MADOQUA

Vol. 18 No. 1 1991

JOURNAL OF ARID ZONE BIOLOGY AND NATURE CONSERVATION RESEARCH

MADOQUA

All contributions to **Madoqua** should be in accordance with the instructions to authors on the inside back cover, and should be addressed to:

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Madoqua is currently published twice yearly (March and September), with a pre-issue subscription of R25 per year. A price list of individual numbers and back issues is available from the Director. All correspondence dealing with purchase, amounts, distribution and other administrative matters should be addressed to:

The Director
Ministry of Wildlife, Conservation and Tourism
Private Bag 13306
Windhoek
Namibia

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Published by the Ministry of Wildlife, Conservation and Tourism,
Namibia: 1991

Printed by MultiServices, P.O. Box 363, Windhoek, Namibia

SHORT NOTE

Neonatal development of *Gerbillurus vallinus* and *G. setzeri*

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Received December 1989; accepted August 1990

ABSTRACT

Gerbillurus vallinus and *G. setzeri* did not breed readily in captivity. Neonatal development of five *G.vallinus* litters and one *G.setzeri* litter is described. Litters consisted of one to five altricial young. A gestation period of 21 days was recorded for *G. setzeri*. Rates of physical and behavioural development were similar in both species, but the single *G. setzeri* litter grew faster than the *G. vallinus* litters. Ultrasonic vocalizations at 50-60 kHz were recorded from neonates.

INTRODUCTION

Gerbillurus vallinus and *G. setzeri* are deserticolous gerbilline rodents endemic to southern Africa. Both species inhabit extremely arid areas of the Karoo and Namib Desert, and occur more commonly on the gravel plains than in areas of soft sand, where the other two species of this genus, *G. paeba* and *G. tytonis*, occur.

Gerbillurus species do not breed readily in captivity (Dempster & Perrin 1989a). Maternal behaviour and neonatal development of *G. paeba* and *G. tytonis* have been described (Dempster & Perrin 1989b) and Ascaray (1986) reported on neonatal development of *G. paeba exilis*. Neonatal development of five litters of *G. vallinus* and one litter of *G. setzeri* is reported here.

METHODS AND MATERIALS

Seventeen adult *G. vallinus* were trapped near Kenhardt, N. Cape, and 31 *G. setzeri* near Rössing, Namibia. Details of laboratory maintenance are given elsewhere (Dempster & Perrin 1989b).

Young were weighed individually at intervals of 2 to 5 days on a Mettler balance, accurate to 0,1g. The standard body measurements of head-body length, tail length and hindfoot length were made. Individual litters were not measured at the same ages, nor were records kept for individual pups. Measurements of littermates were summed for the day on which they were measured, and a growth curve was constructed for the litter. Mean size at 2-day intervals was calculated by summing litter dimensions obtained from growth curves and dividing the sum by the total number of pups. This method was used to derive average growth curves for mass, head-body length, tail length and hindfoot length. Consequently it was not possible to calculate standard errors.

Growth rates were calculated using the method of Case (1978) for the relatively linear phase of growth from about 10% to 50% adult mass and tail length, 20% to 70% adult hindfoot length, and 30% to 70% adult head-body length. These values were chosen since they represented the longest comparable period of growth for the two species. Growth rate was scaled to adult body size, using average adult mass of laboratory animals within a week of capture, and other body dimensions from Schlitter (1972). Due to the small sample sizes, no statistical testing was attempted.

RESULTS

One *G. vallinus* gave birth shortly after arrival in the laboratory and a further four litters were conceived in captivity over a 3-year study period. Only one *G. setzeri* litter was bred during the same period. The gestation period for this litter was 21 days. The gestation period for *G. vallinus is* not known. Litter sizes for *G.vallinus* were 1, 3, 4, 4, and 5 young, while the single *G.setzeri* litter consisted of three pups.

The maternal behaviour of G. *vallinus* and G. *setzeri* consisted of brooding and grooming the neonates during the 3-week period before the young emerged from the nest. No maternal defense of the young was observed. Females covered the young with nest material and blocked the nest entrance when leaving the young. Nipple-clinging did not occur; females mouth-carried young which had strayed from the nest.

At birth neonates were naked with closed eyes and fused digits on fore- and hindfeet. Ear pinnae were folded down and fused to the head. Dimensions of young at birth are given in Table 1, and growth curves in Figure 1. Growth rates are indicated in Table 2.

TABLE 1: Sizes of G. *vallinus* and G. *setzeri* young at birth. Data are presented as mean±S.D. (sample size).

