zw 17.0;  $m^3 - m^3$  10.4; ml 17.1.

**Diagnosis** : A large vespertilionine bat; orange-brown above, with some white spots and streaks; hairs dark brown at base, then extends from shoulders to abdomen, a white collar commencing beneath each ear, rest of lower parts brown; ears moderate, subtriangular, tips rounded; tragus bluntly pointed, a pointed projecting lobe at base; tip of tail free.

**Distribution** : In West Bengal : Darjiling district (Blyth 1863a), Jalpaiguri district (Inglis *et al.* 1919). In India (other than West Bengal) : Sikkim, Meghalaya, Manipur (Anderson 1881), Arunachal Pradesh (Robinson 1913). Outside India : Possibly Bangladesh (Khan 1982), northern Myanmar (Hill 1962).

**Remarks** : Ellerman & Morrison-Scott (1951) have recognised two subspecies in the non-Chinese range of *Scotomanes ornatus*, viz – *S. o. imbreensis* apparently for the Jaintia Hills population and the nominate subspecies for other areas, including the Khasi Hills. Thomas (1921), while reviewing *Scotomanes ornatus*, erroneously took Darjiling as the type-locality of *S. o. ornatus*, while in reality, it is Cherra Punji, Khasi Hills. Thomas (*loc. cit.*) also stated that *imbreensis* (from Jaintia Hills) was to be found in ‘Assam Hills’ and also referred specimens from the Khasi Hills and the Garo Hills to it. Thus, Thomas (1921) himself could not find any difference between the Khasi Hills and Jaintia Hills populations. It, therefore automatically follows that *imbreensis* does not warrant recognition. Hence, *Scotomanes ornatus imbreensis* is hereby synonymised with the nominate subspecies.

Sinha & Chakraborty (1971) have studied the skull of the holotype of *Nycticejus emarginatus* and transferred that species to the genus *Scotomanes* on account of its similarities with that genus, but maintained the same as a separate species for its alleged differences (smaller forearm and tooth-row, and the absence of whitespots) from *Scotomanes ornatus*. The small differences between the lengths of forearm, upper tooth-row and lower tooth-row of the holotype of *N. emarginatus* (55.2, 7.2 and 8.0, respectively) and those of three examples of *Scotomanes ornatus* (58.0, 58.5, 64.0 ; 8.0, 8.0, 8.2 and 8.6, 9.0, 9.0 respectively) may appear to be of some significance when the sample-size is small (as is here), but these may not be maintained at all when large series is measured, especially so in a species where there is ‘wide range of size variation’, as noted by Hill (1962) who provided range of forearm measurement as 53.0 – 60.0 for the Myanmar population. Further, Blanford (1891) has stated, ‘In females [of *Scotomanes ornatus*] the markings [white patches] are much less distinct’ The holotype of *Nycticejus emarginatus* (♀, preserved in rectified spirit) was examined. Its phalangeal epiphyses are rather swollen. Therefore, the specimen is not fully adult. Thus, the small morphometric differences between the holotype of *emarginatus* and only three examples of *ornatus* (possibly from the same area too), as noted by Sinha & Chakraborty (*loc. cit.*), do not appear to be sufficient enough to justify maintaining *emarginatus* as a distinct species. *Nycticejus emarginatus* is, therefore, considered here as a synonym of *Scotomanes ornatus*. Examining the type-specimen of *emarginatus*, has agreed that it should be treated synonymous with *ornatus*.

Genus *Scotophilus* Leach, 1821

Dental formula :  $i \frac{1}{3}, c \frac{1}{1}, pm \frac{1}{2}, m \frac{3}{3} \times 2 = 30$ .

Two species and subspecies of the genus *Scotophilus* occur in West Bengal.

**Key to the species and subspecies of the genus *Scotophilus***

Larger (forearm more than 55.0 mm).....*Scotophilus heathi heathi*

Smaller (forearm 55.0 mm or less).....*Scotophilus kuhli kuhli*

The arrangement of species is after Ellerman & Morrison-Scott (1951).

**38. *Scotophilus kuhli kuhli* Leach**

1821. *Scotophilus kuhli* Leach, *Trans. Linn. Soc. Lond.*, **13** : 72 (type-locality unknown, but India, according to Hill & Thonglongya 1972).

1843. *Scotophilus fulvus* Gray, *List Specimens Mammalia Colln Br. Mus.* : 31 (Java, and Madras = Madras, Madras district, Tamil Nadu, India).

1897. *Scotophilus wroughtoni* Thomas, *J. Bombay nat. Hist. Soc.*, **11** : 275 (Kim. Surat = Kim, Bharuch district, Gujarat, India).

*Common name* : Lesser Yellow Bat (Eng.).

*Material examined* : Bankura district : 1 ♂, 2 ♀, Susunia, coll. V. C. Agrawal, 6, 7. i. 1985. Bardhaman district : 2 ♂, Arrah, coll. P. K. Das, 20, 24. iv. 1988; 1 ♂, 1 ♀, Raniganj, purchased, 1869. Birbhum district : 1 ♀, Santiniketan, —, 28. iii. 1971. Calcutta district : 22 ♂, 13 ♀, 13 unsexed, Calcutta (Bowbazar, Indian Museum Compound, Subodh Mallick Square), Coll. J. Anderson, V. Ball, B. Dasgupta, D. K. Ghosal, F. H. Gravely, S. W. Kemp, J. B. Richardson, F. Stoliczka, purchased (2 specimens), 1867, 1868, 1870, 1875, 1876, 18. i. 1879, 1. xi. 1915, 22. xi. 1919, 14. i. 1922. —. ix. 1952, 6. xii. 1976. Darjiling district : 1 ♂, Pashok, coll. N. A. Baptista. vi – viii. 1915. Haora district : 2 ♂, Shibpur (Indian Botanic Garden), coll. S. S. Saha, 6. xii. 1969. Hugli district : 1 ♀, Kamardingi, coll. S. Chakraborty, 20. ii. 1974; 1 ♂, 1 ♀, Singur, coll. P. K. Das, 17. ix. 1974. Jalpaiguri district : 1 ♀, 1 unsexed, Hasimara, coll. N. A. Baptista, 20. i. 1916; 6 ♂, Khuntimari, coll. P. K. Das, 21. ii. 1979. Koch Bihar district : 2 ♂, 1 ♀, Sitalkuchi, coll. S. Chakraborty, 10. iv. 1986. Maldah district : 1 ♂, 1 ♀, Adina Mosque, coll. P. K. Das, 26, 28. ii. 1979. Medinipur district : 1 ♂, 1 ♀, Amlagora, coll. P. K. Das, 21, ix. 1984 : 2 ♂, 2 ♀, Balivasa, coll. P. K. Das. 12, 13. ix. 1984; 3 ♂, 4 ♀, Salbani, coll. C. A. Crump. 14., 15. ix. 1914. Murshidabad district : 1 ♂, 1 ♀, Shibnagar, coll. S. Chakraborty, 17, 18. x. 1987. Nadia district : 1 ♀, Madanpur,

coll. P. K. Das, 17. vii. 1969. North 24-Parganas district : 8 ♂, 4 ♀, Salt Lake, coll. B. Biswas, 25. v. 1963, 25. iv. 1964, 28. i. 1965. 23. ii. 1965, 7. iii. 1966, 31. I. 1968. 7. iii. 1968. Puruliya district : 1 ♀ Ajodhya Hills, coll. A. K. Mukherjee, 25. ii. 1982. South 24-Parganas district : 1 ♂, Barabagan, coll. S. Chattopadhyay, 21. I. 1979 ; 6 ♀, Basantipur, coll. —, —; 1 ♂, Bawali, coll. P. K. Das, 17. iv. 1978; 1 ♂, Canning coll N. Annandale, 21. vii. 1907; 1 ♀, Kalikapur, coll. S. Chattopadhyay, 7. v. 1980; 2 ♀, Sajnekhali, coll. S. Chattopadhyay, 9. 11. xi. 1978. West Dinajpur district : 1 ♂, 1 ♀, Raiganj, coll. S. Chakraborty, 10. x. 1987.

*Measurements* : External : 15 ♂ : Fa 45.5 – 55.0(49.5); E(14) 12.0 – 16.0(14.1); Tb 17.9 – 24.3(20.1); F & Cl(14) 9.5 – 11.8(10.7). 11 ♀ : Fa 48.5 – 54.9(51.0) : E 9.9 – 15.5(13.0) : Tb 18.6 – 22.2(20.3); F & Cl 9.8 – 11.8(10.8). Cranial : 10 ♂ : l 17.0 – 22.0(19.2); mtr 6.3 – 6.9(6.7); c<sup>1</sup> – c<sup>1</sup> 5.7 – 7.1(6.5); iw 4.1 – 5.5(4.9); cw 8.7 – 10.2(9.3); zw (8) 12.8 – 14.4(13.5); m<sup>3</sup> – m<sup>3</sup>(7) 8.3 – 9.4(8.9); ml 12.5 – 15.3(13.5). 7 ♀ : l(5) 18.0 – 19.2(18.6); mtr 6.7 – 6.9(6.8); c<sup>1</sup> – c<sup>1</sup> 6.1 – 6.5(6.4); iw 4.7 – 5.3(5.0); cw(5) 8.8 – 10.1(9.2); zw 12.9 – 14.2(13.4); m<sup>3</sup> – m<sup>3</sup> 8.7 – 9.2(8.9); ml 12.5 – 14.0(13.2).

*Diagnosis* : Ears small, tips rounded; tragus semilunar, posterior border markedly convex, anterior border concave, tip slender and forward-pointing; wing from side of foot near base of toes; tip of tail free; fur short, dense and sleek; dorsal colour olive-brown, ventral colour creamy white with a tinge of red.

*Distribution* : In West Bengal : Darjiling district, Jalpaiguri district, Koch Bihar district, West Dinajpur district, Maldah district, Murshidabad district, Nadia district, Barddhaman district (Dobson 1876), Birbhum district, Purulia district (Anderson 1881), Bankura district, Medinipur district (Wroughton 1915), Hugli district, Haora district, Calcutta district (Blyth 1863a), North 24-Parganas district (Dobson 1878), South 24-Parganas district (Khajuria 1953). In India (other than West Bengal) : Widely distributed practically throughout the Indian Union, including Nicobar Islands (Blyth 1863b, Hill 1967). Outside India : Pakistan (Walton 1974), Sri Lanka, Bangladesh (Blyth 1963a), Myanmar.

*Remarks* : Ellerman & Morrison-Scott (1951) have used *Scotophilus temmincki wroughtoni* thomas, 1897 for the Lesser Yellow Bat of India, Sri Lanka and Myanmar. Hill & Thonglongya (1972). However, have shown that the name *Scotophilus kuhli kuhli* Leach should be used for this.

### 39. *Scotophilus heathi heathi* (Horsfield)

1831. *Nycticejus heathi* Horsfield, *Proc. Zool. Soc. Land.* : 113 (Madras = Madras, Madras district, Tamil Nadu, India).

1834. *Vespertilio belangeri* I. Geoffroy, *In Belanger. Voyage aux Indes-Orientales, Mammiferes* : 87 (Towns near Pondicherry, India).

1851. *Nycticejus luteus* Blyth, *J. Asiat. Soc. Beng.*, 20 : 157 (Bengal ; Coromandel. India).

1851. *Scotophilus flaveolus* Horsfield, *Cat. Mammalia Mus. Hon. East-India Co.* : 37 (Many parts of Continental India).

*Common name* : Greater Yellow Bat (Eng.).

*Material examined* : Barddhaman district : 5 ♀, Arrah, coll. P. K. Das, 21 – 25. iv. 1988; 1 ♂, 3 ♀, Churpurni, coll. P. K. Das, 27, 29. iv. 1988. Jalpaiguri district : 1 ♂, 2 ♀, Bharnabari, coll. N. A. Baptista, 6. ii. 1916, 2. iii. 1916. 10. v. 1916; 4 ♂, 1 ♀, Chilapata, coll. S. Chakraborty, R. K. Ghose, 16. ix. 1983, 7. iii. 1985; 2 ♂, 3 ♀, Hasimara, coll. N. A. Baptista, 21. i. 1916, 4. iii. 1916, 14. iii. 1916, 18. iv. 1916, 1. v. 1916. Koch Bihar district : 1 ♂, Mathabhanga, coll. S. Chakraborty, 17. iv. 1986; 1 ♂, 7 ♀, Sitalkuchi, coll. S. Chakraborty, 9, 18. iv. 1986. Maldah district : 7 ♂, Adina Mosque, coll. P. K. Das, 26, 18. ii. 1979; 5 ♂, Gour, coll. P. K. Das, 27. ii. 1979. Medinipur district : 1 ♂, Amlagora, coll. P. K. Das, 21. ix. 1984. Nadia district : 1 ♂, Kaliganj, coll. S. Chakraborty, 20. x. 1987. West Dinajpur district : 1 ♂, Kulik, coll. S. Chakraborty, 14. x. 1987.

*Measurements* : External : 7 ♂ : Fa 56.0 – 60.0(57.3); E 11.0 – 13.3(12.0); Tb 22.8 – 25.5(23.9); F & Cl 10.0 – 12.7(11.3). 14 ♀ : Fa 56.4 – 64.0(60.1) : E 11.9 – 15.3(13.5); Tb 21.8 – 28.0(24.4); F & Cl 9.9 – 13.8(11.7). Cranial : 2 ♂ : *l* 23.0, 23.1; *mtr* 7.9, 8.0; *c*<sup>1</sup> – *c*<sup>1</sup> 7.6, 7.8; *iw* 5.6, 5.9; *cw* 10.7, 10.8; *zw* 16.0, 16.1; *m*<sup>3</sup> – *m*<sup>3</sup> 9.9, 10.0; *ml* 16.2, 16.4. 2 ♀ : *l* 22.9, 23.4; *mtr* 7.7, 8.2, *c*<sup>1</sup> – *c*<sup>1</sup> 7.4, 7.6; *iw* 5.8, 5.9, *cw* 10.3, 11.0; *zw* 15.6, 15.9; *m*<sup>3</sup> – *m*<sup>3</sup> 9.8, 10.4; *ml* 15.8. 16.0.

*Diagnosis* : Very much similar to the Lesser Yellow Bat, but larger ; ventral parts lemon-yellow to orange-yellow.

*Distribution* : In West Bengal : Jalpaiguri district, Koch Bihar district, West Dinajpur district, Maldah district, Nadia district, Barddhaman district, Medinipur district. In India (other than West Bengal) : Widely distributed throughout the Indian mainland, east at least to Tripura (specimen in ZSI). Outside India : Afghanistan (Meyer-Öehme 1965), Pakistan, Nepal (Agrawal & Chakraborty 1971), Sri Lanka, Bangladesh (Hutton 1872), Myanmar.

*Remarks* : Ellerman & Morrison-Scott (1951) have recognised two subspecies of the Greater Yellow Bat, viz – *S. h. heathi* and *S. h. belangeri*, for the Indian population. Siddiqi (1961b) has, however, synonymised *belangeri* with the nominate subspecies.

On the basis of the specimen mentioned above, *Scotophilus heathi heathi* is hereby reported for the first time from Tripura.

#### Genus *Eptesicus* Rafinesque, 1820

*Dental formula* :  $i \frac{2}{3}$ ,  $c \frac{1}{1}$ ,  $pm \frac{1}{2}$ ,  $m \frac{3}{3} \times 2 = 32$ .

The genus *Eptesicus* is represented in West Bengal by a single species.

40. *Eptesicus tatei* Ellerman & Morrison-Scott

1863. *Nycticeius atratus* Blyth, *Cat. Mammalia Mus. Asiat. Soc.* : 31 (Darjiling = Darjiling district, West Bengal, India). Preoccupied by *Amblyotus atratus* Kolenati, 1858, a synonym of *Eptesicus nilssonii* (Keyserling & Blasius., 1839).

1951. *Eptesicus tatei* Ellerman & Morrison-Scott. *Checklist Palaearctic Indian Mammals* : 158. *Nomen novum* for *Nycticeius atratus* Blyth.

*Common name* : Tate's Bat (Eng.).

*Material examined* : Darjiling district : 2 ♀, Darjiling, coll. W. S. Sherwill, 1853 (syntypes of *Nycticeius atratus*).

*Measurements* : External : 2 ♀ : Fa 39.4, 43.5; Tl 38.5, 41.5; E i.7, 10.0; Tr 3.7, 4.0; Tb 15.0, 17.5; F & Cl 7.5(2). Cranial : 1 ♀ : l 15.8; mtr 5.8; c<sup>1</sup> - c<sup>1</sup> 4.7; iw 4.3; m<sup>3</sup> - m<sup>3</sup> 7.0; cw 8.1.

*Diagnosis* : Ears large, oval, tips rounded, inner margin convex, outer margin slightly hollowed out below tip; rounded lobule at base of tragus; wings from base of toes; last caudal vertebra free; fur long, dense and black throughout; inner upper incisors very long and bifid, outer upper incisors minute, scarcely raised above level of gum and close to inner incisors.

*Distribution* : In West Bengal : Darjiling district. In India (other than West Bengal) : Not recorded yet. Outside India : Not recorded yet.

*Remarks* : So far, only three specimens of the present species have been collected, all from Darjiling (Blyth 1863a), of which the two listed above are now available with the Zoological Survey of India. The American Museum of Natural History also has specimen(s) of this taxon (beyond the type-series) from undiagnosed locality of India.

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Genus *Tylonycteris* Peters, 1872

*Dental formula*  $i \frac{2}{3}, c \frac{1}{1}, pm \frac{1}{2}, m \frac{3}{3} \times 2 = 32.$

The genus *Tylonycteris* is represented in West Bengal by a single species and subspecies.

41. *Tylonycteris pachypus fulvida* (Blyth)

1859. *Scotophilus fulvidus blyth*, *J. Asiat. Soc. Beng.*, 28 : 293 (Schwegyin, Sittang River, southeastern Myanmar).

1915. *Tylonycteris rubidus* Thomas. *Ann. Mag. nat. Hist.*, 15 : 227. Error for *fulvidus* Blyth.

1915. *Tylonycteris aurex* Thumas. *Ann. Mag. nat. Hist.*, 15 : 228 (Astoli, Belgaum, Alt. 2000 = Astoli, c 610 m, Belgaum district, Karnataka, India).

*Common name* : Club-footed bat (Eng.).

*Material examined* : Darjiling district : 2 ♀, Darjiling, coll. F. Stoliczka, 1871; 1 ♂, 2 ♀, Kalimpong, coll. N. A. Baptista, 22. vii. 1916, 29. x. 1916; 3 ♂, Pashok, coll. N. A. Baptista, 24. vi. 1915, 7, 8. ix. 1915; 1 ♀, Sivok, coll. C. A. Crump, 29. iii. 1915.

