Rec. zool. Surv. India, 67 : 261-28, 1972

NOTES ON A COLLECTION OF MAMMALS FROM GOA

By

V C. AGRAWAL

Zoological Survey of India, Calcutta

(With 4 Tables)

INTRODUCTION

After the merger of Goa with the Indian Union, the Zoological Survey of India sent several parties to explore the faunal wealth of this place. This paper is based on the material brought by me during 1968-69 and on a few specimens already present in the National Zoological Collections of the Zoological Survey of India. These collections are the first authentic record from Goa. All measurements are in millimetres and have been taken after Pocock (1939) for Carnivora, Khajuria (1952) for Chiroptera and Roonwal and Agrawal (1966) for the rest except those which are self explanatory. The colour names in the text with initial capital letters are according to Ridgway's (1886) nomenclature. Except where otherwise mentioned, all the collections have been made by me.

I am thankful to Dr. A. P. Kapur, Director, Zoological Survey of India, Calcutta, for providing facilities for this work and to Dr. B. Biswas, Superintending Zoologist, for suggestions. The assistance provided by the Conservator of Forests, Goa, Daman and Diu, during the collection work is gratefully acknowledged.

Abbreviations.—The following abbreviations have been used in the text.

C′ - C′	distance between outer surface of upper canines.
cb.,	Condylobasal length.
CR.,	Cranial rostrum measured from front of orbit to anterior extremity of nasal.
cw.,	Cranial width.
dst.,	length of upper diastema.
E.,	length of ear.
FA.,	length of forearm.
HB.,	length of head ond body.
HF.,	length of hind foot.
iw.,	interorbital width.

i′ - m^3.,	length of toothrow from first upper incisor to third molar
l..	total length
ml.,	mandibular length
m^3 - m^3.,	distance between outer surface of third upper molars
m_1.,	length of the first lower molar
nas.,	nasal length
on.,	Occipitonasal length
orb.,	length of orbit
pf.,	length of anterior palatal foramina
pl.,	length of palate
pow.,	post orbital width.
pm^4.,	length of fourth upper premolar
tb.,	length of tympanic bulla
Tib.,	length of tibia
Tl.,	length of tail
TR.,	length of maxillary toothrow
zw.,	Zygomatic width

Physiography : Goa lies between latitude 14°.5′-15°.45′N and longitude 73°.45′-74°.2′E, covering an area of approximately 3600 Sq. Km. Tucked between the Western Ghats and the Arabian Sea, it has a warm tropical climate with an average temperature of 21°c throughout the year. The South-West monsoon results in an annual precipitation of about 305 cm., mostly between June to September.

The western part of Goa has an approximately 105 km. long coastal line displaying luxuriant growth of palms and coconut trees. The eastern tract is ornamented with a vast stretch of dense hilly forest, extending from Valpoi in the north to Canacona in the south. The vegetation in the forest area comprises Teak (*Tectona grandis*), Bamboo (*Bombusa* sp.), Sal (*Shorea robusta*) Babul (*Acacia arabica* and *A. juliflora*), Jamun (*Eugenia jambulana*), Cotton (*Bombax malabaricum*), Cashew-nut (*Anacardia occidentale*), Mango (*Mungifera indica*), Rubber (*Sicus elastica*) Neem (*Azadirhata indica*), Banyan (*Ficus bengalensis*), Peepal (*Ficus religiosa*) and various kinds of bushes.

The soil has a reddish hue because of the presence of manganese and iron ores. In addition, various kinds of natural salts like Ichthyophthalmite, Stilluti, Apophylite, Heliotrope etc. and basalt salts, dikes and columnar basalts are also present.

Localities.—The following are the main collection localities.

Margao : It lies on latitude 15°15′N and longitude 73°.55′E and at an altitude of 25.5 metres from sea level.

Molem : Situated on Panjim—Belgaum Highway, about 5 km. N. of Colem railway station, it lies on latitude 15°2′N and longitude 74°15′E.

Poinguinim : A small village situated at a distance of *ca.* 10 km. S. of Canacona and *ca.* 35 km. S. of Margao. It lies on latitude 15°N and longitude 74°E.

Valpoi : Situated approximately 50 km. N. of Colem railway station, it lies on latitude 15°3′N and longitude 74°05′E.

SYSTEMATIC ACCOUNT

Order INSECTIVORA

Family SORICIDAE

Suncus murinus caerulescens (Shaw)

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

1831. *Sorex giganteus* Geoffroy, *Voy. Belanger Indes Orient. Zool.*,: 117 (Bengal).

Material.—1 ♂ ; Margao ; 20.xii.1968.

Measurements.—External : *HB* 149 ; *Tl* 95 ; *HF* 23 ; *E* 15.

Skull : *Cb* 38.2 ; *on* 33.3 ; *iw* 6.2 ; *cw* 15 ; *C′-C′* 4.6 ; *i′-m*^{3} 16.4 ; *pl* 18.2 ; *ml* 18.7

The subspecies is supposed to be restricted (*vide* Ellerman and Morrison-Scott, 1951) to Bengal, Bihar and E. Nepal. Its occurrence at Bombay and in Ceylon was attributed by Lindsay (1929) and Phillips (1925, p. 189) respectively as casual and carried over to these places by human agencies like railway and ship. Its presence at Goa too, suggests that the subspecies, irrespective of its mode of dispersal, has established itself throughout Peninsular India and Ceylon, probably due to its commensal habit.

