Rhynchocyon chrysopygus. By Galen B. Rathbun

Rhynchocyon Peters, 1847

Rhynchocyon Peters, 1847:36, type species *Rhynchocyon cirnei* Peters by monotypy.
Rhinonax Thomas, 1918:370, type species *Rhynchocyon chrysopygus* Günther.

CONTEXT AND CONTENT. Order Macroscelidea, Family Macroscelididae, Subfamily Rhynchocyoninae. Corbet and Hanks (1968) recognized three allopatric species of *Rhynchocyon* (figure 1) for which they wrote the following key:

1   Rump straw-colored, contrasting sharply with surrounding rufous pelage ------------------------ *R. chrysopygus*
    Rump not straw-colored ------------------------------------ 2
2(1) Rump and posterior half of back with a pattern of dark lines or spots on a yellowish-brown or rufous ground; top of head without a rufous tinge ------------- *R. cirnei*
    Rump and posterior half of back black; top of head with a rufous tinge ------------------------------ *R. petersi*

Rhynchocyon chrysopygus Günther, 1881

Rhynchocyon chrysopygus Günther, 1881:164. Type locality River Mombaça, Kenya.

CONTEXT AND CONTENT. Context given above. The species *R. chrysopygus* is monotypic.

DIAGNOSIS. See key above.

GENERAL CHARACTERS. This largest of the elephant-shrews has a rounded or convex back which is higher at the rump than at the shoulders (figure 2). The head is small and narrows into a long, flexible, proboscis-like nose, from which the family derives its common name. The mouth is small and located well behind the long nose. The pinnae and eyes are large and the tail is nearly as long as the head and body. The animal is semi-digitigrade, supported by long muscular rear legs and shorter, less developed forelegs (from Greek *macro* + *scel* = large leg). In overall form it is similar to a miniature duiker or dik-dik (Bovidae). The body is dark amber with a distinct golden rump-patch and a grizzled gold forehead. The feet, legs, ears, and tail are black except for the distal third of the tail, which is white with a black tip. The pinnae are naked, but the tail is finely haired and has a sparse tuft of black hairs at the tip. The body fur is fine, stiff, and glossy. The rump patch fur is similar, but longer and finer. A short crested mane extends from between the ears down the back of the neck to the shoulders. The only trait exhibiting sexual dimorphism is the canine, which averages 6.6 mm in length in males and 4.6 mm in females (Rathbun, in press *a*; see Ansell and Ansell, 1973, for a similar condition in *R. cirnei*). The color pattern of the young is the same as for adults, but the fur is not as glossy. Adults weigh an average (N = 20) of 540 g and have mean (N = 20) standard body measurements of: total length, 526 mm; tail length, 243 mm; rear foot (*sin unguis*) length, 74 mm; ear (inside) length, 34 mm. Corbet and Hanks (1968) provided detailed descriptions of the different species of *Rhynchocyon* and included a color plate of study skins. Black-and-white photographs of living specimens may be found in Walker et al. (1975), Vaughan (1978) and Rathbun (in press *b*), and a color photograph was published in National Geographic Magazine (145[5]:3).

DISTRIBUTION. This elephant-shrew inhabits a restricted narrow strip of moist, dense, coastal scrub, and lowland semideciduous forest and woodland along the Kenya coast from sea level to 30 m. Rathbun (1976) presented evidence for a wider distribution than had been recognized (figure 3): as far north as the Boni Forest, which is north of the Tana River and south of the Kenya-Somalia border, and as far south as the Kombeni River, which is in the Rabai Hills, just behind Mombasa. *Rhyncho-*

cyon chrysopygus apparently does not occur in the gallery forests of the Tana River, in the ground-water forest at Witu, or in the dry bushlands between the Galana and Tana rivers. This elephant-shrew's habitat is being cleared for exotic forest plantations and agriculture all along the coast, resulting in a discontinuous and reduced distribution. It will re-occupy fallow agricultural land that is allowed to become overgrown with dense bush (Rathbun, unpublished data).

