FALLOW DEER PRODUCTION RESEARCH IN AUSTRALIA

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Introduction

The first record of fallow deer landed on Australian soil occurred in "The Hobart Town Courier" of 9 March 1836 (Bentley, 1978). Six bucks and six does arrived from England on the ship "Wave" and quickly established a small nucleus herd from which animals were later drawn by Acclimatization Societies in Tasmania and on the mainland. Small numbers of fallow deer were introduced to Victoria from Tasmania in the 1850's, and by 1862 several herds numbering up to 50 animals were established (Rolls, 1977).

In New South Wales (NSW) the introduction of fallow deer quickly followed their introduction to Victoria - for example in 1875 two breeding pairs were released on "Currandooly" in the southern tablelands of NSW, and this herd later proved to be an excellent source of breeding stock for the deer farming industry (English, 1981).

In 1924 six fallow deer were liberated on a property in the New England ranges of NSW called "Rangers Valley". Descendants of this release now form the second largest population of wild fallow deer in NSW, with the largest population undoubtedly in Tasmania, where there is an estimated 15,000 deer (Anon, 1983).

At the time that interest began to develop in the farming of deer in Australia, some 15 years ago, there were very few deer in captivity. The majority of these would have been fallow deer, with most in small private collections and fauna parks. This situation reflected their status as the most numerous deer species in the wild in Australia, and their general attractiveness to these types of owners.

It was not surprising that the advent of deer farming as a new primary industry saw fallow deer utilized as the predominant species in most States, due entirely in the first instance to their availability. It was only in Queensland that there was a substantial herd of wild red deer, and deer farming in that State has continued to be based primarily on that species- although there are recent signs of a very logical interest in deer of tropical origin, primarily Moluccan rusa and chital deer.

It is only with the introduction of several thousand red deer from New Zealand in the last three years that the position of fallow deer as the predominant species on farms in southern Australia has been challenged. Nonetheless, fallow deer have now amply demonstrated their ability to thrive under a wide variety of Australian conditions, with good information available on which to base management strategies (English, 1990).

At the time of the establishment of the Deer Research Unit (DRU) at Camden in 1978, there was virtually nothing of substance known of the species in captivity under Australian conditions, and at that time there was a degree of skepticism about the potential of fallow deer in New Zealand - dominated as it was by owners of red deer. It is suffice to say that the species has long since disproved the earlier perceptions of its lack of suitability on both sides of the Tasman.

The first studies to be conducted at the DRU involved fallow deer, with work commencing in 1982 after preliminary observations in the first 3 years of the DRU's development. It should be emphasized and acknowledged here that the then NSW Deer Breeders Association gave strong support to the establishment of the Unit, with donations of stock, materials and labour. The fallow deer project reached the end of a phase in 1989, with the publication of the results of the work to date (Mulley, 1989).

This paper will provide a brief summary of the nature and scope of the fallow deer studies at the DRU, with some key findings.

Reproductive Biology

The annual reproductive cycles of both males and females in NSW were defined, using endocrinological and behavioural observations, with a particular view to later studies on artificial breeding. First oestrus of fallow does each year was synchronized naturally, by decreasing photoperiod, from mid to late April. The mean length of their first and second oestrous cycles was found to be 21.7 ±1.1 days. The mean progesterone concentration in serum ranged from 1.5 nmol/L on the day of oestrus to peak luteal level of 20.8 nmol/L.

In addition to defining the breeding season of fallow bucks, the characteristics of semen collected by electroejaculation were defined. Peak spermatozoal output, morphological normality and motility occurs just before the commencement of the rut in April, and persists until August, before undergoing a rapid decline in September. Collection of semen for storage can be achieved at any time during this period without compromising quality.

Artificial insemination

The techniques necessary for AI in fallow deer were developed during this study. Collection and storage of semen, synchronisation of oestrus, and uterine insemination were performed, with the result being successful insemination of fallow does with both fresh and frozen-thawed semen (Mulley et al 1988).

Advancing the breeding season

Treatment of fallow deer with subcutaneous melatonin was used successfully in 1987 to advance the start of the breeding season. Fawning occurred up to 4 weeks early as a result of this treatment, with no adverse effects on fawn birthweights or survival. The results confirm that the fallow deer fawning season can be brought into closer alignment with abundant Spring pasture growth - although to date there has been little demand for this technology from Australian fallow deer farmers.

