

Hey Tough Fish, What Are You Lookin' At?

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Can concave and convex mirrors be used to simulate another individual of a disproportionate size to induce different aggression responses from cichlids (*Astatotilapia burtoni*)?



Is the divergence in aggressiveness between convex and concave groups represented in secreted testosterone?

- **Male Aggressiveness and Size:**
 - **Cichlid males are territorial and often fight other males to protect their territory**
 - **Male size is linked to dominance (honest signal of fighting ability)**
 - **winning a fight(even with a mirror) shown induces an increase in circulating androgens like testosterone**

Experimental Design

Recording Behavior Using J-Watcher



- Each tank was split in half with a black divider with one male and two females in each section
- Concave or convex mirror was introduced to each tank
- Observed for 10 minutes for aggressive behavior using J-Watcher:
 - Dorsal fin flaring
 - Attacking mirror

Secreted Testosterone Measured Using ELISA



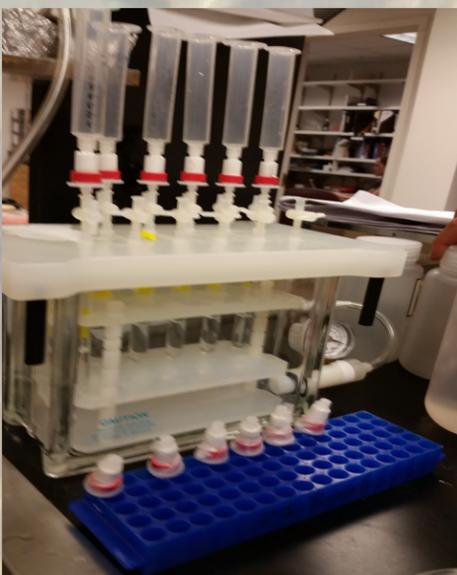
Secreted testosterone collection



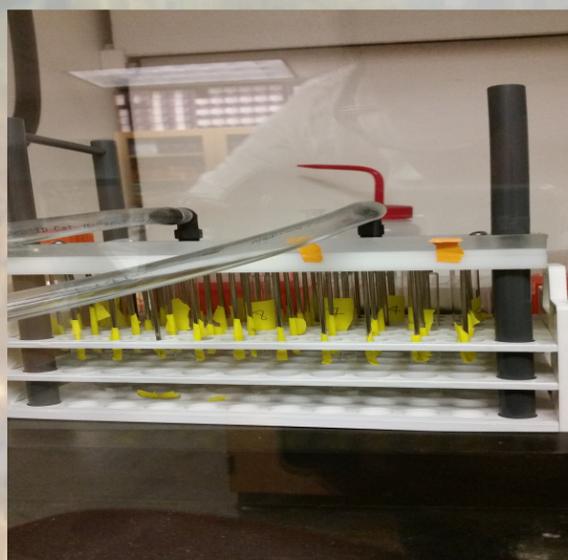
Filtered large particles in fish water



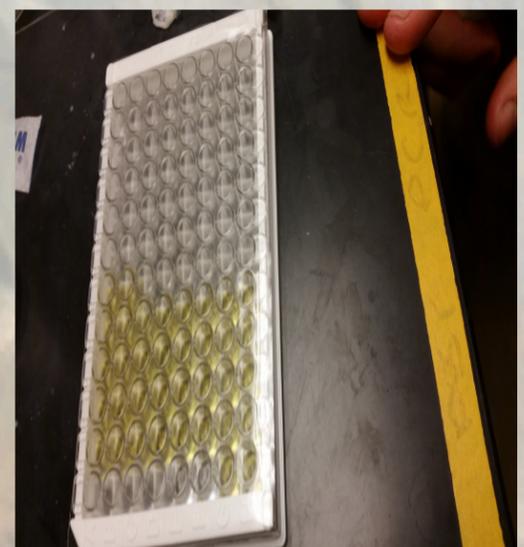
Extracted secreted testosterone from fish water



