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MAMMALS FROM THE SAVE RIVER, MOZAMBIQUE, WITH DESCRIPTIONS OF TWO NEW BATS

BY WALTER W. DALQUEST

ABSTRACT: During October 1963, 325 specimens of mammals were obtained from the Save River area, Mozambique, mostly near the hunting camp of Zinave, midway between the Indian Ocean and the Southern Rhodesian boundary. *Nycteris vinsoni* and *Scotophilus alvenslebeni* are described as new, *Triaenops persicus* is recorded from southern Africa for the first time, and data are provided concerning 51 other kinds of mammals, most of which are represented by specimens.

In the fall of 1963, Mr. Jerry Vinson of Wichita Falls, Texas, planned a big game hunting trip to the Save River in southern central Mozambique, between the Limpopo and Zambesi rivers, and approximately midway between the Southern Rhodesian boundary and the Indian Ocean. This area has been virtually inaccessible until very recent years. Mr. Vinson suggested that the writer join him in Africa and gather a representative collection of mammals for the vertebrate collections at Midwestern University. As a result, 325 specimens of mammals, representing 54 species, were obtained. Two of these seem to be undescribed species, another species represents a genus not previously known to range into southern Africa, and several rare or little-known forms are included in the collection.

Although the wildlife of countries surrounding Mozambique has been well known for many years, very little has been published concerning the mammals of Mozambique. Based on collections made by W. H. Peters in the 1860's, C. H. B. Grant in the early 1900's and other older naturalists, brief papers were published describing new species from the Limpopo and Zambesi valleys and along the coast. In recent times only Austin Roberts seems to have published on Mozambique mammals. His efforts consist of descriptions of new subspecies collected on brief visits to the coastal area near Beira and the Limpopo valley.

The interior of Mozambique has been, until quite recently, almost inaccessible. In spite of native snaring and commercial hunting by Europeans for ivory and meat, the big game mammals have remained abundant. Some 10 years ago the government established the Coutada system for big game management and hunting. Bag limits and license fees are set by the government. Large areas of land in the interior of the country, or Coutadas, are exclusive concessions to professional hunting companies. The companies have absolute charge of, and responsibility for, the game and wildlife in the concession. They have their own game wardens and are charged with enforcement of game laws. With snaring and commercial hunting controlled, wildlife has increased tremendously. The few trophy specimens taken by big game hunters make no impression on the population.

The Mozambique Safarilandia concessions include Coutadas 4 and 5. The

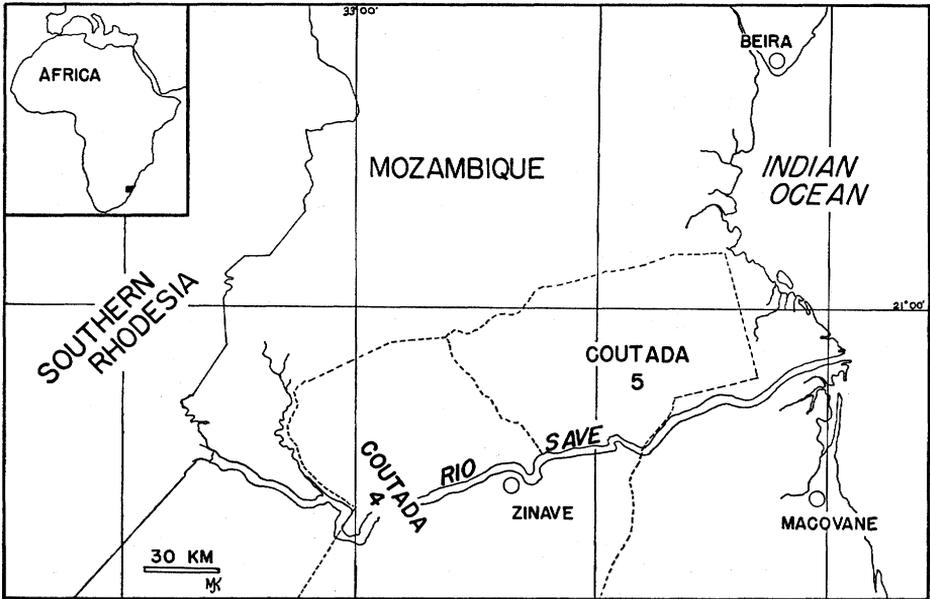


FIG. 1.—The Save River area of Mozambique. Dark rectangle on small map shows position of area. Collecting localities were at Zinave and Macovane, shown by circles.

combined concessions extend from near the Indian Ocean to the Southern Rhodesian boundary, an area nearly as large as Switzerland.

The base of our expedition was the hunting camp of Zinave, in Coutada 4 (see map). This site is approximately 212 km SSW of Beira, the nearest large city. Virtually all specimens listed were taken within 5 miles of Zinave. On 20 October in the company of Mr. Rui Quadros, I visited the caves near Macovane. These are enormous limestone caverns that are said to extend for miles. We found entrances at a point 65 km S of the mouth of the Save River and 3 km W of the 35th parallel. Millions of bats of several species were observed and some specimens collected. With the exception of these bats, all other specimens are labeled "Save River, 212 km SSW Beira, Mozambique."

The very abundance of mammals required some modification of field techniques. I prepared all of the smaller mammals, up to the size of genet cats and suni antelope, as conventional study skins. Smaller antelopes (duiker, oribi, etc.), porcupine and mammals up to the size of bushbuck were saved as flat skins with measurements. Larger antelopes and carnivores were saved as skulls-only, without measurements.

Technical names in the following accounts follow Ellerman, Morrison-Scott and Hayman (Southern African mammals, 1857 to 1951: a reclassification. British Museum, 1953), with a few exceptions. Identifications are largely based on Roberts (The mammals of South Africa, 1951). In spite of the criticism of this work by Ellerman, Morrison-Scott and Hayman, I found the

accounts dependable and logical, both biologically and geographically, at least as they apply to Mozambique. It is apparent that the best features of the paper by Ellerman, et al., the keys and descriptions of geographic ranges, are taken with little change from Roberts' work.

In the accounts that follow, measurements are given in millimeters, and unless otherwise stated they are in the conventional sequence (total length, length of tail, length of hind foot to tip of claw and height of ear from notch).

ANNOTATED LIST OF SPECIES

Elephantulus brachyrhynchus langi Roberts.—Although the short-snouted elephant shrew is probably common, I obtained only five specimens. Only one was taken in a trap. The others were shot from the tire-ruts of jeep roads at night. This species prefers grassland, and none was seen on the roads which passed through woodland or bushveld. Measurements of a male are 192—90—26—19; means for four females are 208—90—28—20.

Elephantulus rupestris mapogonensis Roberts.—One immature rock elephant shrew, sex unknown, was taken in a trap in grassland. It was so severely damaged by insects that no measurements could be taken.

Petrodromus tetradactylus beirae Roberts.—Four-toed elephant shrews were much too large to capture in mouse traps. Two female specimens were shot at night on bare, leaf-littered ground beneath thickets and low trees. However, while driving at night through grasslands, I saw large shrews I judged to be of this species leaping from ruts of jeep roads. Means of two females are 343—156—56—35.

Crociodura hirta beirae Dollman.—One male Zambesi red musk shrew was taken in an oat-baited trap set in a thorny palm thicket. Measurements are 133—41—14—11.

Nycteris thebaica capensis A. Smith.—Two Egyptian slit-faced bats, both in the gray color phase, were taken from the hollow of a large baobab tree by building a fire in the hollow and holding a mist net over the entrance. The female was not pregnant. Measurements of the male are 107—52—10—35; of the female 114—46—10—35.

Nycteris vinsoni new species

Type.—Adult female, skin and skull, no. 18739, Walter W. Dalquest, Midwestern University Collection, taken on the south bank of the Save River, 212 km SSW Beira, Mozambique.

Diagnosis.—A very large *Nycteris*, similar in general proportions to *Nycteris thebaica* but larger and stouter. Forearm more than 50 mm and length of skull from canines more than 21 mm. Ears relatively short, probably less than 25 mm in life.

Comparisons.—This species needs comparison only with *Nycteris thebaica*, the only species of *Nycteris* ranging into southern Africa that is nearly as large. Fortunately two *Nycteris thebaica capensis* were taken in a hollow tree a few hundred yards from the site where the type and paratype of *N. vinsoni* were found. These *N. thebaica* are apparently typical and their measurements agree closely with those given by Roberts (1951). *N. vinsoni* differs from *N. thebaica* principally in its much larger size, more massive skull and heavier dentition but shorter ears. Both *N. thebaica* are in the gray color phase, while the type of *vinsoni* is in the orange phase. However, the paratype of *vinsoni* is of the gray phase.

The size difference between *thebaica* and *vinsoni* is too great to be individual variation within a species. The rostrum of *vinsoni* is 20% heavier than that of *thebaica*, and the superorbital flanges overhang the orbits to a much greater degree; breadth across the flanges in *thebaica* is 6.8 mm versus 9.0 mm in *vinsoni*.

Measurements.—External measurements of the type are: total length, 125; length of tail, 55; length of hind foot, 13; height of ear from notch, 22. Cranial measurements are

those used by Roberts (1951): length of skull from canines, 22.0; frontals to occiput, 17.3; zygomatic breadth, 13.3; braincase breadth, 10.0; width across upper M3's, 8.8; width across upper canines, 5.8; canine—upper M3 length, 7.8; height at bullae, 10.3; mandible length plus incisor, 15.0; canine to lower M3, 8.4; forearm length, 50.6. Every measurement exceeds, usually by a considerable margin, the maximum given by Roberts for *N. (thebaica) capensis*, as well as the measurements of the specimens of *N. thebaica* from the Save River.

Remarks.—The type and paratype were occupying a small hollow, not more than 6 inches in diameter, at the base of a large baobab tree. A fire was built at the base of the hollow and two bats were stupified by the smoke. One, in the gray color phase, fell into the flames and was so singed the skin could not be saved. The ears and membranes of the other, the type, were somewhat shriveled. It is likely that the height of the ear in the living bat was greater than the 22 mm recorded, although some allowance was made for the shriveling of the ear. In any event, the ear was much shorter than that of the *N. thebaica* (35 mm) taken nearby.

This species is named for Mr. Jerry Vinson, the sponsor of the Save River expedition.

Rhinolophus hildebrandtii Peters.—A few Hildebrandt's horseshoe bats were found in the large, cool, dimly lighted entrance rooms of limestone caverns near Macovane. There they mingled with thousands of Schreber's bats. Four of the horseshoe bats were taken in mist nets set in a dark corridor. The same nets took more than 100 Schreber's bats. Means for four females are 114—33—14—32.

Rhinolophus landeri landeri Peters.—Most of the large hollows in giant baobab trees near Zinave housed colonies of Lander's horseshoe bats during the day. When small fires were built at the bases of the hollows, 20 to 100 of these small bats were sometimes forced into mist nets. Means for two males are 75—28—9—14; for 12 females, 78—27—9—14.

Hipposideros cafer cafer Sundevall.—The South African lesser leaf-nosed bat is similar to the Lander's horseshoe bat in size, color, appearance and habits. Both spend the day in hollows in large baobab trees, but the colonies of *Hipposideros* were smaller and seem to be scarcer. I found but two, both with 15 or 20 leaf-nosed bats. Of 12 taken from one colony, only one was a male. Measurements of the male are 87—32—9—15; means for 11 females are 79—29—9—14.

Hipposideros commersoni commersoni Noack.—A small colony of the large Commerson's leaf-nosed bats was found clinging in a recess in the roof of a warm, humid cave near Macovane. Others may have been present in nearby recesses, but the sound of a shot put thousands of *Trienops* to flight, and prevented further observations. Eight males were taken, of which two are small and immature. Means for six apparently adult males are 153—36—23—32. One of two females captured is apparently adult and measures 145—31—23—32.

Trienops persicus afer Peters.—An enormous colony of trifold leaf-nosed bats occupied the warm, humid caves near Macovane. The temperature in the caves was so high we were able to penetrate only a short distance. Millions of bats were probably present, apparently all of this kind.

Trienops has not been previously reported from the mainland of southern Africa. I compared our series with *Trienops persicus persicus* Dobson, from Aden, borrowed from the United States National Museum through the courtesy of Dr. Henry W. Setzer. The skulls are closely similar, except that the premaxillaries of the Arabian form are so short that the anterior faces of the canines and incisors are on the same plane as seen in lateral view. In the specimens from Mozambique, the premaxillaries are elongated, and there is a distinct gap between the anterior faces of the canines and the posterior faces of the incisors. The gap is sufficiently wide (1 mm) to permit the insertion of the edge of an index card.

Triaenops persicus afer was previously known from East Africa, in Kenya and Tanganyika. Dr. Charles W. Mack, of the Museum of Comparative Zoology, kindly loaned me a specimen of this form. The premaxillaries are elongated, like those of the specimens from the Save River, and the skulls are otherwise similar. The color of the Tanganyika specimen is within the range of variation in the Mozambique series. The bats from Mozambique are therefore referable to *T. p. afer*.

Means for seven males are 100—32—10—15; for three females, 98—32—9—15.

***Scotophilus alvenslebeni* new species**

Type.—Adult male, skin and skull, no. 18767 Walter W. Dalquest, Midwestern University Collection, taken on the south bank of the Save River, 212 km SSW Beira, Mozambique.

Diagnosis.—A very large, dark *Scotophilus*, exceeded in size only by *Scotophilus gigas* among bats of this genus known from the African mainland. Sagittal crest enormously developed, extending posteriorly over the occiput in an exaggerated crescent. Forearm, 77 mm; condylobasal length of skull, 26 mm.

Comparison.—This species needs comparison only with *Scotophilus gigas* Dobson, for no other *Scotophilus* from the African mainland approaches it in size. I have not seen specimens of *S. gigas*, but the forearm of that species is said to be more than 85 mm in length (Ellerman, Morrison-Scott and Hayman, p. 85), which is considerably greater than that of *alvenslebeni*. The fur of *alvenslebeni* is dark sooty or dusky brown. The ears and membranes are black. *S. gigas* is yellow in color. *S. alvenslebeni* has not been compared with *S. robustus* of Madagascar, but it is highly improbable that the insular form would occur on the African mainland.

Measurements.—External measurements of the type and only known specimen are: total length, 175; length of tail, 77; length of hind foot, 14; height of ear from notch, 20; height of tragus, 9. Cranial measurements are: length of skull from canines, 31.0; condylobasal length, 26.2; zygomatic breadth, 20.0; braincase breadth, 14.8; width across upper M3's, 12.4; width across upper canines, 9.6; upper canine-M3 length, 9.9; mandible length plus incisor, 21.4; lower canine-M3 length, 12.1; forearm, 77.

Remarks.—The type was shot as it flew over the camp clearing at Zinave in the late evening. The species is named for Baron Werner von Alvensleben, in partial recognition of his labors in behalf of our work in Mozambique.

It seems unlikely that this form will be found to intergrade with *S. gigas*. *S. gigas* is known from Nigeria, Nyasaland and Southern Rhodesia. The specimen from Southern Rhodesia is in the British Museum, and has a forearm in excess of 85 mm. The forearm of the type, from Nigeria, has a forearm 3.4 inches (85 mm). The Southern Rhodesian bat thus does not approach *S. alvenslebeni* in size.

Miniopterus schreibersi natalensis A. Smith.—I found Schreiber's bats to be abundant in the cool, dry limestone caves near Macovane. Some heaps of guano in the caves where this species was most common must have included hundreds of cubic yards, single heaps covering an acre of ground 10 feet deep. My specimens were taken in mist nets held across narrow passages. Means for 12 males are 100—42—9—12—5; for 14 females, 101—41—9—12—5.

Galago senegalensis granti Thomas and Whroughton.—Local residents considered the Senegal bushbaby to be the common form near Zinave and were apparently unaware of the existence of the larger *G. crassicaudatus*. I saw but a single specimen, a male, that I shot at night from a vine-grown bush in an extensive thicket. The eyes shone brilliantly in the beam of a hunting light. Measurements are 368—204—56—40.

Galago crassicaudatus lonnbergi Schwartz.—Thick-tailed bushbabies were often heard calling at night from the upper growth of tall trees, but could rarely be located. On three

occasions I was able to see the reflection of their eyes long enough to shoot. Others looked only briefly at the light, and some refused to look at it. All of the bushbabies that I collected from tall trees were this form, and I judge it to be the common species at Zinave. Measurements of two males are 781—435—90—64 and 724—412—92—61. Measurements of a female are 715—391—87—56.

Cercopithecus aethiops rufoviridis Geoffroy.—Vervet monkeys were uncommon near Zinave. Small groups of 3 to 10 animals were seen in open woodland and palm-grown flats near the river. One female was carrying a newly born young in early October. Four specimens were obtained: one a pick-up skull (sex unknown), one a female flat skin prepared by a native skinner (skull in good condition), and two skins with skulls. Measurements of an old male are 1185—684—138—41; of a young adult female, 994—558—123—32.

Papio ursinus griseipes Pocock.—Chacma baboons were very abundant in the concession. Bands of 10 to 100 animals were commonly seen, though the large groups may have been composed of several smaller bands that were temporarily united. The calling of baboons was a characteristic sound in the woodland, and their tracks were seen wherever sand or dust could hold their impressions. The animals are shy and rarely allow a close approach. At one native village the baboons had stolen all of the chickens, returning again and again until every bird was gone. White hunters told me that baboons do great damage to wildlife, even taking the young of the larger antelopes. Present abundance of baboons is certainly abnormal and probably results from the reduction of leopards and lions by native snares. Control of native poaching may increase the leopard population and decrease baboons. Otherwise, some control of baboon numbers will have to be devised if the birds and smaller mammals are to be protected. Five flat skins with skulls and two skulls-only were saved; no external measurements were taken.

