Some Gaps in Our Knowledge of the Seasonal Variation in Reproductive Activity of Ewes of Merino and Related Breeds.

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SUMMARY

DATA are presented on the occurrence and distribution of mating following the introduction of rams among Merino ewes on 25 occasions and among Corriedale ewes on 4 occasions at different times of the year.

The behaviour was similar in the ewes of the two breeds. When rams were introduced among ewes in the late summer and autumn, mating always commenced immediately, and most ewes mated within the first three to four weeks. On some occasions when rams were introduced in the spring, there was a delay before mating began; on most other occasions the initial rate of mating was rather low and in most instances it was five to six weeks before most ewes had mated. In one instance many ewes failed to mate within the eight weeks the rams were present.

Despite this last instance, it is suggested that present evidence is too limited to indicate whether failure to mate is ever a major source of wastage in reproduction among flocks in the field. It is concluded, too, that present evidence is insufficient to define the precise nature and time relationships of the annual rhythm of reproductive activity in Merino and Corriedale ewes and the manner in which they may vary, in particular in relation to the onset of activity in the late spring and early summer.

I. INTRODUCTION

It is proposed to direct attention to two gaps in the knowledge of reproductive activity in Merino ewes. Both result from the poverty of information on the seasonal variation in the occurrence of mating. Firstly, it is not known to what extent failure to mate may constitute a source of wastage in reproduction in Merino sheep which, in different parts of Australia, are mated at widely different times of the year. Secondly, it is not possible to form any clear picture of the time relationships of the seasonal variation in reproductive activity; and without that clear picture it is not possible to get any real idea of the manner in which the annual rhythm of reproductive activity is controlled. It is known that such factors as light and temperature are probably involved, but it is hot known just how they work. The discussion of these gaps in our knowledge is undertaken in the hope that others who have or have had something to do with mating and lambing in sheep may be able to provide information which will assist in bridging them.

The extensive observations of Kelley and Shaw (1939, 1943) indicated clearly that most ewes might be expected to mate during the late summer and autumn months, and they suggested that many might fail to do so during the spring and early summer months. In these observations, ewes were run continuously with vasectomised rams. It has since been shown that, during the spring, the introduction of rams among ewes which have been run separately from them has a stimulating influence on sexual activity among the ewes (Underwood, Shier and Davenport, 1944; Riches & Watson, 1954; Schinckel, 1954a, b). The results of Kelley & Shaw, therefore, do not provide any real picture of behaviour in the spring in the field, as ewes are normally depastured separately from rams for most of the year and joined with them for mating for short periods only.

Some information on the variability in behaviour under these latter conditions was obtained by Riches and Watson (1954). More recently, further information has been provided from the mating of a number of groups of sheep at the C.S.I.R.O. Field Stations at Tooradin and Werribee, and on a number of properties in the Western District of Victoria. This information and its implications are discussed in the following sections.

II. NATURE OF OBSERVATIONS

Between 1947 and 1954, mating was recorded in nineteen groups of Merino ewes at the C.S.I.R.O. Field Stations at Tooradin and Werribee. During

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1953 and 1954 it was recorded in six groups from five Merino flocks and four groups from two Corriedale flocks in the Western District of Victoria.

Four lots of ewes were involved in the observations at the C.S.I.R.O. Field Stations: a lot of a medium fine-woolled type from the Riverina, whose actual origin is unknown (M-N), the progeny of these ewes and Peppin rams from the Riverina (M-NB), a lot of Peppin ewes from another source in the Riverina (M-C), and a lot of ewes from south-western Queensland of Peppin origin (M-GP). The Merino ewes from the Western District of Victoria ($M\text{-}V_{1\text{-}5}$) were all of fine or superfine types of Victorian origin.

The age of the ewes varied widely but in most instances those in each lot were of uniform age. The Corriedale ewes of lot C-lm were maidens. All others had been joined for mating on one previous occasion at least. All ewes had been reared in the environment of southern Australia except those from south-western Queensland. These ewes, iot M-GP, had only been transferred to Victoria four months before mating was commenced. The physical condition of the ewes varied with the seasonal variation in nutrition, but the general level was always fair or good.

The time at which the rams were introduced varied in the different groups from mid-March to the end of December, and the period for which they remained with the ewes varied from four to more than twelve weeks. Coloured grease raddle was applied to the brisket of the rams daily and a record was made each day at the Field Stations, and every one to three days in the field, of the ewes which had been marked on the rump with raddle.

HI. RESULTS

(a) Eventual Occurrence of Mating.

