Table 1. PERCENTAGES OF DIFFERENT FOLLICLE GROUPS, S/P AND PL/PC FOLLICLE RATIOS, AT MID-SIDE OF RAJASTHAN SHEEP BREEDS

Breed	No. of sheep	Percentage of total number of groups				Mean S/P ratio					PL/PC
		More than 3	Trio	Couplet	Solitary	More than 3	Trio	Couplet	Solitary	All follicles	
Chokla	7	1·8	64·0	12·6	21·6	2·02	2·54	2·65	2·99	2·58	1·41
Magra	7	0·2	60·2	15·5	24·1	2·75	2·26	1·98	2·49	2·28	1·36
Nali	7	2·7	62·8	13·9	20·6	1·22	2·58	2·57	3·00	2·55	1·45
Jaisalmere	8	0·2	64·3	17·7	17·8	3·87	2·46	2·40	3·36	2·53	1·46
Marware	6	0·4	63·1	12·9	23·6	2·25	2·12	2·14	2·66	2·19	1·39
Malpura	7	0·3	46·3	19·6	33·8	1·75	1·78	1·57	1·78	1·74	1·12
Sonadi	8	0·2	37·3	23·6	38·9	1·00	1·14	1·01	1·19	1·13	0·98

The ratio of PL to PC follicles varies from 0·98 to 1·41 in these Indian breeds and is consistently lower than the figure 1·9 observed by Ross[2] in New Zealand Romney N-type sheep. Further, the proportions of trio groups, which varies from 37 to 64 per cent, is much lower than the figures of more than 90 per cent for Romney N-type sheep (Ross[2], quoted by Fraser and Short[3]).

In the hairy group (Malpura and Sonadi) the PL/PC ratio, the mean S/P ratios and percentage of trio groups is lower and of couplet and solitary groups is higher than in the carpet wool group (Chokla, Magra, Nali, Jaisalmere and Marware).

The trio percentage is higher in the carpet wool group and lower in the hairy wool group than the total of couplet and solitary groups. In these hairy breeds, the trio arrangement is apparently not a predominant feature of the grouping of the P follicles.

As adult maturity is approaching, it becomes progressively more difficult to establish the essential arrangement of the primary follicles in their original trio, couplet or solitary configuration. Hence these results need to be corroborated by qualitative and quantitative histological examination of appropriate pre-natal material, from the different breeds, covering the transition from the pre-trio to the post-trio stage in development of follicle population.

In general, the mean S/P ratio of the solitary groups is greater than that of both couplet and trio groups. Differences in S/P ratio between trio and couplet groups are usually small compared with the differences between solitary and trio or couplet groups.

The mean follicle densities of Sonadi (lowest among these breeds) are compared with those of Chokla (highest) in Table 2.

The PC density can be taken as indicating the density of follicle groups, and hence it is seen that the increase in total follicle density from Sonadi to Chokla is associated with substantial increases in both PL follicles (57 per cent) and S follicles (228 per cent) per group, but a much smaller (14 per cent) increase in the density of the groups themselves. The total population of both P and S follicles has also increased from Sonadi to Chokla, with only a very small increase (7 per cent) in the total number of follicle groups.

Stephenson[4] speculated that "central primary anlagen, once present, may inhibit the initiation of new central primaries within a certain radius". The initiation of new PC follicles may possibly depend on skin expansion taking place simultaneously at the required rate. Since PC follicles directly influence the initiation of PL follicles, for a given rate of skin expansion, the rate of formation of P follicles may vary from different positions, and such variation may also occur between different fœtuses. It may be that variations in formation of P follicle are greater for lateral than for central primaries.

Table 2

	PC	PL	S	$PC + PL + S$
Chokla	1·6	2·2	9·5	13·3
Sonadi	1·4	1·4	2·9	5·7
Sonadi adjusted to body-weight of Chokla	1·5	1·5	3·2	6·2

Two probably independent mechanisms seem to influence the number of S follicles per P : one which provides for an increase of S follicles in those breeds with higher PL densities and another which allows the initiation and development of more S follicles around couplet and solitary primaries.

Helpful comments from Mr. H. B. Carter, of the Animal Breeding Research Organization, Edinburgh, Dr. A. G. Lyne and Dr. B. F. Short, of the Commonwealth Scientific and Industrial Research Organization, Australia, and Mr. N. L. Narayan, of the Animal Husbandry Department of Rajasthan, are acknowledged with thanks.

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Sex Composition of Lamprey Populations

SINCE 1947 records have been kept of the size and sex composition of annual spawning populations of *Lampetra planeri* in the River Yeo in Somerset. In a previous communication[1] it was reported that up to 1954 there had been marked variations in the sex ratio from year to year and that in general these changes were associated with fluctuations in the relative abundance of this small isolated population. Observations made in subsequent years have confirmed the existence of a positive correlation between abundance and the ratio of males to females; that is, the bigger the population the larger has been the proportion of males. This trend is emphasized in Fig. 1, where the total annual catches have been plotted against the number of males and females separately and the corresponding regression lines fitted to the observations. The lowest observations, which lie close to the intersection of the two regression lines, give sex ratios of 1·2 ♂/♀ for the smallest populations of 50–60, while the highest observed sex ratio of 3·4 corresponds to a relative population of about 200.

