

Xerus erythropus. By Matthew D. Herron and Jane M. Waterman

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***Xerus erythropus* (Geoffroy Saint-Hilaire, 1803)**

Striped Ground Squirrel

Sciurus erythropus É. Geoffroy Saint-Hilaire, 1803:178. Type locality “inconnue,” probably Senegal (vide Rosevear 1969).

Sciurus albobittatus Desmarest, 1817:110. Type locality “probablement de l’Inde.”

Sciurus leucoubrinus Rüppell, 1835:38. Type locality “Sennaar und Kordofan,” Sudan.

Sciurus marabutus Lesson, 1838:467. Type locality “Sénégal.”

Sciurus prestigiator Lesson, 1838:467. Type locality “Sénégal.”

Xerus trivittatus Fitzinger, 1867:488. Part.

Xerus erythropus: Thomas, 1905:387. First use of current name combination.

Euxerus erythropus: Thomas, 1909:473. Name combination.

CONTEXT AND CONTENT. Order Rodentia, suborder Sciurognathi, family Sciuridae, subfamily Sciurinae, tribe Xerini (Moore 1959), genus *Xerus*, subgenus *Euxerus*. Six subspecies are recognized (Ammann 1975).

X. e. chadensis Thomas, 1905:387. Type locality “Yo, Lake Chad.”

X. e. erythropus (É. Geoffroy Saint-Hilaire, 1803:178), see above (*agadius* Thomas and Hinton, 1921:6; *albobittatus* Desmarest, 1817:110; *lessonii* Fitzinger, 1867:488; *maestus* Thomas, 1910:419; *marabutus* Lesson, 1838:467; and *prestigiator* Lesson, 1838:468 are synonyms).

X. e. lacustris Thomas, 1905:388. Type locality “Masindi, Unyoro.”

X. e. leucoubrinus (Rüppell, 1835:38), see above.

X. e. limitaneus Thomas and Hinton, 1923:255. Type locality “Zal- ingei, mouth of Wadi Aribi. 2800’.”

X. e. microdon Thomas, 1905:389. Type locality “British East Africa Kitui, alt. 1000 m.” (*fulvior* Thomas, 1905 is a synonym).

DIAGNOSIS. *Xerus erythropus* can be distinguished from *X. rutilus*, with which it is sympatric over part of Uganda, Sudan, and Kenya, by presence of a well-defined white or buffy lateral stripe from shoulder to rump (Fig. 1) and by its larger size (Kingdon 1974). Length of head and body is 300–460 mm and body mass is 500–1000 g in *X. erythropus* compared to 200–255 mm and 300–335 g, respectively, in *X. rutilus* (Kingdon 1974). *X. erythropus* can be distinguished from *X. inauris* and *X. princeps* by 3, rather than 2, pairs of mammae (Ammann 1975). Baculum of *X. erythropus* is distinguished from that of congeners by a narrow upper edge on distal portion (Pocock 1923). An acrocentric Y chromosome distinguishes the karyotype of *X. erythropus* from those of *X. inauris*, *X. princeps*, and *X. rutilus*, in which the Y chromosome is metacentric (Baskevich 1997; Dobigny et al. 2002; Robinson et al. 1986).

GENERAL CHARACTERS. *Xerus erythropus* is pale sandy to reddish and dark brown, with shades varying from lighter in drier areas of its distribution to darker in the more humid, southern part of its range (Dorst and Dandelot 1970). Pelage, except on tail, is short, coarse and bristly, and lies close to body (Rosevear 1969). Hairs are flat in cross-section, longitudinally grooved for part or all of their length, and distributed in groups of 3 (Rosevear 1969). Underparts are whitish and sparsely furred, whereas dorsum is darker and appears flecked. A lateral white stripe, composed of all-white hairs, runs from shoulder to rump (Rosevear 1969). Tail is bushy and is covered by long (up to 50 mm) multi-colored hairs that form alternating light and dark bands (Dorst and Dandelot 1970; Rosevear 1969). Tail hairs fan out sideways, rather than bushing out evenly all around (Rosevear 1969). Tail length is reported as about as long as head and body (Dorst and Dandelot

1970) or as shorter (Rosevear 1969). Ears are small. Muzzle is long, blunt, and well furred, with a projecting nose (Kingdon 1997). White lines are present above and below each eye; the lower line is less well-defined (Ewer 1966; Rosevear 1969). Limbs and feet are paler than dorsal pelage (Rosevear 1969). Feet are large and powerful, with long, flat, relatively straight claws (Rosevear 1969).

