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Author(s): Martin Daly

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EARLY USE OF SOLID FOOD BY A LEAF-EATING GERBIL
(*PSAMMOMYS OBESUS*)

Psammomys obesus, a leaf-eating Saharan gerbil (Petter, 1952), is apparently able to eat solid foods at an earlier age than other gerbils. This is interpretable as an adaptation to low-energy diets which demand relatively little search time but relatively great ingestion time in comparison with such high-energy food items as seeds or small invertebrates (Daly and Daly, 1973; 1975). However, comparisons drawn from published data collected by different observers are inexact because of different husbandry conditions and observation regimes; such apparently minor disturbances as those involved in regularly weighing pups can significantly alter rodent development (e.g. Altman *et al.*, 1968; Ader, 1969).

Therefore, *P. obesus* and two mainly granivorous gerbils, *Meriones libycus* and *M. crassus* (Petter, 1961), were raised in the same laboratory under nearly identical conditions (although necessarily differing in diet). Wild-caught mothers, some pregnant at captivity and some mated in the laboratory, were housed in cages with sand-covered floors. They were given paper as nest material, no water, and the following foods: a mixed diet of cultivated and natural seeds and greens; stale bread; occasional carrots for the *Meriones*; a mixture of natural foods, mainly fresh leaves of *Suaeda mollis*, *Traganum nudatum*, and *Salsola foetida*, for the *Psammomys*.

Each litter was observed with the mother removed for 15 minutes daily from 1 to 21 days of age. I recorded all behavior patterns exhibited by the pups, and briefly described those that were undergoing developmental change in form. Pups were left undisturbed except on a few occasions when a spontaneous gape was not observed during the observation trial; then a pup was briefly held and a twig poked into the mouth in order to induce opening to check for incisor eruption.

Four litters of *P. obesus* (N = 2, 3, 4, 5; mean = 3.5), four of *M. crassus* (N = 3, 3, 4, 4; mean = 3.5), and three of *M. libycus* (N = 1, 3, 7; mean = 3.7) were observed. There was no mortality between day 1, when litters were first counted, and the end of observations.

Table 1 presents the ages of first occurrence of several developmental events—the first figure represents the median earliest age based on one score per litter, and that in parentheses the earliest age recorded. The first three events are chosen for their relevance to feeding behavior. The other five serve various functions and were chosen for comparison because they were conspicuous, unambiguous events observed in all litters.

Species were compared in each event by *t*-test with litters treated as unit subjects. All comparisons significant at $P < .05$ (two-tailed) are summarized in Table 1.

P. obesus clearly eats solid foods earlier than the species of *Meriones*; furthermore, this is a specific acceleration of the development of feeding rather than a general precocity. *M. crassus* was in fact significantly quicker to develop mature digging behavior, although slower to feed and to leave the nest.

These differences in self-feeding appear before the pups collect any of their own food. For granivores (and carnivores), foraging is time-consuming, but food is quickly ingested and young are raised with a prolonged total dependence upon nursing. In *P. obesus*, ingestion is relatively time-consuming (Daly and Daly, 1973), and this task is transferred to the pups earlier. In the field, lactating *M. libycus* were observed to eat seeds, flowers, and greens where they were found, rather than to hoard to a home burrow like *P. obesus*.

The great variety in precocity among rodent families may likewise be attributable to feeding niche. Considerations of maternal time-budgeting may favor an early capacity for self-feeding in such herbivores as cavies, gundis, and porcupines. In large

TABLE 1.—Age of development (days) events (further explanation in text).

