

## TAXONOMIC RESEARCH ON INDIAN MAMMALS

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### INTRODUCTION

The need for a review of the work on taxonomy of the important group of mammals of the Indian subcontinent has keenly been felt for sometime particularly in view of urgent necessity of preparation of second edition of several orders of Blanford's *Fauna of India* covering the whole subcontinent, the first edition having been prepared about a century ago (published 1888-1891). No such review has so far been attempted particularly during the period after Indian Independence possibly because of the vastness of this well-defined geographical zone including seven countries (India, Pakistan, Burma, Bangladesh, Nepal, Bhutan and Sri Lanka) and extensive literature scattered in numerous periodicals and monographs. Kinnear (1952) has, however, ably dealt with the history of Indian mammalogy during the pre-Independence period.

An attempt has been made here to prepare a brief review of important works on taxonomy of Indian mammals with special reference to the present status of the subject and bibliography. The historical information given by previous authors about pre-Independence period has been condensed, recasted in the light of more literature and reclassified to suit the present needs.

Only important works of pre-Independence period have been included. Cross references to other earlier works will be found in these references. Numerous references dealing with Indian mammal survey conducted by Bombay Natural History Society (ca 1911-1929 ; but mainly from (1912-1920) are all published in the society's journal and are, thus, easily accessible. They are, thus, except Wroughton's 'summary' reports, not reproduced in the bibliography to limit space. The various sources from where the information given in this article is taken are given in the bibliography.

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### PRESENT STATUS OF TAXONOMIC RESEARCH

Work on taxonomy of Indian mammals during pre-independence period has mainly been done by British nationals, many of whom had

access to unrivalled British Museum collection which contained not only highly representative collection of Indian mammals but also collection from all over the world for comparison. After independence, it was very difficult for Indian workers to study British Museum collection as well as collection in other museums because of difficulty of borrowing a large series of expensive mammalian specimens. Good reference collection in Zoological Survey of India and the Bombay Natural History Society, though representative of Indian mammals, did not permit undertaking of any revisionary work without extensive borrowing of specimens from abroad. Under the circumstances, although there has been much effort in the collection of specimens, identification, cataloguing, description of new forms etc., sufficient revisionary work could not be attempted as compared with work done in other scientifically advanced countries like U. S. A., U. S. S. R. and other European countries. The said difficulty has also reduced the number of taxonomic monographs published by Indian workers. Because of confinement of reference collection, mostly to Calcutta and Bombay, the number of taxonomic workers is also very limited. The Zoological Survey of India has, however, now opened fifteen regional offices in different parts of the country. Each of these offices will develop its own collection in due course. This will help to increase the number of taxonomic workers.

Important fields which need urgent further work are :

- (i) Publication of a second revised edition of Fauna of India on all groups of mammals except Primates, Carnivora and Rodentia (already revised by Pocock and Ellerman) because the first edition was published as early as 1888-1891.
- (ii) World wide revision of some groups particularly of Insectivora and Chiroptera.
- (iii) Further intensive collection particularly by regional offices of the Zoological Survey of India, especially in those localities and groups which could not properly be attended by the mammal survey *vide* Wroughton (1918-1919). Such a modern collection with detailed data can help in the clarification of problems on subspeciation, distribution and habits of several forms. The selected bibliography given at the end gives a clear picture of our present knowledge of the group.

About five hundred living species (Khajuria, 1963, p. 1) are likely to occur in the area under review out of about 3700 estimated by Mayr (1969) in the whole world,

## A REVIEW OF TAXONOMIC RESEARCH

Work on zootaxonomy (handling of specimens including collection with field notes—labelling, identification, cataloguing, classification, etc.) of Indian mammals dates from times immemorial (see Rao, 1957). However, modern work can be considered to date from 1758, the date of publication of tenth edition of Linnaeus' *Systema Naturae* which gave modern binomial names to a number of common Indian mammals. Accessibility of Indian mammalian fauna to European scientists particularly during British regime, gave a very significant fillip to the study of taxonomy of this important group on the basis of fast advancing European science.