The proportion which eventually mated of the ewes in the different groups is set out in Table I. in relation to the time of introduction of the rams. In this table, too, the various series of observations are distributed according to the length of the period which elapsed before most mating had taken place.

TABLE 1

DISTRIBUTION OF SERIES ACCORDING TO PERIOD REQUIRED TO COMPLETE 95 PER CENT OF THE MATINGS WHICH **OCCURED** FOLLOWING INTRODUCTION OF RAMS AT DIFFERENT TIMES.

Month of Joining	Breed of Ewes*	Site of Observ-ations†	Total No. of Series	Ewes which Finally Mated (%)	Distribution of Series According to Period (Weeks) occupied by 95% of all matings			
					3-4	5-6	7-8	9-12
March to May	M	T, W	6	89-99‡	6			
	M	WD	1	100	1			
	C	WD	2	94-97	2			
June to August	M	T, W	5	88-100	5			
September	M	T	1	41			1	
October	M	T	1	97				1
November	M	T	2	100	1		1	
		WD	3	96-97		3		
December	M	T	4	99-100		4		
		WD	2	99	2			
	C	WD	2	97-98	1			1§

*M represents Merino and C represents Corriedale.

†T is Tooradin, W is Werribee, and WD is Western District.

‡97 to 99% except in two groups of 27 and 28 animals which were with rams for only four weeks.

§Maiden ewes; 87% had mated within 6 weeks.

(i) Merino ewes at Tooradin and Werribee: Only 41 per cent. of ewes mated in the series of observations in which the rams were introduced in September. In all other instances between 89 and 100 per cent. of the ewes eventually mated. However, whereas between March and August 95 per cent. of the ewes which eventually mated did so within three to four weeks after the introduction of the rams, this proportion had not mated until 7 to 10 weeks

after the introduction of the rams during September, October and November, except in lot M-GP and 5 to 6 weeks after the introduction of the rams in December.

(ii) Merino ewes in Western District: At least 96 per cent. of the ewes eventually mated in each series of observations. In the observations in which rams were introduced during November, 95 per cent. of the final level was attained in 5-6 weeks. This level was attained, too, in 3-4 weeks in the series in which the rams were introduced in December and March.

(iii) Corriedale ewes in Western District: 94 to 98 per cent. of the ewes eventually mated in all four series of observations. In lot C-lm in which the rams were introduced among maiden ewes in December, it was 10 weeks before 95 per cent. of the final level had been attained. In the other series in which the rams were introduced in December, this level was attained within four weeks.

(b) Course which mating followed.

The distribution of mating throughout the mating period in various series of observations is plotted in Figures 1 and 2 in relation to the time of introduction of the rams.

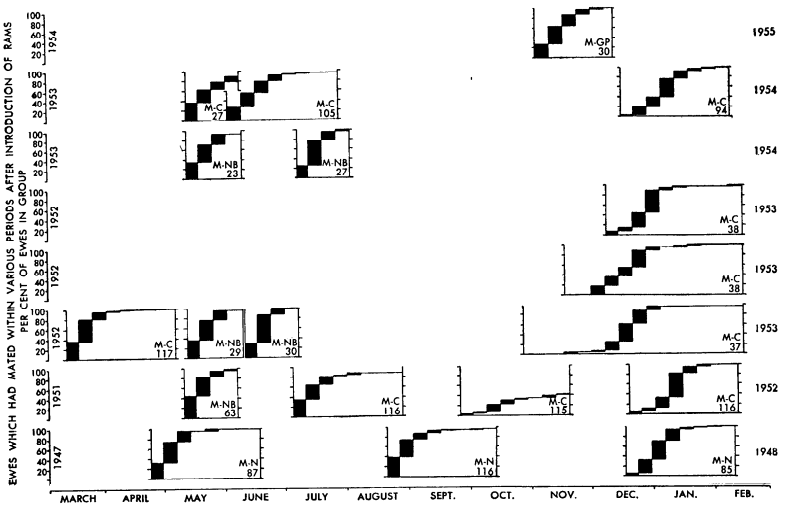

FIGURE 1: Course of mating following the introduction of rams at different times of the year.

Observations at Tooradin and Werribee.

The connected vertical lines depict the dates of introduction and removal of the rams.

The letters and figures in the lower right-hand corner of each series of observations indicate respectively the lot to which the animals belonged, and the number of animals in the group.

The first block in each series, according to the base line, refers to an interval of either 6 days or 7 days (M-GP only in this group), the later blocks to 7 days.

