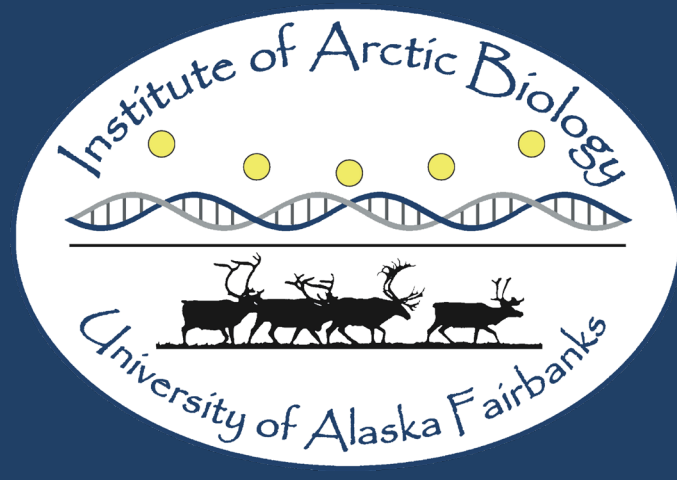


Thermal Acclimation Potential of Juvenile Alaska Chinook (*Oncorhynchus tshawytscha*)



Wagner-Jones, A. L.* , Berkelhammer, S. A., Barreiros Scatamburlo, L., Williams, E. P., Snyder, A. M., Gilbert, M. J. H.
 Department of Biology and Wildlife and Institute of Arctic Biology, University of Alaska, Fairbanks, AK, United States



*Presenting Author

BACKGROUND

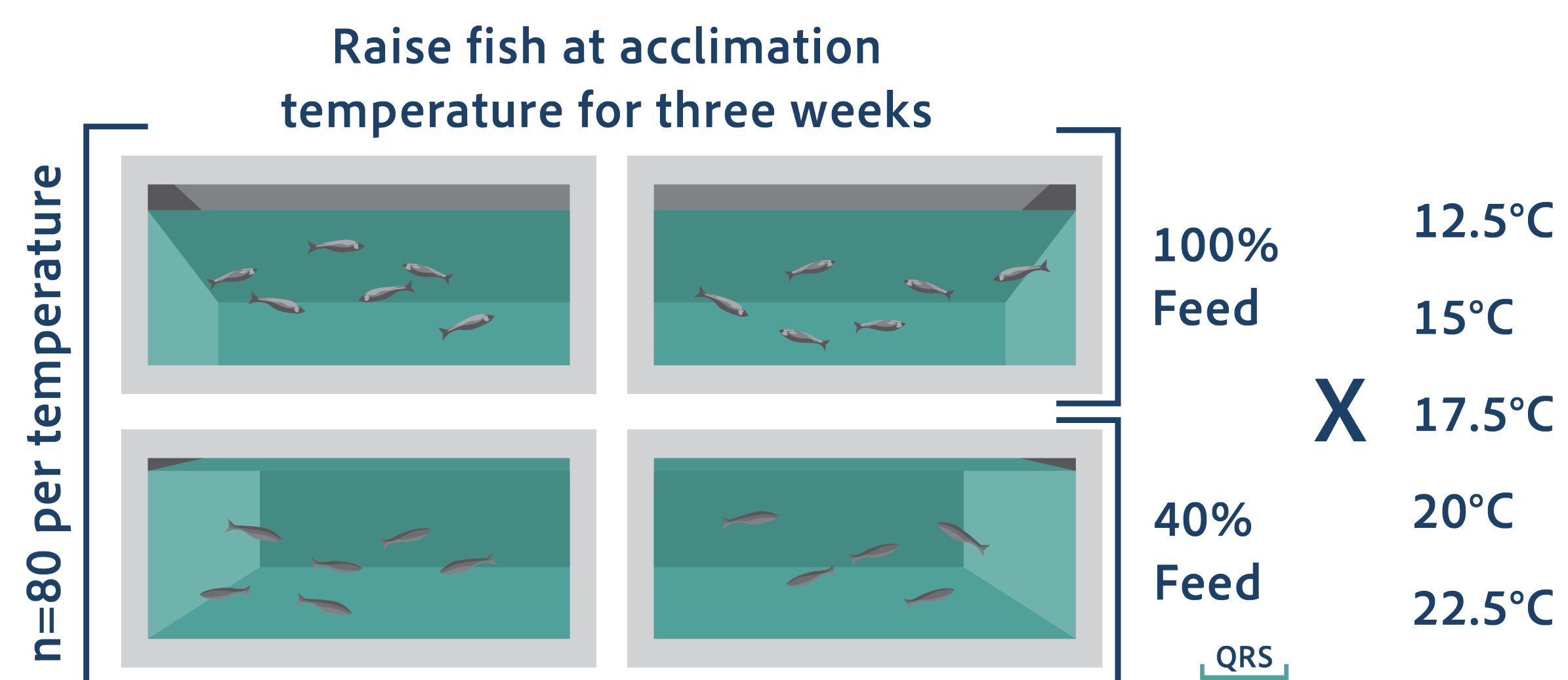
- » Northern climates are defined by extreme seasonality
- » Seasonal plasticity of cardiac function may serve to maximize performance in prevailing water temperatures across seasons
- » While seasonal plasticity of cardiac function has been explored in many northern fish species and lower latitude Chinook strains, research is lacking on northern Chinook populations

