Table 2: Body measurements of the captured Short-nosed Fruit Bats

	Weight* (g)	Head and Body (mm)	Tail (mm)	Hind foot (mm)	Ear (mm)	Forearm (mm)	Wing span (mm)
Female (31)	51.4 ±5.1	85.3 ±12.0	16.3 ±1.9	16.6 ±1.8	19.3 ±1.5	70.5 ±1.8	463.7 ±15.3
Male (24)	51.8 ±4.2	89.5 ±12.3	15.4 ±2.3	16.4 ±1.7	19.5 ±2.0	70.0 ±2.0	467.7 ±11.3
Mean	51.6 ±4.7	87.1 ±12.2	15.9 ±2.1	16.5 ±1.8	19.3 ±1.8	70.3 ±1.9	465.4 ±13.7

Short-nosed Fruit Bats produce high pitched vocalization audible to the human ear and can be identified easily while feeding and flying around trees. They fed on 10 plant species, *Madhuca indica*, *Ficus benghalensis*, *Ficus religiosa*, *Musa paradisica*, *Polyalthia longifolia*, *Calophyllus polyanthum*, *Syzygium cumini*, *Bombax ceiba*, *Psidium guajava*, and *Gardenia jasminoides*. They fed mainly on fruit and occasionally on nectar and leaves. Banded bats were observed to carry fruit 100-2000 m away from the foraging sites to their roosts.

Fruit bats are excellent seed dispersers, pollinators and indicators of habitat diversity, but the Indian Wildlife (Protection) Act, 1972 categorises all species of fruit bats as vermin. No quantitative data exists on the extent of damage caused to cash crops in south India, either by the Short-nosed or other species of fruit bats. In Tamil Nadu and the neighbouring state of Kerala, Elephant *Elephas maximus* and Wild Boar *Sus scrofa* were mainly reported to cause damage to agricultural crops, along with Hanuman Langur *Semnopithecus entellus*, Bonnet Macaque *Macaca radiata*, Porcupine *Hystrix indica*, Gaur *Bos frontalis*, Sambar *Cervus unicolor*, Barking Deer *Muntiacus muntjak*, Mouse Deer *Moschiola meminna*, Black-naped Hare *Lepus nigricollis*, Malabar Giant Squirrel *Ratufa indica* and Indian Peafowl *Pavo cristatus* (Veeramani and Jayson 1995). Since not much is known on the extent of damage done to orchards by fruit bats, future studies should focus on this aspect.

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3. A NOTE ON DISTINGUISHING *GERBILLUS GLEADOWI* AND *GERBILLUS NANUS* BASED ON THEIR FOOTPRINTS IN THE THAR DESERT, INDIA

Tracking is one of the most effective methods for determining the preference, movement, home range and habitat use by small mammals (Sheppe 1965; Maybee 1998). It has been used successfully in wildlife and pest control (Sheppe 1965; Spaulding and Jackson 1984; Ratz 1997). Compared to live capture traps, tracking does not restrict the animal's movement, allows one to cover a larger area and is also less time and labour intensive (Sheppe 1965; van Apeldoorn *et al.* 1993; Maybee 1998). It does not involve handling of rodents, thereby reducing exposure to transmissible diseases (Drennan *et al.* 1998). Various methods like aluminium tracking plots, weather resistant tracking stations, sand, dirt and lime track beds have been used for studying small mammals (Sheppe 1965; Spaulding and Jackson 1984; van Apeldoorn *et al.* 1993).

There is no information on species level identification from tracks and signs for any of the small mammals in the Indian subcontinent. Here we describe the distinguishing characteristics of footprints of two gerbil species, *Gerbillus gleadowi* and *G. nanus* for field identification. The characters were recorded from track plots. Compared to track stations, track plots allow easy movement of animals, are less expensive and easy to lay. Footprint identification was standardised to help in the study of habitat use by gerbils in the Thar desert, India.