The era which followed can conveniently be divided into five somewhat overlapping periods with peaks lasting for about half a century<sup>1</sup>.

(i) *Pre-Hodgson period* :

French workers such as Charles Belanger, Jean Baptiste Leschenault, Medard Diard, Alfred Duvaucel, Dussumier<sup>2</sup>, Victor Jacquemont were active during the period mainly in collections which were studied by such well known authorities as the Cuvier, Geoffroy and Blainville. A number of new species were discovered by these workers. The well known Belanger's "*Voyage aux Indes orientales*" published in 1838 was an important contribution based on these investigations. The publication described a number of new species. Other workers such as Pallas, Erxleben and Schreber also described a number of species. The most outstanding English worker of the period was Thomas Hardwicke (1756—1835) who collected extensively in West Bengal, U. P. and Kashmir from 1778 to 1823. Under his supervision, numerous drawings particularly of large mammals were made by local artists. A number of important species were described by him but some of his descriptions were not published. Many of his illustrations were published by Gray (1830-1835).

(ii) *Hodgson-Jerdon-Blyth period* :

This period has rightly been called the Golden Age of Indian Mammalogy because of collection of large number of specimens with field data by dedicated workers but mainly by the following.

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1. Kinear (1952) has covered much wider scope while giving a history of Indian Mammalogy upto middle of this century.

2. Only surname of the worker is given where full name is not known. A few localities carry old names to avoid confusion.

Brian Houghton Hodgson (1800-1894). He was the most active worker of the period. He worked in India in various capacities from 1818 to 1843 finally retiring as Resident to the Government of Nepal. He continued to work in India upto 1858 even after retirement. He made a large collection through hunters and described several new species. He also engaged local artists to make numerous coloured drawings of mammals. He published his catalogue dealing with 115 species in 1846. Hodgson's collection, however, suffered from inadequate labelling as was the practice in those days.

Thomas Caverhill Jerdon (1811-1872). He was a medical officer and was another outstanding worker of this period. He worked from 1835-1870 in South and Central India, Kashmir and various hill stations of the Himalayas. He is well known for his work entitled "Mammals of India" published in 1874 which is the first book on taxonomy of Indian Mammals and which, though not exhaustive, considerably served the purpose for which it was prepared. The work, mainly dealt with species in Kashmir, peninsular India, and Assam and treatment of small mammals as admitted by the author was inadequate.

Edward Blyth (1810-1873). Blyth worked in India from 1841 to 1862 as Curator of Museum of the Asiatic Society of Bengal, Calcutta and published several papers and detailed catalogues of the collection. Because of his curatorial duties, his field activity was mainly confined to Bengal within the area under review. Nevertheless he was responsible for creation of considerable interest in scientific collections, because of versatile knowledge and energy.

A notable student, though not a collector, was J. E. Gray who while in London published a number of papers on Indian mammals. He is well known for his publication "Illustrations of Indian Zoology" published in 1830-35 in two volumes. Although inaccurate in many details, the work provides considerable original data.

Other notable collectors of this period are : T. Hutton (Mussoorie), Boys (Rajasthan), Tytler (Kumaon, Andamans), W. Griffith (Assam), J. McClelland (Assam), S. R. Tickell (Singhbum, Bihar, Chaibassa, Orissa), W. Elliot (Dharwar), Heath (Madras), W. H. Sykes (South India), A. L. Adams (Poona), J. Barbe (Tipperah hills, Nicobars) Stewart (Mussoorie), R. W. Frith (Cherrapunji), Baron von Hugel (Kashmir).

Other important works of this period are : (i) MS of a book on mammals and birds of India by S. R. Tickell. unpublished and kept with the Zoological Society of London ; (ii) MS of "Popular account of mammals of north western India" by T. Hutton, unpublished, locations not known ; (ii) Catalogue of species of mammals found in

Southern Mahratta country by W. Elliot ; (iv) Wanderings of a naturalist in India by A. L. Adam, (v) Papers of Baron von Hugel Reichder Sick, J. McClelland, Horsfield and J. Barbe on several species of mammals.