This shrew was one of the three, regularly visiting the kitchen of a hotel, where it was trapped. It is treated as a sacred animal and commonly called as 'Ganpati' by the local people.

Order PRIMATES

Family CERCOPITHECIDAE

Presbytis entellus achates (Pocock)

1928. *Pithecus entellus achates* Pocock, *J. Bombay nat. Hist. Soc.*, **32**: 488. (Haunsbhavi, Dharwar, India).

Material.—1 ♀ (Juv.) ; Poinguinim ; 25.xii.1968.

Measurements.—External : *HB* 400 ; *tl* 600 ; *HF* 130 ; *E* 40

Skull : Broken.

Dorsal colour is darker than that of *Presbytis entellus entellus*. Manus and pes are not as black as in specimens of this subspecies from Dharwar—probably due to difference in age.

Order CHIROPTERA

Suborder *MEGACHIROPTERA*

Family PTEROPIDAE

Pteropus giganteus giganteus (Brünnich)

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

Material.—1 ♂ ; Molem ; 11.ix.1969 ; *R. C. Sharma* Coll.

Measurements.—External : *HB* 220 ; *FA* 154 ; *Tib* 71.

Skull : *l* 66.5 ; *cb* 63.8 ; *zw* 33.1 ; *cw* 24.4 ; *CR* 24.7 ; *pl* 35.3 ; *TR* 26 ; m^3-m^3 18.6 ; *ml* 48.8.

The bat was collected from an old house.

Rousettus leschenaulti (Desmarest)

1820. *Pteropus leschenaulti* Desmarest, *Encycl. Meth. Mammalia*, **1** : 110 (Pondicherry, India).

Material.—1 ♂ ; Margao ; 19.xii.1968 ; 2 ♀ (1 Juv.) ; Poinguinim ; 24 and 25.xii.1968.

Measurements.—External : 1 ♂ ; *HB* 113 ; *E* 19 ; *FA* 80 ; *Tib* 35.

1 ♀ ; *HB* 112 ; *E* 20 ; *FA* 86 ; *Tib* 40.

Skull : 1 ♂ ; *l* 37.1 ; *cb* 35.5 ; *zw* 21 ; *cw* 15.2 ; *pl* 20.2 ; *CR* 11.3 ; m^3-m^3 11 ; *TR* 13.4 ; *ml* 28.6.

1 ♀ ; *l* 37.2 ; *cb* 35.7 ; *zw* 23.1 ; *cw* 15.8 ; *pl* 20 ; *CR* 12.6 ; m^3-m^3 11 ; *TR* 13.6 ; *ml* 29.

One specimen collected in December had a foetus in her womb in early stage of development. Brosset (1962) found females with newly born young in March, August and October. Thus the breeding season seems to extend throughout the year.

Cynopterus brachyotis ceylonensis Gray

1870. *Cynopterus marginatus* var. *ceylonensis* Gray, Cat. Monkeys, Lemurs and Fruit-eating Bats, Brit. Mus. London (Ceylon).

Material.—3 ♂ , 1 ♀ ; Poinguinim ; 24 and 26.xii.1968.

Measurements.—External : 3 ♂ ; *HB* 87-95 (92) ; *E* 16-17 (16.7) ; *FA* 65-66 (65.5) ; *Tib* 25.5-26.5 (26.1). 1 ♀ ; *HB* 89 ; *E* 17 ; *FA* 66 ; *Tib* 26.

Skull : 3 ♂ ; *l* 29.5-31 (30) ; *cb* 28.5-30.2 (29.1) ; *zw* 18-20.5 (19.4) ; *cw* 12-13 (12.6) ; *pl* 15-16.7 (15.8); *CR* 7.3-7.6 (7.5) ; *TR* 9.5-10 (9.8) ; m^3-m^3 9-9.7 (9.4); *ml* 22-23.8 (22.9).

1 ♀ ; *l* 29 ; *cb* 28.5 ; *zw* 18 ; *cw* 12.5 ; *pl* 15.5 ; *cr* 7.7 ; *TR* 9.5 ; m^3-m^3 9.0 ; *ml* 22.2.

The subspecies has hitherto been known only from Ceylon. The present collection not only extends its distribution further north but is also its first authentic record from India.

Cynopterus sphinx sphinx (Vahl)

1797. *Vespertilio sphinx* Vahl, *Skr. nat. selsk. Copenhagen,* 4(1): 123 (Tranquebar, Madras, India).

1912. *Cynopterus sphinx gangeticus* Anderson, *Ann. Mag. nat. Hist.,* 6: 623 (Lucknow, U.P., India).

Material.—1 ♀ ; Margao ; 20.xii.1968 ; 1 ♂ ; Valpoi ; 18.ix.1969.

