



CONTINUOUS LIGHT TREATMENTS REDUCE PRECOCIOUS MATURATION IN AGE 1+ MALE SPRING CHINOOK SALMON (*Oncorhynchus tshawytscha*)

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Oncorhynchus tshawytscha, Chinook Salmon

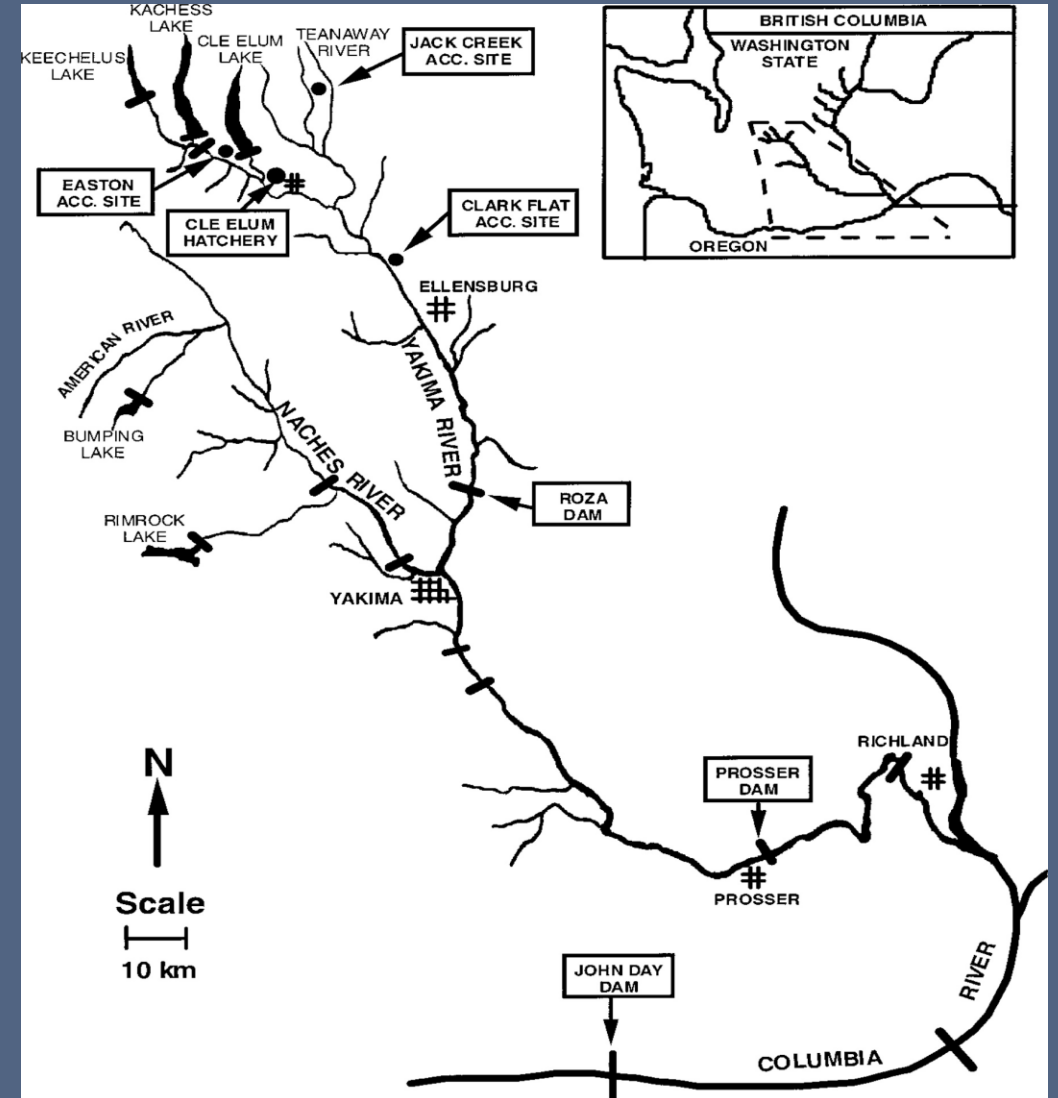
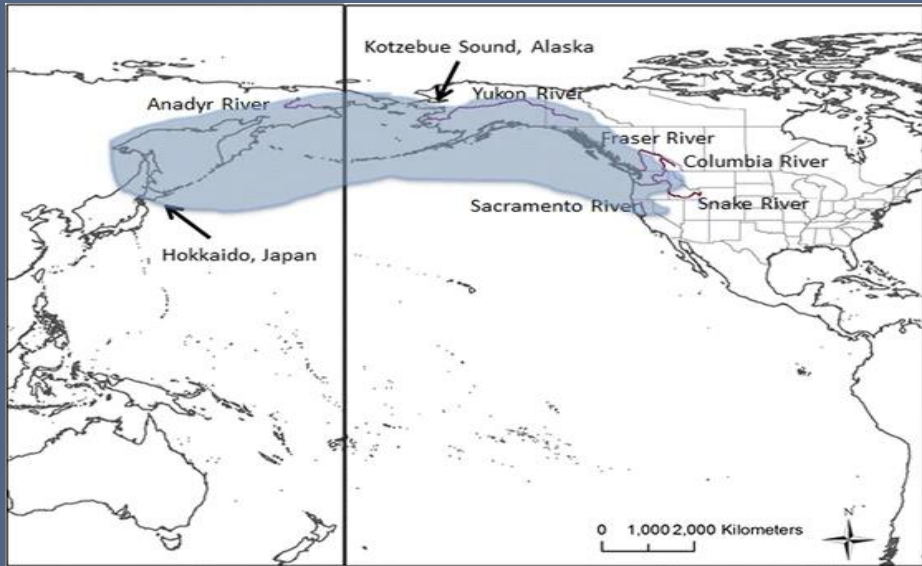
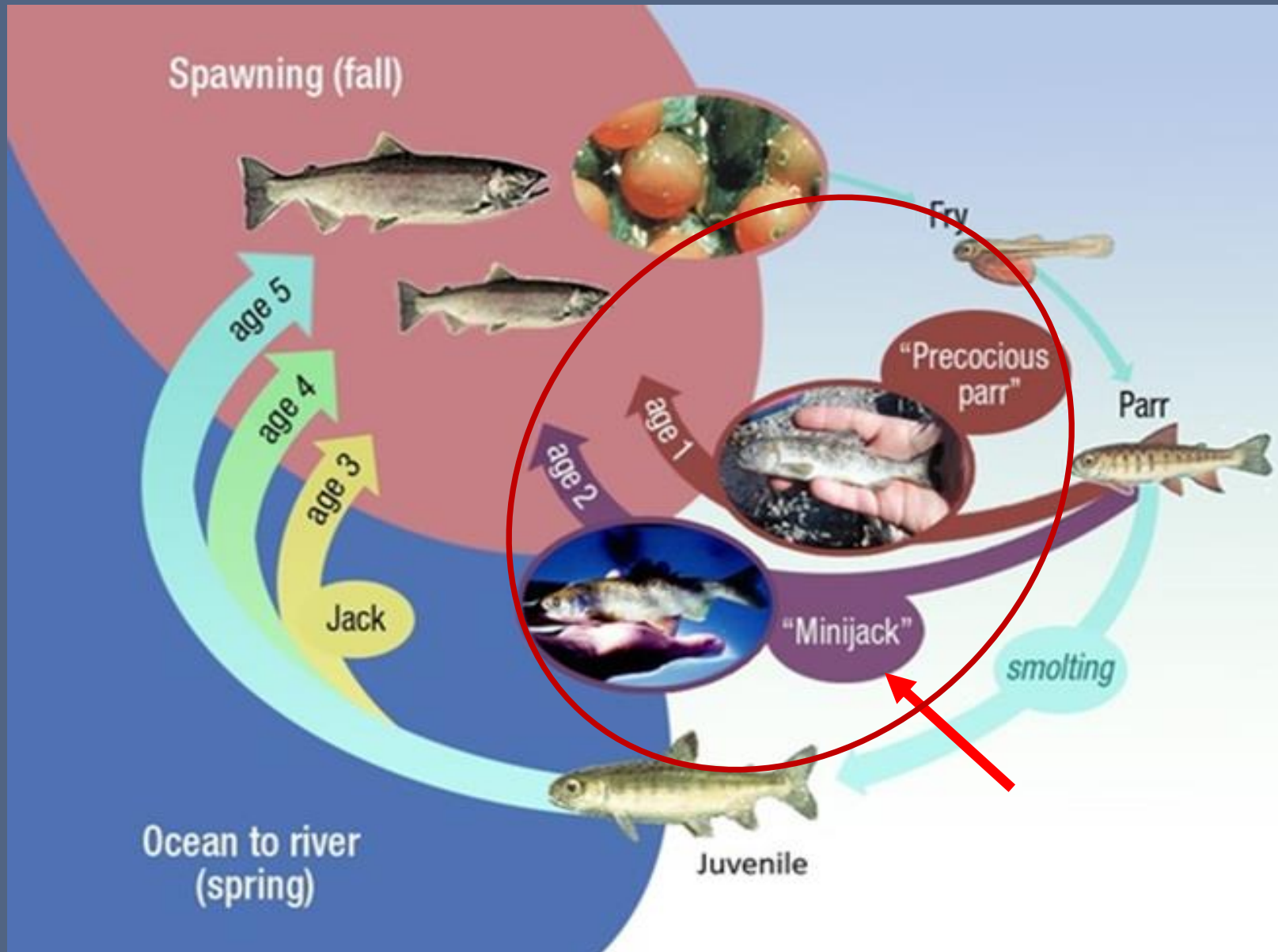