			G. *vallinus*	G. *setzeri*
Individual mass	$\bar{x}$ birth(g)		2. 0(8)	2. 3 (3)
	$\bar{x}$ adult		31. 5±5. 2(17)	37. 6±7. 3(31)
	birth mass / adult mass	%	6. 3	6.1
Litter mass	$\bar{x}$ birth(g)		5.3(3)	6.8(1)
	l itter mass / adult mass	%	16. 9	18.1
Head-body length	$\bar{x}$ birth(mm)		31. 8(8)	33. 3(3)
	$\bar{x}$ adult°°		138. 9(26)	127. 4(43)
	birth length / adult length	%	31. 5	31. 5
Tail length	$\bar{x}$ birth(mm)		12. 5(8)	11. 3(3)
	$\bar{x}$ adult°°		138. 9(26)	127. 4(43)
	birth length / adult length	%	9. 0	8. 9
Hindfoot length	$\bar{x}$ birth(mm)		6 . 9 (8)	6 . 0 (3)
	$\bar{x}$ adult°°		31. 2(27)	32. 5(44)
	birth length / adult length	%	22.1	18. 5

°° = Data from Schlitter (1972)

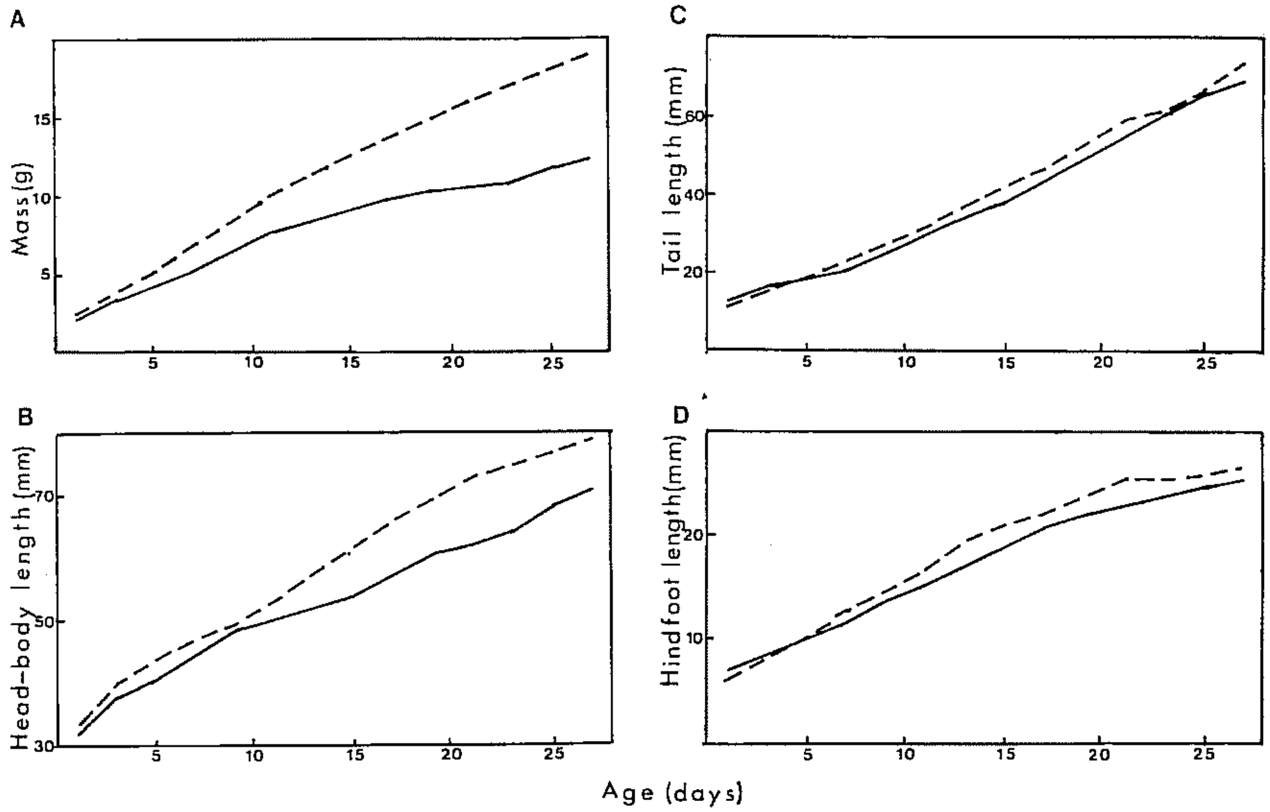

FIGURE 1: Growth curves for *G. vallinus* (——) and *G. setzeri* (- - -). A) Mass. B) Head Body length. C) Tail length. D) Hindfoot length. n = 8 for *G. vallinus*; n = 3 for *G. setzeri*

Ear pinnae were free at 6-7 days in *G. vallinus* and *G. setzeri*. Toes began to separate at 6 days and all digits were free by 14 days. Hair proliferation began at 4-6 days, when a dark pigmentation was visible on the dorsum, and the whole body was covered in fur by day 14. Incisors were visible at 11-12 days in both species. Ages at which eyes opened varied among *G.vallinus* litters from 16-20 days. The single *G. setzeri* litter had their eyes open at 18 days.

