

# ELEPHANT SHREWS

**a** PPEARING MUCH LIKE GIANT VERSIONS OF true shrews, elephant shrews were not described in the scientific literature until the mid-19th century, partly because they are cryptic, difficult to trap, and confined to Africa. Almost another century passed before a few short notes on their natural history appeared in print. Knowledge of them has expanded greatly over the last 50 years, revealing for the first time just how unique these animals really are.

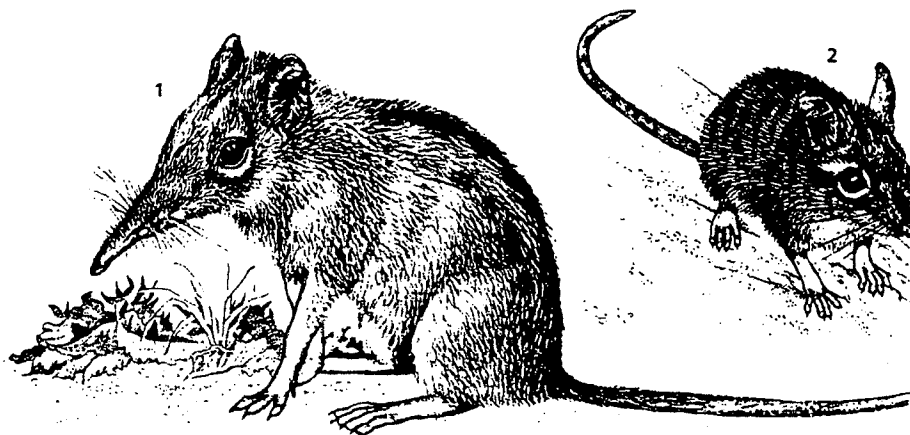
In the past, the animals were sometimes referred to as "jumping shrews," but this is something of a misnomer since only the smaller species make pronounced leaps when alarmed; the normal method of locomotion is to walk on all fours. The name "elephant shrew," bestowed by field naturalists in Africa, alludes to their long snouts. With large eyes, a trunklike nose, high-crowned cheek teeth, and a large cecum similar to that found in herbivores, long legs like those of small antelopes, and a long, ratlike tail, elephant shrews sometimes seem like walking anthologies of other animals.

## Anteaters on Stilts

### FORM AND FUNCTION

The elephant shrews found in Africa today give little insight into the family's long and diverse evolutionary history. Fossil sengis first appeared in the early Eocene 50 million years ago, but they reached their maximum diversity by the Miocene (24 million years ago), when they comprised six subfamilies. One included a small, herbivorous form (*Mylomys*) weighing about 50g (1.8oz) that resembled a grass-eating rodent; another a large planteater (*Myohyrax*) ten times that weight that was so ungulate-like it was initially thought to be a hyrax. Today, all that remains from these ancient forms are representatives of two well-defined, insectivorous subfamilies, the giant elephant shrews (*Rhynchocyoninae*) and the soft-furred elephant shrews (*Macroscelidinae*). The other four subfamilies mysteriously died out by the Pleistocene, 1.5 million years ago.

Taxonomically, elephant shrews have long been a source of controversy. At first, biologists included them with other insect-eaters in the Insectivora. Then they were briefly thought to be distantly related to ungulates. Next there was a scheme to include them with the tree shrews in a new grouping, the Menotyphla. More recently, they have been associated with rabbits and hares. Most biologists now agree that elephant shrews belong in their own order, the Macroscelidea. Perhaps to



avoid the old association with true shrews, it has been recently suggested that elephant shrews should also be known as sengis, a name derived from several African Bantu languages.

So what is their exact phylogenetic relationship with other mammals? With the advent of molecular techniques to unravel evolutionary relationships, there is a growing consensus that the Macroscelidea belong to an ancient radiation of African mammals that today share few obvious morphological similarities. The latest proposal includes the elephant shrews in the superorder Afrotheria, which also includes elephants, hyraxes, sea cows (the Paenungulata), aardvarks, golden moles, and tenrecs.

## Widespread, but Not Common

### DISTRIBUTION PATTERNS

Elephant shrews are widespread in Africa, occupying very diverse habitats. For example, the distribution of the Short-eared elephant shrew (*Macroscelides proboscideus*) includes the Namib Desert in southwestern Africa as well as gravelly thornbush plains in South Africa's Cape Province, while the two rock elephant shrew species (*Elephantulus myurus* and *E. rupestris*) are largely restricted to rocky outcrops and boulder fields in southern Africa. Most other species of *Elephantulus* live in the vast steppes and savannas of southern and eastern Africa. The three giant elephant shrews of the *Rhynchocyon* genus and the Four-toed elephant shrew (*Petrodromus tetradactylus*) are restricted to lowland and mountain forests and associated thickets in central and eastern Africa. *Elephantulus rozeti* is found in semi-arid, mountain habitats in extreme northwestern Africa, isolated from all other species by the Sahara. The absence of sengis from western Africa has never been adequately explained. Nowhere are elephant shrews particularly common, and despite being highly

terrestrial and mostly active above ground during the day and in the evening, they often escape detection because of their swift locomotion and secretive habits.

