Nature Watch

The Amazing Desert Gerbil [1]

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Ishwar Prakash received his Ph.D. and D.Sc from Rajasthan University. His areas of work include desert ecology, rodent pest management, wild life conservation etc. Currently he is popularising science by writing books and articles.

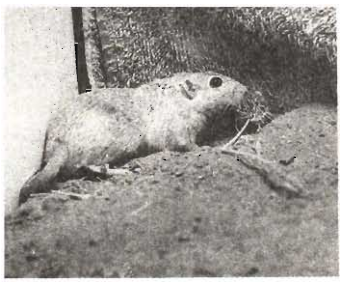
Gerbils are rodents with a long hairy tail terminating in a tassel of hair. *Gerbillus, Tatera* and *Meriones* are the genera found in India. These rodent genera of Sahara-Tharian region differ from each other in their origin and dispersal. Since a large number of species of the genus *Gerbillus* are found in the African continent, it is conjectured that Africa was the centre of their differentiation. However, *Tatera* is found only south of Sahara. *Meriones* of Asiatic origin which crossed over to northern Africa across the Sinai desert is now found in Egypt, Libya, Algeria, Tunisia, Morocco and several parts of Asia.

The Merion Gerbil

The Indian desert gerbil *Meriones hurrianae (Figure 1)* is found in abundance in the Great Indian or the Thar desert. Its range does not extend east of the Aravallis. The species was first described by Jerdon in 1867 on the basis of specimens collected from Hisar. But in recent times this desert dweller has vanished from irrigated parts of Haryana, Punjab and northern Rajasthan, mainly due to the perennial enhancement of soil moisture regime. In western Rajasthan, which constitutes 62 percent of the Thar desert, *M. hurrianae* is the most predominant species constituting 40-55 percent population of rodents belonging to 20 species. But, it is outnumbered by *Gerbillus gleadowi* in the extreme western 100 mm rainfall zone in Jaisalmer and Barmer districts. Surprisingly, the desert gerbil is diurnal in habit though 84 percent mammals of the Thar desert evade the adverse conditions of heat by adapting to a nocturnal life. It withstands the stresses because of its comparatively low basal metabolic rate, extremely efficient renal system and also by living in extensive burrow systems.

[1] Dedicated to the memory of B P Pal, the eminent agricultural scientist who out of affection, used to call me 'Mr Gerbil'.

Figure 1. The desert gerbil, Meriones hurrianae.



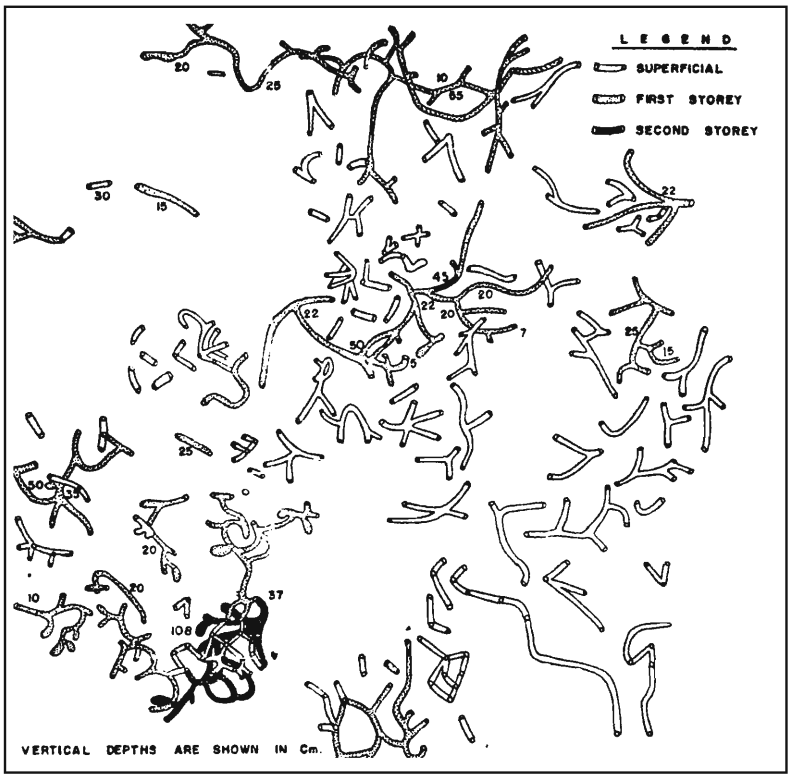


Figure 2. Surface view of a burrow system of desert gerbils (after Prakash, 1981).

