Mate Recognition in the Simultaneous Hermaphrodite sea slug *Doto chica*

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Background

- Mate recognition strategies are used among all species and are especially important for those that have smaller population sizes or those that do not typically live together in large groups (Chatfield-Taylor, 2019).
- Hermaphrodites may have different strategies than separate sex animals because of their non-distinct male or female roles (Wethington, 1995).
- *Doto chica* is a hermaphroditic gastropod that leaves behind energetically costly mucus as a result of locomotion. The goal of this study was to determine if *D. chica* uses these trails to locate other adults.
- Here we describe the results of two experiments testing mate recognition in the simultaneous hermaphrodite sea slug, *Doto chica.* We examine 1) whether *D. chica* can locate a mate without a mucus trail and 2) whether *D. chica* can follow a mucus trail in the absence of another adult slug.

Methods

Treatment 1

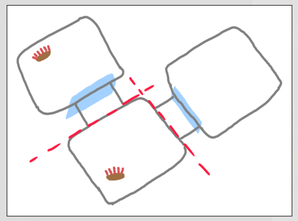


Figure 1: Y-maze apparatus. Dotted line is where focal must pass entire body through to begin counting time or be considered a choice. Shaded area is where mesh partition was placed.

To determine if *D. chica* can locate a mate without the presence of a mucus trail, one adult slug was placed in one of the Y-maze arms. A focal was then placed in the center of the Y-maze. The focal was recorded via 3Hero 7 GoPro for one hour and later assessed. First choice and time in each arm were recorded.

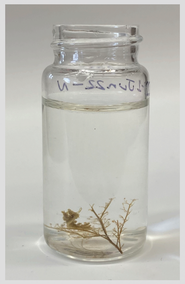


Figure 3: Vials where D. chica were kept while in the lab.

Treatment 2

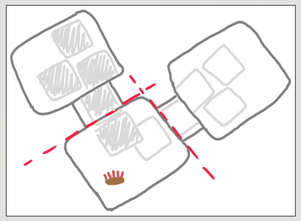


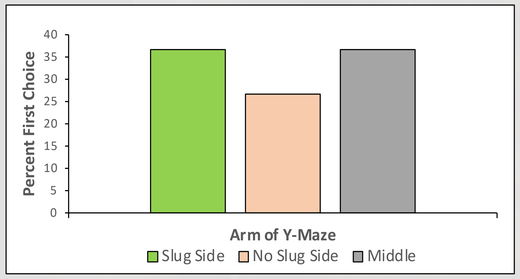
Figure 2: Y-maze apparatus. Dotted line is where focal must pass entire body through to begin counting time or be considered a choice. Shaded squares represent mucus trail, clear squares represent no mucus trail.

To determine if *D. chica* can locate a mate using a mucus trail in the absence of a second slug, several slugs were placed in one arm of the Y-maze overnight along with cover slips. In the morning, cover slips were arranged into a trail for the focal to follow. The focal was recorded in the same manner as treatment 1. First choice and time in each arm were recorded.

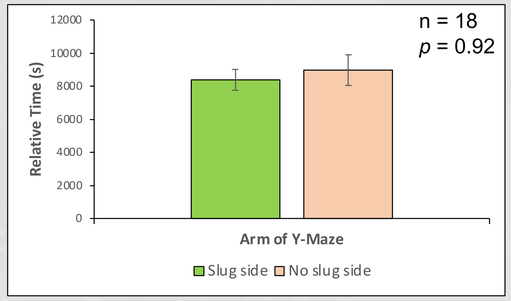
Figure 4: Experimental setup for treatment 2.

1. Can sea slugs recognize the presence of a potential mate with just the presence of a living adult? NO

Slugs did not show preference for visiting either side of the maze first, 37% of slugs made no choice.

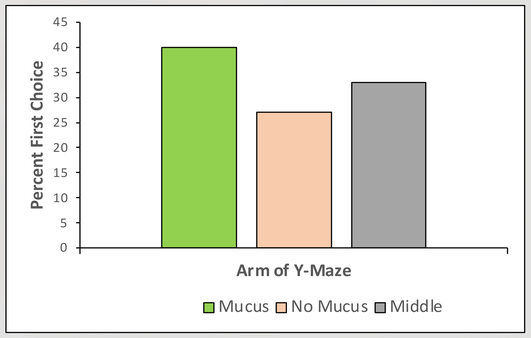


Slugs showed no preference for side of the Y-maze containing another slug or side with no slugs.

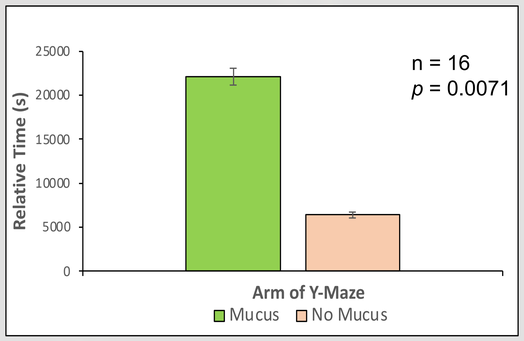


2. Can sea slugs recognize the presence of a potential mate via mucus presence alone? YES

Slugs did not show preference for visiting either side of the maze first, 33 % of the slugs made no choice.



There was a significant difference in the total time spent in the Y-maze arm containing mucus and the time spent in the arm with no mucus.



Conclusions

- Focal individuals spent about the same amount of time in each arm of a Y-maze when given a choice of selecting between a side containing an adult alone (without mucus trail) or a side with no adults or mucus trail.
- When given a choice between an arm containing mucus trail and one without mucus trail, focal slugs spent significantly more time in the mucus containing arm of the Y-maze.
- Therefore, we conclude that *D. chica* may use mucus trails to locate and recognize potential mates.
- Future studies could focus on the exact chemical composition of *D. chica* mucus, and the different signals that the mucus may give off.

References

Chatfield-Taylor, W., J. A. Cole. 2019. Noisy neighbours among the selfish herd: a critical song distance mediates mate recognition within cicada emergences (Hemiptera: Cicadidae). *Biological Journal.* 128(4): 854-864

Wethington, A. R., R. T. Dillon. 1995. Gender choice and gender conflict in a non-reciprocally mating simultaneous hermaphrodite, the freshwater snail, Physa. Animal Behavior. 51(5): 1107-1118.

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