*Measurements* : External : 4 ♂ : Fa 26.4 – 28.7(27.6); Tl 27.0 – 33.0(29.5); E 9.0(4); Tb 9.9 – 12.4(11.1); F & Cl 5.6 – 6.3 (6.0). 5 ♀ : Fa 25.7 – 27.4(26.6); Tl(4) 27.7 – 30.0(28.5); E 7.5 – 9.2 (8.8); Tb 0.5 – 11.3(10.3); f & Cl 5.5 – 7.3(6.1). Cranial : 4 ♂ : l 11.4 – 11.6(11.5); mtr 3.6 – 3.7(3.6); c<sup>1</sup> – c<sup>1</sup> 3.3 – 3.8(3.5); iw 3.3 – 3.7(3.5); cw 6.5 – 7.1(6.7); cw(1) 8.2; m<sup>3</sup> – m<sup>3</sup> 4.9 – 5.2(5.0); ml(3) 7.2 – 7.4(7.3). 5 ♀ : l(4) 10.9 – 11.6(11.3); mtr 3.4 – 3.7(3.5); c<sup>1</sup> – c<sup>1</sup>(4) 3.4 – 3.6(3.5); iw(4) 3.5 – 3.7(3.6); cw 6.3 – 6.7(6.5); zw(3) 8.1 – 8.5(8.3); m<sup>3</sup> – m<sup>3</sup>(4) 4.9 – 5.1(5.0); ml(3) 6.7 – 7.2(7.0).

*Diagnosis* : One of the two smallest bats of India and West Bengal (the other is *pipistrellus minus*); reddish brown above and below; ear shorter, tip rounded; tragus short, tip rounded; fleshy pads at junction of thumb and second finger, and on soles; skull dorsoventrally flattened, braincase and rostrum at same level.

*Distribution* : In West Bengal : Darjiling district (Dobson 1876). In India (other than West Bengal) : Karnataka, Kerala (specimens of ZSI), Sikkim, Meghalaya (specimens in ZSI). Tripura (specimen in ZSI), Mizoram (specimen in ZSI), Manipur, Andaman Islands (Dobson 1876). Outside India : (?) Bangladesh (Ahmed & Husain 1982), Myanmar, southern China, Vietnam, Laos, Thailand (Lekagul & McNeely 1977).

*Remarks* : From the descriptions of habitats, habits, coloration of pelage, relative abundance, etc., as provided by the authors (Ahmed & Husain 1982), the record of *Tylonycteris pachypus* from Dhaka and Tangail of Bangladesh appears to be based on misidentified specimens of *Pipistrellus mimus*. However, *T. pachypus* most probably occurs in Sylhet and Chittagong area of that country.

Thomas (1915b) described *Tylonycteris aurex* on the basis of its coloration, but also indicated that it might be conspecific with the Myanmarese form as well. Ellerman & Morrison-Scott (1951) have considered *aurex* as a subspecies of *T. pachypus*, Myanmarese and northeastern Indian populations of *T. pachypus* have been compared with the southwestern Indian population. As a result, it has been found that there is a wide range of colour variations, from brownish to dull golden yellow, which cannot be associated with sex, age, season or geographical area. There are also no differences in size between the two populations.

Therefore, *Tytonycteris aurex* is here considered as a synonym of *Tytonycteris pachypus fulvida*.

On the basis of specimens mentioned above, *Tytonycteris pachypus fulvida* is hereby recorded for the first time from Kerala, Meghalaya, Tripura and Mizoram.

Genus *Pipistrellus* Kaup, 1829

Dental formula :  $i \frac{2}{3}, c \frac{1}{1}, pm \frac{1}{2}, m \frac{3}{3} \times 2 = 34.$

Seven species and subspecies of the genus *Pipistrellus* occur in West Bengal.

**Key to the species and subspecies of the genus *Pipistrellus***

1. Larger (forearm 38.0 mm or more) ..... 2  
     Smaller (forearm less than 38.0 mm) ..... 3
2. Outer upper incisors acutely pointed ..... *Pipistrellus affinis*  
     Outer upper incisors hollowed (to accommodate lower canine) .....  
     ..... *Pipistrellus ceylonicus indicus*
3. Forearm less than 30.0 mm, on average ..... *Pipistrellus minus*  
     Forearm more than 30.0 mm, on average ..... 4
4. Tragus very broad (about 4.0 mm) ..... *Pipistrellus cadornae*  
     Tragus narrower (less than 4.0 mm) ..... 5
5. Baculum more than 4.0 mm is length ..... 6  
     Baculum less than 4.0 mm is length ..... *Pipistrellus coromandra coromandra*
6. Baculum 5.2 to 5.5 mm in lengths ..... *Pipistrellus peguensis*  
     Baculum 5.8 to 7.0 mm in length ..... *Pipistrellus babu*

The arrangement of species is after Hill & Harrison (1987).

42. *Pipistrellus babu* Thomas

1915. *Pipistrellus babu* Thomas, *J. Bombay nat. Hist. Soc.*, 24 : 30 (Murree 8,000' = Murree, c 2,438 m, Rawalpindi district, The Punjab. Pakistan).

*Common name* : Babu Pipistrelle (Eng.).

*Material examined* : Darjiling district : 1 ♀, Paperkheti, coll. R. L. Chowdhury, 1. xii. 1980; 4 ♀, 1 young ♀, Sukna, coll. P. K. Das, 21. v. 1980; 1 ♂, Takdah, purchased, 7. viii. 1958.

*Measurements* : Exgernal : 1 ♂ : Fa 32.7; E 12.8; Tb 12.3; F & Cl 6.4. 4 ♀ : Fa 33.1 – 36.0(34.3); E 11.5 – 13.0(12.3); Tb 12.5 – 13.9(13.1); F & Cl 6.7 – 8.0(7.2). Cranial : 1 ♂ : *l* 13.3; *mtr* 4.7; *c*<sup>1</sup> – *c*<sup>1</sup> 4.3; *iw* 3.5; *cw* 6.3; *m*<sup>3</sup> – *m*<sup>3</sup> 5.4; *ml* 9.2. 2 ♀ : *l* 14.0. 14.1; *mtr* 5.0, 5.1; *c*<sup>1</sup> – *c*<sup>1</sup>(1) 4.6; *iw* 3.9; 4.2; *cw* 7.6, 8.4; *m*<sup>3</sup> – *m*<sup>3</sup> 6.5, 6.7; *ml* 10.4, 10.6.

*Diagnosis* : A medium-sized (forearm around 34.0 mm) pipistrelle; dorsal colour sepia brown, cinnamon brown or olive brown, tips of hairs greyish or paler brown; ventral colour only slightly paler, inguinal region not whitter; wings from base of toes; distinct post-calcarial lobule.

*Distribution* : In West Bengal : Darjiling district (Thomas 1915a). Jalpaiguri district. In India (other than West Bengal) : Himachal Pradesh (Thomas 1915a), Uttar Pradesh, Sikkim, Assam, Madhya Pradesh, Maharashtra (Khajuria 1953). Outside India : Afghanistan (Meyer-Öehme 1965), Pakistan, Nepal, Bangladesh (Thomas 1915a). Myanmar (Honacki *et al.*, 1982).

*Remarks* : In West Bengal, the Babu Pipistrelle is a montane species which migrates to lower altitudes in suitable seasons.

#### 43. *Pipistrellus peguensis* Sinha

1969. *Pipistrellus peguensis* Sinha, *Proc. Zool. Soc., Calcutta*, 22 : 83 (Pegu. Myanmar)

*Common name* : Pegu Pipistrelle (Eng.).

*Material examined* : Darjiling district 6 ♂, Darjiling, coll, W. S. Atkinson, 1872

*Measurements* : External : 4 ♂ : Fa 32.6 – 34.0(33.2); E 9.6 – 12.2(11.3); Tb 10.0 – 13.0(11.6); F & Cl 5.3 – 6.1(5.8). Cranial : 4 ♂ : *l* 12.8 – 13.4(13.3) : *Mtr* 4.8 – 5.0(4.9); *c*<sup>1</sup> – *c*<sup>1</sup> 4.0 – 4.5 (4.4); *iw* 3.5 – 3.8(3.7); *cw* 6.4 – 7.3(7.0); *zw* 8.3 – 8.7(8.5); *m*<sup>3</sup> – *m*<sup>3</sup> 5.8 – 6.0(5.9); *ml*(3) 8.8 – 9.2(9.0)

*Diagnosis* : A rather medium-sized pipistrelle (forearm around 33.0 mm); fur dense and long; dorsal colour brown throughout; ventral colour dirty white, base of hairs brown; calcarial lobe well-developed; baculum straight, 5.2 to 6.0 mm in length.

*Distribution* : In West Bengal : Darjiling district (Sinha 1990b). In India (other than West Bengal) : Not recorded. Outside India : Myanmar.

**Remarks** : The Pegu Pipistrelle, described by Sinha (1969*b*), has recently been reported from Darjiling district of West Bengal, by the same author (Sinha 1990*b*), extending the distributional range of the species much westward.

#### 44. *Pipistrellus coromandra coromandra* (Gray)

1838. *Scotophilus coromandra* Gray, *Mag. Zool. Bot.*, 2 : 498 (Pondicherry, Coromandel coast, India).
1851. *Vespertilio coromandelicus* Blyth, *J. Asiat. Soc. Beng.*, 20 : 159.
1853. *Myotis parvipes* Blyth, *J. Asiat. Soc. Beng.*, 22 : 581 (Masori = Mussoorie, Dehra Dun district, Uttar Pradesh, India).
1863. *Scotophilus coromandellianus* Blyth, *Cat Mammalia Mus. Asiat. Soc.* : 33 (Calcutta, Calcutta district, West Bengal, India).
1872. (?) *Vesperugo micropus* Peters, *Proc. Zool. Soc. Lond.* : 259 (Masuri = Mussoorie, Dehra Dun district, Uttar Pradesh India)
1872. (?) *Vesperugo micropus* Hutton, *Proc. Zool. Soc. Lond.* : 708 (Dehra Doon = Dehra Dun, Dehra Dun district, Uttar Pradesh, India).

**Common name** : Indian Pipistrelle (Eng.).

**Material examined** : Darjiling district : 1 ♂, Darjiling, coll. —, —, 1 ♂, 1 ♀, Gopaldhara, coll. N. A. Baptista, 11. v. 1915, 5. vi. 1915; 1 ♂, Nimbong, coll. N. A. Baptista, 13. vii. 1916; 2 ♂, 1 ♀, Pashok, coll. N. A. Baptista, 4, 5. vii. 1915, 13. ix. 1915; 4 ♂, 4 ♀, Pedong, coll. N. A. Baptista, 13 – 16. viii. 1916. 9 – 13. ix. 1916; 1 ♂, Ranichera, coll. R. L. Chowdhury, 5. xii. 1980; 1 ♂, Takdah,, Purchased. 7. viii. 1958. Jalpaiguri district : 2 ♂, 2 ♀, Hasimara, coll. N. A. Baptista, 8, 22. xi. 1915, 13, 14. ii. 1916; 1 ♂, 1 ♀, Jalpaiguri, coll. C. A. Crump, 17, 18. iv. 1915. Koch Bihar district : 4 ♀, Haldibari, coll. N. A. Baptista, 13. iv. 1915. Medinipur district : 5 ♂, 7 ♀, Salbani, coll. C. A. Crump. 18 – 23. ix. 1914. North 24-Parganas district : 1 unsexed, Bhajna, coll. Y. Chaturvedi, vii. 1968; 1 ♂, 1 ♀, Salt Lake, coll. B. Biswas, 25. v. 1963, 4. ii. 1965.

**Measurements** : External 18 ♂ : Fa 28.2 – 34.4(30.6); Tl(10) 30.0 – 35.0(32.2); E(17) 9.5 – 13.0(10.5); Tb(15) 9.1 – 13.7(11.1); F & Cl(17) 4.0 – 8.0(6.0). 18 ♀ : Fa 28.1 – 34.2(31.0); Tl(10) 28.0 – 38.0(32.0); E 10.0 – 11.0(10.5); Tb(17) 8.9 – 13.6(11.3); F & Cl 4.0 – 8.4(6.6). Cranial : 11 ♂ : l(10) 10.8 – 13.8(12.1); *mtr*(9) 4.0 – 4.6(4.3); *c*<sup>1</sup> – *c*<sup>1</sup>(10) 3.6 – 4.5(4.0); *iw*(9) 3.1 – 3.6(3.3); *cw* 6.0 – 7.3(6.3); *zw*(1) 7.9; *m*<sup>3</sup> – *m*<sup>3</sup>(9) 5.0 – 6.6(5.4); *ml*(1) 9.2; 10 ♀ l 11.1 – 12.3(11.9); *mtr* 3.6 – 4.5(4.3); *c*<sup>1</sup> – *c*<sup>1</sup> 3.5 – 4.1(3.9); *iw* 3.2 – 3.6(3.4); *cw* 6.0 – 6.4(6.2); *zw*(2) 7.7, 7.9; *m*<sup>3</sup> – *m*<sup>3</sup> 4.5 – 5.5(5.3); *ml*(1) 7.8.

**Diagnosis** : A. small-sized pipistrelle (forearm 31.0 mm, on average); dorsal fur blackish brown, tips of hairs slightly rufescent; ventral fur slightly paler brown; tragus forward-curving and bluntly rounded; calcarial lobe small.

*Distribution* : In West Bengal : Darjiling : Darjiling district (Wroughton 1916b), Jalpaiguri district (Wroughton 1916b), Koch Bihar district (Wroughton 1916b), Medinipur district (Wroughton 1915), Calcutta district (Blyth 1863a), North 24-Parganas district (Sinha 1970). In India (other than West Bengal) : Widely distributed in peninsular India, north to Jammu (Sharma & Sharma 1976) & Kashmir (Chakraborty 1983), east to northeastern states including Tripura (Agrawal & Bhattacharyya 1977). The present species has also been reported from the Car Nicobar Island (Bhattacharyya 1977). Outside India : Afghanistan (Meyer-Oehme 1965), Pakistan (Walton 1974), Nepal (Hinton & Frg 1923), Sri Lanka Bangladesh (Khan 1982).

*Remarks* : The Indian Pipistrelle is a common bat in West Bengal, but is rather difficult to collect when in flight, as it efficiently avoids the mist net.

#### 45. *Pipistrellus mimus* Wroughton

1899. *Pipistrellus mimus* Wroughton, *J. Bombay nat. Hist. Sac.*, **12** : 722 (Mheshkatri, Dangs, Surat district = Mheshkatri, The Dangs district, Gujarat, India).

1915. *Pipistrellus principulus* Thomas, *Ann. Mag. Nat. Hist.*, **15** : 231 (Gauhati = Guwahati, Kamrup district, Assam, India).

*Common names* : Indian Pygmy Pipistrelle (Eng.), *Chamchika* (Beng.).

*Material examined* : Barddhaman district : 2 ♂, 1 ♀, Arrah, coll. P. K. Das, 23,24, iv. 1988; 1 ♂, Churpurni, coll. P. K. Das, 27. iv. 1988; 2 ♂, 1 subad. ♂, 1 ♀, 1 subad. ♀, Katoya, coll. P. K. Das. 30. iv. 1988 1. v. 1988 Calcutta district : 16 ♂, 1 young ♂, 10 ♀, 1 unsexed, Calcutta (Beckbagan, Beliaghata, Bowbazar, Calcutta, Indian Museum Compound, Lindsay Street, Park Circus, (Tollygunge), coll. S. M. Ali, B. Biswas. T. K. Chakraborty, B. B. Dutta, Dillon, S. R. Dey Sarker, D. K. Ghosal, F. H. Gravely, S. A. Hussain, A. P. Kapur, C. K. Misra, R. N. Mukherjee, B. Ram, Ramchandra C. Routh, S. S. Saha, C. Sarkar, Y. P. Sinha, 1866, 1. xi. 1915, 20 xi. 1915, 19. iv. 1951, 29. xi. 1951, x. 1952, 5. iii. 1959. 25. vii. 1962, 19. ix. 1963, 17. xii. 1966. 30. iii. 1967, 11. vii. 1967, 29. ix. 1967, 9. viii. 1969, 4. x. 1969, 4. x. 1969, 21. x. 1974, 15. x. 1977, 17. iv. 1979, 14. x. 1979, 20. x. 1979, 2. xi. 1979, 28. iv. 1980; 3 ♂, 2 ♀, Dhakuria, coll. K. Das, P. K. Das, 5. I. 1978, 28. xii. 1978, 4. V. 1979, 30. iii. 1981, 12. vii. 1982. Darjiling district : 1 ♂, Kalijhora, coll. P. K. Das, 19, ii. 1979. Hugli district : 1 ♀, Singur, coll. Parrack, 24. viii. 1964; 1 ♂, Tarapur, coll. S. Chakraborty, 22. ii. 1974. Jalpaiguri District; 1 ♂, Bharnabari, coll. N. A. Baptista, 13. ii. 1916; 8♂, 7♀, Hasimara coll. N. A. Bapista, 7. iv. 1915, 26. x. 1915, 2, 3, 10. xi. 1915, 15. i, 1916, 21. iii. 1916; 2♂, 2♀, Khuntimari, coll. S. Chakraborty, 8, 9, ix. 1983; 1♂, 4♀, Sulkapara, coll. S. Chakraborty, 4. ix. 1983; Koch Bihar district : 1♂, 1♀, Haldibari, coll. C. A. Crump, 13. iv. 1915; 1♂, 1♀, Haldibari, coll. C. A. Crump, 13. iv. 1915; 1♀, Sitalkuchi; coll. S. Chakraborty, 10. iv. 1984. Maldah district : 2♂, 3♀, Maldah coll. P. K.

