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Meriones crassus. By Barry R. Koffler

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Meriones crassus Sundevall, 1843
Gentle Jird

Meriones crassus Sundevall, 1843:233, tab. II, fig. 4. Type locality ("Habitat in deserto Sinaitico, ad vias circa fontes Mosis") restricted to "Ain Musa" by Chaworth-Musters and Ellerman (1947).

CONTEXT AND CONTENT. Order Rodentia, Superfamily Muroidea, Family Muridae (in the broad sense including the Cricetidae), Subfamily Gerbillinae. Approximately 12 species are recognized in the genus, but an adequate revision would probably change the number. Nine subspecies of *M. crassus* are recognized (by Ellerman and Morrison-Scott, 1951; Setzer, 1957, 1961; and Chaworth-Musters and Ellerman, 1947) as follows:

M. c. crassus Sundevall, 1843:233, see above (*pelerinus* Thomas and *ismahelis* Cheesman and Hinton are synonyms).

M. c. swinhoei Scully, 1881:228. Type locality Gatai, Afghanistan, at "a place on the edge of the desert, about halfway betwen Kandahar and the Khojak Pass, at an elevation of about 4,000 feet."

M. c. longifrons Lataste, 1884:88. Type locality Djeddah [= Jedda], Arabia.

M. c. pallidus Bonhote, 1912:226. Type locality Atbara, Sudan.

M. c. tripolius Thomas, 1919:265. Type locality "Gebel Limhersuk, in the northwest part of the country," [near Sokna] Libya.

M. c. charon Thomas, 1919:269. Type locality Iran, "Ahwaz, alt. 220′. Mound of Susa (*K. Loftus*)."

M. c. taureg Thomas, 1925:193. Type locality "Teguidda [Tigueddi], near Tisem, west of Asben [Air]," Niger.

M. c. asyutensis Setzer, 1961:82. Type locality "beginning of Wadi et Asyut, 13 mi SE Asyut, Eastern Desert Governorate, Egypt."

M. c. perpallidus Setzer, 1961:86. Type locality "Cairo-Alexandria Road, 4 km from Cairo, Western Desert Governorate, Egypt."

DIAGNOSIS. The following characters are gathered from several sources and at best are diagnostic only when used in combination. An adequate diagnosis will result only from a thorough generic revision. Soles of hind feet are covered with white hair except for a bare patch near each heel, bullae usually exceed one-third of occipitonasal length (Figure 1), claws are pale, posterior processes of suprameatal triangle are not joined, and hair on tail forms a weak brush (Chaworth-Musters and Ellerman, 1947; Petter, 1957).

GENERAL CHARACTERS. The tail is equal in length to, or shorter than, the head and body. Published measurements (in mm) of adults from samples representing most of the subspecies do not exceed the following: length of head and body, 150; length of tail, 150; length of hind foot (with claw), 38; occipitonasal length, 40.6; and bullar length, 16.5. Other descriptive details are available in Ranck (1968) and Agrawal (1967). Mermod (1970) weighed seven specimens from the Guir in Algeria; the only female weighed 48.3 g, and the males ranged from 47.0 to 59.5 (mean, 52.9). These animals were trapped alive and their age was not estimated.

Black-and-white photographs of a living female and her young appear in Petter (1954).

DISTRIBUTION. *M. crassus* ranges over much of the southwestern part of the Palearctic Region (Figure 2), from Waziristan in the east (Chaworth-Musters and Ellerman, 1947), west across Iran and Iraq (Petter, 1961) into Turkey and Syria (Lay, *in litt.*), throughout most of Saudi Arabia (Harrison, 1955; Thomas, 1919; Lataste, 1884), stopping at approximately 20°N, and in Africa up the Nile into Sudan