Photo credit: <https://www.fisheries.noaa.gov/species/chinook-salmon>. Healey 1991; Augerot 2005, Bourret et al. 2016)

From Larsen et al. 2004

Spring Chinook salmon have diverse ages of maturity



Hatchery environments increase rates of minijacks

Raceway at Cle Elum Supplementation Research Facility (CESRF)

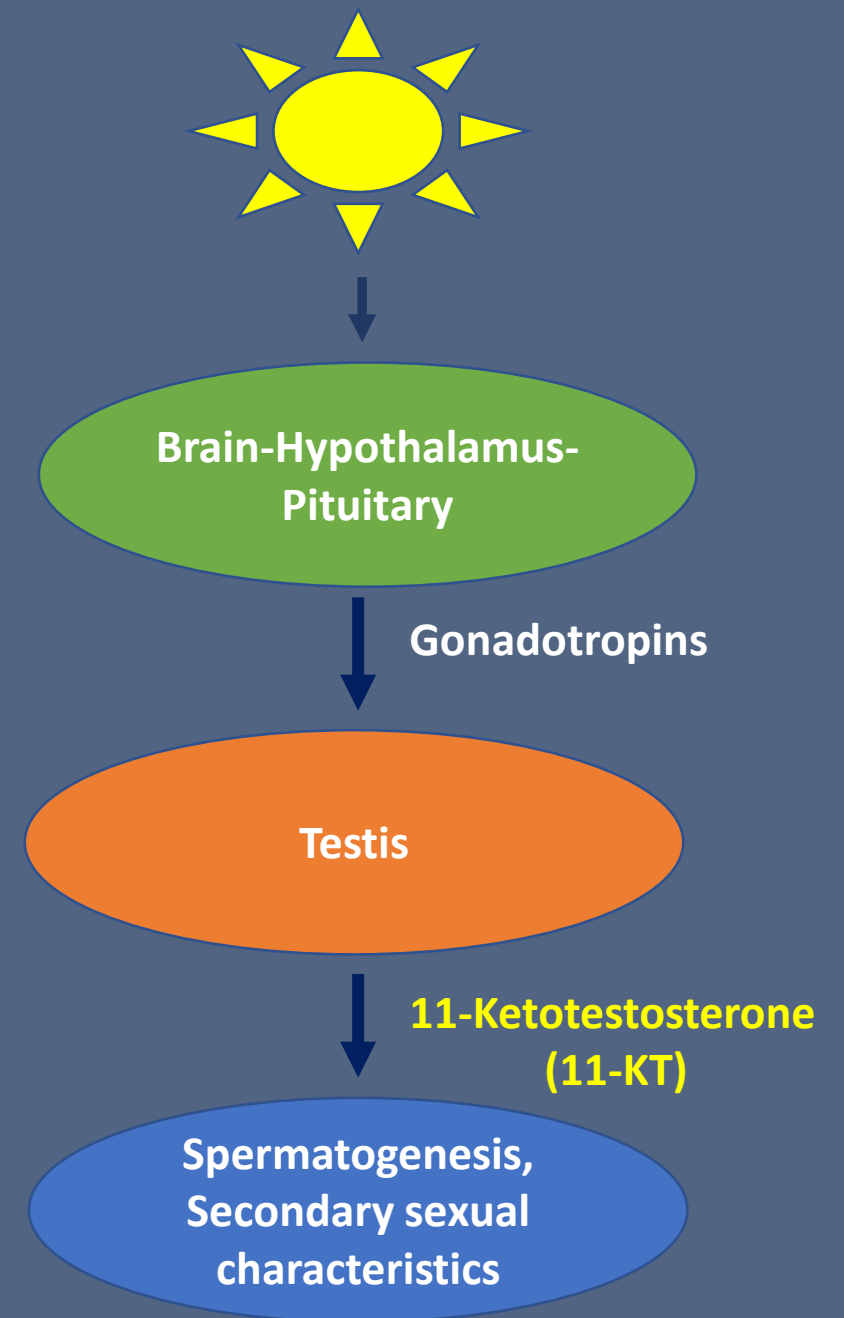
- In natural origin populations minijacks rates are 1-5%.
- At CESRF an average 40% of males are minijacks
- Results in loss of anadromous adult hatchery production.
- Differs from natural population age structure



Photo credit: <https://www.nwcouncil.org/fish-and-wildlife/previous-programs/field-guide-2/>

Photoperiod is major regulator of reproduction

- Factors controlling maturation: energy reserves, temperature, genetics, **photoperiod**
- Photoperiod entrains circannual endogenous rhythms, so maturation occurs at the proper time of year.
- 11-Ketotestosterone (11-KT) is the main sex hormone in male fish.
- 11-KT is early indicator of maturation.