**Das, 25, 26, 28, ii.** 1979. Medinipur district : 1♂, 1♀, Balivasa coll. P. K. Das, 10, 13. ix. 1984; 1♂, 1♀, Chandra, coll. P. K. Das, 16, 18. ix. 1984; 1♂, 5♀, Chilkgarh, coll. P. K. Das, 9. ix. 1984; 3♀, Dhadika, coll. P. K. Das, 22. ix. 1984; 2♂, 1♀, Maldalpuskarini, coll. P. K. Das, 22. ix. 1984; 3♂, 3♀, Salbani, coll. C. A. Crump, 20, 22. ix. 1914. Murshidabad district : 1♂, Namile coll. S. Chakraborty, 17. x. 1987; 1♀, Shibnagar, coll. S. Chakraborty, 17. x. 1987. Nadia District : 3♂, 7♀, Madanpur, coll. P. K. Das, 16. vii. 1969. North 24-Parganas district : 1♂, Barrackpore, coll. G. Topal, 7. v. 1967; 1♂, Hasnabad coll, S. S. Saha, 22. viii. 1973; 1♂, Lake Town, coll. S. K. Chanda, 9. iv. 1981; 7♂, 24♀, Salt Lake, coll. B. Biswas, S. S. Saha, G. Topal, 21, 24, 27. iv. 1963, 25. v. 1963, 19. iv. 1964, 31. i. 1965, 4. ii. 1965, 14, 19. iii. 1965, 26. iv. 1966, 30. iii. 1967, 16. viii. 1967, 21. iv. 1969, 28. vii. 1969. Puruliya district : 1♂, Ajodhya Hills, coll. A. K. Mukherjee, 25. ii. 1982; 6♂, 9♀, Kuilapal, coll. v. C. Agarwal, 6 – 19. i. 1985. South 24-Parganas district : 1♂, 3 unsexed, Behala, coll. S. S. Saha, C. B. Srivastava, —, — ; 2♂, 2♀, Belgachia, coll. A. K. Mandal, 27. xii. 1968; 1♂, 6♀, Dayapur, coll. A. K. Mandal, 28, 29. ix. 1969; 1♂, Patharpratima, coll. S. S. Saha 10. vii. 1967; 5♂, 10♀, Sajnekhli, coll. S. K. Chattopadhyay, A. K. Mandal, 3. xi. 1978, 2. ix. 1982; 4♂, 12♀, Taldi, coll. A. K. Mandal, 27. xii. 1968; 2♂, Thakurpukur, coll. A. K. Nag, 13, 16. iv. 1979. West Dinajpur district : 1♀, Kulik, coll. S. Chakraborty, 11. x. 1987.

*Measurements* : External : 19♂ : Fa 25.0 – 30.2(27.3); E 8.5 – 11.8(10.2); Tb 10.3 – 12.5(10.9); F & Cl 4.5 – 7.0(5.9). 26♀ : Fa 25.8 – 30.0(28.0) : E. 8.2 – 11.5(10.2); Tb 10.1 – 12.0(11.0); F & Cl 5.5 – 7.0(6.3). Cranial : 7♂ : *l* 10.4 – 12.4(11.2); *iw* 3.2 – 3.6(3.4); *cw* 5.5 – 6.9(6.1); *zw* 7.0 – 7.9(7.4); *m<sup>3</sup> – m<sup>3</sup>* 4.8 – 5.4(5.2); *mtr* 3.5 – 4.2(3.9); *ml* 7.2 – 8.6(7.7). 8♀ : *l* 10.3 – 12.3(11.3); *iw* 3.3 – 3.8(3.5); *cw* 5.6 – 6.7(6.3); *zw* 7.2 – 7.8(7.5); *m<sup>3</sup> – m<sup>3</sup>* 4.5 – 5.8(5.4); *mtr* 3.2 – 4.2(3.7); *ml* 7.0 – 8.6(7.9).

*Diagnosis* : Smallest (forearm around 28.0 mm) pipistrelle of West Bengal; fur dense and short; dorsal coloration bistre brown, base of hairs almost black; ventral parts lighter; face, ears and wing-membranes almost black; ears small and scarcely triangular; tarsus short and curved forward; post-calcarial lobe present; wings from base of toes.

*Distribution* : In West Bengal : Darjeeling district, Jalpaiguri district (Wroughton 1916b), Jalpaiguri district (Wroughton 1916b), West Dinajpur district, Maldah district, Murshidabad district, Nadia district, Bardhaman district, Puruliya district, Medinipur district (Wroughton 1915), Hugli district, Haora district, Calcutta district (Wroughton 1915), North 24-Parganas district, South 24-Parganas district (Khajuria 1953). In India (other than West Bengal) : Widely distributed throughout the mainland of Indian Union. Outside India : Afghanistan (Meyer-Öehme 1965), Pakistan, Nepal (Hinton & Fry 1923), Sri Lanka, possibly Bangladesh (Khan 1982), Myanmar, Vietnam, Thailand (Lekagul & McNeely 1977).

*Remarks* : Sinha (1980) has synonymised *Pipistrellus mimus glaucillus* Wroughton, 1912 (type-locality : Multan, The Punjab, Pakistan) with *Pipistrellus m. mimus*. Ellerman & Morrison-Scott (1951) have considered *Pipistrellus principulus* as a subspecies of *P. mimus*, with

hesitation. Hill & Harrison (1987) have considered *principulus* conspecific with *mimus*. Specimens of *P. mimus* from Assam and adjoining areas do not differ from those of other parts of India.

#### 46. *Pipistrellus ceylonicus indicus* (Dobson)

1878. *Vesperugo indicus* Dobson, *Cat. Chiroptera Colln Br. Mus.* : 222 (Mangalore, Malabar coast = Mangalore, Dakshina Kannada district, Karnataka, India).

1899. *Pipistrellus chrysothrix* Wroughton, *J. Bombay nat. Hist. Soc.*, 12 : 720 (Mheskatri, Surat Dangs = Mheskatri, The Dangs district, Gujarat, India).

1915. *Pipistrellus ceylonicus subcanus* Thomas, *J. Bombay nat. Hist. Soc.*, 24 : 30 (Yalala, Junagadh State, Kathiwar, Alt. 200' = Talala, c 62 m, Junagadh district, Gujarat, India).

*Common name* : Kelaart's Pipistrelle (Eng.).

*Material examined* : Calcutta district : 1 subad. ♂, Calcutta, coll. G. E. Dobson, 1878.

*Measurements* : External : 1 subad. ♂ : Fa 35.1; E 9.8; Tb 15.3; F & Cl 7.7. Cranial : 1 subad. ♂ : *l* 14.5; *mtr* 6.0; *c*<sup>1</sup> – *c*<sup>1</sup> 5.0; *iw* 3.7; *cw* 7.6; *m*<sup>3</sup> – *m*<sup>3</sup> 6.7; *ml* 11.1.

*Diagnosis* : One of the larger (forearm may reach nearly 40.0 mm) pipistrellus of West Bengal; ear short and triangular, outer margin straight; tragus with straight inner and convex outer margin and a triangular lobule at base; wings from base of toes; post-calcarial lobe semicircular; extreme tip of tail free from membrane; dorsal colour brown, reddish brown or greyish brown, ventral parts slightly paler; ears and membranes blackish brown.

*Distribution* : In West Bengal : Calcutta district (Anderson 1881, as *Vesperugo abramus*). In India (Other than West Bengal) : Rajasthan (Ryley 1914), Uttar Pradesh (Lal 1984), Madhya Pradesh (Brosset 1962c). Gujarat, Maharashtra (Wroughton 1912a), Goa (specimen in ZSI), Karnataka, Kerala (Blanford 1891), Tamil Nadu (Dobson 1878), Andhra Pradesh (Lal 1984), Orissa (Das & Agrawal 1973), Bihar (Wroughton 1915). Outside India : Pakistan, possibly Bangladesh (Siddiqi 1961a).

*Remarks* : Ellerman & Morrison-Scott (1951) have recognised three subspecies of *Pipistrellus ceylonicus*, viz—*indicus*, *chrysothrix* and *subcanus* for the Indian mainland, on the basis of differences in size and colour. Brosset (1962c) has observed differently coloured individuals in the same colony of *P. ceylonicus*. Khajuria (1980) has synonymised *chrysothrix* with *indicus*, while Lal (1984) has considered both *chrysothrix* and *subcanus* as synonyms of *indicus*. Sinha (1986) could not find any major differences in the external and cranial measurements of the three Indian subspecies of *P. ceylonicus*. He (Sinha 1986) identified specimens from Bihar as *P. c. indicus*, but maintained the northwestern Gujarat population,

*i.e.*, *subcanus* as such. Under the circumstances, Lal's (*loc. cit.*) view appears to be most acceptable.

On the basis of specimen mentioned above, *Pipistrellus ceylonicus indicus* is hereby reported for the first time from Goa.

Kelaart's Pipistrelle is rather rare in West Bengal.

#### 47. *Pipistrellus cadornae* Thomas

1916. *Pipistrellus cadornae* Thomas, *J. Bombay nat. Hist. Soc.*, 24 : 416 (Pashok, 3,500' = Pashok, c 1,067 m, Darjiling district, West Bengal, India).

*Common name* : Thomas' Pipistrelle (Eng.).

*Material examined* : None.

*Measurements* : Nil.

*Diagnosis* : A rather small (forearm about 32.0 mm) pipistrelle with very broad tragus; ears broad and triangular; upperparts dark brown, underparts lighter, individual hairs slaty at base, brown at tip.

*Distribution* : In West Bengal : Darjiling district. In India (other than West Bengal) : (?)Assam (Lekagul & McNeely 1977). Outside India : Myanmar (Hill 1962), Thailand (Hill & Thonglongya 1972).

*Remarks* : Ellerman & Morrison-Scott (1951) have included *cadornae* as a subspecies of *Pipistrellus savii* (Bonaparte 1837), with some element of doubt. Hill (1962), however, has considered it as a distinct species.

Lekagul & McNeely (1977) have included Assam in the distributional range of *Pipistrellus cadornae*, but no specimen from that area can be traced.

#### 48. *Pipistrellus affinis* (Dobson)

1871. *Vesperugo (Pipistrellus) affinis* Dobson, *Proc. Asiat. Soc. Beng.* : 213 (Bhamaw, Yunan = Bhamo, northeastern Myanmar).

*Common name* : Chocolate Bat (Eng.).

*Material examined* : None.

*Measurements* Nil.

*Diagnosis* : A large pipistrelle of the size of Kelaart's Pipistrelle (forearm around 40.0

mm); back chocolate brown, head and neck lighter, ventral pelage dark brown with lighter tips, pubis and ventral surface of thigh dirty white; outer margin of ear straight; upper incisors of nearly equal length, first upper premolar minute and displaced inwardly.

*Distribution* : In West Bengal : Darjiling district (Wroughton 1916c), Calcutta district (Wroughton 1918a). In India (Other than West Bengal) : Uttar Pradesh (Wroughton 1918a), Maharashtra (Pathak & Sharma 1969). Outside India : Nepal (Francis & Hill 1986), Sri Lanka (Phillips 1935a), possibly Bangladesh (Khan 1982), Myanmar, southern China (Tate 1942a, Pen *et al.* 1962), including Tibet (Feng *et al.* 1980).

*Remarks* : Francis & Hill (1986) have stated that specimens from India (and also from Nepal), labelled as *Pipistrellus mordax* (Peters, 1866) and those from the former country listed as such by Wroughton (1916c, 1918a) match well the type description of *P. affinis*, and that all Indian records of *P. mordax* should probably be referred to *P. affinis*. According Koopman (1989), *P. mordax* is endemic to Java, and the Indian records of *P. mordax* are referable to *P. affinis*. Thus, Phillips' (1935a) specimens from Sri Lanka should also be regarded as *P. affinis*. However, Pathak & Sharma (1969) have reported both *Pipistrellus affinis* and *Pipistrellus mordax* from the same locality of Maharashtra. These authors have also found the karyotypes of these two species, though apparently identical, differ by a small pair of small subtelocentric chromosomes.

#### Genus *Scotozous* Dobson, 1875

*Dental formula* :  $i \frac{2}{3}$ ,  $c \frac{1}{1}$ ,  $pm \frac{2}{2}$ ,  $m \frac{3}{3} \times 2 = 34$ .

The genus *Scotozous* is monospecific.

#### 49. *Scotozous dormeri* (Dobson)

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

1915. *Scotozous dormeri caurinus* Thomas, *J Bombay nat Hist. Soc.*, 24 : 33 (Junagadh, Kathiawar, Alt. 400' = Junagadh, c 122 m, Junagadh district, Gujrat, India).

*Common name* : Dormer's Bat (Eng.).

*Material examined* : Bardhaman district : 3♂, 2♀, Arrah, coll. P. K. Das, 22, 24. iv. 1988; 2♀, Katoya, coll. P. K. Das, 30. iv. 1988. Birbhum district : 1♀, Chandrapur, coll., A. K. Poddar, 11. xii. 1985. Calcutta district : 1♂, Calcutta, coll. —, —; 1♀, Dhapa, coll. G. E. Dobson, 1876. Hugli district : 1♂, Singur, coll. Ajoy K. Mandal, 26. ix. 1975; 1♀, Tarapur, coll. S. Chakraborty, 20. ii. 1974. Jalpaiguri district : 1♂, Bharnabari, coll. N. A. Baptista, 10. v. 1916. Malda District : 1♂, Adina, coll. P. K. Das, 26. ii. 1979. Medinipur district : 1♀, Balivasa, coll. P. K. Das, 12. ix. 1984; 1♂, 1♀, Mandalpuskarini, coll. P. K. Das, 20, 21. ix.

1984. North 24-Parganas district : 1 ♀, Mitpukur, coll. B. Biswas, 22. v. 1971; 1 ♀, Salt Lake, coll. B. Biswas, 25. v. 1963.

**Measurements** : External : 6♂ : Fa 30.0 – 35.0(33.0); E 11.0 – 13.0(11.7); Tb 11.6 – 14.0(12.4); F & Cl 6.0 – 8.5(7.3). 7♀ : Fa(6) 30.0 – 34.7(32.9); E. 9.2 – 12.5(11.0); Tb 11.2 – 12.5(11.7); F & Cl 5.5 – 8.0(7.0). Cranial : 2♂ : *l* 13.7, 14.5; *mtr* 5.3, 5.5;  $c^1 - c^1$  4.8, 4.9; *iw* 4.0, 4.2; *cw* 7.6, 8.1; *zw*(1) 9.6;  $m^3 - m^3$  6.5, 7.0; *ml* 9.4, 10.7, 2♀ : *l* 14.0, 14.1; *mtr* 5.5, 5.6;  $c^1 - c^1$  4.7, 4.8; *iw* 4.0, 4.2; *cw* 7.5(2); *zw* 10.0(2);  $m^3 - m^3$  (1) 7.2; *ml* 9.5, 10.5.

**Diagnosis** : Very much similar to Kelaart's *Pipistrelle*, but second upper incisor very small, not extending beyond cingulum of inner incisor; underparts whitish, often lemon yellow in live and freshly killed specimens.

**Distribution** : In West Bengal : Jalpaiguri district (Wroughton 1917a), Maldah district, Bardhaman district, Birbhum district, Medinipur district, Hugli district, Calcutta district, North 24-Parganas district. In India (other than West Bengal) : Widely distributed in the Indian mainland from Jammu & Kashmir (Chakraborty 1983), south at least to Karnataka, and from Gujarat east at least to Manipur (specimens in ZSI). Outside India : Pakistan (Roberts 1977), probably Bangladesh (Khan 1982), possibly Taiwan.

**Remarks** : Ellerman & Morrison-Scott (1951) have recognised two subspecies of *dormeri*. Agrawal (1973) has, however, synonymised *Scotozous dormeri caurinus* with the nominate subspecies.

Ellerman & Morrison-Scott (1951) have accommodated *dormeri* under the subgenus *Scotozous* of the genus *Pipistrellus*. This view is held by most of recent workers, viz—Brosset (1962c), Agrawal (1973), Roberts (1977), Corbet (1980), Honachi *et al.* (1982), Chakraborty (1983), Sinha (1986), and many others. Khajuria (1965) and Corbet & Hill (1986), however, think that *dormeri* should have its own genus. The flying habits of the present species (observed by the present worker) as also its breeding habits (Madhavan 1978) differ from those of other Indian pipistrelles. It would, therefore, be only justified to keep *dormeri* under a separate genus, *i.e.*, *Scotozous*.

On the basis of specimens mentioned above, *Scotozous dormeri* is hereby reported for the first time from Manipur, extending its distributional range further eastward.

#### Genus *Scotoecus* Thomas, 1901

**Dental formula** :  $i \frac{1}{3}$ ,  $c \frac{1}{1}$ ,  $pm \frac{1}{2}$ ,  $m \frac{3}{3} \times 2 = 30$ .

The genus *Scotoecus* is represented in West Bengal by a single species.

50. *Scotoecus pallidus* (Dobson)

1831. (?) *Vespertilio noctulinus* I. Geoffroy, In *Bèlanger. Voyage. aux Indes-Orientales* : Mammiferès : 92, pl. 3 (Bengal = (?)West Bengal, India).

1876. *Scotophilus pallidus* Dobson, *Monogr. Asiat. Chiroptera* : 186 (Mian Mir, near Lahore, India = Mian Mir, Lahore district. The Punjab, Pakistan).

*Common name* : Yellow Desert Bat (Eng.).

*Material examined* : Calcutta district : 1♀, Calcutta, coll. — , —

*Measurements* : External : 1♀ : Fa 36.7; E 11.9; Tb 13.9; F & Cl 7.4; Tr 5.1. Cranial : 1♀ : *l* 14.5; *mtr* 5.7; *c*<sup>1</sup> – *c*<sup>1</sup> 5.1; *iw* 4.5; *cw* 7.9; *m*<sup>3</sup> – *m*<sup>3</sup> 6.6.

*Diagnosis* : A rather small (forearm around 38.0 mm) vespertilionine bat; dorsal surface pale brown, tinged with fawn; ventral surface paler; antitragal lobe thick and fleshy; tragus long and broad, tip rounded, prominent triangular lobule near base.

*Distribution* : In West Bengal : Calcutta district. In India (other than West Bengal) : Himachal Pradesh (Allen 1908), Uttar Pradesh (Khajuria 1953), Bihar (Khajuria 1953). Outside India : Pakistan.

*Remarks* : Blyth (1863a) listed (under his Catalogue Number 93B) a series of alcohol-preserved specimens of *Nycticejus temmincki* (= *Scotophilus kuhli*) from Calcutta. Dobson (1876) listed (under his Catalogue Numbers 386 to 388) three such specimens of *Scotophilus temmincki* (= *S. kuhli*) from Calcutta, which he referred to Blyth's No. 93B. Anderson (1881) mentioned six alcohol-preserved specimens of *Scotophilus temmincki* (under his Catalogue No. 159m to 159r) from Calcutta and referred them to Blyth's No. 93B. It is to be noted that Blyth (1863a), Dobson (1876) and Anderson (1881) — all had mentioned Calcutta as the locality of these specimens, but could not provide any further history as to the date(s) of collection, collector(s). etc. The specimen listed above bears metal tags containing Dobson's Catalogue No. 386 and Anderson's Catalogue No. 159m. The Zoological Survey of India has eight more spirit-preserved specimens of *Scotoecus pallidus* labelled as 'No history' It is quite possible that at least some of these specimens may be the ones mentioned by Blyth (1863a), Dobson (1876) and Anderson (1881) from Calcutta, but without any further history.

Ellerman & Morrison-Scott (1951) have placed *Scotophilus pallidus* Dobson, 1876 under the genus *Nycticeius* Rafinesque, 1819. Hill (1974), however, has shown that this species should belong to the African genus *Scotoecus*.

