Learning, forgetting and the contribution of learning to competition in desert ants

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Foraging or searching for food is one of the most important behaviors animals engage in. Central place foragers, such as social insects, rodents and birds, must navigate well, because they do not only need to find food, but also return to their nest or burrow. We used a maze with food reward at its endpoint to imitate in the laboratory the complexity of the natural habitat. We collected desert ant colonies and let them search in the maze. The time required to reach the food in successive trials within a single day decreased in a decelerating rate (a typical learning curve), indicating within-day learning. Ants also demonstrated between-day learning, indicated by the shorter food-discovery time on the following day. We then tested the memory duration of ants and tested the colonies again after different time intervals. Food-discovery time leveled-off to its original/initial levels after ~16 days. While there was a tight positive link between colony size and the number of workers searching in the maze, larger colonies did not collect more food, and I will suggest several explanations for this contradiction. Larger colonies were also more consistent in their behavior than smaller colonies. Next, we performed a competition experiment to test for the contribution of learning to foraging under competition conditions. We trained pairs of colonies to solve a complex and a simple maze, and then competed one against another in a complex maze. The colony trained to solve a complex maze reached faster the food reward than the one trained to solve a simple maze. The former also dominated the food reward by placing more workers next to it, demonstrating the benefits of learning under competition conditions. Finally, in a third experiment our goal was to better understand what motivates the ants to search in the maze. We discovered that the ants learn to solve the maze also without the food reward. After detecting the food reward, workers transmit information about its existence, raising the motivation to go out of the nest and search.