

Xerus rutilus. By Thomas J. O'Shea

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***Xerus* Hemprich and Ehrenberg, 1833**

Xerus Hemprich and Ehrenberg, 1833:folio ee. Type species *Sciurus* (*Xerus*) *brachyotus* Hemprich and Ehrenberg, 1833. Originally named as a subgenus of *Sciurus*.

Geosciurus Smith, 1834:128. Type species *Sciurus capensis* Kerr, 1792.

Spermosciurus Lesson, 1842:110. Type species *Sciurus rutilus* Cretzschmar, 1828.

Euxerus Thomas, 1909:473. Type species *Sciurus erythropus* Geoffroy Saint-Hilaire, 1803.

CONTEXT AND CONTENT. Order Rodentia, Suborder Sciuromorpha, Family Sciuridae, Subfamily Sciurinae, Tribe Xerini (Moore, 1959). *Xerus* includes four extant species confined to the African continent. Ellerman (1940) and Moore (1959) recognized three subgenera; *Xerus*, *Geosciurus*, and *Euxerus*. The following is a key to the subgenera and species of the genus *Xerus* (adapted from Amtmann, 1975):

- 1 With white or buffy longitudinal flank stripe 2
- Without white or buffy flank stripe (*Xerus*) *X. rutilus*
- 2 (1) Upper third premolar absent; females with two pairs of mammae (*Geosciurus*) 3
- Upper third premolar present; females with three pairs of mammae (*Euxerus*) *X. erythropus*
- 3 (2) Orbit normally <33% of occipitonasal length; incisors white *X. inauris*
- Orbit normally >33% of occipitonasal length; incisors pigmented *X. princeps*

***Xerus rutilus* (Cretzschmar, 1828)**

Unstriped Ground Squirrel

Sciurus rutilus Cretzschmar, 1828:59. Type locality "eastern slope of Abyssinnia," probably near Massawa, Ethiopia (Yalden et al., 1976).

Sciurus brachyotus Hemprich and Ehrenberg, 1833:folio ee. Type locality "Gedam and Taranta, Abyssinnia [=Gedem near Arkiko, and Taranta near Eilet, Ethiopia]."

Sciurus dabagala von Heuglin, 1861:17. Type locality "Somali coast Zeila, Berbera [=Zeila and Berbera, northern Somalia]."

Sciurus fuscus Huet, 1880:139. Type locality "mountains of Adel, Abyssinnia [Ethiopia]."

Xerus saturatus Neumann, 1900:546. Type locality "Kibuesi, southern Ukamba, East Africa [=Kibwezi, Machakos District, Kenya]."

CONTEXT AND CONTENT. Context as in the generic account above. Amtmann (1975) and Toschi (1945) listed eight subspecies of *X. rutilus* and their provisional distribution, but cautioned that subspecific classification was not certain. The subspecies are:

- X. r. dabagala* von Heuglin, 1861:4, see above.
- X. r. dorsalis* Dollman, 1911:519. Type locality "Baringo, British East Africa [Kenya]. Altitude 4000 feet."
- X. r. intensus* Thomas, 1904:100. Type locality "Gerlogobi Wells, Somaliland [Ethiopia]."
- X. r. massaicus* Toschi, 1945:142. Type locality "Olorgesailie, 20 miles north of Magadi, on the Magadi Road (Masai Reserve), Kenya Colony; altitude 3,450 feet."
- X. r. rufifrons* Dollman, 1911:518. Type locality "Eusso Nyiro [northern Uaso Nyiro, Kenya]."
- X. r. rutilus* (Cretzschmar, 1828:59), see above.
- X. r. saturatus* Neumann, 1900:546, see above.

X. r. stephanicus Thomas, 1906:301. Type locality "Lake Stephanie. Alt. 2000' [Chew Bahir, Ethiopia]."

DIAGNOSIS. *Xerus rutilus* is distinguishable from other African ground squirrels because it lacks longitudinal stripes (Fig. 1). *X. erythropus* is the only African ground squirrel that occurs sympatrically with *X. rutilus*; *X. erythropus* is larger, with a typical length of head and body ranging from 250 to 350 mm as opposed to 200-240 mm in *X. rutilus*. The skull of *X. rutilus* (Fig. 2) also is less robust and smaller, with greatest length >60 mm in *X. erythropus*, but not in *X. rutilus* (Delany, 1975). *X. rutilus* lacks the minute extra premolar found in *X. erythropus*.