Genus *Nyctalus* Bowdich, 1825

*Dental formula* :  $i \frac{2}{3}$ ,  $c \frac{1}{1}$ ,  $pm \frac{2}{2}$ ,  $m \frac{3}{3} \times 2 = 34$ .

Only one species and subspecies of the genus *Nyctalus* is found in West Bengal.

51. *Nyctalus noctula labiatus* (Hodgson)

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

*Common name* : Noctule (Eng.).

*Material examined* : Darjiling district : 1♂, Darjiling, coll. F. Stoliczka, 1871; 1♀, Sangser, coll. N. A. Baptista, 23. viii. 1916.

*Measurements* : External : 1♂ : Fa 53.6; E 15.5; Tb 21.5; F & Cl 10.5. 1♀ : Fa 54.2; E 16.0; Tb 23.0; F & Cl 10.0. Cranial : 1♂ : *l* 27.4; *mtr* 6.9;  $c^1 - c^1$  6.7; *iw* 5.0; *cw* 10.0; *zw* 12.3;  $m^3 - m^3$  8.6; *ml* 12.9.

*Diagnosis* : Ears nearly as broad as long, tip broadly rounded, thickened convex lobe on outer margin in front of tragus; tragus short, curved toward tip, small triangular projection at base; nostrils rather wide apart; wing from ankle; large, semicircular post-calcarial lobe; dorsal fur bright yellowish brown (often chestnut or bright chocolate coloured), ventral fur slightly paler; outer incisor short, tip directed inward toward inner incisor.

*Distribution* : In West bengal : Darjiling district. In India (other than West Bengal) : Jammu (Sharma & Sharma 1976) & Kashmir, Himáchal Pradesh (Dodsworth 1914, Lindsay 1926c), Uttar Pradesh (Bhat 1974), Sikkim (Blanford 1891), Nagaland (Mills 1923). Outside India : Pakistan (Roberts 1977), Nepal, (?) Sri Lanka (Dobson 1878), Myanmar, (?) Malaya (Chasen 1940), (?) Singapore (Dobson 1878), (?) Sumatra (Dobson 1876), (?) Java (Dobson 1878).

*Remarks* : Even though Dobson (1878) listed a specimen from Sri Lanka, subsequent literature (Phillips 1935b, Eisenberg & Mckay 1970, Hill 1980) did not mention the present species from that country. Chasen (1940) included 'Malaya States' not on the basis of any specimen, but entirely on 'geographic ground' Medway (1978) has examined the specimen from Singapore and doubted that the locality might be erroneous. The records of this species from Sumatra and Java are possibly not based on specimens, and need confirmation (Chasen 1940).

Genus *Hesperoptenus* Peters, 1868

*Dental formula* :  $i \frac{2}{3}$ ,  $c \frac{1}{1}$ ,  $pm \frac{1}{2}$ ,  $m \frac{3}{3} \times 2 = 32$ .

The genus *Hesperoptenus* is represented in West Bengal by a single species.

### 52. *Hesperoptenus tickelli* (Blyth)

1851. *Nycticejus tickelli* Blyth, *J. Asiat. Soc. Beng.*, 20 : 157 (Chaibasa in Central India = Chaibasa, Singbhum district, Bihar, India).

1851. *Nycticejus isabellinus* Horsfield, *Cat. Mammalia Mus. Hon. East-India Co.* : 38 (Central India = Chaibasa, Singbhum district, Bihar, India, *vide* Wroughton 1912c).

*Common name* : Tickell's Bat (Eng.).

*Material examined* : None.

*Measurements* : Nil.

*Diagnosis* : A rather large-sized (forearm about 60.0 mm) vespertilionine bat; colour golden yellow, head greyish; ears oval; wing-membrane backish; wings from base of toes; small pad under thumb; second upper incisor small and located at base of first.

*Distribution* : In West Bengal : Jalpaiguri district. In India (Other than West Bengal) : Rajasthan, Madhya Pradesh (Dobson 1876), Gujarat (Wroughton 1912c), Tamil Nadu, Orissa (Wroughton 1915), Andhra Pradesh (specimen in CMNH), Bihar, Andaman Islands (Dobson 1876). Outside India : Nepal (Mitchell 1980), Sri Lanka, Bangladesh (Khan 1982), Myanmar (Anderson 1881), possibly southwestern China (Honacki *et al.* 1982), Thailand (Hill & Thonglongya 1972).

*Remarks* : On the basis of the specimen mentioned above, *Hesperoptenus tickelli* is hereby reported for the first time from Andhra Pradesh.

Tickell's Bat appear to be essentially a sub-montane species which may migrate to the plains in suitable season. This bat is rather uncommon in West Bengal.

### Subfamily MINIOPTERINAE

The subfamily Miniopterinae consists of the single genus *Miniopterus*.

#### Genus *Miniopterus* Bonaparte, 1837

*Dental formula* :  $i \frac{2}{3}$ ,  $c \frac{1}{1}$ ,  $pm \frac{2}{3}$ ,  $m \frac{3}{3} \times 2 = 36$ .

One species and subspecies of the genus *Miniopterus* has been reported from West Bengal.

53. *Miniopterus schreibersi fuliginosus* (Hodgson)

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

**Common names** : Schreiber's Long-fingered Bat, Long-winged Bat, Bent-winged Bat (Eng.).

**Material examined** : None.

**Measurements** : Nil.

**Diagnosis** : A medium-sized (forearm between 45.0 and 50.0 mm) vespertilionid bat; head greatly elevated above face-line; ears much shorter than head, inner margin much convex, outer margin emarginate opposite base of tragus; terminal phalanx of longest finger flexed forward on under surface of metacarpal (Fig. 32); wings from near the ankle; tail totally included within interfemoral membrane; colour of fur varies from blackish brown to reddish brown.



**Fig. 32** : Wing of *Miniopterus schreibersi*.

**Distribution** : In West Bengal : (?) Calcutta district (Allen 1908), In India (other than West Bengal) : Uttar Pradesh, Maharashtra (Wroughton 1916a), Karnataka (Bhat & Sreenivasan 1981), Meghalaya (specimens in ZSI). Outside India : Eastern Afghanistan (Gaisler 1970), possibly Pakistan (Gaisler 1970), Nepal, Sri Lanka, Myanmar.

**Remarks** : In recent years, there has been much discussion on the taxonomy of the genus *Miniopterus*. Hill's (1983) view has principally been accepted here to enumerate the distributional range of *Miniopterus schreibersi fuliginosus*. According to Roberts (1977), this bat has not yet been obtained from Pakistan. The required habitat conditions of this bat, as given by Brosset (1962c), were never available in Calcutta. It is, therefore, extremely doubtful if the specimen reported from Calcutta by Allen (1908) was actually collected from that very place.

On the basis of specimens mentioned above, *Miniopterus schreinersi fuliginosus* is hereby reported for the first time from Meghalaya.

### Subfamily MURININAE

Two genera of the subfamily Murininae has been reported from West Bengal.

#### Key to the genera of the subfamily *Murininae*

- Last upper molar normal .....*Murina*  
 Last upper molar much reduced, often deciduous .....*Harpiocephalus*

#### Genus *Murina* Gray, 1842

Dental formula :  $i \frac{2}{3}$ ,  $c \frac{1}{1}$ ,  $pm \frac{2}{2}$ ,  $m \frac{3}{3} \times 2 = 34$ .

Four species and subspecies of the genus *Murina* have been reported from West Bengal.

#### Key to the species and subspecies of the genus *Murina*.

- 1 Small (forearm around 35.0 mm) ..... 2  
     Large (forearm 40.0 mm or more) .....*Murina leucogaster rubex*  
 2. Upper half of outer margin or ear concave .....*Murina tubinaris*  
     Upper half of outer margin of ear convex or straight ..... 3  
 3. Dorsal colour ferruginous ..... *Murina cyclotis cyclotis*  
     Dorsal colour brown ..... *Murina huttoni huttoni*

The arrangement of species is after Hill (1964a) and Koopman & Danforth (1989).

#### 54. *Murina leucogaster rubex* (Thomas)

1916. *Murina rubex* Thomas, *J. Bombay nat. Hist. Soc.*, 24 : 639 (Pashok, 3500' = Pashok, c 1,067m, Darjiling district, West Bengal, India).

*Common name* : White-bellied Tube-nosed Bat (Eng.).

*Material examined* : Darjiling district : 1♂ (skull missing), Sangser, coll. N. A. Baptista, 20. viii. 1916.

*Measurements* : External : 1♂ : Fa 40.0 (from study skin); E 14.0; TI 36.0; F & CI 9.0.

*Diagnosis* : Largest (forearm 40.0 mm or more) tube-nosed (Fig. 30B) bat of West Bengal; fur thick, close and woolly; colour above greyish russet, below dull buffy; ear without pointed projection at inner base, well-defined notch at upper third of outer margin.

*Distribution* : In West Bengal : Darjiling district. In India (other than West Bengal) : None recorded yet. Outside India : None.

*Remarks* : The White-bellied Tube-nosed Bat is one of the rarest bats of West Bengal, and is restricted to the montane regions of the Darjiling district. Besides the type-locality, it has also been collected from Sangser of the same district (Wroughton 1917b, who identified three males as *Murina huttoni*, but one of these, present in the Zoological Survey of India, has been identified as *Murina leucogaster rubex*).

### 55. *Murina tubinaris* (Scully)

1881. *Harpiocephalus tubinaris* Scully, *Proc. zool. Soc. Lond.* : 200, fig 1 (Gilgit, Gilgit district, Jammu & Kashmir, India).

*Common name* : Scully's Tube-based Bat (Eng.).

*Material examined* : None.

*Measurements* : Nil.

*Diagnosis* : Small-sized (forearm around 31.0 mm) tube-nosed bat; ears rather broader and rounded, small lobe at base of anterior margin, less prominent emargination on posterior margin; dorsal surface grey, ventral surface greyish white, pelage dark brown at base; forearms, tail, legs and upper surface of interfemoral membrane thinly covered with hair; anterior upper and lower premolars reduced.

*Distribution* : In West Bengal : Darjiling district. In India (other than West Bengal) : Jammu & Kashmir, Himachal Pradesh (specimen in AMNH), Sikkim (Sanborn 1932), Meghalaya (Hinton & Lindsay 1926), Arunachal Pradesh (Hinton & Lindsay 1926). Outside India : Pakistan (Koopman & Danforth 1989), Myanmar, Vietnam, Laos, Thailand (Hill 1983).

*Remarks* : Ellerman & Morrison-Scott (1951) listed *tubinaris* as a tentative subspecies of *Murina huttoni*, but Hill (1962, 1964a) has shown that *tubinaris* should be treated as a species distinct from *huttoni*, on grounds of its pelage characteristics and size.

On the basis of the specimen mentioned above, *Murina tubinaris* is hereby reported for the first time from Himachal Pradesh.

56. *Murina huttoni huttoni* (Peters)

1872. *Harpyiocephalus huttoni* Peters, Mber. K. preuss. Akad. Wiss. : 257.

1872. *Harpyiocephalus huttoni* Peters, Proc. zool. Soc. Lond. : 711 (Jeripanee, below Mussoore = Jeripani, near Mussoorie, Dehra Dun district, Uttar Pradesh, India).

*Common name* : Peters' Tube-nosed Bat (Eng.).

*Material examined* : None.

*Measurements* : Nil.

*Diagnosis* : Similar to *Murina tubinaris*, but larger (forearm 35.0 mm, on average); dorsal surface greyish brown; ventral surface greyish white with brownish tinge, more so on flanks; anterior upper and lower premolars relatively less reduced.

*Distribution* : In West Bengal : Darjiling district (including 'Sikkim district' of Ellerman & Morrison-Scott 1951, also Hill 1964a). In India (other than West Bengal) : Jammu & Kashmir (Sharma & Sharma 1976, Chakraborty 1983), (?) Rajasthan (Hill 1964a), Uttar Pradesh, Assam (Hill 1964a). Outside India : Pakistan (Roberts 1977), Tibet (Hill 1964a).

*Remarks* : According to Hill (1964a), a specimen from Rajasthan approaches the eastern subspecies, *M. h. rubella* Thomas. 1914, in size and colour.

Hinton & Fry (1923) reported a specimen of *Murina huttoni* from Nepal, which was collected and reported by Scully (1888) as *Harpyiocephalus leucogaster*. The specimen (examined) is neither *leucogaster* nor *huttoni*.

57. *Murina cyclotis cyclotis* (Dobson)

*Muriana cyclotis* Dobson, 1872. Proc. Asiat. Soc. Beng. : 210 (Darjiling = Darjiling, Darjiling district, West Bengal, India).

*Common name* : Round-eared Tube-nosed Bat (Eng.).

*Material examined* : Darjiling district : 1♀, Darjiling, coll. F. Stoliczka, — ; 1♂, Pashok, coll. N. A. Baptista, 3. viii. 1915; 1♂, Takdah, purchased, 8. viii. 1958.

*Measurements* : External : 2♂ : Fa 30.7, 31.0; TI(1) 31.0; E 14.4, 15.0; Tb 14.0, 14.8; F & Cl 7.0, 8.2. 1♀ : Fa 34.1; TI 32.5; E 14.5; Tr 7.4; Tb 16.8; F & Cl 7.8. Cranial : 2♀ : l 15.0, 15.6; mtr 5.0, 5.1; c<sup>1</sup> - c<sup>1</sup> 3.5, 3.8; iw 3.9, 4.3; cw 7.2, 7.6; zw(1) 9.0; m<sup>3</sup> - m<sup>3</sup> 5.2(2); ml(1) 10.0. 1♀ : l 16.0; mtr 5.5; iw 4.2; cw 7.3; m<sup>3</sup> - m<sup>3</sup> 5.4; ml 10.3.

*Diagnosis* : Medium-sized (forearm 33.5, on average) tube-nosed bat; ears broad, rounded, small lobe at base of anterior margin, posterior margin without emargination; dorsal surface warm rufous brown to ferruginous, ventral surface greyish white with brownish tinge,

especially along flanks, individual hairs brown at base; forearm, tail, foot and upper surface of interfemoral membrane covered with hairs; anterior upper and lower premolars less reduced.

*Distribution* : In West Bengal : Darjiling district : In India (other than West Bengal) : Tamil Nadu (specimen in ZSI), Andhra Pradesh (Ghosh 1989), Sikkim, Meghalaya (Hinton & Lindsay 1926). Outside India : Nepal (specimen in ZSI), Myanmar, sothern China (Honacki *et al.* 1982), including Hainan Islands, Vietnam, Laos, Thailand (Hill & Thonglongya 1972), Philippine Islands.

*Remarks* : Scully (1888) reported a specimen of *Harpyiocephalus leucogaster* from Nepal. This specimen (present in ZSI, examined) is, in fact, an example of *Murina cyclotis cyclotis*.

On the basis of specimens mentioned above, *Murina cyclotis cyclotis* is hereby reported for the first time from Tamil Nadu and Nepal.

#### Genus *Harpyiocephalus* Gray, 1842

*Dental formula* :  $i \frac{2}{3}$ ,  $c \frac{1}{1}$ ,  $pm \frac{2}{2}$ ,  $m \frac{3}{3} \times 2 = 34$ .

Two species of the genus *Harpyiocephalus* occur in West Bengal.

#### Key to the species and subspecies of the genus *Harpyiocephalus*

Zygomatic width less than 14.0 mm ..... *Harpyiocephalus harpia lasyurus*

Zygomatic width more than 14.0 mm ..... *Harpyiocephalus mordax*

The arrangement of species is after Ellerman & Morrison-Scott (1951).

#### 58. *Harpyiocephalus harpia lasyurus* (Hodgson)

1847. *Noctilinia lasyura* Hodgson, *J. Asiat. Soc. Beng.*, 16 : 896 (Central Hills = Darjiling, Darjiling district, West Bengal, India).

1851. *Lasiurus pearsonii* Horsfield, *Cat. Mammalia Mus. Hon. East-India Co.* : 36 (Darjiling = Darjiling, Darjiling district, West Bengal, India).

1923. *Harpyiocephalus harpia madrassius* Thomas, *J. Bombay nat. Hist. Soc.*, 29 : 88 (Perumal, Palni Hills, 5,000' = Perumal, Palni Hills, c 1,524 m, Madurai district, Tamil Nadu, India).

*Common name* : Hairy-winged Bat (Eng.)

*Material examined* : Darjiling district : 2♂ (one badly damaged), Darjiling, coll. W. S. Atkinson, purchased, 1851, 1872; 1♂, Karsiyang, coll. E. Barlow, —.

*Measurements* : External : 3♂ : Fa 45.0-48.7(47.1); E(2) 15.2, 16.6; Tr(2) 9.1, 9.6; Tb(2) 21.4, 22.1; F & Cl(2) 8.4, 9.7. Cranial : 3♂ :  $l(2)$  21.4, 21.8;  $cb(2)$  18.8, 19.0;  $ccl(2)$  18.1, 18.7;  $mtr$  6.5-6.8(6.6);  $c^1-c^1$  6.7-6.8(6.8);  $m^2-m^2$  7.1-7.4(7.2);  $zw(2)$  13.3, 13.7;  $iw(1)$  5.5;  $cw(2)$  9.8, 10.0;  $ml(2)$  15.2, 15.3.

*Diagnosis* : Very much like a tube-nosed bat, but larger; fur thick and woolly, extends to legs, feet, interfemoral membrane and tail; wings haired on both surfaces, thinly haired toward tip; bright rusty or bright rufous above, greyish buff below.

*Distribution* : In West Bengal : Darjiling district, Jalpaiguri district. In India (other than West Bengal : Kerala (Thomas 1923, Das 1986a), Tamil Nadu, Andhra Pradesh (specimen in CMNH), Assam (specimens in BNHS)\*, Meghalaya (specimen in AMNH). Outside India : None recorded yet.

*Remarks* : Das (1986a) has synonymised *Harpiocephalus harpia madrassius* with *Harpiocephalus harpia lasyurus*.

Das (*lot. cit.*) listed the present taxon from Sikkim and Meghalaya as well. However, the concerned specimens actually belong to the next species.

On the basis of the specimens mentioned above *Harpiocephalus harpia lasyurus* is hereby reported for the first time from Andhra Pradesh, Assam and Meghalaya.

### 59. *Harpiocephalus mordax* Thomas

1923. *Harpiocephalus mordax* Thomas, *J. Bombay nat. Hist., Soc.*, 29 : 88 (Mogok, northern Myanmar).

*Common name* : Broad-skulled Hairy-winged Bat (Eng.)

*Material examined* : Darjiling district : 1♀ : Karsiyang, coll. E. Barlow, —.

*Measurements* External : 1♀ : Fa 51.3 ; E 17.2; Tr 9.5; Tb 23.5; F & Cl 9.7. Cranial 1♀ :  $l$  22.5;  $cb$  20.0;  $ccl$  19.5;  $mtr$  7.2;  $c^1-c^1$  7.1;  $m^2-m^2$  7.6;  $zw$  14.4;  $iw$  5.5;  $cw$  9.7;  $ml$  15.8.

