Measuring Testosterone and Social Conditions in a Non-Hierarchical Species

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Studies have found correlations between testosterone level and social environment within hierarchical species. We further these studies by investigating a non-hierarchical species, *Xenopus laevis.*

Cichlids:

- social hierarchy-- dominant vs subordinate males[1]
- dominant males have higher levels of testosterone[2]
- testosterone levels influenced by social environment[2]

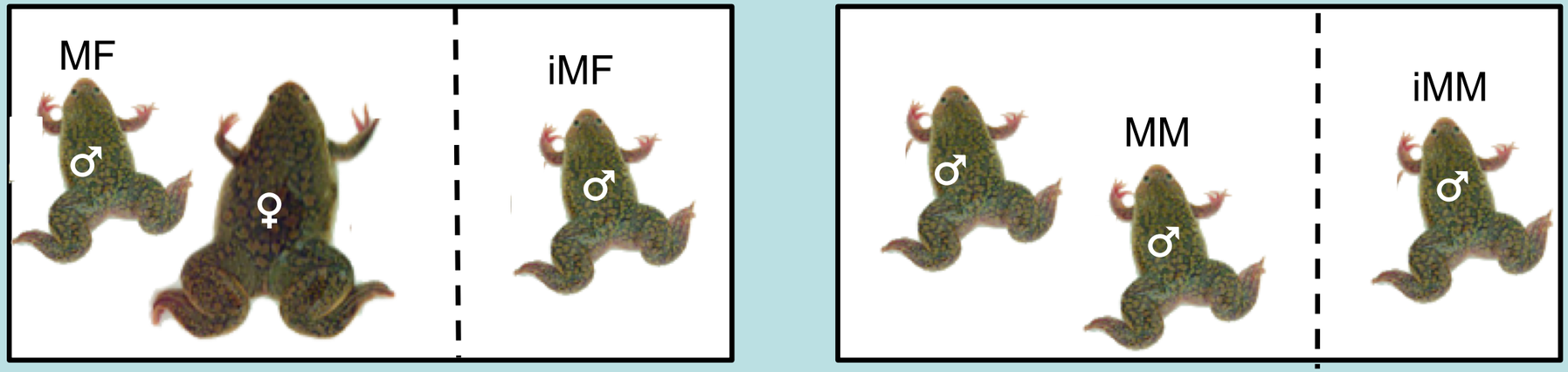
African Clawed Frog:

- do not have conclusive social hierarchies[3]
- will social conditions influence testosterone?

http://newportbay.org/wildlife/reptiles-amphibians/african-clawed-frog/

https://www.eurekalert.org/multimedia/pub/28689.php

Experimental Design:



Two tanks divided with a clear plastic screen.
Five male frogs were cycled through five social conditions, each for 24 h.
They were in isolation “i” and/or paired with a male “MM” or female “MF”.

http://www.enzolifesciences.com

Water samples collected from all male frogs.

Testosterone concentration of samples tested with ELISA (enzyme-linked immunosorbent assay).

Results:

Male *Xenopus laevis* do not change their testosterone levels under the different social environments