Mean measurements (in mm, ranges in parentheses) of mature specimens (sample size not reported) in the British Museum of Natural History (Rosevear 1969) are as follows: length of head and body, 255 (223–290); length of tail, 219 (185–262); length of hind foot, 62 (58–69); length of ear, 16 (14–19). Cranial measurements are: skull length, 60.8 (57.1–65.7); interorbital breadth, 15.7 (13.0–17.1); length of upper molar row, 12.3 (11.5–12.9); incisor to 3rd molar, 28.4 (26.9–31.8). Volumes of braincases of 44 adult *X. erythropus* (sexes combined) average $6.64 \pm 0.08 \text{ cm}^3$ ($\bar{X} \pm SE$ —Roth and Thorington 1982). Body masses of 47 adult *X. erythropus* (sexes combined) average $502.4 \pm 7.7 \text{ g}$ ($\bar{X} \pm SE$ —Roth and Thorington 1982).

Skull morphology (Fig. 2) of *X. erythropus* is as follows: infraorbital canal very small; masseteric tubercle present, large, laterally directed; rostrum elongate; anterior margin of mesopterygoid fossa posterior to last molar; greatest length of skull >57 mm (Delany 1975; Rosevear 1969).

DISTRIBUTION. The striped ground squirrel is endemic to Africa (Fig. 3) and ranges from Mauritania to southwestern Ethiopia and Kenya (Kingdon 1974). Because of its close association with cultivated land, the range and habitat of this species is expanding in Kenya (Key 1990a).

Subspecies distributions are as follows: *X. e. chadensis* from southeastern Niger, northeastern Nigeria, northeastern Cameroon, Chad, and Sudan; *X. e. erythropus* from Senegal and southern Mauritania to northeastern Nigeria, invading the high forest zone, also in southeastern Morocco; *X. e. lacustris* from northeastern Congo and northwestern Uganda; *X. e. leucoubrinus* from western Sudan, southwestern Ethiopia, and probably northeastern Uganda and northwestern Kenya; *X. e. limitaneus* from Sudan and probably southeastern Chad and northeastern Central African Republic; and *X. e. microdon* from southwestern Kenya (Ammann 1975).

FOSSIL RECORD. *Xerus erythropus* fossils were recovered from the Upper Pliocene, members B and C of the Shungura Formation, lower Omo Valley, Ethiopia (Wesselman 1984).

FORM AND FUNCTION. Dental formula is 1/1, 0/0, 2/1, 3/3, total 22. Peglike extra upper premolar is a poor diagnostic character because it often erupts late and can be shed soon after (Rosevear 1969). Upper molars have well-developed transverse ridges and hollows bounded by an internal heel; lower molars are deeply divided by a transverse cleft, giving the appearance that each is composed of 2 laminae (Rosevear 1969). Incisors are yellow and ungrooved (Rosevear 1969).



FIG. 1. *Xerus erythropus* from Nigeria. Photograph by D. C. D. Happold.



FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of *Xerus erythropus* from Pirisi, Ghana (female, National Museum of Natural History, USNM 420159). Greatest length of cranium is 59.5 mm. Photographs by Chad Schennum, USNM.

Mammæ are nearly evenly spaced with the 1st pair just below the rib cage, the 3rd pair in the groin area, and the 2nd pair approximately equidistant between the 1st and 3rd (Rosevear 1969; R. Thorington, pers. comm.).

ONTOGENY AND REPRODUCTION. Litter size is reported as 2–3 (Rosevear 1969), 2–6 (Kingdon 1974), or 3–4 (Delany 1975). Young *Xerus erythropus* (age not specified) show no avoidance response to a sudden drop or declivity, and this is attributed to their terrestrial lifestyle (Ewer 1968). They do, however, avoid open spaces and run for cover if placed in the open (Ewer 1968). Young squirrels respond to each other's distress calls by gathering together (Ewer 1968). Young captive *X. erythropus* eat earth before making the transition to solid food (Ewer 1968).

ECOLOGY. Striped ground squirrels are terrestrial, their relatively straight claws adapted for digging rather than climbing (Rosevear 1969), although on rare occasions they can climb into shrubs to reach fruit (Linn and Key 1996). They are strictly diurnal, spending the night in rock and tree-root crevices, termitaria, and self-dug burrows from well before dark until several hours after dawn (Kingdon 1974; Linn and Key 1996). Heavy cloud cover can delay emergence further, and they do not emerge in even light rain (Linn and Key 1996).