Lycan pictus venaticus (Burchell).—Although the hunting dog was said to be rare on the concession, at least two packs came within a few miles of Zinave during our visit. Mr. Gose came upon a pack on the south bank of the river and shot four specimens. The skulls of these animals were unfortunately left in Africa. Mr. Vinson encountered a large pack on the north side of the river and shot 10 of the dogs. The skull of an adult was saved. The dogs were bold and approached the hunting jeep in a menacing fashion, growling as they did so. Not until 10 dogs were killed did the others flee. Later a few dogs, doubtless the remnants of the pack, were seen in the same general area, but were then extremely shy and wary.

Viverra civetta Schreber.—I saw no African civets but did see tracks in the dust of a road that a native hunter told me were of a civet. Christian von Alvensleben has a skin of this species that was killed by a jeep in the early evening, 1 mile from Zinave, a week before our arrival.

Herpestes ichneumon mababiensis Roberts.—My only specimen of the Egyptian mongoose is a male, taken by a native trapper. He told me the animal had formed a habit of coming to his palm winery and drinking the fermenting liquid. The species is apparently rare, and local residents had not seen it before. Measurements are 1140—537—108—35.

Helogale parvula parvula (Sundevall).—Mr. Vinson shot a male dwarf mongoose as it crossed a jeep road. I had fleeting glimpses of other small mongooses that I thought were of this species; the smaller mongooses move so swiftly that identification is difficult. Measurements are 385—164—48—16.

Atilax paludinosus Cuvier.—I saw one water mongoose clearly but was unable to collect it. The species is said to be fairly common.

Mungo mungo senescens (Thomas and Wroughton).—Bands of the small banded mongoose are occasionally seen dashing across the bushveldt, often in single file. They travel swiftly and keep under cover beneath bushes and palms as they flee, so that specimens are extremely difficult to obtain. Like most species of mongooses in Mozambique, the banded mongoose is strictly diurnal. Measurements of a female are 486—190—67—21.

Genetta rubiginosa zambesiana Matschie.—Rusty-spotted genet cats appear to be common near Zinave. I saw one or more each moonless night spent hunting along jeep roads. The animals were usually seen on the ground but climbed into trees when disturbed by the light. They are skilled chicken thieves and are trapped by the natives for that reason. A white hunter, Harry Manners, told me that he had trapped nearly 100 genet cats around his chicken yard at Zinave, and all were of this species. Measurements of a male are 974—668—95—54. Measurements of two females are 922—450—87—50 and 911—465—88—57.

Crocuta crocuta (Erxleben).—I am unable to account for the scarcity of spotted hyenas in the Zinave area. Mr. Vinson shot one male, which he saved as a trophy. The killing of this animal was a matter of great excitement to the natives of the area, as the hyena is extremely important in local witchcraft. I saw no individuals, and my only specimen is a pick-up skull.

Mellivora capensis (Schreber).—Baron von Alvensleben told me that honey badgers were common near camp and that he had trapped several. None came to my traps, and I failed to kill the only individual seen.

Felis pardus Linnaeus.—Leopards are still uncommon on the concession. They were greatly reduced in past years by native poachers using wire snares. Now, under protection, their numbers are increasing. Tracks were seen on a few occasions.

Felis leo Linnaeus.—Lions are only moderately common in the area. Mr. Vinson killed a large male. Mr. Gose shot a very large female, so large that it was mistaken in the field for a male. Lions occasionally come within less than 1 mile of Zinave.

Felis libyca Forster.—I saw one African wild cat as it dashed across a jeep road before daylight one morning.

Loxodonta africana africana (Blumenbach).—I saw no elephants at Zinave, and the herds do not ordinarily occur in the immediate vicinity of camp during October. Mr. Vinson saw one herd of cows and calves some 10 miles from Zinave. Droppings of elephants litter the ground throughout the concession, and their trails are found everywhere. Tracks, deeply impressed in mud during the last rainy season, were still clear almost a year later. Most yellow fever trees are somewhat damaged by elephants. Baron von Alvensleben estimates that there are 1,500 elephants on his Save River concessions. One lower jaw was saved. Several skulls were seen in the bushveld.

Equus burchellii selousii Pocock.—The bushveld is apparently not optimum habitat for Burchell's zebras. Herds are small and scattered, usually remaining within a relatively small home range. The total number on the two concessions is estimated by Baron von Alvensleben at not more than 800. Eight skulls were collected; one from a lion kill lacks the lower jaws.