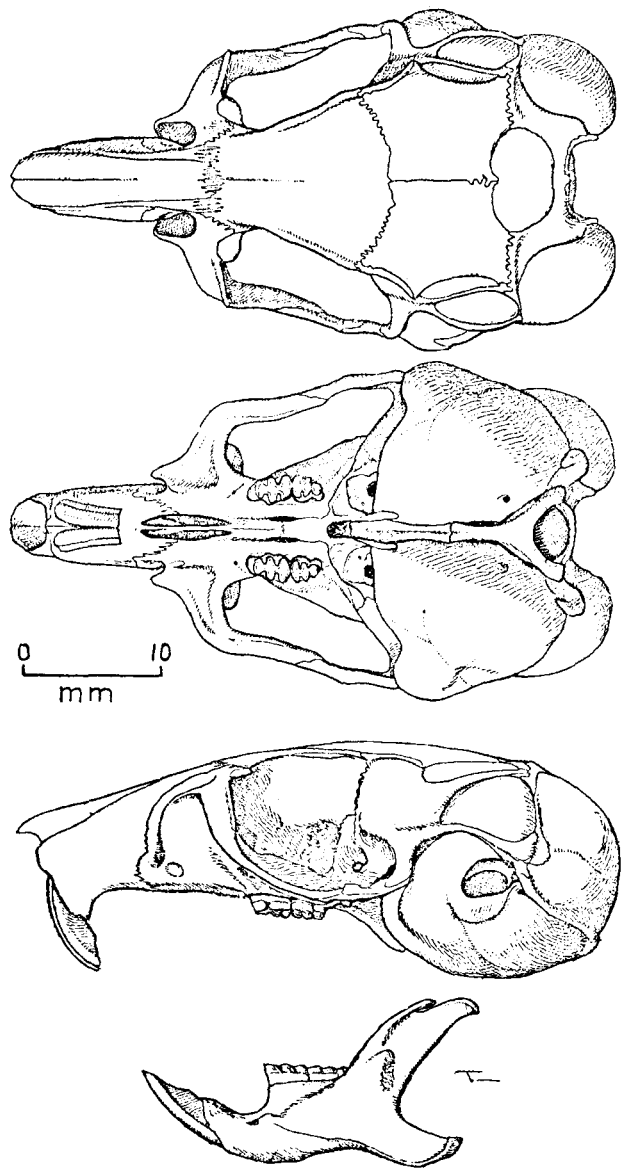

FIGURE 1. Cranium and jaw of *Meriones crassus*; from top to bottom, dorsal view, ventral view, and lateral view (from Ellerman, 1941:526, by permission of the British Museum of Natural History).

(Happold, 1967), probably across northern Chad, Niger, Mali, and Mauritania (although the only record here is for *M. c. taureg* in Niger—Thomas, 1925), in most of Algeria (Chaworth-Musters and Ellerman, 1947; Heim de Balsac, 1936), in parts of Libya (Ranck, 1968), and in Morocco and Rio de Oro (Lay, *in litt.*).

FORM. The pelage is fine and soft. Most of the dorsal hairs are terminally buffy and basally lead-gray; some hairs are tipped with dark brown. Ventral hairs are white their entire length. The enamel pattern of the juvenal dentition was illustrated by Petter (1956). Morphology of adult molars is illustrated in Figure 3. Wisner *et al.* (1954) compared the

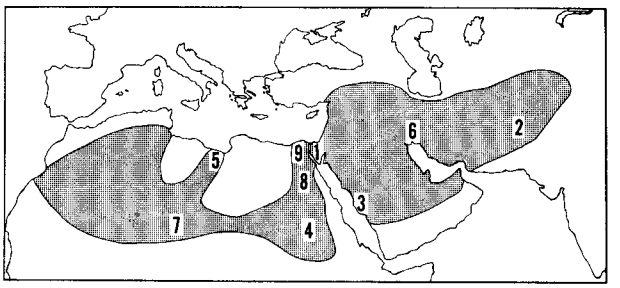

FIGURE 2. General geographic range of *Meriones crassus*. Type localities of recognized subspecies are: 1, *M. c. crassus*; 2, *M. c. swinhoei*; 3, *M. c. longifrons*; 4, *M. c. pallidus*; 5, *M. c. tripolius*; 6, *M. c. charon*; 7, *M. c. taureg*; 8, *M. c. asyutensis*; and 9, *M. c. perpallidus*. The limits of the ranges of these subspecies have not been clearly defined and are not here mapped.

