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Population Structure and Reproductive Status of Koalas on Raymond Island, Victoria

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Abstract

In December 1980, 87 adult (>1-year-old) koalas (36 males, 51 females) were captured and marked on Raymond Island, in the Gippsland Lakes of Victoria. A further 85 adults and 34 juveniles (6–12 months old) were sighted but not captured. In August 1985, 25 females and 24 males were captured and examined. The proportions of animals in the older age classes (age classes 4 and above) were 61% in 1980 and 39% in 1985, while the reproduction rates were 38 and 40%, respectively. The low reproduction rates, and the high proportions of older animals in 1980, were attributed to reproductive tract disease, although the presence of this disease did not prevent the population from increasing to a density at which trees were being overbrowsed.

Introduction

In 1953, 11 male and 31 female koalas were taken from Phillip Island, in Western Port Bay, Vic., to Raymond Island, in the Gippsland Lakes of Victoria (R. Warneke, personal communication). The koalas became established on the island, but no detailed studies of the population were undertaken prior to 1980. In 1980, *Mycobacterium ulcerans* infection was discovered in koalas on the island (Mitchell *et al.* 1984, 1987; McOrist *et al.* 1985). As part of the disease investigation, information was collected on the structure and condition of the koala population on Raymond Island. In 1985, the population was again examined, as part of a wider investigation into chlamydiosis in koalas. This paper reports the results of these two population surveys.

Methods

Raymond Island has an area of about 750 ha, with three woodland associations dominated by *Eucalyptus tereticornis*, *E. viminalis* and *E. botryoides*, respectively. In December 1980, the island was searched for koalas by 3–5 people for 6·5 days. Adults koalas (>1 year old) were captured if they were within easy reach. The age class of captured animals was determined from their body weight and wear on their premolar teeth, according to Martin (1981, 1985). Pouches of all females were inspected. Eight koalas showing signs of disease were removed for post mortem examination; other captured animals were marked and released.

In August 1985, 50 koalas were captured in the *E. viminalis* woodland on Raymond Island. The age, sex, weight and reproductive status of each animal were recorded, and a blood sample was taken for serology (R. Martin, unpublished data).

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Results

In 1980, 36 adult males and 51 adult females were captured. This sex ratio did not differ significantly from parity ($\chi^2 = 2{\cdot}586$; $P > 0{\cdot}05$), assuming that the rates of capture were the same for males and females. Eighteen of the females showed evidence of having bred in the previous breeding season (Nov.-Mar.; Martin and Lee 1984): 4 had pouch young, 12 had young on their backs and 2 were lactating with young nearby. This constituted 38% of females in age class 3 and above. Not all the juveniles were captured: their sex ratio was assumed to be parity in the following calculations. Three females, all in age class 3, had neonates in their pouches resulting from matings in the current breeding season. A further 25 adult males, 36 adult females and 24 adults of unknown sex were sighted but not captured or marked during the survey. Juveniles were seen with sixteen (44%) of the uncaptured females.

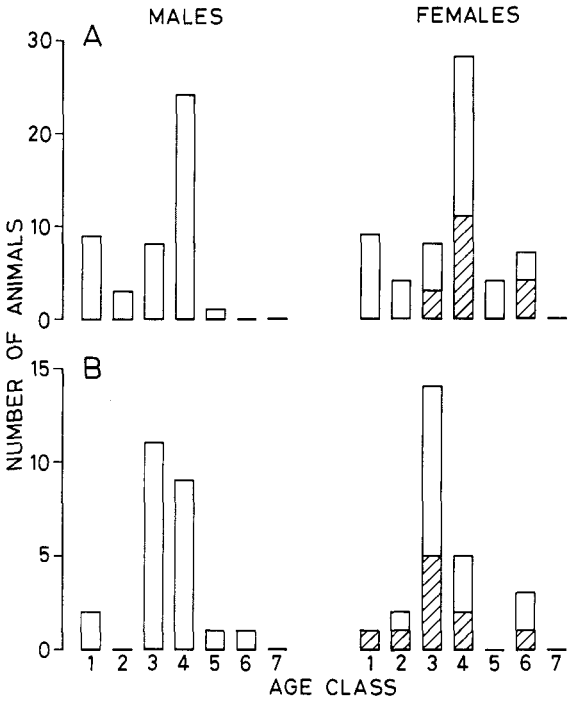

Fig. 1. Age classes of koalas captured on Raymond Island in 1980 and 1985. Shaded rectangles indicate females accompanied by juveniles or lactating.

A high proportion of the captured males (56%) and females (65%) were in age class 4 and above, with most in age class 4 (Fig. 1). More females (18%) than males (2%) were in age classes 5 and 6 ($\chi^2 = 6{\cdot}37$; $P < 0{\cdot}05$). There was no significant difference between the proportion of females with juveniles in age class 4 and the proportion in the younger and older age classes ($\chi^2 = 0{\cdot}03$; $P > 0{\cdot}05$). The average weight of females with juveniles (8·6 kg) was not significantly different from the average weight of females without juveniles (8·3 kg; $t = 0{\cdot}08$; d.f. = 44; $P > 0{\cdot}05$).

In 1985, 24 males, 25 females and one hermaphrodite (with a small scrotum and rudimentary pouch) were captured. Ten (40%) of the females had pouch young, and pouch young were found in females of all age classes. High proportions of males (46%) and females (56%) were in age class 3, with 46% of males and 32% of females in age class 4 and above (Fig. 1).

During the two surveys, three non-lactating females in age class 4, weighing 10·4, 9·9 and 8·2 kg, respectively, were found to have fat deposits behind their shoulders. Post mortem examination of one animal showed large subcutaneous fat deposits extending posteriorly from the axillae and anteriorly from the iliac areas, and a small circumscribed deposit in the pelvic canal. No abdominal or renal fat was observed.

Eight females (seven in 1980, one in 1985) had fur on their rumps that was wet with urine and showed a slight to moderate degree of matting, consistent with a diagnosis of 'dirty tail' (Dickens 1978). Four were in age classes 5 or 6, and only one was lactating. One of these females was weak and emaciated. On post mortem examination, this animal showed severe inflammation of the medial vagina, but no inflammation in either the uterus or urinary tract. The other two females examined post mortem (including the fat female) had moderate metritis and vaginitis, and one had fluid-filled cysts up to 10 cm in diameter obscuring one ovary (which appeared normal). Two males with corneal opacity and one male with slight corneal proliferation were seen in 1985.

Three of the koalas captured in 1980 had *M. ulcerans* infection; these animals are described elsewhere (Mitchell *et al.* 1984, 1987).

Discussion

The population of koalas on Raymond Island in 1980 had a high proportion (61%) of animals in age classes 4 and above, and a low rate of reproduction (38% of females were accompanied by juveniles). In 1985, the reproduction rate was still low, but there were fewer animals (39%) in the older age classes. The differences in age distribution could be an artefact of sampling, or could indicate a fluctuation in the structure of the population that resulted from fluctuations in the rates of reproduction and survivorship. High proportions of the populations sampled at Walkerville (62%) and Phillip Island (56% of females) were in these older age classes, while the rates of reproduction were low—11–36%, and 22%, respectively (Martin 1981, 1985). On French Island (Martin 1985) and the Brisbane Ranges (Hindell 1984), the proportions of older animals were lower—22 and 31%, respectively—and the reproduction rates were higher—>60% in both populations.

At Walkerville, the low rates of reproduction, and hence the high proportion of older animals, were partly attributed to nutritional stress due to overbrowsing of the preferred food trees (Martin 1981, 1985). There was little evidence of overbrowsing of trees or nutritional stress in koalas on Raymond Island in 1980. Nutritional stress could cause greater weight loss and could delay or reduce reproduction in certain susceptible groups—lactating females, young growing females and old females with worn teeth. The number of juveniles still in the pouch (4/18) in December 1980 indicated that some females were breeding after the main breeding season (Nov.–Mar.) in Victoria. However, there was no difference in body weights between females that reared and those that failed to rear young in 1980, and no difference in reproduction rates between females in age class 4 and those in younger or older age classes. In 1985, overbrowsing of trees was recorded on Raymond Island (Thomas *et al.* 1986). However, the reproduction rate in 1985 was similar to that in 1980, indicating that the increased level of overbrowsing on the island was not associated with a decline in fertility.

Reproductive tract disease was another factor affecting koala populations on Phillip Island and at Walkerville (Martin 1981). The lesions observed in the reproductive tracts of females on Raymond Island were consistent with the pathology of reproductive tract disease described by Obendorf (1981), and associated with *Chlamydia* sp. infection (McColl *et al.* 1984). Antibodies to *Chlamydia* sp. were detected in 43 of the 50 blood samples collected from the koalas in 1985 (R. W. Martin, K. A. Handasyde and A. K. Lee, personal communication). This disease would account for the low reproduction rates and high proportions of older animals observed in affected populations. The koalas on Raymond Island originally came from Phillip Island, where the combined effects of reproductive

tract disease and road deaths have severely restricted population growth (Handasyde 1986). Despite the presence of the disease on Raymond Island, the koala population has grown from 42 in 1953 to at least 206 in 1980, finally reaching a density in 1985 at which trees were being overbrowsed. At Walkerville, the presence of the disease also failed to prevent overbrowsing (Martin 1981, 1985), while in the Brisbane Ranges, reproduction rates were high (61%; Hindell 1984) despite the presence of the disease (R. Martin, personal communication).

Mycobacterium ulcerans infection was found in eleven koalas on Raymond Island between 1980 and 1985 (Mitchell *et al.* 1987), giving an incidence of less than two cases per year in the population of 200 animals. The disease is probably not an important factor in the dynamics of the population.

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