Typical habitats of striped ground squirrels include open

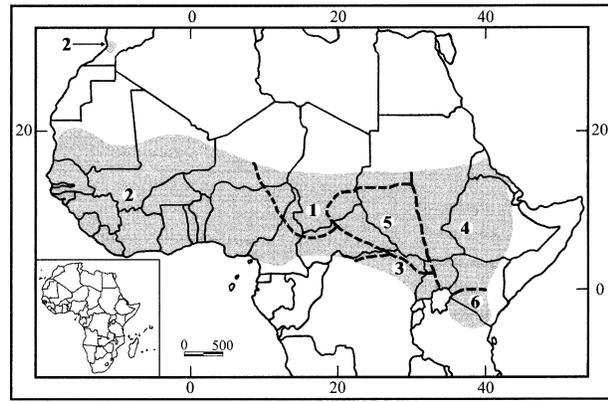


FIG. 3. Geographic range of *Xerus erythropus* showing 6 subspecies recognized by Amtmann (1975). Subspecies, bounded by dashed lines, are: 1, *X. e. chadensis*; 2, *X. e. erythropus*; 3, *X. e. lacustris*; 4, *X. e. leucombrinus*; 5, *X. e. limitaneus*; 6, *X. e. microdon*.

woodlands and Sudanic savannahs, but they can be found in a variety of environments from high forest clearings to semidesert and reach the sea in coastal scrub (Linn and Key 1996; Rosevear 1969). In forested regions, they are found only in disturbed or open areas (Rosevear 1969). They are common and widespread and are not considered endangered (Kingdon 1997).

Burrow systems are shallow (<1 m), consisting of a central chamber lined with dry grass and small twigs and typically have several entrances (Kingdon 1974). Burrow entrances may be blocked at night by loose soil that is pushed toward the entrance from below to form a barrier; young squirrels display this behavior "at a very early age" (Ewer 1968; Linn and Key 1996). Blind passages ending near the soil surface can be broken through for use as emergency exits (Linn and Key 1996). Burrows in cultivated areas are often simpler, with only 1 or 2 entrances and no well-defined nest area (Linn and Key 1996). Burrows are not defended against conspecifics and can be occupied by constantly changing mixed-sex groups (Linn and Key 1996). Burrow complexes can form in areas of high concentration and are sometimes shared with smaller rodents (Dorst and Dandelot 1970; Kingdon 1974). A female *X. erythropus* shared a burrow with a male and a female *X. rutilus* in Kenya (O'Shea 1976).

Based on radiotracking of 5 adult individuals, intensive foraging takes place within a home range averaging ca. 12 ha, and frequent expeditions into the surrounding area increase the total range to ca. 40 ha (Linn and Key 1996). Individual squirrels travel a mean of ca. 1500 m per day and often travel into neighboring home ranges. Striped ground squirrels require high quality food, which is an unpredictable resource, and travel into neighboring ranges to monitor food availability (Linn and Key 1996). Ranges were estimated in a semi-arid area where high quality food was scarce, so these estimates might be larger than is typical for more productive areas (Linn and Key 1996). Although home ranges are not defended, and in fact overlap considerably, these areas are scent-marked by rubbing cheek glands on stones and tree trunks (Ewer 1966, 1968; Key 1990b; Linn and Key 1996).

Xerus erythropus colonizes newly cultivated land and is considered an agricultural pest in both West and East Africa (Kingdon 1974; Linn and Key 1996). An increase in numbers of *X. erythropus* is often associated with increasing cultivation, and in areas of sympatry, *X. rutilus* might be displaced (Key 1990a). Striped ground squirrels can cause significant damage to maize (*Zea mays*) crops by eating newly planted seeds, damaging seedlings by eating the attached seed, and attacking ripe cobs before harvest (Key 1990a, 1990b). Trapping and poison baiting were ineffective in reducing damage to maize, and the potential food value of harvesting *X. erythropus* might outweigh the damage it causes to crops (Key 1990b). Peanuts (*Arachis hypogaea*), yams (*Dioscorea*), *Gmelina* seeds, young bolls of cotton (*Gossypium hirsutum*), sweet potatoes (*Ipomoea batatas*), cassava (*Manihot esculenta*), *Pinus caribea* saplings, and pods of various legumes are also consumed (Delany 1975; Linn and Key 1996). Crop losses due to striped ground squirrel damage are unpredictable and can be a substantial hard-

ship for people engaged in subsistence agriculture (Key 1990a, 1990b). Foods other than crops include roots, grass seeds, fallen fruit, seeds, nuts, and *Acacia* pods, occasionally supplemented with eggs, young birds, small reptiles, and insects (Kingdon 1974).

Predators include birds of prey, servals (*Felis serval*) and other wild cats, jackals (*Canis*), and snakes, especially the puff adder (*Bitis arietans*—Kingdon 1974). In some areas, striped ground squirrels are hunted and eaten by humans.

Parasites include ticks of the genera *Hyalomma* and *Ornithodoros*, which have been found in *X. erythropus* burrows (Logan et al. 1993). The tick-borne Bhanja virus has been isolated from the blood serum of *X. erythropus* from Nigeria (Hubálek 1987; Kemp et al. 1974). Nematodes of the genus *Gongylonema* were found in captive *X. erythropus* housed with numerous primate species and afflicted with chronic respiratory problems (Craig et al. 1998).

