

Mother-Child Combinations concerning an Inherited Character after a Panmixia

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1. Introduction.

In a previous paper¹⁾ we have discussed from a stochastic viewpoint the distributions of genotypes in the next generation originated from an original generation with a given distribution after a panmixia. In succession, we shall now deal with an analogous problem concerning mother-child combinations.

Consider again a population of size $2N$ consisting of N females and N males, and observe a single inherited character which consists of m multiple alleles at one diploid locus denoted by

$$A_i \quad (i=1, \dots, m).$$

Let the given distributions of the genotypes $\{A_a A_b\}$ in females and in males be designated by

$$\mathfrak{F} = \{F_{ab}\} \quad \text{and} \quad \mathfrak{M} = \{M_{ab}\} \quad (a, b=1, \dots, m; a \leq b),$$

respectively, so that

$$\sum_{a \leq b} F_{ab} = \sum_{a \leq b} M_{ab} = N.$$

The order of genes in a genotype being immaterial, both genotypes $A_a A_b$ and $A_b A_a$ are identified each other even when the suffices a and b are distinct. Accordingly we put $F_{ab} = F_{ba}$ and $M_{ab} = M_{ba}$.

We now observe a mother-child combination, designated by $(A_\alpha A_\beta; A_\xi A_\eta)$, which consists of a fixed pair of mother's type $A_\alpha A_\beta$ and child's type $A_\xi A_\eta$ and introduce a stochastic variable X extending

1) Y. Komatu, Distributions of genotypes after a panmixia. Journ. Math. Soc. Japan 6 (1954), 266-282.