ON THE TUNNEL SYSTEM OF BRANTS' KARROO RAT, **PAROTOMYS BRANTSI** IN THE KALAHARI GEMSBOK NATIONAL PARK

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INTRODUCTION

Our knowledge concerning the ecology of Southern African rodents is meagre, in contrast to what is known of their taxonomy and distribution. Certain ecological particulars are known pertaining to a number of species, but in the majority of cases the animals were observed under laboratory conditions. The Kalahari National Gemsbok Park is an ideal outdoor laboratory where the behaviour of rodents can be studied under natural conditions. It was felt that attention could profitably be focussed on *Parotomys brantsi* (Muridae, Otomyinae) occurring in vast numbers mainly in the southern portion of the Park.

Although it is one of a number of murid species known to tunnel, no relevant information has hitherto been available about its tunnel systems. In the present paper the structure of the tunnel system of Brants' Karroo rat will be discussed, as observed during a visit to the Park in December 1963. In view of the fact that *P. brantsi* is virtually the dominant rodent in some parts of the Park, this work may eventually be of value when the overall influence of this species on its physical environment, as well as its biological role in the ecosystem, is to be assessed.

P. brantsi is widely distributed throughout the central, western and northern Cape Province (Karroo and southern Kalahari), also occurring in southern South West Africa (Davis, 1962, Meester, 1964). These areas are included in the South West Arid biotic zone by Davis. This zone lies in the under 20" rainfall area and is divided across the middle by the Orange River. It contains within it the western and southern portions of the Great Escarpment (Davis, 1962).

Opinions differ concerning the taxonomy of the species, especially at subspecific level. Roberts (1951) recognizes five subspecies, Ellerman *et. al.* (1953) accept no subspecies, while Meester (1964) lists four subspecies, of which *Parotomys brantsi deserti* is most probably the form encountered in the Park.

Three tunnel systems of *Parotomys brantsi* and two of the gerbil *Gerbillus paeba,* all in the vicinity of Twee Rivieren, are analysed.

Method

P. brantsi lives in colonies varying in size and extent. The tunnel systems chosen were isolated from other neighbouring systems, and not too extensive in size (extending roughly over an area of 14' x 20').

The selected systems were delimited in a form of a rectangle by means of markers. All entrances were plugged with grass tufts in order to trap all possible inhabitants within the tunnel system. Proceeding from a specific entrance the tunnel was opened up by means of a spade removing the bulk of the soil above it. Track was kept of the direction of the tunnel by careful manual excavation. Dichotomies were marked and these side tunnels were then subsequently followed up. The tunnel system was mapped on a grid during the course of the excavation.

Discussion

P. brantsi tends to congregate in colonies inhabiting intricate and extensive tunnel systems. These burrows are found in the soft, deep, sandy soil of the dune-streets, and also on the sides of the dunes themselves, although practically never on the crests of the dunes. No colonies were found to inhabit the beds of the Nossob and Auob Rivers or their hard calcrete banks. The mode of constructing the tunnels was not observed.

The number of entrances varied between 13 and 21 in the three systems analysed, of which only some openings were constantly in use, others being partly collapsed and showing signs of disuse. The entrances occur either on open ground or frequently under shrubs such as the driedoring, *Rhigozum trichotomum.* In the latter case, the roots bore little sign of gnawing. All the entrances show flattened elevations being the excavated soil which is usually scattered during the course of time.

The systems were all longer than broad, thus portraying an elongate configuration (figs. 1, 2 and 3). The tunnels are more or less circular, with an average diameter of 80 mm., although occasionally a sudden widening occurs (A in figs. 1 and 3). As can be seen from the figures, the tunnels run in haphazard directions. Frequently blind alleys are formed (B and C in figs. 1, 2 and 3), the purpose of which is unknown. Other blind alleys, however, are definitely used as defaecating chambers (B in fig. 3).

The depth of the tunnels below the surface varied considerably. Even a specific tunnel does not always maintain the same horizontal level. The deepest tunnel encountered was approximately 30" below the surface of the soil.

A nest was found in one system only. The nest chamber was rounded with a number of tunnels radiating from it, one leading obliquely to the surface in a straight line (entrance no. 21, in fig. 3). Some of these tunnels were littered with nesting material and faecal pellets.

