THE ECOLOGY OF THE DAMA WALLABY (MACROPUS EUGENII, DESMAREST) IN FORESTS AT ROTORUA, WITH SPECIAL REFERENCE TO DIET

BY

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ABSTRACT

The dama wallaby (*Macropus eugenii*, Desmarest, 1817), tammar or Kangaroo Island wallaby is present in high numbers throughout the Okataina Scenic Reserve and common elsewhere in the Rotorua Lakes region. Little is known of the animals' ecology in the area although its present status is that of a pastoral and forest pest. Major aims of the present study were to investigate feeding habits and general ecology of the dama.

Between November 1983 and March 1985 1076 wallabies were shot and autopsied; results have confirmed that the dama is a preferential grazer and where there is access to managed pasture, upwards of 70% of identifiable stomach material is likely to consist of pasture species. However wallabies also live and successfully breed within indigenous forest of the Okataina Scenic Reserve, with access to meagre amounts of grass. Here preferred foods include foliage of *Melicytus ramiflorus*, *Weinmannia racemosa*, *Geniostoma rupustre*, *Coprosma* spp., *Hedycarya arborea* and *Leptospermum* spp.

Some seasonal variation in plant species selected is evident, as are some minor differences in diet between adults and juveniles; however there are no significant differences in foods eaten between males and females.

Wallabies in exotic forest consume largely grass and weed species but relatively little *Pinus radiata*.

Molar indexing appears to be an excellent method of aging *M. eugenii* up until at least three years of age.

Wallabies in general attain the largest size where they have access to managed pasture and it is suggested that a pasture/forest margin is very suitable wallaby habitat. This is supported by kidney fat assessment, which shows that male and female wallabies with access to pasture are in better condition than those in nutritionally

poorer areas. Breeding data suggests that yearling wallabies from pasture margins may be more fecund than those from other areas.

Kidney fat reserves of males drop considerably during the rut and take several months to reach previous levels. Whereas for females considerable stress is imposed during the late spring when energy demands of the pouch young are greatest.

In general female damas breed in their first year and as in Australia the breeding season is very short; however in New Zealand it is marginally earlier.

Sex ratios of pouch young, with one exception were found to be not significantly different from 1:1. Nevertheless there was a significant and consistent bias towards males in shot samples. It is suggested that this is a result of males being more active within their home-range.

Rhodamine trials revealed that wallabies may travel at least 500m from within the forest to pasture margins, presumably to feed.

Evidence is presented which suggests that wallabies are detrimentally influencing the structure of forests within the Okataina Scenic Reserve, however it is also held that there is considerable doubt as to how much blame is directly attributable to wallabies.

CHAPTER ONE

INTRODUCTION

1.1 General

The dama wallaby (*Macropus eugenii*); known in Australia as the tammar or Kangaroo Island wallaby, was liberated in the Rotorua region about 1912 (Wodzicki and Flux, 1967). Their rate of dispersal has been slow (Kean, 1959, see Fig. 1.1) but they are now regarded as a local pest and have reached high numbers in the Okataina Scenic Reserve (Knowlton and Panapa, 1982). Knowlton and Panapa conclude that "There seems little doubt that wallabies are having a considerable effect on the vegetation of the Okataina Scenic Reserve." This reserve (4388 ha) is locally a valuable asset, but as well as alleged forest damage in this immediate area, the potential impact of wallabies in adjacent forests must be considered. That is, unlike the insular situation of Kawau Island where the dama has also been reported to be damaging indigenous vegetation (V. Vujcich, 1979) the Rotorua Lakes region is bordered by the Mamaku and Urewera State Forests. The potential impact of wallabies in these forests is an important consideration.

In addition to being a threat to indigenous forest the dama is considered to be a pasture pest on rateable land and large numbers have been shot by the Central Bay of Plenty Pest Destruction Board (D.S. Moore, personal communication). Although this shooting has been ongoing for many years and the present status of the animal is that of a pastoral and forest pest, the research work available to reach such a conclusion is very scant.

Plate 1: Dama wallaby in kamahi forest (mid-afternoon).