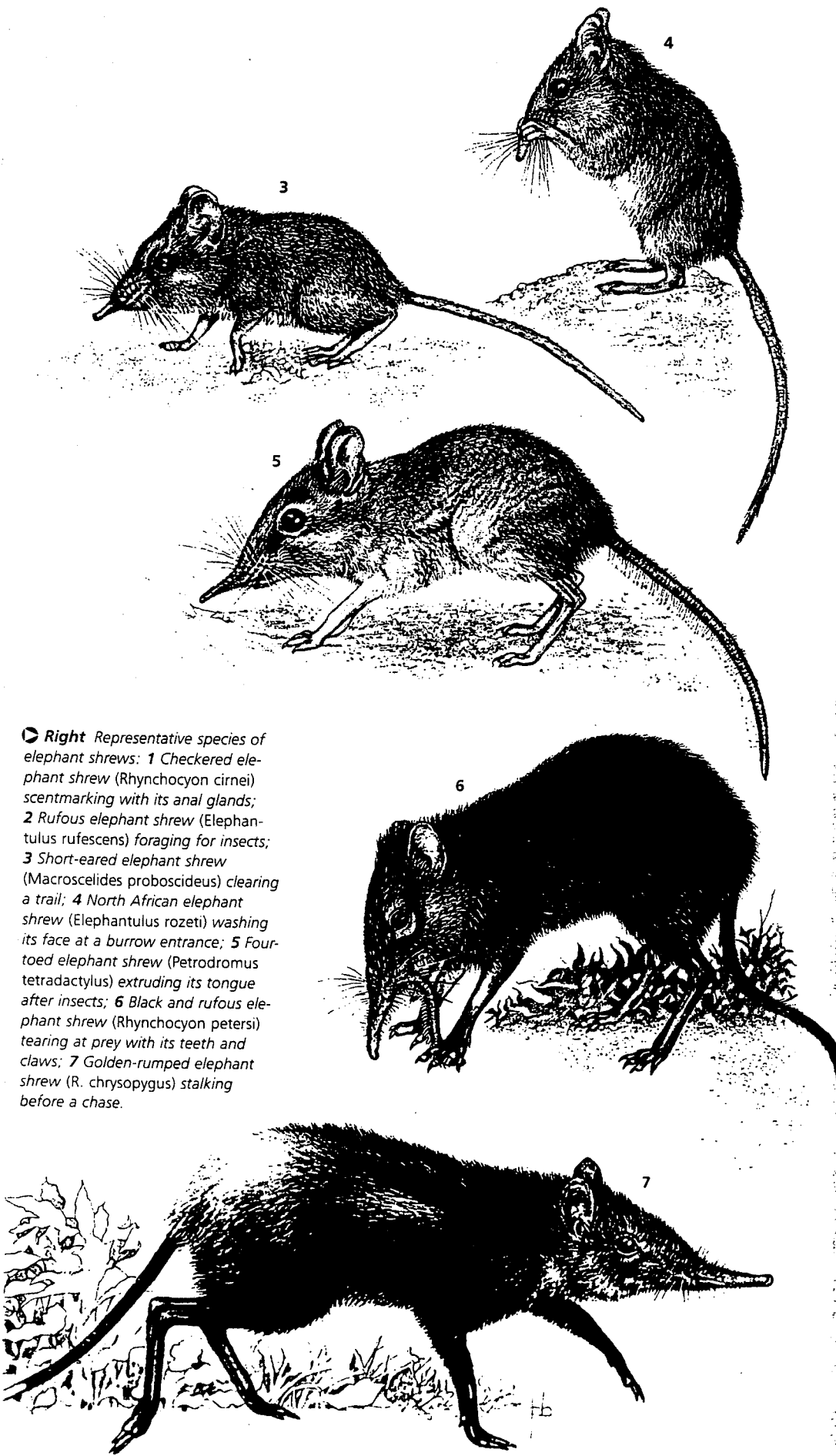
Golden-rumped elephant shrews spend up to 80 percent of their active hours searching for invertebrates, which they track down in the litter on the forest floor by using their long, flexible noses as probes, in the manner of coatis and pigs. *Rhynchocyon* species also use their forefeet which have three long claws, to excavate small conical holes in the soil. Important prey include beetles, centipedes, termites, spiders, and earthworms. The soft-furred species spend only half as much time foraging. They normally glean small invertebrates, especially termites and ants, from leaves, twigs, and the soil's surface, but they eat plant matter, especially small, fleshy fruits and seeds. All elephant shrews have long tongues that extend well beyond the tips of their noses and are used to flick small food items into their mouths.

## Monogamy and Trail-Clearing

### SOCIAL BEHAVIOR

While elephant-shrew species look diverse and live in vastly differing habitats, they all have similar sex lives. Individuals of the Golden-rumped, Four-toed, Short-eared, Rufous, and Western species live as monogamous pairs, but there appears to be little affection between partners.

Rufous elephant shrews that inhabit Kenyan densely wooded savannas are distributed as male-female pairs on territories that vary in size from 1,600 to 4,500sq m (0.4-1.1 acres). The same pattern is found in Golden-rumped elephant shrews in the coastal forests of Kenya, although the territory sizes are larger, averaging 1.7ha (4.2 acres). Although monogamous, individuals of both species spend



Right Representative species of elephant shrews: 1 Checkered elephant shrew (*Rhynchocyon cirnei*) scentmarking with its anal glands; 2 Rufous elephant shrew (*Elephantulus rufescens*) foraging for insects; 3 Short-eared elephant shrew (*Macroscelides proboscideus*) clearing a trail; 4 North African elephant shrew (*Elephantulus rozeti*) washing its face at a burrow entrance; 5 Four-toed elephant shrew (*Petrodromus tetradactylus*) extruding its tongue after insects; 6 Black and rufous elephant shrew (*Rhynchocyon petersi*) tearing at prey with its teeth and claws; 7 Golden-rumped elephant shrew (*R. chrysopygus*) stalking before a chase.