TABLE 2: Growth rates for G.*vallinus* and G.*setzeri* (n = 8 for *G.vallinus*, n = 3 for *G.setzeri*)

	G.*vallinus*	G.*setzeri*
Mass (6%-50% adult)		
Growth rate (g/day)	0.4	0.7
growth rate / adult mass %	1.3	1.8
Head-body length (30%-70% adult)		
Growth rate (mm/day)	1.5	2.0
growth rate / adult size %	1.5	1.9
Tail length (9% - 50% adult)		
Growth rate (mm/day)	2.2	2.3
growth rate / adult size %	1.6	1.8
Hindfoot length (20% - 70% adult)		
Growth rate (mm/day)	0.8	1.0
growth rate / adult size %	2.7	3.1

Behavioural development proceeded similarly in both species. Initially, pups moved very little and remained in the nest all the time. Crawling with head and body prone and limbs splayed laterally preceded quadrupedal walking. The adult mode of locomotion, quadrupedal saltation, was achieved by approximately 3 weeks of age, when the young first emerged from the nest. Self-grooming began at approximately 10 days, when pups were seen to scratch themselves with a hindfoot. A few days later, pups were seen to groom their noses with their forepaws, and by the time of nest emergence, the full adult grooming sequence and sandbathing were performed.

Weaning occurred between 23 and 28 days in both species, when young were seen to be consuming solid food while continuing to be suckled occasionally.

Ultrasonic vocalizations were detected from neonates of both species using a bat detector (QMC S100) tuned to 50-60 kHz. Converted ultrasounds of a 14-day *G.setzeri* pup were recorded and analysed with a Uniscan sonograph. The tuned frequency was 50 kHz, mean duration of each vocalization was 104.5±17.3 ms (n = 23), and the range of frequencies in each converted vocalization was 0-5.6±1.2 kHz. Sonograms of three typical calls are shown in Figure 2. It was noted that when pups were returned to the cage after weighing, ultrasonic vocalizations continued until each pup had been retrieved and returned to the nest by the mother.

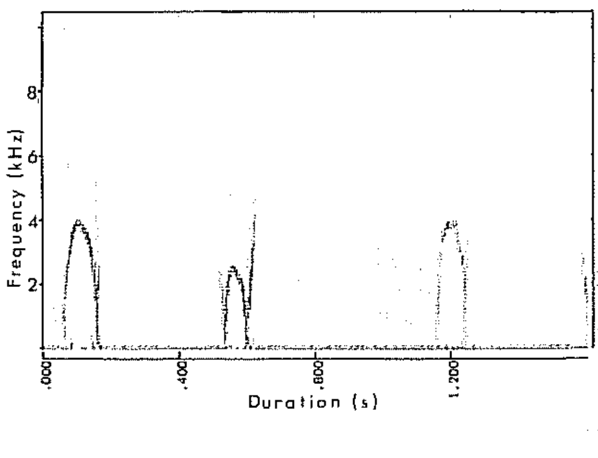

FIGURE 2: Sonogram of three converted ultrasounds of a *G. setzeri* neonate. Tuned frequency = 50kHz.

DISCUSSION

The results presented here indicate that G. *vallinus* and G. *setzeri* have altricial young which are entirely dependent on their mother for food and warmth for the first 3 weeks of life. The growth rate of all body parameters was higher in the G.*setzeri* litter than in *G.vallinus* litters, although sizes at birth relative to adult size were similar. Physical and behavioural development proceeded at the same rates in both species.

Differences in rates of development and growth rates of *G.paeba* and *G.tytonis* were thought to be related to differences in locomotion (Dempster & Perrin 1989b). *G.tytonis* had a slower growth rate and was more bipedal than G.*paeba*, although adults of the two species are of similar size. No difference in mode of locomotion has been noted between *G.vallinus* and *G.setzeri*, despite the different growth rates of these species. However, growth rates of more litters need to be measured in order to validate the apparently higher growth rate of *G.setzeri*.

Ultrasonic calling by rodent neonates has been described for many species (Sales & Pye 1974) and elicits increased care-giving from the mother (Bell 1979). In this study, ultrasonic vocalizations served to guide the mother's retrieval response when young were out of the nest.

Although sample sizes are small, this study is presented as the only available information on the neonatal development of two little-known gerbil species. A review of neonatal development in southern African gerbilline rodents in relation to body size, habitat, and phylogeny is planned.

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