The average diameter of the chamber was approximately 10" and it was situated 12" below the surface. The nest itself weighted 190 grams and was loosely constructed from the following plant material:

Graminae: *Schmidtia bulbosa* (Kalahari sandweek), *Aristida uniplumis* (blinkhaargras).

Bignoniaceae: *Rhigozum trichotomum* (driedoring).

Acanthaceae: *Monechma incanum* (bloubos).

Compositae: *Helichrysum* sp., *Pteronia mucronata.*

The nesting material was mostly finely shredded, although larger pieces, e.g. roots of the driedoring were also used. Faecal pellets also occured in the nest itself.

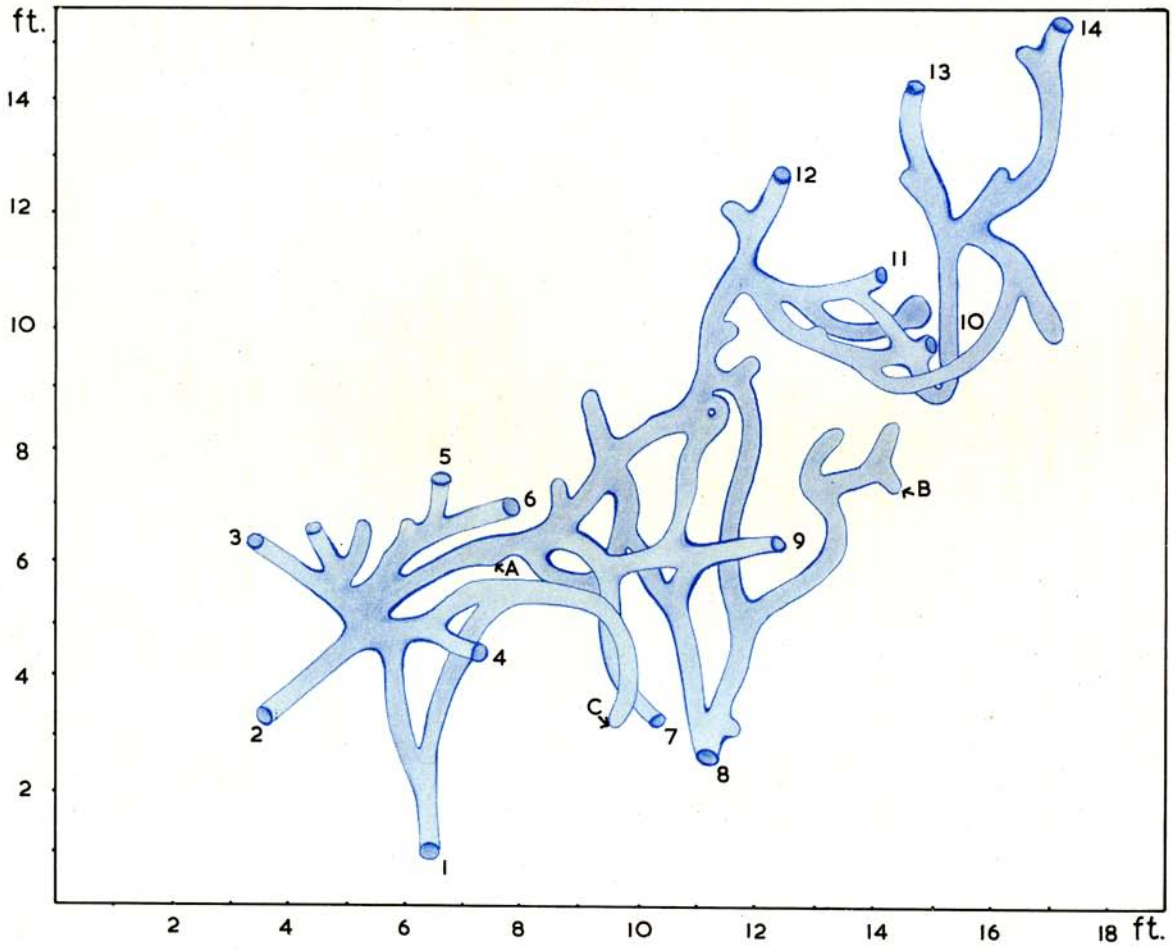
The number of inmates per tunnel system is unknown, although two individuals were observed in one case. No information is available on the number of young, gestation period or population structure of this species.