**ORDER: MACROSCELIDEA**

Elephant shrews or Sengis  
 Family: Macroscelididae  
 2 subfamilies, 4 genera; 15 species

**Distribution** N Africa, E, C and S Africa, absent from W Africa and Sahara

**Habitat** Varied, including montane and lowland forest, savanna, steppe, desert.



**Size** Ranges from Short-eared elephant shrew, with head-body length 10.4–11.5cm (4.1–4.5in), tail length 11.5–13cm (4.5–5in), weight about 45g (1.6oz), to the Golden-rumped elephant shrew a head-body length of 27–29.4cm (11–12in), tail length 23–25.5cm (9.5–10.5in), weight about 540g (19 oz).

**Coat** Soft, in various shades of gray and brown.

**Diet** Beetles, spiders, centipedes, earthworms, ants, termites and other small invertebrates; also fruits and seeds.

**Breeding** Gestation 57–65 days in the Rufous elephant shrew, about 42 days in the Golden-rumped elephant shrew.

**Longevity** 2½ years in the Rufous elephant shrew (5½ in captivity), 4 years in the Golden-rumped elephant shrew.

**Conservation status** *R. chrysopygus*, *R. petersi*, and *E. revouili* are classed as Endangered; *R. cirnei*, *M. proboscideus*, *E. edwardii*, and *E. rupestris* as Vulnerable.

**GENUS RHYNCHOCYON**

Golden-rumped elephant shrew (*Rhynchocyon chrysopygus*), Black and rufous elephant shrew (*R. petersi*), Checkered elephant shrew (*R. cirnei*).

**GENUS PETRODROMUS**

Four-toed elephant shrew (*Petrodromus tetradactylus*)

**GENUS MACROSCELIDES**

Short-eared elephant shrew (*Macroscelides proboscideus*)

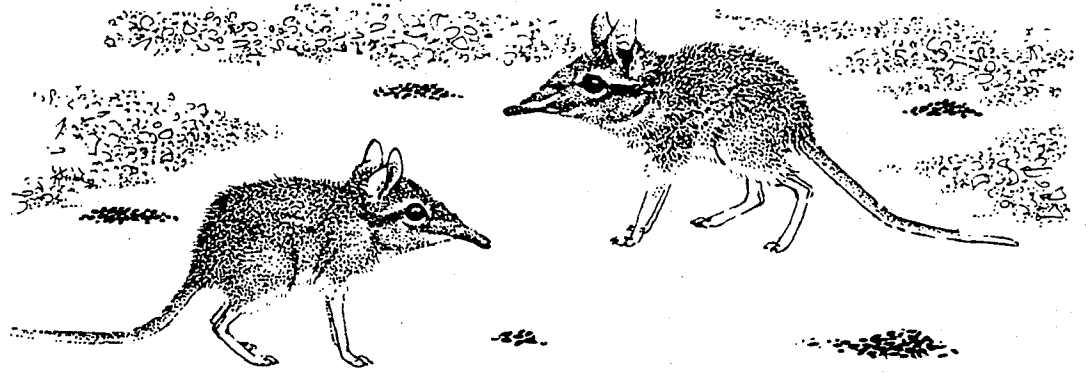
**GENUS ELEPHANTULUS**

Short-nosed elephant shrew (*Elephantulus brachyrhynchus*), Cape elephant shrew (*E. edwardii*), Dusky-footed elephant shrew (*E. fuscipes*), Dusky elephant shrew (*E. fuscus*), Bushveld elephant shrew (*E. intufi*), Eastern rock elephant shrew (*E. myurus*), Somali elephant shrew (*E. revouili*), North African elephant shrew (*E. rozeti*), Rufous elephant shrew (*E. rufescens*), Western rock elephant shrew (*E. rupestris*).

Note: Elephant shrews may shortly be reassigned, with other endemic African placentals (e.g. golden moles, tenrecs, and elephants), to a new grouping, the "Afrotheria" – see p. 723.

Right Elephant shrew tails – the one shown is from the Four-toed elephant shrew – are lined with knobbed bristles. Their exact function is controversial, but it has been noted that, during aggressive and sexual encounters, individuals lash their tails across the ground, dragging the bristles across the substrate. It may be that the animals are scentmarking through this behavior, with the knobs acting as swabs to spread scent-bearing sebum from large glands on the tail's under-surface.

Right Rufous elephant shrews visibly mark their territories by creating small piles of dung in areas where the paths of two adjoining pairs meet. Occasionally aggressive encounters occur in these territorial arenas. In these situations, two animals of the same sex face one another and, while slowly walking in opposite directions, stand high on their long legs and accentuate their white feet, much like small mechanical toys. If neither of the animals then retreats, a fight usually develops and the loser is routed from the area.



Below A perfect ball of fur but for the protruding nose, a Short-eared elephant shrew basks in the sun. The species – the only representative of the *Macroscelides* genus – is limited to a region of about 20,000sq km (7,700sq mi) of southern African plain and desert, and is listed as Vulnerable by the IUCN.



little time together. The male and female share precisely the same territory, but defend this area individually, with females seeing off other females and males evicting intruding males. This system of monogamy, characterized by limited cooperation between the sexes, is also found in several small antelopes, such as the dikdik and klipspringer. As in most monogamous mammals, the sexes are similar in size and appearance, but male giant elephant shrews have larger canine teeth.