Additional material examined.—4 , 4 ♀ ; W Bengal ; 3 ♂, 3 ♀ ; Tripura ; 1 ♂ , 1 ♀ ; Assam ; 1 ♂ , 2 ♀ ; Burma ; 1 ♂ , 1 ♀ ; Andaman Islands.

Measurements : External : 1 ♂ : *HB* 95 ; *E* 20.5 ; *FA* 73 ; *Tib* 27.5.

1 ♀ : *HB* 107 ; *E* 20 ; *FA* 76 ; *Tib* 31.

Skull : 1 ♂ : *l* 33.2 ; *cb* 32.2 ; *zw* 21.3 ; *cw* 13.5 ; *pl* 17.2 ; m^3-m^3 10.2 ; *TR* 11.7 ; *CR* 8.8 ; *ml* 24.

1 ♀ : *l* 34.3 ; *cb* 33.4 ; *zw* 21.4 ; *cw* 14.3 ; *pl* 18.5 ; m^3-m^3 9.3 ; *TR* 12 ; *CR* 9.3 ; *ml* 26.7

Andersen (1912) described the subspecies *Cynopterus sphinx gangeticus* from Lucknow (U.P.) and differentiated it from *C.s. sphinx* "as conspicuously larger" *viz* forearm 73-78 *vs* 66-73.5, tibia 28.5-31 *vs* 25-27.5 and greatest length of skull 33-36 *vs* 31.5-34.5. Chaturvedi (1969) felt difficulty in the identification of specimens of *C.s. sphinx* from Andamans up to subspecific level due to their overlapping measurements. A thorough examination of material from the distributional range of both the subspecies reveals that, contrary to those mentioned by Andersen (1912), there are no differences in their external

and cranial measurements (Table 1). Moreover, these can not be differentiated on the basis of colour as the same is very varied ranging from wood-Brown to Seal-Brown and masked with individual variation. I would, therefore, regard *Cynopterus s. gangeticus* a synonym of *C.s. sphinx*.

Suborder *MICROCHIROPTERA*

Family RHINOLOPHIDAE

Rhinolophus rouxi rouxi Temminck

1835. *Rhinolophus rouxi* Temminck, *Mon. Mamm.*, **2**: 30b (Pondicherry and Calcutta, India).

Material.—1 ♂ , 2 ♀ : Poinguinim ; 23 and 29.xii.1968.

Measurements.—External : 1 ♂ ; *HB* 62 ; *E* 20 ; *FA* 48 ; *Tib* 22.

2 ♀ ; *HB* 58-60(59) ; *E* 20 ; *FA* 48 ; *Tib* 22 (in both).

Skull : 1 ♂ ; *l* 21.2 ; *cb* 19 ; *zw* 11 ; *cw* 9.6 ; *pl* 6.8 ; *TR* 8.4 ; *ml* 15.

1 ♀ ; *l* 20 ; *cb* 18 ; *zw* 10.8 ; *cw* 9.2 ; *pl* 6.5 ; *TR* 8.1 ; *ml* 14.6.

The dorsal colour of above mentioned specimens ranges from Drab to Broccoli-Brown and the ventral from Cream to Cream-Buff rather than dark brown above and mouse-grey on the ventral surface (Andersen, 1917).

Family VESPERTILIONIDAE

Subfamily *VESPERTILIONINAE*

Pipistrellus dormeri dormeri (Dobson)

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

1915. *Scotozous dormeri caurinus* Thomas, *J. Bombay nat. Hist. Soc.*, **24**: 33 (Junagadh, Gujarat).

Material.—1 ♂ ; Margao ; 18.xii.1968.

Additional material examined.—1 ♂ , 1 ♀ ; Sind ; 7 ♂ , 11 ♀ ; Rajasthan ; 1 ♂ , 1 ♀ ; Bihar ; 1 ♂ , 1 ♀ ; Deccan.

Measurements.—External : 1 ♂ : *HB* 50 ; *Tl* 41 ; *E* 12.5 ; *FA* 38 ; *Tib* 15.

Skull : 1 ♂ : *l* 14.6 ; *cb* 13.8 ; *zw* 9.6 ; *cw* 7.2 ; *TR* 5.2 ; *pl* 6.7 ; m^3-m^3 7.0 ; *ml* 10.5.

Thomas (1915) differentiated *Pipistrellus dormeri caurinus* from *P. d. dormeri* on the colour of fur (hoary grey *vs.* brown) and larger skull and tooth row. An analysis of measurements (Table 2) of *Pipistrellus dormeri* from ranges of both the subspecies shows that there is no significant difference in the length of forearm, skull and tooth row. Further, contrary to Khajuria's assertion (1965) that second upper incisor is practically absent in adults of the nominate subspecies, it, though small, is present in all but two specimens of each of the subspecies, present at my disposal.

