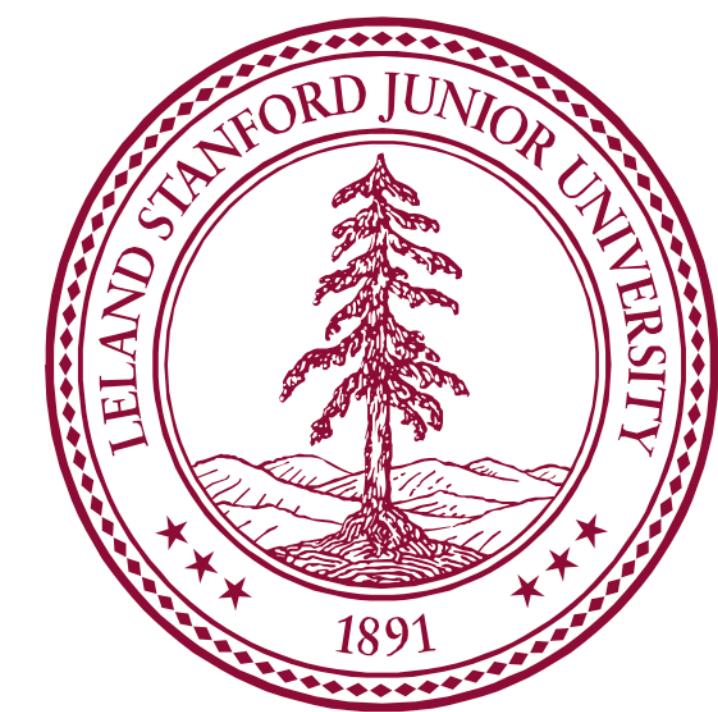




Modular genetic control of social status in a cichlid fish



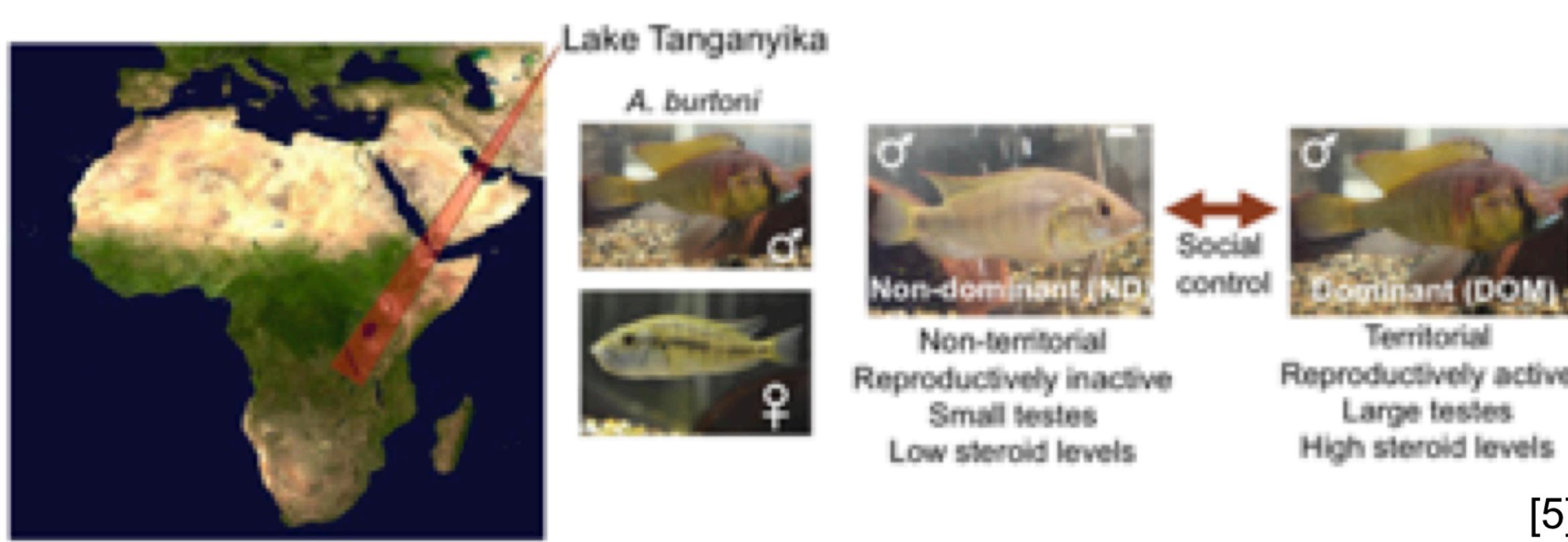
Beau Alward^{a, b}, Christopher Skalnik^b, Ryan York^b, Scott Juntti^b, Vibhav Laud^c, Russell Fernald^b