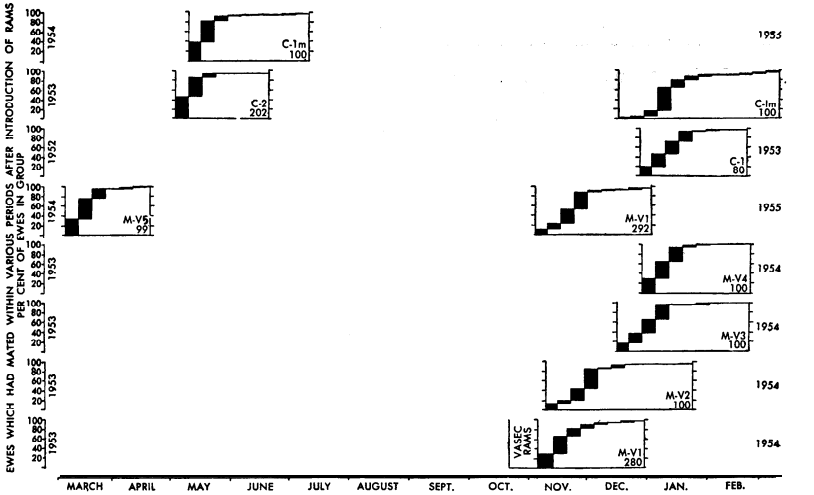

FIGURE 2: Course of mating following introduction of rams at different times of the year.

Observations in flocks in Western District of Victoria.

Presentation as in Figure 1.

Prefix M refers to Merino ewes, and C to Corriedale ewes.

(i) Merino ewes at Tooradin and Werribee: In 11 series in which the rams were introduced between March 12 and August 20, mating proceeded from the onset at a rate which was consistent with the regular cyclical occurrence of oestrus in the great majority of the ewes. In one of the eight series in which rams were introduced between September 26 and December 19, lot M-GP, the initial rate of mating was quite high and all had mated within five weeks. The initial rate of mating was low in the other seven series. In the one in which the rams were introduced in September, mating was still proceeding at a very low rate when they were removed eight weeks later. In the remaining six series, the incidence of mating increased to a high level two to eight weeks after the introduction of the rams.

(ii) Merino ewes in the Western District: Rams were introduced for mating on November 7 after aproned rams had been with the ewes for a fortnight in one series. In this series, lot MV-1, 1954, the incidence of mating was high from the outset. In the two other series in which the rams were introduced in early November, the initial incidence of mating was low but it increased to a high level in the third and fourth weeks. The initial incidence of mating was somewhat higher in the series in which the rams were introduced in mid-December, and it was still higher in the series in which the rams were introduced in late December, almost at a level consistent with the regular cyclical occurrence of oestrus. Mating proceeded at this latter level from the outset in the series in which the rams were introduced in March.

(iii) Corriedale ewes in Western District: Behaviour was similar to that in Merino ewes. In the two series in which the rams were introduced during December the initial incidence of mating was low. Indeed in one of them, lot C-lm, it did not attain a high level until the fourth week. In contrast, the incidence of mating was high from the outset in the two series in which the rams were introduced in May.

IV. DISCUSSION

It may be expected from these observations and those of Riches and Watson (1954) that, under the conditions under which they were made, at least 90 per cent. of ewes of the breeding of those studied will mate within four weeks after the introduction of rams between March and August, and that

following the introduction of rams during September and October behaviour may be variable, and some ewes may fail to mate unless the rams are left with the ewes for more than two months.

It is not possible to decide whether the variation in behaviour in the different series of observations arose from a difference in the source of the ewes, a difference in treatment — one lot of ewes, lot M-GP, had recently experienced a major change in environment — or a difference in seasonal conditions.

However, it is certain from these observations, those of Underwood, Shier and Davenport (1944), and those of Thompson and Schinckel (1952) and Shinckel (1954 a, b) that ewes of Victorian and South Australian strains frequently exhibit a higher degree of sexual activity during November and December than did the ewes of lot M-C at Tooradin — ewes of Peppin origin. If the difference in behaviour should have arisen from a difference in the origin of the ewes, then it is possible that ewes of the Victorian and South Australian strains may also exhibit a high level of sexual activity earlier in the Spring, during September and October. Without further evidence, therefore, it is not possible to say that ewes of Victoria and South Australian strains, would not mate if rams were introduced during September and October. It is just not known what the behaviour would be.