Characters	<i>Meriones crassus</i>	<i>Meriones libycus</i>	<i>Psammodmys obesus</i>
	Age of Development		
Incisor eruption	10 (9)	12(10)	4 (3)
Oral exploration (mouthing objects)	14(13)	14(11)	9 (8)
Eating	17(16)	18(17)	12(11)
Scratching with body contact	7 (5)	7 (5)	6 (5)
Eye opening	16(15)	17(15)	14(13)
Leaving the nest	13(13)	13(11)	12(11)
Over-head grooming (simultaneous forepaw wipe over snout, beginning above eyes)	14(13)	16(15)	13(11)
Digging with simultaneous hindkicks	13(13)	17(17)	14(14)
	Species Comparisons		
<i>Meriones crassus</i> - <i>Meriones libycus</i> :	Digging	† 5df = 5.0 $P < .01$	
<i>Meriones crassus</i> - <i>Psammodmys obesus</i> :	Incisor eruption	† 6df = 10.4 $P < .001$	
	Oral exploration	† 6df = 6.2 $P < .001$	
	Eating	† 6df = 9.9 $P < .001$	
	Leaving nest	† 6df = 5.6 $P < .01$	
	Digging	† 6df = 2.5 $P < .05$	
<i>Meriones libycus</i> - <i>Psammodmys obesus</i> :	Incisor eruption	† 5df = 6.5 $P < .01$	
	Oral exploration	† 5df = 3.0 $P < .05$	
	Eating	† 5df = 13.3 $P < .001$	

mammals, predation pressure is the most obvious force favoring precocity in herbivores, but these considerations may also apply.

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MARTIN DALY, *Centre National de la Recherche Scientifique—Centre de Recherches sur les Zones Arides, Beni-Abbès, Algeria, and Department of Psychology, University of Bristol, United Kingdom (present address: 7 Greengate Road, Don Mills, Ontario, M3B 1E7, Canada). Submitted 24 May 1974. Accepted 22 November 1974.*

BODY AND ORGAN MEASUREMENTS OF FUR SEALS, *ARCTOCEPHALUS FORSTERI* (LESSON), FROM NEW ZEALAND

In this note, data are presented on body and organ measurements taken from specimens of the fur seal *Arctocephalus forsteri* (Lesson) collected in New Zealand. Specimens were collected by shooting through the head with a .22 calibre rifle. Six seals (K- series) were taken on Sugar Loaf Point, Kaikoura Peninsula, South Island, and four (OBI- series) were collected on the Open Bay Islands, Westland, South Island. All specimens except K1 were weighed entire on a spring balance; K1 was weighed piecemeal and the total weight corrected by assuming a 10 percent underestimate due to blood loss (Bryden, 1972). Surface areas of flippers were estimated from outline drawings made on paper of scale 25 squares per square inch. Results are summarized in Tables 1 and 2.

Hector (1871) provided figures of 117 kilograms (kg) and 123 kg for two males and 94 kg for a female. Thomson (1921), who may have been referring to Hector's figures, wrote that males exceed 118 kg and females range from about 90 to 100 kg. In this study the largest male (K1) weighed 135 kg, and he was rather small compared with adult territorial males observed during the following breeding season. Adult males probably surpass 180 kg or so at that time. Hector's reported weights for females are suspiciously high. The old female K2 weighed only 32 kg; the young pregnant female OBI3 weighed 35 kg with fetus and placenta removed. Both females were of average size and it seems unlikely that females could often exceed about 50 kg in body weight. According to these estimates, the ratio of body weight of breeding adult males to that of breeding adult females is about 3.5:1.0 (compared with about 4.5:1.0 for *Callorhinus*; Scheffer and Wilke, 1953) at the commencement of the breeding season, a time when sexual dimorphism in body weight is maximal (Howell, 1930; Rand, 1956; Schusterman and Gentry, 1971). Sexual dimorphism is pronounced in this species even in pups a few weeks of age (Crawley and Brown, 1971).

Kidney and heart weights are in accord with those reported for *A. gazella* (Bonner, 1968; Scheffer, 1960), and gut lengths agree with those reported for other species of pinnipeds (King, 1964).

Total flipper surface area declines relative to body weight as body weight and body length increase (Table 2). Regression of total flipper surface area on body weight^{3/4} (to correct for size-related changes in metabolic rate) yields a slope significantly less than zero ($P < 0.01$). Flippers function to dissipate heat at high ambient temperatures (Gentry, 1973; Matsuura, 1972) and may comprise more than a third of the total body surface area of young animals (Iversen and Krog, 1973). It is therefore possible that thermoregulatory importance of flippers decreases as body size increases (Scheffer and Wilke, 1953). Crawley and Brown (1971) present flipper measurements of pups of *A. forsteri*.

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