*Diagnosis* : Similar to *Harpiocephalus harpia lasyurus*, but slightly larger with broader skull; zygomata more widely expanded; cranial rostrum well-developed, broad and heavy; incisors, canines and premolars much enlarged, stouter and heavier; last premolar often slightly broader than first molar.

*Distribution* : In West Bengal : Darjiling district. In India (other than West Bengal) : Sikkim (Das 1986a, as *H. harpia lasyurus*), Meghalaya (Dobson 1876, as *H. harpia* ; Das 1986a, as *H. harpia lasyurus*). Outside India : Myanmar, Thailand (McBee *et al.* 1986), Borneo (Hill & Francis 1984).

*Remarks* : Ellerman & Morrison-Scott (1951) considered *Harpiocephalus mordax* as a

\* Das (1986a) erroneously assumed that the Teesta Valley Tea Estate was in Darjiling district of West Bengal. It has since been ascertained that the said Tea Estate is in Assam.

subspecies of *Harpiocephalus haria* (Temminck, 1840), with some doubt. After Das' (1986a) paper was sent (in December 1982) to press, Hill & Francis (1984) identified a specimen of *Harpiocephalus* from Sabha, Borneo, as *Harpiocephalus* (?) *mordax*. *Harpiocephalus harpia* was already known from Sabha (Medway 1965). Hill & Francis (*loc. cit.*) critically compared their specimen with the type-series of *H. mordax* and a small series of *H. harpia* from Java. These authors (Hill & Francis 1984) also compared measurements of these specimens with those of the lectotype and five examples of topotypes of *H. harpia* as also with those of the specimen of *H. harpia* from Sabha. As a result of their study, Hill & Francis (*loc. cit.*) found out that all the characters (except one) given by Thomas (1923) in the original description of *H. mordax* were also reflected in their specimen from Sabha, and that the principal distinguishing characteristic between *harpia* and *mordax* was not a sex or age related feature. Payne *et al.* (1985) listed *H. harpia* from Sabha, with the comment that a specimen from Sepilok, Sabha (obviously, the one studied by Hill & Francis 1984) might possibly be *H. mordax*. McBee *et al.* (1986), for the first time, accepted *mordax* as a distinct species. Das (1986a) could find the last upper premolars larger than the first upper molars in one out of seven skulls examined by him. He (Das 1986a), however, could not realise the significance of broader rostrum and wider zygomata in three of his specimens (from Karsiyang, Darjiling district, West Bengal; Sikkim; Meghalaya). Specimens with narrower rostrum and less wider zygomata and those with broader rostrum and much wider zygomata have both been reported from Sabha (Medway 1965, Hill & Francis 1984) and south-central Thailand (Lekagul & McNeely 1977, McBee *et al.* 1986). These two forms also occur in a small area (Karsiyang, Darjiling district, northern West Bengal) of northeastern India. Moreover, two specimens, one of each form as detailed above, were procured by the same person (E. Barlow), possibly at the same location and on the same date (Das 1986a, Table 1). Under the circumstances, there appears to be no other alternative but to accept these two forms, *i.e.*; *harpia* and *mordax* as two distinct species.

On the basis of the specimens listed and mentioned above, *Harpiocephalus mordax* is hereby reported for the first time for India, from West Bengal, Sikkim and Meghalaya, extending its distributional range further westward.

#### Subfamily KERIVOULINAE

The subfamily Kerivoulineae is represented in West Bengal by the genus *Kerivoula* only.

#### Genus *Kerivoula* Gray, 1842

*Dental formula* :  $i \frac{2}{3}$ ,  $c \frac{1}{1}$ ,  $pm \frac{3}{3}$ ,  $m \frac{3}{3} \times 2 = 38$ .

Three species and subspecies of the genus *Kerivoula* have been reported from West Bengal.

**Key to the species and subspecies of the genus *Kerivoula***

- 1 Wing-membrane coloured orange and black..... *Kerivoula picta picta*  
 Wing-membrane of same colour throughout ..... 2
2. Larger (forearm more than 40.0 mm)..... *Kerivoula papillosa lenis*  
 Smaller (forearm 35.0 mm or less) ..... *Kerivoula hardwickei depressa*

The arrangement of species is after Hill (1965).

**60. *Kerivoula picta picta* (Pallas)**

1767. *Vespertilio pictus* Pallas, *Spicil. Zool.*, 3 : 7 (Ternate Island, Molucca Islands, Indonesia).

*Common name* : Painted Bat (Eng.).

*Material examined* : Calcutta district : 1 ♀ : (badly damaged), Calcutta, coll. J. Anderson, 1869.

*Measurements* : Nil.

*Diagnosis* : A rather medium-sized (forearm around 35.0 mm) kerivouline bat with characteristic colour pattern; ears large, bluntly pointed, bright orange coloured, shallow concavity below tip of posterior margin; tragus long and slender; fur soft and silky; dorsal colour light orange; ventral colour slightly paler; wing-membrane orange coloured, prominent black markings between fingers; distinct fringe of short, white hairs along posterior margin of interfemoral membrane.

*Distribution* : In West Bengal : Darjiling district (Anderson 1881), Jalpaiguri district (Inglis *et al.* 1919), Calcutta district (Dobson 1876). In India (other than West Bengal) : Rajasthan (Sharma 1987), Maharashtra (Wroughton 1916a). Goa (Agrawal 1973), Karnataka, Tamil Nadu (Jerdon 1867), Andhra Pradesh (specimen in ZSI), Orissa (Blyth 1863a), Bihar (Inglis 1916), Sikkim (Blanford 1891), Assam (Chaturvedi 1969). Outside India : Sri Lanka, Bangladesh (Jerdon 1867), Myanmar (Jerdon 1867), Vietnam (Chasen 1940), Thailand (Chasen 1940), Malaya, Sumatra, Java, Bali, Lombok (Hill 1965), Borneo, Molucca Islands.

*Remarks* : The Painted Bat has a wide distributional range in India, especially in southern and western parts, but is rather sparsely distributed in West Bengal.

On the basis of the specimen mentioned above, *Kerivoula picta picta* is hereby reported for the first time from Andhra Pradesh.

61. *Kerivoula hardwickei depressa* Miller

1906. *Kerivoula depressa* Miller, *Proc. biol. Soc. Wash.*, 19 : 64 (Biapo, Karen Hills, southern Myanmar).

1913. *Kerivoula crypta* Wroughton in Wroughton & Ryley, *J. Bombay nat. Hist. Soc.*, 22 : 14 (Kardibetta Forest, Shimoga district, Karnataka, India).

*Common name* : Hardwicke's Bat (Eng.)

*Material examined* : Darjiling district : 1♀, Gopaldhara, coll. N. A. Baptista, — ; 1♂, Pashok, coll. N. A. Baptista, 19. ix. 1915.

*Measurements* : External : 1♂ : Fa 32.6; Tl 37.0; E 12.0; F & Cl 7.3. 1 ♀ : Fa 34.8; E 13.0; F & Cl 5.6. Cranial : 1♂ :  $l$  13.4;  $mtr$  5.0;  $c^1-c^1$  3.3;  $cw$  7.2;  $zw$  8.3;  $m^3-m^3$  5.2;  $ml$  10.0. 1♀ :  $l$  13.9;  $mtr$  5.4;  $c^1-c^1$  3.4;  $cw$  7.2;  $zw$  8.5;  $m^3-m^3$  5.4;  $ml$  9.5.

*Diagnosis* : Structurally similar to the Painted Bat, but distinctly differently coloured; ears longer, tip rounded, inner margin convex, outer margin deeply concave below tip; tragus long and slender; wing from base of toes; posterior margin of interfemoral membrane fringed with very few hairs; greyish brown above and below, basal half of hairs dark brown.

*Distribution* : In West Bengal : Darjiling district. In India (other than West Bengal) : Jammu & Kashmir (Chakraborty 1983), Madhya Pradesh (specimen in ZSI), Karnataka, Assam (Dobson 1876), Meghalaya (Dobson 1876), Nagaland (Khajuria 1953). Outside India : (?) Pakistan (Blanford 1891), Myanmar, southern China, Vietnam (Osgood 1932), Cambodia (Dobson 1878), Thailand (Lekagul & McNeely 1977).

*Remarks* : Ellerman & Morrison-Scott (1951) have treated *Kerivoula crypta* as a subspecies of *Kerivoula hardwickei* (Horsfield, 1824). These authors (Ellerman & Morrison-Scott, *loc. cit.*) have considered the populations of Darjiling, and Malaya Peninsula to Sulawesi as belonging to the nominate subspecies of *K. hardwickei*, while the southern Indian and northern Myanmar populations, and the southern Chinese and southern Mayanmese populations have been regarded by them as *K. h. crypta* and *K. h. depressa*, respectively. Again, Khajuria (1953) has identified *Kerivoula hardwickei crypta* from Nagaland, northeastern India. These have resulted in a mosaic distributional pattern with respect to these three subspecies of *K. hardwickei*. Hill (1965) has noticed variation in colour among the Darjiling, Jaintia Hills and northern Myanmar populations, but has attached no taxonomic importance to the same. He (Hill 1965) has given much importance to the shape of the braincase and has treated the northern Indian (including the Darjiling population), Myanmar and the Indo-Chinese populations as *K. h. depressa*. The same author (Hill, 1965), however, has maintained *crypta* as a subspecies without assigning any reasons for the action.

There are no differences in the measurements of *depressa* and *crypta* (*vide* measurements given by Wroughton 1913a and Hill 1965), and the colour variation here is such that no taxonomic value can be ascribed to it.

Under the circumstances, it would appear highly desirable to treat *K. crypta* as a synonym of *K. h. depressa*.

Blanford (1891) has mentioned a specimen (in the British Museum) of *K. hardwickei* from the Punjab on the Indus. The place referred to is in the Punjab Province of Pakistan. Interestingly enough, Hill (1965) and Roberts (1977) have made no mention of this specimen.

On the basis of the specimen mentioned above, *Kerivoula hardwickei depressa* is hereby reported for the first time from Madhya Pradesh.

## 62. *Kerivoula papillosa lenis* Thomas

1916. *Kerivoula lenis* Thomas, *J. Bombay nat. Hist. Soc.*, 24 : 416 (Calcutta, West Bengal, India).

*Common Name* : Papillose Bat (Eng.).

*Material examined* : None.

*Measurements* : Nil.

*Diagnosis* : A large (forearm more than 40.0 mm) kerivouline bat; much like *Kerivoula hardwickei*, but shallow emargination below tip of posterior margin of ear; no fringe of hairs along posterior margin of interfemoral membrane; dorsal colour glossy brown, head whitish buff, hairs of back with basal three-fifths dark slaty of blackish, ventral colour paler and grayer.

*Distribution* : In West Bengal : Calcutta district. In India (other than West Bengal) : None recorded yet. Outside India : (?) Sri Lanka (Jerdon 1867), possibly Bangladesh (Khan 1982).

*Remarks* : Compared to the Malayan form *Kerivoula papillosa malayana* Chasen, 1940, *lenis* appears to be a valid subspecies. But it is not certain whether the holotype sent to London from Calcutta, was actually procured in or around Calcutta. Blanford (1891) doubted the identification of the specimen from Sri Lanka. The record from Bangladesh is not based on specimen(s), though it may very well occur there.

The Papillose Bat is perhaps the rarest bat of West Bengal and India. No other specimen has been collected from India since the holotype was procured.

## Family MOLOSSIDAE

Muzzle broad, obtuse and obliquely truncate; nostrils open on a specialised pad; lips large, upper lip furrowed by vertical wrinkles; ears large, broad with distinct antotragus and may or may not be united at bases across forehead; tragus small; wing narrow; wing-membranes thick and leathery; tail (Fig. 33) projecting far beyond free edge of interfemoral membrane; interfemoral membrane narrow in retracted position, but extendible backward; legs short but strong; foot short and broad; toes unequal, bear long stiff bristles; claws dissimilar; postorbital process absent; second digit of wing with one rudimentary phalanx;

third digit with three phalanges, first phalanx flexed on upper side of metacarpal in resting wing, third phalanx mostly cartilagenous; fifth finger scarcely longer than metacarpal of first.

The family Molossidae is represented in West Bengal by the genus *Tadarida* only.

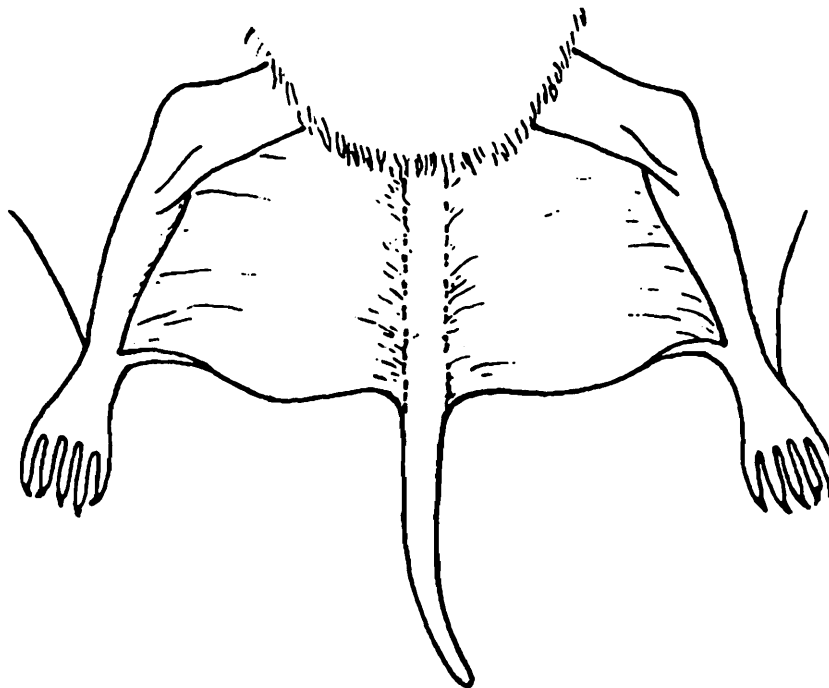


Fig. 33 Tail in Molossidae (*Tadarida* sp.).

Genus *Tadarida* Rafinesque, 1814

Dental formula :  $i \frac{1}{2}$ ,  $c \frac{1}{1}$ ,  $pm \frac{2}{2}$ ,  $m \frac{3}{3} \times 2 = 30$ .

**Key to the species and subspecies of the genus *Tadarida***

- 1. Larger (forearm more than 57.0 mm).....*Tadarida teniotis insignis*
- Smaller (forearm less than 54.0 mm) ..... 2
- 2. Inner margin of ears have a common point of origin on forehead; tragus broadened  
..... *Tadarida aegyptiaca tragata*
- Ears joined on muzzle by a narrow band of skin; tragus small and quadrate .....  
..... *Tadarida plicata plicata*

The sequence of species is after Ellerman & Morrison-Scott (1951).

**63. *Tadarida teniotis insignis* (Blyth)**

1861. *Nyctinomus insignis* Blyth, *J. Asiat. Soc. Beng.*, 30 : 90 (Amoy, Fujian, China).

*Common name* : European Free-tailed Bat (Eng.).

*Material examined* : Darjiling district : 1♂, Darjiling, coll. —, 1970.

*Measurements* : External : 1♂, Fa 64.7, E 28.0, Tb 19.9; F & Cl 11.2. Cranial : 1♂ : l 24.3;  $c^1 - c^1$  5.5; cw 12.4;  $m^3 - m^3$  10.2.

*Diagnosis* : Ears united by bases of inner margins at short distance from tip of nose; tragus broad, rounded above, half concealed by large antitragus; well-marked vertical wrinkles on upper lip; well-developed gular sac in males; wing from lower third of tibia; dorsal surface paler light brown, ventral surface more greyish; usually three (instead of two) pairs of lower incisors, though one or both of outer pair may occasionally be absent.

*Distribution* : In West Bengal : Darjiling district (Hill 1964b). In India (other than West Bengal): None recorded. Outside India : Eastern Asia from eastern Himalaya north to China, Ussuri region, North Korea and Japan (Corbet 1980)

*Remarks* : Ellerman & Morrison-Scott (1951) have recognised two subspecies for the eastern Asian populations of *Tadarida teniotis*. Corbet (*loc. cit.*), however, has considered all the described forms of this species from eastern Asia as synonymous with *insignis*.

#### 64. *Tadarida aegyptiaca tragata* (Dobson)

1874. *Nyctinomus tragatus* Dobson, *J. Asiat. Soc. Beng.*, 43 (pt. 2) : 143 (Calcutta, Calcutta district, West Bengal, India).

1919. *Tadarida thomasi* Wroughton, *J. Bombay nat. Hist. Soc.*, 26 : 732 (Bhuj, Cutch = Bhuj, Kachchh district, Gujarat, India).

1919. *Tadarida gossei* Wroughton, *J. Bombay nat. Hist. Soc.*, 26 : 733 (Sasoon Hospital, Poona = Pune, Pune district, Maharashtra, India).

*Common name* : Dobson's Wrinkled-lipped Bat (Eng.).

*Material examined* : Calcutta district : 1♂, Calcutta, —, — (holotype of *Nyctinomus tragatus*).

*Measurements* : External : 1♂, Fa 52.0; TI 46.0; E 20.0. Cranial : 1♂ : mtr 8.0;  $c^1 - c^1$  5.1; iw 4.8; cw 10.4;  $m^3 - m^3$  8.8.

*Diagnosis* : Ears and tragus very much similar to those of *Tadarida teniotis insignis*, but not joined at bases and not arising so near the extremity of muzzle as in that form; wing from ankles; calcanium terminating in a lobule.

*Distribution* : In West Bengal : Calcutta district. In India (other than West Bengal) : Rajasthan, Madhya Pradesh (Dobson 1876), Gujarat, Maharashtra, Karnataka, Outside India : Eastern Pakistan (Siddiqi 1961a), Sri Lanka (Phillips 1935b), possibly Bangladesh (Khan 1982).

*Remarks* : Ellerman & Morrison-Scott (1951) have treated *Tadarida tragata* as a species distinct from *Tadarida aegyptiaca* (E. Geoffroy, 1818). Chaturvedi (1864) has, however, shown that *tragata* is conspecific with *aegyptiaca*. Ellerman & Morrison-Scott (1951) have recognised two subspecies of *Tadarida aegyptiaca* in India, viz— *T. ae. thomasi* and *T. ae. gossei*. Sinha (1970), on the other hand, has synonymised *gossei* with *thomasi*. Since *tragata* has priority over *gossei* and *thomasi*, the Indian form should be named as *Tadarida aegyptiaca tragata* (Dobson).

