

Abstract*

Modes and speed of information transmission in *Formica pratensis* RETZIUS, 1783 (Hymenoptera: Formicidae)

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In this study, a new system of group foraging and information transmission has been revealed through use of the Reznikova-Ryabko Binary Tree Maze, for *Formica pratensis* RETZIUS, 1783. The main idea of this approach is to ask ants to transmit items of information of definite length and complexity (REZNIKOVA & RYABKO 1994). The investigations were carried out in 2003 - 2005. Ants had to memorize and pass on 2, 4, or 6 bits of information in order to find a trough with syrup on one of the final "leaves" of a maze involving 2, 4, or 6 forks. All possible ways that might help ants to find food, except distant homing, were excluded. The behavioural patterns of individually marked ants from 2 colonies (457 and 521 individuals) were studied by observation and filming.

The foraging mode was found to depend on the colony size: an increase in number from 1500 to 3000 individuals was accompanied by switching from individual foraging to group foraging. The ants proved to use distant homing. They are able to memorize and transmit up to 6 bits of information. It is to be noted that the few scouts explored were able to work in a maze with 6 forks.

It was demonstrated experimentally that "informed" foragers (after antennal contact with a scout) need significantly less time to attain a goal in a maze with 4 forks relative to "uninformed" foragers (Wilcoxon, $p < 0.05$). The data on the duration of information contacts in experiments with 2- or 4-fork mazes differed significantly (Fig. 1; Wilcoxon, $p < 0.05$). In mazes of different complexity, the speed of information transmission was about 4 - 5 bits per minute (mean $\pm$ SD: 2 forks – 3.4 ± 7.6 , $n = 87$ vs. 4 forks – 5.3 ± 11.76 , $n = 45$; the data did not differ significantly; Wilcoxon, $p < 0.05$). Essential differences in the organization of the work and information streams were observed for the colonies of *F. polycetena* FÖRSTER, 1850 and *F. pratensis*. Whereas the foraging system of *F. polycetena* is based on constant "cliques" of ants which receive information from a single scout (REZNIKOVA & RYABKO 1994), the *F. pratensis* ants demonstrate a "net"-like system. A scout transmits information to 2 - 7 foragers, each of which in turn

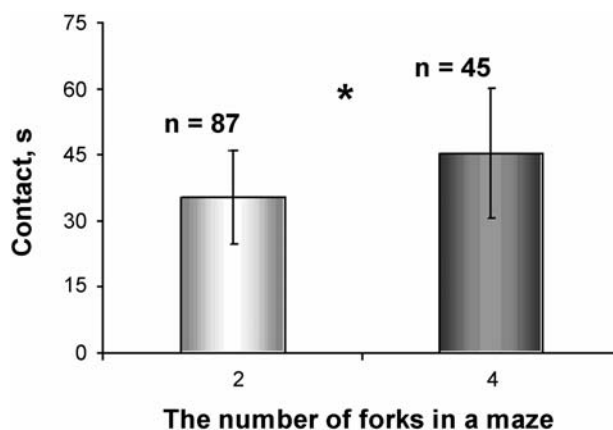


Fig. 1: Duration of information contacts between scouts and foragers. Mean $\pm$ SD. * – the data differ significantly (Wilcoxon, $p < 0.05$).

contacts several further individuals. "Intermediary" individuals ("couriers") adjust the "links" between scouts and the local groups of passive foragers. This allows notification and mobilization of the ants to carry out different work of the first order. These results enable us to suggest species-specific variants of group foraging and information transmission in group-retrieving ant species.

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References

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