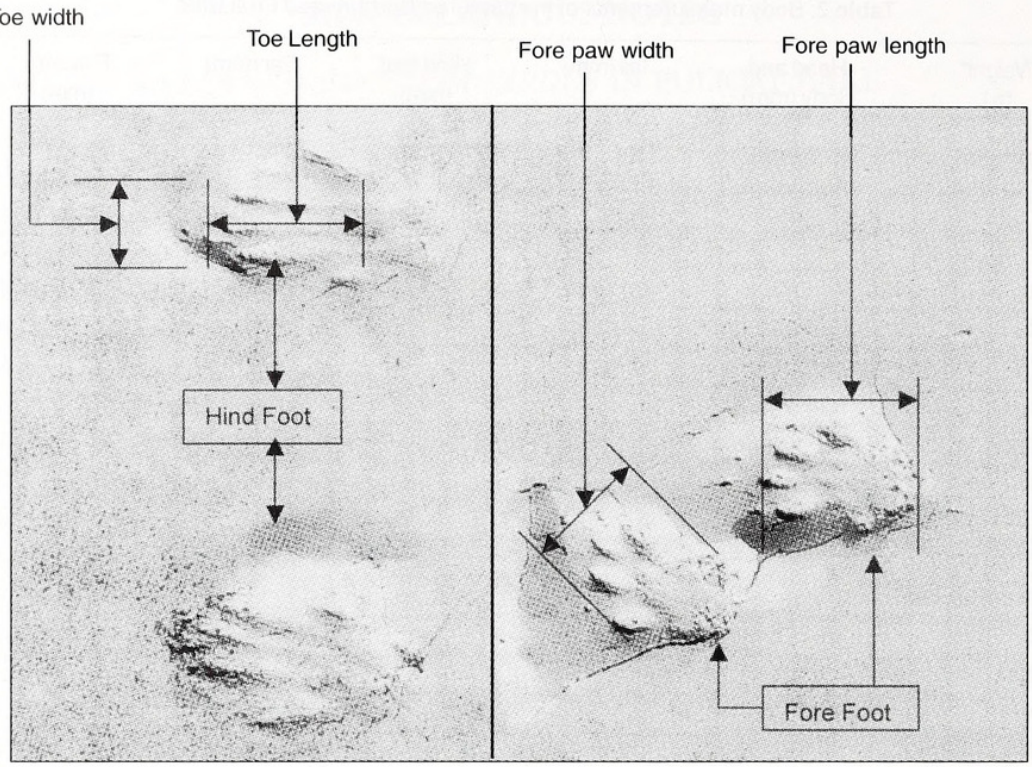

Fig. 1: Measurements of various foot print characteristics

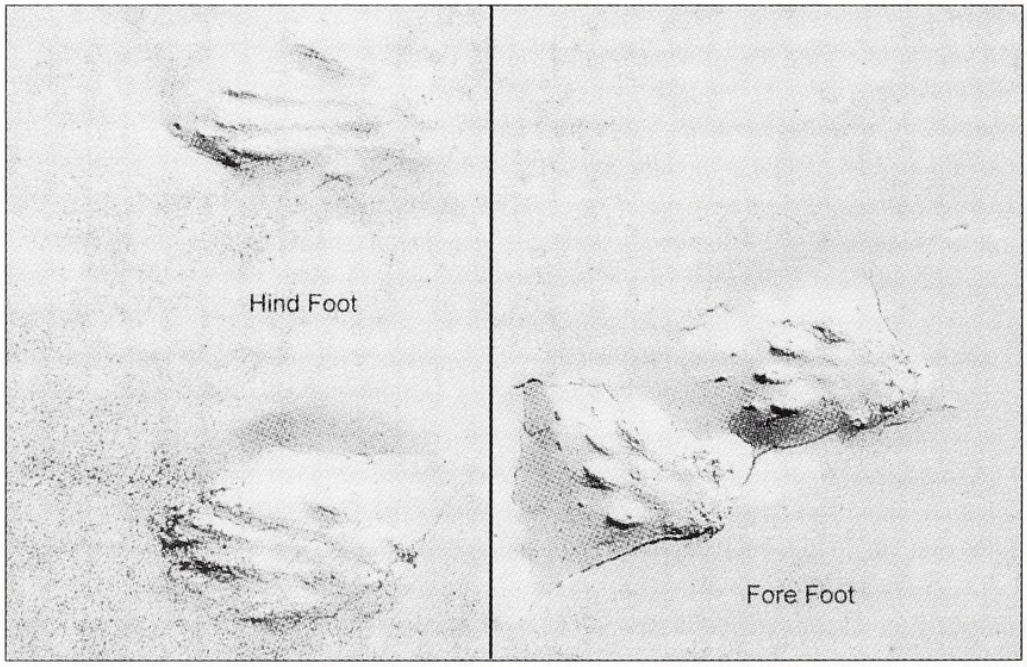

Fig. 2: Hind foot (left) and fore foot (right) tracks of *Gerbillus gleadowi*

Sand tracking is one of the most widely used techniques for studying desert rodents in the field. In this method, sand is smoothened in a small patch. The rodents leave footprints on these stations while foraging. These tracks form the basis for studying their movements.

