

## BEHAVIOUR AS A POSSIBLE CRITERION FOR SELECTION FOR LAMB SURVIVAL

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### SUMMARY

In a search for indirect selection criteria for the improvement of lamb survival through improved ewe lamb-rearing ability, young ewes and rams from two flocks that differed in lamb-rearing ability were studied. The two flocks were the Trangie Fertility Flock and the Random Flock. Ewes and rams from the two flocks were subjected to an arena test at 6, 12 and 20 months old and the distance walked and the number of bleats were measured. At all three ages, Fertility ewes and rams walked a significantly lower distance than the Random ewes and rams and, at 6 and 12 months, bleated significantly fewer times than the Random ewes and rams. Arena behaviour, therefore, is worthy of further investigation as an indirect selection criterion for the genetic improvement of lamb survival since it can be measured early in the life of the animal and can be measured in rams.

**Keywords:** Lamb survival, selection, reproduction

### INTRODUCTION

The poor survival of Merino lambs has been known since the early 1950's and recent studies show that the problem is still with us. In studies of Merinos under commercial conditions, Kleemann *et al.* (1991) and Kilgour (1992) showed that losses of the potential lamb crop are greater than 30%, while Luff (1980) had previously showed that the perinatal death of lambs through starvation is the greatest single contributor to these losses. In order to improve lamb survival, two avenues of investigation available are management and genetic selection. In this paper, I report the results of a study aimed at the genetic improvement of lamb survival in the Australian Merino.

Three major issues render improvement of lamb survival by genetic means particularly difficult. Firstly, survival involves a behavioural relationship between a lamb and its dam, so there is always uncertainty as to which is the more important in the relationship. Secondly, a ewe's success or lack of it in rearing a lamb is rarely known before she is two years old. Thirdly, the trait is sex-limited.

While admitting that the ewe's contribution is not alone in determining lamb survival, it is an important contribution, so the approach that I have taken is attempt to identify an indirect selection criterion in ewes that can be measured early in life. The reason why I have concentrated on the early life of the ewe is to assess her likely lamb-rearing performance before her first joining. This would be a character that does not require the presence of a lamb and which would have the possible added advantage of being measurable in rams. Previous work along these lines has studied the behaviour of two flocks of ewes that are known differ in lamb survival, the Trangie Fertility and Random flocks (Atkins 1980). This work has shown that, in a simple test of behaviour in an arena, differences appear between the two flocks in the amount of ambulation and in the number of bleats (Kilgour and

Szantar-Coddington 1995,1997). It is therefore possible that such a test of behaviour might be used as a criterion for the genetic improvement of lamb survival, possibly through maternal ability. However, for such a criterion to be useful, it should be measurable in ewes early in their lives, while a bonus would be that the criterion be measurable in rams. The study I report here measured the arena behaviour of young ewes and rams from the Fertility and Random Flocks in order to establish whether differences were measurable as early as 6 months of age.

#### **MATERIALS AND METHODS**

**Experimental animals.** The animals used were Australian Merino ewes and rams from the Trangie Fertility and Random flocks described by Atkins and Robards (1976). Ewes of the Fertility Flock were selected on an index, with major emphasis on lamb rearing ability but emphasis also given to increased hogget fleece weight and increased growth rate from birth to weaning. Any ewe failing to rear a lamb was excluded from the flock, while preferential inclusion was given to ewes rearing twins. Rams were all twin-born and selected on an index of their dam's rearing performance. The Random Flock was an unselected flock.

A total of 30 Fertility ewes and 24 Fertility rams and 31 Random ewes and 42 Random rams were used in the study. All of these animals were of known pedigree and had been born over a six-week period. The Fertility animals were the progeny of three Fertility sires while the Random animals were the progeny of three Random sires.

**Measurement of temperament.** Behaviour was measured in the animals at mean ages of 6, 12 and 20 months using a modification of the arena test described by Fell and Shutt (1989). Briefly, the animals were introduced singly into an arena measuring 13m x 3m, adjacent to one end of which was a smaller pen containing a group of 8 to 10 sheep. The arena was divided into 39 numbered squares each measuring 1m x 1m. The sheep in the smaller pen were screened from the view of the sheep in the arena by opaque plastic, and the sheep in the arena was prevented from jumping into this pen by an open steel barrier mounted above the plastic. Inside the arena, a human being sat directly in front of the pen containing the group of sheep, the idea being to set up a conflict between the sheep's attraction to those in the pen and its repulsion by the human being.

A stock handler took the sheep to be tested from the pen containing the group and placed it into the arena about half way along its length. The stock handler then shut the sheep in the arena and moved quietly out of view. The sheep remained in the arena for 10 minutes and the number of the square in which its front left hoof rested was recorded at 15-second intervals. At the end of the test, the sheep was then placed back into the pen containing the group. The number of bleats during the test was also recorded. From the data relating to the position of the sheep the total distance travelled in the 39 15-second intervals was calculated.

**Statistical analyses.** Data were analysed by least-squares analysis of variance testing for the effect of flock, sex and the flock x sex interaction on total distance and the number of bleats at the three testing periods. Untransformed data were used in all analyses since they were approximately normally distributed. Repeatability was measured as the coefficient of intraclass correlation.

## **RESULTS AND DISCUSSION**

At all three ages, mean total distance was significantly lower in the animals from the Fertility Flock compared to that of the Random animals ( $P < 0.05$ , Figure 1). At none of these ages was there an effect of sex, nor was there a flock x sex interaction. The simple flock means, when sex was disregarded, were  $56.3 \pm 5.1$ ,  $55.0 \pm 5.1$  and  $55.6 \pm 4.8$  m for the Fertility Flock animals at 6, 12 and 20 months respectively and  $80.7 \pm 5.4$ ,  $82.7 \pm 4.2$  and  $78.2 \pm 5.1$  m for the Random animals at the same ages.

