

Plasticity of Female Cichlid Dominant Hierarchies

Alex Loukides and Hannah McConnell

Reed College Bio342

Female cichlids will create dominance hierarchies in the absence of males. We investigated whether females cichlids in dominance hierarchies will have similar hierarchical behavior as males.



Female A. Burtoni
cichlid



Male A. Burtoni
cichlid

- When a dominant male in a cichlid hierarchy is removed, one of the males left behind will become dominant
- Males who become dominant undergo behavioral and transcriptional changes within the first fifteen minutes following the dominant male being removed

Experimental Design and Results:

Female and male cichlids in single-sex environments have similar dominance hierarchies

Hypothesis: When a dominant female cichlid is removed from the environment, one of the female cichlid's remaining will undergo the same behavioral and transcriptional changes as a male, and become dominant within fifteen minutes

While assays of transcription changes would be difficult to manage, the changes in color and behavior that occur in the fish during that first fifteen minute period can be easily observed

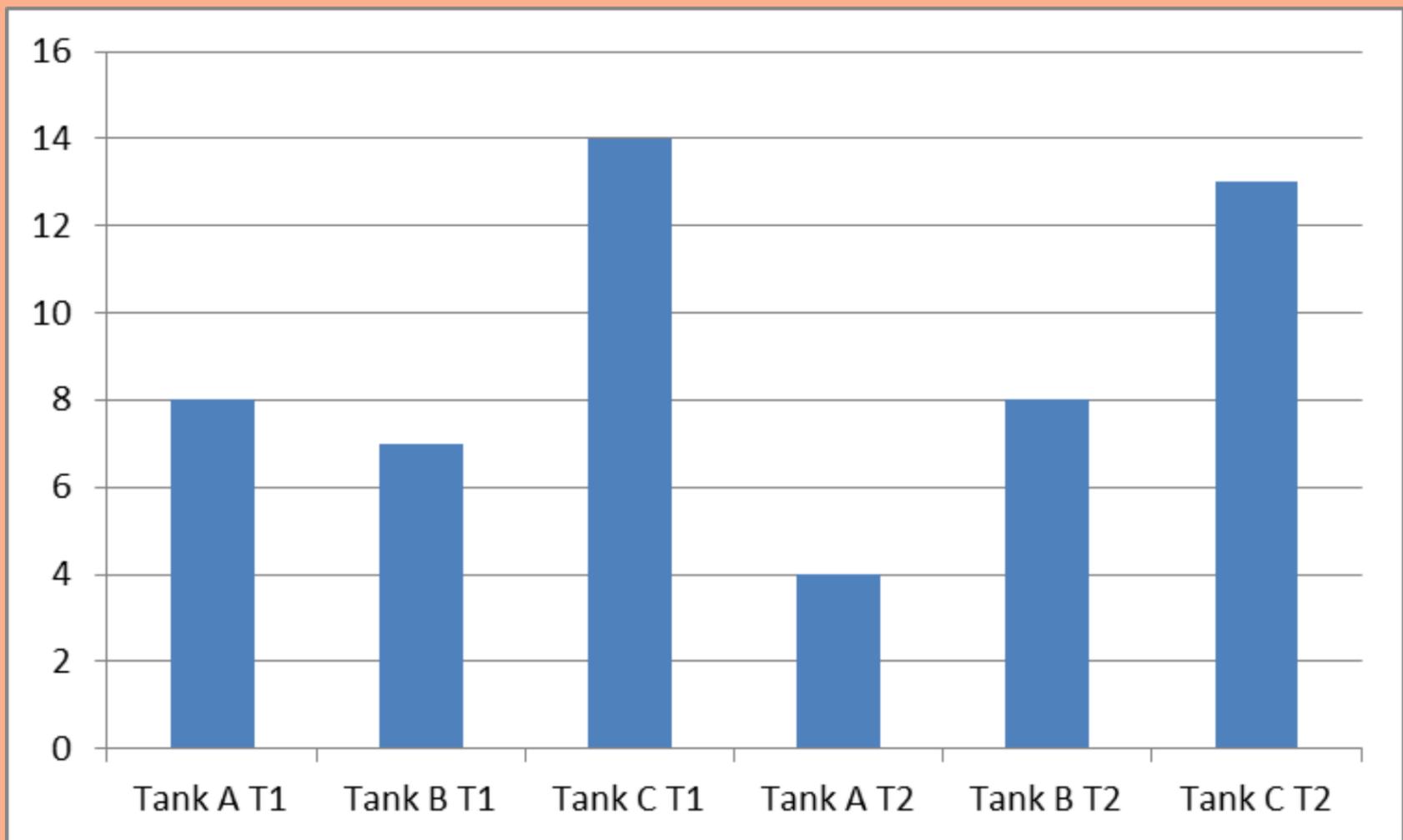
We measured changes in color and aggression over fifteen minutes and then the same three to four days following removal to observe if the same female is still dominant

	Tank A T1	Tank B T1	Tank C T1	Tank A T2	Tank B T2	Tank C T2
Dominance after 15 minutes	Orange	Orange	Green	Pink	Pink	Blue
Dominance after 3 hours	Orange	Orange	Green	Pink	Pink	Blue

Fish that appeared to become dominant within fifteen minutes of removal of the previous dominant retained their dominance three days later

The left column of this graph indicates which female appeared to be dominant (acted most aggressive and territorial) and the right column indicates which female appeared to be dominant three days later. Each paired point represents one trial, and the colors of the line represent the recognition tag of an individual fish

Results cont.:



The amount of time required for a fish to become dominant; all female cichlids that replaced the previous dominant female underwent behavioral changes – aggression and territoriality – within fifteen minutes following the removal of the previous dominant female

Conclusions:

Cichlids in an all-female hierarchy share the same response to the removal of a dominant individual as cichlids in an all-male hierarchy do

Future Investigations:

- Hierarchy changes when a dominant female cichlid is removed and allowed to re-enter the environment after a new hierarchy forms
- Hormonal and transcriptional assays of the cichlids immediately following a new dominant cichlid taking over

References:

- (1) Renn, Suzy C.P, Eleanor J. Fraser, Nadia Aubin-Horth, Brian C. Trainor, and Hans A. Hoffman. "Females of an African Cichlid Fish Display Male-typical Social Dominance Behavior and Elevated Androgens in the Absence of Males." *Hormones and Behavior* 61.4 (2012): 496-503. *Females of an African Cichlid Fish Display Male-typical Social Dominance Behavior and Elevated Androgens in the Absence of Males*. Elsevier. Web. 20 Oct. 2015.
- (2) Shwartz, Mark. "Social Status Triggers Genetic Response in Male Cichlid Fish." *Stanford University*. Stanford, 19 Oct. 2005. Web. 20 Oct. 2015
- (3) " Model System: Astatotilapia Burtoni." *Maruska Lab*. Louisiana State University. Web. 01 Dec. 2015
- (4) Costandi, Mo. "Fish Use Simple Logic to Infer Their Social Status." *Wordpress*. N.p., 25 Jan. 2007. Web. 01 Dec. 2015

Acknowledgements:

Suzie Renn, Mason Kennon, Nadia Aubin-Horth, Hans Hoffman