

# Phenological mismatch reduces survival in wild steelhead trout population

*Samantha Wilson\*, Thomas Buehrens, Jennifer Fisher, and Jonathan Moore*

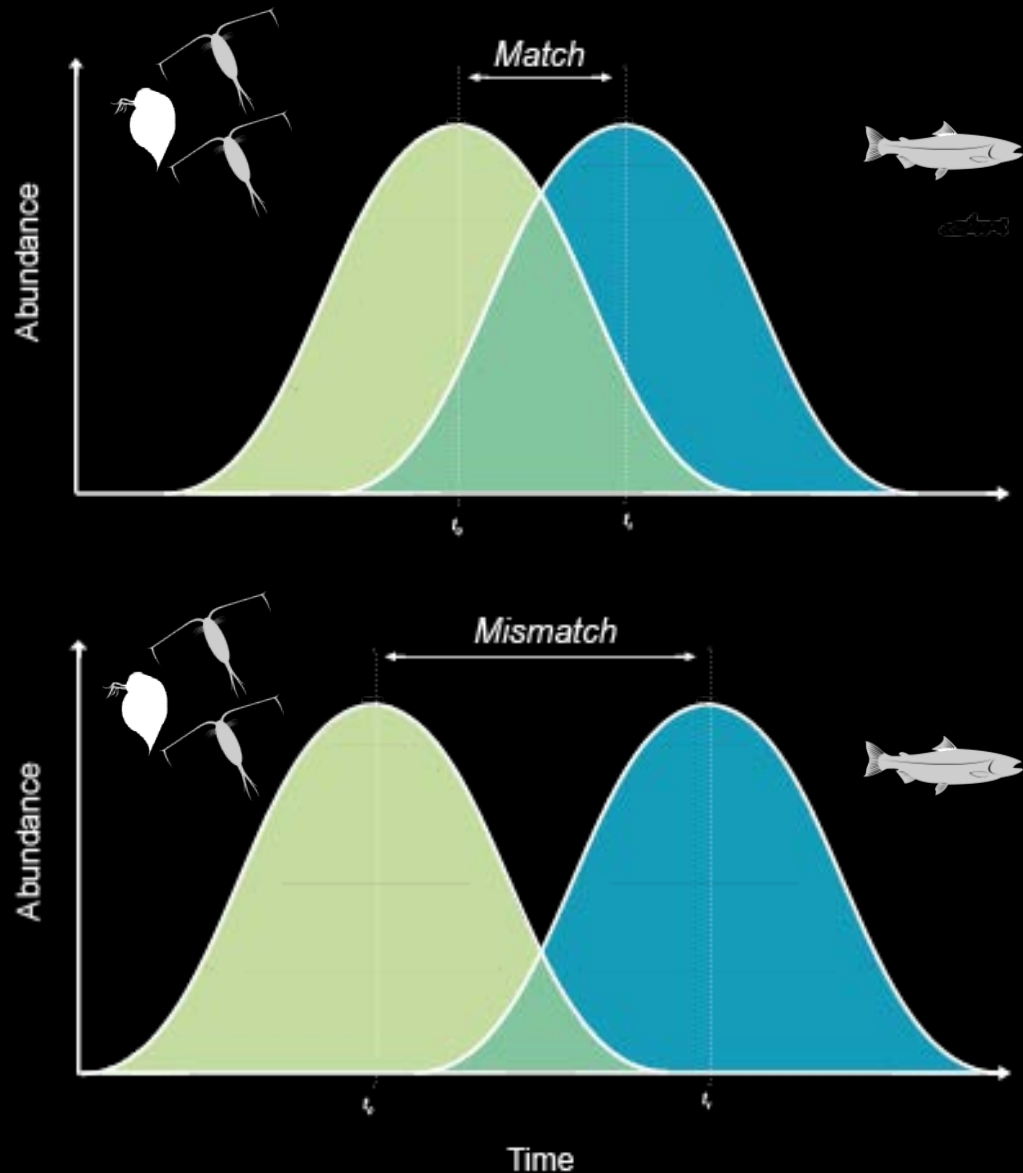




The first few months in the ocean is critical. Why?



