

THE FREQUENCY OF OCCURRENCE OF ALBINISM IN TERRESTRIAL ISOPODS

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The well-known British geneticist, Professor F. A. E. Crew, of the University of Edinburgh, in a plate illustrating his article, "Albino," in the fourteenth edition of the *Encyclopaedia Britannica*, gives an excellent figure showing albinism in the common European lobster, *Homarus gammarus* (L.). This unusual figure and record, as one of the few reported cases of albinism among the Crustacea, deserves more than passing comment.

Albinism among animals is a long-recognized phenomenon, and has been mentioned by the early writers in Natural History as occurring in such animal groups as insects, fishes, birds, and mammals. In the mammals, such familiar races as albino strains of the common rodents, the rat and mouse, have long been observed. Strabo (*fl.* 40 B.C.) and the elder Pliny (*d.* 79 A.D.) mention the ferret (a distinct albino variety of the polecat, *Mustela putorius*), which even in Pliny's day was used by the Romans in rabbit-hunting. At the present time albinism has been recorded in all domesticated mammals, as well as in many wild species. It has been found to occur in a wide variety of economic plants, from the White Pine of the northern regions to the Coconut of the Straits Settlements; and this phenomenon in plants has engaged the critical attention of a host of geneticists, as will be seen from current bibliographies in such records as *Biological Abstracts* and the *Experiment Station Record*. Among the Crustacea, however, the phenomenon is distinctly rare.

A rather careful study of the literature of terrestrial Isopoda during the past seven or eight years has netted

but few references to albinism. Brandt (1870) in a paper on albinism in *Porcellio scaber*, mentions his collection in a garden in St. Petersburg of one pure albino and eleven white-flecked individuals out of a total of approximately 800 individuals. The pure albino was a female of 8.5 mm. body-length; the other eleven were about equally distributed between the two sexes. Carl (1908) in his monograph of the Isopoda of Switzerland notes that he has found in the course of his collecting two male specimens of *Porcellio ratzeburgii* that were completely albino; one coming from St. Anthonienthal and the other from Schuls (p. 171); and further states (p. 193) that he has an albino *Porcellio scaber* [Brandt's species] which was collected in the vicinity of Nyon. Of the species *Porcellio rathkei* he also notes (p. 174) that the museum at Basle has two albinos, but does not state the sex and collection-locality. These two references are all that the writer has been able to find on albinism in the Isopods.

In the course of studies on the Isopods of Iowa and Texas the writer has very frequently encountered albino individuals. Sometimes the number encountered in restricted localities was very considerable. Thus, in the spring of 1927 thirteen albino *Armadillidium* were found in the course of a few weeks in litter in the rear of a city lot in Dallas. Two advanced students of mine found in other localities, that spring, a total of 44 individuals. We then started a breeding colony of albinos, but it later died out. In the spring of 1928 we collected albinos systematically and recorded their occurrence in detail. In the very warm weather of the summer of 1928 this colony also died out, after we had collected fifty-nine individuals. In the fall of 1928, in five days' systematic trapping, we found 46 pure albinos out of about 10,000 trapped *Armadillidium*. The males exceeded the females in size; 57% of the males, as compared with 30% of the females, being over 8 mm. long. In the spring of 1929, with systematic trapping, 158 albino *Armadillidium* were found out of about 20,000 individuals. This species is our most widely distributed and abundant species. Out of about 2,800 individuals of *Metoponorthus pruinosis*

trapped locally, only one albino, a 7-mm. male, was found. Careful trapping of about 3,000 *Porcellio laevis* failed to reveal a single albino specimen.

In extensive collections of *Porcellio rathkei* from Iowa not a single albino has been found. Our material of *Porcellio scaber* is too scanty to make any estimates regarding the frequency of albinism in this species. A collection of over a thousand *Philoscia cf. muscorum* showed no albinos.

From the foregoing, it will be seen that albinism in the terrestrial Isopods is exhibited by both sexes, and that its incidence may be high in certain localities. It is probable that other localities will show albino strains for species of terrestrial Isopods, and that the occurrence of albinism is not so rare as the references in the literature would indicate.

The rather high frequency, locally, of albinism in terrestrial Isopods is reminiscent of the experience of Huggins (1926) who found albinism frequent among Tortricid *Lepidoptera* in the Faversham district in Kent, England; and Morris's (Cooke, 1895) experience with albino varieties among Gastropod mollusks near Lewes, in County Sussex. This latter locality appeared, for some unexplained reason, to be particularly favorable to the production of albino varieties; no fewer than fourteen land-species and five water-species having produced albinistic individuals.

During 1930-31 the writer found albino individuals among collections of *Armadillidium vulgare* from Ellis and Parker Counties (Texas); from which it would appear that the frequency of occurrence of albinism in the Isopods at Dallas is not a sharply-localized phenomenon. More information is needed, and the writer earnestly invites correspondence from fellow-naturalists in Texas.

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A NOTE ON THE CALCULUS OF THE DISTRIBUTION OF GENETIC CHARACTERS IN CROSSES INVOLVING LINKAGE

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Teachers of genetics will welcome a simplified method for the calculation of the segregation of characters in crosses involving linkage, over the old, laborious method now in use. At the present time, when such crosses of linked characters are made, the usual method employed is to lay out a Punnett Square of the ordinary sort, with the different classes of gametes laid out on the axes, but with the diverse gametes **weighted** with the frequencies of their occurrence. With the purpose of simplifying this process for the use of my students, I have studied the distribution of characters, both as to genotypes and phenotypes, in the diverse sorts of crosses involving any pair of linked factors, A and B. The formulae given below will be found valid for any positive degree of linkage up to 50% of Crossing-over [which is independent segregation.]

In the formulae given below, the terms x and y are used to designate, respectively, the **linkage** and **cross-over** values of any given linked factors. Thus, if the cross-over value ascertained by experiment to exist between two genes on the same chromosome is 20.0%, the value of its linkage is 80%; and in the use of the formulae, 80, or 4; and 20 or 1, are the values to be set for x and y , respectively. The formulae follow: