

# Bigheaded Carp Behavior and Bioacoustics



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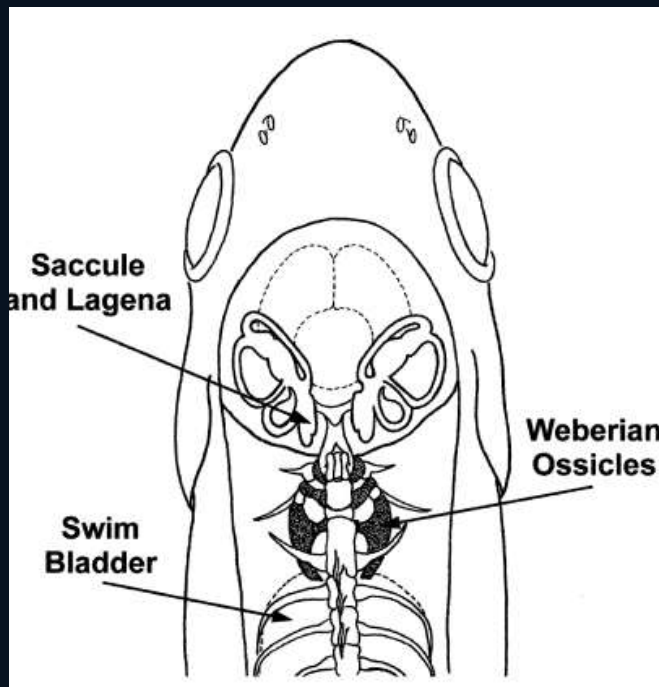
# Silver Carp Jumping Behavior