(iii) *Blanford-Anderson period* :

William Thomas Blanford (1822-1905) naturalist and geologist, is well known for preparation of the first edition of Fauna of British India, Mammalia, published in two parts in 1888 and 1891. He worked in India from 1855-1882 and contributed many papers. He mainly collected in South and Central India. Blanford's main work referred to above was, however, based on insufficient data, which he himself admitted. He also did not follow law of priority in naming taxa. He was also instrumental in the establishment of the Museum in Calcutta and in sanction by the Government of volumes of Fauna of British India series.

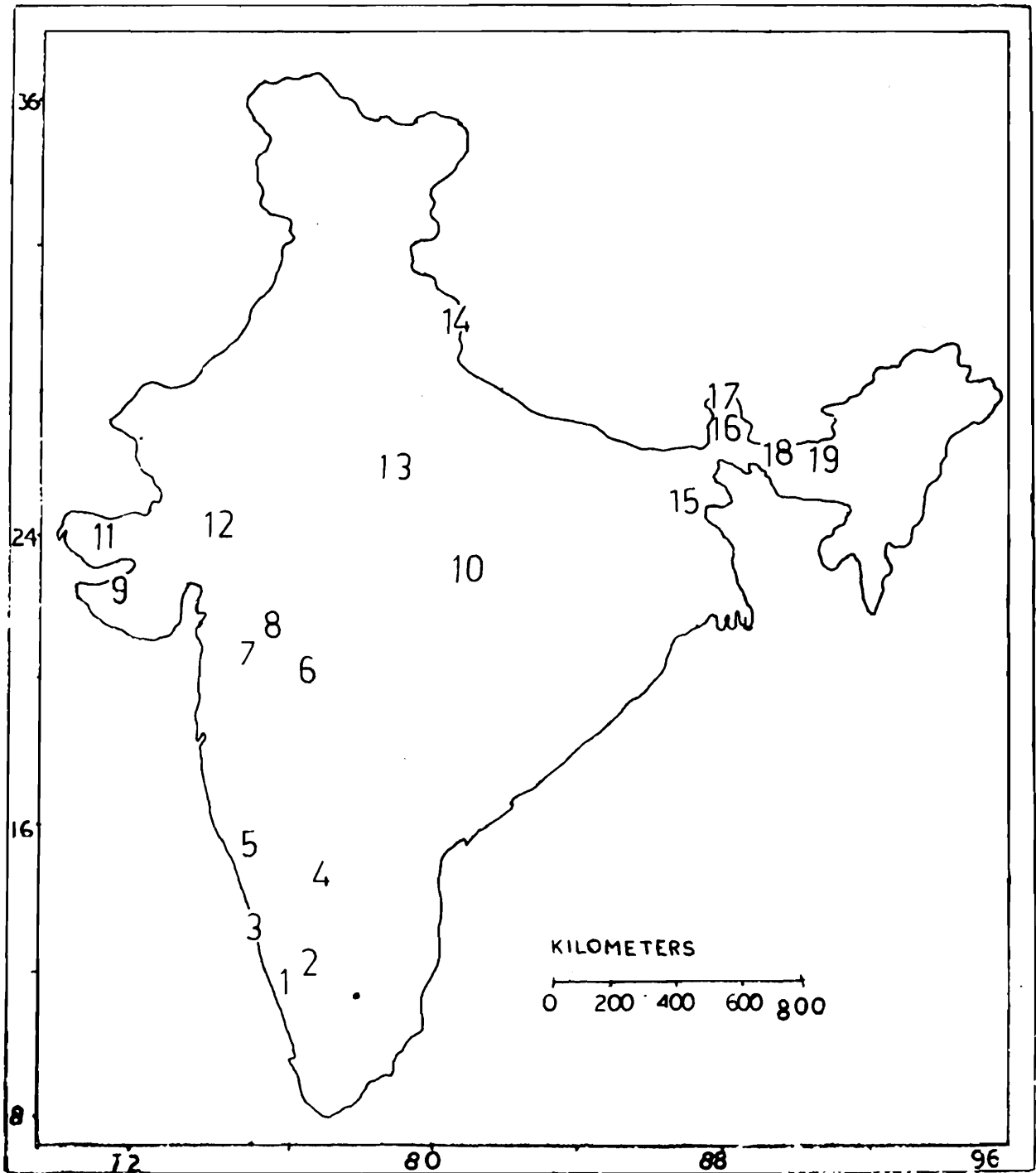
Dr. John Anderson (1833-1900) was the first Superintendent of the Indian Museum Calcutta and worked in India from 1865 to 1888. He had many publications on Indian mammals. The collection of Asiatic Society, Bengal was transferred to Indian Museum under his charge.

Other important students during the period were Horsfield, Dobson, O. Thomas, P. L. Sclater. This was mainly a study period. Among the collectors may be mentioned Mouat (Andaman Islands), C. B. Kloss (Nicobar and Andaman Islands), W. L. Abbot (Kashmir, Nicobar and Andaman), Ward (Kashmir), Theobald (Kashmir), H. Furguson (Travancore), Bitrel & Dunn (Panjab), Whitehead (Central India), C. H. Stockley (Kashmir).

(iv) *Mammal Survey period* :

The mammal survey of India along with that of the adjoining countries was started in 1911. It was interrupted by the first world war but continued till 1920. About 25,000 specimens were collected with a large amount of field data by experienced collectors in well selected localities. The study was also modernized and was carried out in British Museum by such highly experienced mammalogist as O. Thomas, R. I. Pocock, J. R. Ellerman, M. A. C. Hinton, R. C. Wroughton, T. C. S. Marrison-Scott, T. B. Fry, Ryley and Lindsay and others. This period can, thus, be called the modern age of Indian mammalogy. The study also ushered in the modern trinomial nomenclature for Indian mammals.

The reason for starting the survey was to modernize taxonomic knowledge of Indian mammals on the basis of studies carried out in



Text-fig. 1. Map of political India showing important localities where planned collections of mammals was made during Mammal survey of Bombay Natural History Society. A few localities bear old names as given in mammal survey reports.

1. Coorg ; 2. Mysore ; 3. Kanara ; 4. Bellary ; 5. Dharwar ; 6. Berar ; 7. Khandesh ; 8. Nimar ; 9. Kathiawar ; 10. Madhya Pradesh ; 11. Kutch ; 12. Palanpur ; 13. Gwalior ; 14. Kumaon, 15. 'Bengal' ; 16. Darjeeling ; 17. Sikkim ; 18. Kalimpong ; 19. Bhutan Duars.

U. S. A. towards the end of nineteenth century, particularly by Hart Marriam, by collecting a large series of specimens from well selected localities and in different seasons with detailed data on locality, altitude, date of collection, sex, age, colour of soft parts, measurements of freshly killed specimens, field notes on habits, etc. Such a study

greatly helped in the understanding of intraspecific variation and in description of new subspecies. However, the system did allow considerable difference of opinion.

The collectors primarily responsible for execution of the survey were C. A. Crump, G. C. Shortridge, A. W. Mayer, C. Primrose, Ryley O. Brain and H. W. Wells. They were helped by collectors (S. H. Prater, C. McCann, N. A. Baptista) in regular employment of the Bombay Natural History Society. Assistance was also rendered by H. H. Maharao of Kutch, Maharaja of Gwalior, Messers H. Stevens and R. H. Lister (Darjeeling), A. P. Kinloch (Malahat), A. H. A. Simcox (Kashmir), C. H. H. Stochley (Panjab and Western Himalayas), J. P. Mills (Assam), R. S. N. Pillay (Travancore, and P. Gosse (Poona). Several naturalists have donated specimens of large carnivores. Other honorary collectors also rendered help.

On the administrative side, the survey was helped by W. S. Millard, Honorary Secretary, Bombay Natural History Society, and later on in the same capacity by R. A. Spence.