Potamochoerus porcus maschona Lonnberg.—The nocturnal bush pigs may be more common than one would judge. I surprised one group of 20 or more on the airplane landing strip, ½ mile from camp, about midnight. The herd was apparently resident in the vicinity, but I saw no trace of it during the day. Three skulls were saved, one a weathered specimen from a predator kill.

Phacochoerus aethiopicus (Pallas).—Warthogs are abundant in the Zinave area. Five or six could usually be seen in an hour's walk around camp, and on longer drives they were equally common. Baron von Alvensleben estimates their number on the concessions at 20,000, and I judge this to be conservative. Skulls of six males and three females were saved.

The taxonomic status of the subspecies of warthogs is uncertain. The typical race, from South Africa, is said to be extinct. Warthogs from southern Mozambique may represent an undescribed subspecies.

Hippopotamus amphibius Linnaeus.—The hippopotamus is common in waterholes and river pools. Approximately 30 lived in the waterhole near camp and their snorting was frequently heard. They emerged from the water only rarely, to walk across the landing strip

and grassland nearby. Baron von Alvensleben estimates the number on the concessions at 250, mostly near Zinave. Few sportsmen care to shoot hippos, and Mr. Vinson rather reluctantly killed our only specimen.

Giraffa camelopardalis (Linnaeus).—Giraffes are very rare on the concessions. None of our party saw any, and only about 40 are thought to be resident in the two Coutadas.

Silvicapra grimmia orbicularis (Peters).—The gray duiker and the oribi are the commonest small antelopes seen in the Zinave area. During the day the duikers remain in the woodland and bushveld, while the oribis are in the open grasslands. Duikers often permit one to approach closely, but when frightened they continue to run until completely lost to view and rarely, if ever, pause to look back. During the day the duikers seem to be solitary, but at night they emerge from cover to feed in the grasslands in small groups. Four flat skins with skulls, one without measurements, and a skull without skin, were saved. Measurements of a male are 927—98—288—122. Measurements of two females are 1019—120—271—117 and 1008—100—286—117.

Raphicerus campestris capricornis Thomas and Schwann.—I saw very few steenboks by day, but at night they were often noted feeding in grassy clearings in the bushveld, and they allowed one to approach closely with the hunting light. At night they could best be distinguished from the common gray duiker by the absence of the tuft of hair on the top of the head. Measurements of a male and a female are 775—0—260—110 and 800—0—223—118.

Ourebia ourebia hastata (Peters).—Orbis are as common as gray duikers in the Save River area, but during the day inhabit grasslands rather than wooded areas. They often permit a close approach and, after dashing off 100 ft or so, stop to look back at the hunter. Two males were saved as flat skins with skulls; measurements available for only one are 1000—85—298—122.

Nesotragus moschatus livingstonianus Kirk.—The tiny Suni antelope is probably fairly common in its preferred habitat. I saw two during the daytime that had apparently been flushed by predators from the dense cover in which they usually occur. They move through the grass in a curious fashion, completing each leap before beginning another and move with a gait very unlike that of antelopes. At night I watched several of them feeding and playing on the bare ground beneath dense trees and vine-hung thickets. The males, at least, are solitary and move slowly and deliberately; I saw no females. Measurements are 624—102—125—80 and 708—97—120—77.

Redunca arundinum arundinum (Boddaert).—Reedbuck is rather rigidly confined to the tall grasses near waterholes. The animals are common and often rather tame, permitting a close approach. It sometimes seemed that every isolated patch of reeds and tall grass sheltered one or more reedbuck. They can hide on occasion and virtually defy detection. In one small patch of reeds, largely dead and broken down, a bird was shot and lost. Several of us made three trips through the cover and on the last trip, after a search so thorough it is hard to see how the bird escaped discovery, a reedbuck broke out and dashed away. Two skulls were saved.

Kobus ellipsiprymnus ellipsiprymnus (Ogilby).—To my thinking the waterbuck is the most handsome of the antelopes. It is common near Zinave, and in the late afternoon one can see numerous herds emerging from the cover of the bushveld and woodland on their way to the river or waterholes to drink. In October some herds consisted only of 30 or more females. Herds consisting entirely of males were smaller, 4 to 12 animals. Some herds were mixed. While herds and small groups were often seen, solitary animals were also common. The odor of the waterbuck is characteristic and lingers in an area for many minutes after an animal has passed. Baron von Alvensleben pointed out that the tsetse fly and other ectoparasites do not afflict the waterbuck. He estimates the waterbuck population on the concessions at more than 8,000. Skulls of three males and two females were saved.

