Short Communications

Infanticide in the tree squirrel, *Paraxerus cepapi*

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Male aggressive behaviour towards juveniles in a family group of tree squirrels, *Paraxerus cepapi* is described. Infanticide and subsequent sexual activity by the male leads to the conclusion that this is how a new male member in a group can increase his reproductive output.

Aggressiewe gedrag deur 'n manlike boomeekhoring *Paraxerus cepapi*, teenoor onvolwassenes in 'n familiegroep word beskryf. Die doodmaak van onvolwassenes en die daaropvolgende seksuele aktiwiteit van die mannetjie lei tot die gevolgtrekking dat dit 'n manier is waardeur 'n nuwe manlike lid in 'n groep sy voortplantingsukses kan verhoog.

Observations on a tree squirrel group, *Paraxerus cepapi*, at Shingwedzi in the Kruger National Park, South Africa, yielded interesting new information on infanticide and reproduction that does not concur with published data on these animals. The group comprised an adult male and female, two subadults and three juveniles. The adult male could be distinguished by the descended testes, clearly visible in the scrotum, whereas the adult female had prominent pectoral mammae and a lighter colour than the male. Observations were carried out from 17h30 one afternoon until sunset at 19h00, from sunrise to sunset the following day and until 07h10, an hour after sunrise on the third day during May 1985.

Attention was drawn to this family group of squirrels when a high-pitched alarm call was heard in the late afternoon. Upon investigation it was noted that one of the juvenile members was being attacked by an adult male. The female intervened but was unsuccessful in chasing off the male. After the attack the female urged the injured juvenile to move on by itself but when it did not respond, she carried it to the base of the tree in which the nest was situated. She then attended to the juvenile's injuries until it was dark, when she abandoned it. Lack of movement indicated that the juvenile died shortly afterwards. This was confirmed on closer examination.

The next morning, the female retrieved two other juveniles from where they were hidden in another tree and took them back to the nest. The group started foraging soon afterwards but the juveniles stayed on the branches around the nest opening, with the female remaining in close attendance. Some time was spent on mutual grooming and playing by the female, the two subadults and the juveniles.

The two subadults were from an earlier litter by the female and were estimated to be 5 – 6 months old. Juvenile age was estimated at 28 days according to tooth eruption and replacement (Viljoen 1976).

After one and a half hours the male again approached the group and attacked one of the juveniles, throwing it down from the tree. He followed it to the ground and killed it within 3 min by repeatedly biting it on the head. The female tried to intervene but without success. Two hours later the male attacked the third juvenile and killed it in a similar fashion. The female aggressively chased the male from this juvenile when it was injured and attempted to hide it in another tree before it died. Later all three juveniles were collected for close examination and measurements (Table 1). Neither during nor after these attacks did the two subadults pay any attention to the injured/dead juveniles, nor did the male pay any attention to the subadults.

Table 1 Measurements of juveniles killed by the male. Age determination was done by tooth eruption, following Viljoen (1976)

				Measurements (mm)			
No	Sex	Age (days)	Mass (g)	Head-body	Tail	Hindfoot	Ear
1	♀	28	63	128	111	28	13
2	♂	28	58	120	118	30	13
3	♂	28	55	120	113	30	13

The remainder of the family group spent the rest of the day foraging together. During the course of the day, the male repeatedly tried to copulate with the female but the latter did not cooperate and turned to chase him over short distances. About an hour after sunrise the next morning, members of the group appeared from their nest and continued with their daily activities.

The present observations indicate that annual reproductive cycles of tree squirrels could differ at Shingwedzi compared to that recorded for the central Transvaal by Viljoen (1975) where it was found that females only had one litter per annum, usually in November, and were in anoestrus during winter. Only under favourable conditions could females become polyoestrus. Furthermore, males showed testicular regression commencing at the end of January and regeneration again from June (Viljoen 1975). In contrast, in the present study the female had had two litters in short succession where only single litters per year have been recorded for tree squirrels in the wild. Judging from the age of the offspring the first litter had been born in November – December 1984 and the second during April 1985. The male had descended testes and showed marked sexual activity in May. His attempts to mate with the anoestrus female immediately after he had killed all three juveniles are evidence for aberrant behaviour. The female was considered not to be in oestrus since she did not respond to his mating attempts, her vulva was not red and swollen and no oestrus vocalization calls were uttered as described by Viljoen (1977).

The warm climate and abundant food resources in the study area may account for these differences in squirrel reproductive cycles, where spring and autumn litters were recorded, when compared to spring breeding as recorded in the central Transvaal by Viljoen (1975).

These observations contrast strongly with the normal situation of parental behaviour by both sexes, but more so by the male, as was reported by Viljoen (1975). Male aggression is usually directed towards maintaining a territory. Such

overt aggression by a male tree squirrel towards juveniles has not been reported before. However, similar incidents have been reported for Arctic ground squirrels, *Spermophilus parryii*, in which immigrant males sometimes killed young while establishing residence in a new area (McLean 1983). Infanticide in the Columbian ground squirrel (*Spermophilus columbianus*) was reported by Balfour (1983) and Waterman (1984).

Unless it is concluded that the male tree squirrel was showing aberrant behaviour it must be presumed that he was gaining an advantage by killing the juveniles. Since the start of observations this male accompanied the family group and did share the same nest at night although the juveniles were then hidden in a tree 30 m away by the female. The assumption is made that the previous male in the group had been replaced by the present male. As a new member of the family group, a male can raise the inclusive fitness (Hamilton 1964) by killing unrelated juveniles. Although infanticide probably occurs at low frequencies, the validity of this hypothesis needs to be tested by further study.

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Recent records of megalopae of the crab *Varuna litterata* (Fabr.) entering Natal estuaries

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An unusual occurrence involving the stranding of many thousands of megalopae of the crab *Varuna litterata* on an outgoing tide is recorded. The locality was sandflats adjacent to the mouth of the Mgobezeleni estuary at Sodwana Bay, Natal, in mid-May 1985. Other records of recent local sightings are included.

'n Buitengewone gebeurtenis, waarby die stranding van duisende megalopae van die krap *Varuna litterata* deur die uitgaande gety betrokke was, word aangeteken. Die lokaliteit was die sandvlaktes aangrensend aan die mondingvan die Mgobezeleni getyrivier by Sodwanabaai in Natal, in die middel van Mei 1985. Ander optekenings van ontlangse plaaslike waarnemings word ook gemeld.

During a recent visit to Sodwana Bay on the Maputaland coast, from 15 – 18 May 1985, a number of small crab megalopae were noted, swimming up into the Mgobezeleni estuary on the incoming afternoon tide. The following morning (*ca.* 08h00) a vast accumulation of these megalopae was found stranded by the outgoing tide on the sandflats about 20 m north of the shallow channel of the outflowing river. The megalopae were two and three layers deep on the drying sand in an area of about 100 m^2 (see Figures 1 and 2). That afternoon large numbers of megalopae were again noted entering the estuary on the incoming tide.

The river was flowing strongly at the time of the visit, and at low tide the bay was noticeably tinted with clear brown humic stain emanating from the river.

Specimens of the megalopae were collected and identified as the young of the crab *Varuna litterata* (Sandiford, 1984).

Figure 1 Thousands of *Varuna* megalopae stranded by the receding tide.