



Decision making of ants in heterogeneous environments in relation to monodomy and polydomy

Author(s): Kazuki Tsuji, Kazuki Tsuji , Aye Thanda Win , Shigeto Dobata

Institution(s): Dept. Subtropical Agro-Environmental Sciences, University of the Ryukyus, Okinawa, Japan ; Dept. Subtropical Agro-Environmental Sciences, University of the Ryukyus, Okinawa, Japan ; Laboratory of Insect Ecology, Graduate School of Agriculture, Kyoto University, Kyoto, Japan ; Dept. Subtropical Agro-Environmental Sciences, University of the Ryukyus, Okinawa, Japan

Why are some ants monodomous (single nest per colony) while others are polydomous (multiple nests per colony)? We compared response to heterogeneous resource distribution between monodomous and polydomous ants by focusing on the genus *Pheidole* (monodomous *P. noda* vs. polydomous *P. megacephala*). They are both polygynous and similar in worker size. First, we tested the physiological integration hypothesis that maintains that nests in a polydomous colony exchange complementary resources and the colony as a whole is physiologically integrated. A series of laboratory experiments with nests connected by tubes revealed that when complementary foods (lacking protein or lacking carbohydrates) were provided to each of the connected nests, the polydomous ant flourished. However, when nests were disconnected by plugging the tubes, the polydomous ant failed, supporting the physiological integration hypothesis. In marked contrast, the monodomous ant kept the highest performance over five weeks even when only a nutritionally biased food was provided. This suggests that they store a large amount of nutrients in adult bodies that can be used when the outside food availability becomes poorer. The above suggests that polydomous ants and monodomous ants might adopt different strategies to heterogeneity in resource distribution. Polydomy might be a strategy to counter it spatially by extending the area of resource searching, whereas monodomous ants might deal with it temporarily by withstanding resource depressed periods of time. Second, using the polydomous ant, we tested a new hypothesis that nests are not only sharing complementary resources, but each nest tends to specialize in collecting one resource under spatially heterogeneous environments. Furthermore, we studied the rules of decision making of each nest that underlies such specialization of resource utilization or task specialization. Namely, we tested the comparative advantage and the absolute advantage models in trade theory.