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# A STUDY ON THE BREEDING SEASON OF ROMNEY EWE LAMBS

T. S. CH'ANG\* and J. I. RAESIDE†

THOUGH THE BREEDING SEASON OF EWES has been studied both in New Zealand and overseas, little knowledge on the breeding season of ewe lambs is available. There is a complete lack of published information on the breeding season of the New Zealand Romney ewe lamb. This paper presents some preliminary results of the first part of a project undertaken to investigate the relationship between the sexual behaviour of ewe lambs and their subsequent reproductive performance as two-tooth ewes. The unsatisfactory reproductive performance of two-tooth ewes has often been stressed and the extent of low lambing percentages in Romney Marsh two-tooth ewes has been reported by Barton (1) and Goot (2).

## Review of Literature

Hafez (3) has reviewed the literature on age at first oestrus in sheep and recorded a range of 6 to 33 months. From observations on a small experimental flock of ten Romney Marsh ewe lambs at Cambridge, he concluded that the age at first oestrus was approximately nine months. The duration of the breeding season ranged from 0 to 114 days with a mean of  $38 \pm 11.9$  days and the number of heats per ewe lamb per season was  $2.0 \pm 0.53$ . The length of the sexual season was thus only about a quarter as long as that of adults. The average length of oestrous cycles, based on 12 observations, was 16.38 days. Three of his ewe lambs did not show oestrus in their first season.

Some unpublished data of Hancock, reported by Walker (4), contains the only recorded information known to the writers of sexual activity of New Zealand Romney lambs in the North Island. In his observations on 71 lambs, approximately 50 per cent. experienced oestrus during their first season, which extended from the last week in May (24th) to the second week in July (19th). The average age at first oestrus was approximately nine months.

\*Lecturer in Sheep Husbandry, Massey Agricultural College, Palmerston North.

†Senior Lecturer in Sheep Husbandry, Massey Agricultural College, Palmerston North.

Although the mating of ewe lambs is not common practice, with perhaps the notable exception of the Clun Forest breed (5), several earlier studies on the effects of breeding from ewe lambs have been recorded by Bowstead (6), Briggs (7), and Longwell (8). Recently Apps (9) gave an account of a farm trial in the South Island in which a draft of the best Romney ewe lambs (7 to 8 months of age) was put to a Southdown ram with a consequent 64 per cent. lambing. Such studies obviously provide limited information on the sexual season in ewe lambs.

The occurrence of oestrus in range ewe lambs of the Rambouillet, Targhee and Columbia breeds has been observed by Wiggins (10) and its relation to subsequent reproduction noted. In each of the three years, approximately 15 per cent. of the lambs had one or more heats during their first winter at the Western Sheep Breeding Laboratory, Idaho, U.S.A.

### Material and Methods

Ninety-five ewe lambs selected at random from the Massey College Romney experimental breeding flock were joined with three vasectomized rams on March 8th, 1956. These teasers, raddled with coloured tuppung paste on the brisket, were used to pick out ewe lambs that came into oestrus. All lambs were branded with numbers on both sides of their body for ease of identification. These animals, throughout the breeding season, were run under normal farm management on the College Terrace farm and were inspected daily for evidence of oestrus.

Hancock's data, reported by Walker (4), showed that the average age at first oestrus in New Zealand Romney ewe lambs is approximately nine months. The animals in this experiment reached the average age of nine months on May 27. On this date, a group of 25 was selected at random from those that had not experienced oestrus and these were later used for experimental induction of oestrus by hormonal methods. This phase of the work will be reported elsewhere. By the latter half of July, incidence of oestrus became negligible and teasers were withdrawn on August 2. At the end of the breeding season, therefore, a ewe lamb could be classified into one of the following three groups:

- (a) Those that have had one or more naturally occurring heat periods, that is, the "cycling" class.
- (b) Those that did not come on heat, that is, the "non-cycling" class.
- (c) The "oestrus induction" group.

Data used in this paper *do not* include those animals of the "oestrus induction" group.

### Data and Results

In this project observations were made on the extent of the breeding season, age, body weight and date at first oestrus

or puberty, the length of oestrous cycles, and the number of oestrous cycles per animal in the breeding season. Additional data were collected to estimate differences with respect to date of birth, body weight and fleece weight between "cycling" and "non-cycling" ewe lambs.