Three species of gerbils, *Gerbillus gleadowi*, *G. nanus* and *Meriones hurrianae* have been reported from the sandy habitats of Rajasthan desert (Prakash 1996). Of these, *Gerbillus gleadowi* and *G. nanus* are nocturnal, while *Meriones hurrianae* is diurnal during winter and crepuscular during summer.

Meriones hurrianae could be studied by direct observation, but for habitat use by nocturnal species we had to study their footprints. Initially we tried to establish differences in the footprints of the two species with captive live specimens at the Central Arid Zone Research Institute,

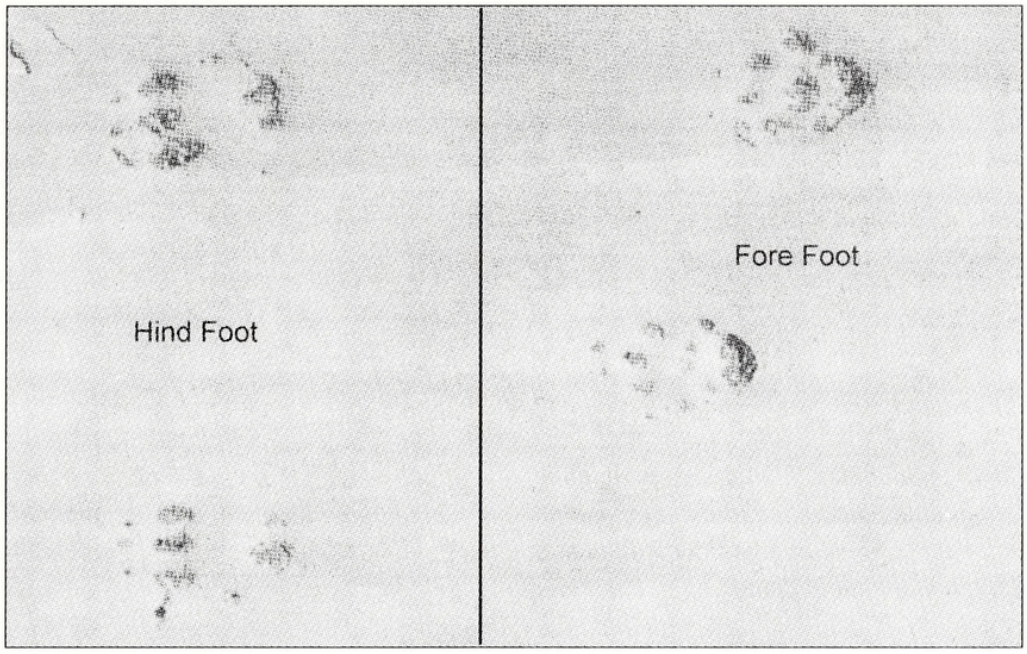

Fig. 3: Hind foot (left) and fore foot (right) tracks of *Gerbillus nanus*

Jodhpur. With sand as the substrate they did not leave good quality tracks. Hence it was not possible to distinguish between the two species. Thereafter, we experimented with lime, which gave a better resolution, allowing us to distinguish the two species from their footprints. Lime being hygroscopic absorbs moisture from the air at night. This makes the track plots less prone to damage by wind activity (in field) and also helps in obtaining a better quality print. For making track plots, lime was first sieved on to the soil and then a metal plate (used by masons) was used to smoothen it. This made the plot more compact, which in turn left a better quality track. We measured the length and width (in mm) of the forepaw and hind foot (toe – 2nd, 3rd and 4th) (Fig. 1). The track plots were laid in the evening (an hour before sunset) and checked early morning when the shadows were very vivid and tracks easiest to read.

The measurements of the fore and hind foot indicate a distinct difference in the footprints of the two species (Table 1). The most prominent is the difference in toe length (TL) (Table 1, Fig. 2). The mean TL of *Gerbillus gleadowi* was 6.32 mm, while that of *G. nanus* was 1.7 mm. The other important difference was in forepaw length (FPL). *Gerbillus gleadowi's* FPL ranged from 9.84-11.28 mm, while that of *G. nanus* ranged from 5.84-7.38 mm. These two differences formed the basis on which the tracks of the two species could be distinguished in the field (Fig. 2). The other differences were seen in forepaw width and toe width (Table 1).

Standardisation of tracks of the two gerbil species in the Rajasthan desert helped us study their movement and habitat use. Similar studies are required to catalogue the track differences among various species of rodents, which could be used to study prey abundance of small carnivores. Compared to Sherman traps, track plots would give better estimates of the relative abundance of small mammals, as it does not restrict the animal's movement and or involve biases, such as trap shyness or trap happiness.

