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NOTES ON THE SOUTHERN AFRICAN BLACK-TAILED TREE RAT *THALLOMYS PAEDULCUS* (SUNDEVALL, 1846) AND ITS OCCURRENCE IN THE KALAHARI GEMSBOK NATIONAL PARK

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Abstract – Data on the Southern African Black-tailed Tree Rat *Thallomys paedulcus* (Sundevall, 1846) have been gleaned from a literature survey and are augmented by observations during various spells of field-work in the Kalahari Gemsbok National Park since 1960. Measurements of male and female specimens occurring over its entire geographical range are given as are details of its ecology and taxonomy.

Introduction

The study of rodents in the Kalahari Gemsbok National Park (KGNP) has been actively pursued since the inception of scientific surveys in the KGNP by the National Parks Board of Trustees during 1957. A number of species have been dealt with in an introductory manner and some idea of the role played by rodents in the ecology of the Park has been gained. Bolwig (1958) studied aspects of the physiology of the Four-Striped Mouse *Rhabdomys pumilio* while Davis (1958) published notes on the small mammals of the KGNP. De Graaff & Nel (1965) studied the tunnel system of Brants' Karoo Rat *Parotomys brantsii*, while Nel & Nolte (1965) reported on the rodents which form part of the prey of owls in the Park. Nel (1967) discussed the burrow system of the Namaqua Gerbille *Desmodillus auricularis*. Rautenbach (1971) presented the scientific results of a number of consecutive collecting trips to the area while De Graaff (1972) had a look at the ecology of the Damara Mole Rat, *Cryptomys hottentotus damarensis*. Nel (1975) discussed aspects of the social ethology of some Kalahari rodents while Nel & Rautenbach (1975) focussed attention on habitat use and community structure of rodents in the southern Kalahari. Finally, Nel (1978) has reported on habitat heterogeneity and changes in small mammal community structure and resource utilization in the Nossob River Valley along the eastern boundary of the Kalahari Gemsbok National Park.

The Black-tailed Tree Rat *Thallomys paedulcus* which is often encountered in the KGNP has been described by Smithers (1975) as ranking amongst the more attractive rats encountered in southern Africa with its pure white ventral surface and pale-yellowish to greyish-yellow dorsal pelage. In addition, it also portrays two other characteristic features. Firstly, a dark stripe runs between the nose and the eye which often continues onwards as a dark line towards the base of the ear. Secondly, it has a conspicuous dark-coloured or black tail giving rise to its vernacular name. Apart from these characteristics the species is also characterised by relatively short hands and feet while the digits have strongly developed curved claws, an adaptation to its arboreal way of life. It is seen frequently at dusk and at night in stands of *Acacia* trees either in the river-beds of the Auob and the Nossob or in areas within the Park where *Acacia* trees grow abundantly.

The information presented below has been gleaned from a literature survey, augmented by my own observations during various spells of field-work in the KGNP since 1960. This allowed me to capture and handle live specimens. In addition I have also incorporated data taken from skins housed in the Transvaal Museum, Pretoria.

Morphology

External Features

The upper parts may be described as a light grey tending to yellowish-grey. The individual hairs are tipped yellowish-brown and contrasts strongly to the dark slaty colour of the basal portions of the hairs. The fur is soft and well dressed, giving the animal a neat appearance. The black mark on the face, extending from the nose to the eye (surrounding it) and spreading in a more diffuse manner in the direction of the ear is very conspicuous in this species. The chin, throat and entire belly portion is a pure white gradually being replaced by the darker colouration of the upper parts along the flanks. The dorsal surfaces of the hands and feet are a pure white, thickly clad with dense, short hair. The hindfoot is broad, the toes short with the fifth digit well developed and extending beyond the base of the fourth toe. Both hands and feet have strong, short claws. The tail is considerably longer than the length of the head-body (as a rule somewhat less than 140% but exceptions do occur) and relatively well covered with dark to black hairs making the black tail very perceptible. The tail is well ringed which occur closely together. The ears are large and wide open and in life stand away from the head.

The colour in this species can vary geographically, as was documented by Smithers (1971). Thomas (1920) has given the mammary formula as $0 - 2 = 4$ whereas Shortridge (1934) states that the "normal number is 6 $(1 - 2 = 6)$", a figure also given by Roberts (1951).

As far as size is concerned, Table 1 gives an indication of the lengths of the head and body (HB), tail (T), hindfoot (HF) and ear (E) respectively.