Maturation status can be assigned based on 11-KT in the spring

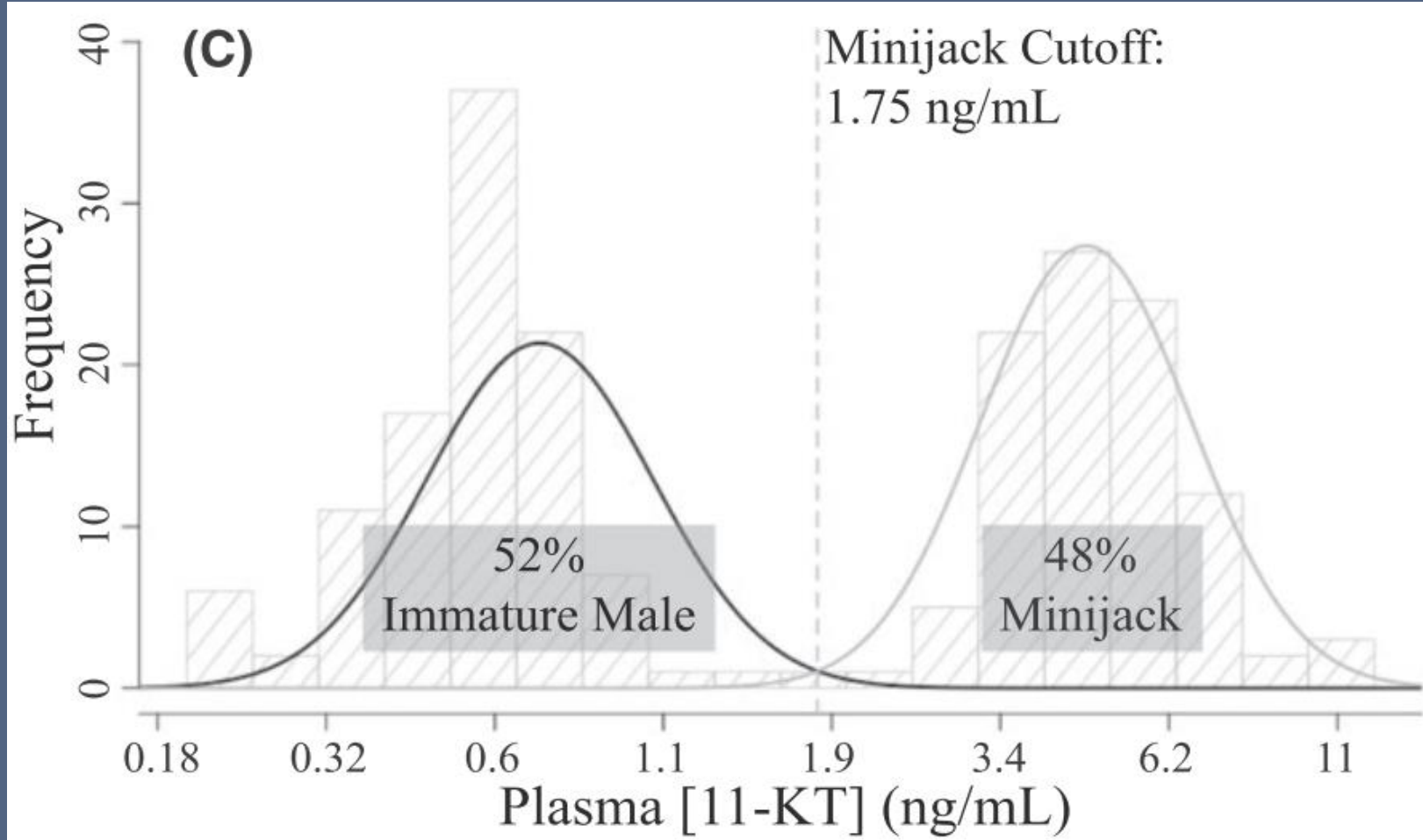
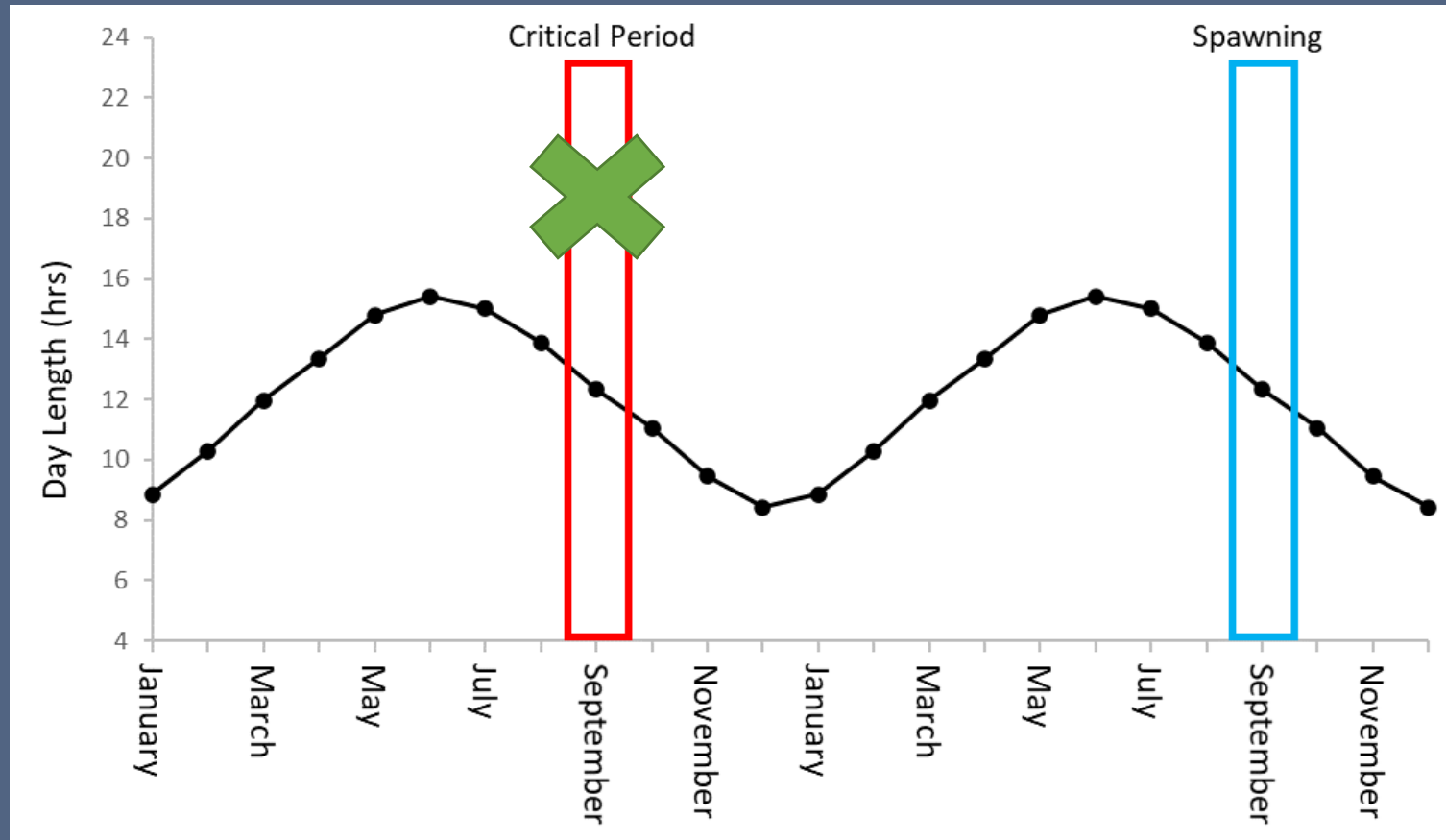