Eluted samples with ethanol



N2 used to dry ethanol

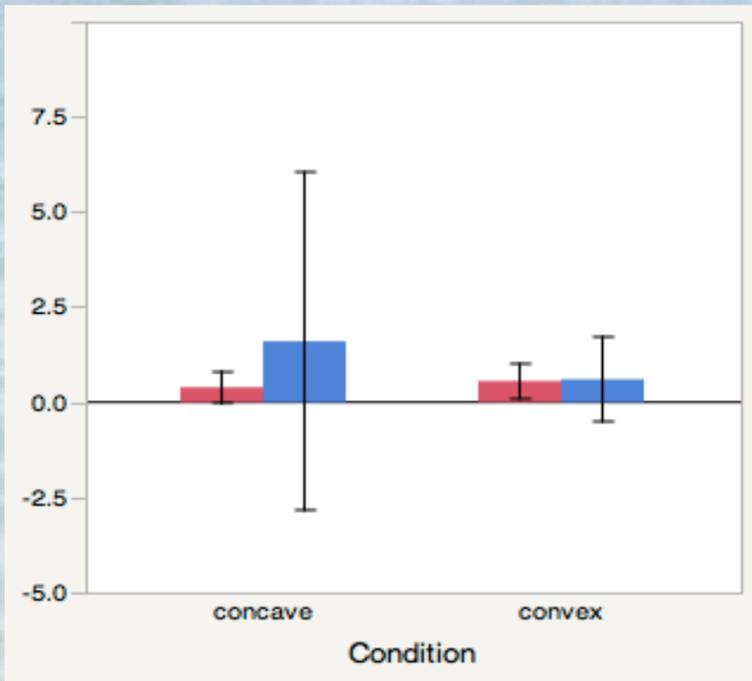


ELISA analyzed using microplate reader

Results

NO RELATIONSHIP between aggressive displays and mirror group (concave or convex)