Table 1

Measurements of male and female Thallomys paedulcus

		M(mm)	*N*	*Obs. Range*	*C.V.%*
Males:	HB	138	15	124 – 153	5,7
	T	170	14	142 – 210	10,0
	HF	26	15	24 – 28	3,9
	E	24	12	21 – 27	6,1
	Mass:	128 g	–	–	–
Females:	HB	142	33	125 – 157	6,5
	T	166	32	145 – 193	8,0
	HF	25	32	23 – 28	5,6
	E	23	30	20 – 25	8,6
	Mass:	108 g	4	97 – 125 g	9,8

Smithers (1971) records a weight of 81 g for males (N = 5, observed range 64 – 100 g) and 80 g (N = 5, observed range 63 – 91 g) for females in specimens for Botswana.

Skull and Dentition

The skull is *Rattus*-like in overall appearance. Where the frontals meet the parietals on the dorsal surface of the brain case, the area tends to be flattened thereby reducing the slight bulge that the parietals usually make on the top of the brain case. The inter-orbital constriction is fairly well developed while the supra-orbital ridges are moderately marked. The anterior palatine foramina are large (longer than half the length of the diastema) and penetrate between the first two upper molars. The palate is broad and not ridged. The anterior margin of the zygomatic plate is vertical and the dorsal portion is cut back exposing a large antorbital foramen. The zygomatic arches are not robust. The bullae are unusually large, usually more than 6 mm in greatest diameter (Meester, Davis & Coetzee 1964). The external auditory meatus is large. The paroccipital process is small but sturdily built.

The M^1 is a five-rooted tooth with the t7 absent giving it eight cusps in total, with the centre row of cusps prominent. In the M^2 both the t2 and t7 are absent, making it a seven-cusped tooth. The M^3 is smaller than the M^2 but not greatly reduced. The molars make a cusped, angular impression and the teeth are surprisingly small for an animal the size of *Thallomys* which is on average larger than the Namaqua Rock Rat, *Aethomys (Micaelamys) namaquensis*. The upper incisors are smooth, orthodont.

The lower molars have prominent and sharply defined cusps. The terminal heels of M_1 and M_2 are usually obliterated. A row of additional small cusps or small ridges often occur on the labial side of the lower molars as extra elements.

Distribution

The species occurs in the South West Arid and Southern Savanna woodlands, but is absent in the Grassland subzone. It is, therefore, found throughout South West Africa, Botswana, Rhodesia, the extreme north and extreme south of Moçambique, Swaziland and Natal. It is conspicuously absent from the Cape Province south of the Orange River, the Orange Free State and Lesotho.

Ecology

Habitat

In Botswana, it is widely distributed throughout the country from the very driest areas (mean annual rainfall less than 200 mm) to higher rainfall areas with a precipitation of more than 750 mm annually (Smithers 1971). Generally, however, they prefer drier environments, inhabiting *Acacia* trees, and living in crevices in the trunks, under loose strips of bark or in holes in the ground between the roots of the tree. In the Kalahari Gemsbok National Park where I have trapped this species, it occurs in both *Acacia erioloba* and *A. reficiens*. According to Shortridge (1934) they inhabit acacia, wild fig and more seldomly mopane trees in the Kaokoveld in South West Africa, while Van Rooyen (1956) reports them as frequenting "cabbage trees" (presumably *Cussonia* sp).

It has also been recorded that they occasionally nest in large specimens of *Aloe* (e.g. specimen No. 6122 in the Transvaal Museum) sometimes staining their pelages with the pollen and nectar of the flowers (information from specimen card for specimen No. 7220).

Smithers (1971) has pointed out that there is a distinct difference in the length of the hair and general weight of the pelage between those specimens in Botswana collected from warmer and wetter as opposed to colder and drier months of the year. In the former (November to April) the pelage is longer and woollier with a dense undercoat.

Diet

They feed largely on *Acacia* seeds, and other vegetable matter like young *Acacia* leaflets, but may infrequently also take insects or meat. Other items on the menu may include ". . . 'wacht-en-bietjie' berries, probably 'gemsbok' roots and the gum of thorn trees" (Bradfield, in Shortridge 1934). Smithers (1971) gives more specific information by stating that they also take the outer green coating of *Acacia tortilis* pods, or the coating itself when dry. They are also partial to young leaves of the Witgat, *Boschia albitrunca* as well as to the green outer coating of the Buffalo-thorn *Ziziphus mucronata*. In the KGNP they take young pods of *Acacia erioloba*.

According to Bradfield (in Shortridge 1934) they do not go to water to drink. This is certainly true for some populations occurring in the north of the KGNP where certain resident populations are at least some five kilometres removed from the nearest open and/or available water.