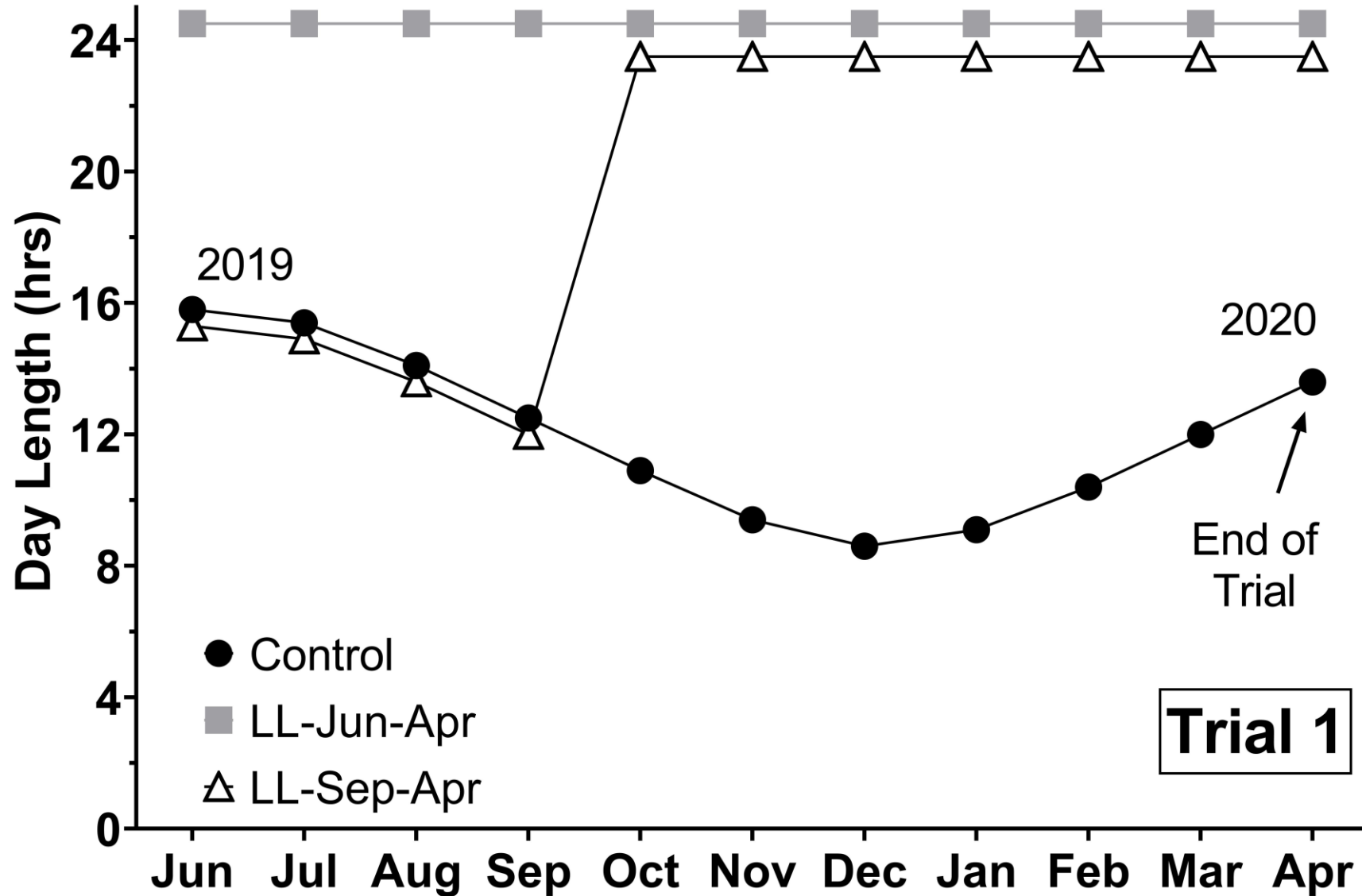
Figure from Medeiros et al. 2018



Hypothesis: Exposing fish to continuous light (i.e., 24-hour) during the critical period will reduce precocious maturation