The striped ground squirrel can carry rabies and trypanosomes (*Trypanosoma xeri*), and its bite can occasionally be fatal (Kingdon 1974; Marinkelle and Abdalla 1978). Salivary glands contain the streptobacillus *Haverhillia*, which causes septicemia (Dorst and Dandelot 1970).

Striped ground squirrels are easily tamed and often kept as pets (Kingdon 1974; Rosevear 1969). They can live up to 6 years in captivity (Kingdon 1974).

BEHAVIOR. Striped ground squirrels normally walk unhesitantly, pausing frequently to sniff or look around, and often look around while standing erect (Kingdon 1974). Normal movement is a “peculiar jumping gait with the tail arched behind” (Dorst and Dandelot 1970:27). Rapid movement is a series of long leaps (Kingdon 1974). The tail is carried horizontally when the animal is walking or running, but is frequently raised vertically when resting (Kingdon 1974). Under normal conditions the tail is often flicked; when the animal is “excited or angry,” the tail can bristle up “like a bottle brush” (Kingdon 1974:442). In mild excitement, the body is carried high with the forelimbs extended, and the tail is carried over the back with hair partially erected. In intense anxiety, the body is crouched close to the ground and the tail is carried over the back with maximum piloerection (Ewer 1968). Play behavior of captive juvenile *X. erythropus* predominantly consists of rapid dashes and quick changes of direction (Ewer 1968). Fighting play is occasionally observed, but most play was considered to be derived from escape behaviors (Ewer 1966, 1968).

Xerus erythropus forages alone and often stops to rest and shed heat (Linn and Key 1996). Striped ground squirrels are skilled at opening the hard shells of nuts, which they often carry into their burrows to open in safety (Ewer 1966). Food items are normally held between the forepaws to be eaten, while the animal sits up on its haunches (Ewer 1966). Captive *X. erythropus* bury food in small, scattered hoards away from burrow entrances (Ewer 1965) and possibly in larger hoards within the burrow (Ewer 1968). Food items buried outside the burrow are often camouflaged with a dead leaf or stone (Ewer 1966, 1968).

Adult *X. erythropus* are usually seen singly or in pairs (Ewer 1966). Meetings between conspecifics can consist of brief greeting behavior in the form of nose to nose sniffing (Ewer 1968), or they can be agonistic, especially if the striped ground squirrels are of the same sex (Linn and Key 1996). Mating behavior includes a chase similar to that of *Sciurus* (Linn and Key 1996). Frequent self-grooming occurs in captive striped ground squirrels (Ewer 1966). From early in life, striped ground squirrels typically bury their urine (Ewer 1966), but they defecate haphazardly outside the burrow (Kingdon 1974). Vocalizations include a chatter similar to that of other squirrels (Kingdon 1974). Daily activity includes an active period in the morning, a midday rest period, and a slightly less active period in the afternoon (Linn and Key 1996). Thermoregulation is accomplished by resting in shaded areas and pressing the underside to an area of cool earth (Coe 1972; Linn and Key 1996).

GENETICS. The diploid number, based on the karyotype of a single individual from southwestern Niger, is 38, with a fundamental number of “at least 68” (Dobigny et al. 2002:509). The sex chromosomes are a submetacentric X and an acrocentric Y (Dobigny et al. 2002).

REMARKS. Geoffroy Saint-Hilaire (1803) established the name *Sciurus erythropus*, a misspelling of *erythropus*. Why Geoffroy

Saint-Hilaire (1803) chose this name is not known, as *erythropus*, meaning red footed, does not describe any subspecies (Rosevear 1969). Ewer (1966) suggested that the specific epithet might refer to a reddish coloration of the forearms and feet due to digging in lateritic soil. The availability of names from Geoffroy Saint-Hilaire’s *Catalogue* is disputed on the grounds that it was never published, and Hoffmann et al. (1993) declare that the work is unavailable. Grubb (2001), however, argues that it has been widely used and should be considered available. In 1971, the International Commission on Zoological Nomenclature issued Opinion 945 (Melville 1971), declaring the original spelling incorrect and establishing *erythropus* as the proper spelling. Other names in common usage for the striped ground squirrel include African ground squirrel, Chad ground squirrel, Geoffroy’s ground squirrel, and Sudanese ground squirrel. Common names of the subspecies include Geoffroy’s ground squirrel and dark ground squirrel for *X. e. erythropus*, lake ground squirrel for *X. e. lacustris*, Rüppell’s ground squirrel for *X. e. leucoubrinus*, and Guinea ground squirrel for *X. e. microdon*.

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