In territorial encounters, visual signals are important, but elephant shrews also bring to bear their scent glands to mark out their land. These are located on the bottom of the tail in several *Elephantulus* species, on the soles of the feet in the Rufous elephant shrew, on the chest of the Dusky-footed, Rufous, and Somali elephant shrews, and just behind the anus in the giant elephant shrews of the *Rhynchocyon* genus. Vocal communication is unimportant, although the Four-toed elephant shrew and some species of *Elephantulus* create sounds by drumming their rear feet on the ground, while *Rhynchocyon* species slap their tails on the leaf litter. When captured, several elephant-

shrew species emit sharp, high-pitched screams, although all are surprisingly gentle when handled and rarely attempt to bite despite their well-developed teeth.

In several respects elephant shrews are similar to small ungulates, especially in their avoidance of predators. Initially they rely on camouflage to elude detection, but if this fails they use their long legs to swiftly outdistance pursuing snakes and carnivores. This is no mean feat for a creature standing only 6cm (2.4in) high at the shoulder and weighing 58g (2oz): the trick is achieved by utilizing a system of trails to rival the road network of a city like London.

Even so, this explanation begs a question about the purpose of monogamy in the case of the Golden-rumped elephant shrew, which does not clear trails, apparently leaving the male of the pair jobless. The answer in its case lies in the forest habitat it inhabits. The tropical climate allows these particular sengis to breed continuously throughout the year, and their food resources are relatively evenly and widely distributed. Under these circumstances, the most productive strategy for a male may be to remain with one female, ensuring that he fathers her young, rather than to wander over huge expanses of forest trying to keep track of the reproductive condition of several females, and thereby running the very real risk of missing opportunities to mate. This resource-based explanation for monogamy is also thought to explain the paired sex lives of several small antelopes, such as the dikdik and some duikers.

In contrast to the path-using Four-toed and Rufous elephant shrews, several other sengis, including the Short-eared, Western rock, and Bushveld species, dig short, shallow burrows in sandy substrates for shelter. Where the ground is too hard, these species will use abandoned rodent burrows. But even the burrow-using sengis do not incorporate nesting material in their shelters, as do most rodents. The giant elephant shrews are more typical of small mammals, in that they spend each night in a leaf nest on the forest floor. To deny predators the reward of a meal in each nest that they find and tear open, the elephant shrews build several nests and then sleep alone in a different nest every few nights.

## ON THE TRAIL OF THE RUFOUS ELEPHANT SHREW

Near Tsavo National Park in Kenya, the Rufous elephant shrew lives in dense thickets in which each pair builds, maintains, and defends a complex network of criss-crossing trails. To enable the sengis to run at full speed along these paths, the trails must be kept immaculately clean. Just a single twig could break an elephant shrew's flight from a fast-moving predator with disastrous consequences, so the sengis regularly go road-sweeping. Every day, individuals of a pair spend 20–40 percent of the daylight hours separately traversing much of their trail network, removing accumulated leaves and twigs with swift sidestrokes of their fore feet. Little-used paths consist merely of a series of small, bare, oval patches on the sandy soil on which the sengi lands as it bounds along the trail; those that are heavily used form continuous bare channels through the litter.

The trails of Rufous elephant shrews, and also those of *Petrodromus*, are exceptionally important because neither species nests or lives in burrows or shelters. They spend their entire lives relatively exposed, as would small antelopes. Their distinct

black-and-white facial pattern probably serves to disrupt the contour of their large black eyes, thus camouflaging them from predators while they are exposed on the trails.

The Rufous elephant shrew produces only 1 or 2 highly precocial and independent young per litter. Since the female alone can nurse her young, the male of the pair can do little to assist. This begs the question of why the animals should be monogamous in the first place.

In the Rufous elephant shrew, part of the answer apparently relates to the system of paths. Males spend nearly twice as much time trail-cleaning as females do – a rather similar arrangement to that of mara couples, which are also monogamous and in which the males put their effort into vigilance, freeing the female to graze. Although this sort of indirect help is not as obvious as the direct cooperation of wolf and marmoset pairs in raising their altricial young, it is just as vital to the elephant shrew's reproductive success, for without paths, its ungulate-like habits would be completely ineffective.



Sengis in the tropics produce several litters throughout the year, but at higher latitudes reproduction becomes seasonal, usually in association with the wet season. Litters normally contain one or two young, but the North African elephant shrew and Checkered elephant shrew may produce three young per litter. Although all elephant shrews are born in a well-developed state with a coat pattern similar to that of adults, the young of giant elephant shrews are not as precocial as those of the soft-furred species, and thus they are confined to the nest for several days before they accompany their mother.

Giant elephant shrews are exceedingly difficult to keep in captivity, and they have never been bred. In contrast, the Rufous and Short-eared elephant shrews have been successfully exhibited and bred in several zoos, which has resulted in

**▲ Above** Looking somewhat like a miniature anteater, a melanistic variant of the Checkered elephant shrew (*Rhynchocyon cirnei*) combs the forest floor for insects.

numerous laboratory studies of their biology. For example, physiological studies of Short-eared elephant shrews have shown that they can go into torpor, with body temperatures dropping from about 37°C (98.6°F) to as low as 9.5°C (49°F) for short periods when food resources are limited. This is thought to be an adaptation to conserve energy. Research on captive Rufous elephant shrews has shown that they can recognize the identities of family members and neighbors from scentmarks alone, so individuals can presumably closely monitor the use of their large territories by others as well as by night.

## Disappearing Forests

### CONSERVATION AND ENVIRONMENT

Generally, sengis are of little economic importance to man, although Golden-rumped and Four-toed elephant shrews are snared and eaten along the Kenya coast. This subsistence trapping is illegal, but is so far thought to be sustainable. A bigger problem for these forest-dwellers is severe habitat depletion, especially for those species occupying small, isolated patches of woodland in eastern Africa that are being degraded by tree-cutting for the wood-aving trade, or else being destroyed outright to make way for subsistence farming, exotic tree plantations, or urban developments. It would be a dreadful loss if these unique, colorful mammals were to disappear after more than 50 million years in existence, their dwindling patches of forest could not be so amply protected.

# ESCAPE AND PROTECTION

The tactics and adaptations of the Golden-rumped elephant shrew

THE AFRICAN SUN WAS JUST STARTING TO SET when a Golden-rumped elephant shrew made its way up to an indistinct pile of leaves about 1 m (3ft) wide on the forest floor. The animal paused at the edge of the low mound for 15 seconds, sniffing, listening, and watching for the least irregularity. Sensing nothing unusual, it quietly slipped under the leaves. The leaf nest shuddered for a few seconds as the elephant shrew arranged itself for the night, then everything was still.

At about the same time the animal's mate was retreating for the night into a similar nest located on the other side of the pair's home range. As this elephant shrew prepared to enter its nest, a twig snapped somewhere. The animal froze, and then quietly left the area for a third nest, which it eventually entered, but not before dusk had fallen.

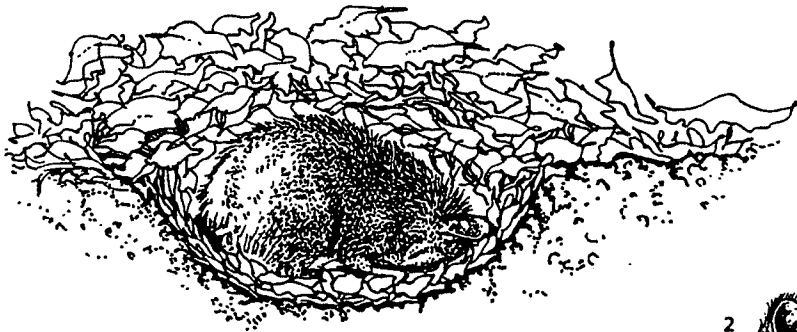
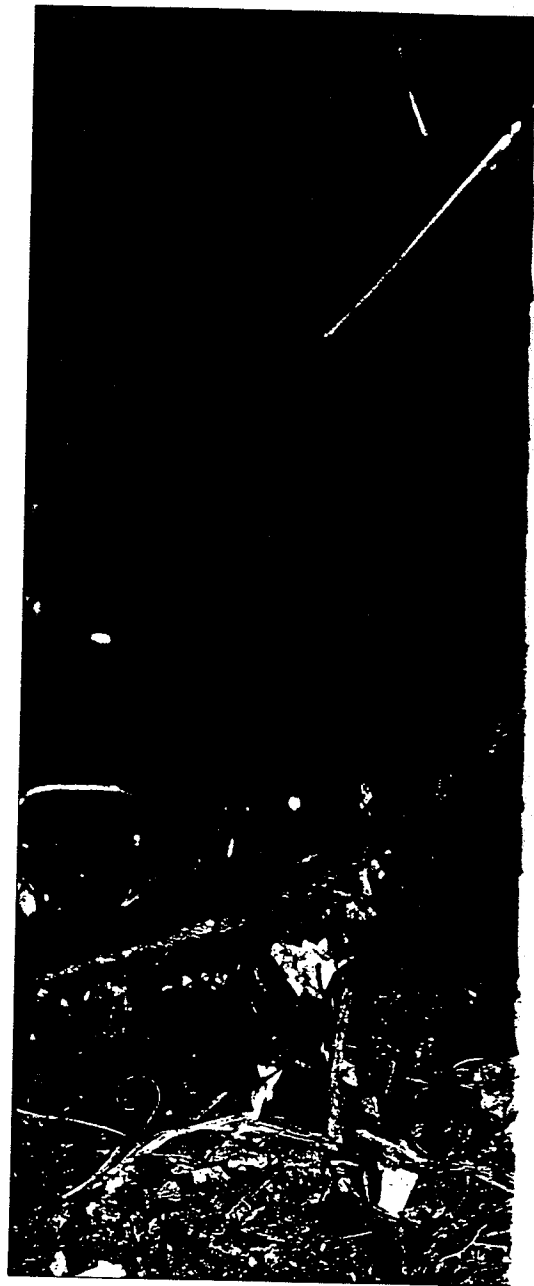
Every evening, within a few minutes of sunset, pairs of elephant shrews like this one separately approach and cautiously enter any one of a dozen or more nests they have constructed throughout their home range. They use a different nest each evening to discourage forest predators such as leopards and eagle-owls from ascertaining exactly where they can be found.