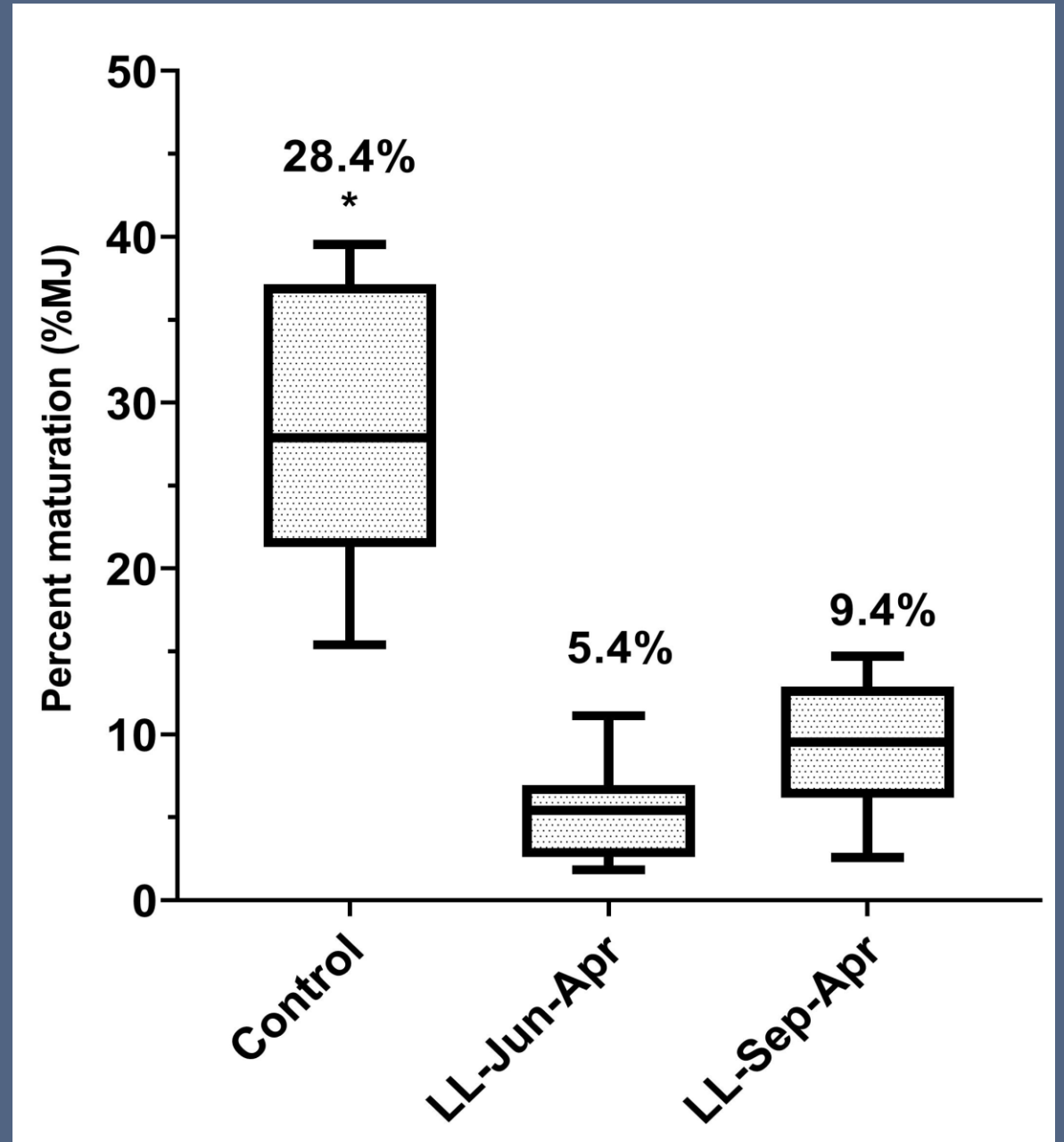
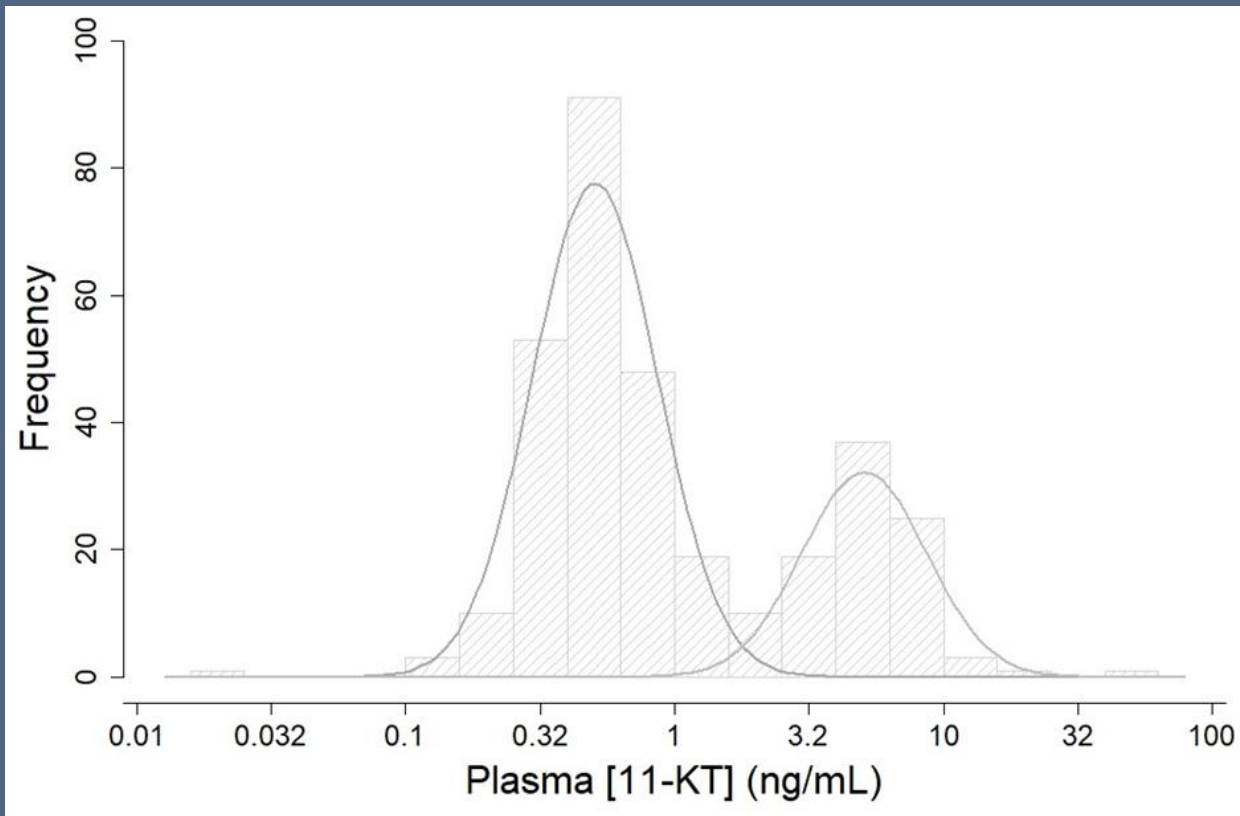