The associated fauna found in the tunnels contain both vertebrates and invertebrates: the lacertid *Mabuya striata,* the scorpions *Opisthopthalmus pictus, O.wahlbergi, O.carinatus, Parabuthus granulatus* and a number of beetles (Coleoptera of which the predaceous ground beetles (*Anthia* sp.) proved to be the most common. It is interesting to note that one *Parotomys,* having been cornered in a sealed-off tunnel, ran to and fro over a scorpion without provoking any aggresive behaviour on the part of the arachnid

The temperatures prevailing in the tunnels were not determined, nor the relative humidity. Bolwig (1958) gives figures of 28°C to 31°C in summer, and it is expected to be rather less in winter. It can be inferred that the temperature of the deeper tunnels remains fairly constant. The humidity recorded by Bolwig in *Parotomys* warrens was up to 95% R.H. (in May) although, as he points out, the true figure may be slightly lower, but definitely well above 50% R.H. The poor air circulation in the tunnels is thought to account for this high figure.

For comparative purposes two tunnel systems of *Gerbillus paeba* were also excavated (figs. 4 and 5). These were situated in the hard, consolidated silt of the Nossob River at Twee Rivieren. These tunnel systems revealed some

Fig. 1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A
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Fig. 2

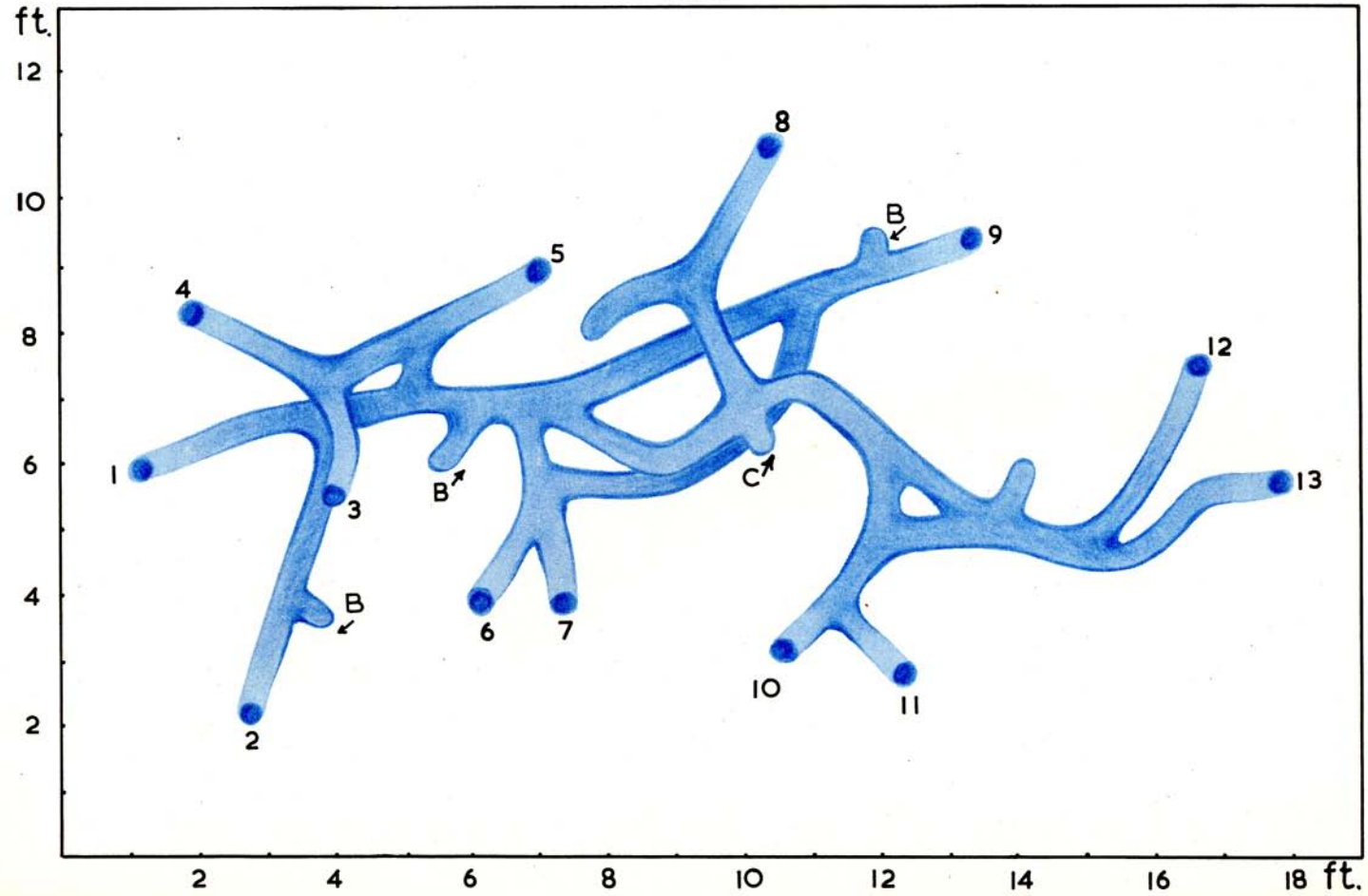

Fig. 3

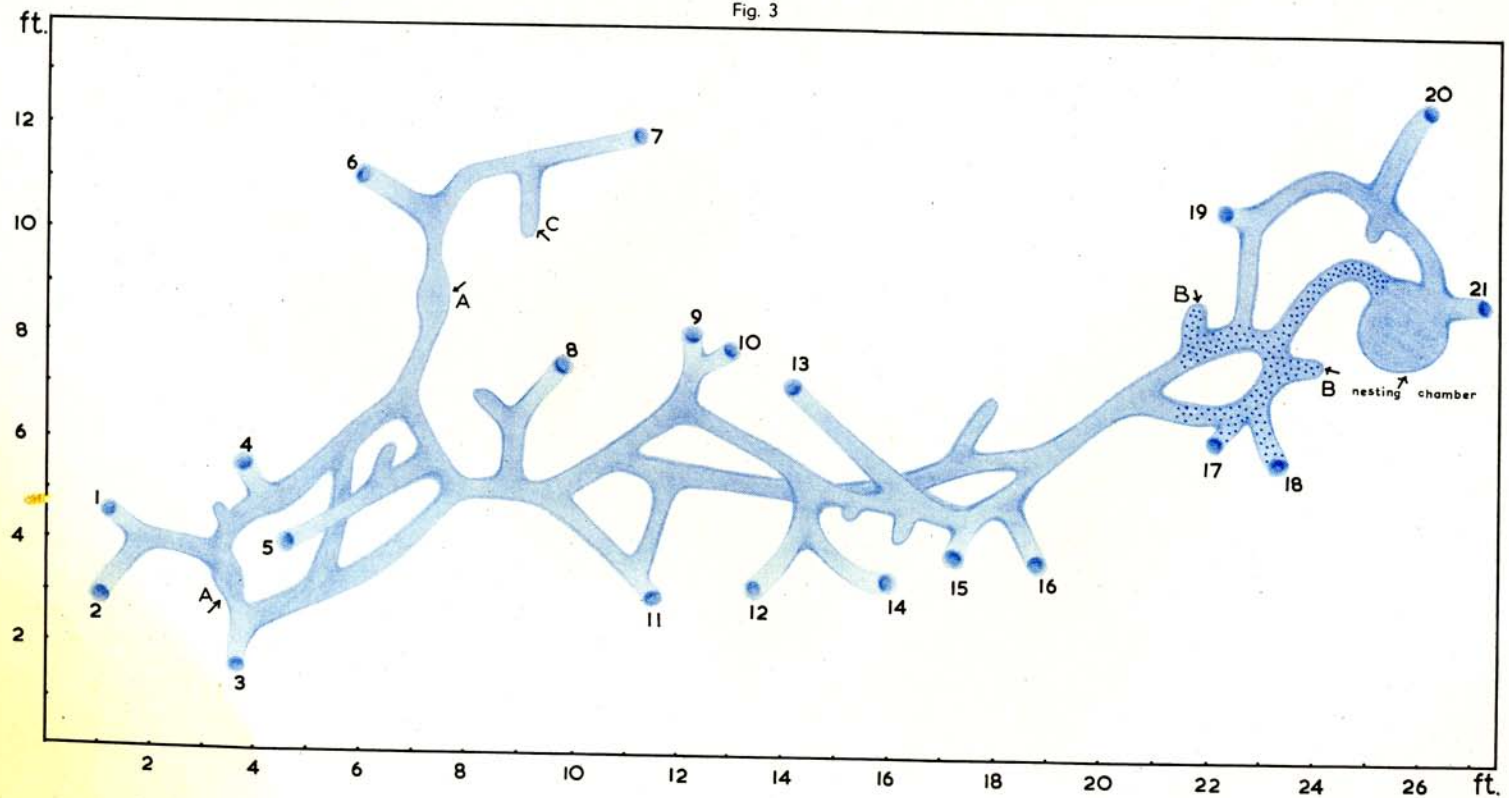
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Fig. 4