Table 1: Footprint measurements [Mean (mm) ± S.D. (Range)] of *Gerbillus gleadowi* and *G. nanus* on lime track plots (n=6)

Measurement	*Gerbillus gleadowi*	*Gerbillus nanus*
Front paw length	10.39 ±0.52 (9.84-11.28)	6.94 ±0.55 (5.84-7.38)
Front paw width	6.24 ±0.46 (5.86-7.14)	4.29 ±0.54 (3.26-4.98)
Toe length	6.32 ±0.54 (5.54-7.14)	1.7 ±0.13 (1.52-1.84)
Toe width	4.34 ±0.40 (3.68-4.7)	3.43 ±0.39 (2.88-3.8)

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4. *RHINOCEROS RUGOSUS* – A NAME FOR THE INDIAN RHINOCEROS

The German zoologist Johann Friedrich Blumenbach introduced a new name for the Indian Rhinoceros (*Rhinoceros unicornis* Linnaeus, 1758) in the first and second editions of the *Handbuch der Naturgeschichte,* published in 1779 and 1782. He changed the names in subsequent editions. His nomenclature is viewed in a historical perspective.

Blumenbach's Handbuch

Johann Friedrich Blumenbach (1752-1840) was appointed lecturer of medicine and curator of the natural history collection at the University of Göttingen in Germany in 1776. Two years later he became full professor and remained at the same university for the rest of his career, initially as a colleague of Johann Friedrich Gmelin (1748-1804), who edited the 13th edition of the *Systema Naturae*. Blumenbach is well known for his contributions to anthropology, comparative anatomy and theoretical biology, and was a prolific author on these subjects (Kohn 1992: 56). To serve as a text for a one-semester course in natural history, he compiled *Handbuch der Naturgeschichte* (HANDBOOK OF NATURAL HISTORY), first published in 1779. This was intended as a summary of the world's fauna with short descriptions of each species, similar to the *Systema Naturae* by Carl Linnaeus (1707-1778). Blumenbach confidently and consistently followed the system of nomenclature and systematics introduced by Linnaeus. Although copies of the *Handbuch* in international zoological libraries are few, twelve editions were produced between 1779 and 1830. The fact that it was a required text for all his students probably explains this incongruity.

Two species of Rhinoceros

When Blumenbach wrote the first edition of the *Handbuch* in 1779, the systematic status of the two-horned rhinoceros was still under review. Linnaeus (1758) had been ahead of his time in listing *Rhinoceros bicornis* as a valid species, but his diagnosis appeared to be confused (Rookmaaker 1998). Blumenbach at first suggested that rhinos only differed in the number of horns, hence the African animal was no more than a variety of the Asian species: "Sie sind aber weiter in nichts von gemeinen Nashorn verschieden, und für eine blose Spielart von diesem anzusehn"(Blumenbach 1779: 135). While working on the second edition of 1782, he heard about the monograph on the African rhinoceros by Petrus Camper (1722-1789) published in Dutch in the same year, but he had not seen the book and he did not change his classification. Camper (1782) studied the anatomy of the African rhinoceros in detail and found that it differed from the one-horned animal not only in the number of horns, but more significantly in the differences in the number and form of the teeth, especially molars. Blumenbach accepted this argument and from the third edition of the *Handbuch* of 1788 onwards, he separated the African rhinoceros with a specific epithet (Table 1). There were further changes in the third edition: the text to each species became much shorter, and the names were thoroughly revised.

In the third edition of *Handbuch der Naturgeschichte* dated 1788, Blumenbach used *Rhinoceros unicornis* for the Asian one-horned rhinoceros and *Rhinoceros bicornis* for

Table 1: Species of Rhinoceros in the Handbuch der Naturgeschichte by J.F. Blumenbach

Date	Edition	Page	Asian species	African species
1779	1	134-135	*R. rugosus*	variety
1782	2	133	*R. rugosus*	variety
1788	3	135	*R. unicornis*	*R. bicornis*
1791	4	123	*R. unicornis*	*R. bicornis*
1797	5	126	*R. asiaticus*	*R. africanus*
1799	6	126	*R. asiaticus*	*R. africanus*
1802	Dutch	163-164	*R. unicornis*	*R. bicornis*
1803	7	123	*R. asiaticus*	*R. africanus*
1807	8	127-128	*R. asiaticus*	*R. africanus*
1814	9	128	*R. asiaticus*	*R. africanus*
1821	10	130	*R. asiaticus*	*R. africanus*
1825	11	107	*R. asiaticus*	*R. africanus*
1830	12	107	*R. asiaticus*	*R. africanus*