Trial 1 continuous light treatments

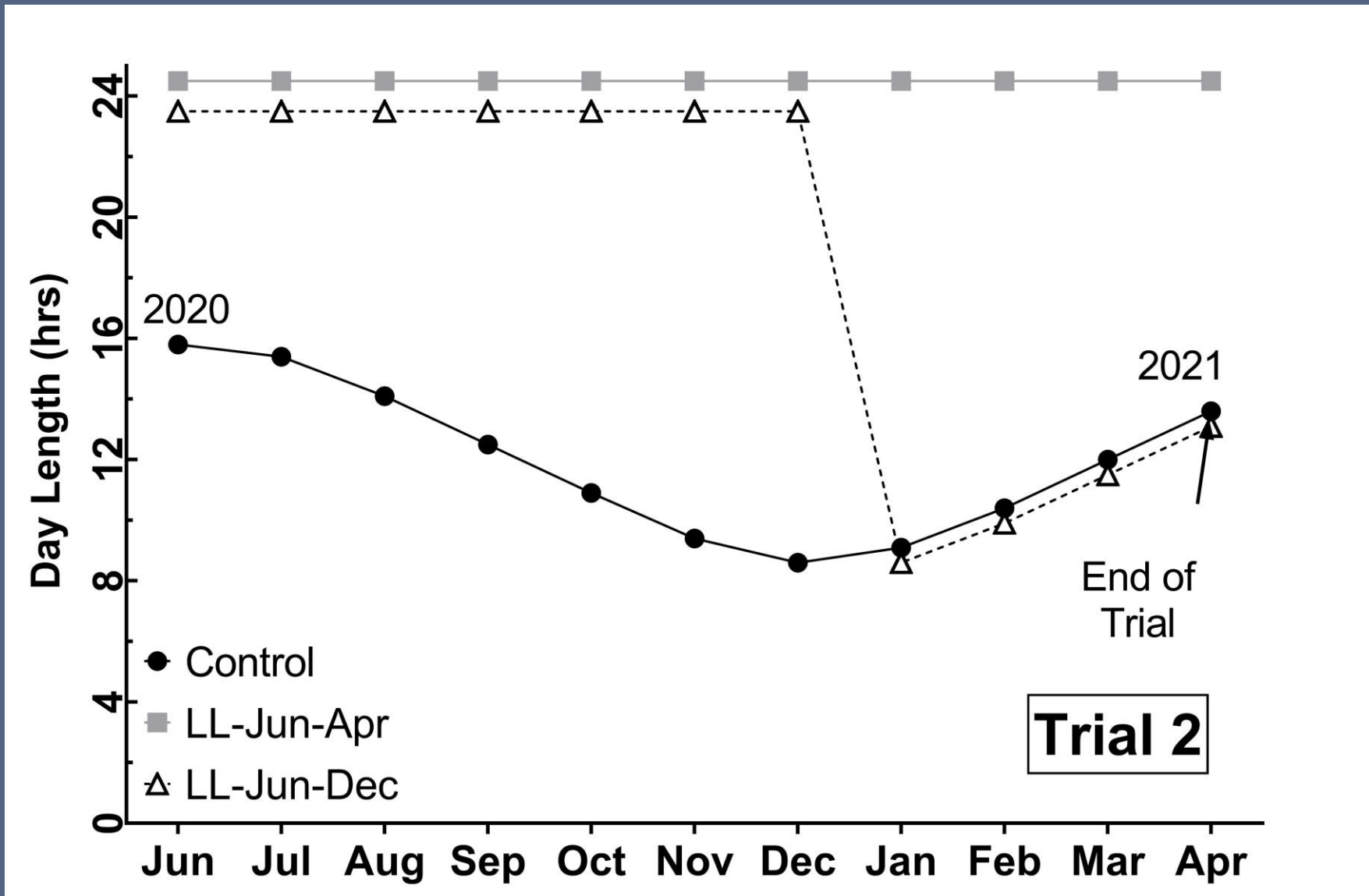


Trial 1 Results:

Continuous light treatments strongly reduced the percentages of maturing males!

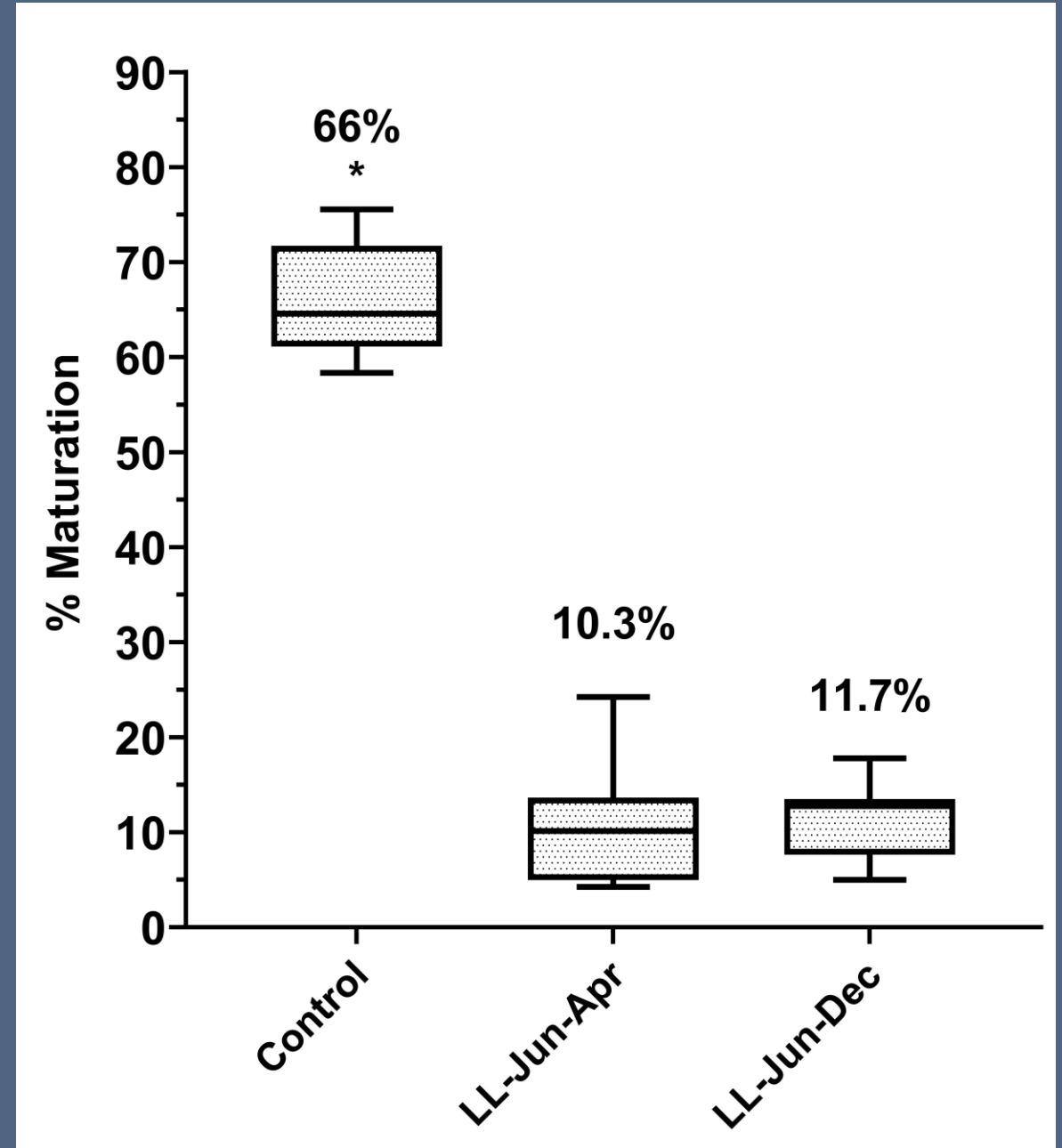
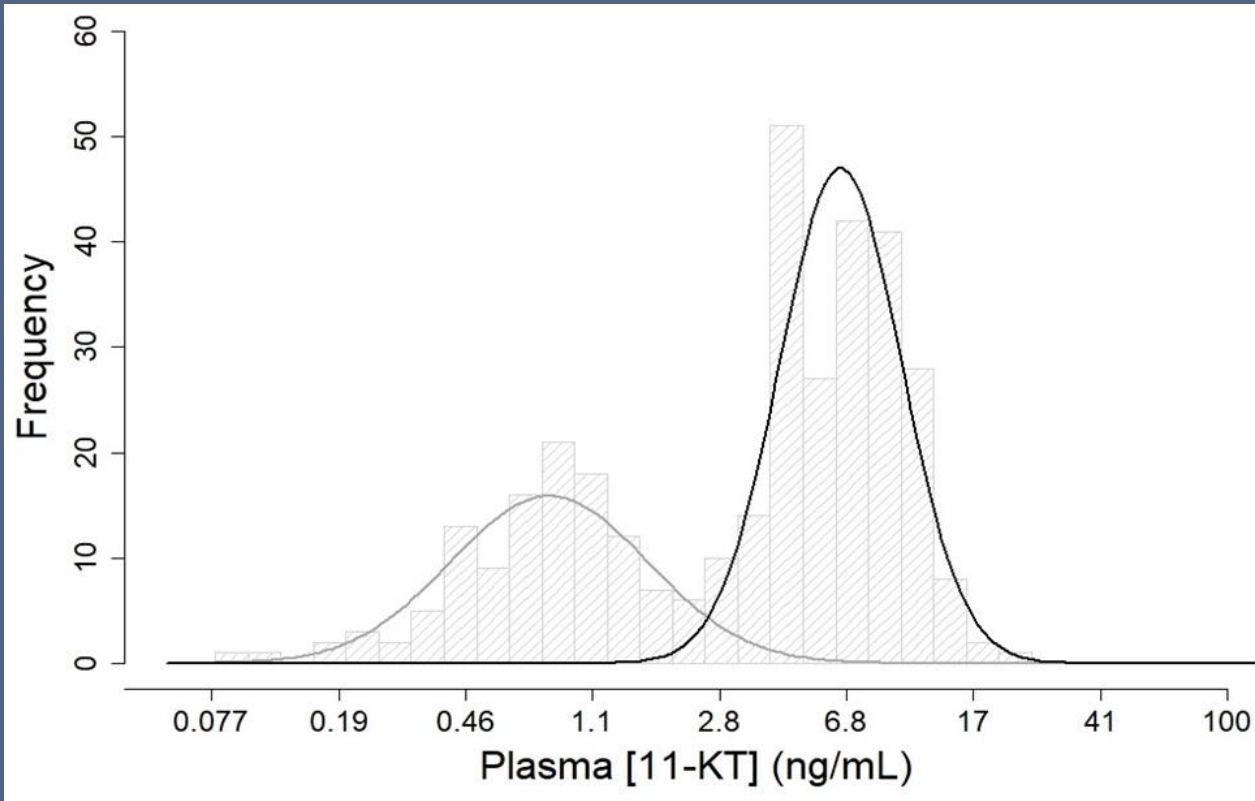


