CHANGING FORAGING STRATEGIES INHERENT TO TRAIL RECRUITMENT

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In most ant species, the exploitation of resources is based on individual foraging. This is also true for species that use a recruitment strategy to exploit large food sources that may not be retrieved by a single forager. In this case a few ants explore independently the foraging area and launch a recruitment after the discovery of a food source.

We will show, how the autocatalytic mechanism of the chemically mediated trail recruitment allows the colony to adjust its foraging behaviour to a changing environment.

Trail recruiting species such as Lasius niger (L.) or Messor rufitarsis, concentrate on one food source when only a small number are available. Only after this source is exhausted does the colony's activity shift to another one. If the number of sources increases, the colony is no longer able to focus its activity on one food source, but distributes its foragers evenly over different sources. Different foragers, discovering a large number of food sources simultaneously, are not able to attract a sufficient number of recruits to their discoveries. As a consequence, none of trails are reinforced, and all the sources are exploited equally.

What is the sense of this change of strategy?

In a mathematical model we show that, with an increasing number of food sources, trail recruitment could lead to either a hetero- or a homogenous exploitation of the sources. For a small number of sources the model's solutions predict that the colony concentrates on one of them. As the number of food sources increases, the number of recruited of ants decreases and has a minimum, corresponding to the passage from the hetero- to the homogenous exploitation of the food sources, after which the number increases. The model thus predicts an interesting paradox, whereby increasing the number of food sources can decrease the number of ants recruited (and which reach the food) and thus decrease the colony's foraging efficiency.

In our contribution we present the theoretical assumptions and experimental verifications.