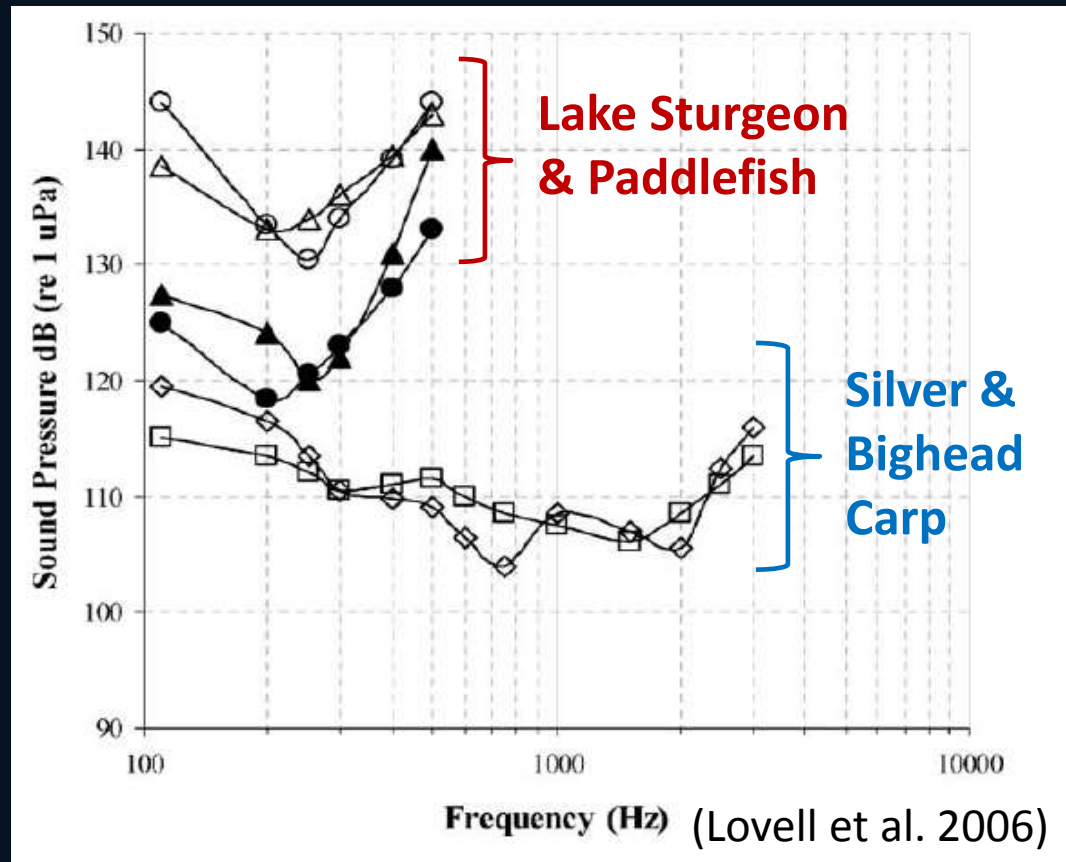
United States Geological Survey

# Background: Hearing Sensitivity

- Ostariophysans
  - Weberian ossicles allow higher frequency hearing

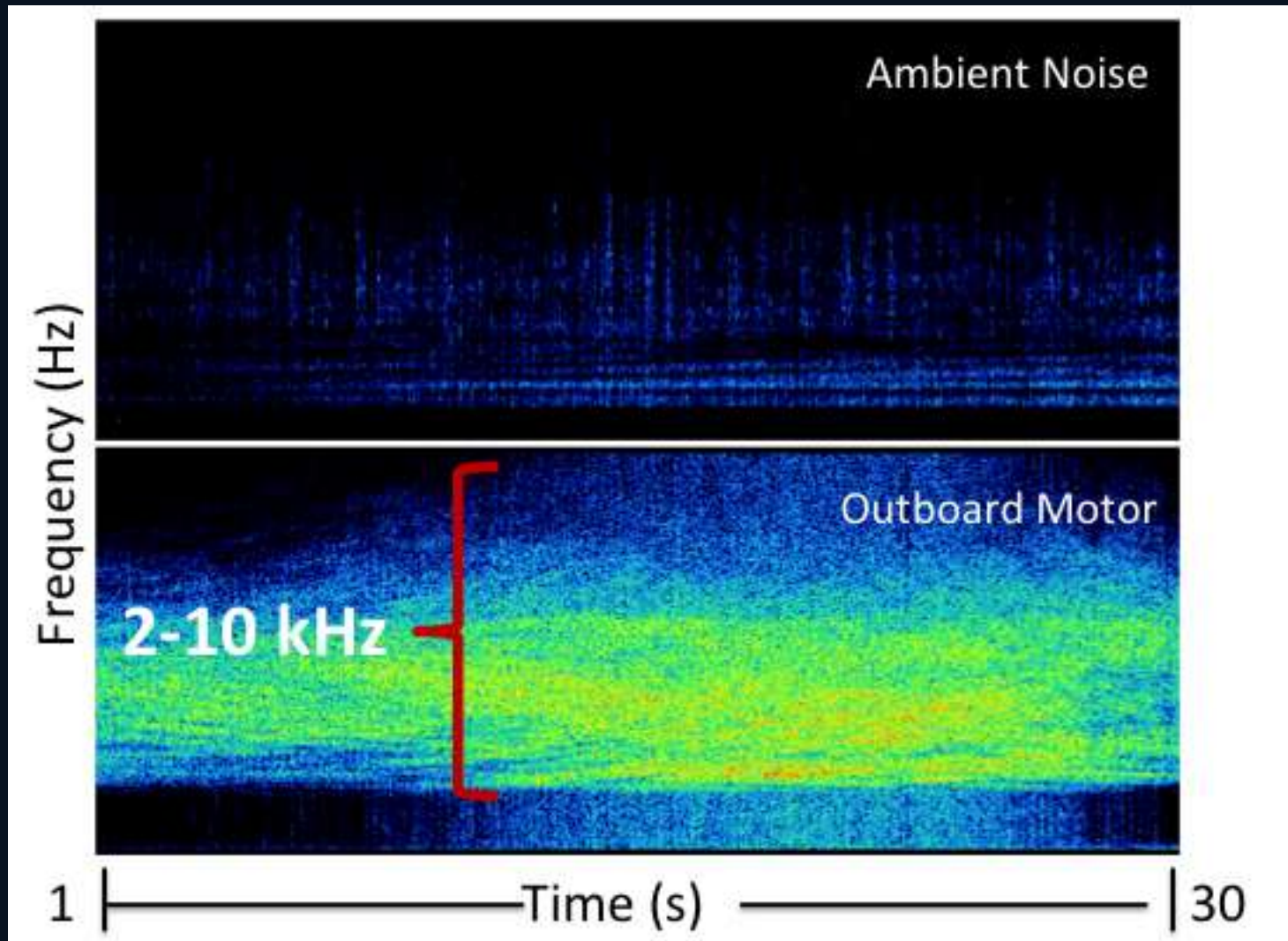


(Lanford et al. 2000)



(Lovell et al. 2006)

# Boat motor sound is broadband and high frequency



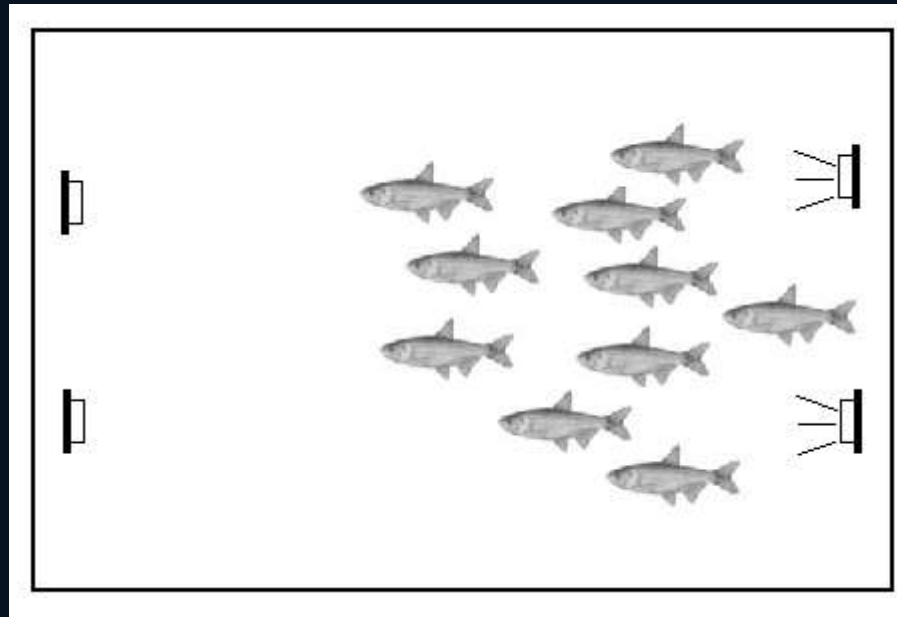
# Experimental Tanks: Bioacoustics

- Can behavior be modulated by sound?
- Will bigheaded carp demonstrate negative phonotaxis?

