Determining whether polyamines function as behavioral deterrents in a model filter-feeding invasive species, the bigheaded carp (*Hypophthalmichthys spp.*)

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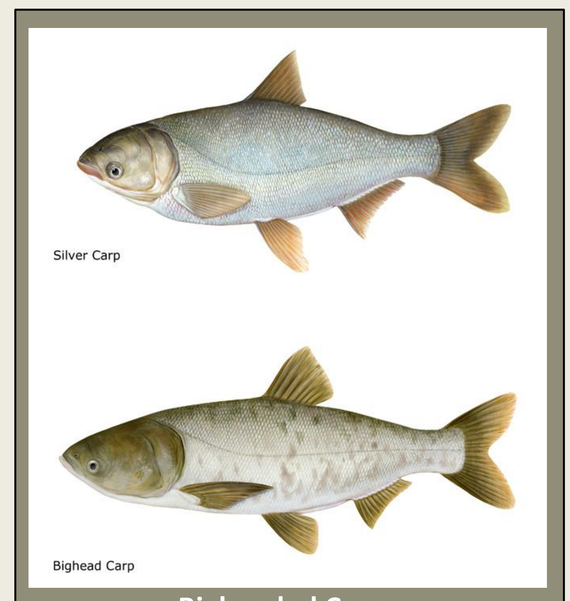
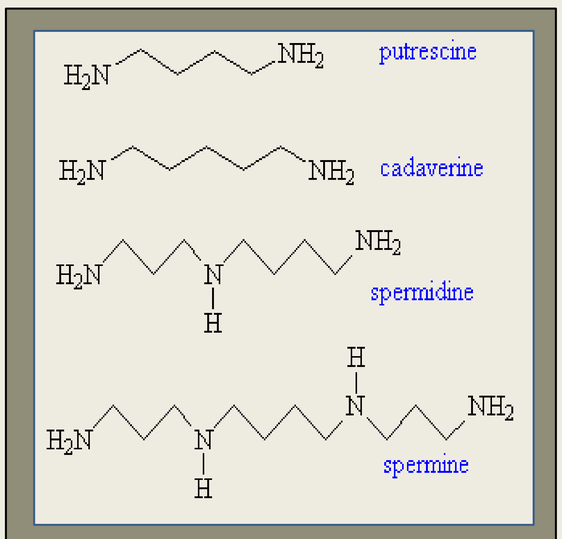
Introduction

- ❖ Polyamines are odorous compounds present in vertebrate body and found in high concentration in decomposing organisms.
- ❖ Role of polyamines in the context of fish behavior and physiology is poorly understood.
- ❖ Polyamines shown to attract goldfish (*Carassius auratus*) and deter zebrafish (*Danio rerio*), both belonging to the Cyprinidae family.
- ❖ The bigheaded carp (*Hypophthalmichthys spp.*) is another species of the Cyprinidae family with an invasive range in the United States.
- ❖ Understanding how polyamines can influence behaviors of bigheaded carp may help in managing invasive populations.
- ❖ This study aim to answer the following questions:
  - Can bigheaded carp smell polyamines?
  - If so, what kind of behavior (attract or deterred) do bigheaded carp display in the presence of polyamines?



Bigheaded Carp



Polyamine structures

Methods

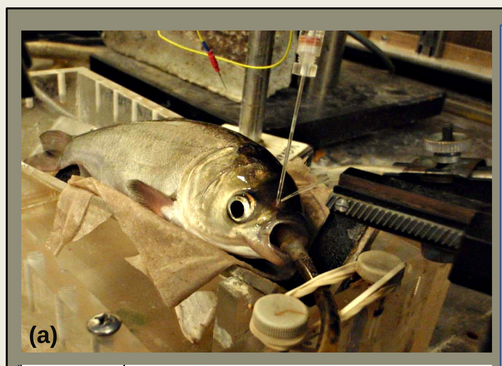


Fig. 1.(a) EOG setup with a ongoing recording of a silver carp (*H. molitrix*)

(b) Representative EOG recording of silver carp towards L-Serine (10^{-5}) as a control

- ❖ Electrophysiological recordings (EOG) used to determine if bigheaded carp can smell polyamines.
- ❖ EOG is an extracellular recording from the olfactory epithelium
- ❖ Polyamines tested at three different molar concentrations (10^{-6}, 10^{-5}, 10^{-4}) with L-serine (10^{-5}) as control.
- ❖ EOG performed on fish, ranging 5 to 7 inches in body length.
- ❖ Reponses measured from baseline to peak and the values expressed in terms responses relative to the average L-Serine (10^{-5}) response for that series.

