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## LIBIDO TESTING AND SUBSEQUENT MATING PERFORMANCE IN RAMS

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### SUMMARY

The performance of eight 1½-year-old and twenty-five 2½ to 3½-year-old Romney rams and eight 2½ to 3½-year-old Cheviot rams, in pen and paddock libido tests, and their flock mating performances at different ram:ewe ratios was recorded. All rams except one Cheviot were sexually active in the libido tests. There was no effect of age or breed of ram on their performance in the pen libido tests, and there was no difference between the performances of the rams in two pen libido tests conducted two weeks and one week prior to the commencement of flock mating. Variation between rams in flock mating performance, measured by the percentage of total ewes that were marked by each particular ram, could not be accounted for by variation in ram:ewe ratio, age or breed of ram, or any of the libido criteria measured.

### INTRODUCTION

The lambing percentage of sheep flocks is a function of both the fecundity and fertility of sheep. Maximum fecundity is set at the time of mating by the number of ova shed per ewe, there being few monozygotic twins in sheep (Morley, 1948; Barton, 1949). Maximum fertility is set by the number of ewes mated. Mating performance of sheep may be affected by many factors, including paddock size and age of ewes and rams (Lindsay and Robinson, 1961; Croker and Lindsay, 1972), breed of ewes and rams (Lees and Weatherhead, 1970; Land *et al.*, 1972), seasonal activity of the rams (Lees, 1965; Lindsay and Ellsmore, 1968; Jackson and Williams, 1973) and ram: ewe ratio (Allison, 1975).

Mattner *et al.* (1967) reported large differences between Merino rams in the number of mounts and services per day in flock mating. A pen libido test was developed (Mattner *et al.* 1971), and the number of services by 1½-year-old Merino rams in these tests was shown to be highly correlated with the number of services in flock mating (Mattner *et al.*, 1971, 1973).

In experiments at Invermay testing the effect of ram:ewe ratios at mating on the fertility of sheep, all of the rams used were

libido tested. This paper presents the results of these libido tests and subsequent performances during flock mating of 41 rams joined with 50 to 210 ewes per ram.

#### MATERIALS AND METHODS

The results are drawn from experiments conducted in 1972, 1973 and 1974 (Experiments 1, 2 and 3, respectively). All rams were semen tested using electro-ejaculation approximately three weeks before the commencement of flock mating, and rams with a motility score below 2.5 were not used. The performance of the selected rams was observed in two pen libido tests (Mattner *et al.*, 1971) conducted two weeks and one week before the commencement of mating. In addition, five days before flock mating commenced in Experiment 3, the performance of each ram in a 0.81 ha paddock containing 8 oestrous and 32 non-oestrous ewes was recorded for one hour (Paddock Libido Test A), and then three days later the rams were placed with the three other rams in their mating group and observed under similar conditions for 1.5 hours (Paddock Libido Test B).

During flock mating all rams were fitted with sire-sine harnesses and different coloured crayons to distinguish individual ram performance. The number of ewes marked by each ram was recorded at the end of the mating period in each experiment. The conduct of the experiments is outlined below.

#### EXPERIMENT 1

Nine Romney rams, 2½ to 3½ years old, were divided at random into three groups of three. Each group was mated with a flock of 210, 420 or 630 mature aged (2½ years and older) Romney ewes (Allison, 1975). Only the data for the first 17 days of mating have been used. The flocks were run in 4 to 6 ha paddocks.

#### EXPERIMENT 2

Two groups of four 1½-year-old rams and two groups of four 2½ to 3½-year-old rams were used (all Romneys). Each of these groups was mated in an 8.1 ha paddock with 240 ewes and 720 ewes for four days, with a four-day period between joining with each flock. There were 25% 1½-year-old and 75% 2½-year or older Romney ewes in each flock.