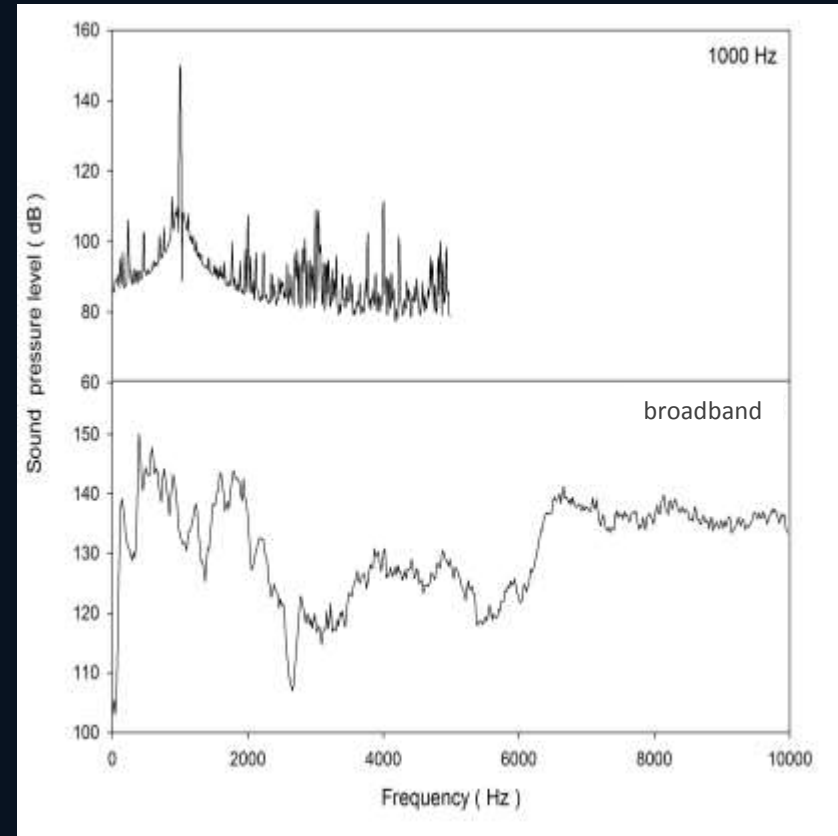
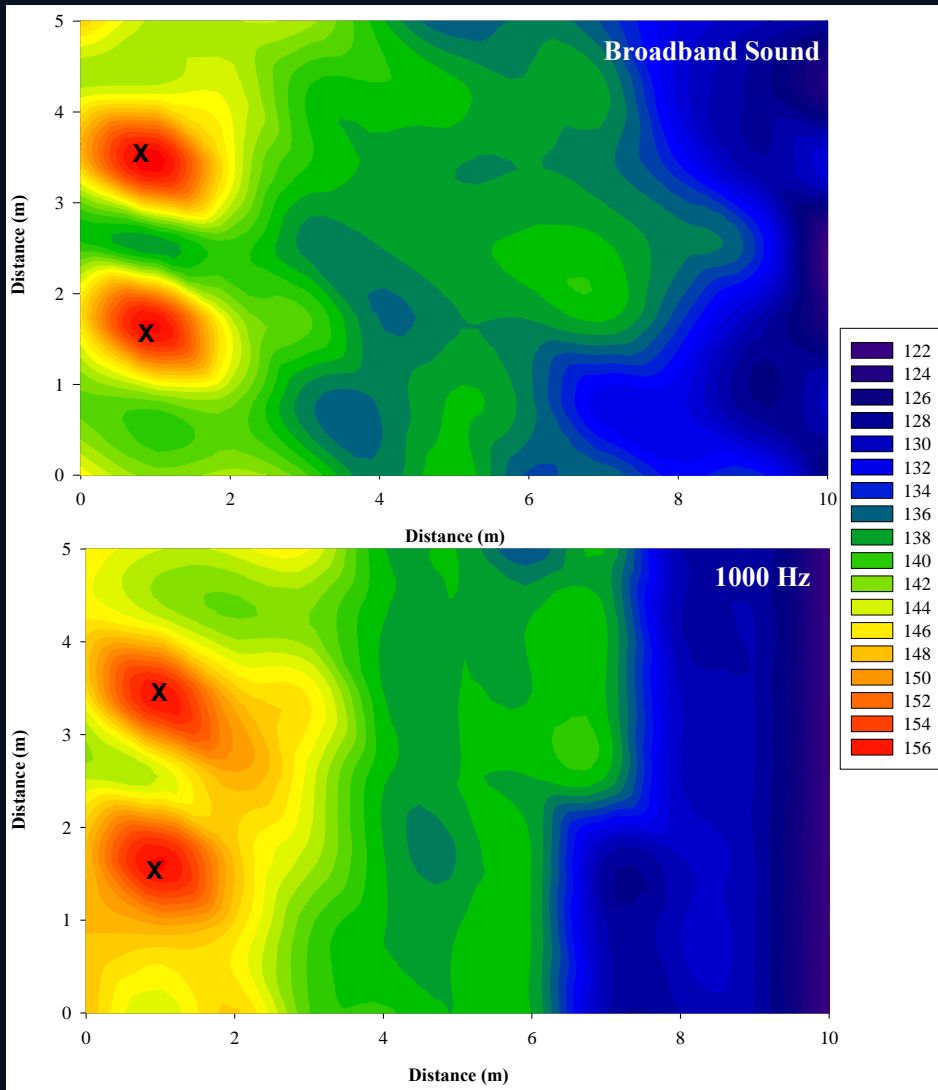


# Experimental Methods

- USGS UMESC—La Crosse, WI
- 10 m x 5 m concrete pond
- 5 Groups
  - 10 silver; 10 bighead carp
- 2 Speakers at each end
- Overhead cameras recording behavior
- Sound Stimuli
  - Pure Tones
    - 500-2000 Hz
  - Broadband Sound
    - Outboard Motor



