CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY

Name(s)
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Project Number
S1904

Project Title
Analyzing the Relationship Between Dominance and Heart Rate in Red Swamp Crayfish (Procambarus clarkii)

Abstract

Objectives/Goals
Our objective is to determine if there is a relationship between formation of functional dominance and heart rate in Red Swamp Crayfish (Procambarus clarkii).

Methods/Materials
We obtained live crayfish from a crayfish distributor in the southern United States. We placed two crayfish in a separated environment, resembling that of their natural habitat. Using diodes connected to an electrical amplifier we monitored the heart rates of the crayfish while at rest, and after the partition was removed. We monitored the heart rate of these animals as they established functional dominance through aggressive encounters.

Results
the data we have so far obtained, there seems to be a correlation between increase of heart rate and formation of functional dominance. In trials up to this point the subordinate crayfish seems to exhibit a greater increase in heart rate during encounters than does the dominant animal.

Conclusions/Discussion
Having taped the interactions of these animals for a period of two and a half hours we went back and assessed the formation of these functional dominance and correlated these data with the heart rate of the animals. We were able to carefully correlate increase in heart rate of both crayfish with encounters between the two animals and the outcomes of these encounters. These data seem to suggest that there is a link between the stress experienced by the animals during encounters and increase in the heart rate, with a greater stress observed in the subordinate. By studying and acquiring a better understanding of the relationship between formation of functional dominance and physiological responses to these formations in invertebrates, we may be able to relate these studies to mammals and gain a new insight into how our own bodies respond to environmental factors.

Summary Statement
We are studying the formation of dominance in Procambarus clarkii to see whether or not there is a correlation between increased heart rate and dominance.

Help Received
Dr. Newt Copp facilitated our research at Claremont McKenna College, Rebecca Dutton reviewed heart rate data and worked directly with crayfish, Elon Thompson hinged board