

A better understanding of the mechanisms that underlie phase transformation in a solitarious desert locust population is an important prerequisite for the development of a quantitative gregarization model and for predicting locust outbreaks. Two types of processes are involved: 1) clustering at diminishing spatial scales, which brings dispersed locusts together and which, in patchy micro-environments with a concentrated food resource, gives rise to nuclei of pheromone-emitting, gregarizing insects; and 2) recruitment processes which promote the horizontal spread of gregarious traits from such nuclei. Because of the heterogeneity of typical breeding habitats and divergent behavior of the 2 phases of the insect, there is a dynamic interplay between the forces of crowd formation and those of dispersal. All the key steps in the course of phase change are reversible and for successful development of a viable gregarious population, all must proceed at optimal pace toward the gregarious phase. The process resembles a chemical transformation that involves a series of reversible sequential steps and may, likewise, be treated as a series of equilibria. Such a conceptual model may constitute a useful framework for quantitative studies in desert locust primary breeding areas and in the development of a predictive gregarization model.