^aDepartment of Psychology, University of Houston; ^bDepartment of Biology, Stanford University;

^cLynbrook High School

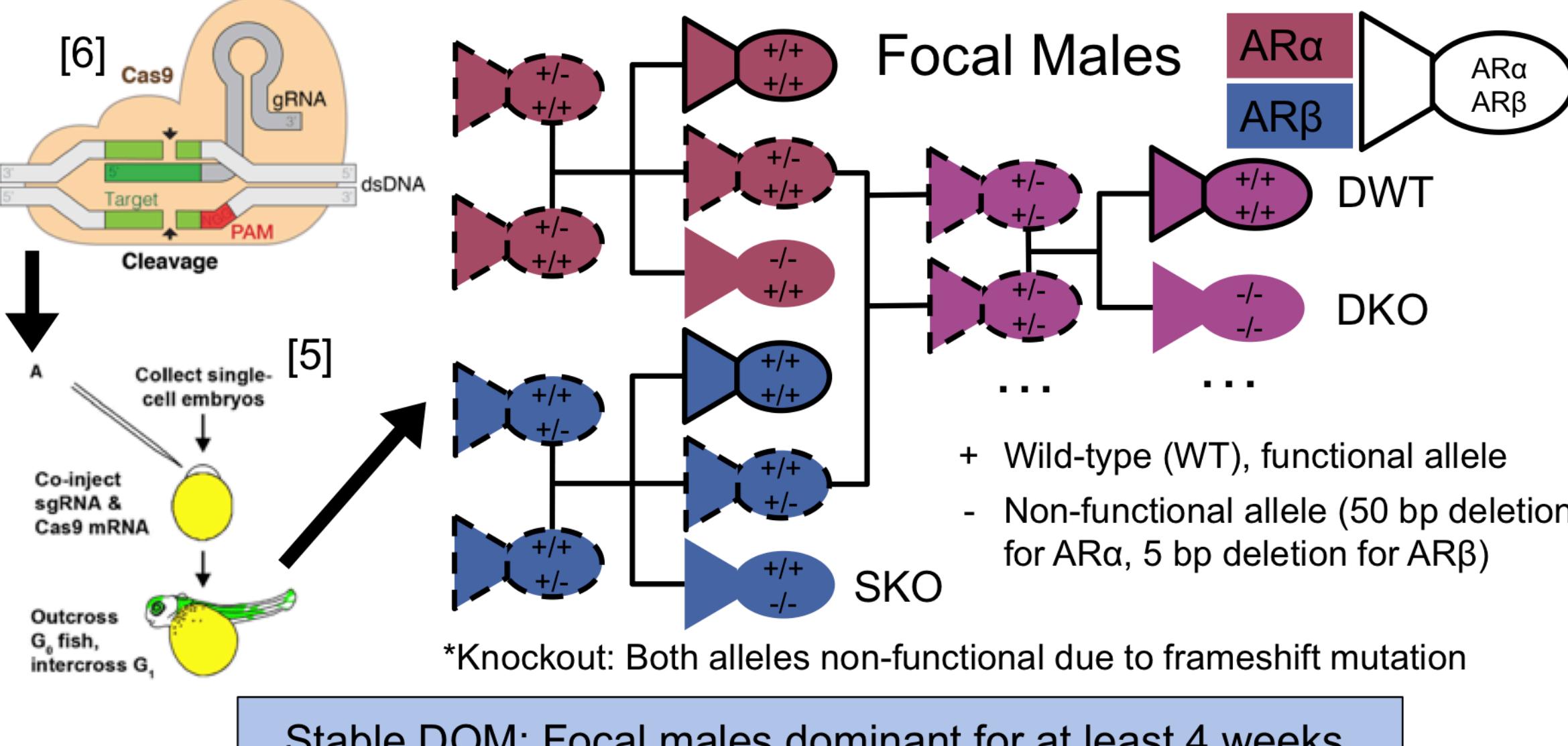
Background

- How the brain interprets and controls responses to social cues remains unclear.¹
- Previous work, including in humans², suggests androgens (e.g. testosterone) may be involved.³
- The East African cichlid *Astatotilapia burtoni* lives in a social hierarchy wherein males shift between dominant (DOM) and non-dominant (ND).¹
- The 2 *A. burtoni* androgen receptors (AR α & AR β) are differentially expressed in DOM versus ND.⁴
- How do AR α and AR β mediate DOM-typical physical and behavioral social responses?**