GENERAL CHARACTERS. As with all xerines, *X. rutilus* is relatively heavy-bodied when compared to most African sciurids. Length of head and body averaged 225.8 mm in a sample of six specimens in the Smithsonian Institution, and body weights for three in this collection averaged 420 g (Roth and Thorington, 1982). However, a mean weight of 257.7 g was noted for an unspecified number of *X. rutilus* from Turkana, Kenya (Coe, 1972), and a weight range of 300-335 g was given by Kingdon (1974).

The pelage is bristly and coarse and varies in coloration from pale tan to red-brown. Populations in drier areas tend to consist of individuals of paler coloration (Kingdon, 1974). Hair on the dorsum shows variable amounts of pale and dark speckling, and this flecking is most pronounced on the tail. The pelage on the feet often is paler in coloration, and the venter is somewhat more sparsely haired and paler in coloration than the back. There is a conspicuous white or buffy eye ring. The pinnae are small. Molting apparently is not seasonal (Ingersol, 1968).

Sexual dimorphism is not readily apparent, but has not been thoroughly studied. Ranges of selected external and cranial measurements (in mm) are (Delany, 1975; Dollman, 1911; Hollister, 1919; Ingersol, 1968; Kingdon, 1974; Toschi, 1945): total length, 320-440; length of head and body, 200-240; length of tail, 120-225; length of hind foot, 35-60; length of ear, 7-19; condylobasal length, 41.9-53.4; zygomatic breadth, 26.4-33.3; interorbital



FIG. 1. Unstriped ground squirrel, *Xerus rutilus*, from near Kibwezi, Kenya.

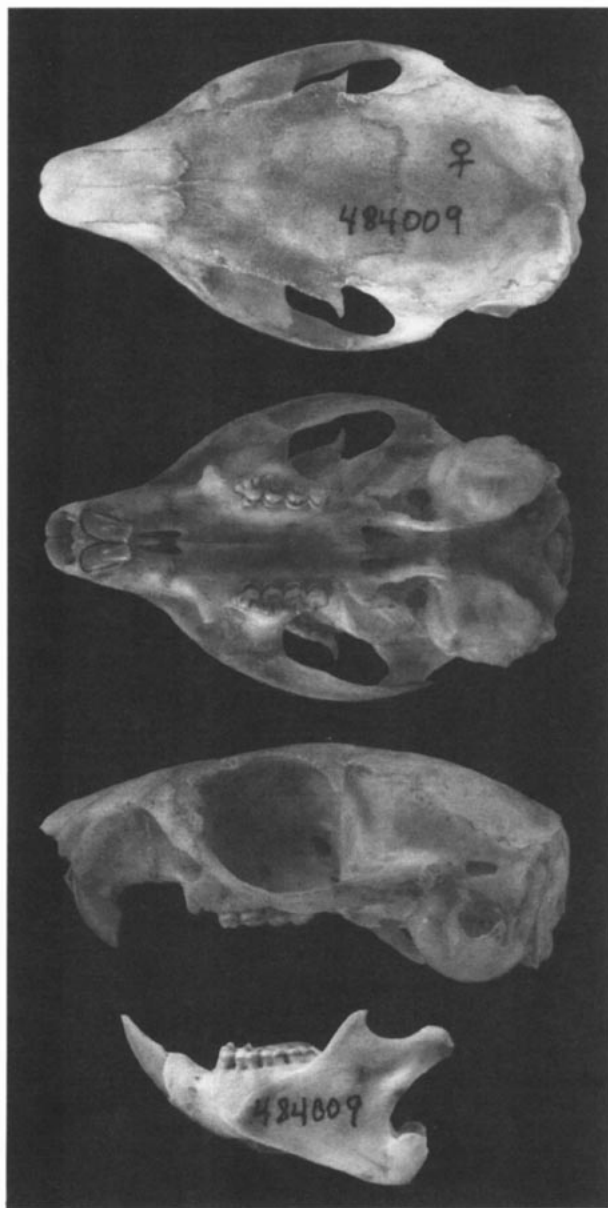


FIG. 2. Dorsal, ventral, and lateral views of the cranium and lateral view of the mandible of a female *Xerus rutilus* (United States National Museum of Natural History 484009) from near the Uaso Nyiro River, Samburu Game Reserve, Kenya. Greatest length of skull is 54.0 mm.

