

How does climate change affect sperm quality in Pacific salmon?



Justin Benjamin, Dr. Ken Jeffries
Department of Biological Sciences, University of Manitoba

Background

- Pacific salmon are ecologically, economically, and culturally important.
- Semelparous life history = single migration and reproductive event during lifetime.
- Climate stressors are energetically costly and have major effects on salmon physiology.
- Decreased energy and sex-hormone levels might affect quality of sperm.

Methods

- **Experimental design:** Controls and experiments of three environmental stressors – temperature, oxygen saturation, and pH levels.
- **Sperm analyses:** Computer assisted sperm analysis (CASA), microscope, and ImageJ programs to measure:

1. Sperm count (millions/mL)
 2. Sperm morphology (length, width)
 3. Sperm swimming speed/motility ($\mu\text{m/s}$)
- Statistical analyses in R programming.



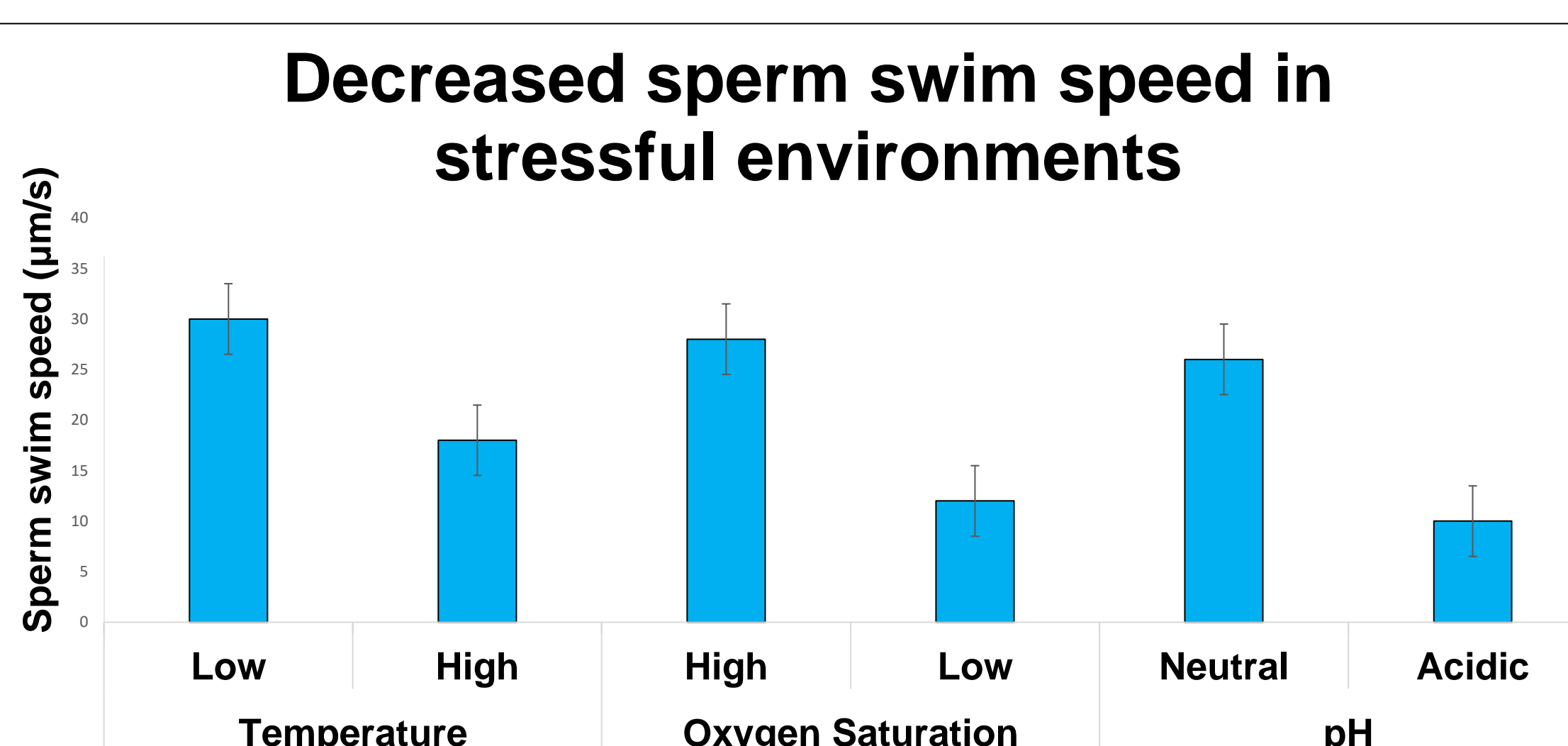
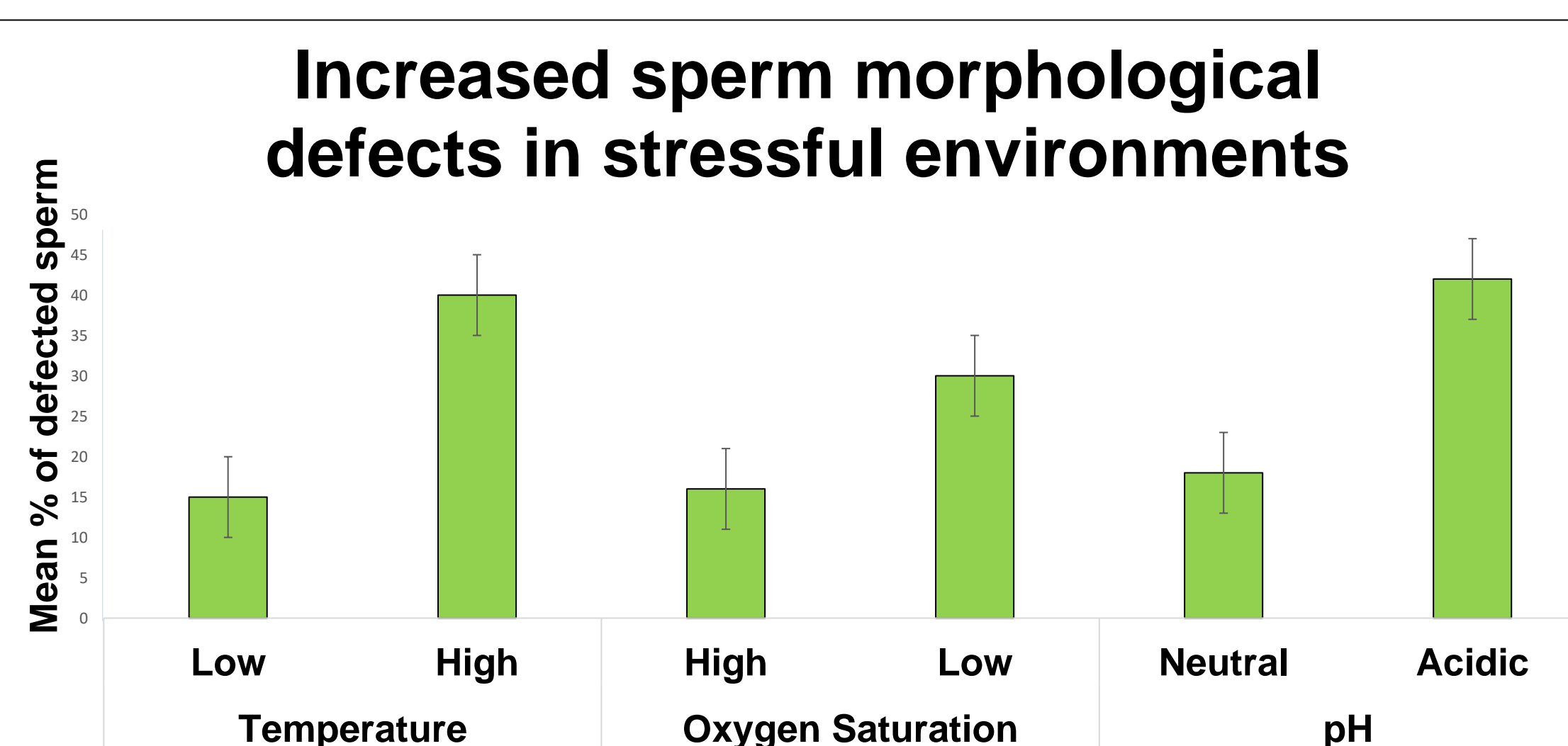
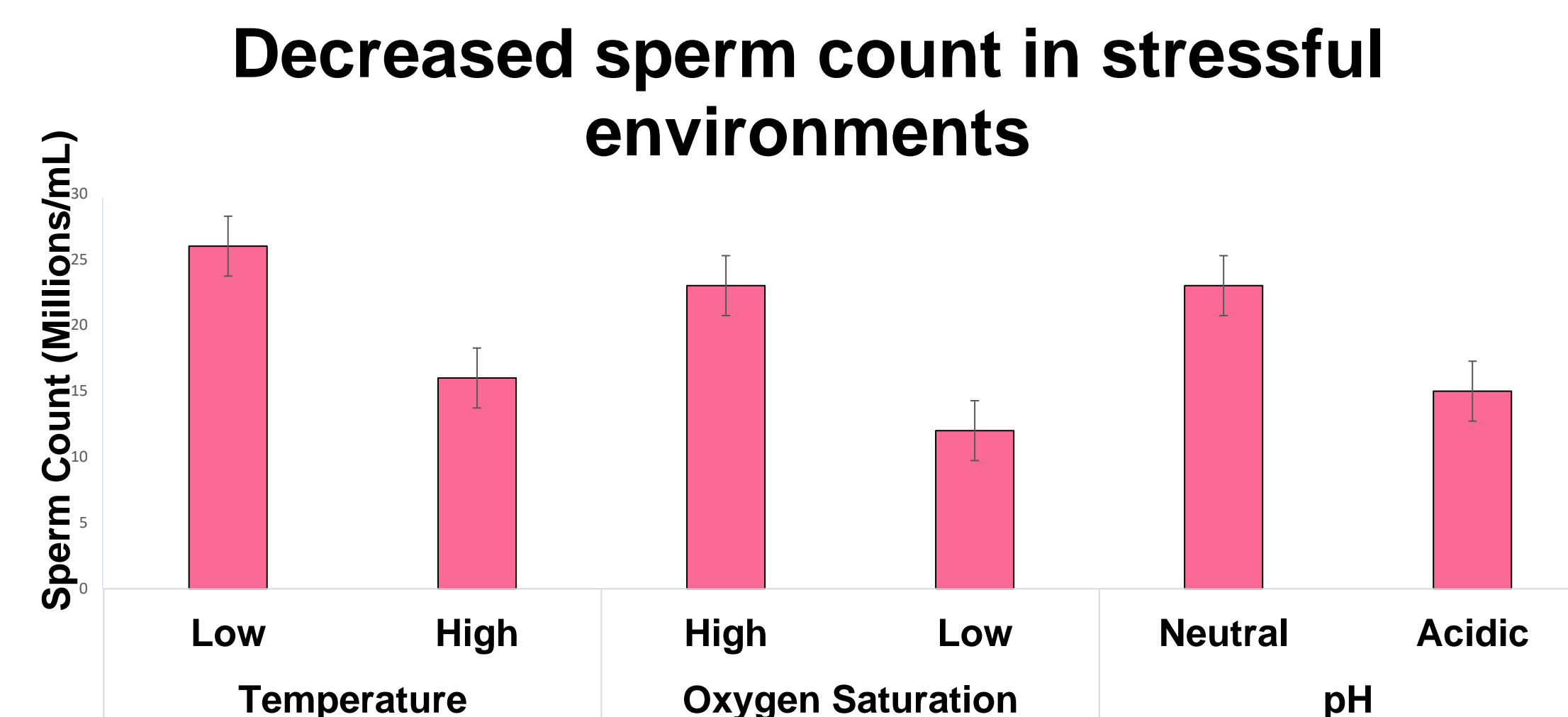
Objective

- How is sperm quality affected by different environmental stressors and to what extent?

Hypothesis

- **Hypothesis:** Environmental stressors decrease sperm quality.
- **Predictions:** Salmon in stressful conditions will have lower sperm counts, decreased sperm swimming speed/motility, and increased sperm morphological defects.

Expected results



Discussion

- Decreased sperm quality reduces likelihood of successful fertilizations.
- Semelparous life history makes single reproduction very important in maintaining population sizes.
- Stable salmon populations necessary for ecological dynamics, fishing and tourism industries, and cultural practices.



- **Future directions:** Explore different experiment durations and the physiological mechanisms behind decreased sperm quality.
- A broader understanding of salmon physiology in a changing world will help guide conservation efforts.

Acknowledgements and references

- Thank you Dr. Ken Jeffries for advising this project and Dr. Jane Waterman for mentoring us throughout this course.
- Special shoutout to my classmates for being a great team to work with.

1. <https://www.cryogenetics.com/species-index/sockeye-salmon/>
 2. <https://www.medicoverfertility.in/blog/what-is-semen-analysis-test,10,n,5475>
 3. <https://spiritsofthewestcoast.com/collections/the-salmon-symbol>
 4. <https://frontline.thehindu.com/environment/conservation/brown-bear-red-salmon/article8300131.ece>
 • benjaminij@myumanitoba.ca