Trial 2 continuous light treatments

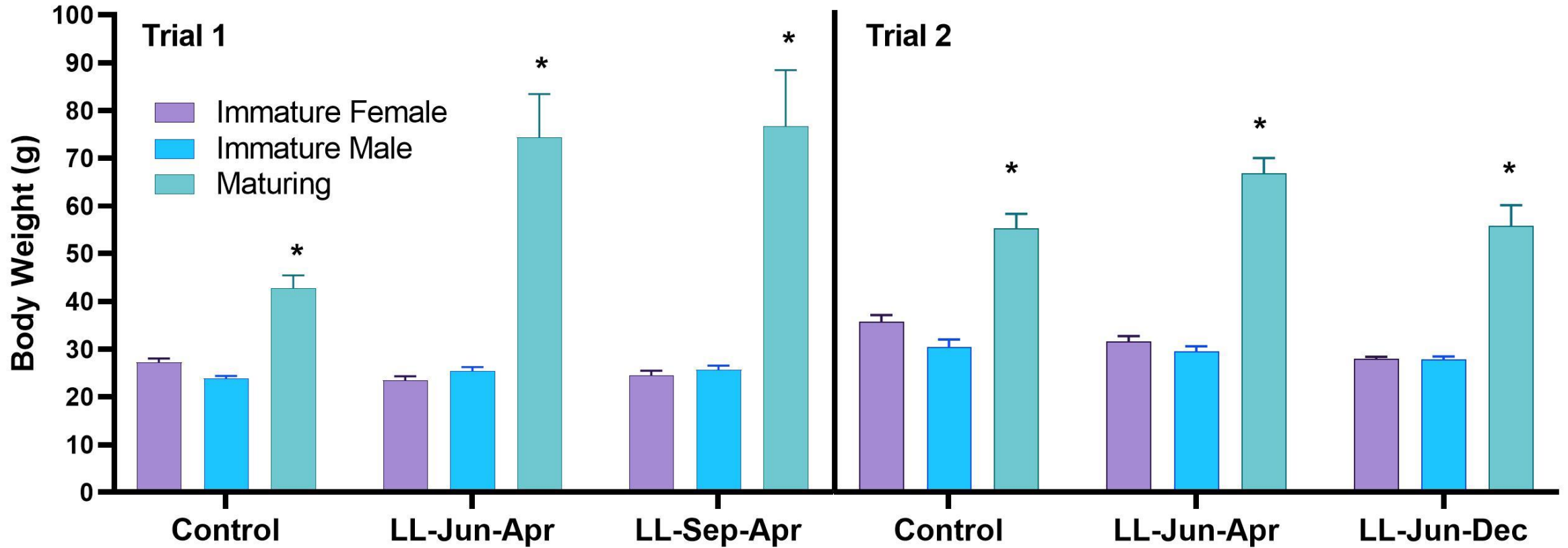


Trial 2 Results:

