A mathematical model for the origin of the family

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Abstract

Humans (*Homo sapiens*) generally form multiple-male–multiple-female groups that include multiple family units. This social structure is maintained because dominant males do not monopolize females and, thus, allow subordinate males to mate, and human females are not generally promiscuous. Although apes show great variation in mating systems, the human-type mating system is unique among primates. The mating systems of apes and humans have evolved in response to their adaptation to different ecological conditions. We created and analyzed a mathematical model to investigate the conditions for each type of mating system to evolve. We focused on the mating strategy of alpha males and the mating and grouping strategies of females. We defined the human-type mating system as one with multiple-male–multiple-female groups in which alpha males do not monopolize females and females are not promiscuous. We demonstrated that the human-type mating system could evolve when a large group is advantageous and the cost of female promiscuity is great. Moreover, the human- and *Pan*-type mating systems can be bistable. Our results shed light on the origin of the human family.