Age Specific Behavioral Variability of Creek Chub Minnows after Exposure to Various Chemicals

Michael Wold, Mackenzie Flynn, Taren Leiztke, Andrew Fischer, Leah Radeke, and Dr. David Lonzarich, Biology Department University of Wisconsin Eau Claire

INTRODUCTION AND OBJECTIVES
An unknown constituent of skin extract from fish of the superorder Ostariophysi (minnows, catfishes, suckers) causes conspecifics to elicit an alarm behavior. We define alarm behavior as an increase in movement and bottom use and a decrease in feeding. Chondroitin sulfate has been proposed as the agent responsible for this behavior. But earlier work in our lab examining the response of Zebrafish (Danio rerio) to this odorant has suggested that it might instead be more likely associated with foraging behavior.

In this study, we explored two still unresolved questions regarding the behavioral effects of alarm odorants on fish behavior. Using a common Wisconsin fish, the Creek Chub (Semotilus atromaculatus), we set out to characterize the behavioral responses of Creek Chub to the putative alert chemical – chondroitin sulfate, and to evaluate the merits of a hypothesis that the nature of the response of fish to alarm odorants is modified with age.

To evaluate the effects of chondroitin on the behavior of test subjects, our experiments included two other odorants – conspecific skin extracts, which have been shown in previous work to elicit alarm behaviors in chub, and bile salts, which have been implicated in fish foraging behavior.

METHODS
- Solutions of skin extract and chondroitin sulfate were made using conventional methods. A saturated solution of bile salt was used.
- Movement was quantified by the number of times a gridline was crossed.
- Feeding behavior was counted as strikes at the surface or digging in gravel.
- The percentage of time spent in the top, middle, or bottom sections of the tank was calculated to give a value for location.

RESULTS

Feeding behavior upon exposure to chondroitin was more similar to that of bile salt but all treatments differed with a p-value < 0.05 (Fig. 1). We also saw a significant difference, p-value < 0.05, in movement between treatments with chondroitin mirroring values generate by bile salt (Fig. 2). This goes against evidence that suggested chondroitin elicits an alarm response. Ontogenetic factors seem to have a strong effect on odorant responses as shown in both Fig. 1 and Fig. 2 where differences between fish size was significant with a p-value<0.5. Our evidence shows that chondroitin does not elicit an alarm response and that there are age dependent changes that cause different behaviors.

Next we will continue to explore the claims challenged in this study by looking more closely at neural stimulation. We have developed protocols to detect neural stimulation in the olfactory bulb which is important in detecting odorants. With data on the location of stimulation between large and small from chondroitin, bile salt, and skin extract stronger evidence about their effect can be generated.

ACKNOWLEDGMENTS
This study was funded by the UWEC Blugold Commitment Program. We are grateful for their support.

REFERENCES