At the end of each flock mating, the groups of rams were immediately placed in a 0.81 ha paddock with either 14 oestrous

ewes and 14 wethers (4:240 group) or 42 oestrous ewes and 42 wethers (4:720 group), and observed continuously for eight hours. The number of oestrous ewes represent the number of ewes expected to be in oestrus daily at each ram:ewe ratio, assuming a random variation in cyclic activity of the ewes—*i.e.*, 240 ewes/17 days = 14 ewes/day. The number of mounts and services by each ram was recorded.

### EXPERIMENT 3

Two groups of four 2½ to 3½-year-old Romney rams and two groups of four 2½ to 3½-year-old Cheviot rams were used. Each of these groups was mated for four days with each of four flocks of Romney ewes. There were two flocks of 200 ewes and two flocks of 400 ewes, one of each flock size being mated in paddocks of 0.81 ha or 8.1 ha. Three flocks were mature aged ewes and the other was a flock of 1½-year-old ewes.

### STATISTICAL ANALYSES

To test the effect of age and breed of ram on their performance in the pen libido tests, the results were analysed by split-plot analyses of variance with animals as the main plots and libido tests as sub-plots. Data for number of mounts were subjected to square root transformation to avoid undue influence from a few extreme observations.

To test the value of the libido data in predicting the flock mating performance of the individual ram, linear regression equations were calculated using as the dependent variable number of ewes marked by each ram (expressed as a percentage of the total number of ewes marked during the mating period by the group of rams), and as the independent variables ram:ewe ratio, age and breed of ram, and the libido data. No transformation was used for the libido data, since this was essentially a between-ram comparison. The change in the multiple correlation coefficient for the equations was tested by an *F* test as each independent variable was added to the regression (in order as above), to test if the inclusion of the variable significantly increased the amount of variation explained. In Experiment 2 the performance of rams during the eight-hour observation following four days of flock mating was also used as the dependent variable.

During any four days' mating in Experiments 2 and 3, the total number of ewes marked deviated, considerably at times, from the expected values assuming random variation in cyclic activity of

the ewes. This deviation was due to non-random variation in cyclic activity, rather than failure to mark the ewes in oestrus, for there was no difference between flocks of mature aged ewes, irrespective of their ram:ewe ratio, in the percentage of ewes marked in the first 17 days of mating. Consequently the ram:ewe ratio was calculated on the basis of ratio of rams per total number of ewes marked during the four days' mating, and then adjusted to a 17-day mating period.

## RESULTS

### LIBIDO TESTS

One of the Cheviot rams failed to display any sexual activity during the tests, and so was excluded from the results. In the two pen libido tests there was no significant difference in the performances of the rams between tests, between ages of Romney rams or between breeds of ram, in any of the five libido criteria that were recorded. The mean values for all of the libido tests are presented in Table 1.

TABLE 1: PERFORMANCE OF RAMS IN THE LIBIDO TESTS  
(Mean value  $\pm$  S.E.)

	<i>Pen Libido</i> <i>Test 1+2</i> (n=40)	<i>Paddock Libido</i> <i>Test A</i> (n=15)	<i>Paddock Libido</i> <i>Test B</i> (n=15)
Total no. of mounts per ram .. ..	24.4 $\pm$ 2.5	15.9 $\pm$ 2.1	15.5 $\pm$ 1.8
Total no. of serves per ram .. ..	7.7 $\pm$ 0.3	5.9 $\pm$ 0.5	5.8 $\pm$ 0.5
Mount:serve ratio ..	3.5 $\pm$ 0.4	3.2 $\pm$ 0.7	3.1 $\pm$ 0.5
Time to first mount (seconds) .. ..	24.2 $\pm$ 2.1	—	—
Time to first serve (seconds) .. ..	89.6 $\pm$ 14.2	—	—

### FLOCK MATING

There were a total of 100 observations on the mating performance of 39 rams over the three experiments, the data from one ram in Experiment 1 being excluded since its mating performance was affected when it developed a foot abscess. There was considerable variation between rams in the percentage of the total ewes

marked that each particular ram marked during the mating periods. The values ranged from zero to 100%, although the majority of rams marked over 50% of the total ewes marked (Fig. 1). The coefficient of variation of this percentage was 26.8%.

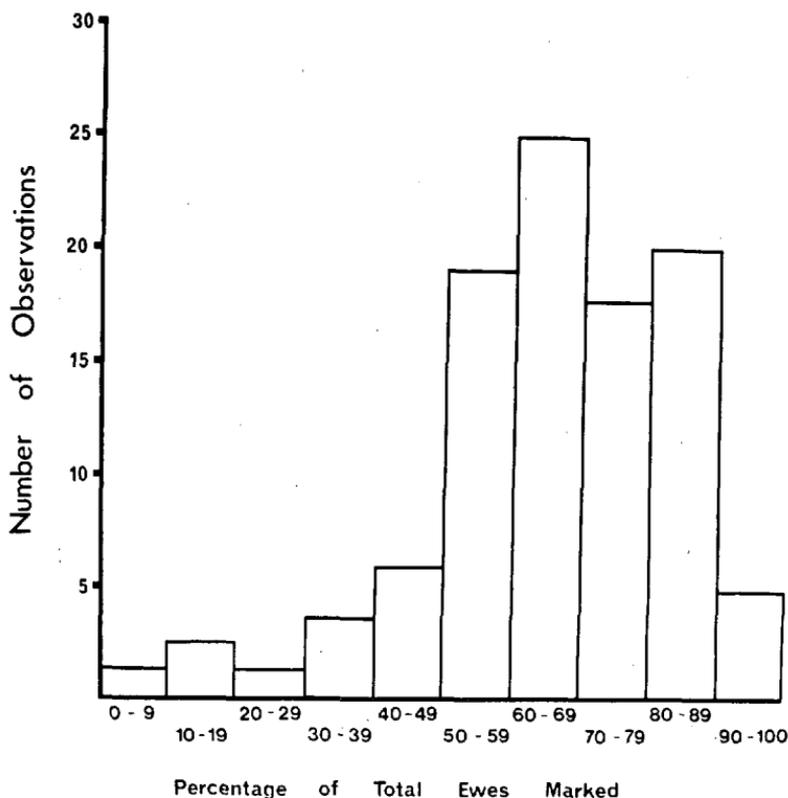


FIG. 1: Distribution of 100 observations of ram performance—classified by percentage of total ewes marked that were marked by any particular ram.

The multiple correlation coefficients of the linear regressions calculated for the flock mating and libido data are presented in Table 2. The addition of the libido variables from the pen tests to the regression equations, using the data from either Test 1 or the combined data from both tests, in all but one case caused no significant increase in the multiple correlation coefficient over that obtained using ram:ewe ratio, age and breed of rams as the independent variables. The exception was when the number of serves in the first libido test was included, there being a significant

increase in that case ( $P < 0.01$ ). Several of the libido variables recorded in the paddock tests significantly increased the multiple correlation coefficient ( $P < 0.05$ ), namely, number of mounts and serves and mount:serve ratio for Test A, and number of mounts for Test B. Nevertheless, the multiple correlation coefficients for all regressions were not large enough to be of practical importance.

TABLE 2: MULTIPLE CORRELATION COEFFICIENTS BETWEEN PERCENTAGE OF TOTAL EWES MARKED THAT WERE MARKED BY EACH RAM AND VARIOUS EXPLANATORY CRITERIA

