VITAL STATISTICS FOR AN EXPERIMENTAL FLOCK
OF MERINO SHEEP IN NORTH WEST QUEENSLAND

MARY ROSE*

Summary
Age-specific death rates are presented for the period 1953-70. Mortality was higher than in more favourable environments and was extremely high in lambs and weaners.

Reproduction rates were low at all ages; the lambing rate at its highest was only 63 per cent and only 75 per cent of these lambs survived to marking.

Both autumn and spring joinings were considered. Losses at different stages in the reproductive cycle were examined and most were attributed to poor nutrition in spring and early summer.

Provision of adequate nutrition for autumn-born ewe weaners is suggested to facilitate selection for a more productive animal in this environment. This may also bring an immediate improvement in flock productivity.

I. INTRODUCTION
Vital statistics provide a comprehensive basis for assessing the extent of flock problems and defining stages in the reproductive cycle where failures occur. Accurate data are not generally available, but experimental or stud flocks for which individual records are kept provide an opportunity to derive this information. Such data have been reported by several authors (Kelley 1939; Granger 1944; Turner, Dolling and Sheaffe 1959; Short 1962; Turner and Dolling 1965).

Moule (1966) reported vital statistics for flocks in semi-arid tropical Queensland. This paper presents age-specific vital statistics for an experimental flock at Julia Creek, northwest Queensland and their use in defining flock problems.

II. MATERIALS AND METHODS
The experimental flock was run on Toorak Sheep Field Research Station, Julia Creek. The environment and flock history until 1959 have been described by Beattie (1961). Since 1959 the flock has been mated as three groups — Plain, Wrinkly and Random. There has been no culling of ewes, and selection of rams has been based primarily on skin fold development. Until 1964 the flock was joined annually in autumn, except in the severe drought of 1960. From 1965 the flock has been joined in spring.

Age-specific death rates for the years 1953-1970 were calculated using the number of ewes present at the annual shearing (June-July). The limitations of using the number of sheep mustered to estimate mortality have been described by Turner, Dolling and Sheaffe (1959).

*Department of Primary Industries, Brisbane, Queensland, 4000.
Fig. 1.—Mean death rates at each age for Peppin Merino breeding ewes.
- - - , mean for “Toorak” flock (all years 1953-70);
△ - △, mean for “Toorak” flock (autumn joining 1953-64);
△ - △, mean for “Toorak” flock (spring joining 1965-70);
○ - - ○, mean for 25 flocks in central and N.W. Queensland (Moule 1966).
Reproductive performance was defined for each age group as the number of lambs born or marked per ewe present at the pre-joining weighing.

These data were separated into years of autumn joining (until 1964) and spring joining (from 1965). Although these joinings took place in different years and are not entirely comparable, it may well be that the extreme variations which occur in this environment make comparisons within one year no more meaningful. However the long periods of observation may provide a useful comparison, as they are representative of a range of seasons experienced in the area. The average rainfall for the years 1953-70 was 413 mm (range 194 mm-834 mm) compared with the 83 years of available records 416 mm (range 92 mm-1 105 mm). The actual distribution of rainfall is of far more importance in this area than total annual rainfall because of the restricted summer growing season and the often detrimental effects of winter rainfall on the pasture. For this reason annual rainfall may not always be a reliable indicator of seasonal pasture conditions.

Differences between spring and autumn joinings for age-specific mortality and reproduction rate were tested using chi-square analyses of the actual figures.

III. RESULTS AND DISCUSSION

(a) Age-specific death rates

Figure 1 shows the mean death rates for ewes of each age group for the years 1953-1970. Death rates have also been presented based on the same data but separated for season of joining.

Moule (1966) reported age-specific death rates derived from observations made between 1947 and 1957 in 25 flocks on the Mitchell grass (Astrebla spp.) country of central and northwest Queensland. These data are also included in Figure 1. Mortality in the “Toorak” flock was similar to that reported for these flocks.

Death rates for this experimental flock were characterised by a very large loss of ewes prior to first joining at 18 months. Much of this loss occurred before marking (29 per cent of ewes born from spring joinings and 32 per cent from the autumn). Mortality in weaner ewes was considerable. Of ewes marked, 24 per cent (spring) and 10.5 per cent (autumn) failed to survive to first joining.

Losses in adult ewes were comparatively minor although greater than those recorded for flocks in more favourable environments (Granger 1944; Turner, Dolling and Sheaffe 1959). Aged ewes showed rapidly accelerating death rates and very few survived beyond 12 years.

Mortalities among autumn-joined adult ewes were significantly higher than those of spring-joined adult ewes. This may be attributable to losses associated with lambing in spring, when owing to the predominantly summer rainfall, the nutritional value of the pasture is submaintenance. Apart from occasional heavy losses among pregnant and aged ewes caused by bogging and drowning after heavy rain, the specific cause and time of death were seldom known and so no detailed analyses could be made.
Fig 2. — Mean reproduction rates at each age for Perkin Merino breeding ewes. The height of each column represents the number of lambs born and the height of the shaded portion the number marked.
(b) **Age-specific reproduction rates**

Figure 2 shows mean reproductive performance of ewes by age for the period 1955-70. The data have been separated for spring and autumn joinings. The most striking feature of the data is the extremely low reproduction levels. The lambing rate at its highest was only 63 per cent and only 75 per cent of these lambs were reared.