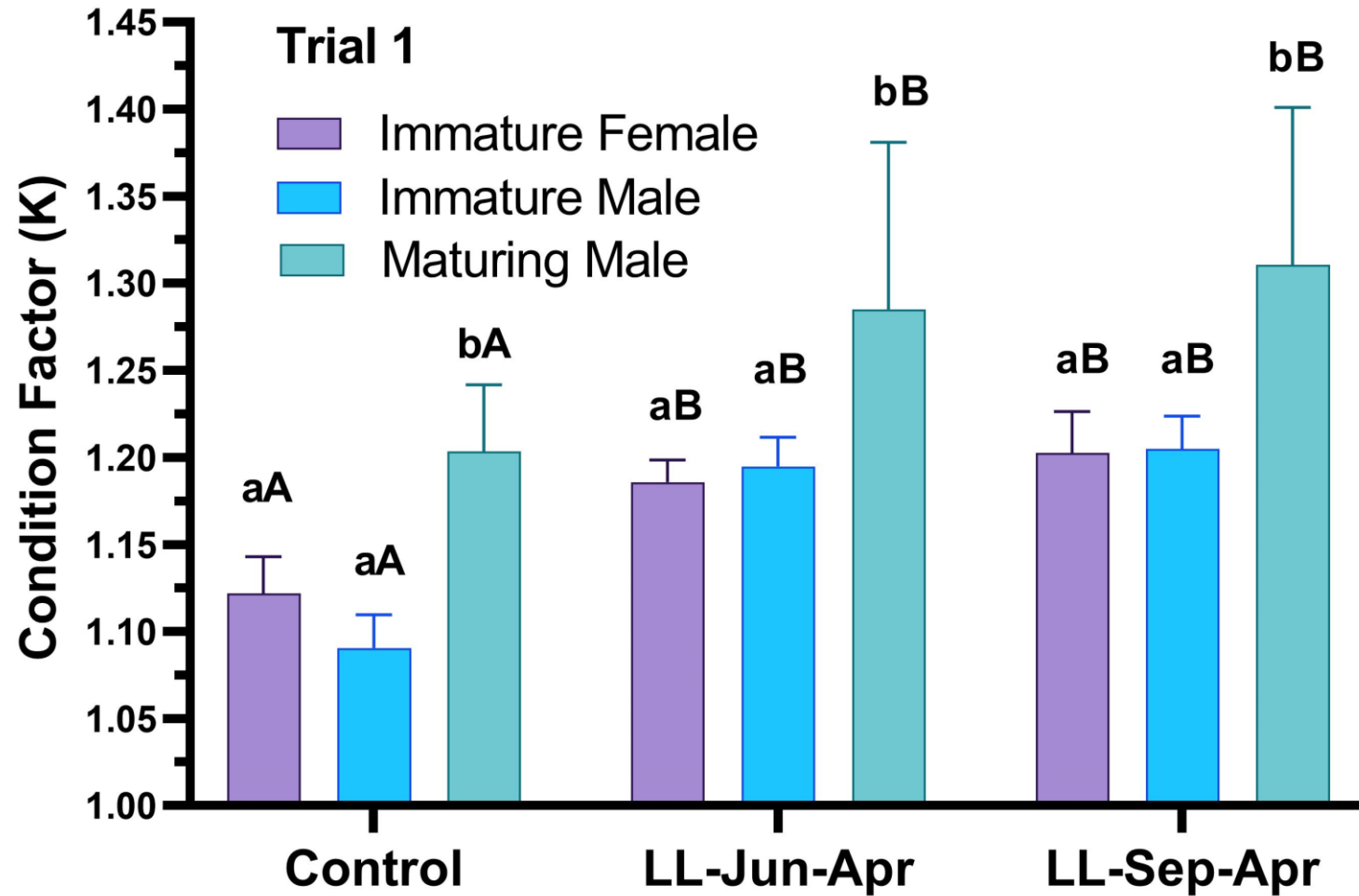
Continuous light treatments were very effective at reducing the percentage of maturing males!



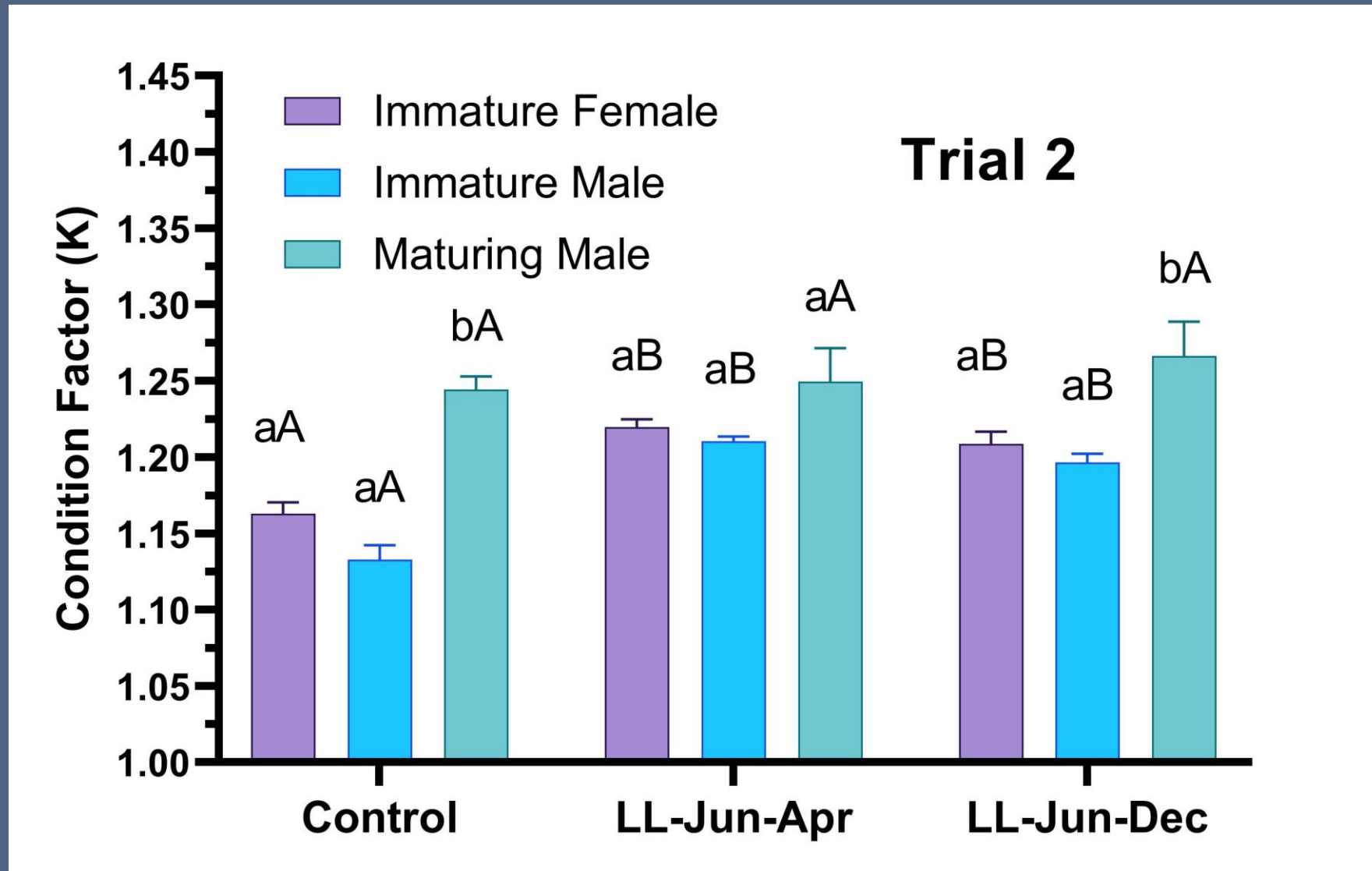
Effect of light treatment on size



Effect of light treatment on size



Effect of light treatment on size



Conclusion

- All continuous light treatments strongly reduced the number of maturing males!
- Trial 1 showed that starting in June or September is effective.
- Trial 2 showed that duration of continuous light can be decreased and end in December.
- The light treatments had little effect on weight/length in immature male and female fish.
- Research is ongoing to determine the effect of continuous light on condition factor.
- Large scale continuous light study is underway at a conservation hatchery!

Thank you!
Questions?