breadth, 12.0–17.9; breadth of braincase, 24.1–25.7; breadth of center of rostrum, 9.4–11.3; length of mandible, 31.0–33.9; length of maxillary toothrow, 8.6–11.0; length of mandibular toothrow, 10.3–11.4.

DISTRIBUTION. The unstriped ground squirrel is a Somali-arid endemic, confined to arid bushlands and savannas of Somalia, Ethiopia, Kenya, northeastern Tanzania, and the Karamoja District of eastern Uganda (Fig. 3). *X. rutilus* probably occurs in both southeastern and northeastern Sudan, although its occurrence in this region was not noted by Setzer (1956) or Happold (1967). These regions are listed as part of the range in general accounts on this species by Amtmann (1975) and Kingdon (1974).

FOSSIL RECORD. The earliest members of the tribe Xerini are placed in the genus *Heteroxerus* from the late Oligocene of western Europe, and no fossil xerines are known from outside Europe and Africa (Black, 1972). The genus *Xerus* is reported from various strata spanning 1–3 million years before present at the Hadar site and in the Omo Valley of Ethiopia (Jaeger and Wesselman, 1976;

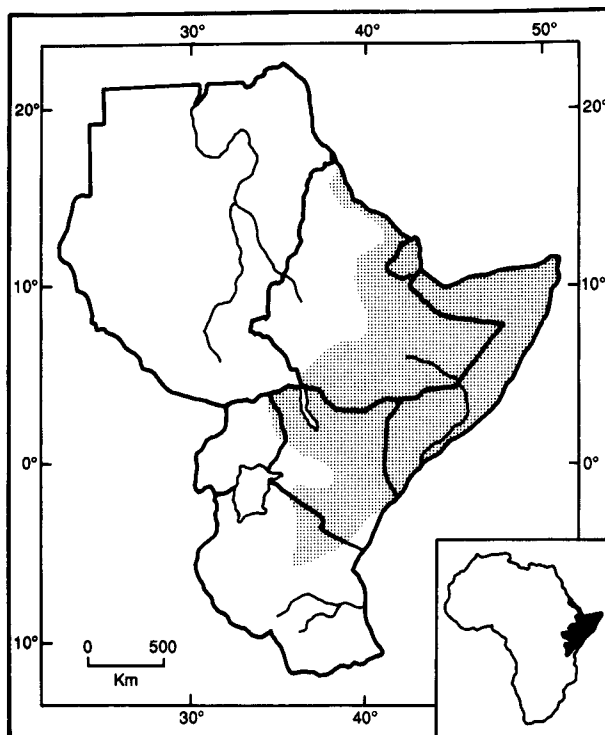


FIG. 3. Distribution of *Xerus rutilus* (after Delany, 1975, Kingdon, 1974, and Yalden et al., 1976).

Sabatier, 1979; Taieb et al., 1976), and from various other late Pliocene and Pleistocene localities in Africa (Dietrich, 1942; Hopwood and Hollyfield, 1954; Savage and Russell, 1983). None of these specimens has been referred to the species *X. rutilus*.

FORM AND FUNCTION. There are eight transverse intermolar palatal ridges that are interrupted at the midline to form a furrow, and two continuous ridges anterior to the molars (Eisen-traut, 1975). The dental formula is 1/1, 0/0, 1/1, 3/3, total 20. The skull (Fig. 2) has an elongate rostrum and small infraorbital canal. The ventral portion of the infraorbital foramen forms a distinctive, laterally directed masseteric knob or tubercle. The palate extends posteriorly beyond the last molars, and the lacrimal bone is relatively large. The well-developed baculum is about 6 mm in length, and has a wide upper surface shaped like a spearhead with convexly rounded sides (Pocock, 1923).