The reproductive performance of ewes in the autumn-joined flock increased with age to a maximum at 5.5 years and thereafter declined. Spring-joined ewes reached their peak at 4.5 years but their performance declined more rapidly with age. The differences between lambing percentages for autumn and spring-joined ewes were statistically significant for ages 5.5, 6.5 and 7.5 years and lambs marked for 5.5 and 7.5 years. There was no difference in lamb survival rates between autumn and spring-joined ewes except for ewes aged 6.5 years.

(c) **Using vital statistics to assess the extent of flock problems**

Granger (1944) developed a formula relating the practicable degree of selection of young ewes to the vital statistics of a flock. If data for the “Toorak” flock are used in this formula, the percentage of young ewes which must be selected to maintain flock numbers in an autumn and a spring-joined flock is 85.5 and 91.5 respectively. Either flock can maintain itself if a limited amount of culling is undertaken and ewes remain in the flock until death.

To achieve a higher culling rate would require an increase in one or more of the factors controlling it — marking percentage, number of ewe lambs surviving from marking to first joining and the average number of joinings per ewe. A culling rate of at least 20 per cent is desirable if any selection programme is to be implemented. The necessary increase in each factor is considered if that factor changed independently of the others.

(i) **Increasing the lamb marking percentage**

For an autumn-joined flock the lamb marking percentage must be raised from 39 to 42 per cent. Losses of lambs were largely the result of poor nutrition and high temperatures resulting in desertion, mis-mothering, prostration and starvation of lambs (Moule 1954; Smith 1964; Murray 1970).

With spring joining, an improvement in the lamb marking percentage from 35 to 40 per cent would be necessary. The high neo-natal mortality in autumn-born lambs was associated with the extremely low birth weights which result from a summer gestation. The average birth weight of these lambs was 2.9 kg compared with 3.7 kg for spring-born lambs. Lambs weighing less than 2.6 kg represented 30 per cent of autumn-born lambs but 76 per cent of neo-natal mortalities.

(ii) **Increasing the number of marked ewe lambs surviving to first joining**

The post marking losses in spring-born ewe lambs were considerable (10.5 per cent). These would have to be reduced to 5 per cent before a 20 per cent culling was possible. These deaths occurred mostly before weaning as a result of poor nutrition.

In a spring-joined flock the death rate in ewe lambs would have to be 10 per cent instead of the present 24 per cent. This loss of almost one quarter of the ewe lambs marked occurred after weaning when nutrition was inadequate.
(iii) **Increasing the average number of times ewes are bred**

For an autumn-joined flock the average number of joinings must be increased from 6.6 to 7.1 and for a spring-joined flock from 8.2 to 9.3. Since no ewes were culled or cast for age in this flock, an increase in the average number of joinings would require a reduction in adult death rates.

(d) **Future Improvement**

Reproductive performance is affected by poor nutrition in spring and early summer. Autumn-joined ewes lamb on poor feed, so unless it were practicable to diagnose pregnant ewes, all ewes would have to be fed. The spring-joined flock is joined on poor feed, so all ewes would have to be supplemented.

The only reports of feeding supplements to breeding ewes in this area are those of Murray (1970). In 1968 he fed autumn-joined groups for six weeks before, eight weeks during and six weeks after lambing with 2.7 kg of grain sorghum per head per week. These treatments did not affect the proportion of ewes dying between joining and lamb marking or the proportion of ewes lambing. Supplementation did increase the lambs reared as a proportion of surviving ewes by 11.1 per cent. For spring-joined groups supplemented for six weeks before and eight weeks during joining, an increase of 15.5 per cent in the number of lambs reared was obtained. On these results the 20 per cent culling rate could be achieved but the response is not likely to be economic.

Supplementary feeding would be more likely to be an economic possibility if only a portion of the flock were fed. Within a spring-joined flock 24 per cent of those ewes which were marked died between six and ten months of age. Providing a better plane of nutrition for these weaners by supplementation or preferred treatment through access to the best pastures available could do much to reduce this loss. Since ewe weaners comprise less than one quarter of the ewe flock, this would not be such a large economic or managerial problem.

Pen feeding trials at “Toorak” have shown that feeding autumn-born ewe weaners to ensure adequate growth rates during their first spring and early summer increased fertility during at least the next two years (K. W. Entwistle personal communication).

Thus, supplementing ewe weaners in a spring-joined flock as well as reducing the excessive loss of potential breeders may have continued benefits in terms of lifetime productivity. Supplementary feeding of this small portion of the flock offers a good chance of improving immediate productivity as well as providing sufficient animals to obtain permanent improvement by the selection of those better able to produce in this environment.
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V. REFERENCES