Figure 1 illustrates some features of the sexual activity of these ewe lambs during the breeding season.

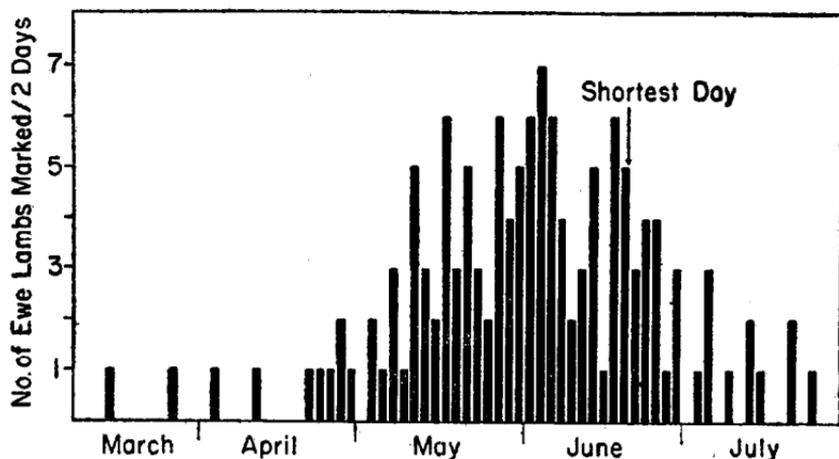


Fig. 1: Variations of the sexual activity of the experimental ewe lambs during the breeding season.

Oestrous activity was negligible until the last week in April. Incidence of oestrus rose and reached its peak between the last week in May and the first week in June. Thereafter it began to decline and, by the end of July, oestrous activity was once again negligible. It can be seen that the duration of the breeding season is approximately four and a half months, extending from mid-March to the end of July. It is also clear that the breeding season of these ewe lambs is not spread evenly about the shortest day, as it is with adult ewes.

On March 13 the first ewe lamb experienced oestrus. The last ewe lamb attained puberty on June 18. The extent of the onset of first oestrus is therefore approximately three months (97 days) extending from mid-March to mid-June. Correspondingly, the extent of the cessation of oestrous activity is approximately two and a half months (73 days) ranging from mid-May to the end of July. Furthermore, it is of interest to note that, not only do early born ewe lambs tend to reach puberty early, but they also tend to finish "cycling" late in the season.

Table 1 summarizes the results obtained from 48 ewe lambs that came into oestrus in the autumn of 1956.

TABLE 1: SOME CHARACTERISTICS OF EWES LAMBS DURING THE BREEDING SEASON.

	Mean	Range
Age at first oestrus (days)	273	212-307
Body weight at first oestrus (lb.)	75	53-92
Date at first oestrus	May 21, 1956	Mar. 13-June 18
Length of oestrous cycles (75 observations) (days)	17.24	14-23
Number of oestrous cycles per animal	2.71	1-6

Estimates of mean age, body weight and date at first oestrus were derived from the method of fitting constants by least squares (11). The estimate of mean age at first oestrus was obtained after having been adjusted for the effects due to sire, age of dam, type of rearing and body weight of lamb at first oestrus. The effects due to sire, age of dam and type of rearing were allowed for in estimating the mean body weight at first oestrus. Similarly, the estimate of mean date at first oestrus was obtained after allowing for the effects due to sire, age of dam, type of rearing, date of birth of the lamb, and body weight of lamb at first oestrus.

Differences between "cycling" and "non-cycling" ewe lambs in date of birth, body weight at a constant age—*i.e.*, 273 days—and hogget fleece weight were likewise estimated by least squares analyses. The difference in date of birth was estimated after allowing for the effects due to sire, age of dam and type of rearing. The same set of effects, plus the effects due to date of birth, were allowed for in the estimation of difference in body weight at 273 days. In estimating the difference of hogget fleece weight (shorn on October 2, 1956), allowance was made for the effects due to sire, age of dam, type of rearing and post-shearing body weight. Table 2 shows these differences between 48 "cycling" and 19 "non-cycling" ewe lambs.