Changing nests is just one of several stratagems Golden-rumped elephant shrews regularly use to avoid predators. The problem they face is considerable. During the day they spend over 75 percent of their time exposed while foraging in leaf litter on the forest floor, where they fall prey to Black mambas, Forest cobras, and harrier eagles. To prevent capture by such enemies the animals have developed tactics that involve not only the ability to run fast but also a distinctive coat pattern that is notable for its flashy coloration.

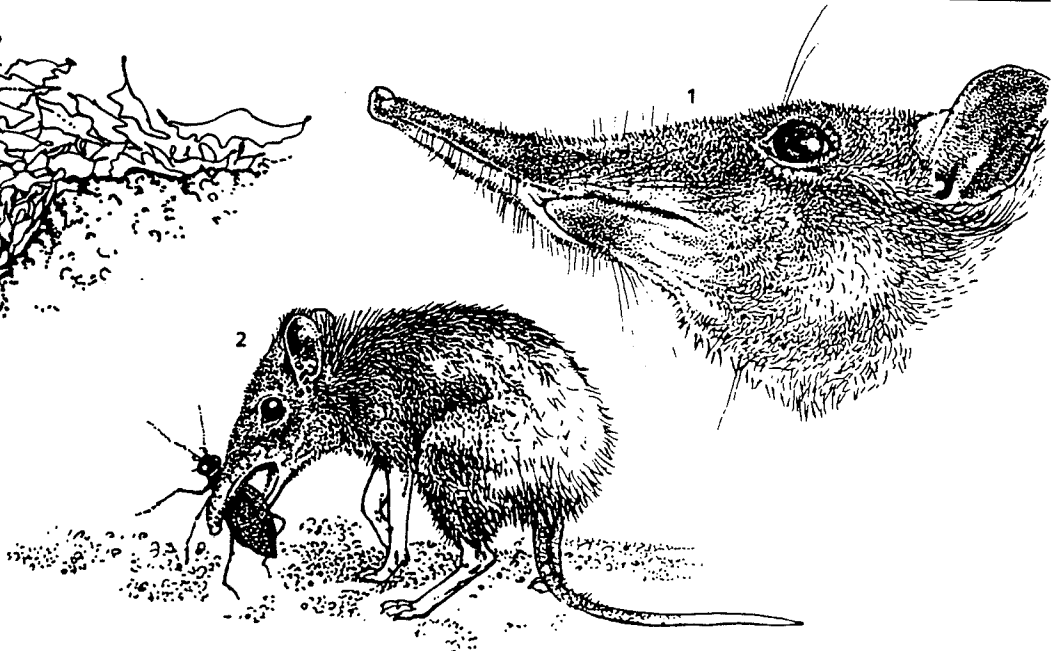
Extraordinarily, Golden-rumped elephant shrews can bound across open forest floor at speeds above 25km/h (16mph)—about as fast as an average person can run. Because they are relatively small, they can also pass easily through patches of undergrowth, leaving larger terrestrial and aerial predators behind as they do so. Despite their speed and agility, however, they still remain vulnerable to ambush by sit-and-wait predators, such as the Southern banded harrier eagle. Most small terrestrial mammals have cryptic coloration on their coats or skins to serve as camouflage. However, the forest floor along the coast of Kenya where the Golden-rumped elephant shrew lives is relatively open, so any defense against predation that relied on camouflage would be ineffective.

