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Conspecifics and familiar odors alter movement patterns in a land snail, *Cepaea hortensis*



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Introduction

When animals are in an unfamiliar place, they often explore it. Younger animals placed in a strange environment often explore less than do adults. At least in vertebrates, the presence of a familiar scent can alter explorative behavior, changing, for example, boldness and distances travelled. Similarly, the presence of a conspecific can also influence these factors.

We used a little-studied native snail, the white-lipped globe snail, to see whether snail size, a familiar odor, and the presence of a conspecific altered behavior.

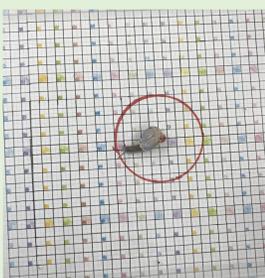
We predicted that juvenile (small) snails would be less bold than large snails, and that the second snail in a trial would tend to be more bold than the first. Thus small snails would travel less and pause and wait more.



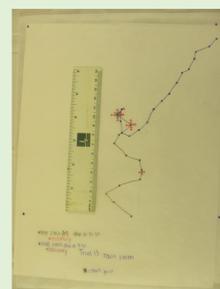
White-lipped globe snail, *Cepaea hortensis*

How we ran the trials:

- We placed a first snail in the center of a glass plate and recorded its position every 30 seconds using color marks under the glass.
- After a maximum of 20 minutes or when the first snail reached the edge of the plate, we removed that snail and set a second snail in the center. The trial ended when the second snail reached the edge or after 20 minutes.
- We ran one set of trials with no familiar odors and another set with a small dish of food (fish flakes) present and just beside the glass plate. We moved the food to a new side of the plate every five trials to be sure snails were not always moving in the same direction, i.e. toward the food.
- We digitized images of the snail's trails and measured distance travelled (total trail length), displacement (linear distance travelled from center), straightness (displacement divided by length * 100), wait time (number of 30 second intervals before the snail moved from the start point), and pauses (number of 30-second intervals during which the snail did not move).



Snail beginning a trial



Two snail tracks with dots showing waits and pauses.

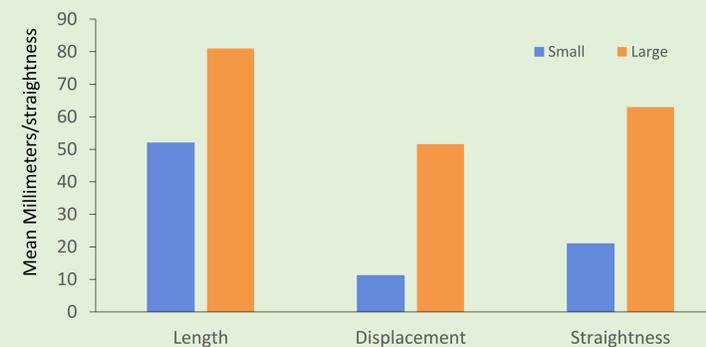
Results

Small vs large snails

Small (juvenile) snails differed from large in several ways. Small snails waited longer before starting and made more pauses while moving.

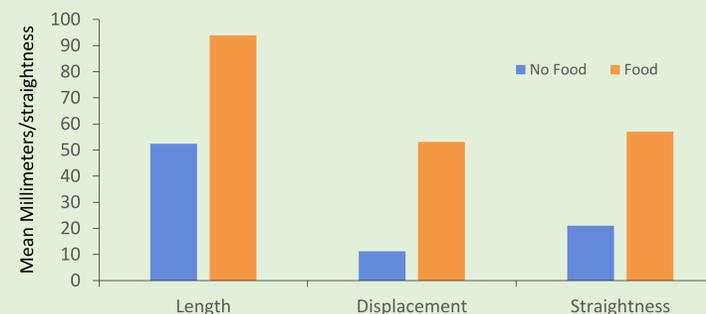


Small snails also travelled shorter distances and had smaller displacement from the start position. Their trails curved frequently and they sometimes changed directions dramatically, causing their trails to be less straight than those of large snails (scaled from 1-100).



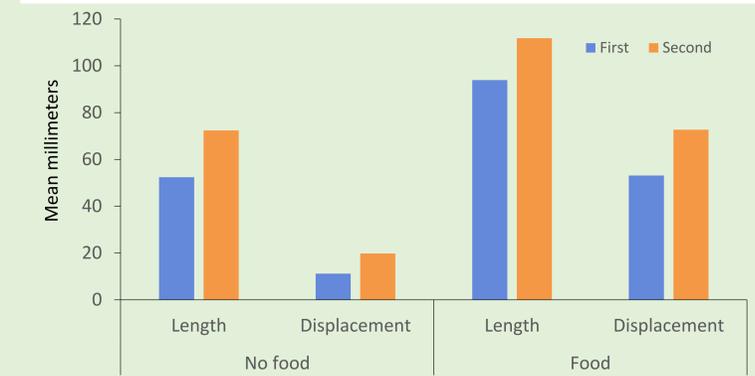
Food vs. no Food

For small snails, behavior was different when a familiar smell was present. Although no snails went toward the food, when food was present, snails made longer, straighter trails with greater displacement

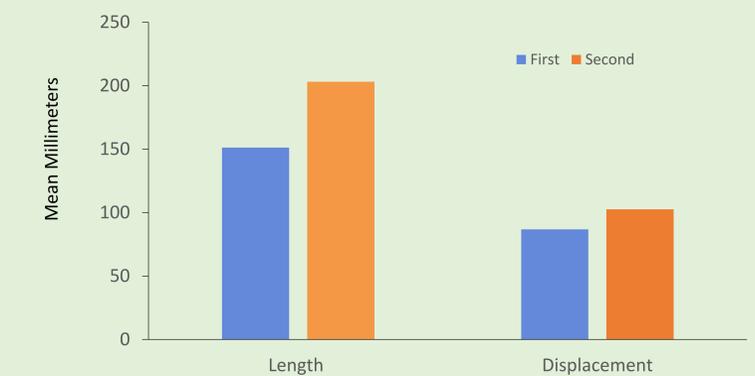


First vs. second snail

For small snails, when no familiar odor was present, the second snail in a trial made longer trails and travelled further from the start point than did the first snail. This effect was similar in the presence of a familiar odor (food).



Similarly, for large snails, the second snail to enter the trial arena made longer trails and travelled slightly further from the start.



Conclusions:

- Smaller juvenile snails appeared to be less bold than larger adults, as evidenced by their greater delay in starting and more frequent pauses.
- Smaller snails also took more sinuous paths, which could indicate fear or confusion.
- The presence of a familiar odor (food) or a previous snail's trail caused small snails to make longer, less sinuous paths, suggesting reduced fear.
- Snails are surprisingly responsive and flexible in their locomotor behavior, suggesting that other aspects of their behavior should be better studied to determine the decision-making skills and unexpectedly complex behavior of this taxon.