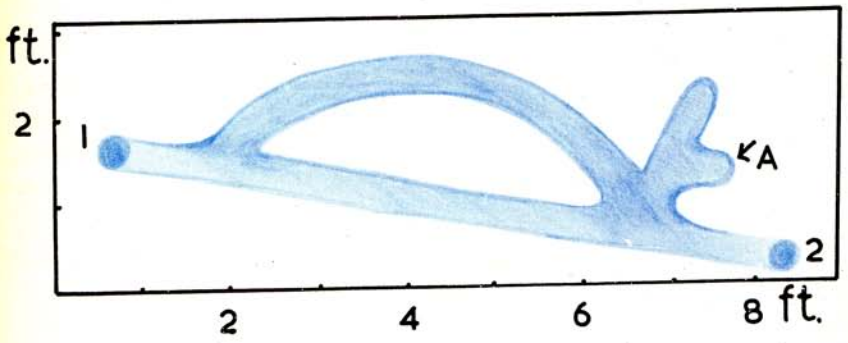
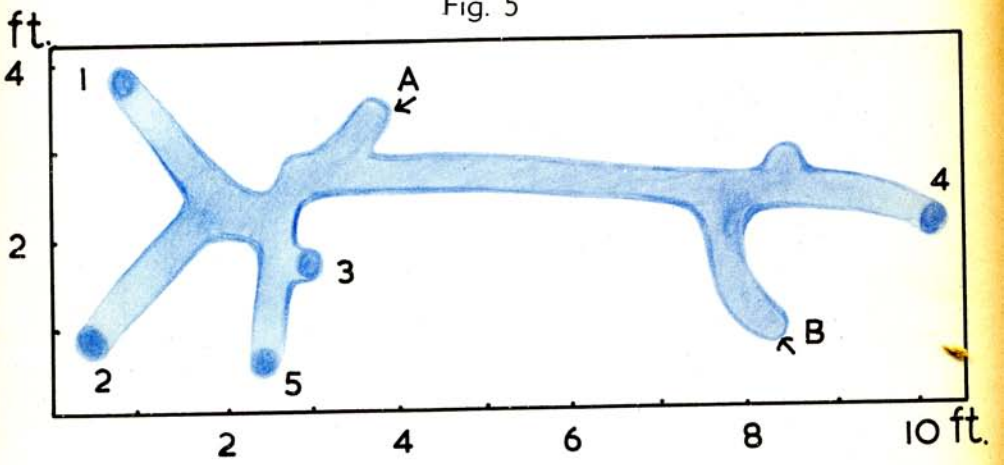


Fig. 5



interesting differences to those of *Parotomys*. The systems are very much less extensive and rather elementary, with fewer entrances. The tunnels are smaller in diameter, averaging about 30 to 40 mm. Blind tunnels also occur, though they are fewer in number, and no nests were found. The tunnels run about 6 " to 9" below the surface, their depth being more constant than those of the *Parotomys* systems.

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