FOSSIL RECORD. As far as is known, the Macroscelididae have always been endemic to Africa (Patterson, 1965). Butler and Hopwood (1957) described *Rhynchocyon clarki* from the early Miocene beds of Songhor, Kenya (near Lake Victoria). Additional Miocene material from Rusinga Island, Kenya, has been referred to this extinct form (Patterson, 1965), which was smaller than the extant species of *Rhynchocyon*. *R. clarki* contributes significantly to the forest related fossil mammal fauna from Rusinga Island, which was discussed by Andrews and Couvering (1975).

The divergence of the Rhynchocyoninae from the other subfamilies of Macroscelididae may have occurred as long ago as the early Oligocene and was part of a remarkable radiation of very diverse elephant-shrew forms that occurred in Africa throughout much of the Cenozoic (Patterson, 1965).

FORM. The skin beneath the rump patch is thicker than that of the surrounding area, thus forming a "dermal shield." This is most pronounced in males, where the shield may be three times thicker than the skin on the middle of the back. Histological examination of the rump skin reveals no specialized structures. Rathbun (in press *a*) suggests the shield may protect individuals from being seriously injured by the canine teeth of conspecific aggressors. A large subcaudal gland, just posterior to the anus at the tail insertion, presumably produces the animal's characteristic pungent odor. Microscopic examination shows a concentration of apocrine and sebaceous glands in this region (Rathbun, in preparation). There are two pairs of abdominal mammae.

Evans (1942) has analyzed and discussed the osteology of the Macroscelididae, using a form of *R. cirnei* to represent *Rhynchocyon*. The skull (figures 4, 5) is roughly triangular in shape when viewed dorsally and is characterized by a swollen braincase and a narrow muzzle. The rhinarium itself is not ossified, but composed of 30 double, cartilaginous rings (Parker,
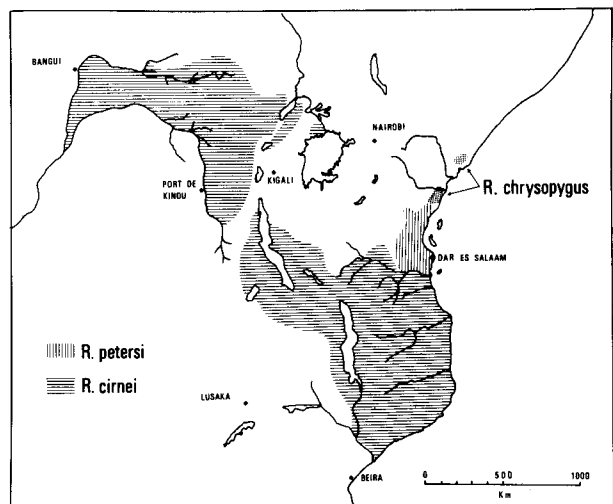

FIGURE 1. Distribution of the 3 allopatric species of *Rhynchocyon* in Africa. Based on Corbet and Hanks, 1968; Kingdon, 1974; Rathbun, 1976.

FIGURE 2. Adult *R. chrysopygus* from Kilifi District, Kenya.

FIGURE 3. Distribution of *R. chrysopygus*.

1885). Ventrally the most distinctive features are the large, ossified auditory bullae. The mandible has a high ascending ramus. The dental formula is i 0-2/3, c 1/1, p 4/4, m 2/2, total 17 to 19, and is characterized by the absence or rudimentary occurrence of the upper incisors, the notched lower incisors, large canines, no diastema, and progressively more complex cheek teeth, from the simple premolars to the slightly hypsodont and dilambdodont molars (Corbet and Hanks, 1968; see Allen, 1922, for a discussion of *R. cirnei* dentition, which is similar to that of *R. chrysopygus*).

The vertebral formula is C 7, T 13, L 8, S 3, Cd 28; the first sacral vertebra is fused with the ilium (Evans, 1942; Corbet and Hanks, 1968). The leg and foot structure is highly specialized, contributing to a "pseudo-ungulate habitus" (Evans, 1942). The radius and ulna are closely appressed and the pollex and the first metacarpal are lacking and only two phalanges make up the fifth digit. The third digit is the largest. The distal half of the tibia is fused with the fibula and the metatarsals and phalanges are elongate; the hallux is lacking and the third digit is the longest. Both the manus and pes bear long curved claws and lack carpal pads (Evans, 1942; Corbet and Hanks, 1968). A caecum is present and has figured prominently in various taxonomic schemes (see Anderson and Jones, 1967, for a brief review). The testes lie dorsally, just posterior to the kidneys, and do not descend to a scrotum. The prepuce is located in the middle of the abdomen. The uterus is slightly bicornuate and the vulva is elongate (Corbet and Hanks, 1968).