Relative length of vibrissae (expressed as a ratio of length of vibrissae to width of skull) is less than in arboreal sciurids, but typical of the range reported for terrestrial ground squirrels (Ahl, 1987). Braincase volume for seven specimens averaged 5.52 cc (Roth and Thorington, 1982), and brain weight is 5.68 g (Mace et al., 1981). Brain size relative to length of body is similar to other African sciurids (regardless of degree of arboreality), but brain size relative to body mass is lower than arboreal squirrels (Roth and Thorington, 1982).

ONTOGENY AND REPRODUCTION. A female collected at Archer's Post, Kenya, during September contained two large embryos (Hollister, 1919), and two embryos were noted in one female taken in August in Ethiopia (Ingersol, 1968). The presence of one or two juveniles per female was reported for a population near Kibwezi in south-central Kenya (O'Shea, 1976). Breeding may take place throughout the year (Kingdon, 1974), but data are insufficient to characterize reproduction and ontogeny adequately. Aspects of growth and development of the young are likely to parallel those reported for *X. erythropus* and *X. inauris* (Ewer, 1966; Herzig-Straschil, 1978).

ECOLOGY. Unstriped ground squirrels are diurnal, burrow-dwelling inhabitants of arid and semi-arid regions. They have been reported at elevations ranging from sea level to >2,000 m, and from an array of vegetation assemblages ranging from bushland thickets to savanna. In south Turkana, Kenya, they are most common in *Salvadora persica* thickets, alluvial flats, and gullies in lava-

derived gravel flats; density estimates for this region in 1970 were 848/km², or a biomass of 218 kg/km². Dense thickets provide shelter from predators and heat. Soil surface temperatures recorded at mid-day in open alluvial habitats in south Turkana exceeded 67°C, whereas those in nearby *Salvadora* thickets did not rise above 36°C. In this situation, unstriped ground squirrels dwelled within thickets and excavated burrows with openings at *Salvadora* stem bases, or they occupied termite mounds and burrows of other mammals. Activity was confined to the thickets, except in morning and early evening when they ventured out of the shade into more open areas. Thorn corrals constructed for domestic stock by Turkana tribesmen also are favored as burrow sites by *X. rutilus*. These corrals or *bomas* provide shelter, shade, and seeds from vegetation growing in local abundance as a result of concentrations of livestock dung (Coe, 1972).

The diet includes fruits, seeds, herbaceous material, and insects. Percentage volume of stomach contents for three individuals from northern Kenya was estimated at 53% seeds, 30% leaves/flowers, 11% soft fruits, and 5% insects (Coe, 1972). Unstriped ground squirrels have been observed feeding on the large, hard fruits of the baobab tree (*Adansonia digitata*) and seeds of *Acacia* and *Commiphora* trees (O'Shea, 1976).

Burrow systems are isolated from one another and typically have two to six entrances. Numbers of individuals sharing burrow sites vary from one to about six (Coe, 1972; O'Shea, 1976). Near Kibwezi, Kenya, burrows typically are occupied by solitary individuals of either sex, one female with young, or a male with one or two females; an instance of burrow sharing between *X. rutilus* and *X. erythropus* has been noted (O'Shea, 1976).

The population biology of the unstriped ground squirrel has not been well studied. Equal adult sex ratios are suggested by collector's records: nine males and eight females were collected at Turkana, Kenya (Coe, 1972); 10 males and seven females near Baringo, Kenya (Dollman, 1911); and 15 males and 16 females at various locations in Ethiopia (Ingersol, 1968). Longevity in the field is unknown, although a wild-caught male survived 6 years and 56 days in captivity (Flower, 1931).

The occurrence of plague has been noted in *Xerus* (species unspecified; Arata, 1975). Ectoparasites reported include the tick *Haemaphysalis calcarata*, which apparently is specific to *X. rutilus* (Hoogstraal, 1955; Theiler, 1964), and the flea *Synosternus somalicus* (Beaucornu et al., 1972). The unstriped ground squirrel also is host to the cestode *Catenotaenia geosciuri* (Joyeux and Baer, 1945).

