SEX RATIO IN SHEEP

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Sex ratios have been the subject of numerous investigations, particularly in studies with humans. In general, however, the literature relating to sex ratio in sheep is limited (Chapman & Lush, 1932; Henning, 1939; Rasmussen, 1940; Karam, 1957).

Population studies have generally been based on an expected sex ratio of 0.5, and any factor causing marked divergence from this ratio is important. Although the proportion of entire males used in domestic animal populations is very much smaller than for females, production from castrated males is a significant proportion of the total production of wool and meat from sheep. Hence, studies of population dynamics and flock structure need to take account of factors causing variation in sex ratios.

This paper examines the influence of some factors, breed and strain, age of mother, year of birth and type of birth (single or twin) on the sex ratio of sheep at birth and weaning.

The data used in these analyses were collected as part of a wider study, which has been previously reported (Mullaney, 1966; Mullaney & Hyland, 1967). Sex ratio at birth was defined as the proportion of males born, either dead or alive; sex ratio at weaning was the proportion of males present at weaning (approximately 150 days of age). Each ewe for each breed (Merino and Corriedale) was classified according to year of birth of offspring, age of ewe, birth type of offspring (single or twin) and strain (property). The method of least squares was used to obtain estimates of the effects of each of these factors on sex ratio at birth and weaning.

The overall sex ratio at birth was 0.508 (11,962 lambs) and at weaning was 0.501 (9746 lambs) (Table 1). These estimates are slightly higher than those quoted previously (Chapman & Lush, 1932; Henning, 1939; Rasmussen, 1940; Karam, 1957) and are based on larger numbers.

There was a trend for the sex ratio in single births for both breeds to be higher than in twin births (0.516 versus 0.489, Merino; 0.503 versus 0.486, Corriedale), but this trend was not significant. This supports previous work which suggested a preponderance of females among twin births, probably resulting from differential intrauterine mortality of males in multiple births.

The sex ratio of single lambs decreased at weaning because of the higher survival rate of females (85.6%) than of males (82.4%) (Table 2). The survival rate of the two sexes was similar for twin lambs (both 65.7%) and the sex ratio of this group remained constant between birth and weaning. Differential

Table 1. Sex ratio and lamb numbers in Merino and Corriedale sheep

	At birth			At weaning		
	Merino	Corriedale	Both breeds	Merino	Corriedale	Both breeds
Total no. of lambs	7840	4122	11962	6458	3288	9746
Sex ratio of all lambs*	0.513	0.500	0.508	0.506	0.490	0.501
No. of singles	7009	3314	10323	5915	2754	8669
Sex ratio of singles*	0.516	0.503	0.512	0.507	0.492	0.502
No. of twins	831	808	1639	543	534	1077
Sex ratio of twins*	0.489	0.486	0.487	0.495	0.479	0.487

$$* \text{ Sex ratio} = \frac{\text{Number of males}}{\text{Total of both sexes}}$$

perinatal mortality between sexes has been reported for primiparous species but there is no evidence of this occurring in multiparous species.

Least squares estimates of the effect of year of observation, breed, property and age of dam were not significant for sex ratios, either at birth or weaning. Other reported data have shown that parents of intermediate ages have more

Table 2. Survival rates of Merino and Corriedale lambs from birth to weaning

	Singles	Twins	Total
All lambs	83.97	65.71	81.47
Merino	84.39	65.34	82.37
Corriedale	83.10	66.08	79.77
Males	82.42	65.71	80.22
Females	85.62	65.71	82.77

Values expressed as percentages.

female offspring than older or younger parents (Kamajaw, 1962; Lowe, 1969; Meadows, 1969). Such effects have however been disputed on statistical grounds (Caughley, 1971) and these data do not show any evidence to support the previous findings.

From this study, there is no evidence that breed or strain of sheep markedly affects sex ratio, but the differential sex ratios that may exist between birth types (single or twin) suggest that current models of population dynamics for sheep may need to be modified to take account of this effect.

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