QUESTIONS

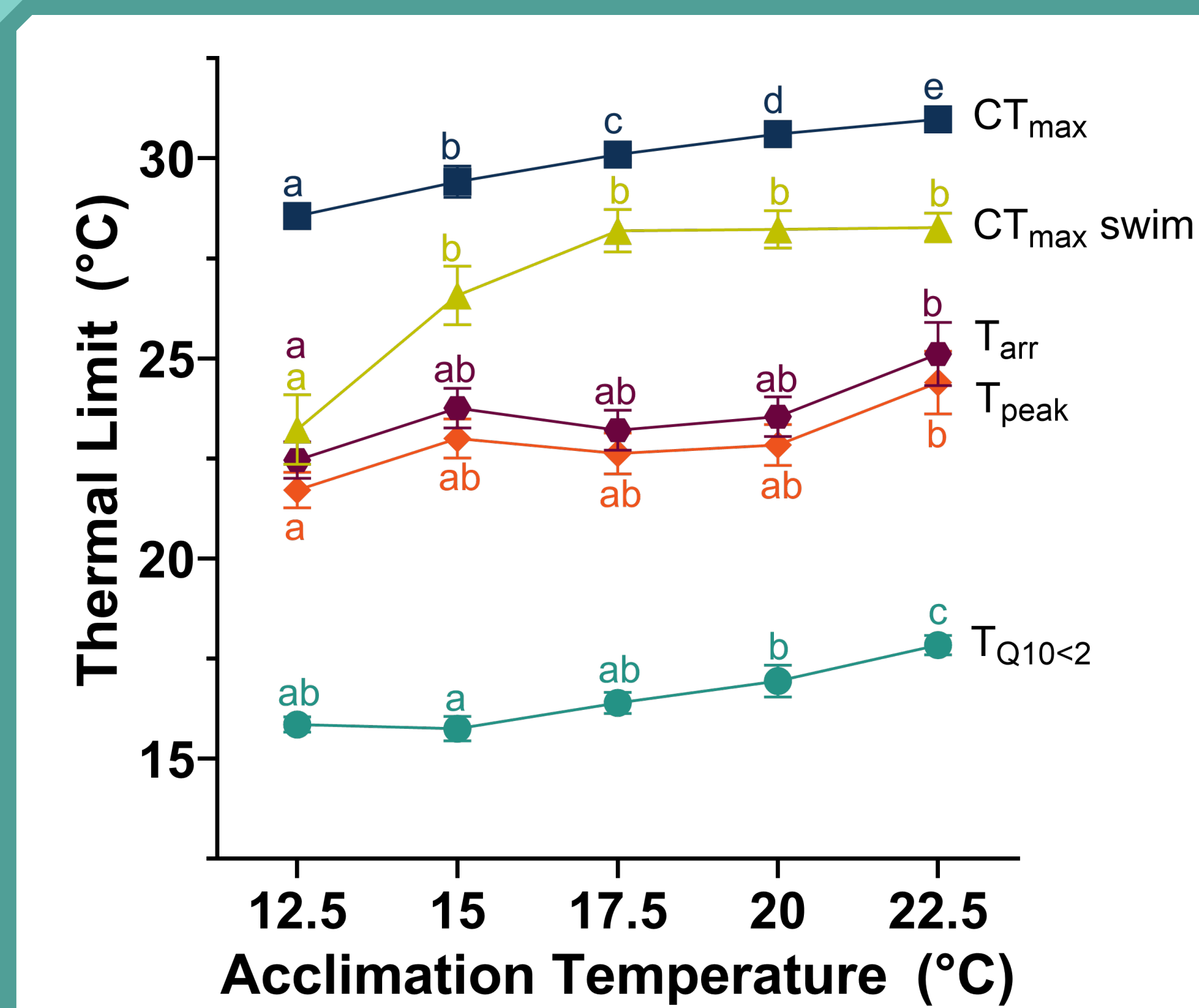
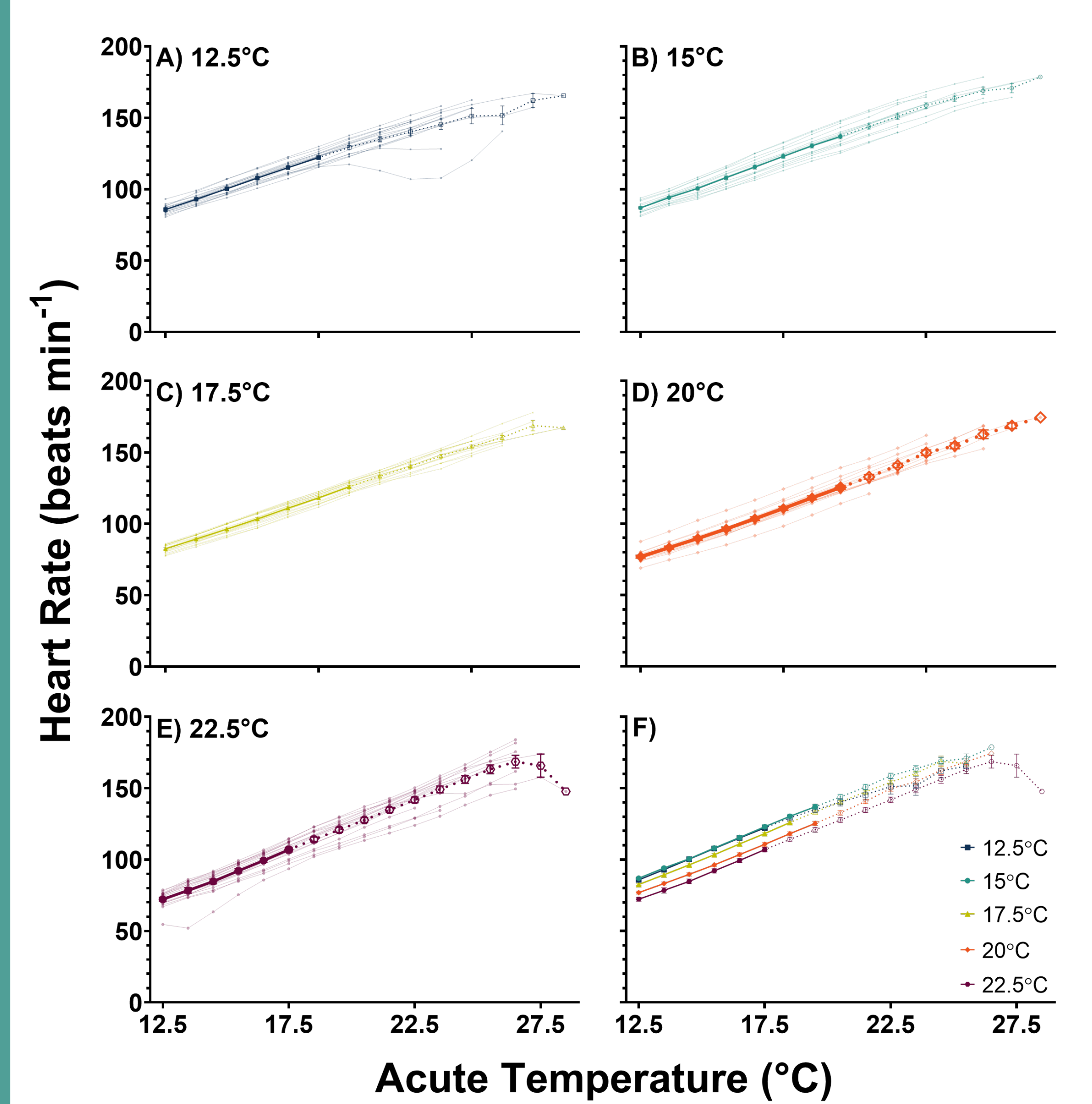
- 1) How does cardiac and whole animal physiology of juvenile Chinook respond to acute heat stress and how is this response altered with acclimation temperature?
- 2) What mechanisms underlie the thermal limits of heart function and seasonal plasticity?

