Rescue behavior in ants: do they know what they are doing?

Various forms of altruistic behavior have been reported in both vertebrates and invertebrates. Rescue behavior (providing adequate help to an endangered individual) belongs to the most advanced forms of altruistic behavior. During a long time the ability of ants to rescue endangered individuals was the matter of controversy. Recent studies of ant rescue behavior have been initiated by the publication of Polish authors (Czechowski, Godzińska & Kozłowski, 2002) who reported a wide repertoire of rescue behavior patterns displayed by workers from three species of ant genus *Formica* in response to individuals captured by ant lion larvae. Subsequently, Nowbahari et al. (2009) designed a laboratory bioassay in which tested ant workers ("rescuers") had to confront a "victim", a worker immobilized in an artificial snare (tethered by means of a nylon loop to a bit of filter paper covered with sand). Workers of the sand-dwelling ant *Cataglyphis cursor* tested by means of that bioassay responded to the immobilized victim by digging in the sand close to the ant, pulling at different parts of its body and, most interestingly, biting/pulling at the nylon loop holding it in place. On the basis of these observations Nowbahari et al. (2009) stated that "Ants are able to recognize what, exactly, holds their relative in place and direct their behavior to that object in particular". Such rescue behavior was named by them "precise rescue behavior".

We subjected this statement to a rigorous test by modifying the bioassay invented by Nowbahari et al. (2009). The victim ant (a worker of the red wood ant species *Formica polyctena*) was tethered to a bit of filter paper by means of a wire loop, and the second loop of the same size was placed on its leg. That loop did not play any role in the immobilization of the victim. The victim was confronted with 5 conspecific rescuers during 20 minutes.

Our study revealed that workers of *Formica polyctena* show rescue behavior which was expressed in 53 of 150 tested individuals (35%). Workers of *F. polyctena* showed diverse patterns of rescue behavior directed to the body of the immobilized ant (pulling, levering) and to the substrate surrounding the ant and the loop holding it (digging in the sand). Most (67%) of the ants showing rescue behavior directed it also to one or both wire loops. The number of workers directing rescue behavior to the immobilizing loop on the petiolus was identical as the number of ants directing that behavior to the loop on the leg. Latencies, numbers of events and total duration of rescue behavior directed by the ants to the loop holding the immobilized ant and to the loop placed on its leg did not show statistically significant differences. The same result was obtained also when we took into account only the responses displayed by the tested ants when the leg with the loop was immobile (movements of the leg and the wire loop could enhance the interest of the ants and mask their preference for the loop on the petiolus). Taken together, all these results suggest that cognitive processes involved in rescue behavior of workers of *F. polyctena* are less advanced than it was proposed for *C. cursor* by Nowbahari et al. (2009): workers of *F. polyctena* seem simply to try to remove foreign objects from the body surface of immobilized nestmates.

Ants that responded to wire loops could be classified into three groups including individuals responding (1) only to the loop on the leg, (2) to both loops, and (3) only to the loop on the petiolus. However, the ants responding only to the loop on the petiolus (group 3) cannot be considered to specialize in precise rescue behavior as their responses to that loop often had very short duration. The bioassay investigating the responses of ant rescuers to a victim bearing on its body two loops, one acting as a snare and another not contributing to the immobilization of the victim provides a useful tool to test ant cognitive abilities.