The following summaries are based on Rathbun, 1976 and in press *b*, unless otherwise cited.

ONTOGENY AND REPRODUCTION. *Rhynchocyon chrysopygus* breeds throughout the year. Gestation requires approximately 42 days, but a mean interbirth interval of 81 days was found at Gedi Ruins, Kenya. The single young is born in a semi-precocial state, weighing an estimated 80 g and being partially haired, but is confined to a nest for about two weeks. Kingdon (1974) illustrated prenatal and postnatal specimens. When the young emerges from the nest it weighs approximately 180 g and is weaned. Initially it closely follows the female around her home range, but progressively becomes more independent, until by the fifth day after emergence the two are rarely seen together. The young remains on the parental home range until it secures a home range of its own, which may occur anywhere from 5 to 20 weeks after nest emergence. Predation, especially of young, has been observed by diurnal birds of prey and snakes. Once an individual secures its own home range it may live to 4 or 5 years of age.

ECOLOGY AND BEHAVIOR. The forest floor along the Kenya coast is relatively open and covered with a continuous carpet of dry leaf litter. *R. chrysopygus* is restricted to the forest floor and never burrows or climbs. This species is diurnal, spending the night alone in one of several dispersed, self-constructed dry-leaf nests on the forest floor. After one to three nights the animal moves to a different nest. Nests are typically built in the morning and are composed of a shallow cup excavated in the soil with the long-clawed forefeet. The cup is lined with dry leaves which are gathered from the immediate area around the nest. The leaves are layered by a rapid patting of the forefeet. The leaf chamber is covered with a pile of dry leaves, resulting in a cryptic dome about 10 cm high and 30 cm across. Nest construction takes about 2 hours and accounts for about 2% of an animal's active time budget.
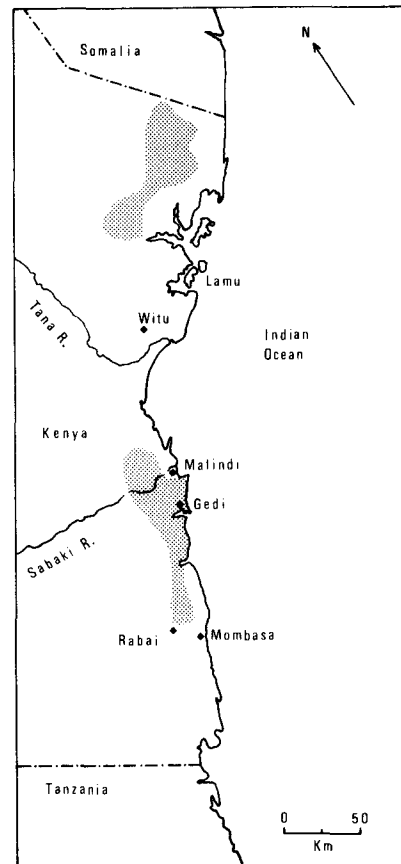
If mildly disturbed, *Rhynchocyon* freezes until the danger passes, or, if further disturbed, it walks away while loudly slapping the leaf litter with its tail every 1 to 3 seconds. If pursued, *Rhynchocyon* takes flight using a swift half-bound gait (Rathbun, 1973), hammering the leaf litter loudly with its rear legs, and producing a characteristic "crunch, crunch, crunch" sound as it disappears. If desperate, an animal may take refuge in a hole in a termitaria, tree base, or rocky area. The anti-predatory behavior of *R. chrysopygus* is very ungulate-like.

Extensive field study of free-living, marked individuals at Gedi Ruins, Kenya, revealed that males and females form monogamous pairs on congruent, equal-sized home ranges that are contiguous with neighboring pairs. The habitat is saturated with nearly equal-sized home ranges averaging 1.7 ha in area. Adults and young at Gedi have a mean monthly density of 1.6 animals per ha. Members of a pair are seen together about 20% of all sightings. Brown (1964) reported seeing *R. chrysopygus* "feeding in companies of from four to six individuals . . . ." Males occasionally attempt to mount foraging females, but unless the female is in estrus, she dislodges the male by walking forward. There is probably a postpartum estrus. Nonestrous females have not been seen to repel males aggressively. Successful mounting is preceded by a long, rapid chase by the male, and ends in a series of about five rapid, short mounts and intromissions. Pairs are stable and permanent, changing only when an individual dies.