# Match- Mismatch Hypothesis

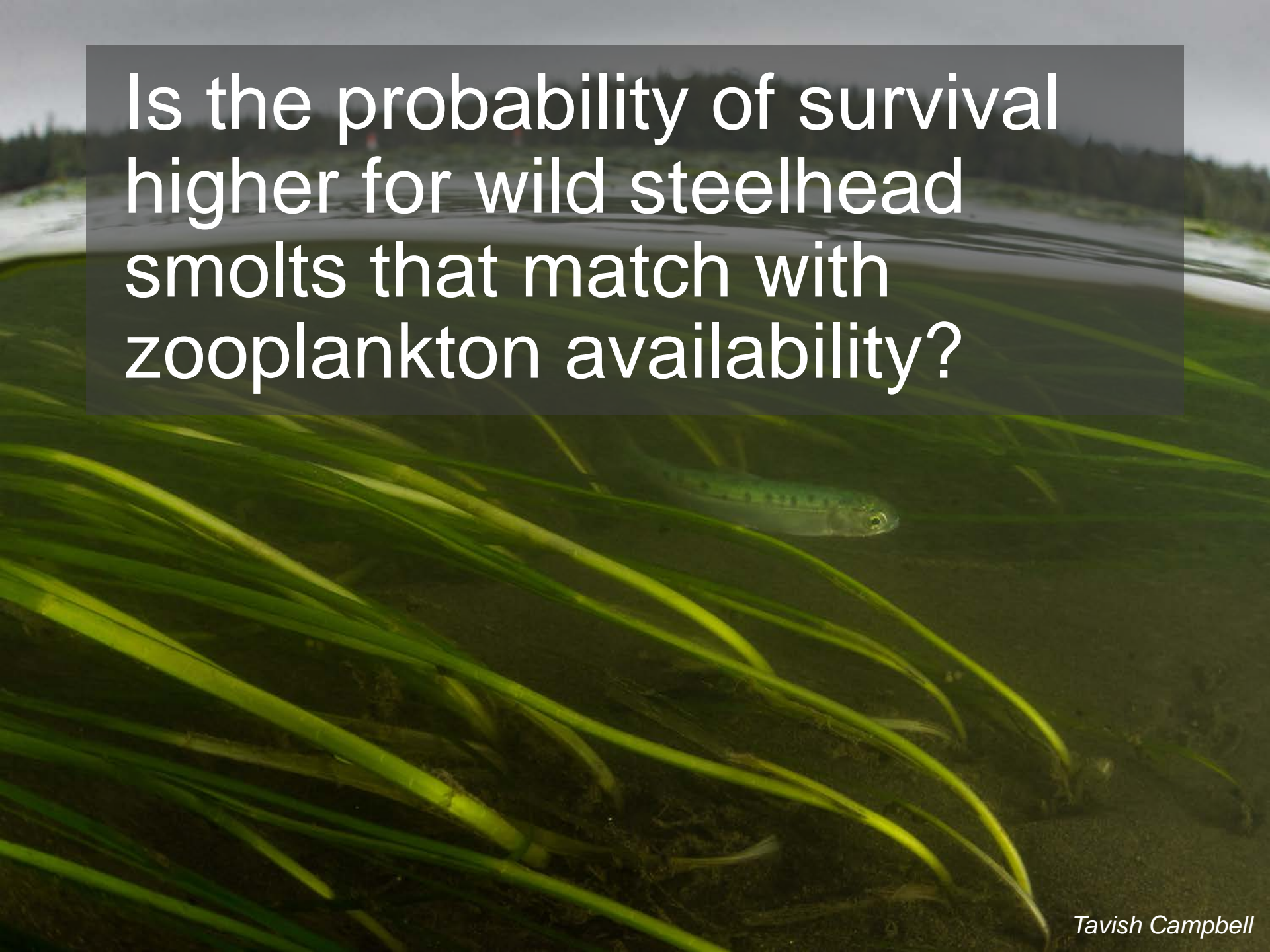


# Critical Size, Critical Time

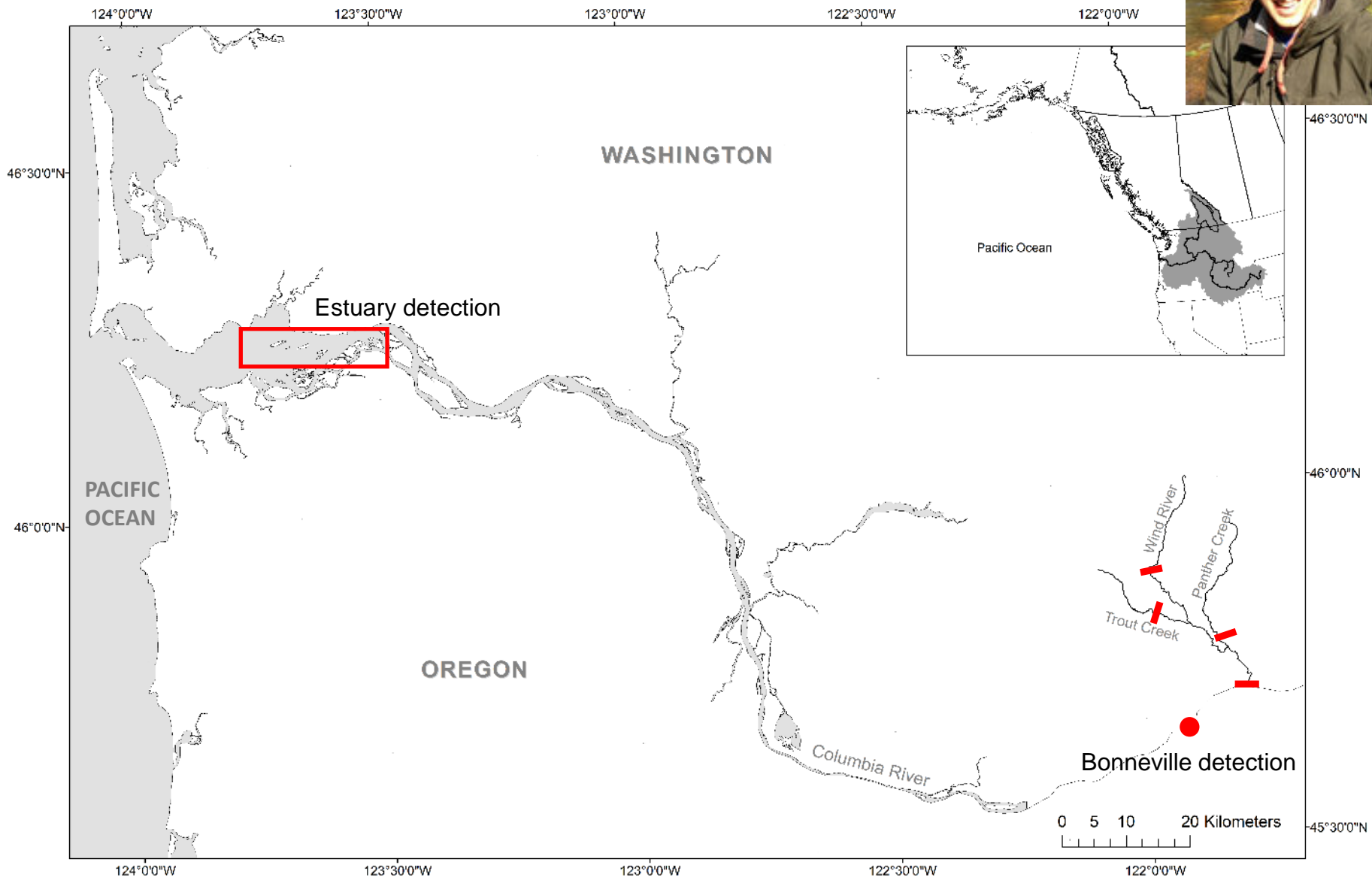
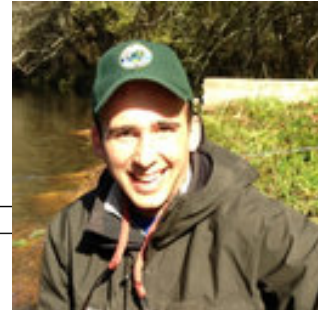
Fish grow faster when they enter the estuary during peak food availability

