

and consequently determining the yield of the fishery in the three zones.

The investigation will be continued and a detailed report published later elsewhere.

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Life-Span of Rat and Mouse Erythrocytes in the Rat-Mouse Chimera

THE secondary disease observed in irradiated animals treated with foreign bone marrow is of general interest and importance. The basic question which remains unanswered is whether immunologically competent cells in the chimera originate from the donor, the host, or a combination of both. Erythrocyte life-span studies might be expected to throw light on whether this secondary reaction, in so far as it is reflected in red cell survival, is of host or of donor origin.

Nine (C57 × 101)F₁ female mice that survived 60 days after 900 r. of X-rays (LD100/20 days) and an injection of Sprague-Dawley rat bone marrow (55 × 10⁶ nucleated cells/mouse) on day zero were transfused intravenously with 0.2 ml. of a 45 per cent suspension of chromium-51-labelled red blood cells in saline. Four mice were given labelled isologous erythrocytes and five were given labelled rat erythrocytes; blood was pooled from normal donors for each group. The activity of chromium-51 in circulating blood measured at 24 hr. was taken as 100 per cent, and measurements were made at intervals for 7 weeks. 25 days after the transfusion of labelled cells these animals had essentially 100 per cent rat erythrocytes by the mannitol test¹.

The level of activity of chromium-51 is plotted against time in Fig. 1, and it can be seen that the

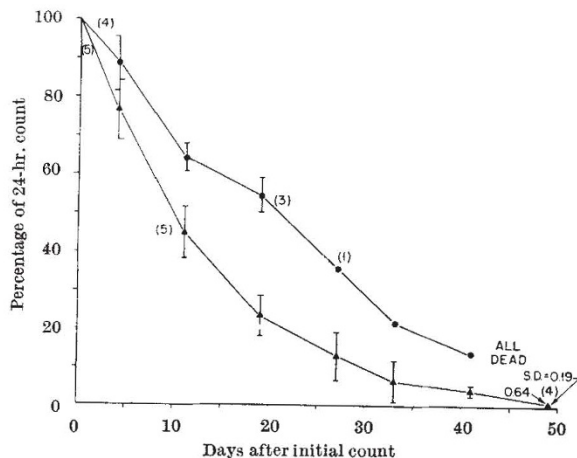


Fig. 1. Disappearance of chromium-51 activity from the circulating blood of rat-mouse chimeras transfused on day zero minus one with either mouse (upper curve) or rat (lower curve) labelled erythrocytes. Number of surviving animals in each group is shown in parentheses at three time points on the curves. Standard deviations are indicated by vertical bars at each point plotted

rat cells disappeared more rapidly in the chimera than did the mouse cells. The latter followed a normal life-span curve for this strain. The curve for rat erythrocytes is intermediate between that for rat cells in the normal rat (maximum life span: 60 days) and that for rat cells in the normal mouse (maximum life span: 4 days) (Smith and Tohá²). It was found by Smith and Tohá² that rat cells from a rat-mouse chimera survived in normal recipients like cells from a normal rat.

It is clear from these preliminary results that the long-term heterologous chimera, although 100 per cent of its circulating erythrocytes are of rat origin, provides an imperfect environment for rat red blood cells. On the other hand, the presence of active rat haematopoietic tissues in such a host does not influence the survival of transfused mouse erythrocytes. This study therefore provides no evidence of an active rat immune system. Whether the accelerated destruction of rat cells reflects a recovering host immune system, as is clearly indicated by the findings of Gengozian *et al.*³, or only the foreign biochemical and physiological environment of these heterologous cells cannot be answered by these data.

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Assortative Mating and Reciprocal Difference in the Blue-Snow Goose Complex

THE lesser snow goose *Chen hyperborea* and the blue goose *Chen caerulescens* are maintained as good species by the standard taxonomic works¹ though the morphological difference between them is confined to colour of plumage. The geographical distribution of the two is different. The snow goose ranges through Siberia, western Canada, the Hudson Bay area and Baffin Island; west of Banks Island the populations are unmixed. To the east, however, most populations contain some blue geese and in the Bowman Bay area of Baffin Island there exist several populations in which more than 90 per cent of the birds are blue. Where the populations are mixed, interbreeding between the two occurs, and the progeny produced are viable, fertile² and phenotypically distinct³. This has led some authorities⁴ to consider the two forms to be polymorphs of one biological species. This communication is concerned with observations made by one of us (F. G. C.) on breeding behaviour in the mixed Boas River population, and for convenience the terms blue and snow are used in a purely descriptive sense. Table 1 shows the observed and expected (random mating) distribution for three

Table 1. OBSERVED AND EXPECTED DISTRIBUTION OF DIFFERENT MATINGS IN A MIXED BLUE AND SNOW GOOSE POPULATION

Type of mating	Two snow birds	Two blue birds	One blue, one snow	Total
No. observed	373	64	83	520
No. expected	330.4	21.4	168.2	520

types of mating: (1) both snow birds; (2) both blue birds; (3) one snow and one blue bird in a random sample of 520 breeding pairs from the Boas River population in 1952.