METHODS

- » Yukon River strain juvenile Chinook ($10.8 \pm 2.1\text{g}$) obtained from Ruth Burnett Sport Fish Hatchery (Fairbanks, AK)



- » Fish anesthetized and fitted with subdermal electrodes
- » Injected with atropine (inhibits cholinergic tone) to induce maximum heart rate (fH_{max}) and isoproterenol (stimulates adrenergic tone)
- » Fish acutely warmed until arrhythmia at $10^\circ\text{C}/\text{hour}$



RESULTS

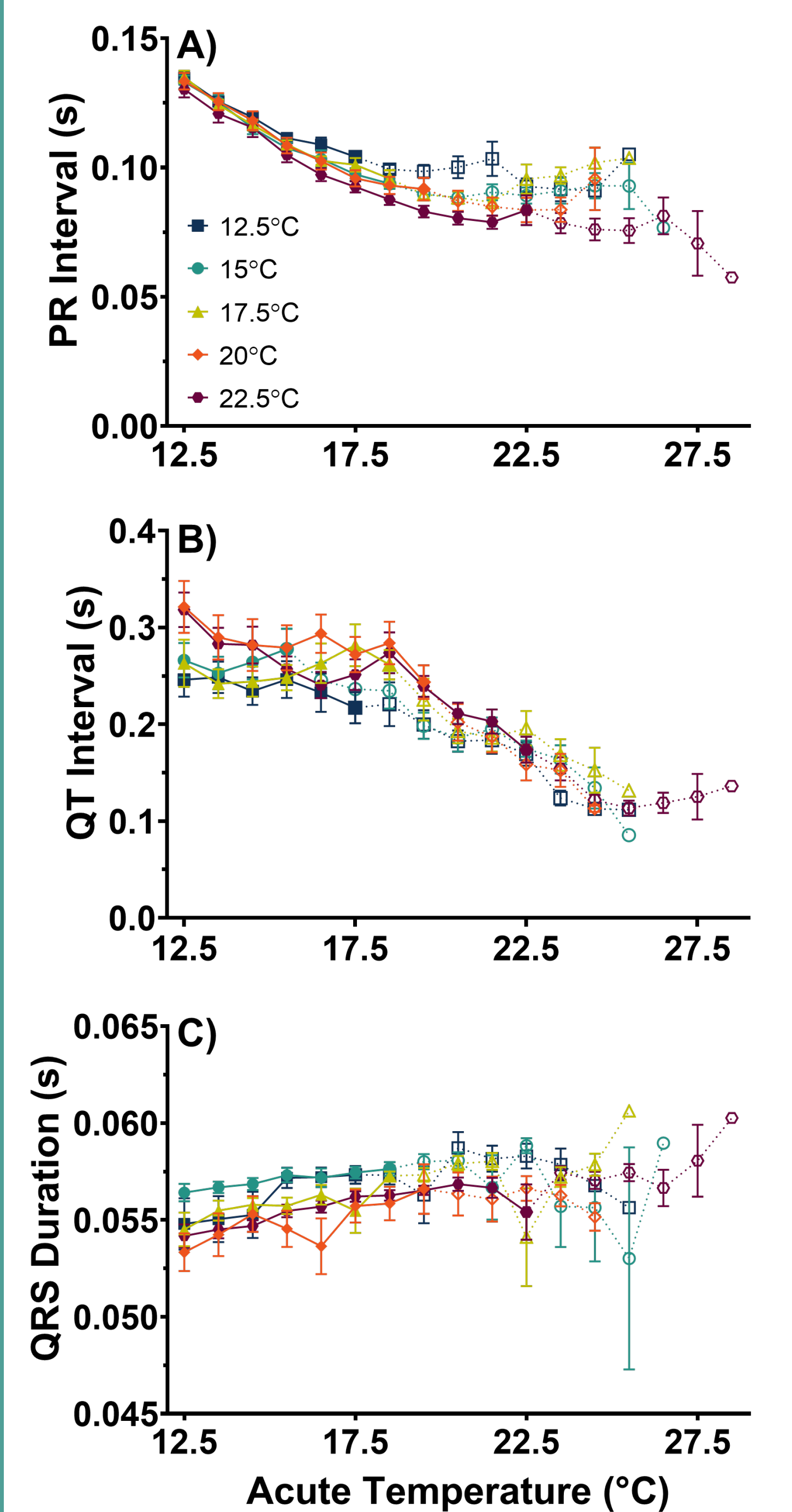
Juvenile Chinook show marked resetting of heart rate with warm acclimation

Acclimation temperature has a significant effect on heart function, particularly contraction and repolarization duration, but not on impulse transmission duration

Cardiac and whole organism heat tolerance increased with warm acclimation but was limited under exercise

Open symbols indicate arrhythmic individuals have been removed
 Letters indicate significant acclimatory difference

T_{peak} : Temperature at peak heart rate
 T_{arr} : Temperature at arrhythmia
 $T_{Q10<2}$: Temperature at which Q_{10} falls and stays below 2.0
 CT_{max} : Critical thermal maxima
 $CT_{max\ swim}$: Critical thermal maxima under exercise



PR interval: the impulse transmission time of depolarization from the atria to ventricle
 QT interval: the time from depolarization to repolarization of the ventricle
 QRS interval: time for ventricle depolarization

NEXT STEPS

- » Cardiac and metabolic enzyme activity assays

CONCLUSIONS

- 1) Cardiac and whole animal thermal tolerance increases at ecologically relevant temperatures with acclimation temperature, allowing for normal heart function to be maintained longer under acute heat stress
- 2) Cardiac function at high temperatures appears to be limited at thermal extremes by impulse transmission

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