Although, majority of specimens under study are spirit-preserved and partially bleached, a few fresh ones from Goa, Bihar, Rajasthan and Gujarat show that the dorsal colour ranges from Sepia to Broccoli-Brown and the ventral from white mixed with light brown to pale yellow or pinkish, irrespective of localities. On the basis of above facts, there is no justification for maintaining the subspecies *Pipistrellus dormeri caurinus* and I would treat it as a synonym of *Pipistrellus d. dormeri.*

Ecological remarks : This bat was collected twice in solitary condition, once from a hole in a coconut tree and another from a crack in the dried bed of a tank, and in groups of seven and eleven (both males and females) from crevice in between the upper beam of the door and the wall of a deserted house. Brosset (1962) also referred about a colony of five females found under the tile of a roof. All these suggest that the latter two are the most favourite roosting place.

Five specimens collected in the last week of July from Rajasthan (Agrawal, 1967b) and one in September from Sind, were found to be pregnant, all carrying a foetus in early or late stages of development. It is, therefore, concluded that this bat breeds at least from July to September.

Subfamily *KERIVOULINAE*

Kerivoula picta picta (Pallas)

1767. *Vespertilio pictus* Pallas, *Spic. zool.*, **3**: 7 (Peninsular India).

Material.—1 ♀ ; Goa ; April 1918 ; *L. De Souza* Coll.

Measurements.—External : *FA* 31.3 ; *Tib* 12.2.

Skull : *l* 13.8 ; *cb* 13 ; *zw* 8.2 ; *cw* 6.7 ; *pl* 7.7 ; *iw* 3.1 ; *TR* 5.2 ; *ml* 10.

This species has a very wide range of distribution extending from Ceylon and peninsular India to Burma, Malaya and Borneo. The present collection is the first authentic record from Goa.

Family MEGADERMATIDAE

Megaderma spasma horsfieldi Blyth

1863. *Megaderma horsfieldi* Blyth, *Cat. Mammal. Mus. Asiat. Soc. Bengal*, p. 23 (India).

Material.—1 ♂, 2 ♀; Valpoi; 13.i.1969.

Measurements.—External: 1 ♂; *HB* 70; *E* 37; *FA* 61; *Tib* 33.5; 2 ♀; *HB* 66-73(70); *E* 36-36(36); *FA* 57-58 (57.5); *Tib* 31-32 (31.5).

Skull: 1 ♂: *l* 25; *cb* 22.5; *zw* 14.2; *cw* 11; *pl* 9.8; *TR* 9.9; *ml* 17.4.

1 ♀: *l* 24.9; *cb* 22.2; *zw* 13.8; *cw* 10.8; *pl* 9.2; *TR* 9.5; *ml* 17.2.

This bat was seen in a colony of about 25-30 individuals of both sexes, roosting in a hollow tree trunk, with many exits.

Order CARNIVORA

Family FELIDAE

Felis chaus kelaarti Pocock

1939. *Felis chaus kelaarti* Pocock, *Fauna Brit. India, Mammalia*, **1**: 300 (Cheddikulam, N.P., Ceylon).

Material.—1 ♀: Molem; 6.i.1969.

Measurements.—External: *HB* 570; *Tl* 245; *HF* 140; *E* 63.

Skull: *l* 101.5; *cb* 91; *zw* 64.8; *iw* 17.6; *pow* 33; *C'-C'* 23; pm^4 11.5; m_1 9.7; *ml* 61.7

Dorsal colour of body cream-buff to greyish-buff with a prominent mid-spinal stripe; latter Ochraceous mixed with black, lighter at anterior than posterior half; tip of ears black, as usual; stripes on the upper portions of legs faint, probably developing.

Family VIVERRIDAE

Viverricula indica indica (Desmarest)

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

Material.—3 ♂; Molem; 5-7.i.1969.

Measurements.—External : 3 ♂ ; *HB* 560-585 (572) ; *Tl* 350-380 (361) ; *HF* 92-99 (97) ; *E* 38-41 (39).

Skull : 3 ♂ ; *l* 94.4-98.5 (97.1) ; *cb* 92.5-96.4 (94.6) ; *zw* 44-45.8 (45) ; *iw* 12.2-13.5 (13) ; *pow* 12.4-14.2 (13.3) ; *C'-C'* 15.3-16.5 (15.9) ; pm^4 8.0-8.3 (8.1) ; m_1 7.3-7.5 (7.4) ; *ml* 61.6-64.8 (63.2)

The animal is of common occurrence throughout Peninsular India as far north as Chilka lake, Orissa. However, this is the first record from Goa.

Order ARTIODACTYLA

Family TRAGULIDAE

Tragulus meminna (Erxleben)

1777. *Moschus meminna* Erxleben, *Syst. Regn. Anim. Mamm.:* 322 (Ceylon).

Material.—1 ♂ (Juv.) ; Bela village *ca.* 10 KM. SE. of Poinguinim ; 29.xii.1968.

Measurements.—External : *HB* 443 ; *Tl* 300 ; *E* 46.5.

Skull : *On* 97.3 ; *cb* 93.8 ; *iw* 24.4 ; *nas* 31 ; *tb* 15.7 ; *pl* 59 ; *pf* 12.5 ; *ml* 75.6.

The last molar had not yet erupted in both the jaws. The specimen was collected at mid-night in a dense forest. It was roaming in a pair.

