Radio tracking of problem Fruit bats *(Rousettus aegyptiacus)* in the Transvaal with notes on flight and energetics

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Abstract

Radio tracking was used to locate a cave in which Egyptian fruit bats roosted after nightly feeding visits to litchi orchards in the Trichardtsdal/Ofcolaco area of the northeastern Transvaal. This paper reports on results of this technique and discusses its shortfalls.

Introduction

The Egyptian fruit bat *Rousettus aegyptiacus* is one of four fruit bat species found in South Africa (Smithers 1983). In view of the possible economic impact of their depredations in litchi orchards in the Transvaal Lowveld the Transvaal Nature Conservation Division investigated possible methods of controlling the bats (Jacobsen and du Plessis 1986). Before any control measures could be applied it was necessary to study certain aspects of the behaviour and ecology of the bats (Jacobsen and du Plessis 1976). The object of this study was to locate the cave or caves in which the bats roosted by day.

In order to observe movements a number of bats were marked by tattooing or ear tagging, (Jacobsen and du Plessis 1976).

This did not however lead to the discovery of the roost cave and it was decided to attempt radio tracking. The study was carried out in the Transvaal Drakensberg and adjoining lowveld in the vicinity of Trichardtsdal, (see Figure).

Material and methods

Bats were caught in mist nets in the litchi orchards during the early evening. This allowed for the animals to be released after attachment of the radio transmitters while there was still time for them to feed.

The transmitters used (SM 1, AVM Instrument Co.) had a mass of 0.5 g and were powered by Mallory Rm630 T2 1.35 volt batteries. A steel 0.045 mm diameter (26 gauge) guitar string antenna 44 cm long (¼ wave length) was attached and the whole package sealed with beeswax and dental acrylic to make it waterproof.

The complete package had a mass of 8–10 g, about 10 % of the body mass of an adult *Rousettus aegyptiacus*. The transmitters emitted pulsing signals at a frequency of 148 MHz.

Transmitters were attached to the fur on the back between the bats shoulder blades using Dow Corning Silastic glue. Transmitters were initially held in place for an hour until the glue had hardened sufficiently. The bats were then released in the orchard and monitored while feeding.

Two vehicles were fitted with dual four element yagi antennae connected to model LA 12 receivers (AVM Instrument Co.) and positioned on the highest points in the vicinity. Bearings were taken at five minute intervals by observers in each vehicle so that triangulation was possible. Continuous radio contact was maintained between tracking vehicles and the base camp. Once the bats moved into the

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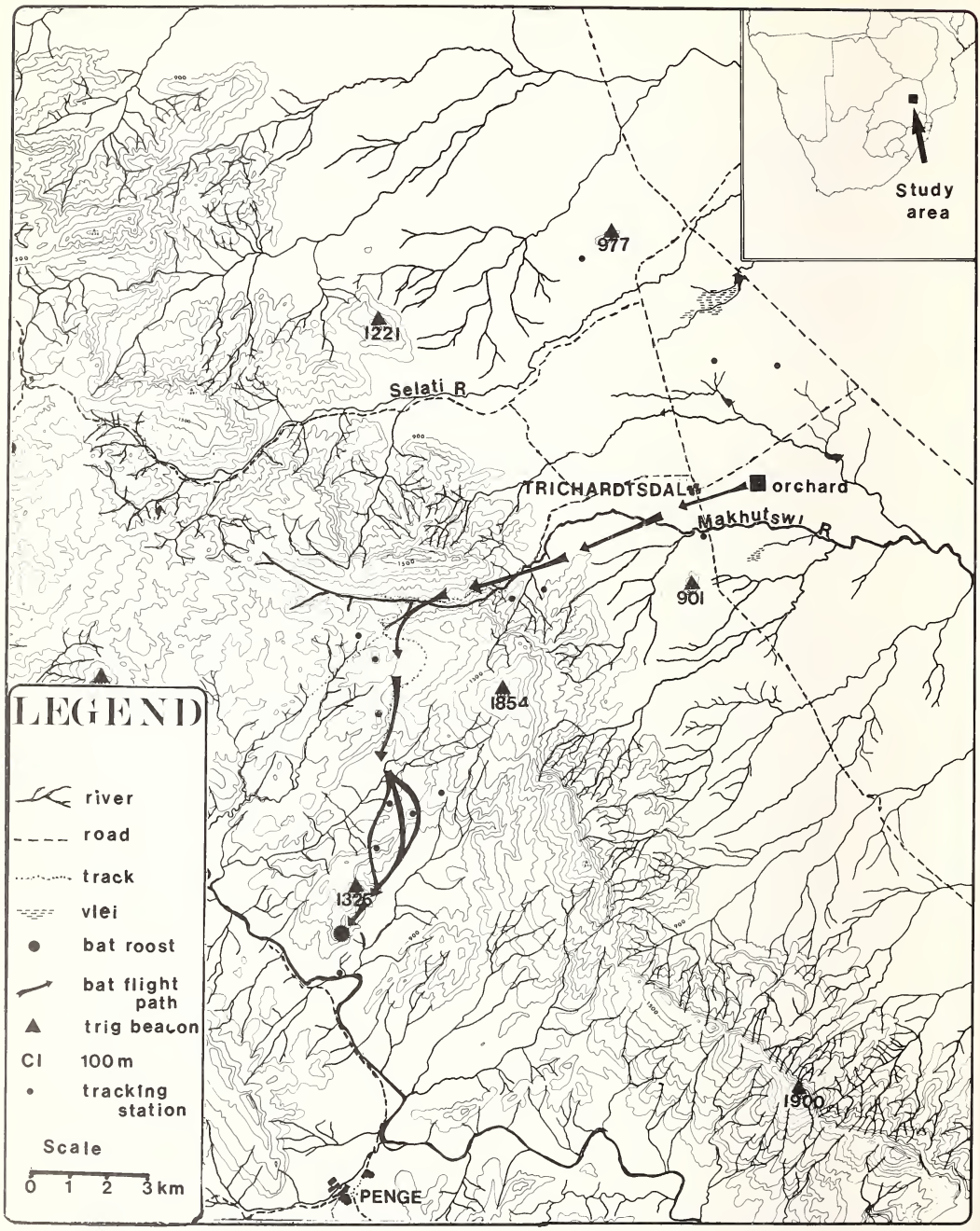