Results

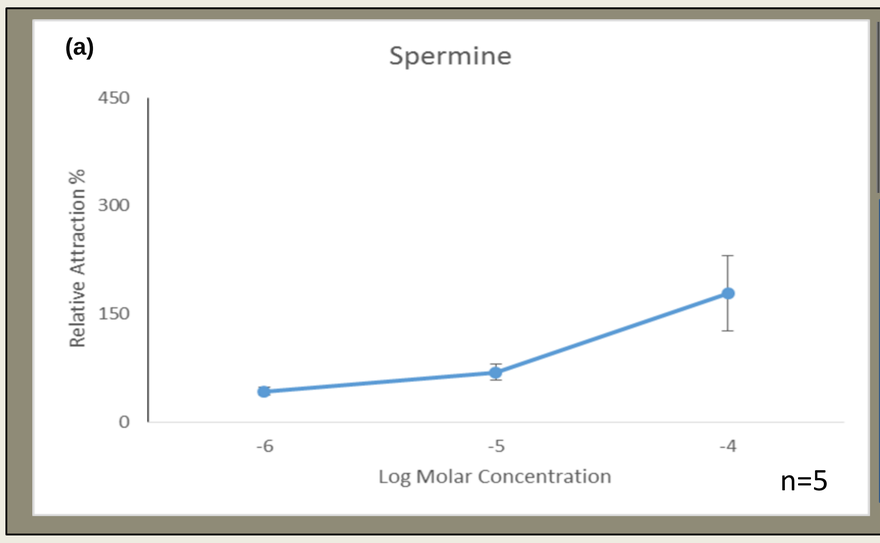


Fig.2.(a) Relative response towards different concentrations of spermine.

(b) Representative EOG recording towards 10^{-4} of spermine.

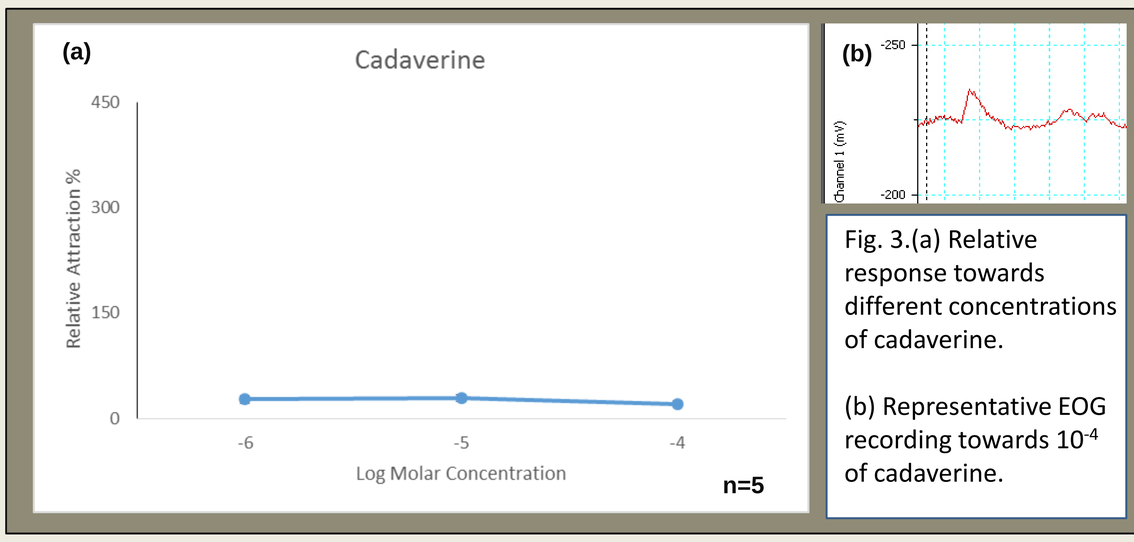


Fig. 3.(a) Relative response towards different concentrations of cadaverine.

(b) Representative EOG recording towards 10^{-4} of cadaverine.

Conclusions & Future Directions

- ❖ Bigheaded carp can detect polyamine compounds.
- ❖ Spermine evoke higher magnitude of responses at 10^{-4} than cadaverine.
- ❖ Bigheaded carps can smell higher concentrations of spermine than cadaverine.
- ❖ Further EOG tests will be performed to increase the sample size.
- ❖ To test whether polyamines act as a deterrent in bigheaded carp will be tested in behavioral trials.

Acknowledgements

Aaron Claus for laboratory guidance and assistance in data collection.

Funding: Legislative-Citizen Commission on Minnesota Resources (LCCMR) and the University of Minnesota's Undergraduate Research Opportunities Program.

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

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