Pregnancy diagnosis

The use of ultrasonography as a reliable technique for diagnosis of pregnancy in fallow deer was developed during this study (Mulley et al, 1987).

Reproductive performance

Observations on the reproductive performance of farmed fallow deer in NSW were made over 6 fawning seasons (Mulley et al, 1990a).

A total of 3110 does had a mean minimum fawning rate of 88.8%, which ranged from 75% to 96.4% between fawning seasons. The weaning rate also varied significantly between years, varying from 65% to 89.1% with a mean over 6 years of 81.4%. The sex ratio of fawns at weaning for all fawns recorded over the 6 years was 1:1.

The mean birthweights of fallow fawns varied significantly between the sexes and between years, with female and male fawns weighing 4.01 kg ± 0.61 (n=330) and 4.23 kg ± 0.72 (n=348) respectively. Fawn birthweights generally approximated 10% of the pre-rut bodyweight of their mothers.

The mean weaning weights for 227 doe fawns and 231 buck fawns was 18.7 kg and 21.2 kg respectively, with a mean birth to weaning interval of 108.4 ± 4.89 days.

The mean pre-rut weight of rising 2-year-old does was 36.7 ± 2.51 kg (n= 87), rising with age to between 40.4 kg and 48.6 kg for adult does.

A major finding in the examination of this data was the association between low birthweights and lower than expected weaning percentages. Of 678 fawns weighed soon after birth, 16.7% were 3.4 kg or less, and only 54.9% of these survived to weaning. This contrasted sharply with a survival rate to weaning of 95.8% for 565 fawns weighing more than 3.4 kg at that time.

Necropsy examination of 144 fawns that died in the perinatal period revealed that 22.9% of these fawns died during the ante-parturient or parturient period, but that 55.8% of the remainder died from exposure/starvation in the early neonatal period. Most of the fawns in the latter category were of low birthweight, with the mean birthweight of all fawns at necropsy being 3.01 kg.

It was apparent that the factors which result in low fawn birthweights warranted further investigation - with the probability that maternal nutrition during gestation would be of major consequence.

Maternal nutrition and fawn birthweights

A pen feeding trial was conducted to investigate the association between the adequacy of maternal nutrition and fawn birthweight, and hence fawn survival, with restriction of food intake in a group of fallow does in late pregnancy.

The feed requirements of adult fallow does (mean weight of 41.4±1.2 kg at joining) in the latter half of pregnancy were shown to increase from 7.7 MJ ME/d in week 19 of pregnancy to 10.6 ME MJ/d in week 31 of pregnancy. This represented a 26% increase in daily energy intake during late pregnancy. In addition, it was determined that a 16% reduction in daily ME intake resulted in a 12.9% decrease in fawn birthweights. There is a clear need for further studies to examine the factors leading to low fawn birthweights.

Carcass studies

It had become apparent that many owners of fallow deer were unable to transport young bucks to slaughter during the period from February to August, due to aggression and carcass bruising. As a result, there was generally a shortage of bucks available for slaughter during the winter, compared to the period around Christmas.

The castration of young fallow bucks was seen as a possible solution to this problem, with males castrated pre-puberally developing no antlers, and no aggressive behaviour. However, there was the suggestion that there would be severe penalties in growth rate, and in carcasses being overfat.

An initial trial in 1983 examined the effects of castration at 7 months on the growth rates, carcass weights and dressing out proportion of fallow bucks killed at 20 months of age, compared to entire bucks (Mulley and English, 1985). The castrates were 10.6% lighter at slaughter, with the mean difference in carcass weight being 6.2 kg. There was no opportunity in this trial to examine the carcass composition of the animals, but subjectively the castrates were not overfat.

A much more detailed study was conducted in 1986, with the aim being to determine the effects of castration on the composition of the fallow buck carcass, in animals with and without a zeranol (Ralgro - Coopers Animal Health) treatment. There seemed to be the possibility that a growth promotant such as zeranol would redress the effects of castration on growth rate, and the study was designed to test this (Mulley et al, 1990b).

The carcasses of 17-month-old entire and castrated fallow bucks were dissected into component muscle, bone and fat to determine the characteristics of the commercial fallow deer carcass. The results show that entire fallow bucks produce a lean carcass with a high muscle:bone ratio, and that castrated bucks produce a marginally fatter carcass with proportionally more muscle in the major commercial meat cuts, such as rumps and saddles, compared to entire bucks.