Map of the study area showing the flight path of the fruit bats from the orchards to the roost cave

mountains tracking was continued on foot, using three and four element hand held yagi antennae. Bearings were taken using prismatic compasses.

To assist the trackers in following the bats plastic "Cyalume" cylinders (Cyanamid) which emitted a greenish white light were attached to several bats which did not carry radio transmitters. These were released at intervals during the night and assisted in determining the route followed by the bats.

Results

The bats were tracked up the Makhutswi river valley and across a saddle to a cave on the farm Ostend above the Olifants river approximately 8 km from Penge, (Fig. 1).

This was 24 km, as the bats flew, from the orchards and at an elevation of 1300 m, 640 m higher than the orchards. The cave was 8 m deep and 5–6 m high with an entrance 3 m high and 4 m across.

About 2000 fruit bats roosted in the cave, in pockets in the rock and along faults in the roof, or under overhanging and slanting rocks projecting from the walls.

Bats flying from the cave to the orchard took 1 hour 29 minutes to complete the journey. This is an average speed of 16.2 km/h which agrees with flight speeds of 4,4 m/s (15,8 km/h) obtained for fruit bats under experimental conditions by Kulzer (1969). The return journey appeared to be faster although the bats were gaining altitude. After leaving the orchard it took from 56 minutes to 1 hour 23 minutes for bats to reach the cave. A flight speed of between 15 and 25 km/h.

Discussion

Transmitters were attached to eleven bats. Five during December 1976 and six during 1977. The initial five were not successful as the bats were captured at the end of the litchi season and on the last day of tracking did not return to the orchard. Although at this stage the trackers were within 4 km of the cave they were effectively out of line of sight.

During 1977 tracking stations were initially placed higher up the valley. This resulted in the roost cave being located after the trackers had positioned themselves in the Olifants river valley south-west of the cave and 700 m below the entrance.

Only three of the transmitters attached to the bats during 1977 functioned well. One bat was apparently adversely affected by the attached transmitter and could not fly properly. It rested frequently in trees between the orchard and the cave and was eventually lost. One transmitter although working when the bat was released in the orchard was not heard subsequently. Of the remainders one stayed on a bat for four days and three others for three days each.

Although considerable care was taken in attaching the transmitters it still appeared that the technique was imperfect and transmitters would not have remained on the animals for longer than a week.

Energetically it was easier for the bats to fly from the cave to the orchards situated at 640 m lower altitude. It is likely that the bats are low on blood sugar at this time and the siting of the cave could be important in this respect. From captive studies it is known that starvation over a period of 24–36 hours can cause the death of bats (Westhuyzen 1978). Blood glucose levels drop from 140 mg/100 ml at the end of a feeding period (04h30) to 80.5 mg/100 ml at 18h00. Further fasting beyond the normal time of onset of feeding caused blood glucose to drop steeply to 28 mg/100 ml (Westhuyzen 1978). One bat however survived over night with a blood glucose level between 19 and 21 mg/100 ml. On the return flight the bats may be expected to have high blood sugar levels following feeding. They were seen to follow the contours as far as possible maintaining an altitude of 25 to 30 m. On reaching the top of the escarpment they had a short level flight to the cave.

Flight times between roost and feeding areas allowed the bats to commence feeding at approximately 20h30 and to leave the orchards again between 03h00 and 04h00. The cave roost therefore provides an environment with a relatively stable temperature and humidity as well as being safe from predators. Caves are of obvious importance in the survival of fruit bats but must be situated close enough to suitable food sources to make the nightly return journey possible.

In conclusion, although labour intensive, this study showed that radio tracking was a successful method of locating the bat roost. In the rugged terrain of the Transvaal Drakensberg it is likely that any other technique would have been even more time consuming. Once the roost site had been located trial control measures were attempted.

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Zusammenfassung

Radio-Ortung von schadenanrichtenden Flughunden (Rousettus aegyptiacus) in Transvaal mit Anmerkungen über Flug und Energiehaushalt

Radio-Ortung wurde zur Auffindung einer von Nilflughunden benutzten Höhle gebraucht, in die sie nach nächtlichem Fressen in Litschi Obstgärten in der Trichardtsdal/Ofcolaco-Region des nordöstlichen Transvaal zurückflogen. Die Arbeit berichtet über die Ergebnisse dieses Verfahrens und diskutiert seine Schwächen.

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