These sheep — the ones studied by Underwood et al. (1944), Thompson and Schinckel (1952), and Schinckel (1954a, b) and those studied in the Western District of Victoria— were all from flocks in which mating is undertaken regularly in November and December. Their behaviour may be characteristic of all sheep that are joined regularly at that time for mating, so that the lack of knowledge extends over a great number of sheep.

In addition to lack of information on whether ewes will mate during the spring, there is lack of information on the course mating may be expected to follow. In the ewes of lot M-GP there was a high incidence of mating from the outset; in those of lots $M\text{-}V_{1\text{-}5}$ and in those studied by Underwood et al. (1954) and Schinckel (1954 a), a high incidence of mating did not occur until 2-3 weeks after the introduction of the rams; and in the ewes of lot M-C the interval between the introduction of the rams and the attainment of a high incidence of mating declined progressively from late October to early December.

The response of ewes to the introduction of rams in the late spring is characterised by the attainment of a high incidence of mating only after the rams have been with ewes for some time. It has been shown by Schinckel (1954 b) and Radford and Watson (in preparation) that at this season the influence of the introduction of the rams is to induce ovulation in the ewes within a few days, but that oestrus does not occur in most of them until ovulation has recurred 2-3 weeks later. This cannot be the course of events if the introduction of the rams has a stimulating influence in the late winter or early spring in such ewes as those of lot M-C, since at that time the introduction of the rams was characterised by a high incidence of mating from the outset.

The progressive decline in the interval between the introduction of the rams and the onset of mating among the ewes of lot M-C in the late spring of 1952 suggests a progressive rise in the sensitivity of the ewes to stimulation by the introduction of the rams. This aspect is discussed in more detail by Radford and Watson, in preparation. It suggests that reproductive activity began to rise in these ewes in late November if not earlier. Either it must have risen earlier still in the ewes of lots $M\text{-}V_{1\text{-}5}$ or it must have remained at a high level throughout in them. The lack of knowledge of what did happen and the lack of knowledge of the influence of the introduction of rams early in the spring merely serve to emphasise the lack of any effective picture of the annual rhythm of reproductive activity in the spring in ewes of Merino and related breeds.

These gaps in our knowledge of seasonal variation of reproductive activity require to be filled, not only to allow a clear definition of the wastage in reproduction from failure to mate, but to allow any real understanding of the manner in which the annual rhythm of reproductive activity is controlled. Their filling would constitute a contribution of knowledge which could be made by any field or research station on which sheep are run. Observations would need to be continued for several years, and care might be needed in original design to ensure that all variables were adequately covered, but little difficulty or expense would be involved in actually carrying them out.

V. ACKNOWLEDGMENTS

The author acknowledges gratefully the co-operation of the various properties in the Western District of Victoria, not only in providing sheep but in undertaking the detailed recording of the occurrence of mating. He is indebted, too, to the staff of the C.S.I.R.O. Field Stations for their careful recording of the occurrence of mating.

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DISCUSSION

Mr. KNIGHT: Was any attempt made to study the twinning rate from matings at different times of the year?

ANS.: The only information is for the M-N ewes, where those joined in April produced 14 per cent. of twins, those joined in September, 8 per cent. of twins, and those joined in January, 0 per cent.

More recently data have been collected by Mr. Radford from the M-NB ewes in pens at Yarkville, on a uniform plane of nutrition which was sufficient only to maintain weight. The ovaries were examined at various times. The proportion of twin ovulations at the various examinations was: August, 1954, 58 per cent.; November, 23 per cent.; January, 1955, 50 per cent.; March, 74 per cent.; May, 78 per cent.; August, 57 per cent.; and November, 36 per cent.

Mr. MOLESWORTH: Was there any flushing of ewes prior to mating?

ANS.: The only flushing was that given by the seasonal variation in the pastures.

Dr. MOODIE: What is the conception rate of ewes at different times of the year as distinct from the incidence of oestrus?

ANS.: Conception rates have been published for the M-N ewes. There was no substantial difference in those in December and in March, but that in September was a good deal lower.

Mr. DUN: Observations at Trangie indicate that ewes come on heat immediately and in high numbers at spring joinings. Teasers contribute nothing towards matings. Ovarian examinations indicate that anoestrous ewes occur only in October and November. Cyclic changes in reproduction during the remainder of the year are indicated by changes in the percentage of twin ovulations from 70 per cent. in March to 20-30 per cent. in September-October.

ANS.: When rams go in and ewes mate straight away teasers cannot be expected to have any effect. However, the high incidence of mating in the spring at Trangie suggests that the annual rhythm of reproductive activity in those ewes does indeed differ from that in the ewes studied by me.