

## Abstract\*

### Early development of aggressive reactions to predatory ground beetles in red wood ants (Hymenoptera: Formicidae; Coleoptera: Carabidae)

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Red wood ants of the *Formica rufa* LINNAEUS, 1761 group compete with carabid predatory ground beetles and attack them on their foraging territory. Carabids use a variety of behavioural tactics in order to avoid conflict with ants. The ant-beetle interactions are based on the mutual detection of the competitor's searching images by a set of key stimuli such as body symmetry, the presence of legs and antennae, the speed of movements, and the smell and coloration of the beetles (REZNIKOVA & DOROSHEVA 2004). In order to investigate the development of aggressive behaviour in these ants, the reactions of two groups of ants to living beetles and four imitative models with various searching images features were compared experimentally. Naïve ants were raised from pupae in the laboratory until the age of 3 - 5 weeks. In control experiments, aggressive members of a "wild" colony serving in nature as "guards" were tested, one by one, on small arenas (225 cm<sup>2</sup>), 5 times each. The following manifestations of aggressiveness were revealed: (1) opening the mandibles, (2) a lunge with open mandibles, (3) short and (4) long bites, (5) a pursuit, and (6) a strong capture.

The sets of behavioural responses to beetles and their models were mainly demonstrated to be similar in both naïve and wild ants. The sole exception was the "strong capture" reaction, which was not present in the behavioural repertoire of the naïve ants. It is likely that ants need individual experience for "tuning" of the overall aggressive behavioural pattern.

The group of naïve ants under study at the age of 3 - 5 weeks was not uniform in manifesting the most aggressive

reactions. Among 20 naïve ants, 2 individuals exhibited both a "long bite" and a "pursuit" reaction in tests with ground beetles. These 2 individuals were comparable as regards the number of aggressive reactions to a live beetle with "adult" guards from a wild colony. It may be assumed that future guards and hunters are recruited from just such individuals.

When recognizing potential competitors (predatory ground beetles) naïve ants use the same visual signs as those from a wild colony. In both groups tested, a white colouring of the model "turned off" the manifestation of aggressive reactions (lunges with open mandibles and short bites), and an asymmetric shape of the model decreased the level of aggressiveness. It is noteworthy that colour serves as a more significant stimulus for naïve ants than for wild ones. These results permit the suggestion that the ability of ants to recognize competitors according to the set of key stimuli has an innate basis and requires further refinement through individual and, possibly, social experience.

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#### References

REZNIKOVA, ZH.I. & DOROSHEVA, H. 2004: Impacts of red wood ants *Formica polyctena* on the spatial distribution and behavioural patterns of ground beetles (Carabidae). – *Pedobiologia* 48: 15-21.

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