Pairs defend home ranges sex specifically, males chasing males and females chasing females. When a resident elephant-shrew discovers an intruder, it cautiously approaches while slapping its tail loudly on the leaf litter every 1 to 3 seconds. When the distance between the two animals becomes 2 or 3 m the intruder takes flight and a high-speed chase in wide circles and zigzags ensues, one animal behind the other. A chase terminates when the intruder is driven across the boundary of the home range. Males exhibit more territorial violations and aggressive chases than females (Rathbun, in press *a*). Intrapair and parental-young aggression has not been observed.

FIGURE 5. Photograph of lateral view of cranium and lower jaw of skull shown in figure 4.
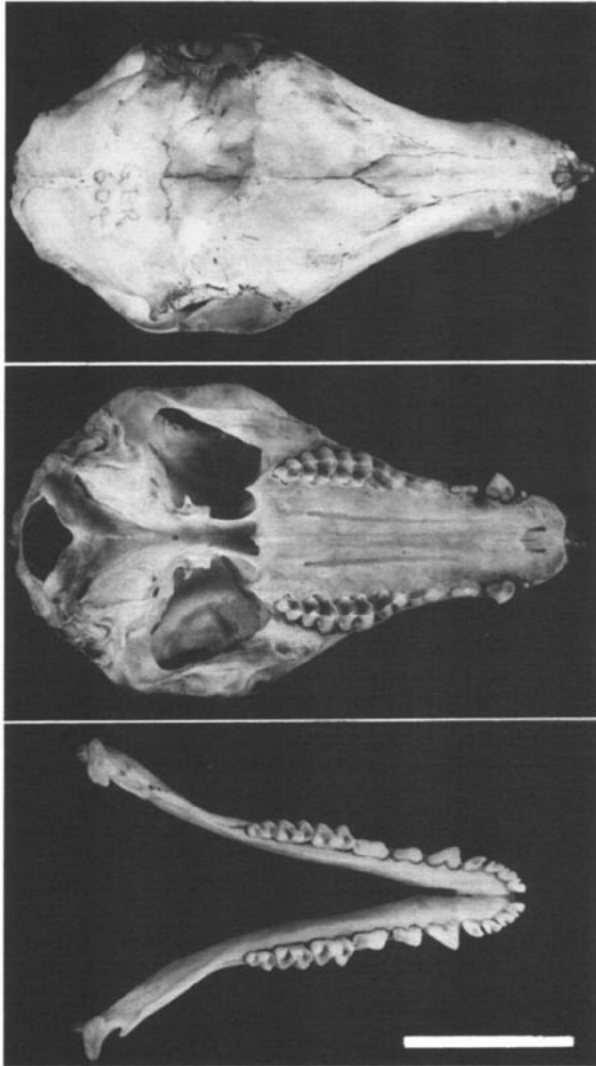

FIGURE 4. Photographs of an adult male skull (G. B. Rathbun collection, No. 604) from Kilifi District, Kenya. From top: dorsal and ventral views of skull and dorsal view of mandible. Photography by V. E. Krantz, National Museum of Natural History. Scale at lower right represents 20 mm.

The subcaudal gland is used by both sexes to scent-mark territories. Scent-marking is not site-specific, but occurs periodically as the animals continuously walk and forage along the forest floor. Trails through leaf litter and vegetation are used only when undergrowth is very dense; otherwise the animals wander widely over their territories. The entire territory of a pair is probably visited daily, but certain areas are used more intensively than others by both members of a pair. Approximately 80% of the day is spent walking slowly along the forest floor foraging for invertebrates. The long nose is used as a probe to overturn leaves, twigs, and fallen bark and the specialized forefeet are used to scuffle the leaf litter and to dig small conical holes in the soil. The majority of food items are very small and are ingested with a rapid flick of the long extensile tongue. Large food items are either held to the ground with a forefoot and torn apart with the teeth, or are ripped into small pieces with the fore-claws while being held in the mouth. Fragments of food are ingested with a flick of the tongue. Based on stomach analyses the elephant-shrew's diet is composed of Orthoptera, Coleoptera adults and larvae, spiders, millipedes, ants, centipedes, earthworms, termites and pupal cases. Analysis of occurrence of these invertebrates in the leaf litter indicates that they are eaten in approximate proportion to their availability. An exception is toxic millipedes, which are taken less often than expected. Plant material is not eaten. The red-capped robin-chat, Cossypha natal-

ensis, has a commensal feeding relationship with R. chrysopygus. The bird forages on invertebrate fragments that have been left behind.