Aepyceros melampus melampus (Lichtenstein).—The impala is the most abundant species of antelope on the concessions. At least 30,000 are resident, and the numbers increase yearly under the protection afforded by Mozambique Safarilandia. The increasing population may soon create a problem. The animals are primarily grassland inhabitants, but readily enter the bushveld or even open woodland. Herds were common within $\frac{1}{4}$ mile of camp. At night they permitted a close approach and were watched as they fed, always on grasses. The skulls of seven males were saved.

Hippotragus niger niger Harris.—Sable antelopes are not common on the concessions, as is true almost everywhere. I saw several small herds and one old, solitary bull with unusually large horns. Other members of the party shot large sable bulls for trophies, but I obtained no specimens.

Alcelaphus lichtensteinii (Peters).—There are probably 1,000 Lichtenstein's hartebeests on the concessions. Most are found on the north side of the river, none within a mile or more of Zinave. Several were shot by members of the party, and several skulls were lost when heavy rains prevented me from retrieving them. The bushveld is not ideal environment for the hartebeest and zebra. These forms prefer the open plains of East Africa.

Connochaetes taurinus taurinus (Burchell).—The immediate vicinity of Zinave seems unsuited to the blue wildebeest, but elsewhere on the concession they are abundant. Baron von Alvensleben estimates the population at 18,000. In the bushveld this species is found in small herds, rarely of more than 30 animals, and often singly. On the open plains of East Africa wildebeests range in larger herds. I saved the skulls of two males and one female.

Tragelaphus scriptus roualeyni (Gray).—Though abundant on the concession, the bushbuck is a shy and elusive animal. Baron von Alvensleben estimates their numbers at 10,000. By day they are rarely seen unless one pushes into the palm thickets and denser woodlands, and even then only sounds of the animals flushing are sometimes heard. At best one may get a brief glimpse. At night they come into the outskirts of the native villages; nightly one passed within yards of the camp dining hall. They are easily watched at night in the beam of a hunting light. One flat skin with skull was saved.

Tragelaphus angasii (Gray).—The nyala is abundant in the Mozambique Safarilandia concessions, and Baron von Alvensleben estimates the population conservatively at 4,000. The species is more prominent and less shy than its smaller cousin, the bushbuck. Males were usually solitary or in small bands of from 2 to 12 individuals. They feed by day, and often I watched small herds of females near camp, apparently oblivious to me when I sat silently with my back against a tree trunk. They are typical bushveld or woodland animals, coming into grassy clearings occasionally at night. I saved the skulls of two males.

Tragelaphus strepsiceros strepsiceros (Pallas).—The kudu is moderately common in the concessions. Several individuals and small herds live within 1 mile of camp. In the extensive open bushveld north of the river, kudu are more common. Males with enormous horns were present here, and one hunter obtained a kudu with horns that measured 72 inches around the curves. Mr. Vinson and the Goses obtained splendid trophies. I saved one skull from a lion kill.

Taurotragus oryx livingstonii Sclater.—Elands are fairly common on the concession lands, mostly north of the river. The population is estimated at 800. All hunters in our party obtained trophy bulls. I saved the skulls of two males and two females.

Syncerus caffer caffer (Sparman).—Baron von Alvensleben estimates the cape buffalo population on his concessions at 3,500. Herds of 40 or more animals were seen, and occasional pairs or single old bulls were noted. One young female was kept as a camp pet and proved affectionate and clever. I saved the skull of a female that had been injured in a native snare.

Lepus europaeus nigrescens Roberts.—The bush hare was the only hare definitely identified. It was common in grasslands and even grassy clearings in woodlands. I obtained

five specimens at night with the aid of a hunting light. Mean measurements of three males are 512—62—111—97; of two females, 530—69—115—97.

Hystrix africae-australis Peters.—Natives hunt the African porcupine for meat, and it has become rare near villages. I saw a few quills scattered through the bushveld, but the only animal taken was shot at night. We were following a large herd of bush pigs when we noted that one of the animals was a porcupine. Whether it was traveling with the pigs is not known. It was a large female measuring 940—130—118—50.

Thrynomys swinderianus (Temminck).—The cane rat is hunted intensively by the natives and has been virtually exterminated near Zinave. I was unable to obtain any specimens. It is found throughout the concession, and Mr. Vinson saw a cane rat in a native trap.