Order LAGOMORPHA

Family LEPORIDAE

Lepus nigricollis nigricollis F Cuvier

1823. *Lepus nigricollis* F. Cuvier, *Diet. Sci. Nat.*, **26**: 307 (Madras, India).

Material.—2 ♂ ; Valpoi ; 12 and 13.i.1969.

Measurements.—External : 2 ♂ : *HB* 425-445 (435) ; *Tl* 86 (in both) ; *HF* 102-103 ; *E* 89 (in both).

Skull : 2 ♂ : *on* 82.7-85.4 (84) ; *cb* 74.5-75.5 (75) ; *zw* 39.4-40.1 (39.7) ; *tb* 9.5-9.6 (9.55) ; *nas* 35.0-37.2 (36.1) ; *TR* 13.7-13.8 (13.75) ; *cw* 27.0-27.2 (27.1) ; *pf* 20.5-22.0 (21.2) ; *pl* 33.5-35.3 (34.4) ; *ml* 59.5-60 (59.7).

Dorsal colour rufous-brown mixed with black ; postero-

dorsal portion slaty with subterminal white bands; external tip of ears and dorsal side of tail black or dark brown rather than rufous-brown (Blanford, 1891); Colour of sole deep ferruginous in one and tawny-Ochraceous in the other.

Order RODENTIA

Family SCIURIDAE

Ratufa indica indica (Erxleben)

1777. *Sciurus indicus* Erxleben, *Syst. Regn. Anim. Mamm.,*: 420 (Bombay Presidency, India).

Material.—4 ♂ , 2 ♀; Molem; 2-4.i.1969; 1 ♂ : Sonaulim *ca.* 12 Km. SE. of Molem; 6.i.1969.

Measurements.—External: 5 ♂ ; *HB* 340-392 (370); *Tl* 410-440 (426); *HF* 78-84 (82); *E* 25-27 (26). 2 ♀: *HB* 360-378 (369); *Tl* 423-425 (424); *HF* 81-82 (80.5); *E* 26 (in both).

Skull: 5 ♂ ; *on* 73-76 (74.2); *zw* 42.5-46.5 (44.8); *iw* 28.2-32 (30); *tb* 14.4-15.7 (15); *nas* 23-25 (24.1); *TR* 14.3-15.2 (14.6); *pl* 31-32.6 (31.6); *orb* 23.2-24 (23.6). 2 ♀: *on* 70-73 (71.5); *zw* 43.7-45 (44.3); *iw* 27.2-28.2 (27.7); *tb* 13.8-14.5 (14.1); *nas* 23-23.8 (23.4); *TR* 14-15 (14.5); *pl* 30.5-31 (30.7); *orb* 22.6-23.5 (23.1).

Dorsal colour of the body and tail, in general, resembles that of *Ratufa indica indica* in being deep red throughout. In two examples from Goa and one example from Satara (Maharashtra), the upper arm and the proximal one-fourth portion of tail, however, are black or blackish brown, thus resembling *R. indica centralis*. The specimens from Goa are further interesting in having the hind foot longer than that of *indica* but subequal to *centralis* (Table 3). Otherwise, the measurements are more or less similar to *indica*. Ellerman (1963) also mentioned about a specimen from Samasgi (Dharwar) as transitory towards *centralis* in colour and conjectures that the intergradation has taken place in this area. The above observations support Ellerman's view. Thus Goa and Satara also appear to fall under the zone of intergradation.

Funambulus tristriatus tristriatus (Waterhouse)

1837. *Sciurus tristriatus* Waterhouse, Charlesworth's *Mag. nat. Hist.*, **1**: 496-499 (Madras, India).

Material.—4 ♂ , 1 ♀ (Juv.) ; Poinguinim ; 22-27.xii.1968 ; 1 ♀ : Arvalem village, *ca* 12 Km. NW of Valpoi ; 12.i.1969.

Measurements.—External : 3 ♂ ; *HB* 145-158 (153) ; *Tl* 140-153 (148) ; *HF* 37-38 (37.5) ; *E* 15-16 (15.5). 1 ♀ ; *HB* 143 ; *Tl* — ; *HF* 36 ; *E* 15.

Skull : 3 ♂ ; *on* 40-42 8 (41.6) ; *zw* 23-24 (23.5) ; *iw* 12.3-13.6 (13) ; *tb* 7.4-7.7 (7.6) ; *nas* 12-13.5 (12.8) ; *TR* 8 (in all) ; *orb* 12-12.6 (12.3) ; *pl* 20-22.5 (21.4).

Dorsal stripes ranging from pale buff to brownish as in *numarius* (Wroughton, 1919) and intermediate bands from brown to blackish ; middle portion of the underside of tail, testis and inguinal region ranging from Cadmium-Orange to Saturn-Red rather than deep red (Ellerman, 1963)

Ecological remarks : This squirrel prefers to live in semi-dense forests near human habitation in contrast to the Indian Giant Squirrel, *Ratufa indica,* which confines itself to tall trees in deep jungles. It is a shy animal and spends most of its time on trees rather than on the ground, which shows that the species is more arboreal than the Northern Palm Squirrel, *Funambulus pennanti* (Agrawal, 1965). The stomach contained vegetative matter mainly pieces of some juicy fruit.