The ear margins of the golden-rumped elephant-shrew are often parasitized by ticks. These ticks include nymphal stages of Rhipicephalus and Ambyomma as well as adults and nymphs of Haemophysalis and Ixodes. Two species of fleas are specific to Macroscelididae in eastern Africa: Chimaeropsylla potis potis and Chimaeropsylla haddowi. During the rainy season foraging elephant-shrews are often followed by small clouds of a dozen or more mosquitos, which bite the rump and tail region. The bites apparently cause some distress, as the elephant-shrews frequently twitch, shake, and sit on their tails. These mosquitos probably include species of Aedes and Eretmopodites. Endoparasites of the large intestine include cestodes, acanthocephalan larvae, and round worms of the genera Subulura and Hymenolepis.

The Giriama Tribe along the northern Kenya coast capture Rhychocyon (vernacular name: fugu) using bent-sapling snares, and also run them down with dogs. The meat is strong and unpleasant tasting. A time consuming but effective method of capture is to string nylon fishing nets vertically along the forest floor and either drive the elephant-shrews into them (Brown, 1964) or leave the animals to become entangled on their own (Rathbun, 1976). Because of the elongate structure of the rear foot, this elephant-shrew can easily be marked by fastening colored plastic bird bands above the ankle.

Individuals of Rhynchocyon have not been successfully kept in captivity for more than two or three weeks; they adapt very poorly to captivity, being prone to headlong flight into cage walls, constant pacing and jumping, and fasting. This syndrome reflects their rather stereotyped behavior (Kingdon, 1974; personal observations).

At present, R. chrysopygus is given full, meaningful protection only within the 44 hectare Gedi Historical Monument (Gedi Ruins) near Malindi, Kenya. A new nature reserve is likely to be established within the Arabuko-Sokoke Forest, which will include some good elephant-shrew habitat. Because the expanding human population requires more agricultural land and because forestry practices are oriented toward financial profit instead of conservation, habitat destruction will soon become a major threat to this species. The Gedi Ruins and Arabuko-Sokoke Forest nature reserve site are probably not large enough to ensure the species' survival.

REMARKS. Based on newly discovered and old fossil materials and a preliminary reconsideration of morphological traits, McKenna (1975) has proposed that the Macroscelididae may be related to the extinct anagalids and more distantly to the Lagomorpha. If further research and analysis prove this to be the case, it would help solve the long standing controversy and confusion as to the phylogeny of the Macroscelidea (see Evans, 1942; Patterson, 1965; Martin, 1968; Tripp, 1970; and Sauer, 1973, for summaries and different points of view).

Peters (1864) and Haeckle (1866) originally referred the elephant-shrews and tree-shrews (Tupaiidae) to the Insectivora, suborder Menotyphla, which continues to be a popular arrangement

(Anderson and Jones, 1967; Vaughan, 1978). The traditional taxonomic position of the elephant-shrews with the Insectivora is of questionable validity. Butler (1956) and Patterson (1965) referred them to their own order, the Macroscelidea. This view is supported by Corbet and Hanks (1968), McKenna (1975), and Rathbun (in press, b).

Corbet and Hanks (1968), in their definitive revision of the family, considered the Genus *Rhynchocyon* to contain three distinct species: *Rhynchocyon cirnei*, *Rhynchocyon petersi*, and *Rhynchocyon chrysopygus*. Kingdon (1974) considered the three forms to be subspecies of *R. cirnei*. Thomas (1918) placed *R. chrysopygus* in a new genus, *Rhinonax*, based on the retention of rudimentary upper incisors. Corbet and Hanks (1968) provided data illustrating the variability of this trait and considered the subfamily to contain the single genus *Rhynchocyon*.

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