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PREY FORAGING BY THE ANT *PHEIDOLE PALLIDULA*: DECISION-MAKING SYSTEMS IN FOOD RECRUITMENTS.

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Foraging is well known as a sophisticated collective pattern. A generalist ant whose diet varies in size, quality, spatial distribution, etc., exhibits different foraging strategies according to the food characteristics, ranging from individual to collective foraging. In this respect, an important problem is to understand how and when a forager "decides" to recruit or not. Such a decision making system has been studied in the Mediterranean ant *Pheidole pallidula*. Indeed, field studies show that this species is an opportunistic and mainly insectivorous one. Prey range from very small insects such as Collembola to larger ones such as imagos of Coleoptera or Hemiptera. The exploitation of these prey, so diverse in their size, requires the ant colony to use different foraging techniques varying from individual foraging to massive recruitment of nestmates. We have tested in the laboratory the hypothesis that prey retrievability is one of the key decision factors for the induction of recruitment. We have compared, in ant colonies starved for 3 days, food recruitment to large unretrievable cockroaches and to a pile of individually retrievable fruit flies. To suppress any bias due to food preference, we will also compare recruitment to piles of flies covered by a 1 mm mesh wire-netting that allows minors access to the flies but prevents them from taking them away.

Foragers stay 324 ± 98s (x ± S.E., n=17) around cockroaches trying to retrieve them. After several unsuccessful attempts, they return to the nest dragging their abdominal tip over the substrate. Their entrance into the nest induces massive exits of workers, with a mean rate of increase of 14.4 minors /min on the foraging area during the growth phase. On the other hand, foragers stay a much shorter time (132 ± 41s, n=19) near the pile of flies, immediately succeeding in taking one of them between their mandibles. The rate of increase of minors on the foraging area is markedly lower than that observed to cockroaches (2.5 minors /min). Prey retrievability by a single forager thus seems to influence the propensity of foragers to recruit. Indeed, when the pile of flies is covered with a net, the vain efforts of foragers to extract them prolong their stay near the prey (249 ± 62s, n=19) and are followed by a stronger trail-laying behaviour than in the case of uncovered flies. The induced mass recruitment is closer to that to cockroaches, with a rate of increase of 7.1 minors /min. In *Ph. fallax* (1), similar differences in recruitment rates were observed between clumped (a whole hardboiled egg yolk) and dispersed (a finely chopped one) food, although to a lesser extent.

To summarize, for these two *Pheidole* species the prey resistance to transport by ants is a key part of the decision making system. It relies on the length of time the foragers stay at the food source trying to retrieve prey back to the nest. This effort could serve as a "measure" of prey size and weight. Another measurement used to decide whether or not to recruit could be the frequency of contact with prey met successively during a forager's exploration, as suggested in a defensive context for *Oecophylla longinoda* recruitment (2). A third decision rule could be based on an estimation of food persistence more than on size or number, although of course the three measures are correlated. For instance, *Messor rufitarsis* (3) or *Lasius niger* (pers. comm. R. Beckers) begin to form a recruitment trail only after a number of successful foraging trips.

In the experiments described above the foragers are faced with the same kind of food in different circumstances. However, other parameters such as the nature of the food source itself are well known to control recruitment intensity.

We have emphazised the role of individual measurement in the foraging patterns without discussing how the characteristics of a recruitment are able to generate a collective decision. The future challenge is to understand how the colony modulates individual / collective complexity in accordance with its ecological constraints.

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