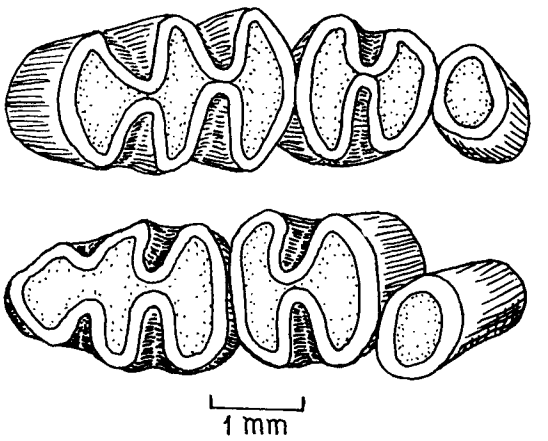

FIGURE 3. Upper left molars in occlusal view (above) and lower right molars in occlusal view (below), anterior is at left of drawing.

cochlea of *M. crassus* with that of *Cavia* at the histological level. Arvy and de Lerma (1961) observed in Harder's gland (a lacrimal gland) of *M. crassus*, a fluorescent "porphyrinique" pigment with a spectroscopic pattern different from that of *Meriones shawi*. Harrison (1955) reported a circular placenta, the common type in rodents.

FUNCTION. Specimens kept by Bonhote developed a "darker and more rufous colour than normal examples" when kept at 33°C in humid conditions (Anonymous, 1911:986). The anatomy of the ear of *M. crassus* and its function in hearing were studied by Petter (1961), Legouix *et al.* (1954), and Wisner *et al.* (1954). The cochlear microphonic responses of *M. crassus* were greater than those of *M. shawi*, and more than double those of *Cavia*. *Meriones crassus* was tested at and responded to frequencies from 200 to 8000 Hz (a Hertz = 1 cycle per second). The greatest response was at about 2000 Hz. The weak cry of *M. crassus* is said to be of the same frequencies as those heard with greatest acuity. High intensity ultrasonic sounds (25,000 to 35,000 Hz) have been recorded from *M. crassus* and it has been suggested that the hypertrophied bullae play a part in the reception of these sounds.

Schmidt-Nielson (1964) reported a powerful kidney in the gentle jird. One urine sample contained a total electrolyte concentration of 1,793 milliequivalents per liter. When kept on a dry diet for one month, *M. crassus* lost only 5% of its weight (Schmidt-Nielson, 1964:181). Misonne (1959) deprived a pair of *M. crassus* of free water for two weeks, at 27°C with relative humidity of 41%; the male lost 12% of its weight and the female 31%. In a similar experiment, with the relative humidity at 88%, a male lost only 9% and a female gained 1%. Horowitz and Borut (1970) studied dehydration in *M. crassus* at 37°C (±1°C) and 15 to 20% relative humidity under which conditions jirds can survive a weight loss of only 5 to 9% as compared with 14 to 22% in *Rattus norvegicus* and 11 to 14% in *Acomys caharinus*; weight was lost more slowly in *M. crassus* and *A. caharinus* than in *R. norvegicus*. Most of the fluid loss was from extracellular compartments in *M. crassus*, whereas in *A. caharinus* the chief loss was from intracellular sources. In another study, Petter (1963) found that *M. crassus* could adapt to temperatures up to 35°C before showing signs of heat stress. In comparison, *Rattus* and *Gerbillus* could not thus adapt, and *Rhombomys* and *Meriones libycus* could tolerate 40°C. Petter (1955b) reported (place and conditions not noted) aestivation in some healthy individuals, during which the rectal temperature did not descend below 32°C. Gross structure and cellular composition in the adrenal cortex of both sexes of *M. crassus* are comparable, however the internal zone of the male cortex is riddled with tiny vacuoles (Chirvan-Nia, 1970).

ONTOGENY AND REPRODUCTION. Gestation usually lasts 21 days, but may last as long as 31 days (Petter, 1961). In Oman, Arabia, Harrison (1955) found three pregnant females in April and May; embryo counts for these specimens were 4, 6, and 7. In Egypt, Hoogstraal *et al.* (1957) captured a female with 4 embryos in February. Males caught in April and June had enlarged testes. Young were caught throughout the spring and early summer. Lewis *et al.* (1965) collected 30 adults along the Iraq-Saudi Arabia frontier during December and January, and these animals were not in breeding condition. Lay (1967) took juveniles during November and December in Iran, and also three adult females with uterine swellings (4, 4, and 3) but no visible embryos. Lataste (1887) raised eight litters of *M. c. longifrons*, two each of 3, 4, 5, and 6 young; seven of these litters were born during the day. According to Petter (1961, 1954) and Lataste (1884) the young are born naked, pink, and blind, and have long vibrissae. The pinnae stand up at 4 to 6 days of age, the first hair appears shortly thereafter (at 6 to 9 days), a full coat (the color of the adult) develops by 2 weeks, and the eyes open later. The incisors erupt between days 9 and 14. The young are fully weaned by one month. Lataste reported that one sibling pair was successfully bred at the age of 58 days, and another female bred at 53 days with an older male (81 days of age). In captivity, *M. crassus* can reproduce at any time of the year. Lataste (1887) raised at least 2 litters of hybrids between *M. crassus* and *M. shawi*.

ECOLOGY. *M. crassus* prefers dry habitats as shown by its range, which is confined to the hottest and driest parts of the Palearctic, and by data of Petter (1961), Ranck (1968), and Zavahi and Wahrman (1957). This jird generally inhabits sandy soils although it can be found in rocky areas, and it does not necessarily seek close proximity to vegetation. At a *daya* (a hollow, temporarily flooded after the rains, which supports permanent vegetation) in Algeria, Mermod (1969) reported a local rodent fauna of five gerbillines and *Jaculus*. *M. crassus* was the only gerbilline that had its burrows outside the limits of the *daya* and rarely went into the center, even for feeding purposes. Of seven *M. crassus* only one was caught within the vegetation, whereas all eight *M. libycus* were captured there. In western Algeria, a permanent relative humidity of 100% in the deeper parts of the burrow was reported by Petter (1961). In September, in Egypt, burrow temperatures ranged from 25° to 37°C, with air temperatures from 26° to 40°C, and relative humidity from 24 to 78% in burrows and 21.5 to 77% in the air (Briscoe, 1956).

The diet of these animals has been noted in some areas. In Arabia, Harrison (1955) reported that they live on *Acacia* during the hottest seasons, whereas Lewis *et al.* (1965) reported some individuals subsisting solely on donkey melons (*Citrullus colocynthis*) and others eating thistles and almost anything else available. In Iran, Lay (1967) found evidence of *M. crassus* feeding on the seeds of *Peganum hormala*, under which they also burrowed. In Egypt, Hoogstraal *et al.* (1957) found numbers of *Cassia acutifolia* in *M. crassus* burrows. Cheesman (1920) successfully trapped gentle jirds with coconut as a bait. In Saudi Arabia and Kuwait, *M. crassus* fed mainly on *Medicago* seeds and on *Schistocerca* locusts when available (Vesey-Fitzgerald, 1953). Finally, Heim de Balsac (1936) included date stones and a cricket, *Orthacanthacris aegyptia*, in the diet.

Lay (1967) reported collecting three specimens from owl pellets in Iran. Lists of parasites may be found in Lewis *et al.* (1965), Wertheim and Greenberg (1970), Briscoe (1956), and Hoogstraal *et al.* (1957). Tenebrionid beetles and scorpions (*Androctonus amoreuxi*) inhabited burrows with *M. crassus* (Petter, 1955a). Harrison (1955) observed usage of burrow riddled hillocks, 2.5 to 3 m in diameter, by both *M. crassus* and

Mus musculus praetextus. Lewis *et al.* (1965) found *M. crassus* sharing burrows with *Meriones libycus syrius*, although Petter (1961) discussed the restriction of *M. crassus* to ecologically marginal habitats where sympatric with either *M. libycus* or *M. shawi*.

In northeastern Iran, Petter (1961, p. 102; 1957) observed "une pullulation" of *M. c. swinhoei*, composed almost totally of juveniles in the late autumn or early winter. He reported a population density for *M. c. crassus* of one per 14 hectares, and for *M. c. charon* of 11 adults on one hectare, or one per .09 hectare. Petter estimated home ranges at 10,000 m^2, except in the dense populations of *M. c. charon*, in which ranges were only about 1,200 m^2. However, inasmuch as *M. c. crassus* may wander as far from the original site of capture as 3,800 m in one night, these home range estimates may well be minimal (Petter, 1968).

BEHAVIOR. *M. c. charon*, of western Iran, often dwells in colonies, as does *M. c. crassus* in northern Arabia. The animals live colonially where the habitat permits, and singly or in pairs in other areas (Petter, 1961; Lay, 1967; and Lewis *et al.*, 1965).