A Structural Engineer

The tiny desert gerbil (body wt. 60 – 80 g ; body length 120 – 125 mm, tail length 100 – 125 mm), cleverly excavates its extensive burrows, usually in three tiers, the surface, the medium and smaller portions which together are more than a metre deep (*Figure 2*). The temperature in the deep gallery is constantly maintained much below the air temperature during summer and much above during winter. By structurally engineering the burrows it lives more or less in an air conditioned environment. It maintains the inside relative humidity between 60 and 70 per cent as compared to the outside RH which is 2 to 5 per cent. It checks the desiccating strong desert winds by plugging the burrow openings in the incoming wind direction. If the wind direction changes, it accordingly makes more openings in the reverse direction. If

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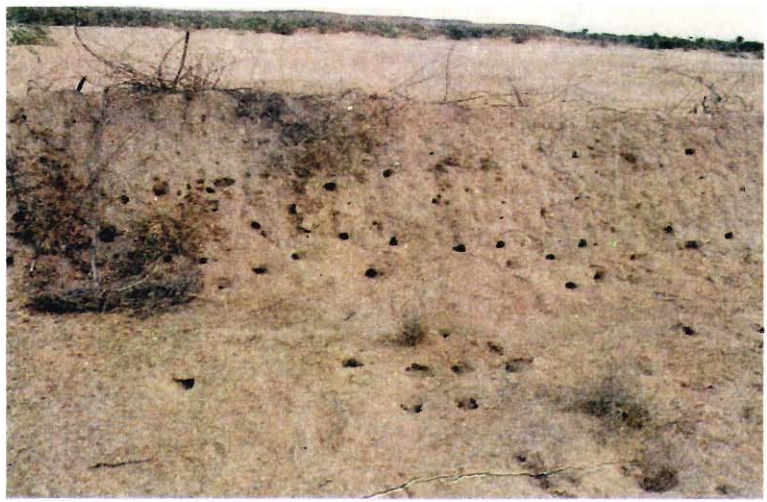

Figure 3. The Thar desert is littered with burrow openings of Meriones hurrianae.

it plugs all the burrow openings a dust storm can be expected 2 to 3 hours later. Even then, if the burrow is desiccated it shovels the dried sand out of its burrow to maintain humidity (*Figure 3*).

A Causative Agent of Desertification

With a density of 200 – 470 per hectare and with an average of 15 openings to a burrow, it excavates about 61,500 kg soil/ km^2/day. The excavated sand which is loosely piled outside the burrow openings is carried away by strong summer winds and is deposited at distant places as Barchan sand dunes. The minute sand particles become airborne and even reach the trophosphere. From the satellite imageries, the Thar desert can, therefore, be identified as the biggest dust bowl on the planet. The soil-erosive activity of this desert denizen is one of the major agents of desertification!

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An Opportunistic Dietician

M. hurrianae is essentially a seedivorous rodent from October to March next when seeds are available in large numbers (*Figure 4*). During summer months when the seeds of desert plants become exhausted, the desert gerbil switches over to

Figure 4. The green pepper is chiselled off the plant by the gerbils. They make a meal of the seeds and discard the pods.

insects, especially grasshoppers and beetles which are also a source of water for them. During the monsoon it shifts to feeding upon green plant parts to ingest maximum nutrients to cope with a high rate of reproduction and when green food is available everywhere, the omnivore turns into a selective feeder, consuming only the most nutritive grass, *Cenchrus ciliaris*. This dietary adaptation makes it the most successful rodent of the Thar desert. Since the grass stems are very soft, the gerbils cannot climb over it to reach the inflorescence-ear which constitute their most preferred food. The gerbils, therefore chisel the whole plants off and feed upon the choicest parts. The amount of plant parts which are found lying near their burrows gives an idea of the colossal destruction (*Figure* 5) of green vegetation and the magnitude of competition they provide to wildlife species and livestock.

A Competitor of Ungulates

I have recorded a very high density (477/h) of merion gerbils in Shekhawati region of the Thar desert. Besides the destruction they inflict upon plants, their annual food consumption would come to about 1044 kg/year whereas the forage production of the vegetation was estimated to be

Dietary adaptation makes the desert gerbil the most successful rodent of the Thar desert.

Figure 5. Plant parts lying near a burrow opening. The rodent feeds upon the tiny seeds and leaves behind the fluffy material of the inflorescence of the herb, Aerva pseudotomentosa.

fluctuating between 900 to 1300 kg/h. If their numbers are maintained at this high level, the desert gerbils will hardly leave any edible plants for the gazelle, *Gazella benetti* and for the huge population of livestock.

A Prolific Breeder

M. hurrianae breeds all round the year, but the peak littering period is synchronised with the monsoon when ample green, proteinaceous food is available and the length of the day is greater. The litter size varies seasonally from 1 to 9 young at a time. However, litters of 6 to 9 are delivered only during monsoon and the survival rate of these young gerbils is much superior to those born before the rainy season. The mating behaviour of these light weight mammals is most interesting. The respective female arches its body and 'presents' itself before the male which mounts repetitively. In one mating sequence for example, a dominant male mounted the dominant female 31 times over a period of 23 minutes. If another male tries to interfere, the copulating male thumps the ground emanating an alarm signal and sometimes scent marks on the nearby ground to spurn the intruder. At times, the intruder is vigorously chased off.