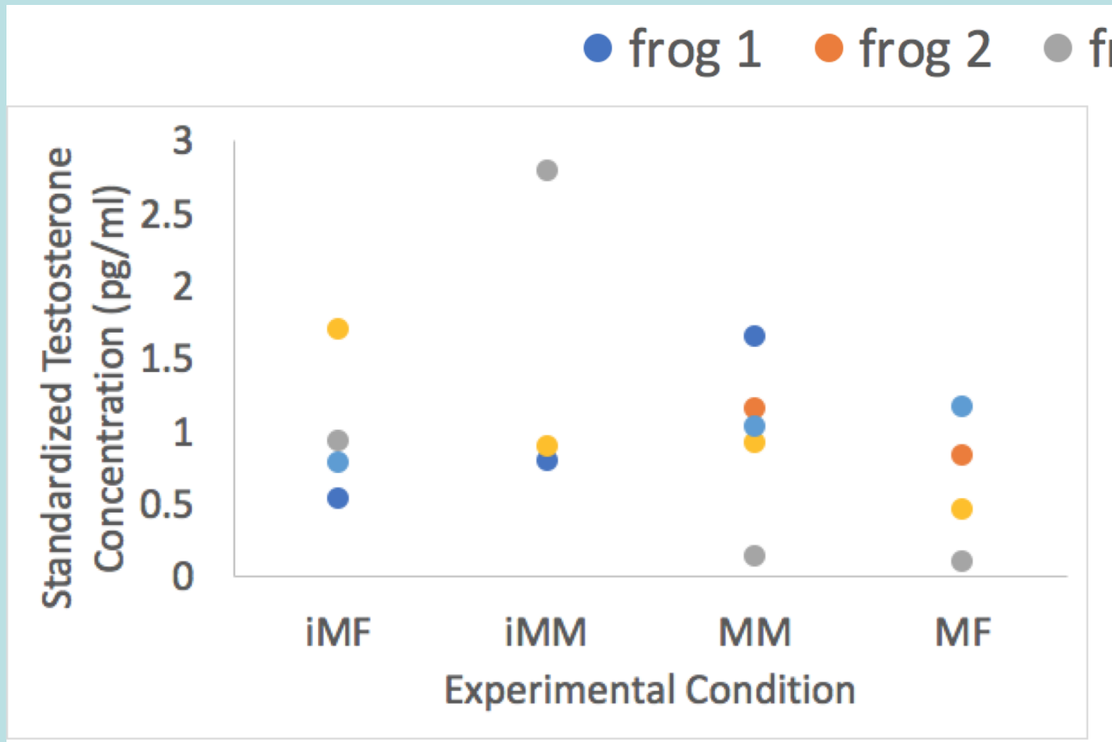


Figure 1: The experimental condition had no significant effect on testosterone concentration. Testosterone concentration was standardized to a frog's individual average.

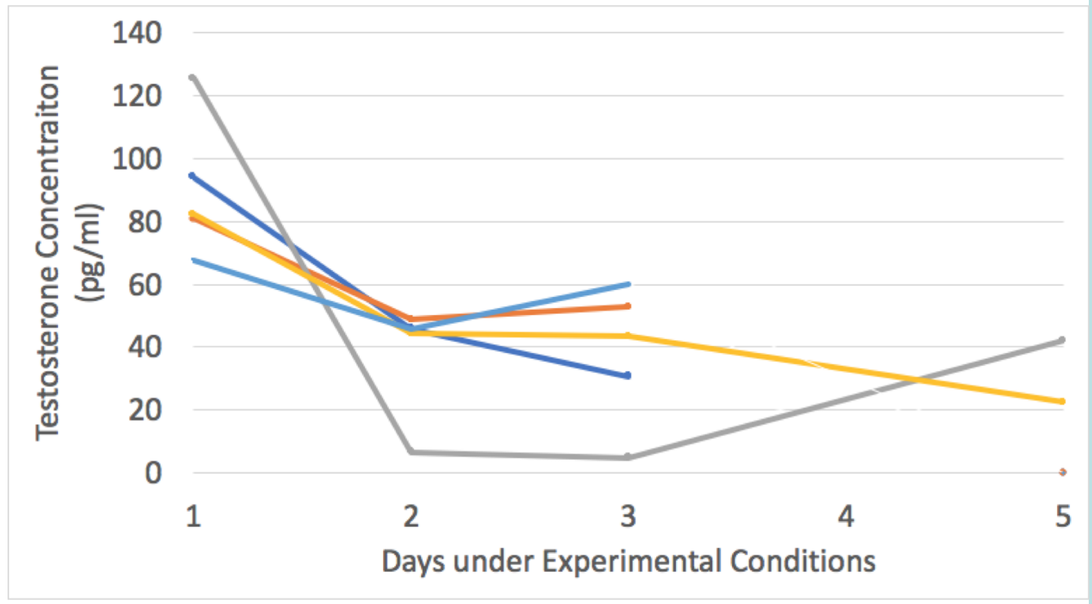


Figure 2: The duration a frog was in the experimental conditions minimally lowered its circulating testosterone over time, regardless of social environment.

We Conclude that:

Social hierarchy may be necessary for social condition to influence testosterone levels.

Future Directions:

Future studies could explore other non-hierarchical species testosterone levels to investigate if there is similarly no correlation. Additionally, studying estrogen levels in female *Xenopus laevis* might confirm that hormone levels are not dependent on social condition for both sexes.

References:

(1) Alonso, F., Honji, R. M., Moreira, R. G., & Pandolfi, M. (2012). Dominance hierarchies and social status ascent opportunity: Anticipatory behavioral and physiological adjustments in a Neotropical cichlid fish. *Physiology & Behavior, 106*(5), 612-618. doi:10.1016/j.physbeh.2012.04.003

(2) Alcazar, R. M., Becker, L., Hilliard, A. T., Kent, K. R., & Fernald, R. D. (2016). Two types of dominant male cichlid fish: behavioral and hormonal characteristics. *Biology open*, *5*(8), 1061-71. doi:10.1242/bio.017640

(3) Tobias, Martha L., et al. “Vocal Competition in Male Xenopus Laevis Frogs.” Behavioral Ecology and Sociobiology, vol. 64, no. 11, Nov. 2010, pp. 1791–803. Crossref, doi:10.1007/s00265-010-0991-3.

Pictures of African Clawed Frog:
http://newportbay.org/wildlife/reptiles-amphibians/african-clawed-frog/
https://www.eurekalert.org/multimedia/pub/28689.php
https://www.xenbase.org/anatomy/intro.do

Picture of ELISA kit:
http://www.enzolifesciences.com/ENZ-KIT141/insulin-elisa-kit/

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