It can be seen that ewe lambs in the "cycling" class were characterized by an earlier date of birth and a slightly higher average rate of live-weight gain from birth to 273 days than those in the "non-cycling" class. Path coefficient analyses were made to measure the relative importance of date of birth and body weight at 273 days on the manifestation of oestrus in the first autumn of a lamb's life. The data suggest that both factors are of approximately equal importance in determining the presence or absence of oestrus in these lambs.

TABLE 2: COMPARISON BETWEEN "CYCLING" AND "NON-CYCLING" EWE LAMBS.

	Cycling Class
Date of birth	14 days earlier*
Body weight at 273 days	5 lb. heavier†
Hogget fleece weight	0.3 lb. more
* Difference significant at 5 per cent. level.	
† Difference significant at 1 per cent. level.	

In addition, an equal number of singles and twins was recorded in the "cycling" class but the "non-cycling" class consisted of 11 singles and 8 twins. Chi-square test (chi-square = 0.340) suggests that whether a lamb cycled or not was independent of its birth rank.

### Discussion and Application

The pattern of sexual activity of ewe lambs described in this paper agrees reasonably well with other published data. In spite of geographical differences and number of animals used, the present observations confirm Hafez's report (3) that the average age at first oestrus is approximately nine months for Romney ewe lambs. Furthermore, in the present data, the average live-weight at first oestrus was estimated to be 75 lb. which is in close agreement with 77 lb. for the Romney Marsh ewe lambs in England, as reported by Hafez. The mean length of oestrous cycle of ewe lambs in the present study was 17.2 days which is the same as reported by Goot (12) for adult Romney ewes.

It may be of interest to compare the time of onset of the breeding season in adult ewes with the occurrence of first oestrus in ewe lambs. For the same district Goot (12) reported that the tupping season began in Romney stud flocks in the second week of March and was practically completed by the middle of May. Till (13) recorded the onset of first oestrus in 79 two-tooth Romney ewes at Massey College and noted that all of them had come on heat between the second week in March and the second week in April. Similarly, Cockrem's unpublished data (14) showed in 1955 a peak in tupping during the last week of March for 90 two-tooth Romneys, with practically all ewes served by mid-April. These dates contrast with the later onset of reproductive activity in ewe lambs in which the occurrence of first oestrus reached a peak during the last week of May and the first week of June.

The economic importance of achieving a satisfactory level of fertility in sheep and especially in two-tooth ewes is well recognized. Thoughts on this problem and approaches to its

solution are, however, quite varied. To increase fertility by genetic methods is not a new approach. It has already been suggested by Rae and Ch'ang (15) that (a) selection for ewes and rams born as twins and (b) selecting ewes that have produced twins, are likely to result in improvement of reproductive rate. While these methods are both valuable and feasible, they are not entirely without drawbacks. For instance, Rae and Ch'ang pointed out that progress from selecting sheep born as twins is likely to be fairly slow, if the average twinning rate in the flock is low. In the second method, selection for ewes producing twins cannot take place until at least one lambing record is available. Under current management practices, the earliest opportunity for selection occurs after two-tooth lambing. This method therefore requires a high proportion of young ewes in the flock; thus, while it may be a useful method for genetic improvement, it is not likely to result in high flock lambing percentage in the initial years.

In view of the limitation attending the use of these two methods, it seems desirable that other approaches be examined in order to improve fertility through breeding. In this respect, it is worth while to mention briefly some possible ways in which the type of data described in this paper may find application in striving for higher fertility. Such uses, as will be suggested, could, of course, be supplementary to existing methods of selection if further study shows their value.

Firstly, it is obvious that data on the breeding season of ewe lambs would find ready application whenever it was held to be desirable to breed from ewe lambs. This practice enables selection for fertility among replacements to be made at the hogget rather than the two-tooth age. While this approach obviates the undesirable features associated with a high proportion of two-tooth ewes in the flock, it deviates considerably from current management practices. There are clearly many aspects requiring investigation before this method can be applied.