### 65. *Tadarida plicata plicata* (Buchanan)

1800. *Vespertilio plicatus* Buchanan, *Trans. Linn. Soc. Lond.*, 5 : 261, pl. 13 (Bengal = West Bengal, India).

1820. *Nyctinomus bengalensis* Desmarest, *Encycl. Meth. Mammal*, 1 : 116.

1830. *Dysopes murinus* Gray, *Ill. Indian Zool.*, Pt. 3 : pl. 7.

*Common name* : Wrinkle-lipped Bat (Eng.).

*Material examined* : Calcutta district : 3♂, 3♀, Calcutta, coll. J. Anderson, J. Caunter, H. Sharma, 16. xii. 1876, 28. vii. 1909, 6. xii. 1966.

*Measurements* : External : 1♂ : Fa 49.8; E 18.2; Tb 17.0, F & Cl. 10.4. 3♀ : Fa 44.7 – 48.3(46.3); E 18.0 – 19.2(18.5); Tb 16.0 – 18.0(16.8); F & Cl 9.1 – 12.0(10.5). Cranial : 1♂ : *l* 19.9; *mtr* 7.6; *c*<sup>1</sup> – *c*<sup>1</sup> 4.8; *cw* 9.8; *zw* 11.9; *m*<sup>3</sup> – *m*<sup>3</sup> 9.6; *ml* 14.0. 3♀ : *l* 19.4 – 20.0(19.6); *mtr* 7.2 – 7.7(7.4); *c*<sup>1</sup> – *c*<sup>1</sup> 4.3 – 5.5(4.9); *cw* 9.3 – 11.2(10.0); *zw* 11.5 – 12.8(12.3); *m*<sup>3</sup> – *m*<sup>3</sup> 9.0 – 10.2(9.2); *ml* 13.0 – 14.4(13.5).

*Diagnosis* : Muzzle broad and thick; upper lip overhanging the lower, marked by pronounced vertical wrinkles; ears large, thick and rounded, joined in front of orbits by a band of skin; antitragus well-defined; lower part of legs free from wing; wing and ankle connected by raphae.

*Distribution* : In West Bengal : Calcutta district (Blyth 1863a). In India (other than West Bengal): Punjab (Blyth 1863a), Rajasthan, Uttar Pradesh (Dobson 1876), Madhya Pradesh (Kashyap 1982), Tamil Nadu (Jerdon 1867), Andhra Pradesh (specimens in ZSI), Meghalaya (Blyth 1852). Outside India : Myanmar, southern China (Honacki *et al.* 1982) including Hainan, Hong Kong (Romer 1960), Tibet (Hill 1961), Vietnam (Honacki *et al.* 1982), Cambodia (Yoshiyuki 1966), Thailand (Hill & Thonglongya 1972), Malaya Peninsula, Singapore (Dobson 1878), Sumatra, Borneo.

*Remarks* On the basis of the specimen mentioned above, *Tadarida plicata plicata* is hereby reported for the first time from Andhra Pradesh.

The Wrinkle-lipped Bat is tolerably common about Calcutta (Jerdon 1867).

## DISCUSSION AND CONCLUSIONS

The Chiropteran fauna of West Bengal can be analysed in a number of ways. A preliminary discussion on the variations in size, structure, colour, etc., would not be out of place.

Bats, as a rule, are small creatures as compared to many other groups of mammals. The largest of all bats of West Bengal is the Indian Flying Fox (*Pteropus giganteus giganteus*) which may attain a forearm length of 200 mm. All other species and subspecies of bats of West Bengal are much smaller than this one. Bats with forearm lengths ranging between 80 and 90 mm are only three, viz, *Rousettus leschenaulti leschenaulti*, *Hipposideros armiger armiger* and *Hipposideros lankadiva*, while bats with forearm lengths ranging between 70 and 80 mm, and between 60 and 70 mm together constitute the largest assemblage, closely followed by those with forearm lengths ranging from 50 to 60 mm. The smaller bats with forearm lengths between 40 and 50 mm are not less. On the smallest side, *Pipistrellus mimus* and *Tylonycteris pachypus fulvida*, regarded as the smallest bats of West Bengal and India, can have forearm as short as 25 and 26 mm, respectively.

The size and shape, relative position of the ear also varies to some extent. In *Megaderma* (both species) and *Plecotus auritus homochrous*, the ears are not only large, but also partially joined with each other. The ears of *Barbastella leucomelas darjelingensis* are also joined across the forehead. The ears are also joined more or less in a similar way in all the three species of *Tadarida* found in West Bengal. In most other bats, the ears are separately placed on the head. The ears of bats belonging to the genera *Rhinolophus*, *Hipposideros* and *Coelops*, as a rule, are quite large. In the genus *Rhinolophus*, the outer margin of the ear is deeply notched to form a distinct lobe called the antitragus (Fig. 25). The ears are funnel-shaped in bats of the genus *Kerivoula*.

The tragus, a leaf-like small structure situated at the antero-internal aspect of the base of the pinna also varies considerably in different groups of bats. This structure, however, is absent in bats of the families Pteropodidae and Rhinolophidae. The tragus is quite small in *Rhinopoma*, while it is very large in *Megaderma* and *Plecotus*, in the former it is befid as well (Fig. 21). In the genus *Taphozous* this structure is short with the tip convex and the sides concave. The tragus in most other bats is long and slender.

The nostrils are usually placed on the ventro-lateral aspect of the muzzle (Fig. 30A), but these are tubular and open laterally (Fig. 30B) in bats of the subfamily Murinae.

The nostrils are included within a complicated leaf-like structure placed at the tip of the muzzle in the families Megadermatidae and Rhinolophidae. This structure, called the noseleaf, is relatively simple in the former family (Fig. 21), while it is much complicated in bats

belonging to the latter family (Figs. 24 & 26). The noseleaf is, however, absent in the suborder Megachiroptera and in the families Rhinopomatidae, Emballonuridae, Vespertilionidae and Molossidae of the suborder Microchiroptera. The different parts of the noseleaf varies widely in various species of bats.

The tail is another structure which varies widely in different species of bats. The tail is not externally visible in *Pteropus giganteus*, *Megaerops niphanae*, *Sphaerias blanfordi*, in both the species of *Megaderma* and in *Coelops frithi*. It is quite short and rod-like (Fig. 11) in *Rouseitus leschenaulti*, *Cynopterus sphinx* and in *Eonycteris spelaea*, while in *Macroglossus sobrinus* the tail is rudimentary. The tail is entirely enclosed in the interfemoral membrane in the family Vespertilionidae (Fig. 29), while it is almost so in the family Rhinolophidae. The distal portion of the tail beyond the interfemoral membrane is very long and slender in the family Rhinopomatidae (Fig. 33), but the same in the family Molossidae (Fig. 15) is short and stout. In the family Emballonuridae, the short and stout tail emerges from the upper surface of the interfemoral membrane (Fig. 16).

The colour of most of the bats of West Bengal are drab with lighter ventral parts. Some are blackish. But certain species are brightly coloured, some others have distinct colour patterns. *Tylonycteris pachypus fulvida*, *Hesperoptenus tickelli* and both the species of *Scotophilus* show varying degrees of bright coloration. *Kerivoula picta picta* is said to be the most colourful bat of West Bengal with its distinctive orange and black colour pattern. *Myotis formosus formosus* shows a somewhat similar colour pattern. *Pteropus giganteus giganteus* also has blackish and orange-yellow colour pattern. Some individuals of *Rhinolophus rouxi rouxi* assume bright golden orange hue at some seasons.

The total number and different kinds of teeth vary widely among the various genera of bats. Twentyeight and 38 are the minimum and maximum number of teeth to be encountered in the 30 genera of bats of West Bengal. The premaxillae are absent in the Megadermatidae. Hence, the incisors are also absent in this groups of bats. There is, however, no variation as regards the canines — a pair of these on both the jaws are to be found in all bats. The cheek-teeth (premolars and molars) differ widely in different genera.

### SPECIES DIVERSITY

It would be useful to know as to how the different taxa of Indian bats are represented in West Bengal. It has already been stated that all the seven families belonging to two suborders of bats which occur in India also occur in West Bengal. The number of genera under each of these families found in India and in West Bengal as well as the percentage of the Indian genera found in West Bengal have been given in Table 7.

**Table 7** : Percentage of the Indian genera of bats of each of the families represented in West Bengal.

Families	No. of genera		Percentage of Indian genera in West Bengal
	India	West Bengal	
1. Pteropodidae	8	7	87.50
2. Rhinopomatidae	1	1	100.00
3. Emballonudae	1	1	100.00
4. Megadermatidae	1	1	100.00
5. Rhinolophidae	3	3	100.00
6. Vespertilionidae	18	16	88.88
7. Molossidae	2	1	50.00
<b>Total</b>	<b>34</b>	<b>30</b>	<b>88.23</b>

An examination of the table at once reveals that four out of the seven families of Indian bats are represented in West Bengal by their total number of genera each. A single genus of each of the families Pteropodidae and Molossidae are missing from West Bengal. Both the genera are monospecific and are restricted in distribution. The two missing genera of the family Vespertilionidae also have restricted distribution in India. Thus, 88.2% of the Indian genera of bats are found in West Bengal.

In continuation of the Chiropteran species diversity in West Bengal, the total number of species under each of the genera occurring in India and in West Bengal, and the percentage of the Indian species found in West Bengal have been provided in Table 8.

**Table 8** : Percentage of Indian species of bats of each of the genera represented in West Bengal.

Genera	No. of genera		Percentage of Indian genera in West Bengal
	India	West Bengal	
1. <i>Rousettus</i>	1	1	100.00
2. <i>Pteropus</i>	3	1	33.33
3. <i>Cynopterus</i>	3	1	33.33
4. <i>Megaerops</i>	1	1	100.00
5. <i>Latidens</i>	1	—	0.00
6. <i>Sphaerias</i>	1	1	100.00

Genera	No. of genera		Percentage of Indian genera in West Bengal
	India	West Bengal	
7. <i>Eonycteris</i>	1	1	100.00
8. <i>Macroglossus</i>	1	1	100.00
9. <i>Rhinopoma</i>	2	2	100.00
10. <i>Taphozous</i>	6	3	50.00
11. <i>Megaderma</i>	2	2	100.00
12. <i>Rhinolophus</i>	14	7	50.00
13. <i>Hipposideros</i>	12	5	41.66
14. <i>Coelops</i>	1	1	100.00
15. <i>Myotis</i>	14	7	50.00
16. <i>Plecotus</i>	2	1	50.00
17. <i>Barbastella</i>	1	1	100.00
18. <i>Otonycteris</i>	1	—	0.00
19. <i>Scotomanes</i>	1	1	100.00
20. <i>Scotophilus</i>	2	2	100.00
21. <i>Eptesicus</i>	5	1	20.00
22. <i>Ia</i>	1	—	0.00
23. <i>Tylonycteris</i>	1	1	100.00
24. <i>Pipistrellus</i>	15	7	46.66
25. <i>Scotozous</i>	1	1	100.00
26. <i>Scotoecus</i>	1	1	100.00
27. <i>Nyctalus</i>	4	1	25.00
28. <i>Hesperoptenus</i>	1	1	100.00
29. <i>Miniopterus</i>	2	1	50.00
30. <i>Murina</i>	6	4	66.66
31. <i>Harpiocephalus</i>	2	2	100.00
32. <i>Kerivoula</i>	3	3	100.00
33. <i>Tadarida</i>	3	3	100.00
34. <i>Otomops</i>	1	—	0.00
<b>Total</b>	<b>116</b>	<b>65</b>	<b>56.03</b>

Even though the table is self-explanatory, some interpretations are still called for. An examination of this table reveals that 52.94% of the Indian genera are represented by all of

their species, 2.94% of the same by 66.66% of the species, 14.70% by 50.00% of their species, 2.94% by 46.66% of the species, 5.88% by 33.33% of their species, 2.94% by 25.00% of the species and still another 2.94% of the Indian genera are represented by 20.00% of the species in West Bengal, while only 11.76% of them are not at all represented in that area. This finally comes to a total of 56.03% of the total species of all the Indian genera represented in West Bengal. Considering the small geographical area occupied by West Bengal as compared to the total area of the Indian Union, this can be taken as a highly satisfactory representation of the Indian Chiropteran fauna in West Bengal.

It would not be out of place to put on record in this context that as many as six species and subspecies of bats known from India have so far been reported from West Bengal only. These are *Myotis hasseltii*, *Eptesicus tatei*, *Pipistrellus peguensis*, *Murina leucogaster rubex*, *Kerivoula papillosa lenis* and *Tadarida teniotis insidnis*. These are again restricted to two different small areas of the state, viz, Darjiling district harbouring four of them (the second, third, fourth and the sixth taxa) while Calcutta and its neighbouring area giving shelter to the other two.

### DISTRIBUTIONAL PATTERN

It is easy to follow that all the species of bats reported from West Bengal do not occur in all the districts of the state. While some of the species do so, there are species which are restricted to certain areas of the state. Likewise, a handful of species are to be found in a variety of habitats, most other species are more or less restricted to the habitats of their likings. Some of the species are quite common, others are uncommon, while still others can be regarded as rare.

#### Species restricted to the northern districts

A substantial segment of the Chiropteran fauna of West Bengal is restricted to the northern districts of the state. These species and their area of occurrence have been given in Table 9.

**Table 9** : Species of bats of West Bengal restricted to the northern districts (dubious record of *Eonycteris spelaea spelaea* from Calcutta has been excluded).

Sl. No.	Taxon	Reported from (District)
1.	<i>Megaerops niphanae</i>	Darjiling
2.	<i>Sphaerias blanfordi</i>	„
3.	<i>Macroglossus sobrinus sobrinus</i>	Darjiling and Koch Bihar
4.	<i>Rhinolophus affinis himalayanus</i>	Darjiling and Jalpaiguri
5.	<i>Rhinolophus pusillus blythi</i>	Darjiling
6.	<i>Rhinolophus luctus perniger</i>	„

Sl. No.	Taxon	Reported from (District)
7.	<i>Rhinolophus trifolius trifolius</i>	„
8.	<i>Rhinolophus pearsoni</i>	„
9.	<i>Hipposideros pomona gentilis</i>	Darjiling and Jalpaiguri
10.	<i>Hipposideros cineraceus</i>	Darjiling
11.	<i>Hipposideros armiger armiger</i>	Darjiling and Jalpaiguri
12.	<i>Hipposideros lankadiva</i>	„
13.	<i>Myotis sicarius</i>	Darjiling
14.	<i>Myotis mystacinus nipalensis</i>	Darjiling and Jalpaiguri
15.	<i>Myotis muricola muricola</i>	Darjiling
16.	<i>Myotis siligorensis siligorensis</i>	„
17.	<i>Myotis annectans</i>	„
18.	<i>Plecotus auritus homochrous</i>	„
19.	<i>Barbastella leucomelas darjilingensis</i>	Darjiling and Jalpaiguri
20.	<i>Scotomanes ornatus ornatus</i>	„
21.	<i>Eptesicus tatei</i>	Darjiling
22.	<i>Tylonycteris pachypus fulfida</i>	„
23.	<i>Pipistrellus babu</i>	Darjiling and Jalpaiguri
24.	<i>Pipistrellus peguensis</i>	Darjiling
25.	<i>Pipistrellus cadornae</i>	„
26.	<i>Nyctalus noctula labiatus</i>	„
27.	<i>Hesperoptenus tickelli</i>	Jalpaiguri
28.	<i>Murina leucogastar rubex</i>	Darjiling
29.	<i>Murina tubinaris</i>	„
30.	<i>Murina huttoni huttoni</i>	„
31.	<i>Murina cyclotis cyclotis</i>	„
32.	<i>Harpiocephalus harpia lasyurus</i>	Darjiling and Jalpaiguri
33.	<i>Harpiocephalus mordax</i>	Darjiling
34.	<i>Kerivoula hardwickei depressa</i>	„
35.	<i>Tadarida teniotis insignis</i>	„

If follows from the table that a total of 35 species (53.84%) of the Chiropteran fauna of West Bengal are restricted to the three northern districts of Darjiling, Jalpaiguri and Koch Bihar, of which 24 species have so far been reported from Darjiling district alone, followed by nine species from Darjiling and Jalpaiguri districts, one from Darjiling and Koch Bihar districts and one from Jalpaiguri district only. Restricted distribution of more than half of the

species of bats of West Bengal to such a small area of the state can better be explained by considering the zoogeographic affinities of these species.

### Species restricted to the southern districts

Species of bats of West Bengal restricted to the southern districts have been given in Table 10, along with their area of occurrence.

**Table 10** : Species of bats of West Bengal restricted to the southern districts (dubious records of *Miniopterus scherbirsi fuliginosus* and of either of the two species of *Rhinopoma* have been excluded).

Sl. No.	Taxon	Reported from (District)
1.	<i>Hipposideros fulvus pallidus</i>	Medinipur
2.	<i>Myotis hasseltii</i>	Calcutta and North 24-Parganas
3.	<i>Pipistrellus ceylonicus indicus</i>	Calcutta
4.	<i>Scotoecus pallidus</i>	”
5.	<i>Kerivoula papillos lenis</i>	”
6.	<i>Tadarida aegyptiaca tragata</i>	”
7.	<i>Tadarida plicata plicata</i>	”

It is apparent from the table that as many as seven species (10.76%) of the bat fauna of West Bengal are restricted to the three southern districts of Calcutta, North 24-Parganas and Medinipur, of which five species have so far been reported from Calcutta district alone, one from Calcutta and its adjoining North 24-Parganas district and one species from Medinipur district.

### Commonly occurring species

In contrast to the species with restricted distribution, there are a number of species which can be regarded as commonly occurring practically all throughout West Bengal. *Cynopterus sphinx sphinx* and *Pipistrellus minus* are the commonest bats of West Bengal. The former is quite common in all habitats from the sea level to moderate heights in the mountain. *Pteropus giganteus giganteus*, *Megaderma lyra lyra*, *Scotophilus kuhli kuhli* and *Pipistrellus coromandra coromandra* are also quite common. The first-named of this latter group of bats is very common in plains, moving to the hills mainly for feeding. *Scotophilus heathi heathi* and *Scotozous dormeri* are the other two commonly occurring bats of West Bengal.