Larger and faster growing fish have higher survival

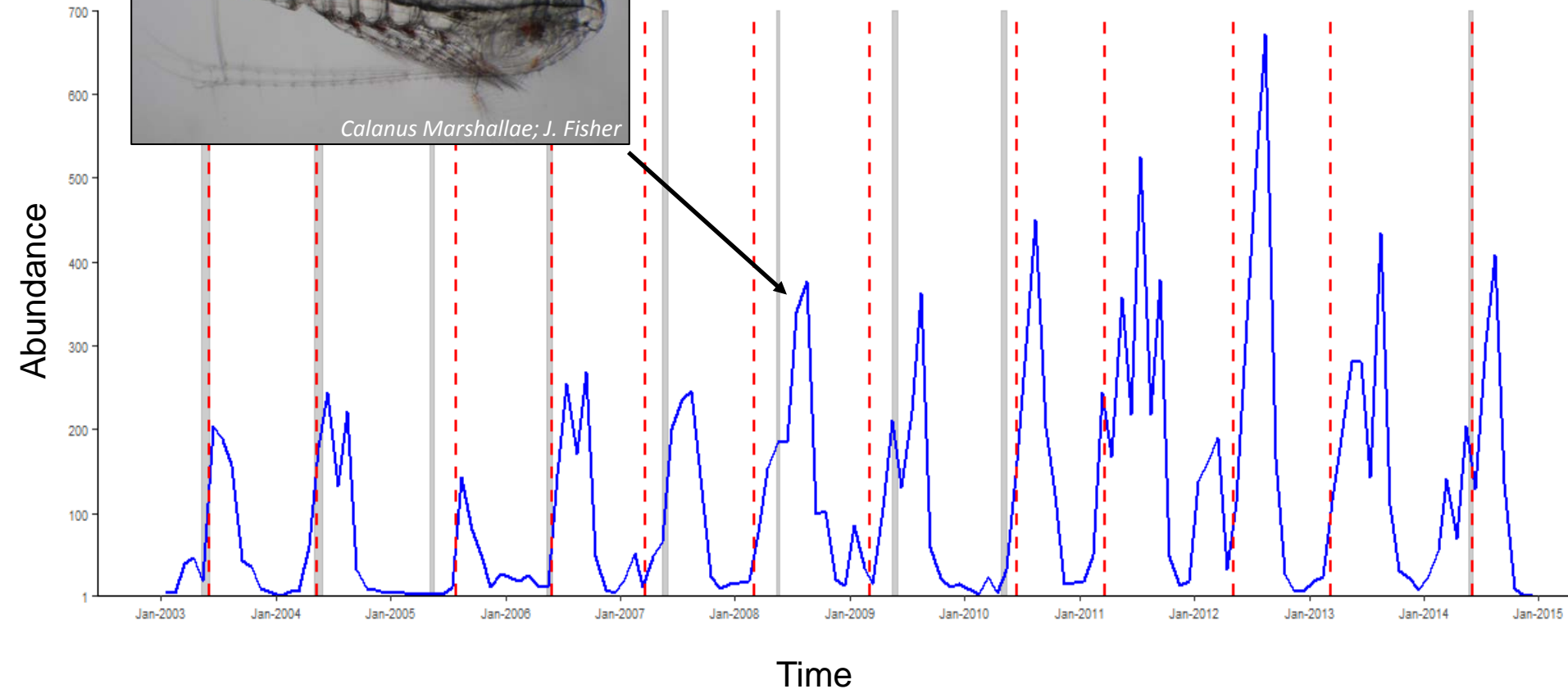
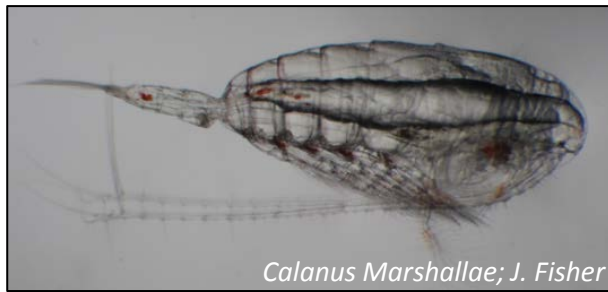


A steelhead smolt is swimming in a stream, partially obscured by green reeds in the foreground. The background shows a riverbank with trees and a cloudy sky. A semi-transparent dark grey box is overlaid on the top half of the image, containing white text.

Is the probability of survival higher for wild steelhead smolts that match with zooplankton availability?

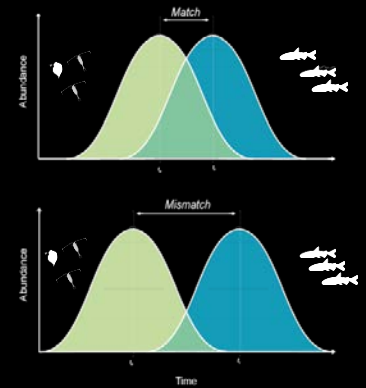
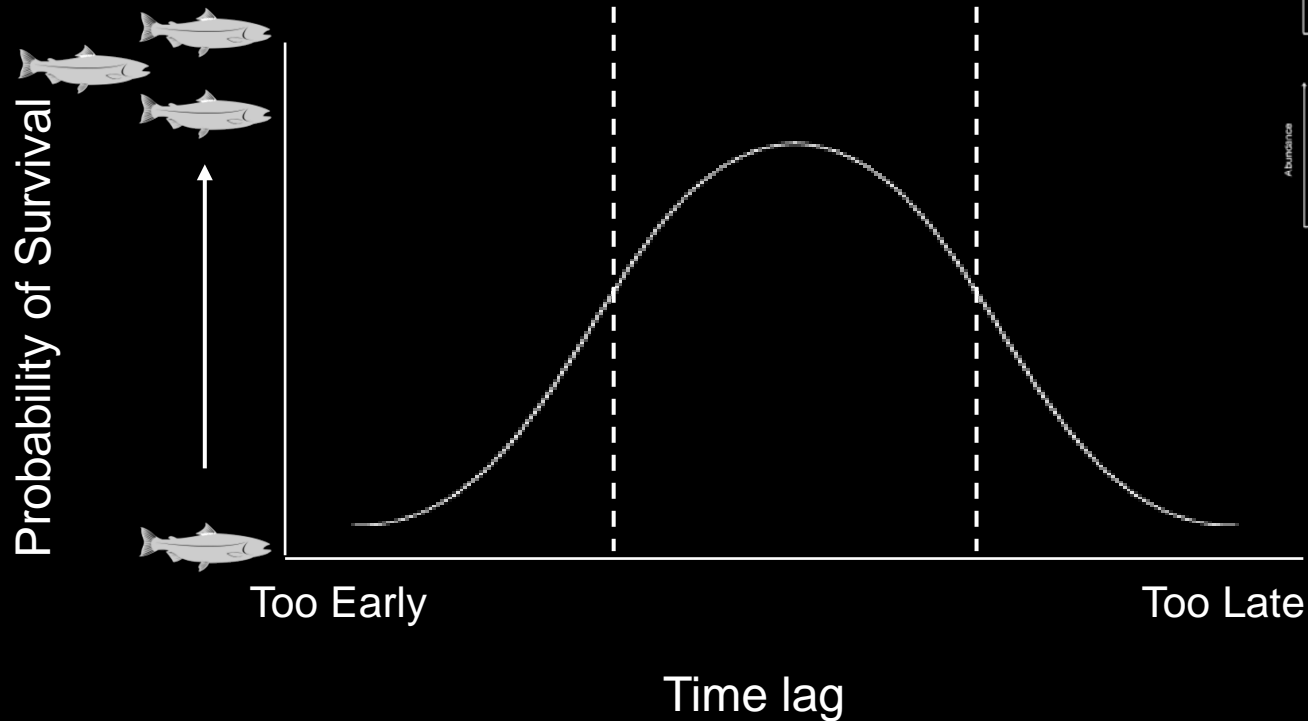


# Timing, duration and size of the zooplankton bloom varies



Is the probability of survival higher for steelhead smolts that enter the estuary during peak food availability?