Family MURIDAE

Subfamily *GERBILLINAE*

Tatera indica hardwickei (Gray)

1843. *Gerbillus hardwickei* Gray, *List. Mamm.,*: **132** (Dharwar, India). Based on Elliot's description of the Dharwar Tatera, 1839, *Madras J. Litt. Sci.,* **10** : 211.

Material.—2 ♂ (1 Juv.) ; Nova Gova ; Feb. 1938 ; *Col. Dell Mello* Coll. 2 ♀ (1 Juv.) ; Poinguinim ; 26-28.xii.1968 ; 1 ♀ ; Molem ; 4.i.1969.

Measurements.—External : 1 ♂ : *HB* 149+ ; *Tl* 191 ; *HF* 42 ; *E* 22.2 ♀ : *HB* 149-170 (160) ; *Tl* 186-195 (190) ; *HF* 44 (in both) ; *E* 23-24.5 (23.7).

Skull : 1 ♂ : *on* 46.5 ; *iw* 7.2 ; *pl* 25.3 ; *TR* 6.5 ; *nas* 20.2 ; *pf* 8.7 ; *tb* 10.8.
2 ♀ : *on* 41.6-47.3 (44.4) ; *iw* 6.9-7.7 (7.3) ; *pl* 22.1-25.5 (23.8) ; *TR* 6.4-6.5 (6.45) ; *nas* 17-19.5 (18.2) ; *pf* 7.5-9.0 (8.3) ; *tb* 10.8-11.8 (11.3).

Specimens from Goa are slightly darker (Broccoli-Brown) dorsally than those from Dharwar and Kanara present in the National Zoological Collection.

Ellerman (1963, p. 410) is of the opinion that the southern subspecies of *Tatera indica* namely *hardwickei*, *cuvieri* and *ceylonica* do not differ from each other in colour but may apparently be differentiated on the basis of external measurements *viz* the length of tail and hind foot. But the above data show that the length of hind foot (26-29%, mean 28%, of head & body length) overlap those of the other two subspecies. However, the subspecies can still be differentiated from *cuvieri* by its shorter tail and longer anterior palatal foramina and from *ceylonica* by narrow interorbital width of skull (Agrawal, 1967a).

A specimen collected on Jan. 4, 1969, was found to be pregnant and had three embryos.

Subfamily *MURINAE*

Bandicota indica indica (Bechstein)

1800. *Mus indica* Bechstein, *Veber Vierf. Thiere*, **2**: 497 (Pondicherry, India).

1801. *Mus malabarica* Shaw, *Genl. Zool.*, **2**: 54 (Malabar, India).

1804. *Mus gigantea* Hardwicke, *Trans. Linn. Soc. London*, **7**: 306 (Hardwar, U.P., India).

Material.—3 ♂ , 1 ♀ ; Margao ; 16-20.xii.1968.

Measurements.—External : 3 ♂ ; *HB* 262-280 (272) ; *Tl* 265-289 (275) ; *HF* 52-54 (53) ; *E* 26-32 (29). 1 ♀ ; *HB* 262 ; *Tl* 289 ; *HF* 54 ; *E* 31 ; mammae 3+3=12.

Skull : 3 ♂ ; *on* 54.8-58.4 (56.7) ; *cb* 56.2-59.8 (58.2) ; *zw* 29.8-32 (31.2) ; *iw* 7.8-8.8 (8.4) ; *tb* 9.2-10 (9.5) ; *nas* 22-23.8 (23) ; *pl* 33-35.5 (34.3) ; *pf* 10.2-10.7 (10.5) ; *TR* 9.5-10 (9.8) ; *dst* 19-20.5 (19.7). 1 ♀ ; *on* 57.6 ; *cb* 58.2 ; *zw* 30.5 ; *iw* 8.5 ; *tb* 9.7 ; *nas* 23.3 ; *pl* 34.3 ; *pf* 9.8 ; *TR* 9.8 ; *dst* 20.

Wroughton (1919) maintained the species *gigantea*, *malabarica* and *indica* on the size of hind foot (*viz* over 60 mm., about 58 mm. and between 48-51 mm. respectively). Later, Ellerman (1947) synonymised *malabarica* and *gigantea* with the nominate subspecies of *indica* with the comment that the specimens of *indica* (one from Ootacmund and another from

Coonoor, Nilgiri Hills) which have been taken into account by Wroughton for differentiating this species from *malabarica* are nothing but small individuals. He further remarked that the difference between the smallest *malabarica* and the largest *indica* was much less than that between the smallest and largest specimens of *malabarica* and therefore it was most likely that the supposed size differences between the two named forms would seize to exist on further availability of specimens. Recently Tiwari *et al* 1971 have resuscitated *malabarica* from W Ghats at subspecific level and differentiated it from *indica* on the basis of longer head-and body, tail, hind foot and skull, by taking into consideration a subadult specimen from Salem (Madras) and the same two specimens of *indica* which were used by Wroughton. However, specimens from Goa, Western Ghats, do not remarkably differ in measurements (Table 4) from those of Madras, thus supports Ellerman's view.