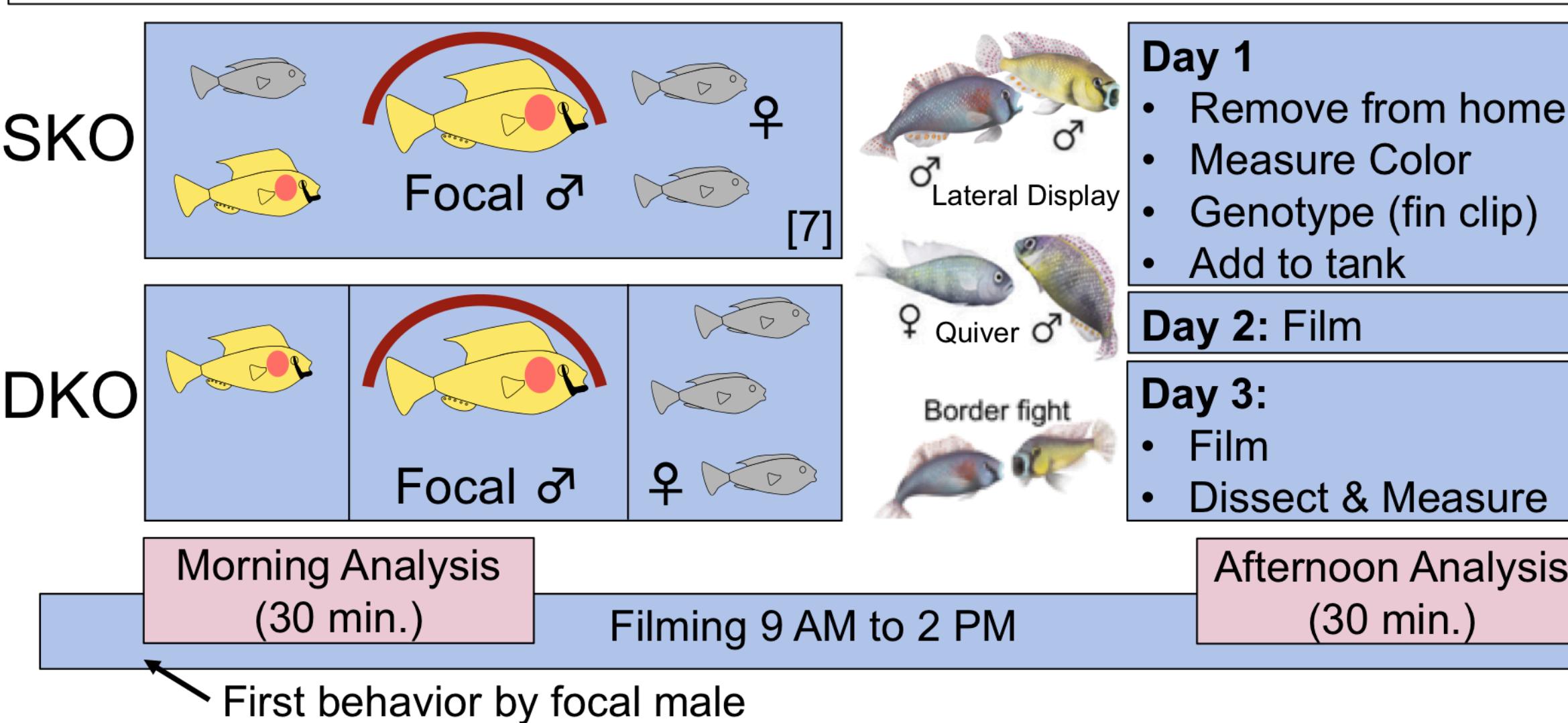


Methods

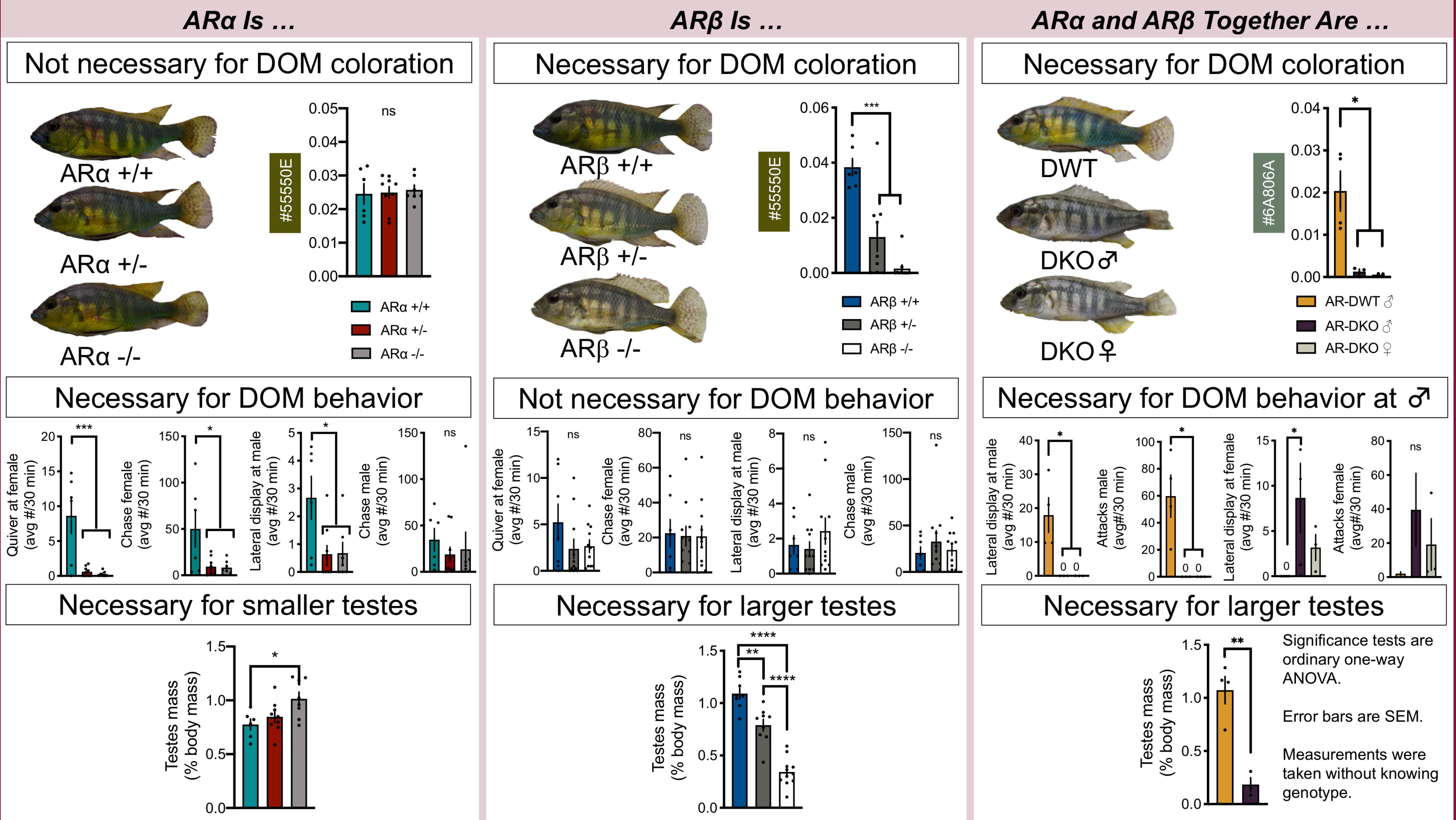
Create double (DKO) and single (SKO) AR knockouts*



Observe in a rich social environment



AR α and AR β Mediate Distinct Components of Social Dominance



Conclusions and Future Directions

- In DKOs, the effect on testes size of disabling AR β masks the effect of disabling AR α , suggesting that AR β is necessary for certain AR α functions.
- ♀-directed and ♂-directed behaviors may be controlled by separate mechanisms.
- DKO males and females exhibit similar color and behavior.
- Our genetic dissection reveals social status is highly dissociable.
- Measuring hormone concentrations may reveal how these control relationships are mediated.

Acknowledgements

Thank you to Danielle Blakkan for her expert advice on all aspects of this work. We relied heavily on the work and tools of past members of the RF lab.

This research was supported by a B-SURPS grant from the Stanford Vice-Provost of Undergraduate Education to CS, an NIH grant (R01NS034950-21) to RF, and an Arnold O. Beckman Postdoctoral Fellowship to BA.

References & Contact

- Fernald RD, Maruska KP (2012) Social information changes the brain. *PNAS* 109:17194–17199.
- Eisenegger C, Haushofer J, Fehr E (2011) The role of testosterone in social interaction. *Trends in Cognitive Sciences* 15:263–271.
- Alward BA, Hilliard AT, York RA, Fernald RD (2019) Hormonal regulation of social ascent and temporal patterns of behavior in an African cichlid. *Hormones and Behavior* 107:83–95.
- Harbott LK, Burmeister SS, White RB, et al (2007) Androgen receptors in a cichlid fish, *Astatotilapia burtoni*: Structure, localization, and expression levels. *The Journal of Comparative Neurology* 504:57–73.
- Alward *et al* (2018) Pharmacological and genetic dissection of social behavior in the African cichlid fish *Astatotilapia burtoni*. Beckman Foundation (Poster)
- By marius walter (CC-BY 4.0), from Wikimedia Commons
- Fish graphics by Danielle Blakkan and the Fernald Lab