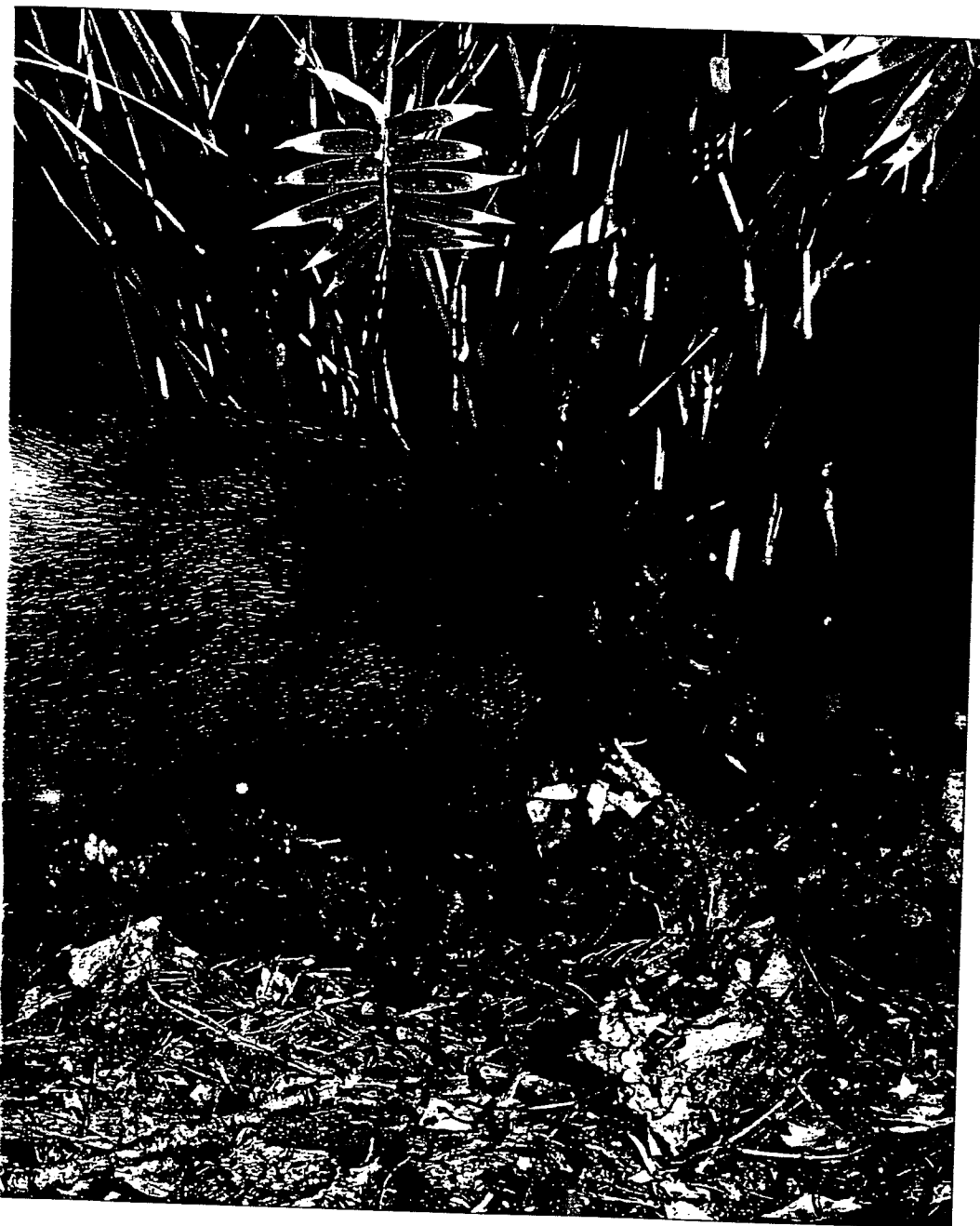
Instead, the elephant shrew's tactic is to actively invite predators to take notice of it. It has a rump patch that is so visible that a waiting predator will discover a foraging shrew while it is too far away to make a successful ambush. The predator's initial reaction to the sight, such as rapidly turning its head or shifting its weight from one leg to another, may be enough to reveal its presence. By inducing the predator to disclose prematurely its intent to attack, a surprise ambush can be averted.

An elephant shrew that discovers a predator while still outside its flight distance does not bound away; instead it pauses and then repeatedly slaps the leaf litter with its tail at intervals of a few seconds. The sharp sound produced probably conveys a message to the predator: "I know you are there, but you are outside my flight distance, and I can probably outrun you if you attack." Through experience, the predator learns that when it hears this signal it is generally futile to attempt a pursuit,



**▲ Above** Nest-building occurs mainly in the early morning hours when dead leaves are moist with dew and make little noise, so that predators are less likely to be attracted by the sound of rustling. Weathered nests are nearly indistinguishable from the surrounding forest floor. Elephant shrews curl up in a ball when preparing themselves for sleep, with the head tucked back under their chest.

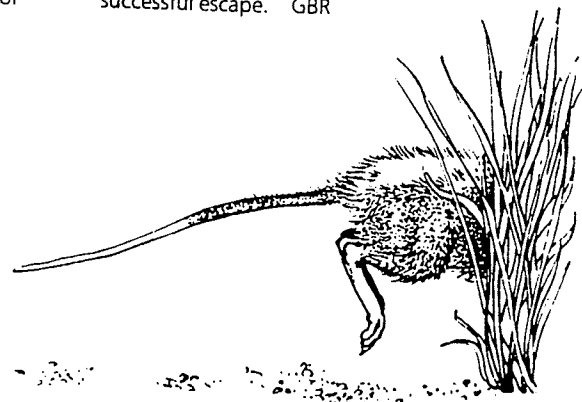
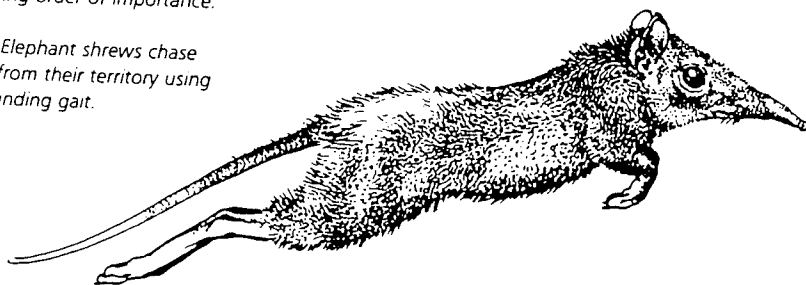




1 Above and Left Foraging in the leaf litter on the forest floor. The Golden-rumped elephant shrew has a small mouth 1 located far behind the top of its snout, which makes it difficult to ingest large prey items. Small invertebrates are eaten by flicking them into the mouth with a long, extensible tongue.

2 In the Arabuko-Sokoke forest of coastal Kenya, elephant shrews feed mainly on beetles, centipedes, termites, cockroaches, ants, spiders, and earthworms, in decreasing order of importance.

3 Right Elephant shrews chase intruders from their territory using a half-bounding gait.



towards the nearest cover as the bird swoops to make its kill, noisily pounding the leaf litter with its rear legs as it bounds away. Only speed and agility can save it in such a situation.