They are shy animals and are not easily flushed from their abodes (creeks, crevices, hollows, etc. in tree trunks) by day. They are predominantly nocturnal and emerge at dusk to run about the branches with great agility, in search of something to eat. Certain horizontal branches in particular trees are used as regular highways *en route* to lower lying branches where they forage.

These arboreal rats live in small communities, usually consisting of a pair of adult animals with their latest off-spring and other progeny in various stages of immaturity. The entrances to the creeks or crevices where they hide during the day are devoid of accumulated debris with the exception of the tell-tale evidence of faeces which is scattered around the bases of tree trunks where they find refuge.

Shortridge (1934) states that they are inquisitive and that they will peek out of their hollows if the tree trunk is tapped. In order to collect them, they may then be shot or they may be smoked out of their dwellings. I have tried the latter procedure but cannot claim it to be very effective. Smithers (1971) speaks of similar experience: they are reluctant to leave the shelters and they perish in the blaze rather than leave it. I have been fairly successful by trapping them in Sherman collapsible traps placed on horizontal branches, baited with a mixture of peanut butter and oats and affixed to the branch by means of masking tape.

Where these rats occur, conspicuous masses of interlaced twigs, boughs and branches may be observed. These large, untidy "nests" are built in the upper strata of *Acacia* trees to form a very perceptible structure near the outer branches of trees, especially during the winter months when trees are devoid of their usual leaf load. From a distance, they may be mistaken for the nests of Buffalo weavers, *Bubalornis albirostris niger,* although these structures hardly attain the size and extent of the nests built by the birds. The amount of material could possibly fill a normal-sized wheelbarrow. Shortridge (1934) points out that these structures are not nests in the true sense of the word and that they are not occupied by day. This has been my experience as well and these structures may serve as playgrounds or shelters while roaming about at night. Some populations (e.g. in Ovamboland), are not prone to constructing these large, conspicuous conglomerates while Smithers (1971) has not come across them in Botswana and he even questions the fact whether *Thallomys* builds these structures themselves. The actual nests consist of sticks and grass which are collected and compacted in hollow tree trunks, some 3 to 4 metres above the ground (Van Rooyen 1956). Smithers (1971) also points out that they will use holes in the tree trunks of the witgat *Boschia albitrunca,* the leadwood *Combretum imberbe* and the mopani *Colophospermum mopane* for this purpose.

Near Upington and vicinity they inhabit the stunted *Acacia* belt alongside the Orange River and this belt is often partly submerged when the

river is in flood forcing them to exist for days on end among the upper branches of the trees (Shortridge 1934).

Parasites

According to Zumpt (1961), the following mites are known to be associated with the Black-tailed Rat:

Laelaptidae	*Androlaelaps marshalli* Berlese
Listrophoridae	*Listrophoroides mastomys* Radford

The flies and fleas that have been taken off this rat include the following species and have been listed by Zumpt (1966):

Calliphoridae	*Cordylobia anthropophaga* (Blanchard)
Pulicidae	*Echidnophaga gallinatea* (Westwood)
	Parapulex echinatus Smit
	Xenopsylla cheopis (Rothschild)
	X. philoxera Hopkins
	X. versuta Jordan
	X. brasiliensis (Baker)
	X. graingeri Smit
	X. robertsi Jordan
	X. zumptii Haeslbarth
Hystrichopsyllidae	*Dinopsyllus ellobius* (Rothschild)
	D. lypusus Jordan & Rothschild
	Listropsylla aricinae De Meillon
	L. dorippae (Rothschild)
	L. prominens Jordan
Chiastopsyllidae	*Chiastopsylla rossi* (Waterson)

Theiler (1962) has listed the occurrence of the following species to tick:

Haemaphysalis leachii leachii (immatures)
H. l. mühsami (immatures)

The helminths are also poorly known. Collins (1972) refers to *Inermicapsifer madagascariensis* (Davaine), a common rodent cestode which occurs as an endoparasite in this rat.

Predators

No information available apart from the fact that they may be taken by owls.

Reproduction

In South West Africa gravid females have been taken at Gobabis between the months of September and December while another was taken near Kovares in April (Shortridge 1934). This tallies with observations recorded by Smithers (1971) that gravid females were collected during

the months October, February, March and April and that they appear to drop their young from October through to May.

According to Wahlberg, who collected the type specimen, the female carries her young when running or climbing attached to her nipples. A simmilar observation has been made on specimen No. 3885 in the Transvaal Museum.