BEHAVIOR. Unstriped ground squirrels are non-territorial and have large, overlapping home ranges. Size of home ranges of males near Kibwezi, Kenya, is 7.0 ha, with females ranging over considerably smaller areas (1.4 ha). Home ranges encompass several different burrow sites, usually occupied by one or two adults, and individual squirrels frequently investigate burrows of others or take refuge in them when in danger. Pregnant females sometimes take up residence in unused burrow systems at the margins of their ranges prior to parturition and later return to the core of the range, leaving the weaned young at the peripheral burrow sites. Individuals with shared home ranges form linear dominance hierarchies, with males typically exhibiting dominance over females for access to food. Agonistic behavior includes scolding vocalizations, threatening lunges, chases, and rare instances of combat. Subordinate squirrels vocalize in agonistic situations, and exhibit marked piloerection of the tail when threatened or chased. Fluffing of the tail may provide a target for deflection of attacks by conspecifics and predators. Sexual behavior also involves piloerection of the tail in a characteristic display given by males when closely approaching females (O'Shea, 1976).

Emergence above ground is late in relation to sunrise, and is followed by sun basking and grooming near burrow entrances for up to 30 min prior to leaving the area to forage (De Winton, 1898; O'Shea, 1976). Behavioral thermoregulation in the form of foraging in hot open areas, then returning to the shade and appressing the belly against the substrate to unload body heat has been observed in *X. rutilus* (Coe, 1972). These and other behavioral adaptations for life in hot arid regions are similar to those described for *X. inauris* (Bennett et al., 1984; Herzig-Straschil, 1979; Straschil, 1975; van Heerden and Dauth, 1987). Unstriped ground squirrels and other xerines scatter-hoard, a behavior that is more typical of tree squirrels than other ground-dwelling sciurids (Ewer, 1965; O'Shea, 1976).

GENETICS. The diploid number of chromosomes is 38. The karyotype consists of 14 metacentrics, 20 submetacentrics, 2 acrocentrics with prominent satellites, a medium-sized submetacentric X, and a minute biarmed Y chromosome (Nadler and Hoffmann, 1974). Chromosome number and morphology of xerine squirrels show close congruence with those of certain Asian tree squirrels (*Callosciurus* and *Dremomys*), suggesting a common ancestral stock (Nadler and Hoffmann, 1974; Nadler et al., 1975; Robinson et al., 1986).

REMARKS. Date of publication for Cretzschmar's original description is listed as 1826 by some authors, and this year appears on the title page of the volume. However, the true date of publication was 1828, which marked the first appearance of the Latin name and an accompanying illustration in the Rüppell's Atlas series. A date of August 1832 appears with the description and use of *Xerus* as a subgenus in Hemprich and Ehrenberg (1833), but this is not the actual date of publication. This description appears on folio pages ee to gg of Hemprich and Ehrenberg's (1833) inconsistently paginated volume, with an illustration on plate IX. Flower and Lydekker (1891) were the first authors to elevate *Xerus* to generic rank, resulting in the current name combination. Forsyth Major (1893), however, provided a more thorough and detailed justification for this ranking. Reviews of subsequent arrangements of African ground squirrels are provided by Ellerman (1940) and Moore (1959).

The name *Xerus* is derived from the Greek *xeros*, meaning dry, either in reference to aridity of typical habitat or to the bristly texture of the pelage. The epithet *rutilus* is Latin, and refers to a red or golden-red coloration. In the Somali language the unstriped ground squirrel is called the *dabagalleh* (Drake-Brockman, 1910). The Kiswahili names are *kindi* and *kidiri* (Kingdon, 1974; Swynerton and Hayman, 1950); Karamojong names are *ekunyuk* and *ngikunyuko* (Coe, 1972; Kingdon, 1974); and in Kiliangulu the unstriped ground squirrel is called *eetata* (Kingdon, 1974). Dorst and Dandelot (1970) use the English common name pallid ground squirrel for *X. rutilus*.

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