Rattus rattus Wroughton Hinton

1919. *Rattus rattus wroughtoni* Hinton, *J. Bombay nat. Hist. Soc.*, **26**: 384 (Coonoor, Nilgiri Hills, India).

Material.—1 ♂ ; Poinguinim ; 25.xii.1968.

Measurements.—External : *HB* 165 ; *Tl* 195 ; *HF* 34 ; *E* 22.5.

Skull : *on* 39.2 ; *iw* 5.3 *tb* 7.0 ; *nas* 14 ; *pl* 21 ; *TR* 6.5 ; *pf* 6.8.

Dorsal colour of the body olive medially and Hair-Brown on sides rather than brownish throughout ; ventral colour white mixed with Sulphur-yellow.

Rattus rattus rufescens (Gray)

1837. *Mus rufescens* Gray, *Ann. Mag. nat. Hist.*, **1**: 585 (Dharwar, India).

Material.—2 ♀ : Molem ; 3 and 7.i.1969 ; 4 ♂, 2 ♀ ; Valpoi ; 12-14.i.1969.

Measurements.—External : 1 ♂ ; *Hb* 179 ; *Tl* 250+ ; *HF* 36 ; *E* 23. 4 ♀ ; *HB* 163-183 (172) ; *Tl* 213-241 (226) ; *HF* 32-35 (33.5) ; *E* 22-23 (22.7).

Skull : 1 ♂ ; *on* 43.4 ; *iw* 6 ; *tb* 7.6 ; *nas* 16 ; *pl* 23 ; *TR* 6.3 ; *pf* 8 ; *dst* 11.8. 4 ♀ ; *on* 39.8-43.7 (41.6) ; *iw* 5.6-6.3 (6.0) ; tb 6.8-7.6 (7.1) ; *nas* 14.7-15.6 (15.2) ;

pl 21-23 (21.8) ; *TR* 6.2-6.7 (6.4) ; *pf* 6.2-7.6 (7.0) ; *dst* 9.8-12 (10.9).

These rats were collected by using bread and fried fish as bait, from kitchen and vegetable shops.

Rattus blanfordi (Thomas)

1881. *Mus blanfordi* Thomas, *Ann. Mag. nat. Hist.*, **7**: 24 (Kadapa, Madras, India).

Material.—1 ♂ ; Valpoi ; 21.ix.1969.

Measurements.—External : *HB* 158 ; *Tl* 172 ; *HF* 37 ; *E* 25.

Skull : *on* 45.4 ; *zw* 21.4 ; *tb* 7.8 ; *nas* 17.9 ; *pl* 23 ; *TR* 6.4 ; *pf* 8.3 ; *iw* 7.

Dorsal colour Seal-Brown medially and light fawn on sides ; distal one-fifth portion of tail white and slightly haired.

Skull having the anterior palatal foramina only 18% and palate over 50% of occipito-nasal length rather than about 20% and less than 50% respectively, mentioned by Ellerman (1963).

Mus booduga (Gray)

1837. *Leggada booduga* Gray, *Charlesworth's Mag. nat. Hist.*, **1**: 586 (Southern Mahratta, India).

Material.—1 ♂ ; Molem ; 11.ix.1969 ; *R. C. Sharma* Coll.

Measurements.—External : *HB* 61+ ; *Tl* 63 ; *HF* 14 ; *E* 11. (Measurements taken from spirit preserved specimen).

Skull : *on* 18.5 ; *TR* 3.4.

Ventral colour greyish-white and tail unicolored instead of bicolored.

The mouse was collected at night from the paddy field.

SUMMARY

The present paper is based on a collection of mammals from Goa. This belongs to 22 species and subspecies. The collection is significant in being the first authentic record from this area. The report also incorporates ecological observations made in the field.

As a result of this study, variations in coloration, size etc. have been recorded in a number of forms. The Ceylon fruit-bat, *Cynopterus brachyotis ceylonensis* Gray has been recorded for the first time from India and the distributional range of the

House shrew, *Suncus murinus cerulescens* (Shaw) has been extended from Bengal, Bihar and E. Nepal to whole of Peninsular India and Ceylon. The short-nosed fruit bat, *Cynopterus sphinx gangeticus* Anderson and the Dormer's bat, *Pipistrellus dormeri caurinus* Thomas have been synonymised with *Cynopterus sphinx sphinx* (Vahl.) and *Pipistrellus dormeri dormeri* (Dobson) respectively. The taxonomic status of *Tatera indica hardwickei* (Gray) and *Bandicota indica indica* (Bechstein) has also been discussed.

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Table 1.—Measurements of *Cynopterus sphinx* from the distributional range of *C. sphinx sphinx* and *C. s. gangeticus*.