Paraxerus cepapi cepapoides Roberts.—Yellow-footed squirrels were not common in the Zinave area and were inconspicuous. Six specimens of this species were collected, and several others were seen. I also had a brief glimpse of a larger, redder species but was unable to get it. Means for four males are 337—147—45—18. Measurements of a female are 352—169—43—17.

Pedetes capensis (Forster).—The curious springhaas proved rather common in the more open bushveld, and I obtained seven by hunting at night. Near Zinave they are not colonial or social animals, but quite solitary. Each animal seemed to have a rather restricted home range. They did not hesitate to enter wooded areas where the grass and undercover were burned away.

Reference to a subspecies is not possible without comparative material. I suspect that the Save River animals belong to an undescribed race. There is considerable range in individual size in the series, indicating a long breeding season and slow growth. Measurements of an adult male are 800—410—148—71. Means for three large, apparently adult females are 799—416—156—70.

Aethomys chrysophilus chrysophilus (de Winton).—The red veld rat is evidently uncommon. My few specimens were taken in grassland and palm thickets. Means for four males are 325—172—31—21. Measurements of a female are 327—176—31—23.

Mastomys natalensis microdon (Peters).—The multimammate mouse is almost ubiquitous. It comes into huts and houses in the manner of *Mus musculus*, which it apparently replaces in the Save River. It is abundant in open grasslands, where it occurs along with gerbils and other rats. It is common even in forest and thickets. In the tall woodland this is the only mouse trapped. Fifty-four specimens were saved, but over twice that number were discarded. There is considerable variation in size, color and size of the skull of adult animals. Mean measurements for 10 adult males are 240—115—23—19. Means for 10 females are 238—115—23—18.

Mus minutoides marica Thomas.—I took five dwarf mice in grassland and along the edge of a bluff in open woodland. The flesh of this form must be especially soft, for every specimen was greatly damaged by insects. I was able to save only the skull of one animal and was unable to measure the ears of any. Means of 3 males are 97—41—12—?. Measurements of a female are 90—42—13—?.

Pelomys fallax australis Roberts.—Four groove-toothed swamp rats were taken in tall, green grasses by a waterhole and under the cover of low palms. The rats are slightly too large to capture in Museum Special traps, and it is possible that larger specimens escaped. Measurements of two males are 279—143—34—18 and 290—143—34—18. Measurements of two females are 307—147—32—18 and 314—150—34—19.

Lemniscomys griselda calidior (Thomas and Wroughton).—I found the single-striped field mouse to occur only in damp or humid areas where the grasses were green and succulent. Its habits appeared much like those of the American *Sigmodon*. It is not common, and concentrated efforts in suitable habitat yielded only 10 individuals. There was considerable variation in size; young of several sizes were taken in October, indicating an extended breeding season and slow growth. Means for two adult males are 281—149—30—18. Means for two females are 275—137—29—17.

Acomys cahirinus selousi de Winton.—The common spiny mouse is rare near Zinave, but its habitat requirements seem to be broad. It was taken in grasslands, marshy areas, thickets and open woodland. Most specimens were injured by ants and other insects. Means for two males are 162—76—15—?. Means for four females are 159—75—15—13. Two others were so damaged that only the skulls were saved.

Sacostomys campestris campestris Peters.—The cape pouched mouse resembles the American *Onychomys* in appearance but is apparently a vegetarian in food habits. Specimens were taken in grassland and palm thickets and once in woodland. The animals are the most tenacious mice I have ever captured. Most were still alive in the Museum Special traps, though larger mice were killed instantly. The skin and connective tissue are extremely tough. The series includes 12 animals, mostly adults. Means of seven males are 160—41—19—18. Means for three females are 157—46—19—17.

Cricetomys gambianus adventor Thomas and Wroughton.—My only specimen of giant rat was brought to camp by a native who had found it dead. He stated that the rat had been killed by a snake, but this is uncertain. The specimen was somewhat decomposed but was prepared as a skin and skull. Measurements of the rat, a male, are 758—415—75—38.

Tatera afra beirensis Roberts.—Schinz gerbils are nearly as plentiful as multimammate mice near Zinave. They were taken in grassland, woodland, open forest and thickets. Where the ground was dusty or sandy they were especially abundant. Tracks and burrows were abundant in the native villages and in our camp. Literally hundreds were seen in the beam of the hunting light on dark, moonless nights. The rats are slightly too large to take in Museum Special traps, and many were discarded because the traps crushed the skulls. The series saved includes 35 skins with skulls and one skull-only. Mean measurements of 10 large males are 299—162—35—21. Means for 10 large females are 312—169—35—21.

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