The χ^2 value for the deviations from expected is very large, 133.45, which for 3 degrees of freedom indicates a probability of less than one in a thousand of obtaining such a result by chance alone.

This is strong evidence for the existence of positive assortative mating in mixed populations and this is in agreement with earlier work^{5,6}.

In our study, however, the reciprocal matings snow \times blue and blue \times snow were distinguished. Table 2 shows for the 83 mixed pairs the observed and expected distribution.

Table 2. OBSERVED AND EXPECTED DISTRIBUTION OF THE TWO RECIPROCAL TYPES OF MIXED MATING IN A MIXED BLUE AND SNOW GOOSE POPULATION

Type of mating	Snow (♀) and blue (♂)	Blue (♀) and snow (♂)	Total
Observed	54	29	83
Expected	41.5	41.5	83

The χ^2 value for the deviations in this case is 7.52 for 1 degree of freedom. The probability that this is the result of chance alone is less than one in a hundred. We may feel, therefore, confident that the incidence of the two reciprocal matings is really different in this, and presumably in other mixed populations, and it is of some evolutionary interest to speculate as to possible reasons for this. One reason may be that the sex ratio is different in the two phases. There are no indications that this is in fact true, but a sex ratio disturbed in the direction of relative female preponderance in snow geese and in the direction of relatively more males in the blue geese might give the effect observed.

A more likely hypothesis is that the mechanism governing resistance to unlike-mate choice more readily breaks down in one type of pair formation than in the other. This might involve different levels of receptivity on the part of the two female types, different levels of sexual drive on the part of the two male types or both. Only a study of the long-term dynamics of the mating barrier would tell us what factors are involved, but from other evidence it is possible to infer what might be happening. The frequency of the blue phase is increasing in all known mixed populations and more populations are becoming mixed; in the Darwinian struggle for existence it seems that the snow phase is losing to the blue and what is observed at present is a transient polymorphism (which may, of course, later become balanced).

Among other things one component of the selective advantage enjoyed by the blue phase may be sexual in that blue males find it easier to obtain an unlike mate than do snow males. The situation is complicated by the fact that the majority of blue birds involved in mixed matings are white-bellied (that is, heterozygous at the principal genetic locus governing difference in colour). This then implies that hybrid males may mate more easily than pure blue males, and in an evolutionary sense this might be a factor in promoting a balanced polymorphic system in the species-complex but equilibrium is so far from being attained that further speculation upon this point seems unwarranted.

Whatever the mechanism underlying the reciprocal mating difference, it is clear that it depends upon factors other than those which are responsible for

assortative mating as such, although this is in itself a matter of considerable interest. Further study should show how far mating preference is a result of family structure⁴, imprinting⁷, pleiotropy of colour genes or more complex genetic systems, and will, it is hoped, contribute towards a better understanding of the taxonomic problem.

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Hæmoglobin and the Habitat of the Harpacticoid Copepod *Elaphoidella gracilis* (Sars)

HÆMOGLOBIN has only recently been found in free-living copepods. Munro Fox¹ found that certain mud-dwelling harpacticoids contained this respiratory pigment, while allied species living in moss or open water lacked it. The correlation between hæmoglobin and habitat can now be extended by the discovery of hæmoglobin in *Elaphoidella gracilis*, a species which inhabits burrows in decaying aquatic vegetation. The red pigment in this species is easily visible under the microscope, and its identity was established spectroscopically.

Elaphoidella gracilis is not very often recorded because of its burrowing habits. Gurney², writing of its seasonal occurrence, says "the capture of it is so capricious that nothing certain is known". Donner³ regards it as a summer form, but I have found this species to be present and active in the Long Water at Hampton Court throughout the whole of the last winter.

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Role of the Supra-oesophageal Ganglion during the Early Stages of Caudal Regeneration in Some Errant Polychaetes

THE importance of the nervous system in annelid regeneration has been realized for some years¹, and it has emerged that, at least in lumbricid oligochaetes and nereid polychaetes, the supra-oesophageal ganglion secretes hormones that are essential for regeneration²⁻⁴. Durchon³ showed that if the supra-oesophageal ganglion of three species of nereid is removed regeneration is retarded. Hubl⁴ discovered that, in lumbricids, extirpation of the supra-oesophageal ganglion at the same time as a number of posterior segments is removed totally inhibits