Overall, it was demonstrated that although the carcasses of castrated bucks were usually smaller than those of entire bucks - there was a 6.8% reduction in liveweight and a 7.8% reduction in cold carcass weight, there was no disadvantage in muscle weight and proportion of carcass when comparing carcasses of equal weight.

It was interesting to note that the major effect of zeranol treatment was to increase the deposition of fat in all the major body depots of both entire and castrated bucks. Quite apart from the image problems which this type of treatment presents to venison marketers, there is obviously no basis for the use of such growth promotants in any practical terms either.

Whereas it is not considered desirable to castrate red deer, there are good grounds for considering the procedure with fallow deer bucks - at least for the proportion of a group which are destined for slaughter during those winter months when entire bucks are so difficult to handle. It seems rational to accept the slight weight deficit to achieve a greatly reduced chance of severe carcass bruising - and there have been substantial losses on occasion in Australia. The practice of removing antlers below the coronet, whether by excision or rubber rings, will not be accepted in Australia for very apparent animal welfare reasons.

Manipulation of antler growth

Apart from defining the annual reproductive cycle of fallow bucks in NSW, there was investigation of methods for manipulating the antler cycle. These methods were - castration, surgical polling, medroxprogesterone acetate MPA administration and LH-RH vaccination. For a discussion of castration and polling of fallow bucks see English (1990).

Muir et al 1982 demonstrated the efficacy of MPA in blocking the endocrine events which regulate antler development in red deer. There were similar effects demonstrated in fallow bucks, with one potentially useful effect being the induction of antler casting by MPA. This could have some use when transport of valuable bucks is contemplated during the breeding season, in that there would be a reduced likelihood of aggression and antler trauma. There appears to be no permanent effect on fertility, provided that MPA is given at least 6 months before the next breeding season.

A small trial was conducted to examine the effects of a luteinising hormone releasing hormone LH-RH vaccine on antler development and behaviour in fallow bucks. The major perceived benefit was thought to be the use of such a vaccine in growing deer, in order to delay the onset of the aggressive behaviour associated with the breeding season, and thus to facilitate the transport of fallow bucks to slaughter.

There was a variable response to LH-RH vaccine, as was reported in red deer by Lincoln et al, 1982. In the fallow bucks which did achieve a response, in terms of a delay in the onset of antlerogenesis and subsequently in rutting behaviour, the period was only several weeks, with all bucks having hard spikes and aggressive behaviour by late April. There was no useful deferment of rutting behaviour with the vaccination regime used in this study - immunisation in early June and early July. There were no differences in growth rates between treated and control animals, and the effects of the vaccine were reversible, with the development of normal semen following treatment. There is a need for a much more detailed study before this vaccine can be applied in commercial fallow deer herds.

Velvet antler production

Although fallow deer are farmed primarily for venison, velvet antler from fallow bucks has attracted good prices in Australia (eg A$140/kg), and most farmers harvest velvet antler from their breeding males.

During this study the opportunity was taken to refine the methods used to harvest the product from fallow bucks, and to obtain data on the commercial production of velvet in this species in NSW.

Harvestable yield of "A" grade antler from fallow bucks increases annually until a peak at 6 years of age. The mean weight of velvet antler obtained rose from 235.6 ± 52.5 g in 2-year-olds to 486.0 ± 72.1 g in 6-year-olds. There was a decline after 6 years of age, with bucks older than 8 years having a mean yield of 333.0 ± 36.4 g.

The mean length of time from button casting to "A" grade velvet antler harvest was 45 ± 3 days.

During the study 27/227 (11.9%) of deer handled through yards for velvetting had damaged antlers as a result of the yarding. A total of 31/227 were damaged by the time of cutting, with 22/31 (71%) being 2-year-olds. This places some emphasis on the need to train deer to a yarding system, preferably while still young. It does seem unlikely that large herds of fallow bucks will be retained for velvet antler production in Australia.

Conclusion

The studies outlined above have produced results which have assisted in the development of management strategies for fallow deer in Australia. The species is performing remarkably well under a range of conditions, and there is no doubt that they have an assured place in the Australian deer farming industry.

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