Secondly, some improvement in fertility may result from the selection of two-tooth replacement ewes from those that have experienced oestrus as lambs. Wiggins (10) of the Western Sheep Breeding Laboratory reported differences in reproductive performance in favour of two-tooth ewes that had cycled as lambs, as against those ewes that did not cycle as lambs. If a similar situation exists in the New Zealand Romney, the use of teasers, or other methods, to pick out lambs that come into heat may well play an important role as an aid to selection for higher fertility. In addition, this method provides a physiological basis for understanding and perhaps for explaining differences that may arise as a result of selection. Selection for higher fertility based on oestrous activity of ewe lambs,

however, requires the following conditions:

- (a) That the characteristic is heritable.
- (b) That there is a positive genetic correlation between this characteristic and subsequent fertility of the ewe.

There are, as yet, no estimates available on the size of the heritability and genetic correlation. The present data, nevertheless, indicate that there is a difference in age at first oestrus among ewe lambs from different sires. Evidence from work on poultry (16) and pigs (17), however, suggests that age at sexual maturity is heritable in these two species.

### Summary

The breeding season of the New Zealand Romney ewe lamb has been studied. Ninety-five ewe lambs were run continuously with three raddled vasectomized rams from March 8 to August 2, 1956. In these lambs, the duration of the breeding season was approximately four and a half months, extending from mid-March to the end of July, and was not spread evenly about the shortest day. The extent of the onset of first oestrus and the cessation of oestrous activity was approximately three months (97 days) and two and a half months (73 days) respectively.

Estimates of mean age, body weight, and date at first oestrus were derived from the method of fitting constants by least squares. Differences between "cycling" and "non-cycling" ewe lambs in date of birth, body weight at a constant age (273 days), and hoggest fleece weight were likewise estimated. Application of the data to breeding for higher fertility was discussed.

### Acknowledgement

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## DISCUSSION

K. H. C. LEWIS: : *I have had some experience in breeding ewe lambs to fertile rams at the Invermay Research Station. Our observations agree with the figures presented for the mean date of first oestrus. On the Taiari plains this date is May 9 but lambs down there are born later than in the North Island. The estimated mean age at first oestrus is seven months and 54 per cent. of the ewe lambs actually come into oestrus by May 9. The weight and age of the lambs do not seem to be so important as that indicated by the authors. It is possible that the primary factor in determining the onset of first oestrus is the light environment factor. As we proceed south, we do achieve a slightly earlier onset as far as age is concerned.*

A: : With reference to Mr. Lewis's remark that light environment is possibly the primary factor in determining the onset of first oestrus, we would like to point out that for the observations reported by us the light environment was practically the same for all animals. Differences in the date of occurrence of first oestrus, therefore, were ascribed to other factors such as body weight and date of birth.

PROF. I. E. COOP: : *Some trials have been carried out at Ashley Dene and the results agree with those of Mr. Lewis. The mean age at which we get our ewe lambs in lamb would be nearer eight than nine months. If we are going to achieve a lambing percentage of much over 50 per cent., then we must expect late born lambs. Frequently we cannot wean these lambs until February, and since we put our rams out in March we do find that this late lambing depresses the subsequent two-tooth performance. For these reasons, the time when ewe lambs can be mated is most important if the practice of mating them as lambs is to be of any commercial significance.*

A: : The main objective of our experiment has been to see if there is any biological relationship between oestrus activity of ewe lambs and their subsequent reproductive performance as two-tooth ewes. At this stage of our investigation, we are not particularly concerned with breeding from ewe lambs. Observations reported here may, however, serve as a guide to those interested in the practice of mating ewe lambs.

I. J. INKSTER: : *While the oestrus activity of lambs might give a good indication of two-tooth reproductive performance, it may not be a good indicator of fertility on a lifetime basis. In experiments at Ruakura, Dr. Wallace has obtained a difference of approximately 15 per cent. in the lambing performance between a flock intensively selected for high fertility and a flock selected for low fertility. Yet he finds that the two-tooth ewes in the high fertility flock are less fertile than those in the low fertility flock. He believes this is because most of the high fertility two-tooths have been reared as twins and are, therefore, smaller than the two-tooths bred in the low fertility flock.*

A: : Mr. Inkster has given us an example of the effects due to birth rank and rearing on subsequent two-tooth reproductive performance in two lines of ewes selected for high and low fertility respectively. It is too early to say whether or not ewe lambs in the "cycling" class will follow a similar pattern of reproductive performance as shown by the ewes in the low fertility flock. Our data, however, did show that, whether a lamb cycled or not, was independent of its birth rank.