### Rare species

As against a handful of commonly occurring bats, the number of rare species of bats of West Bengal is quite high. *Megaeros niphanae*, either *Rhinopoma microphyllum kinneari* or

*Rhinopoma hardwickei hardwickei*, *Kerivoula papillosa lenis* and *Tadarida aegyptiaca tragata* can be regarded as the four rarest bats of West Bengal. Only one specimen of each of these species have so far been collected. *Rhinolophus trifolius trifolius*, *Myotis sicarius*, *Eptesicus tatei*, *Pipistrellus cadornae*, *Miniopterus schreibersi fuliginosus*, *Murina leucogaster rubex*, *Murina tubinaris*, *Murina huttoni huttoni* and *Kerivoula picta picta* should also be regarded as quite rare. All these species have been collected only once from single localities, and in most cases only one specimen of a species has been collected so far. Other species of bats which can be regarded as rare in West Bengal are— *Taphozous nudiventris kachhensis*, *Megaderma spasma horsfieldi*, *Rhinolophus affinis himalayanus*, *Coelops frithi frithi*, *Myotis annectans*, *Plecotus auritus homochrous*, *Pipistrellus ceylonicus indicus*, *Pipistrellus affinis*, *Scotoecus pallidus*, *Hesperoptenus tickelli*, *Harpiocephalus harpia lasyurus*, *Harpiocephalus mordax* and *Tadarida teniotis insignis*. All these species have either been collected from two different localities each, but only a single specimen has been procured from a locality, or from only one locality but collecting more than one specimen. It is interesting to note that bats like *Rhinopoma microphyllum kinneari*, *Rhinopoma hardwickei hardwickei*, *Tadarida aegyptiaca tragata*, *Scotoecus pallidus*, *Kerivoula picta picta*, *Taphozous nudiventris kachhensis*, *Megaderma spasma horsfieldi* normal *Pipistrellus ceylonicus indicus* are fairly common in many other parts of India, but are rarely met with in West Bengal.

### HABITAT-PREFERENCE

Other conditions remaining conducive, bats generally stick to their respective habitats. It is under compelling circumstances that bats move out of their preferred habitats. There are, however, certain other species which habitually accommodate them in a number of habitats. The habitat-preference of various species of bats of West Bengal is discussed in the following paragraphs.

#### Montane species

It has been estimated that as many as 35 species (53.84% of the total Chiropteran fauna of West Bengal) are essentially montane, living in mountains and hills at varying altitudes. Many of these, however, migrate seasonally to foot-hills or even to the adjoining plains regularly, presumably for feeding. At least six of these, viz, *Hipposideros cinaraceus*, *Myotis sicarius*, *Myotis muricola muricola*, *Myotis siligorensis siligorensis*, *Plecotus auritus homochrous* and *Tadarida teniotis insignis* habitually live at higher elevations. Other montane species are *Megaerops niphanae*, *Sphaerias blanfordi*, *Rhinolophus rouxi rouxi*, *Rhinolophus pussilus blythi*, *Rhinolophus luctus perniger*, *Rhinolophus pearsoni*, *Myotis annectans*, *Eptesicus tatei*, *Pipistrellus peguensis*, *Pipistrellus cadornae*, *Nyctalus noctula labiatus*, *Murina leucogaster rubex*, *Murina tubinaris*, *Murina huttoni huttoni*, *Murina cyclotis cyclotis*, *Harpiocephalus harpia lasyurus*, *Harpiocephalus mordax* and *Kerivoula hardwickei depressa*. *Eonycteris spelaea spelaea*, *Macroglossus sobrinus sobrinus*, *Rhinolophus affinis himalayanus*, *Hipposideros*

*pomona gentilis*, *Hipposideros armiger armiger*, *Hipposideros lankadiva*, *Myotis mystacinus nipalensis*, *Barbastella leucomelas darjelingensis*, *Scotomanes ornatus ornatus*, *Tylonyctris pachypus fulvida* and *Pipistrellus babu* are still other montane forms which live at moderate to higher elevations and more to the foot-hills and adjoining plains in suitable seasons.

### Bats of the semi-arid tract

Bats of the genus *Rhinopoma* primarily live in the arid and semi-arid zones. Thus, these bats are expected in Puruliya district as also in the western drier parts of Bankura, Birbhum and Medinipur districts. *Hipposideros fulvus pallidus* and *Scotoecus pallidus* are two other bats of this habitat.

### Forest-dwelling species

At least a dozen of bats of West Bengal can be classified as essentially forest-dwelling species, *Megaerops niphanae*, *Sphaerias blanfordi*, *Macroglossus sobrinus sobrinus*, *Rhinolophus affinis himalayanus*, *Harpiocephalus harpia lasyurus* and *Kerivoula picta picta* are to be found primarily in moist evergreen forests, while *Eonycteris spelaea spelaea*, *Rhinolophus rouxi rouxi* and *Myotis formosus formosus* occur in moist evergreen and dry deciduous forests. *Pipistrellus ceylonicus indicus* is an inhabitant of the dry deciduous type of forest. *Megaderma spasma horsfieldi* and *Coelops frithi frithi* on the other hand, occur in moist evergreen as well as in the mangrove forests.

### Cave-dwelling species

Caves provide ideal conditions for day-time roosting sites of bats. Accordingly, there are a number of cave-dwelling bats in West Bengal. *Eonycteris spelaea spelaea*, *Rhinolophus affinis himalayanus*, *Rhinolophus rouxi rouxi*, *Rhinolophus pearsoni*, *Hipposideros fulvus pallidus*, *Hipposideros armiger armiger*, *Hipposideros lankadiva* and *Myotis siligorensis siligorensis* of the Chiropteran fauna of West Bengal are basically cave-dwellers. *Rhinolophus lepidus lepidus* also lives in caves, but this bat has been found in tunnels and similar hideouts as well.

### Perihuman bats

Bats generally prefer to live away from human habitations. Nevertheless, there are a number of bats who feel quite comfortable in living in and around human habitations. *Pipistrellus mimus* prefers to live in crevices of buildings, even of occupied ones. *Pipistrellus coromandra coromandra* is another bat which likes a similar hiding place. Ventilators of occupied and deserted buildings appear to be the most ideal day-time roosting site of *Myotis hasseltii* in southern West Bengal. *Taphozous longimanus longimanus* and *Taphozous saccolaimus crassus* have been observed to live comfortably in eaves of thatched huts.

*Scotophilus kuhli kuhli* and *Scotophilus heathi heathi* live beneath the corrugated roof made of galvanised iron sheets or asbestos sheets. Attic of even inhabited buildings and thatched huts is a favourite roosting site of *Megaderma lyra lyra*. The type-specimen of *Plecotus auritus homochrous* was collected from a dwelling house at Darjiling. Hence, this bat is presumably perihuman.

### **Problematic locality-records**

Considering the distributional pattern and habitat-preference of the different species of bats as discussed above, one is tempted to offer one's comments on several problematic locality-records of certain taxa from some localities of West Bengal.

As many as four species of essentially cave-dwelling bats have been recorded from Calcutta by earlier workers. Since no caves are to be found in and around Calcutta, these records may not be relied upon. The specimen of one of these, *Eonycteris spelaea spelaea*, from Calcutta might have been actually collected from Darjiling where its donor Dr. F. Stoliczka collected between 1871 and 1872. Similar might be the case of *Miniopterus schreibersi fuliginosa*. The only area of West Bengal where this bat can occur, is Darjiling district, an area situated near the type-locality (Nepal) of the taxon. The specimen of either *Rhinopoma microphyllum kinneari* or, more probably, of *Rhinopoma hardwickei hardwickei* might have actually been collected from a place 'in some western districts of West Bengal where the requisite habitat conditions of *Rhinopoma* are available. The specimen(s) of *Rhinolophus rouxi rouxi* of the type-series might have only been shipped from the Calcutta port, the place of its collecting being some other distant locality. Incidentally, the record of this species from Barrackpore, a place near Calcutta is probably based on specimen(s) of *Rhinolophus lepidus lepidus*, a bat quite common around Calcutta and thought to be conspecific with *Rhinolophus rouxi*, in those days. Likewise, the records of *Coelops frithi frithi* and *Myotis formosus formosus* from South 24-Parganas district and Calcutta district, respectively appear to be equally dubious. The type-specimen of the former might have actually been collected from the Bangladesh part of the Sundarban, because R. W. G. Frith, the collector of the specimen, was posted at Mymensingh and collected mostly in erstwhile eastern Bengal, now in Bangladesh. The supposed occurrence of *Myotis formosus formosus* in Calcutta is most probably based on misidentified specimen of *Myotis hasseltii*, a specimen of which was listed from Calcutta by Blyth (1863a) as *Vespertilio adversus* Horsfield, 1824.

## **ZOOGEOGRAPHIC CONSIDERATIONS**

Practically the whole of the mainland part of the Indian Union, including West Bengal, falls under the Oriental Region. It is, therefore, expected that the majority of the Chiropteran species of West Bengal would be of Oriental affinity. While this is true, it is equally true that some bats enjoy a much wider distributional range. Thus, in West Bengal one comes across at least some species of bats which are either predominantly Ethiopian or extensively Palearctic

in distribution, entering India (and West Bengal) toward the eastern segment and southern segment of their distributional range, respectively. These species with affinities other than Oriental constitute only 15.4% of total Chiropteran species of West Bengal, while the rest major share (84.6%) is occupied by the Oriental elements.

### Non-Oriental faunal elements

Two exotic faunal elements mingle with the predominantly Oriental complement of the Chiropteran fauna of West Bengal. These elements are of Ethiopian and Palaearctic affinities. All together 10 species come under this category. Four out of these deserve special mention. These are — two species of the genus *Rhinopoma* (i.e., family Rhinopomatidae), viz. *Rh. Microphyllum* (Brünnich, 1782) and *Rh. Hardwickei*, one of the genus *Taphozous* (Family Emballonuridae); viz, *Taphozous nudiventris* Cretzschmar, 1830 or 1831 and one species of the genus *Tadarida* (Family Molossidae), viz., *Tadarida aegyptiaca* (E. Geoffroy, 1818). All of them are distributed extensively throughout the continent of Africa. These, therefore, can be termed as Ethiopian-Palaearctic faunal elements which extend eastward and enter India through the northwest. *Rhinopoma microphyllum kinneari* is the eastern subspecies of the species which is essentially Indian in distribution, extending east to western part of West Bengal. *Rhinopoma hardwickei hardwickei* is again the eastern subspecies of the species which extends further east to reach Thailand in the Indochinese subregion. *Taphozous nudeventris kachhensis* is restricted to the Indian subregion. The distributional pattern of *Tadarida aegyptiaca tragata*, the eastern subspecies of the species, is similar to that of *Rhinopoma microphyllum kinneari*, except that it reaches further east at least to Calcutta.

The remaining six species of the non-Oriental faunal elements of the Chiropteran fauna of West Bengal are extensively distributed in the Palaearctic Region. Therefore, these may be regarded as the Palaearctic faunal elements of the fauna of West Bengal. Five of these belong to five different species of the family Vespertilionidae while the sixth one belongs to the genus *Tadarida* of the family Molossidae. The five Palaearctic species of the family Vespertilionidae are *Myotis mystacinus* (Kuhl, 1819), *Plecotus auritus* (Linnaeus, 1758), *Barbastella leucomelas* (Cretzschmar, 1826), *Nyctalus noctula* (Schreber, 1774) and *Merina leucogaster* Milne-Edwards, 1792, and the one of the family Molossidae is *Tadarida teniotis* (Refinesque, 1814). The subspecies of three of these six Palaearctic species which form part of the fauna of West Bengal, are also Palaearctic in distribution, but reaches India in the Palaearctic-Oriental transitional zone in the Himalaya (Darjiling district in West Bengal). These are— *Myotis mystacinus nipalensis*, *Barbastella leucomelas darjelingensis* and *Tadarida teniotis insignis*. The subspecies of the other three Palaearctic species occurring in West Bengal can be regarded as the fauna of the Indian subregion, (one of these, *Nyctalus noctula lobiatus*, marginally extends to the adjoining Indochinese subregion ; *Plecotus auritus homochrous* and *Murina leucogaster rubex*, the remaining two, are known from Darjiling district only). The particulars of the non-Oriental species of the Chiropteran fauna of West Bengal and the affinities of the concerned subspecies are given in Table 11.

**Table 11** : Non-Oriental species of the Chiropteran fauna of West Bengal and the affinities of the concerned subspecies.

Faunal element	No. of species	Zoogeographic affinity of subspecies
I. Ethiopian-Palaeartic	4	Indian : 3 subspecies
		Indian & Indochinese : 1 subspecies
II. Palaeartic	6	Palaeartic : 3 subspecies
		Indian : 2 subspecies
		Indian & Indochinese : 1 subspecies

It is easy to follow from the table that only three subspecies (one of each species) out of the 10 non-Oriental species are of Palaeartic affinity, the remaining seven are of Indian or Indian and Indochinese affinity.

### Oriental faunal elements

It has already been stated that the predominant element of the Chiropteran fauna of West Bengal is Oriental. This is but obvious as all the species belonging to three out of the seven families of bats occurring within the area under consideration are Oriental. These three families are Pteropodidae (seven species), Megadermatidae (two species) and Rhinolophidae (13 species). Some more species of three other families are also of this category. These families are Emballonuridae, Vespertilionidae and Molossidae which have two, 30 and one Oriental species, respectively. Thus, a total of 56 species (out of 65 species) of bats occurring in West Bengal are Oriental faunal elements. The particulars of the Oriental species of the Chiropteran fauna of West Bengal are given in Table 12.

**Table 12** : Particulars of Oriental species of the Chiropteran fauna of West Bengal.

Families	Total No. of species	No. of Oriental Species	Percentage of Oriental species
1. Pteropodidae	7	7	100.00
2. Rhinopomatidae	2	0	0.00
3. Emballonuridae	3	2	66.66
4. Megadermatidae	2	2	100.00
5. Rhinolophidae	13	13	100.00
6. Vespertilionidae	35	30	85.71
7. Molossidae	3	1	33.33
<b>Total</b>	<b>65</b>	<b>55</b>	<b>84.61</b>

Each of the polytypic species of bats of West Bengal is represented by a single subspecies in the area. It would be interesting to examine further the affinities of all the subspecies of the polytypic and of the monotypic Oriental species of bats of West Bengal individually. The results of such an analysis are summarised in Table 13.

**Table 13 :** Affinities of the subspecies of the polytypic and of the monotypic Oriental species of bats of West Bengal.

Affinities (Subregions)	No. of Species/subspecies	Percentage
1. Indian	24	43.63
2. Indochinese & Indian	17	30.90
3. Indochinese	4	7.25
4. Malaysian, Indochinese & Indian	7	12.72
5. Malaysian & Indochinese	3	5.45
<b>Total</b>	<b>55</b>	

Table 11 contains a total of seven subspecies of the non-Oriental species which are Oriental (Indian : five subspecies = Indian & Indochinese : three subspecies) in distribution. This brings the total number of taxa of bats of West Bengal with Oriental affinity to 62 (including 55 taxa of Table 13), The remaining three subspecies are Palaearctic which enter India marginally into the transitional zone in the Himalaya (in northern district in West Bengal), mainly through the north.

Further analysis of the distributional pattern along with that of zoogeographic affinities of the different taxa of bats of West Bengal reveals certain other interesting facts. This are discussed in the following paragraphs.

#### **West Bengal at the end of distributional range**

There are a number of bats for which West Bengal is situated at the extreme end of their respective distributional range. These are *Megaerops niphanae*, *Macroglossus sorbinus sorbinus*, *Rhinolophus trifolius trifolius*, *Hipposideros fulvus pallidus*, *Coelops frithi frithi*, *Myotis siligorensis siligorensis*, *Myotis annectans*, *Scotomanes ornatus ornatus*, *Pipistrellus peguensis*, *Pipistrellus ceylonicus indicus*, *Pipistrellus cadornae*, *Scotoecus pallidus*, *Harpiocephalus mordax* and *Tadarida teniotis insignis*. Of these, three, viz., *Macroglossus sobrinus sobrinus*, *Rhinolophus trifolius trifolius* and *Harpiocephalus mordax* are predominantly Malaysian and Indochinese in affinity which enter northeastern India and extends west up to Darjiling district in West Bengal. *Megaerops niphanae*, *Coelops frithi frithi* and *Pipistrellus cadornae* are Indochinese elements entering India and extending west to Darjiling district. *Myotis annectans*,

*Scotomanes ornatus ornatus* and *Pipistrellus peguensis* can be regarded as Indochinese and Indian elements on the westernmost limit of which taxa Darjiling is situated. *Tadarida teniotis insignis* is a member of the southern Palaearctic which extends southward to the transitional zone in the Himalaya, reaching as south as Karsiyang in Darjiling district. *Hipposideros fulvus pallidus*, *Pipistrellus ceylonicus indicus* and *Scotoecus pallidus* are restricted to the Indian subregion. The northeastern limit of the distributional range of these three taxa is southern and southwestern West Bengal.

### **Indian Chiropteran fauna known from West Bengal only**

It is interesting to note that six species and subspecies of the Chiropteran fauna of the Indian Union are known from West Bengal only. Four of these, viz, *Eptesicus tatei*, *Pipistrellus peguensis*, *Murina leucogaster rubex* and *Tadarida tragata insignis* are so far known only from the hilly areas of Darjiling district. The latter two are Palaearctic elements, while the zoogeographic affinity of the former two cannot be determined with certainty as the first-named taxon has so far been recorded from Darjiling only, while *Pipistrellus peguensis* is known from two localities of Myanmar and from Darjiling only. The remaining two of the six taxa occur in a restricted area of southern West Bengal—*Myotis hasseltii* in Calcutta and North 24-Parganas districts and *Kerivoula papillosa lenis* in Calcutta.

### **Bats of West Bengal endemic to the Indian Union**

A total of five taxa come under this category. Two of these—*Megaderma spasma horsfieldi* and *Harpiocephalus harpia lasyurus*, though known from other parts of India, are endemic to the mainland part of the Indian Union. *Eptesicus tatei* and *Murina leucogaster rubex* are known from Darjiling district only, while the fifth taxon, *Kerivoula papillosa lenis* is known only by the holotype from Calcutta.

### **Taxonomic Changes**

Tremendous amount of work has been done on the taxonomy and geographical distribution of the bats of the Old World after the publication of Ellerman & Morrison-Scott's (1951) comprehensive work. Studies on these aspects of Indian bats were made by a number of foreign and Indian bat specialists. Consequently, the taxonomic status and geographical distribution of a large number of Indian taxa of bats (including many of those occurring in West Bengal) have changed considerably from those adopted in Ellerman & Morrison-Scott (1951). Some revisionary studies on the taxonomy and geographical distribution of certain taxa of bats occurring in West Bengal have been done also under the present work. The resultant deviations from those given in Ellerman & Morrison-Scott's locally cited work have been detailed in Table 14.

**Table 14 :** Details of change in taxonomic status of some taxa of the Chiropteran fauna of West Bengal since the publication of Ellerman & Morrison-Scott (1951).