# Sound in the concrete ponds

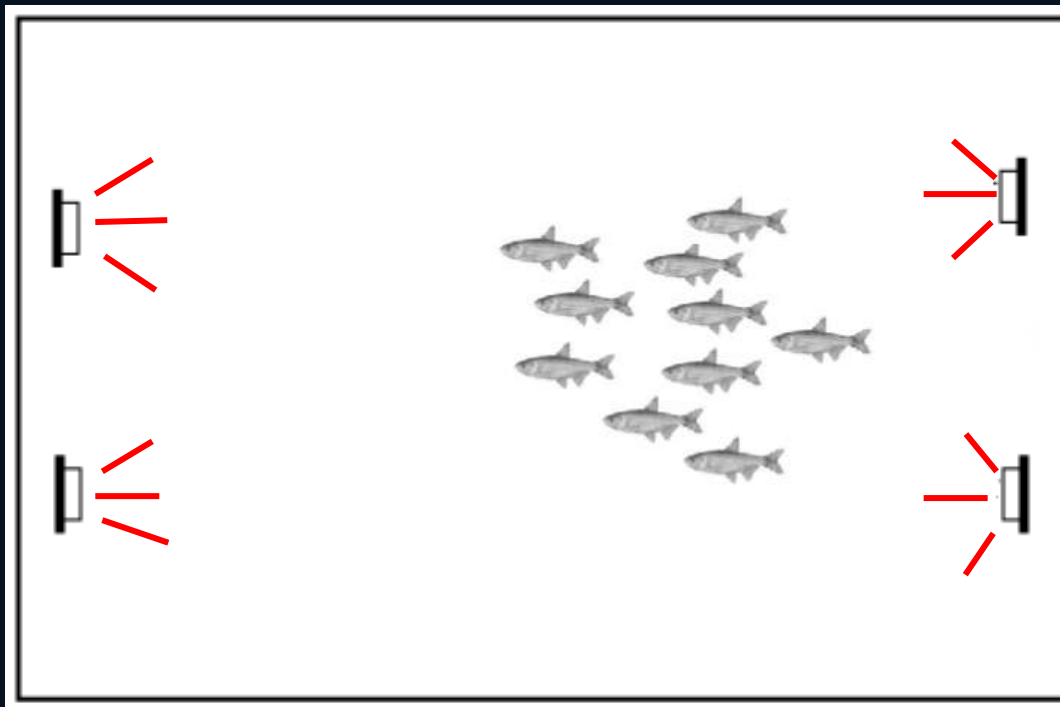


(Vetter et al. 2015)

# Results Analysis

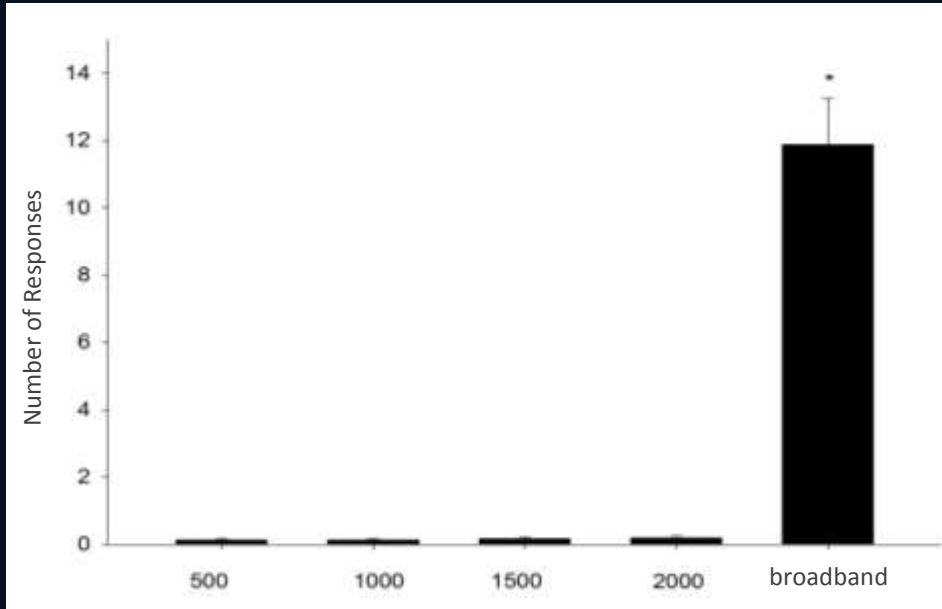
## Characterizing Responses:

- No Response
- One Reaction
- Two or more consecutive reactions



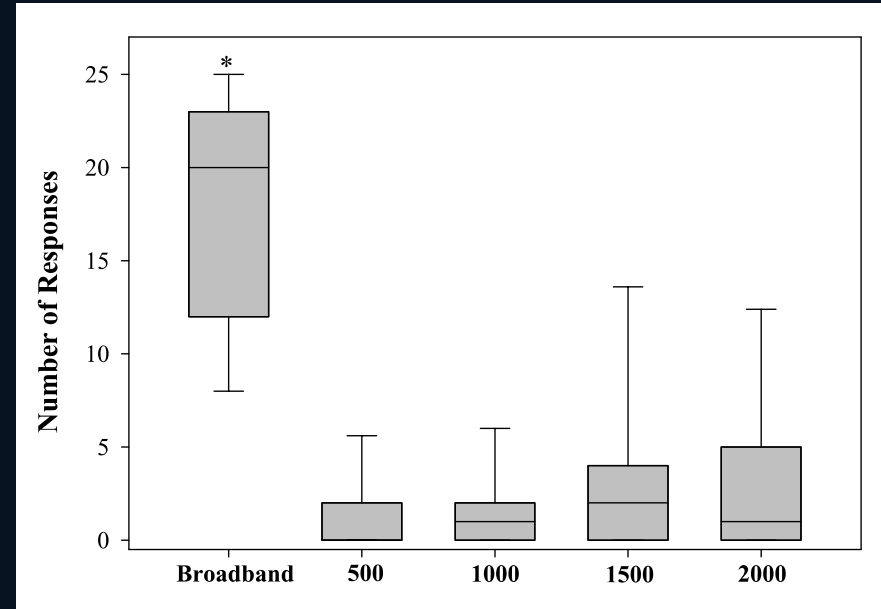


# Results: Number of Responses



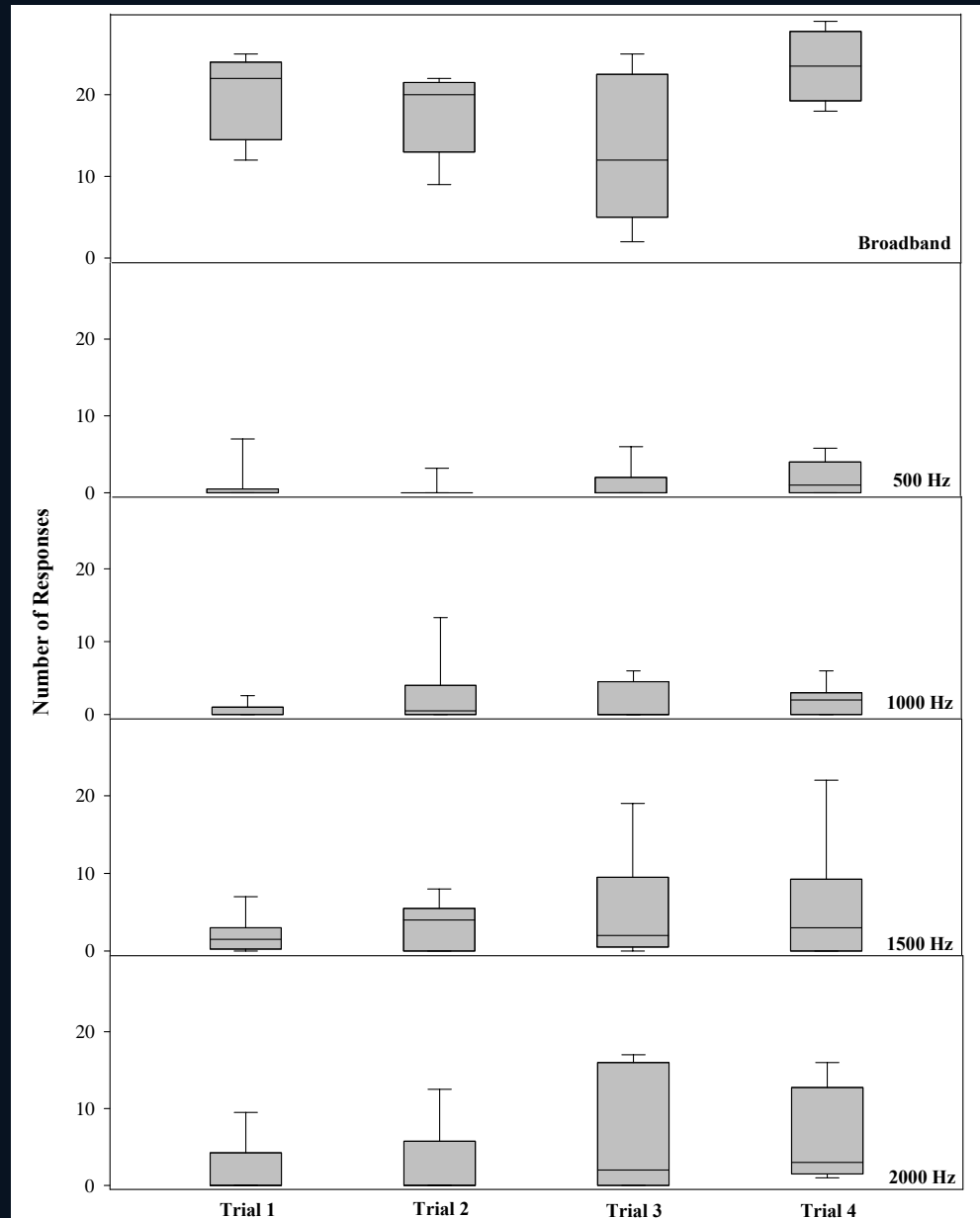
(Vetter et al. 2015)

Silver Carp

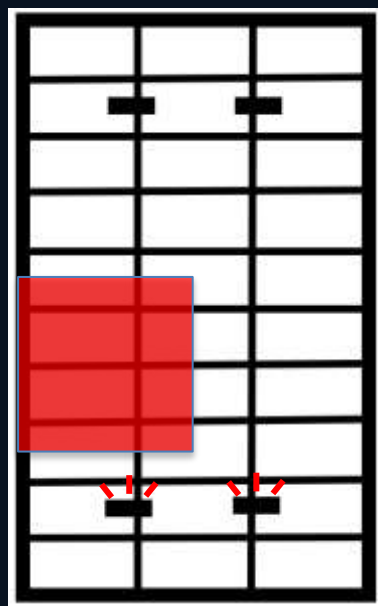


Bighead Carp

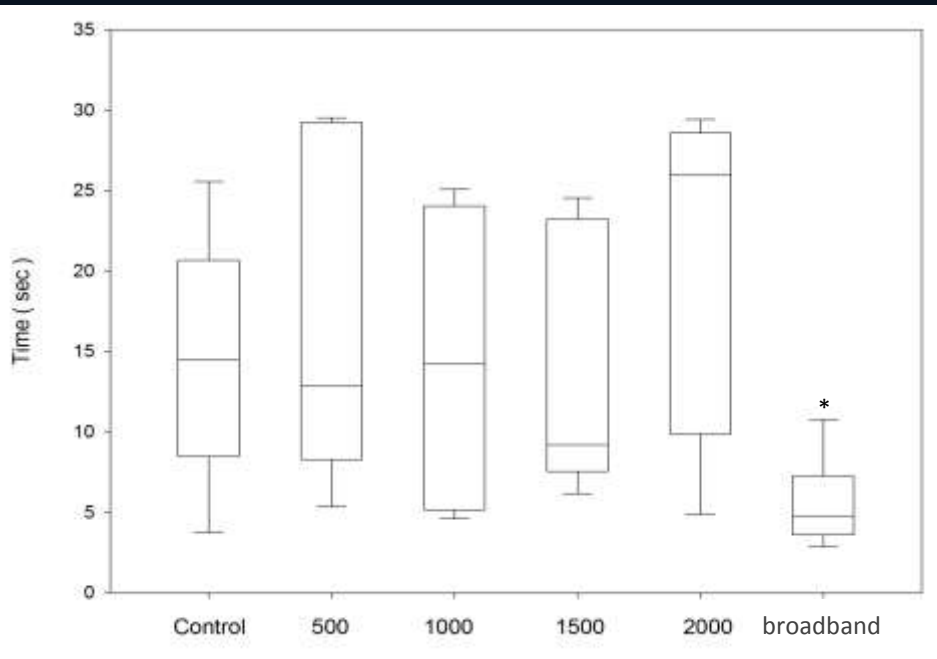
# Results: Bighead carp responses over time