A Master Communicator

The desert gerbil possesses a prominent mid-ventral scent marking gland from which it exudes sebum with a musky odour.

The desert gerbils live in social groups of 20 to 40 individuals of both sexes in one assemblage. Their early morning feeding spree is not disturbed even when doves, babblers, partridges are feeding very close to them, probably because the gerbils have learnt that these avians are harmless. No sooner, however, a raptor, shikra, kestrel or a hawk, arrives up in the sky, the entire gerbil group ducks in their burrows and thumps the ground with one of the hind feet producing loud drumming noise. This alarm call is quickly perceived by others and they also start thumping the soil surface inside the burrow opening. Desert gerbils cannot see a raptor in the sky but perceive its presence by identifying the noise of its wing beats which they have differentiated as a danger as against the harmless wing beats of doves, pigeons etc. This marked ability to differentiate between harmful and harmless noise is probably due to their hypertrophied bullae tympanicae (35% of the skull) which act as resonators, amplifying the sound vibrations and enhancing the perception. Having acquired a highly specialised auditory communication ability, *M. hurrianae* has evolved an efficient olfactory communication system as well.

A Scent Marker

Like the musk deer, the desert gerbil possesses a prominent mid-ventral scent marking gland from which it exudes sebum with a musky odour. Both the sexes scent-mark the soil surface, low lying objects, grass clumps in their home range by depressing and dragging the ventrum and ano-genital region in a forward direction. The male gerbils mark twice as often as females. But the females double their scent marking frequency during oestrous. During the peak breeding season, the dominant female chases away the other adult females from the overlapping home range of a dominant male in a social group. Through intermittent scent marking, the desert

Through intermittent scent marking, the desert denizens saturate their territory and identify it to be their 'home'. The scent marks also indicate the dominant status of an individual to other conspecifics.

denizens saturate their territory and identify it to be their 'home'. The scent marks also indicate the dominant status of an individual to other conspecifics. The other sympatric Indian gerbil, *Tatera indica indica*, roams at night in a much larger home range, equivalent to that of several merion gerbils. When it encounters a sebum mark of the diurnal species, the male *Tatera* repeatedly scent marks the spot with its own sebum. In the morning when the desert gerbil ventures out of its burrow for foraging and finds sebum odour of *T.indica* in its home range, it repeatedly scent marks over it. This game of superimposing scent marks by both the diurnal and nocturnal sympatric gerbils of the desert region is a never ending process. We found that addition of minute quantity of sebum exudation functions as a phago-stimulant not only for conspecifics but also for other rodent species. We are thus attempting to use sebum as a masking agent to mitigate poison shyness among rodents which develops after exposure to acute toxicants especially zinc phosphide.

The Predatory Myth

Snakes are considered to be the most effective predators of rodents. This appears to be untrue. About 25 species of snakes and two species of monitor lizard, *Varanus*, occur in the desert. I have examined hundreds of stomachs of snakes collected from arid environment but only a few contained rodent remains. They feed on lizards, birds, eggs and insects but rarely on rodents. An exhaustive herpatological study undertaken in Pakistan also tends to indicate that rodents constitute only 3 – 4 percent of the natural food of the snakes. It is quite plausible that snakes are unable to catch an agile merion gerbil from its extensive burrow system. Moreover the hypertrophied tympanic bullae of merion gerbils makes them capable of perceiving the creeping sound of the serpent. *Varanus* and many raptors are relatively more effective predators.

This tiny Irano-Tharian desert gerbil has assumed the position

of a Conquerer of the Thar desert due to its sheer numbers and superior behavioural and physiological adaptive mechanisms to survive and propagate in the xeric environment!

Suggested Reading

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A body of soldiers marching in step across a suspension bridge, may set it into vibration, its 'natural vibration', by a series of uniform steps so that it ultimately swings to a dangerous extent. This has actually happened on two recorded occasions when soldiers have been marching in step over such a bridge with disastrous results.

The first of these occurred on 11 April 1831, when men of the 60th Rifle Corps were marching back to their quarters after a morning spent on field exercises. Their route lay across a chain suspension bridge, fifty yards long, which spanned the River Irwin, connecting Pendleton with Broughton, near Manchester. The bridge was privately owned, and by a very strange coincidence, the officer in charge of the troop of sixty-eight men was Lieutenant Fitzgerald, the son of the owner of the bridge.

Nineteen years later a similar accident occurred when a regiment was crossing a suspension bridge that had been built about twelve years ago across the River Maine in France. An ugly rumour was started that this regiment was being sent to Africa as a punishment. So the men were disobedient and deliberately refused to obey the order when they were commanded to break step. This rumour was, however officially denied.

From: *Stories from Science*, Vol.2, by *A Sutcliffe and A P D Sutcliffe*
Cambridge University Press, 1962.