Sl. No.	Status in Ellerman & Morrison-Scott (1951)	Present status	Authority
Order CHIROPTERA			
Suborder MEGACHIROPTERA			
Family PTEROPODIDAE			
Subfamily PTEROPODINAE			
1.	<i>Rousettus seminudus</i> (Kelaart, 1850)	<i>Rousettus leschenaulti leschenaulti</i> (Desmarest, 1820)	Sinha 1969a
2.	<i>Pteropus giganteus leucocephalus</i> Hodgson, 1835	<i>Pteropus giganteus giganteus</i> (Brunnich, 1782)	<b>Present work</b>
Subfamily MACROGLOSSINAE			
3.	<i>Macroglossus minimus sobrinus</i> Andersen, 1911	<i>Macroglossus sobrinus sobrinus</i> Andersen, 1911	Lekagul & McNeely 1977
Suborder MICROCHIROPTERA			
Family RHINOPOMATIDAE			
4.	<i>Rhinopoma kinneari</i> Wroughton, 1912	<i>Rhinopoma microphyllum kinneari</i> Wroughton, 1912	Allen 1959
Family EMBALLONURIDAE			
5.	<i>Taphozous kachhensis</i> Dobson, 1872	<i>Taphozous nudiventris kachhensis</i> Dobson, 1872	Felten 1962
Family MEGADERMATIDAE			
6.	<i>Megaderma lyra caurina</i> (Andersen & Wroughton, 1907)	<i>Megaderma lyra lyra</i> E. Geoffroy, 1810	Sinha 1977

Sl. No.	Status in Ellerman & Morrison-Scott (1951)	Present status	Authority
Family RHINOLOPHIDAE			
Subfamily RHINOLOPHINAE			
7	<i>Rhinolophus andamanensis</i> Dobson, 1872	<i>Rhinolophus affinis andamanensis</i> Dobson, 1872	Sinha 1973
8.	<i>Rhinolophus petersi</i> Dobson, 1872	<i>Rhinolophus rouxi rouxi</i> Temminck, 1835	Sinha 1973
9.	<i>Rhinolophus cornutus blythi</i> Andersen, 1918	<i>Rhinolophus pusillus blythi</i> Andersen, 1918	Hill & Yoshiyuki 1980
10.	<i>Rhinolophus gracillis</i> Andersen, 1905	<i>Rhinolophus pusillus gracilis</i> Andersen, 1905	Sinha 1973, Hill & Yoshiyuki 1980
11.	<i>Rhinolophus monticola</i> Andersen, 1905	<i>Rhinolophus lepidus monticola</i> Andersen, 1905	Hill & Yoshiyuki 1980 Das 1986b
Subfamily HIPPOSIDERINAE			
12.	<i>Hipposideros (?) bicolor fulvus</i> Gray, 1838	<i>Hipposideros fulvus fulvus</i> Gray, 1838	Hill 1963
13.	<i>Hipposideros (?) bicolor pallidus</i> Andersen, 1918	<i>Hipposideros fulvus pallidus</i> Andersen, 1918	Hill 1963
Family VESPERTILIONIDAE			
Subfamily VESPERTILIONINAE			
14.	<i>Myotis mystacinus muricola</i> (Gray, 1846)	<i>Myotis muricola muricola</i> (Gray, 1846)	Hill 1983
15.	<i>Myotis mystacinus caliginosus</i> (Tomes, 1859)	<i>Myotis muricola muricola</i> (Gray, 1846)	Present work
16.	<i>Pipistrellus annectans</i> Dobson, 1871	<i>Myotis annectans</i> (Dobson, 1871)	Topal 1970
17.	<i>Myotis primula</i> Thomas, 1920		

Sl. No.	Status in Ellerman & Morrison-Scott (1951)	Present status	Authority
18.	<i>Myotis (?) formosus andersoni</i> (Trouessart, 1897)	<i>Myotis formosus formosus</i> (Hodgson, 1835)	Present work
19.	<i>Plecotus auritus puck</i> Barretl-Hamilton, 1907	<i>Plecotus auritus homochrous</i> Hodgson, 1847	Corbet 1980
20.	<i>Nycticeius emarginatus</i> (Dobson, 1871)	<i>Scotomanes ornatus ornatus</i> (Blyth, 1851)	Present work
21.	<i>Scotomanes ornatus imbrencis</i> Thomas, 1921		
22.	<i>Scotophilus temmincki wroughtoni</i> Thomas, 1897	<i>Scotophilus kuhli kuhli</i> (Leach, 1821)	Hill & Thonglongya, 1972
23.	<i>Scotophilus heathi belangeri</i> (I. Geoffroy, 1834)	<i>Scotophilus heathi heathi</i> (Horsfield, 1834)	Siddiqi 1961b
24.	<i>Tylonycteris pachypus aurex</i> Thomas, 1915	<i>Tylonycteris pachypus fulvida</i> (Blyth, 1859)	Present work
25.	<i>Pipistrellus mimus glaucillus</i> Wroughton, 1912	<i>Pipistrellus mimus</i> Wroughton, 1899	Sinha 1980
26.	<i>Pipistrellus (?) mimus paterculus</i> Thomas, 1915	<i>Pipistrellus mimus</i> Wroughton, 1899	Hill & Harrison 1987, Present work
27.	<i>Pipistrellus ceylonicus chrysothrix</i> Wroughton, 1899	<i>Pipistrellus ceylonicus indicus</i> (Dobson, 1878)	Lal 1984
28.	<i>Pipistrellus ceylonicus subcanus</i> Thomas, 1915	<i>Pipistrellus cadornae</i> Thomas, 1916	Hill 1962
29.	<i>Pipistrellus (?) Savii cadornae</i> Thomas, 1916		
30.	<i>Pipistrellus mordax</i> (Peters, 1866)	<i>Pipistrellus offinis</i> (Dobson, 1871)	Francis & Hill 1986, Koopman 1989
31.	<i>Pipistrellus dormeri dormeri</i> (Dobson, 1875)	<i>Scotozous dormeri</i> Dobson, 1875	Khajuria 1965, Present work

Sl. No.	Status in Ellerman & Morrison-Scott (1951)	Present status	Authority
32.	<i>Pipistrellus dormeri caurinus</i> (Thomas, 1915)	<i>Scotozous dormeri</i> Dobson, 1875	Agrawal 1973
33.	<i>Nycticeius pallidus</i> (Dobson, 1876)	<i>Scotoecus pallidus</i> (Dobson, 1876)	Hill 1974
Subfamily MURININAE			
34.	<i>Murina</i> (?) <i>huttoni tubinaris</i> (Scully, 1881)	<i>Murina tubinaris</i> (Scully, 1881)	Hill 1962, 1964a
35.	<i>Harpiocephalus harpia madrassius</i> Thomas, 1923	<i>Harpiocephalus harpia lasyurus</i> (Hodgson, 1847)	Das 1986a
36.	<i>Harpiocephalus</i> (?) <i>harpia mordax</i> Thomas, 1923	<i>Harpiocephalus mordax</i> Thomas, 1923	McBee <i>et al.</i> 1986, <b>Present work</b>
Subfamily KERIVOULINAE			
37.	<i>Kerivoula hardwickei hardwickei</i> (Horsfield, 1824) [Northern Indian and other populations of nearby countries]	<i>Kerivoula hardwickei depressa</i> Miller, 1906	Hill 1965
38.	<i>Kerivoula hardwickei crypta</i> Wroughton, 1913	<i>Kerivoula hardwickei depressa</i> Miller, 1906	<b>Present work</b>
Family MOLOSSIDAE			
39.	<i>Tadarida aegyptiaca thomasi</i> Wroughton, 1919	<i>Tadarida aegyptiaca tragata</i> (Dobson, 1874)	Chaturvedi 1964, Sinha 1970, <b>Present work</b>
40.	<i>Tadarida aegyptiaca gossei</i> Wroughton, 1919		
41.	<i>Tadarida tragata</i> (Dobson, 1874)		

## TAXA ADDED TO THE CHIROPTERAN FAUNA OF WEST BENGAL

During the last three decades, several workers of the Zoological Survey of India, including the present worker, systematically collected specimens of bats from different parts of West Bengal. Through the efficient use of the newly acquired nylon mist nets, it was possible to collect certain taxa of bats which could not be done previously with the limited resources available at that time. Besides, several taxa of bats were reported in some publications appearing during this period. as a result, more than a dozen of species could be added to the list of bats of West Bengal which might be compiled from Ellerman & Morrison-Scott (1951). The details of these new additions to the Chiropteran fauna of West Bengal are provided in Table 15.

Further, Ellerman & Morrison-Scott (1951) did not include West Bengal in the distributional range of *Myotis sicarius* and of *Plecotus auritus homochrous* even though these were already known from that state. Wroughton (1916c) reported *Myotis sicarius* from Darjiling district. Obviously, this was missed by these authors who also thought that the type-specimen of *Plecotus auritus homochrous* came from Nepal, while in reality the same was from Shilliguri of Darjiling district. The two taxa should, therefore, also be added to the Chiropteran fauna of West Bengal.

**Table 15 :** Taxa added to the Chiropteran fauna of West Bengal after the publication of Ellerman & Morrison-Scott (1951), as a result of subsequent records and revisionary studies.

Sl. No.	Name of taxa	Authority
Order CHIROPTERA		
Suborder MICROCHIROPTERA		
Family PTEROPODIDAE		
Subfamily PTEROPODINAE		
1	<i>Megaerops nipheanae</i> Yenbutra & Felten, 1983	First record for India from Arunachal Pradesh by Saha (1984), but identified as <i>Megaerops ecaudatus</i> (Temminck, 1837); Koopman (1989) listed from West Bengal.
2.	<i>Sphaerias blanfordi</i> (Thomas, 1891)	First record for India from Uttar Pradesh by Bhat (1968 <i>b</i> ); Chakraborty (1975) recorded from West Bengal.
Subfamily MACROGLOSSINAE		
3.	<i>Eonycteris spelaea spelaea</i> (Dobson, 1871)	First record for India from Uttar Pradesh by Bhat (1968 <i>a</i> ); recorded for the first time from West Bengal in the <b>present work</b> .
Suborder MICROCHIROPTERA		
Family MEGADERMATIDAE		
4.	<i>Megaderma spasma horsfieldi</i> Blyth, 1863	Bhat (1974) reported for the first time from West Bengal.
Family RHINOLOPHIDAE		
Subfamily HIPPOSIDERINAE		
5.	<i>Hipposideros pomona gentilis</i> Andersen, 1918	Hill <i>et al.</i> (1986) reported for the first time from northeastern India; recorded for the first time from West Bengal in the <b>present work</b> .
6.	<i>Hipposideros fulvus pallidus</i> Andersen, 1918	Recorded for the first time from West Bengal in the <b>present work</b> .

Sl. No.	Name of taxa	Authority
7.	<i>Hipposideros cineraceus</i> Blyth, 1853	Siddiqi (1961a) recorded for the first time from West Bengal.
8.	<i>Hipposideros lankadiva</i> Kelaart, 1850	Recorded for the first time from West Bengal in the <b>present work</b> .
Family VESPERTILIONIDAE		
Subfamily VESPERTILIONINAE		
9.	<i>Myotis annectans</i> (Dobson, 1871)	Recorded for the first time from West Bengal by Topal (1970).
10.	<i>Myotis hasseltii</i> (Tamminck, 1940)	Recorded for the first time for India from West Bengal in the <b>present work</b> .
11.	<i>Pipistrellus peguensis</i> Sinha, 1969	Recorded for the first time for India from West Bengal by Sinha (1990b).
12.	<i>Pipistrellus affinis</i> (Dobson, 1871)	Recorded for the first time for India from West Bengal and other areas by Francis & Hill (1986).
Subfamily MURININAE		
13.	<i>Harpiocephalus mordax</i> Thomas. 1923	Recorded for the first time for India from West Bengal and other areas in the <b>present work</b> .
Family MOLOSSIDAE		
14.	<i>Tadarida teniotis insignis</i> (Blyth, 1861)	Recorded for the first time for India from West Bengal by Hill (1964b).

## SUMMARY

A detailed review of the extract literature on the taxonomy and geographical distribution of Indian bats, the same of West Bengal separately, and a history of collecting bats in the state have been given. Important characters of the order Chiroptera, its suborders, families and of some subfamilies as also keys for the identification of the families of the suborder Microchiroptera, all genera, species and subspecies (when applicable) have been provided. Complete Indian synonymies (with type-locality). Diagnostic characters and detailed geographical distribution (district-wise in West Bengal, statewide in other parts of India, and in adjoining countries) have been given for all the 65 species and subspecies of bats reported from West Bengal. The account is based primarily on material collected from 135 localities of different districts of West Bengal and their standard measurements (of 50 taxa). All the species included have been fully discussed taxonomically and zoogeographically, so far India is concerned. Every opportunity has been taken to cite literature extensively. Camera lucida drawings of the skull of *Sphaerias blanfordi* (adult), *Hipposideros lankadiva* and of *Myotis hasseltii* (Indian population) appear for the first time in this work. Distribution maps of several interesting taxa have been added.

As a result of revisionary studies undertaken in the present work, a number of taxa have been synonymised with earlier ones. Thus, *Pteropus leucocephalus* Hodgson, 1835 has been synonymised with *Pteropus giganteus giganteus*. *Sphaerias blanfordi motuoensis* Cai & Zhang, 1980 with *Sphaerias blanfordi*, *Nycticejus emerginatus* Dobson, 1871 with *Scotomanes ornatus* and *Scotomanes ornatus imbreensis* Thomas, 1921 with the nominate subspecies. *Tylonycteris aurex* Thomas, 1915 with *Tylonycteris pachypus fulvida*, and *Kerivoula crypta Wroughton, 1913* with *Kerivoula hardwickei depressa*. *Megaderma spasma horsfieldi* Blyth and *Tadarida aegyptiaca tragata* (Dobson) have been considered here as the respective Indian subspecies of the concerned species. Further, it has been clearly indicated that the Indian population might have to be considered as a distinct subspecies on the basis of metrical characters.

Based on the extensive material of *Hipposideros pomona* Andersen, 1918 and *Hipposideros fulvus* Gray, 1838 present in the Zoological Survey of India, new light has been thrown on the geographical distribution of these two species in India and adjoining countries.

Nepal is wrongly cited as the *type-locality* of *Myotis siligorensis* and of *Plecotus auritus homochrous*. The same has been corrected as Shilliguri, Darjiling district., West Bengal for the former taxon and as Darjiling of the same district and state for the latter one. Besides, the possibility of Bangladesh part of the Sundarban as the *type-locality* of *Coelops frithi* has been discussed.

Based on wrongly placed synonymies as consequences of misidentification of specimens from the area under consideration, *Taphozous melanopogon melanopogon* Temminck, 1841 and *Rhinolophus ferrumequinum tragatus* Hodgson, 1835 have hitherto been considered as

members of the Chiropteran fauna of West Bengal. Due to lack of authentic specimens, these two species have been deleted from the list of bats of West Bengal. It is, however, quite likely that the former taxon may be procured from the southwestern fringe of West Bengal, while the latter may be collected from higher reaches of Darjiling district, in future.

Much light has been thrown on the distribution of at least three dozens of taxa. Thus, *Eonycteris spelaea spelaea*, *Taphozous saccolaimus crassus*, *Hipposideros Pomona gentilis*, *Hipposideros fulvus pallidus*, *Hipposideros lankadiva*, *Myotis hasseltii* and *Harpiocephalus mordax* have been reported for the first time from West Bengal. Besides, a large number of taxa have also been reported for the first time from other states / Union Territories of India. The area(s) from which these have been newly recorded have been placed in parenthesis after the scientific name of each such taxa here. These are — *Megaerops niphanae* (Mizoram, Manipur, Arunachal Pradesh), *Sphaerias blanfordi* (Sikkim, Mizoram), *Eonycteris spelaea spelaea* (Andhra Pradesh, Mizoram, Manipur, Nagaland, Arunachal Pradesh, North Andaman Island), *Macroglossus sobrinus sobrinus* (Meghalaya, Tripura, Arunachal Pradesh), *Rhinopoma hardwicket hardwickei* (Andhra Pradesh), *Taphozous saccolaimus crassus* (Kerala), *Taphozous nudiventris kachhensis* (Andhra Pradesh), *Megaderma spasma horsfieldi* (Gujarat, Andhra Pradesh), *Rhinolophus affinis himalayanus* (Tamil Nadu), *Rhinolophus rouxi rouxi* (Sikkim, Mizoram, Arunachal Pradesh), *Rhinolophus pusillus blythi* (Sikkim), *Rhinolophus lepidus lepidus* (Gujarat, Mizoram), *Rhinolophus luctus perniger* (Andhra Pradesh), *Rhinolophus luctus beddomei* (Tamil Nadu), *Hipposideros pomona gentilis* (Mizoram), *Hipposideros pomona pomona* (Kerala, Tamil Nadu), *Hipposideros fulvus pallidus* (Uttar Pradesh, Karnataka, Tamil Nadu, Orissa), *Hipposideros armiger armiger* (Manipur), *Hipposideros lankadiva* (Andhra Pradesh, Orissa, Tripura, Manipur), *Myotis mystacinus nipalensis* (Assam), *Myotis muricola muricola* (Bhutan), *Myotis siligorensis siligorensis* (Sikkim), *Myotis formosus formosus* (Jammu & Kashmir), *Scotophilus heathi heathi* (Tripura), *Tylonycteris pachypus fulvida* (Kerala, Meghalaya, Tripura, Mizoram), *Pipistrellus ceylonicus indicus* (Goa), *Scotozous dormeri* (Manipur), *Barbastella leucomelas darjelingensis* (Mizoram), *Hesperoptenus tickelli* (Andhra Pradesh), *Miniopterus schreibersi fuliginosus* (Meghalaya), *Murina tubinaris* (Himachal Pradesh), *Murina cyclotis cyclotis* (Tamil Nadu), *Harpiocephalus harpia lasyurus* (Andhra Pradesh, Assam, Meghalaya), *Harpiocephalus mordax* (Sikkim, Meghalaya), *Kerivoula picta picta* (Andhra Pradesh), *Kerivoula handwickei depressa* (Madhya Pradesh) and *Tadarida plicata plicata* (Andhra Pradesh). Four taxa have been reported for first time from India and some other adjoining countries. These are — *Hipposideros pomona gentilis* (Nepal, Bangladesh), *Myotis hasseltii* (India), *Murina cyclotis cyclotis* (Nepal) and *Harpiocephalus mordax* (India). In many instances, these new locality records have become the basis of extension of the distributional range of the respective taxon, substantially.

Notes on some aspects of the general biology of *Rousettus leschenaulti leschenaulti*, *Pteropus giganteus giganteus*, *Cynopterus sphinx sphinx*, *Taphozous longimanus longimanus* and *Megaderma lyra lyra* have been appended. Notes on the habits of *Rhinolophus lepidus lepidus*, *Myotis mystacinus nipalensis* have also been included. An account (illustrated) on the discovery of two different diurnal roosting sites and group composition of the rare bat, *Taphozous saccolaimus crassus* have been given in fair details.

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