Locality→ Measurements ↓	Lucknow U.P.*	Bengal	Tripura	Assam	Burma	Andaman Islands	Goa
No. of examples	6♂, 10♀	4♂, 4♀	3♂, 3♀	1♂, 1♀	1♂, 2♀	1♂, 1♀	1♂, 1♀
External :							
Fore arm	70·2—77·3 (74·2)†	67—76 (71·8)	64—77 (70)	69·5—74 (72)	72—74 (73·2)	72·5—76·5 (74·5)	73—76 (74·5)
Tibia	26·7—32·2 (29·1)	24·5—30 (27·7)	25—30 (27·5)	25·5—28 (26·7)	27·5—28 (27·6)	— —	27·5—31 (29)
Skull :							
Greatest length	31·2—34·7 (33·5)	31·7—34·5 (33·5)	32·5—33·7 (33·1)	30·6	33	33—34 (33·5)	33·2—34·3 (33·8)
Zygomatic width	20·8—22·6 (21·7)	18·8—22·3 (20·6)	20·3—21·3 (20·9)	19·3	20·5	21·3—21·5 (21·4)	21·3—21·4 (21·4)
Cranial width	13·1—14·6 (14·3)	13·2—15·0 (14·1)	13·6—13·9 (13·8)	13·6	14·8	13·5—14·4 (14)	13·5—14·3 (13·9)
Tooth-row	10·2—12·0 (11·3)	10·5—12·0 (11·0)	10·7—11·6 (11·1)	10·3	10·4	11·5—12 (11·7)	11·7—12·0 (11·8)
Mandibular length	23·7—26·7 (25·8)	23·5—26·3 (25·1)	23—24·5 (23·6)	23	25·2	25·5—26 (25·8)	24—26·7 (25·4)

*Measurements after Khajuria (1952).

†Figures in parentheses show mean measurements.

Table 2.—Measurements of *Pipistrellus dormeri* from different localities in India.

Locality→ Measurements ↓	Sind	Rajasthan	Gujarat	Bihar	Deccan	Goa
No. of examples	1♂, 1♀	7♂, 11♀	4♂, 3♀*	1♂, 1♀	2♂, 1♀	1♀
External :						
Fore arm	32·5—34·5 (33·5)	34—37 (35·6)	34—36 (35)	34—35 (34·5)	33·5—35 (34·2)	38
Skull :						
Greatest length	13·7—13·8 (13·75)	13·4—14·2 (13·7)	14—14·5 (14·3)	13·6—13·7 (13·65)	13·2—13·6 (13·4)	14·6
Zygomatic width	9·8—9·9 (9·85)	9·8—10·6 (10·1)	10—10 (10)	9·7—10 (9·85)	— —	9·6
Tooth-row	5·3—5·5 (5·4)	5·2—5·6 (5·3)	5·6—6·0 (5·9)	5·3—5·5 (5·4)	5·2—5·3 (5·25)	5·2

Figures in Parentheses show mean measurements.

*Measurements after Brosset (1962).

Table 3.—External and cranial measurements of *Ratufa indica indica* and *R. indica centralis.*

Name of Subspecies & locality	No. of examples	Head & Body	Tail	Tail as % of HB	Hind foot	Hind foot as % of HB	Ear	Occipito-nasal length	Tooth-row
Ratufa indica indica	3 ♂	370—380 (375)*	370—405 (391)	97—108% (104%)	57—76 (69)	15·2—20% (18·4%)	26—29 (27)	71·9—74·1 (73·2)	14·5—14·9 (14·8)
(Satara & Dharwar)	8 ♀	340—370 (351)	380—447 (419)	110—130% (119%)	59—77 (68)	16·8—21·4% (19·3%)	26—33 (28·4)	68·3—74·9 (71·7)	14·1—15·5 (14·8)
Goa	5 ♂	340—392 (370)	410—440 (426)	109—120% (115%)	78—83 (81)	21·1—23·2% (21·8%)	25—27 (26)	73—76 (74·2)	14·3—15·2 (14·6)
	2 ♀	360—378 (369)	423—440 (431)	116—117% (116 5%)	80—81 (80·5)	21·4—22·2% (21·8%)	26—26 (26)	70—73 (71·5)	15—15·5 (15·25)
Ratufa indica centralis	11 ♂	309—365 (343)	375—450 (414)	110—130% (120%)	72—81 (76)	20·5—23·6% (22·1)	26—30 (28)	68—74·3 (72)	13·8—15·2 (14·4)
(M.P., Orissa, Mysore)	10 ♀	314—407 (350)	385—460 (415·5)	109—130% (119%)	74—84 (77)	20·5—23·2% (22%)	25—32 (28·2)	69·8—76·4 (72·8)	14—15·5 (14·6)

*Figures in Parentheses show mean measurements.

Table 4.—External and cranial measurements of *Bandicota indica indica* from Goa (Western Ghats) and Madras.

Locality	No. of examples	Head & body	Tail	Hind foot	Ear	Occipito-nasal length	Tooth-row
Goa	3 ♂, 1 ♀	262—280 (270)†	265—289 (279)	52—54 (53)	26—32 (30)	54·8—58·4 (57)	9·5—10 (9·8)
Madras	2 ♀	230—255* (242)	275—295 (285)	54—54 (54)	26—30 (28)	55·7—57 (56·3)	10—10 (10)

†Figures in parentheses show mean measurements.

*Measurements taken from spirit preserved specimens.