Plate 2: Immature wallaby from the Makatiti Dome. When photographed this animal was grazing the vegetation seen here, that is predominantly *Leucopogon fraseri*, *Epilobium* spp. and *Raoulia glabra*. (Photograph by Chris Cheesman.)

Plate 3: For a short period during the study 2 immature wallabies (male and female) were kept in captivity - male is seen in the foreground.

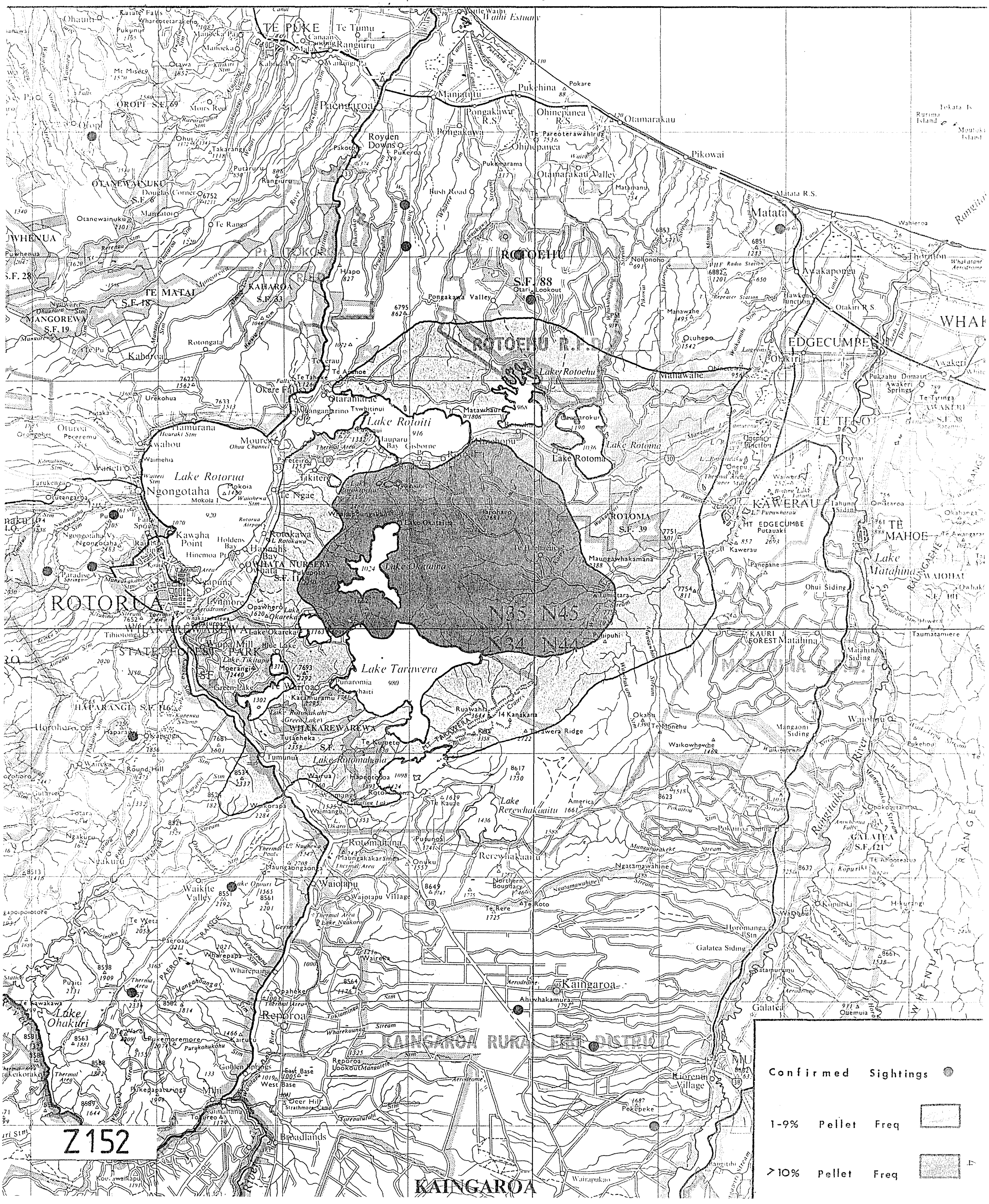
1.2 Present Distribution of *Macropus eugenii*