This joint effort resulted in the publication of a number of excellent papers published in the Society's journal. The most important work was the second edition of Fauna of British India, Mammalia, published in two volumes, covering the orders Primates and Carnivora by R. I. Pocock (1939-1941). A revised edition of the Sterndale's popular work "Mammals of India" was also brought out in 1929 by Finn. Phillips (1935) is also an important work.

A notable event of this period was the establishment of the Zoological Survey of India in 1916 with Nelson Anandale, as the first Director and transfer of mammal collection of the Indian Museum to this department. However, there was no trained mammalogist to look after this collection till M. L. Roonwal with special interest in rodents took charge of it after about two and half decades. He, however, had also to leave to take up a research post with forces during second world war.

(v) *Post-Independence period :*

India became independent in 1947. The position of taxonomic work during this period has already been referred to briefly above. By an agreement, major part of the mammal survey collection and types were retained in the British Museum. The rest was returned to the Bombay Natural History Society. A part of the latter, selected under the supervision of the author, was given to the Zoological Survey of India. There were, thus, three centres where good taxonomic research on Indian mammals was possible. The work in the British Museum

continued with considerable zeal and resulted, in addition to a number of good papers, in such outstanding works as Checklist of Palaearctic and Indian mammals by Ellerman and Morrison Scott (1951) with second edition in 1966, and second edition of the Fauna of India, Rodentia, published in two parts in 1961 by Ellerman. S. H. Prater, Curator, Bombay Natural History Society, also published an excellent semipopular work "Book of Indian animals", in 1948, which was a great advance, over Sterndale's similar work in accuracy and scope, Second and third editions, of this book were published in 1965 and 1971 respectively. Eisenberle and Mekay (1970) published an annotated checklist for Sri Lanka and Khajuria *et al.*, (1977) an annotated catalogue of type specimens in the Zoological Survey of India. In the Zoological Survey of India also, M. L. Roonwal, Bhola Nath (trainee) and H. Khajuria, Assistant, published a number of taxonomic papers by making fresh collections or by studying the existing collections. However, both M. L. Roonwal and Bhola Nath left the department. S. H. Prater also retired and left for U. K. B. Biswas who took charge of Bird and Mammal Section and H. Khajuria, Bird and Mammal Assistant, continued the work as the time permitted as Dr. Biswas was mainly interested in birds. H. Khajuria took over as Assistant Zoologist in 1956 and M. L. Roonwal and Bhola Nath also returned to the department as Director and Assistant Zoologist, respectively. With the joining of a trainee, the taxonomic work was again restored to its former zeal. Meanwhile, some outstanding foreign workers other than those already mentioned became interested in Indian mammals and made highly praiseworthy contributions in their respective fields : J. E. Hill, A. Brosset, G. Topal (Chiroptera) ; W. C. Osman Hill, J. Fooden, P. C. Groves (Primates) ; G. H. H. Tate, J. C. Moore, H. Abe (Rodentia) ; and P. C. Groves (Ungulates). At present there are a number of active workers engaged in taxonomic research in Zoological Survey of India and its regional stations. They are M. L. Roonwal (Jodhpur), B. Biswas (Calcutta), H. Khajuria (Solan), G. U. Kurup (Madras), V. C. Agarwal, P. K. Das, R. K. Ghosh, A. K. Mandal, Y. Chaturvedi, S. Chakraborty, S. S. Saha, D. K. Ghoshal, T. P. Bhattacharyya (Calcutta) and Y. P. Sinha (Patna). The team has done highly commendable work in a short period. Other workers actively interested in the field are I. Parkash, and S. M. Monhot (Jodhpur), H. Abdulali (Bombay), H. R. Bhat and V. Dhanda (Poona). A notable feature of this period are extensive ecological observations along with taxonomic work and excellent photographs of animals in their natural habitats published in several publications on Indian wild life. Mention may also be made of revisionary monographic works



on various groups of mammals on world wide basis which also include Indian mammals. A list of these works appears in the bibliography.