These figures bear a remarkable similarity to those previously published for adult ewes from the two flocks (Kilgour and Szantar-Coddington 1995,1997), indicating that these behavioural differences appear at any age in the life of animals from the two flocks from the age of 6 months to 8 years. Repeatability of total distance was 0.61, slightly higher than that of 0.51 reported by Kilgour and Szantar-Coddington (1995).

At all three ages, Fertility Flock animals also bleated less than Random Flock animals, but these differences were only significant at 6 and 12 months ( $P < 0.05$ , Figure 1). At 12 months, there was also a significant effect of sex ( $P < 0.001$ ), wherein rams bleated less than ewes; there was also a significant flock x sex interaction ( $P < 0.05$ ), wherein the difference in number of bleats between the Fertility ewes and rams was less than that between the Random ewes and rams (Figure 1). At 6 and 12 months, the Random Flock animals bleated approximately 50% more than those of the Fertility Flock, similar to results reported by Kilgour and Szantar-Coddington (1995,1997). However, the lack of difference at 20 months was unexpected, at least among the ewes, since Kilgour and Szantar-Coddington (1995) have shown that the flock difference in number of bleats was maintained in adult ewes that underwent arena behaviour measurement three times in an 18-month period. This lower number of bleats in the animals when they were tested at 20 months of age resulted in a repeatability of 0.26, much lower than the repeatability of 0.57 reported by Kilgour and Szantar-Coddington (1995). Number of bleats, therefore, also shows some promise as an indicator of lamb-rearing performance, at least at the first two measurements.

The results of this study, along with those previously reported by reported by Kilgour and Szantar-Coddington (1995,1997) indicate that animals from the two flocks differ in their arena behaviour, thus suggesting arena behaviour as a possible indirect selection criterion for the improvement of lamb survival through lamb-rearing ability. The fact that these differences appear in animals as young as 6 months old, especially in rams, strengthens the possible usefulness of measures of arena behaviour as such a selection criterion. However, before this could be recommended to Merino breeders as a means of genetically improving lamb rearing performance, further work in random-breeding flocks, rather than in selection flocks with their problems of drift and founder effects, would have to be

carried out. Such work would relate measures of arena behaviour to ewe lifetime rearing performance, relationships that could not be derived from the current data.

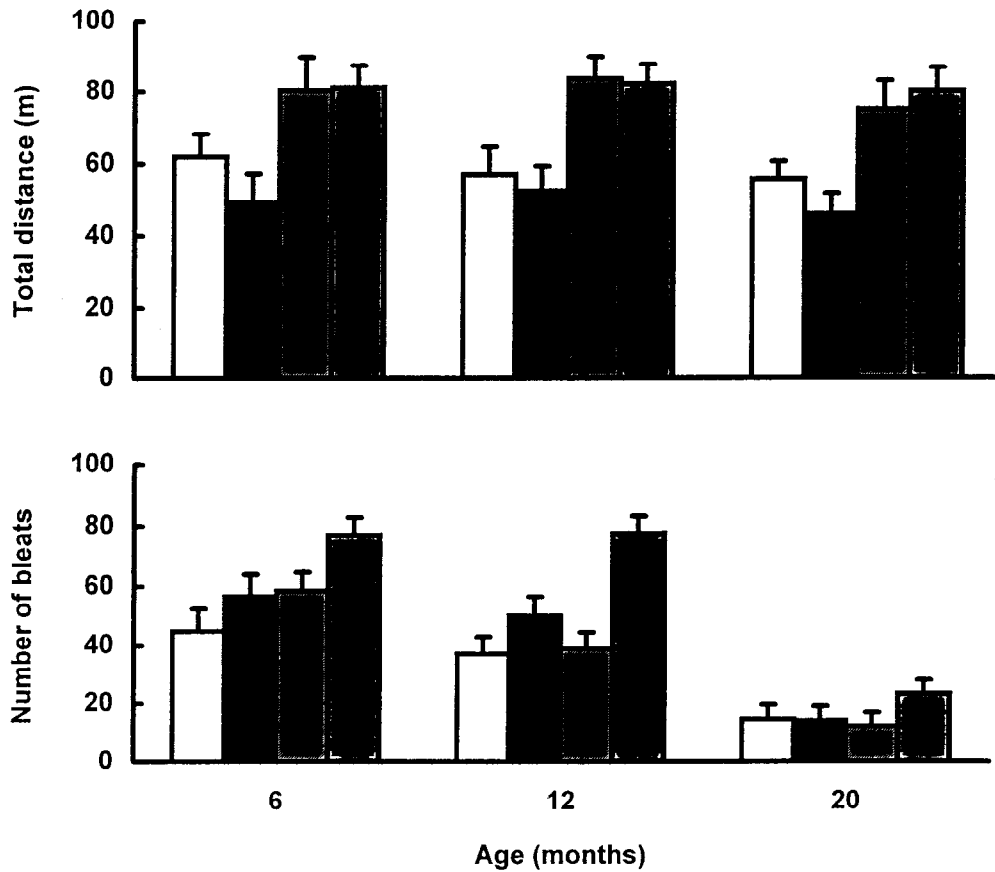


Figure 1. Mean  $\pm$  sem. total distance travelled (upper panel) and number of bleats (lower panel) in Fertility Flock rams (white bars) and ewes (black bars) and Random Flock rams (light grey bars) and ewes (dark grey bars) during arena tests at 6, 12 and 20 months of age.

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