M. eugenii was once widely distributed through south-west Western Australia, and was common in South Australia (Hume, 1982). It is now largely confined to mainland Western Australia and several islands off Western and Southern Australia (Tyndale-Biscoe, 1973). Among the latter is Kangaroo Island which according to Inns (1980) is the only area in Australia *M. eugenii* can presently be found in abundance.

In New Zealand the dama is found on Kawau Island "...where it was presumably introduced by Sir George Grey about 1870" (Wodzicki and Flux, 1967) and in the Rotorua Lakes region. Wodzicki and Flux reported that the origin of the Rotorua wallabies is obscure, although they may have been released by the late M.H.R. Benn near Lake Okareka. The area occupied by the Rotorua dama has been steadily increasing albeit slowly. Fig. 1.1 is the most recently available map of wallaby distribution in the Rotorua region and is largely the result of a 1983/84 animal survey by the New Zealand Forest Service, combined with confirmed sightings in outlying areas (Llewellyn, 1985a). Llewellyn notes that "While the spread of wallabies has been slow in comparison to red deer, they have now colonised a large area of the central Bay of Plenty and continue to occupy new territory."

Fig. 1.1: Dama wallaby distribution 1983/84.
From Llewellyn (1985a).

DAMA WALLABY 1983/84 DISTRIBUTION.
Scale 1 250,000



1.3 Previous Research

Some aspects of dama biology have been extensively studied by Australian researchers. For example nutritional physiology and metabolism, and morphology of the digestive system have, in relation to other aspects of the animals biology, been well documented. This is evident in the unpublished bibliography by Knowlton (1982).

Publications regarding ecology and behaviour of *M. eugenii* are not well represented in the literature. As summed up by Hume (1982) "*Macropus eugenii* has been the subject of numerous laboratory investigations, but only comparitively recently has its field ecology received any great attention." In this latter regard, Hume may have been referring to the unpublished Ph.D thesis of Inns (1980) who investigated the ecology of *M. eugenii* on Kangaroo Island.

There has only been a paltry amount of New Zealand research on the dama. Knowlton in his 1982 bibliography noted that "...there are only six known published documentations containing information on the species in the New Zealand situation."

There are no detailed studies of *M. eugenii* in the Rotorua region.

The only New Zealand work on the diet of this animal has been carried out on Kawau Island. There, generalities of the feeding ecology were appraised by Kinloch (1973) and studied in more depth by V. Vujcich (1979). Some anecdotal information concerning dama diet is scattered through the literature (eg. Kean, 1959; Wodzicki and Flux, 1967; Andrewartha and Barker, 1969).

The social behaviour of *M. eugenii* on Kawau has been studied by M. Vujcich (1979).

1.4 Aims of the Study

1.4.1 Diet

1.4.1.1 Diet in Relation to Habitat, Season, Sex and Age

It was an important aim to identify preferred foods of wallabies living in the Okataina Scenic Reserve. It was held that this information would help to suggest the extent to which forest damage being sustained in this reserve can be attributed to wallabies. Such information could be used to predict what impact the dama may have on the Urewera and Kaimai State Forests which are on the outskirts of the animals present distribution.

Identification of highly palatable plant species could be of assistance should natural vegetation poisoning such as that used on red-necked wallabies (*Macropus rufogrisea*) in the South Island (Warburton, 1983) ever be considered as an appropriate means of control.

To identify preferred foods it was considered necessary to examine not only wallabies living exclusively within the reserve, but also those frequenting adjoining farmland. That is, if such animals are making full use of pasture as a food source they may be consuming little or no forest vegetation.

It was also hoped to confirm or refute the claim that wallabies consume large amounts of pasture and therefore to determine whether the extensive shooting of wallabies which has been carried out on rateable land is justified.

