

OR249*The Achilles heel of decision making system in termites***Chiho Iwata**, Kazuya Kobayashi, Kenji Matsuura

Collective decisions in social insects are made in self-organizing manner where all group members only react to local information. This system exerts a great deal of power in a huge colony where a large number of individuals are performing enormous work. However, it is unknown whether decision making in self-organizing manner can be performed invariably under any social conditions, especially under the conditions with little work and/or few workers. Egg piling behavior in termites is an ideal model system to approach this question. When we randomly arrange eggs in a Petri dish, termite workers gather the eggs together in a single egg pile to take care of them. By using this system, we can investigate the process by which the workers collectively decide the location of the single egg pile. Here we show that the self-organization system in termites is less efficient in the case with less work to do. When workers were given a lot of eggs, they gathered all the eggs into a single egg pile quickly. The speed of egg piling increased as the number of workers. Interestingly, when workers were given only a few eggs, it took them much longer time to finish egg piling regardless of the number of workers. These results matched well with the prediction of our agent-based model with the algorithm that incorporated local communication mediated by a pheromone informing the location of egg pile. This study elucidated the major effects of the amount of work and the number of workers on the efficiency of self-organization system. We propose a novel approach to identify the algorithm of decision making system in social insects.