Lataste (1887) was successful in getting many *M. c. longifrons* to breed in captivity. Mating occurred mainly at night, and the male would attend the female for about two hours. Foot-stomping, which has also been recorded in other members of the genus, occurs in *M. crassus* prior to, and at intervals during, mating. This behavior also appears in non-reproductive contexts, when the animals become excited by some other stimulus. Copulation requires only a short time but may be quickly repeated. Foot-stomping occurs between intromissions. The tail of the male beats the ground during mounting. The female will flee from the male, and then assume a position of lordosis, often twittering in a birdlike fashion. The female will turn and groom the male when he draws back between mounts, and he frequently washes his penis, holding it between his forefeet.

The female carries a young one by seizing its flank; when thus held the infant curls about her muzzle quiet securely. This curling reflex is retained in young animals after weaning. By one month of age, the young have left the maternal nest (Petter, 1954). The young are quiet most of the time, in contrast to young *M. shawi*, which frequently vocalize. Foot-stomping behavior appears by the age of one month (Lataste, 1887).

M. crassus is nocturnal, preferring to emerge from its burrow after dusk, both in the field (Petter, 1961) and under experimental conditions (Saint Girons, 1962). Lewis *et al.* (1965) found the greatest activity during the first hour after dark. Homing behavior seems well developed. Under experimental conditions in the Sahara, *M. crassus* has homed from 6 km, and the mean of 11 returns (out of 16 trials) was 2.9 km (Petter, 1961). Under natural conditions, one animal was captured the same night at two points 3 km apart (Petter, 1968). These jirds forage extensively but tend to return to the burrow to eat. Food is not stored in special chambers, but small quantities are sometimes found in dead-end tunnels or scattered along a gallery, and one specimen had 500 g of rice (from a nearby camp) stored in its burrow. In captivity these animals tend to store food in a corner of the cage (Petter, 1955a, and Lewis *et al.*, 1965).

The burrows of *M. crassus* vary in complexity (Petter, 1955a, 1961). Young animals sometimes take up residence in an abandoned burrow of long standing, and at other times dig their own. These newly dug burrows are usually somewhat spiralled, descend at an angle of from 15° to 30° to a depth of 0.5 m, and have only one entrance. The most complex galleries often attain a combined shaft length of 30 to 40 m and have as many as 18 entrances, although rarely are more than two or three entrances used. These complexes descend, at their deepest, more than one meter (Lay, 1967, reports 2 m). Petter measured the depth of 97 random points in 11 burrows he excavated; the average depth of each burrow was calculated, giving a range of .16 to .78 m, and the mean depth of the 11 burrows was .37 m, based on their individual means. The sample represents structures from simple to complex. Most dead-end shafts are directed away from the center of the burrow system and usually end .05 to .10 m below the surface. The curves in the shafts formed arcs with radii of more than .20 m. In colonies, *M. c. charon* was not found to inhabit burrows more than 12 m in total gallery length or with more than 10 entrances, and was often captured at burrows with a length of only .30 to .40 m. Petter suggested that each individual may use several of these small burrows within its range. Nests are constructed of shredded dry vegetation, usually at the deepest point in the burrow. When the habitat permits, *M. crassus* tends to construct its burrows under bushes (Lewis *et al.*, 1965; and Zavahi and Wahrman, 1957). *M. crassus* is reported (Petter, 1951) to be docile (hence the common name of "gentle jird") and can be handled upon capture as it does not attempt to bite or escape, however Lay (*in litt.*) has scars to the contrary.

GENETICS. *M. crassus* has 60 chromosomes (diploid) and 72 chromosomal arms. The sex chromosomes are submetacentric, the autosomes are metacentric (2), submetacentric (8), and acrocentric (48). The karyotypes of males from Iran and Egypt are identical (Nadler and Lay, 1967). Of the ten species of *Meriones* thus far studied, only *M. crassus* has 60 chromosomes.

REMARKS. *M. sacramenti* was removed from the synonymy of *M. crassus* on the basis of chromosomal evidence, $2N = 46$ (Zavahi and Wahrman, 1957) and cranial characteristics (Petter, 1957). *M. zarudnyi* was removed from *M. crassus* by Lay (1967). Saint-Girons and Petter (1965), stated that it is not possible to taxonomically separate any of the African *M. crassus*, or those from the deserts of Syria and Iraq.

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