A further aim of the diet study was to ascertain whether exotic forest (namely *Pinus radiata*) is at all palatable to wallabies.

It was deemed necessary to investigate the variation in usage of plant species with season, sex and age. Such information would be particularly relevant when considering the likely success of a natural vegetation poisoning campaign.

1.4.1.2 Wallaby Impact in Forests

Knowing the diet per se of an animal is of limited use in isolating its impact on the forest; it is also necessary to have information on spatial and temporal changes in forest structure which can then be related to the animals diet.

At the time this study commenced, the New Zealand Forest Service had begun a vegetation survey of the Okataina Scenic Reserve. For this reason it was considered superfluous to examine forest structure in this study. In addition to the vegetation survey the Forest Service also established exclosure plots within the reserve. These were erected early in this study in the hope that it would be possible to incorporate results into the diet analysis work.

1.4.2 Population Biology

It was considered essential to look at as many aspects of population biology as possible.

1.4.2.1 Age Structure

By aging all animals shot it was hoped to get an indication of age structures of the populations in each habitat sampled. The most obvious use for such information is to assess the effectiveness of present control techniques (ie. night shooting). Also as stated by Odum (1971) "... the ratio of the various age groups in a population determines the current reproductive status of the population and indicates what might be expected in the future."

1.4.2.2 Animal Size

Another major aim was to ascertain whether there exist any significant differences in animal size between habitats. Such differences might be attributable to nutrition (Challies, 1973) and thus it may be possible to get some indication of the most optimal wallaby habitat. Such information might be useful when predicting the likely spread of wallabies into surrounding areas.

A further reason for examining the size of wallabies in the Rotorua area was to investigate the rumour that there may be a second species there, as suggested by Wodzicki and Flux (1967) and Jane (1979).

1.4.2.3 Wallaby Condition

"The level of fat reserves provides a useful indication of a populations general well-being because it reflects changes in environmental favourability over short periods of time." (Caughley, 1970). Thus it was hoped to examine fat reserves to measure differences in "general well-being" with habitat, season, sex and age. Such data might be useful when designing poisoning campaigns, as well as supporting data on size differences to indicate ideal wallaby habitats.

1.4.2.4 Breeding

It was intended to investigate the age at which damas first breed and also to determine the proportion of females that successfully breed, for both yearlings and adults. In addition to this it might be possible to establish whether wallabies confined to the forest interior have significantly lower breeding success than those with access to pasture, also to discover whether New Zealand damas are any more or less fecund than Australian animals. A further aim was to establish the season of births and relate this to Australian studies (eg. Inns, 1980). Such data might also be useful for deciding on the most appropriate time to poison should it be necessary.

1.4.2.5 Sex Ratios

Coleman and Green (1984) described four geographically separated populations of brush-tailed possums (*Trichosurus vulpecula*) which showed biases in sampling toward males. They suggested this resulted from males being more mobile than females. It was decided in the present study to compare sex ratios of pouch young with adults in shot samples for each habitat and season. This might provide information on wallaby movements and/or real biases in sex ratio.

1.4.3 Wallaby Movements

Because of time constraints on this study it was decided that relatively little attention could be spent investigating wallaby movements. However the distinct paucity of information available on this subject led to the conclusion that any investigation no matter how limited might yield useful data. Therefore studies were initiated to ascertain:

1. The distances wallabies travel to reach pasture. Such data would be valuable for estimating likely kills from poison laid along marginal areas. It was also hoped to discover any differential pasture usage with sex and age.

2. Long term dispersal habits of wallabies.

1.4.4 Summary of Aims

1. To identify preferred foods.
2. To establish possible food preferences in relation to habitat, season, sex and age.
3. To quantify wallaby impact on forests.
4. To ascertain the age structure of each habitat.
5. To compare animal size for each habitat.
6. To describe variation in short-term condition with habitat, season, sex and age.
7. To investigate breeding success and season of births.
8. To investigate differences in sex ratios for pouch young and adults and describe any variation with habitat.
9. To collect information on wallaby movements.