The Golden-rumped elephant shrew is monogamous, but pairs spend only about 20 percent of their time in visual contact with each other; the remainder is spent resting or foraging alone. So for most of the time they must communicate via scent or sound. The distinct sound of an elephant shrew tail-slapping or bounding across the forest floor can be heard over a large part of a pair's 1.5ha (3.7 acre) territory. These sounds not only signal to the predator that it has been discovered, but also communicate to the elephant shrew's mate and young that an intruder has been detected.

Each pair of elephant shrews defends its territorial boundaries against neighbors and wandering subadults in search of their own territories. During an aggressive encounter a resident will pursue an intruder on a high-speed chase through the forest. If the intruder is not fast enough, it will be gashed by the long canines of the resident.

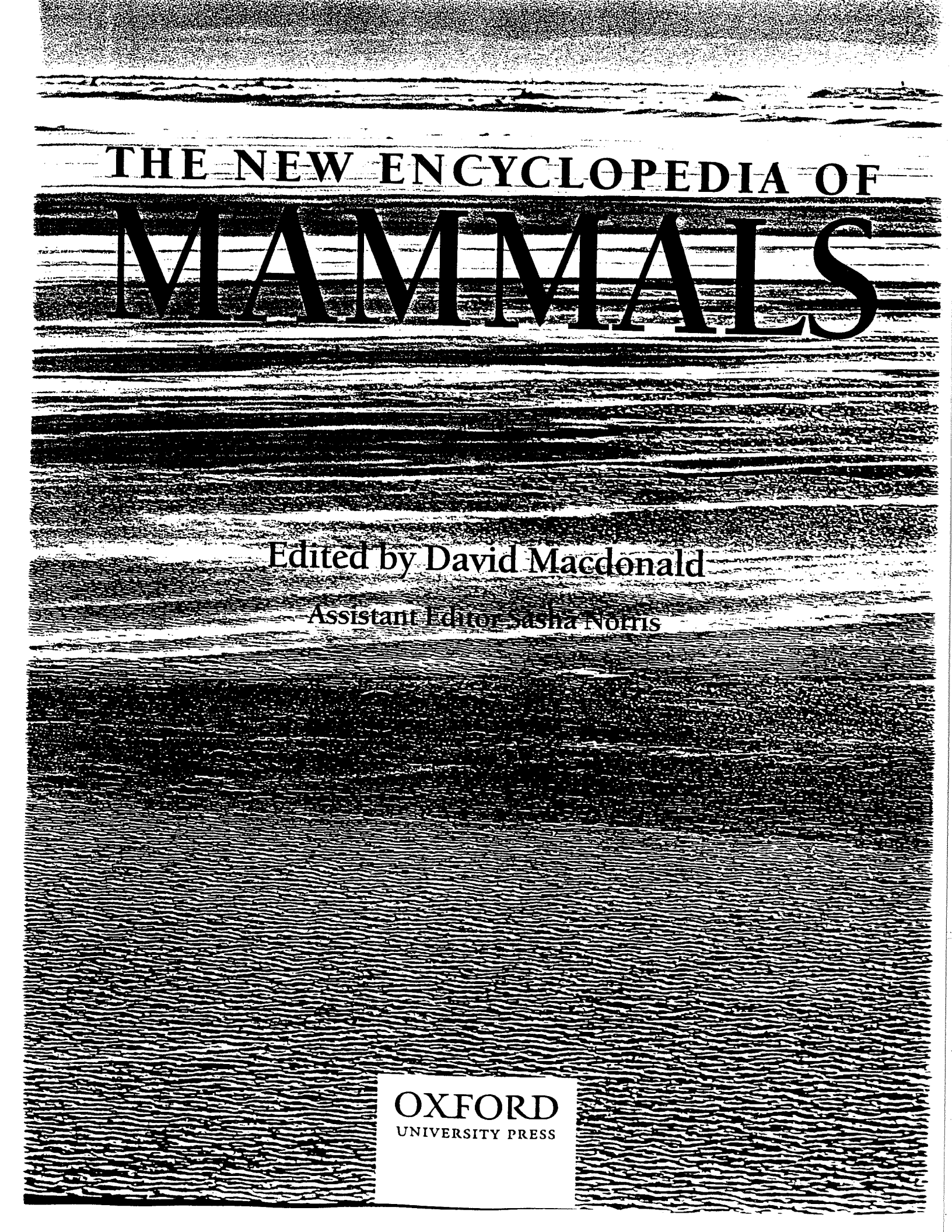
These conflicts between elephant shrews can be thought of as a special type of predator-prey interaction, revealing yet another way in which the animal's coloration may serve to avoid successful predation. The skin under the animal's rump patch is up to three times thicker than that on the middle of its back. The golden color of the rump probably serves as a target, diverting attacks on such vital parts of the body as the head and flanks to an area of the body that is better suited to take assaults.

Deflective marks are common in invertebrates, and have been shown to be effective in foiling predators; for example, the distinctive eye spots on the wings of some butterflies attract the predatory attacks of birds, allowing the insects to escape relatively unscathed. The yellow rump and the white tip on the black tail of the elephant shrew may serve a similar function by attracting the talons of an eagle or the fangs of a striking snake, thus improving the animal's chances of making a successful escape. GBR

because the animal is on guard and can easily make its escape back to a place of refuge.

The situation is very different when an elephant shrew becomes aware of a predator – say, for example, an eagle – so close that a safe escape cannot be guaranteed. In those circumstances, the animal will take flight across the forest floor





THE NEW ENCYCLOPEDIA OF  
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