# Broadband Sound Phonotaxis

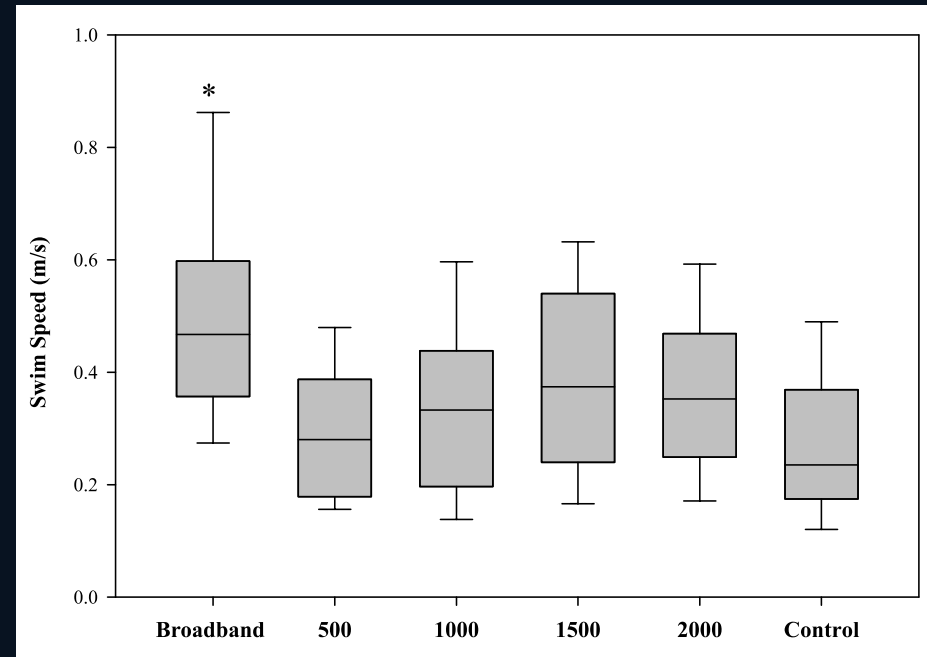


# Results: Reaction swim speed



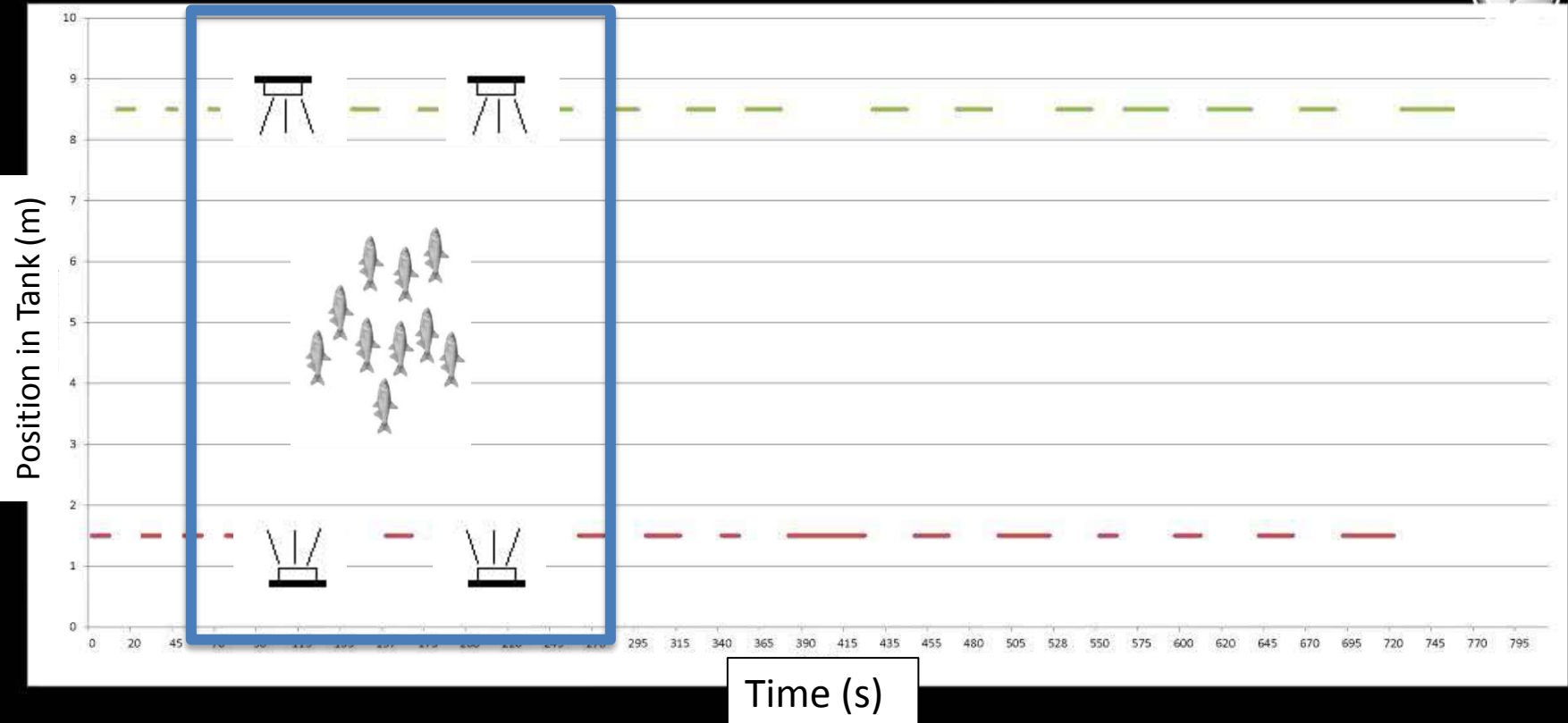
(Vetter et al. 2015)