#### A BRIEF GROUP-WISE REVIEW OF POST INDEPENDENCE LITERATURE

*Order Insectivora*—A taxonomic revision is overdue on both regional and world-wide basis. Roonwal and Monhot (1977) have reviewed the Indian species of family *Tupaiaidae* and Agarwal (1975) has revised the subspecies of *Tupaia glis*. Biswas and Ghosh (1970) described a new species and subspecies of genus *Paraechinus*.

*Order Chiroptera*—The necessity of a taxonomic review is as badly needed as in the case of Insectivora. Brosset (1962) gave a good account of Central and Western Indian species with ecological notes. Khajuria (1979 and in Press) revised with ecological data all taxa found in Central India by making intensive collection in Jabalpur Dist. for about ten years. Both these works are based on recent collections made in the areas. Khajuria, in addition, studied in detailed the external morphology including bacula and forms of stomach. Brosset synonymised a number of subspecies based on colour. Hill (1963) has provided an exhaustive revision of genus *Hipposideros*. Sinha (1973) admirably revised in detail the Indian species of genus *Rhinolophus* and also described a new pipistrelle from Burma. Khajuria (1970) described a new race of *Hipposideros* from Central India.

*Order Primates*—Primates, because of their great importance in biomedical research, has received perhaps the maximum attention. Roonwal and Monhot (1977) is an exhaustive review of all species and provides lengthy bibliography not generally accessible to Indian students. Khajuria (1953-58) prepared catalogue of whole collection in Zoological Survey of India with detailed notes and critical examination of the whole classification and also described a new species. Thorington and Groves (1970) has ably examined the classification of the superfamily Cercopithecoidea and Hill (1974), Groves (1971, 1972) and Fooden (1975, 1976, 1979) are very good reviews of genera *Macaca*, *Nycticebus* and gibbons.

*Order Rodentia*—Rodentia is another order which has been well studied during the period. The most outstanding work is Ellerman (1961) on Fauna of India. Roonwal and Biswas (1961) provided additions to this volume in form of ten new taxa not included in the volume. Agarwal (1967) published a detailed monographic study of skulls of Oriental rodents in relation to ecology. Mishra and Dhanda (1975) reviewed the genus *Millardia*. In addition to a number of collections which have been made and studied, a number of new taxa have been

added (Moore, 1950, Biswas and Khajuria 1955; Ghosh; 1964 Chaturvedi, 1966, Fitgibbon, 1966, Agarwal and Ghosal, 1969; Agarwal and Chakraborty (1971b), Saha (1975).

*Order Lagomorpha*—Two new species of mouse hare have been described (Biswas and Khajuria 1958), and Agarwal and Chakraborty, 1971). The group is now under active study of one of the members of the staff of Zoological Survey of India (Shri R. K. Ghosh).

*Order Carnivora*—No comprehensive study has been published on this group after Pocock (1939-41). However, Ghosh (1965b) has been able to describe a new species of mongoose from West Bengal.

*Order Perissodactyla*—Only a few good papers by Groves (1967a, 1971a, 1972b) and Groves and Majak (1967) dealing with Rhinoceroses and wild asses have come to notice.

*Order Artiodactyla*—Again Grove's (1967b, 1969, 1974, 1976), excellent revisionary papers on genera *Procapra*, *Gazella*, *Muntiacus* and *Moschus* have placed the systematics of these groups on a firm footing.

*Orders Cetacea, Pholidota, Sirenia, Dermoptera and Proboscidea*—It is unfortunate that very little taxonomic work has been done so far on the large important group of Indian Cetacea. Our knowledge is mostly limited to stray observations and a few specimens stranded or collected by chance. Even the famous Indian mammal survey excluded it from its study possibly because of difficulty of making a systematic collection. In fact the only regional good account is still Blanford (1888-1891). However, monographs on world-wide basis have appeared by well-known authorities (*vide* bibliography), and include Indian taxa also. Because of their extensive movements and distribution, in many cases world-wide, in absence of good distributional barriers, such monographs can meet the regional needs to some extent. Except some sightings, the single species of Indian Sirenia has also not received much attention. No important work has been done on other three orders after the Mammal Survey.

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