PEN LIBIDO TESTS		
<i>Independent Variables</i>	<i>R Value</i>	
Ram : ewe ratio	0.14	
Ram : ewe ratio plus age of ram	0.28*	
Ram : ewe ratio plus age and breed of ram - (1)	0.33	
<i>Libido variables</i>	<i>Libido 1</i>	<i>Libido 1 and 2</i>
(1) plus number of mounts	0.34	0.35
or (1) plus number of serves	0.45**	0.33
or (1) plus mount : serve ratio	0.35	0.35
or (1) plus time to first mount	0.35	0.33
or (1) plus time to first serve	0.34	0.34
PADDOCK LIBIDO TESTS		
<i>Independent Variables</i>	<i>R Value</i>	
Ram : ewe ratio	0.06	
Ram : ewe ratio plus breed of ram - (1)	0.13	
<i>Libido variables</i>	<i>Test A</i>	<i>Test B</i>
(1) plus number of mounts	0.31*	0.31*
or (1) plus number of serves	0.29*	0.15
or (1) plus mount : serve ratio	0.31*	0.13

Asterisks indicate significance of the increase in  $R$  when new variable included in regression.

Regression equations were also calculated using the results obtained in the eight hours of observation in Experiment 2 as the dependent variables. The addition of the variables number of mounts and mount:serve ratio from the pen libido tests to the regression for number of mounts in eight hours significantly increased the multiple correlation coefficient ( $P < 0.001$  and  $P < 0.01$ , respectively, Table 3). There was no effect of the addition of any libido variables on the multiple correlation coefficient for number of services in eight hours, although age of the ram increased the coefficient from that using ram:ewe ratio as the only independent variable ( $P < 0.05$ ).

TABLE 3: MULTIPLE CORRELATION COEFFICIENTS BETWEEN NUMBER OF MOUNTS AND SERVES IN EIGHT HOURS (EXPERIMENT 3) AND VARIOUS EXPLANATORY CRITERIA

<i>Independent Variables</i>	<i>No. of Mounts</i>	<i>No. of Serves</i>
Ram : ewe ratio	0.35	0.27
Ram : ewe ratio plus age of ram - (1)	0.42	0.46*
<i>Libido variables (Libido 1 + 2)</i>		
(1) plus number of mounts	0.78***	0.46
or (1) plus number of serves	0.45	0.47
or (1) plus mount : serve ratio	0.65**	0.46
or (1) plus time to first mount	0.48	0.46
or (1) plus time to first serve	0.52	0.49

Asterisks indicate significance of the increase in R when new variable included in regression.

#### DISCUSSION

In the flock mating there was considerable variability between rams in the percentage of total ewes marked that each particular ram marked. However, less than 20% of this variation could be accounted for by the observations recorded for each ram, including the data from the three libido tests. In contrast, Mattner *et al.* (1971) reported correlation coefficients of 0.66 to 0.72 between the number of serves by 1½-year-old Merino rams in the pen and flock libido tests, and service frequency during flock mating. Our failure to record such a positive relationship could have been due to several reasons, including a higher and less variable libido in our rams than those used by Mattner *et al.* The performances of our rams in two pen libido tests was equal to or better than that of their Merino rams in three tests, and the variability in performance was less as indicated by smaller standard errors. Also 23% of their Merino rams failed to mount any ewes during their tests, whereas only one ram failed to display any sexual activity in our tests. This ram subsequently marked 120 of 209 ewes marked by the rams in its mating group, and during a pen libido test conducted immediately after mating mounted eight times with five serves.

There may be inaccuracies in measuring ram performance during flock mating by using raddle marks. Nevertheless, in Experiment 2 during the eight hours observation, although there were relationships between the number of mounts in eight hours and the pen libido criteria, there were no such relationships for number of serves.

It is concluded that only a minor proportion of the variation that exists between rams in the percentage of total ewes marked during flock mating can be accounted for by differences in libido (as measured by the libido tests conducted in these experiments), ram:ewe ratios or age and breed of ram. The behaviour of the rams in flock mating is obviously affected by factors other than these four. The results from the eight hours of observation of flock mating suggest that, in contrast to the situation that exists where there is a libido problem with rams (Mattner *et al.*, 1971, 1973), there would appear to be no value in conducting pen libido tests when the rams have a good libido, since the performance of rams in these tests will not necessarily reflect the number of services they will perform in the field.

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