Silver Carp

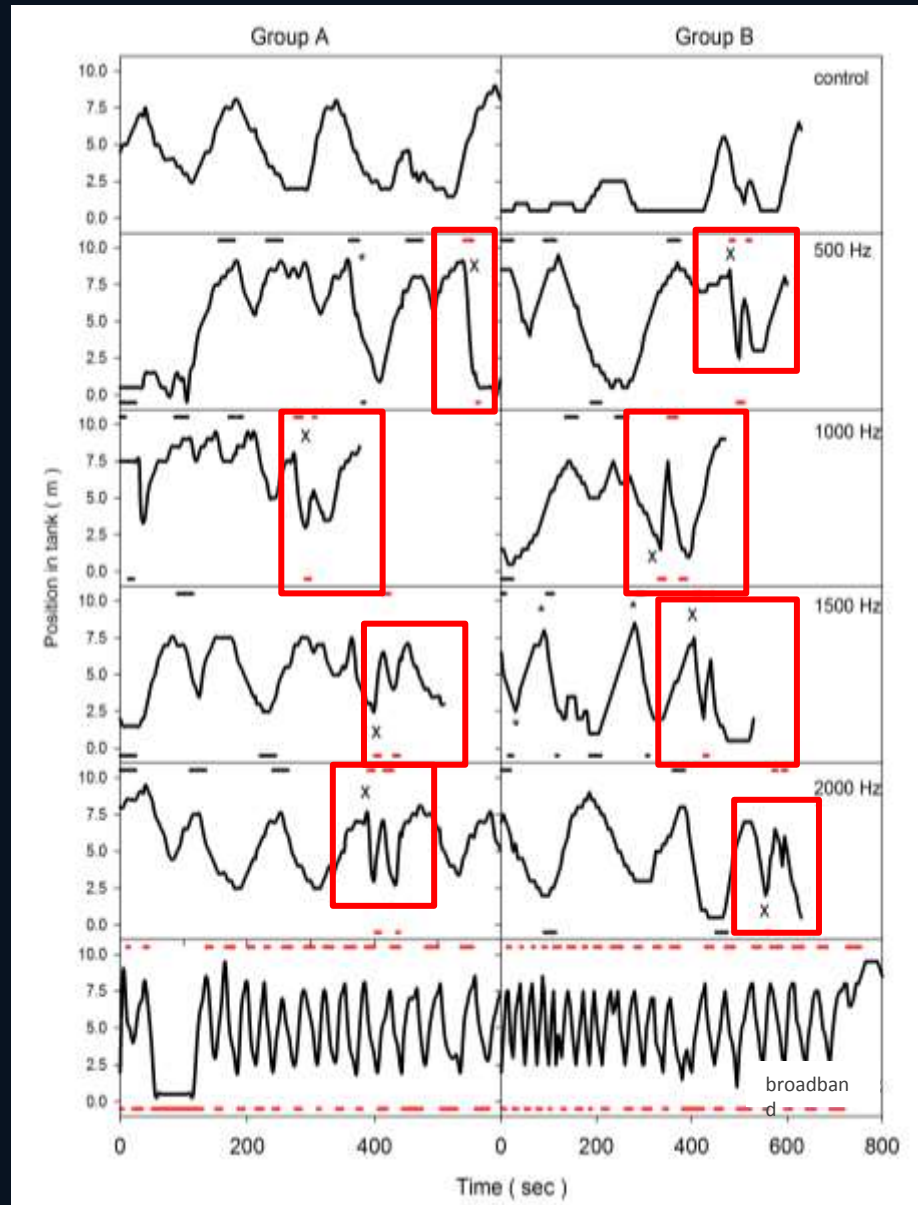


Bighead Carp

# Broadband Sound Results

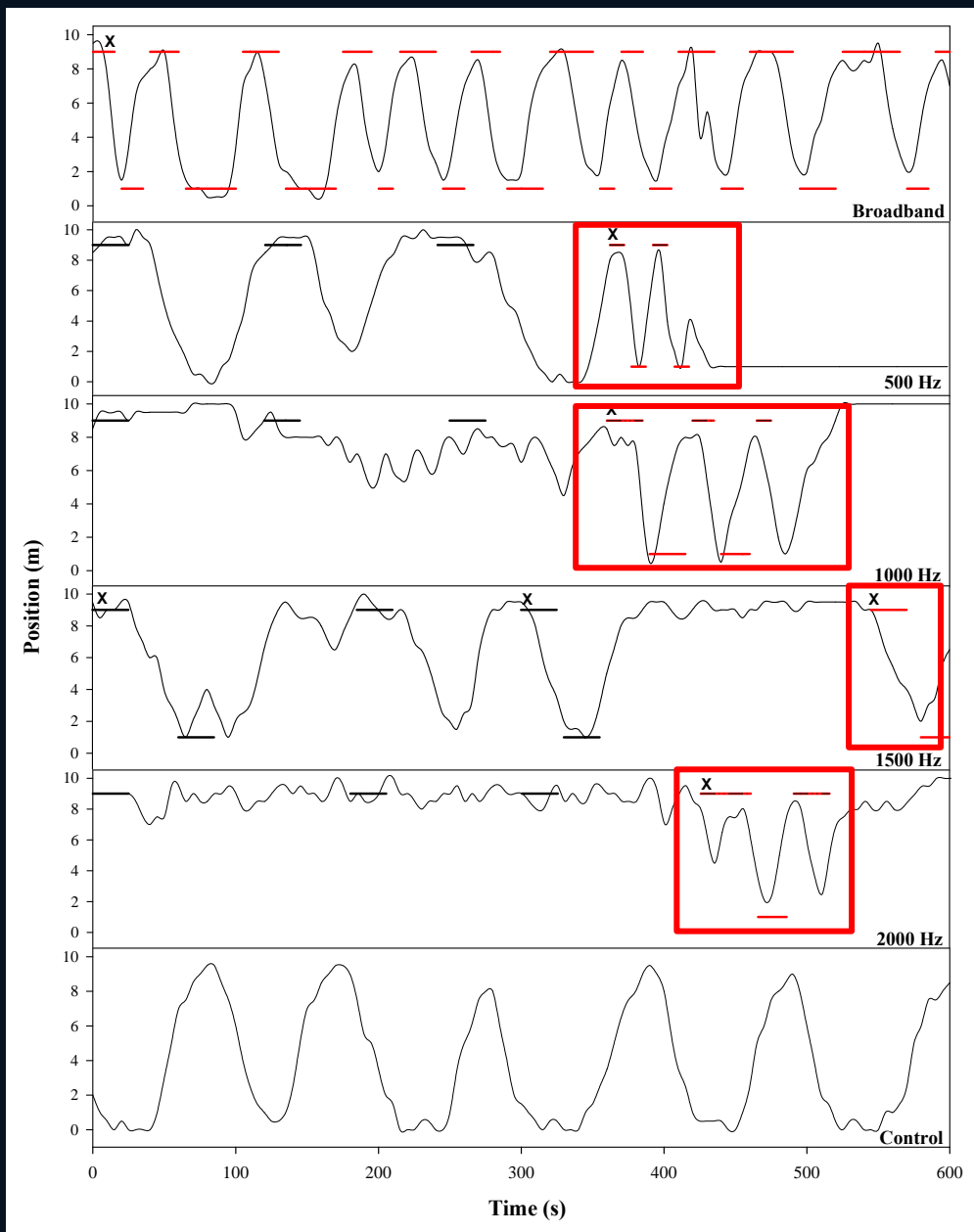


# Silver Carp

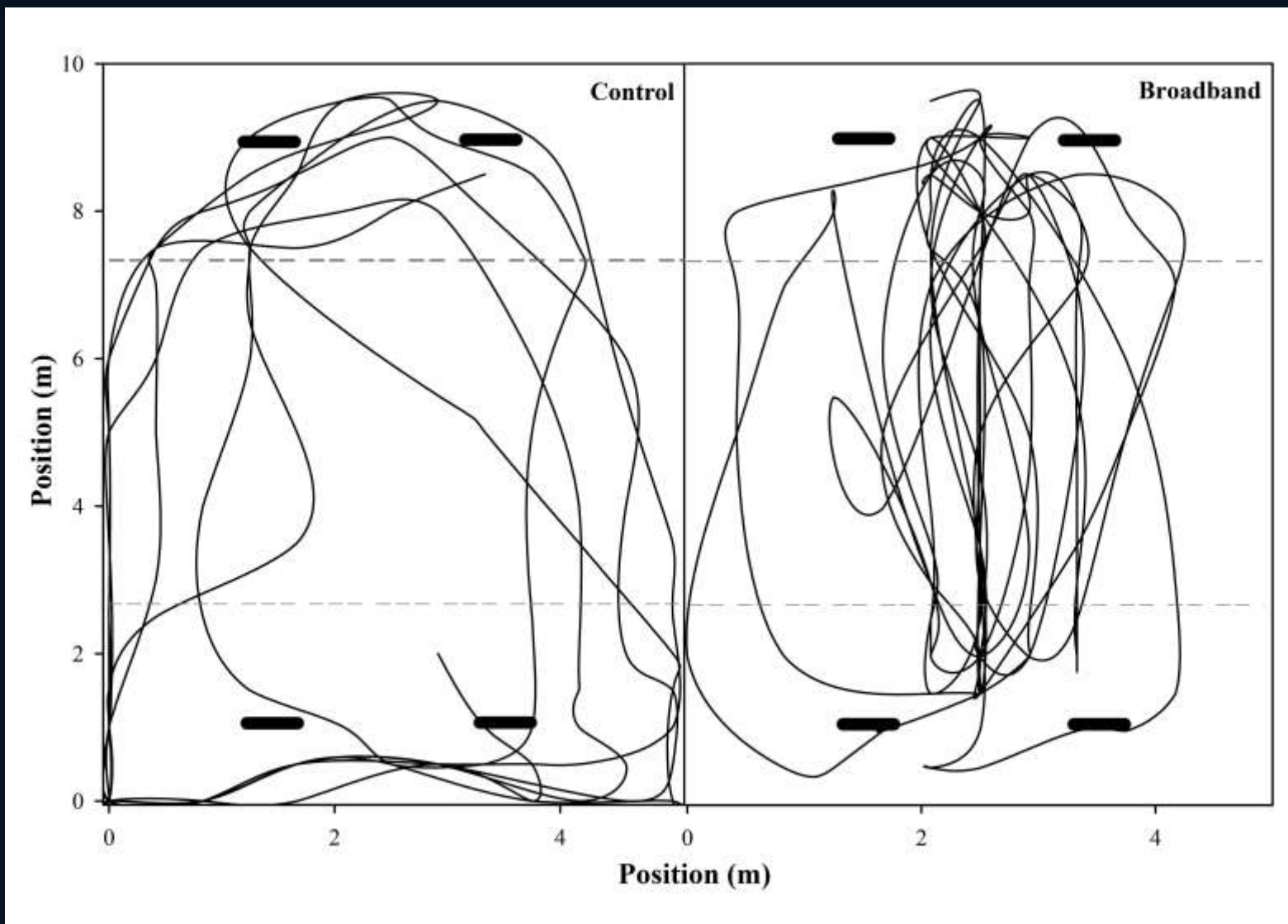


(Vetter et al. 2015)

# Bighead Carp



# Bighead carp behavioral map





# Conclusions

- Pure Tones
  - No Response
  - Habituate Quickly
- Broadband Sounds
  - Both species displayed consistent negative phonotaxis
- Sound may be an important management tool



# Current Work and Future Directions

- Determine wild silver carp response to broadband sound alone
- Broadband sound as a tool to herd fish
- Silver and bighead carp sound sensitivities
- Applications for deterrents and barriers?



# Acknowledgements

- USGS UMESC
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