In the course of the work on the landlocked sea lamprey (*Petromyzon marinus*) in the Lake Huron–Michigan watersheds, undertaken by the U.S. Depart-

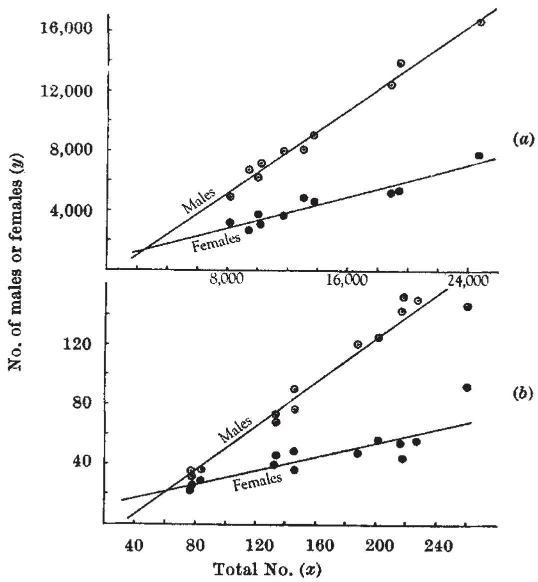

Fig. 1. Changes in the sex ratio of lamprey populations with relative abundance. *a*, *P. marinus* (Oqueoc River, 1944–57): males, $y♂ = -468+0\cdot71x$; females, $y♀ = 632+0\cdot27x$. *b*, *L. planeri* (R. Yeo, 1947–60): males, $y♂ = -9\cdot0+0\cdot74x$; females, $y♀ = 10\cdot5+0\cdot25x$

ment of the Interior, Fish and Wildlife Service, a somewhat similar situation has come to light in the upstream-migrants of this parasitic species. The data on relative abundance and sex composition for the Oqueoc River, supplied by Dr. V. C. Applegate, have been plotted in the same way as the observations on *L. planeri* (Fig. 1) and the corresponding regression coefficients calculated. The similarity in the curves is indeed remarkable; for the male *planeri* the slope of the regression line as given by the regression coefficient *b* is 0·74 compared with 0·71 for *P. marinus*, while the corresponding values for the females are 0·25 and 0·27 respectively. The correspondence is the more striking when it is borne in mind that, whereas the observations on *P. marinus* are based on very large numbers (8,000–24,000), the information on the brook lamprey populations has been limited to annual catches of 50–200.

In view of this correspondence, it is tempting to search for a common explanation for these changes in the sex composition of the spawning populations. However, it is important to recognize that the pattern of changes in relative abundance have been somewhat different in the two species. In the brook lampreys of the Yeo, there have been no continuous upward or downward trends in population size, but rather a series of annual fluctuations with a distinct tendency for large and small populations to follow one another. In the Great Lakes, on the other hand, there appears to have been a continuous increase in the lamprey population during 1944–49 and during this period the relative abundance increased from an estimated 3,300 in 1944, to 24,600 in 1949. In this phase, the sex ratio also increased from 1·65 ♂/♀ in 1947 to 2·13 in 1949. The highest sex ratios were recorded from 1950–52 (2·56—2·58 ♂/♀) but in subsequent years the excess of males tended to decrease and in 1957 the sex ratio was 1·56, that is, slightly lower than in 1947, when records were first made. Although there have been fluctuations in relative abundance, the general trend of the population during the period 1950–57 has been downwards.

Such a close parallel in the sex composition of spawning populations is the more surprising in view of the great divergence in the life-cycle of the two species. Whereas in *L. planeri* spawning takes place within about six months of metamorphosis, in *P. marinus* a period of parasitic life in the Great Lakes, of about two years duration[2], is interposed between metamorphosis and spawning. The existence of a similar relationship between sex ratio and population size, in spite of geographical differences and diversity of life-cycle, suggests that whatever factors may be responsible, their operation should be sought in those phases of the life-cycle which are common to both species. Moreover, since any attempt to account for this relationship must start from the assumption that the sexes are present in approximately equal proportions during the larval stages[3], this would appear to limit the causal period to the critical stage of metamorphosis or to the period of sexual maturity.

The observed variations in the sex ratio could conceivably be explained by assuming that the mortality-rate is dependent on density and higher in the female lamprey than in the male, but while this would be plausible in the large parasitic populations of *P. marinus*, it is unlikely that it could apply to the small Yeo population of brook lampreys which do not feed in the adult state. Moreover, in view of the differences in environment and size of the two forms, similar patterns of mortality due to predation could almost certainly be excluded.

In a detailed study of the brook lamprey population of the River Yeo, which will be published elsewhere, it has been suggested that the spawning class consists of more than one age group and that fluctuations in abundance may be due to differences in the annual recruitment of these age groups. If this hypothesis is extended to include a differential recruitment of the two sexes with respect to their age class, it is possible to explain the sequences of high and low populations and high and low sex ratios which have been observed in brook lamprey populations during 1947–60. A similar situation, it is thought, might exist in the landlocked sea lamprey, a possibility which could be verified by determining the distribution of the sexes in large numbers of the downstream migrants.

I should like to acknowledge with gratitude the help received from Dr. V. C. Applegate of the U.S. Department of the Interior, Fish and Wildlife Service, both in supplying specimens and in furnishing the information on the sea lamprey.

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Isolation of *Plasmodium knowlesi* from Philippine Macaques

BETWEEN October 1959 and November 1960 blood films were examined for parasites from 164 Philippine long-tailed macaques (*Macaca irus*) at the University of California Medical Center. Ten of the animals were found infected with species of *Plasmodium*. Morphological investigations suggested that several species