Prehistory

A maxillary fragment, a mandibular fragment and an isolated $M_{\overline{1}}$ of *Thallomys cf. paedulcus* was identified from fossiliferous breccia collected at the Cave of Hearths in the Makapansgat Valley (De Graaff 1960). It was also reported among the mammalian microfauna collected at Kromdraai by Draper in 1895 (De Graaff 1961). A fossil species, *Thallomys debruyni* was reported from the Taung deposit (Broom 1948) which had yielded the juvenile australopithecine *Australopithecus africanus* some 23 years earlier.

Taxonomy

This species was first collected by the Swedish explorer Wahlberg in South Africa and the locality was given as "In Caffraria interiore, prope tropicum". The type specimen, described as *Mus paedulcus* by Sundevall in 1846, is housed in the Stockholm Museum, Sweden.

During the 19th Century *Mus paedulcus* was gradually accepted as a representative of the genus *Rattus* and interpreted accordingly. The genus *Thallomys* was separated from the genus *Rattus* by Thomas in 1920 on account of differences which, *inter alia,* could be demonstrated in the morphology of the molars. The differences include a greater complexity and angularity of the molars than is usual in *Rattus* as well as certain external specializations towards arboreal life which prompted Thomas to elevate the group to generic rank. Whether these arguments distinguishes the genus from all forms of *Rattus,* is a matter of doubt and Ellerman (1941) has pointed out that the genus has been retained mostly for convenience.

After Thomas has separated this genus from *Rattus* in 1920, Ellerman (1941) retained it as a separate genus. As the type species Ellerman selected *Mus nigricauda* described by Thomas in 1882, a specimen collected at the Hou(n)top River in Great Namaqualand, South West Africa. He furthermore divided the genus into two groups which he called the *nigricauda* Group and the *namaquensis* Group respectively. The former contained the species *nigricauda, damarensis, moggi* and *paedulcus* as species (together with subspecies equalling some 17 named forms) while the latter group contained the *namaquensis* species (a total of 13 named forms). It will be recalled that (i) the *namaquensis* group was referred to the genus *Aethomys* by Thomas after originally placing it in *Praomys,* and (ii) that *namaquensis* is today accepted as a full species of the genus *Aethomys.* However, Ellerman (1941) retained it under *Thallomys.* A note by Roberts in Shortridge (1934) states that if the *namaquensis*

group is not to be referred to *Praomys* it can neither be referred to *Aethomys* — on account of the heavier molar structure as well as features of the hindfoot and tail and that the matter should be looked into again.

In 1951, however, Roberts interpreted the *namaquensis* group as a full species of *Aethomys* (together with *selindensis* and *chrysophilus*) while *Thallomys* contained *nigricauda, shortridgei, damarensis* and *moggi* as species.

In 1953 Ellerman, Morrison-Scott and Hayman pointed out that a syntype skull of *Rattus paedulcus* Sundevall existed in the British Museum whose name was hitherto not certainly identified. The syntype skin bears no measurements, but the skull has the unusually large bullae characteristic of *Thallomys* while the shape of the hindfoot with its relatively long fifth tow ". . . enables us to suggest that *paedulcus* is in reality the prior name for the group to which *nigricauda, damarensis* and *moggi*, all here considered conspecific, belong." Consequently, these animals were interpreted as *Rattus (Aethomys) paedulcus* in the systematic section which followed in Ellerman *et al.* (1953), and interpreting *paedulcus* as the senior name in contrast to *nigricauda* has been followed subsequent to 1953.

In 1964 Meester *et al.* interpreted *Thallomys* as a genus in its own right and accepted *paedulcus* as the only species. Meester *et al.* (1964) consequently uphold the following as acceptable subspecies:

Thallomys paedulcus paedulcus (south eastern Botswana, southern Moçambique, Swaziland and Zululand); *T.p. nigricauda* (South West Africa, south western Kalahari); *T.p. shortrigei* (vicinity of Upington) and *T.p. damarensis* (along the Zambesi River, Rhodesia, Ngamiland, the Caprivi and northern South West Africa). *T.p. paedulcus* is taken to include *moggi, acaciae, lebombonsis* and perhaps *molopoensis. T.p. nigricauda* includes *kalaharicus, leuconoë, bradfieldi (=robertsi)* and *davisi. T.p. damarensis* includes *ruddi* (= *Thamnomys (Grammomys) ruddi* Thomas Wroughton 1908), *herero, stevensoni* and *zambesiana.* Van Rooyen (1956) made a taxonomic study of the genus in southern Africa and regarded *shortridgei* of the Orange River as well marked distinct form. Misonne (1971) includes all the southern African forms named above as well as *loringi, nitela, quissame, rhodesiae, scotti* and *somalensis* from elsewhere in Africa under *Thallomys paedulcus.*

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