

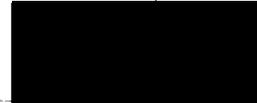
PARENTAL INVESTMENT AND REARING SCHEDULES
IN THE EASTERN GREY KANGAROO

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DECLARATION

I declare that no part of this thesis has been accepted or presented for the award of any degree or diploma by any University, and that to the best of my knowledge, the thesis contains no material previously published or written by any other person, except where due reference is given to that author by direct credit in the text or references.



Abstract

Mother-young relations were studied in a wild population of eastern grey kangaroos (*Macropus giganteus*) during three years. The studied population comprised approximately 100 individually-known kangaroos, all of whom were habituated to close approach on foot. The females' reproductive status was monitored on a monthly basis and half were located almost every day of the 10-day monthly field trips. About 12 females were observed regularly for recording behavioural information on the mother-young relationship.

The findings have been described and discussed with reference to parental investment theory and rearing schedules. Since parental investment involves a wide range of forms of parental care; the study investigated this topic within 4 principal contexts: the general ecology of the (mothers') local population; the mothers' social positions and behaviour within the social organisation; the development of the structure of the young's behaviour and the interdependent nature of the mothers' and young's behaviour; and the mothers' and young's roles in maintaining and defining the relationship.

The majority of mothers' reared sons and daughters at an unusually high rate of one young every 11 months. Most matings involved females with small pouch-young; it was inferred that most females were reproducing according to the delayed blastocyst cycle. However, females did not appear to be commencing to reproduce until a relatively late age compared to females of the same species of other studied populations.

While most females were not constrained to producing young to one seasonal schedule, there were some differences in the females' reproduction which were related to the seasonal timing of rearing the young. Fewer young emerged permanently from the pouch during one half of the year (defined as the offpeak season) than the other half (defined as the peak season). Young who emerged permanently from the pouch in the offpeak season were more likely to die than the young of the same mothers who emerged in the peak season. Offpeak young were likely to have had a shorter pouch-life than peak young. Thus the females were

less likely to produce consecutive offpeak young than consecutive peak young. Mothers of offpeak emerging young were likely to be in poorer condition (from a subjective index of the females' appearance) than those of peak emerging young. More females than expected from random were observed to produce only peak young; these females were more likely to comprise primiparae and 'old' females (age was estimated by a subjective assessment of a female's physical appearance).

The tactic of rearing young at a high rate in this population was believed to be related to, not just the females' ability to reproduce throughout the year, but also to the high mortality of young. Though the probability of a young dying was in part related to the 'breeding type' of the mother, (i.e. whether or not she produced only peak young) and to whether the mother had just reared a young to weaning, it was probably more related to seasonal and annual variations in the environment.

The mothers' general strategy for rearing sons and daughters differed. The population produced and reared to weaning significantly more males than females. Males were particularly likely to be conceived after several months of relatively high rainfall. Males tended to emerge permanently at the beginning of spring. The pouch-life duration of sons was more variable than for daughters and varied in relation to the time of year, to whether the mother had reared the previous young to weaning, and to the sex of that previous young. There were other differences in the manners mothers reared sons and daughters, but overall it was not possible to conclude that they invested more intensely preweaning in individual sons than daughters, as might be expected according to current theory on parental investment. I suggest reasons for this departure from the expected, which contribute to developing the current theory on this topic.

The mother-young relationship appeared to consist of 4 phases which related to the young's stage of development. The first phase (pouch-neonate) spanned the period prior to the young's first exit from the pouch. The second phase (pouch-infant) spanned the period in which the young made temporary exits from the pouch. In this phase the young played as much as many eutherian young. Its behaviour when out of the pouch was more randomly structured than the mother's behaviour and comprised a wide variety of activity states defined as 'play'. A pouch-infant was strongly oriented toward the pouch and readily re-entered whenever the mother signalled. One third to one half of its time out of the pouch was spent with its head in the pouch (suckling?). The mother of a pouch-infant significantly altered her behaviour when the young was out of the pouch. She surveyed more frequently

and rested less than usual; also her behaviour became less structured. However, the mother appeared proximately at least, in control of the times and durations of her infant's exit from the pouch. Infants were allowed out of the pouch less than one third of the daylight hours.

The pouch-infant phase was terminated by a very brief but critical time (permanent emergence) when the young radically altered its behaviour, stopped entering the pouch, and was highly likely to be lost (both temporarily and permanently). The mother appeared responsible for the reduction in the young's orientation toward the pouch; a mother rejected significantly more of her young's attempts to poke its head in the pouch during this brief transition period between the pouch infant and young-at-foot (YAF) phases. During this transition period period of her young's life a mother's activity schedule was most disrupted; a mother spent more of her time surveying and less resting. Further, a mother tended to be likely to enter the various activity states with a more even probability over the day. Generally females without a permanently emerging young would spend the morning and evening predominantly grazing, and the midday period resting. A mother with a permanently emerging young was less likely to aggregate with conspecifics and tended to range over a smaller area, than she would during the other phases of her young's life.

Once the young no longer entered the pouch it was defined as a young-at-foot (YAF). The behaviour of the YAF throughout this phase was quite adult-like. The sequential structure of a YAF's behaviour was less random than an infant's behaviour. YAF played much less than infants. Mother-young relations changed little during this phase until weaning, whereupon the mother and young (now a subadult) associated with each other less frequently, though shared the same home range.

Male young dispersed typically between 2 and 4 years of age. Females appear to remain in their natal home-range to commence breeding.

Male and female young behaved differently and seemed to do so without direction from the mother. Most of the sex-related differences in the mother's relations with her young probably arose in response to the behaviour of the young. The principal exception was that mothers tended to be more active in maintaining their association with daughters than sons.

Overall, the sex-related differences in the mother-young relationship lead me to conclude that the young in part defined the form of the mother-young relationship. Further, this study found that the behaviour of the infant appeared to be a disruptive influence to the mother's activity schedule and to the structure of her behaviour. This finding has

implications for parent-offspring conflict theory, since it may be in this manner that young might act to 'manipulate' the mother toward investing in it to a greater extent than that which would maximise her genetic contribution to future generations. Moreover, this study found that parent-offspring conflict could be a prominent part of the relationship during the stage of permanent emergence.

Finally females' reproductive tactics appeared to change with their age, though note that this is a very tentative finding and requires substantiation.

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Figure 1: ...*“So ... this is life mum?”*

A very small pouch-infant (class 10) poking its head from the pouch.