Proportion of time spent flaring and number of attacks

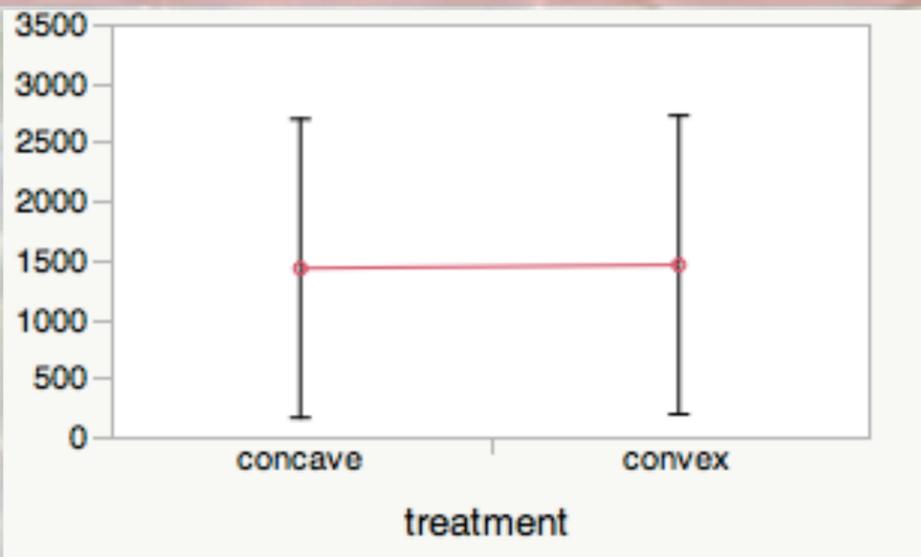


Mean Proportion of Time Spent Flaring

Mean Number of Attacks

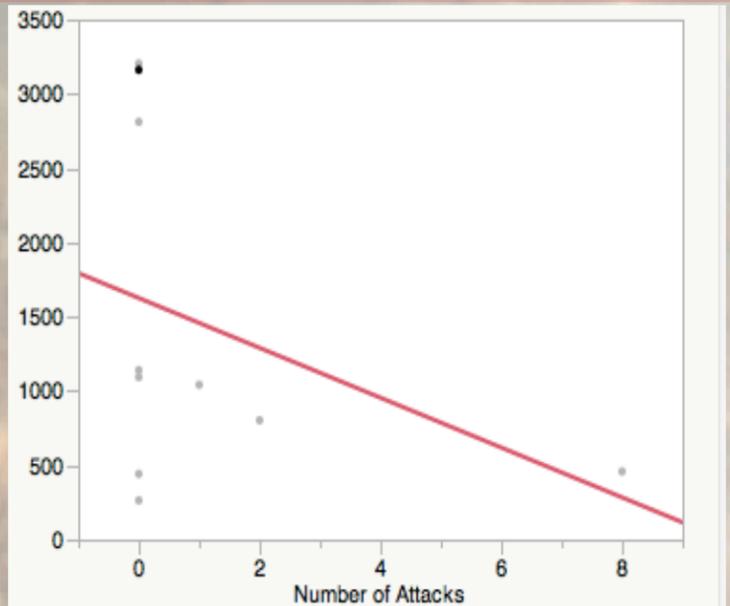
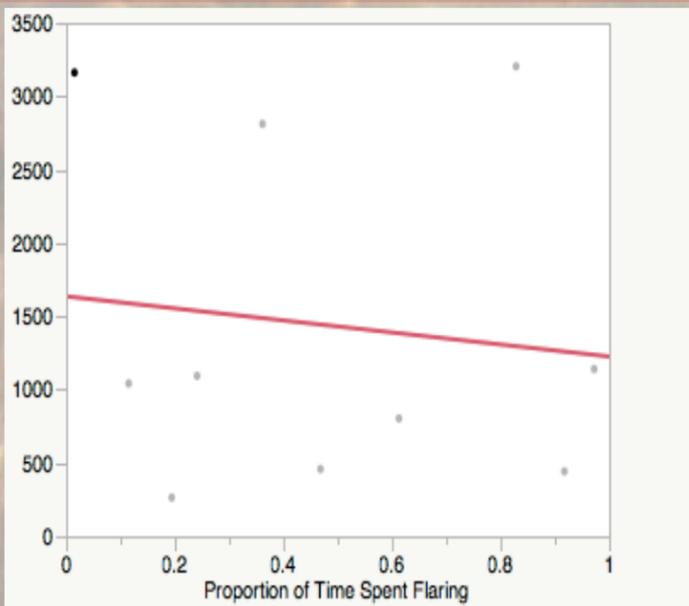
NO RELATIONSHIP between secreted testosterone (pg/ml/hr) ÷ cichlid mass(g) and mirror group (concave or convex)

Testosterone secreted (pg/ml/hr) ÷ cichlid mass(g)



NO RELATIONSHIP between secreted testosterone (pg/ml/hr) ÷ cichlid mass(g) and aggressive behaviors

Testosterone secreted (pg/ml/hr) ÷ cichlid mass(g)



Conclusions

Concave and convex mirrors are ineffective at simulating another cichlid fish of disproportionate size.

Future Directions

Experimental design could be redefined to yield significant results →

- Increase sample size.
- Redefine ethogram to capture more subtle aggressive behavior (Ex. Account for male female interaction)
- Account for environmental variance more rigorously (Ex. Perform behavioral and hormonal measurements at set time)
- Collect more data for comparative analysis (Ex. Test effects of convex/cave mirrors against those of real fish) (Ex. Test effects of flat mirror in addition to convex/cave)

References

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(1) http://www.huffingtonpost.com/2013/08/29/vincent-connare_n_3837441.html

(2) <http://www.nature.com/news/fish-fail-to-see-reflections-as-rivals-1.16099>

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