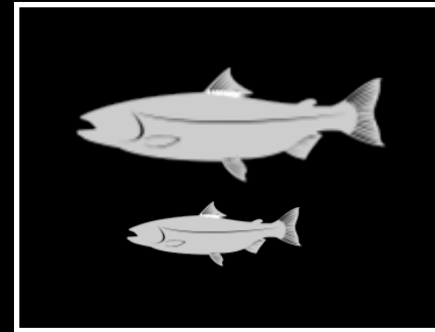
## *Predictions*



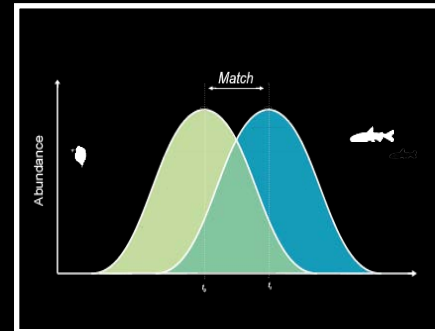


# Hypotheses

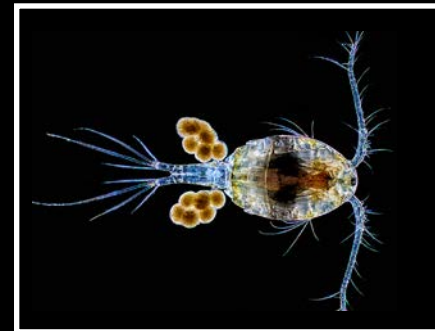
Size



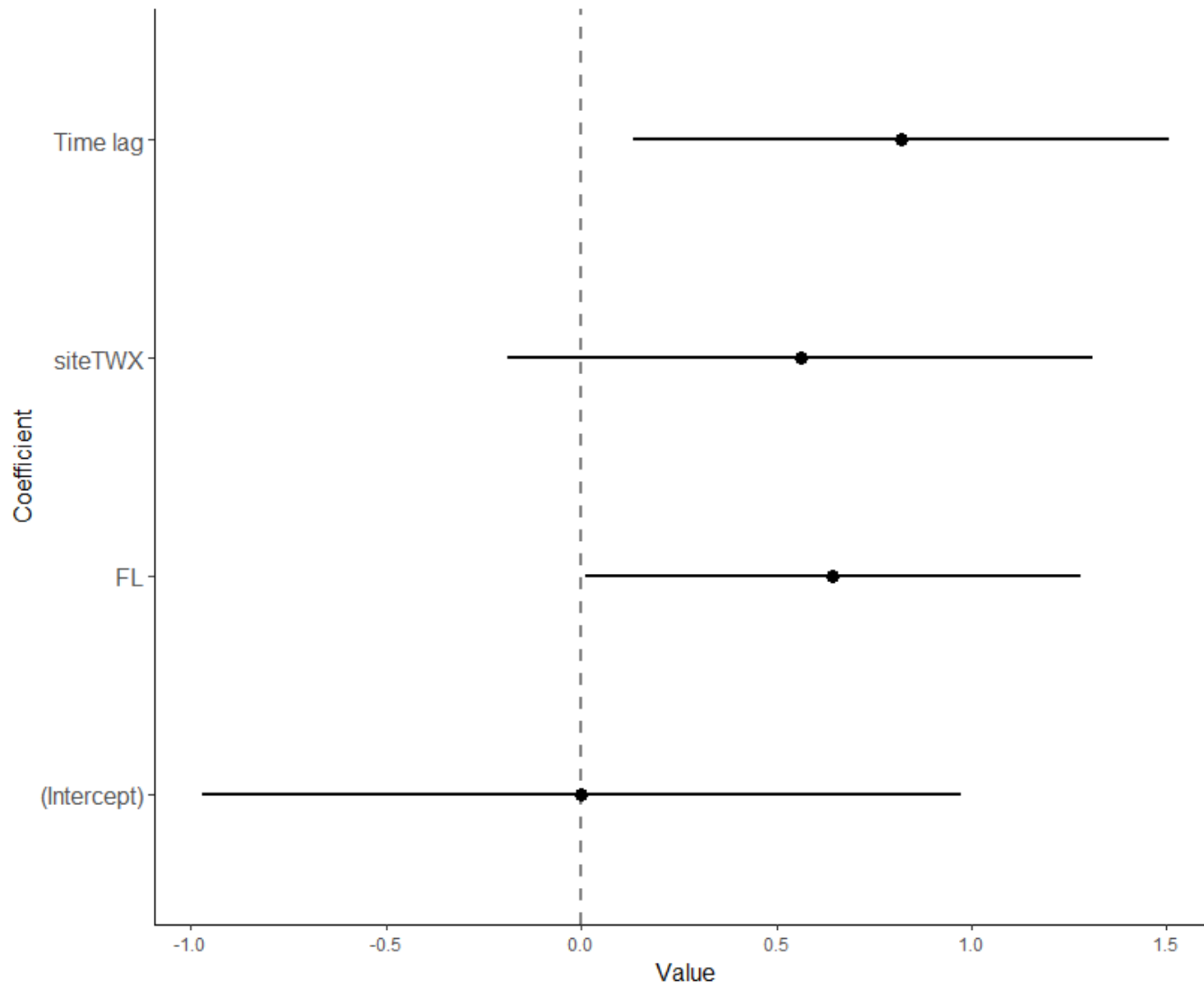
Time Lag

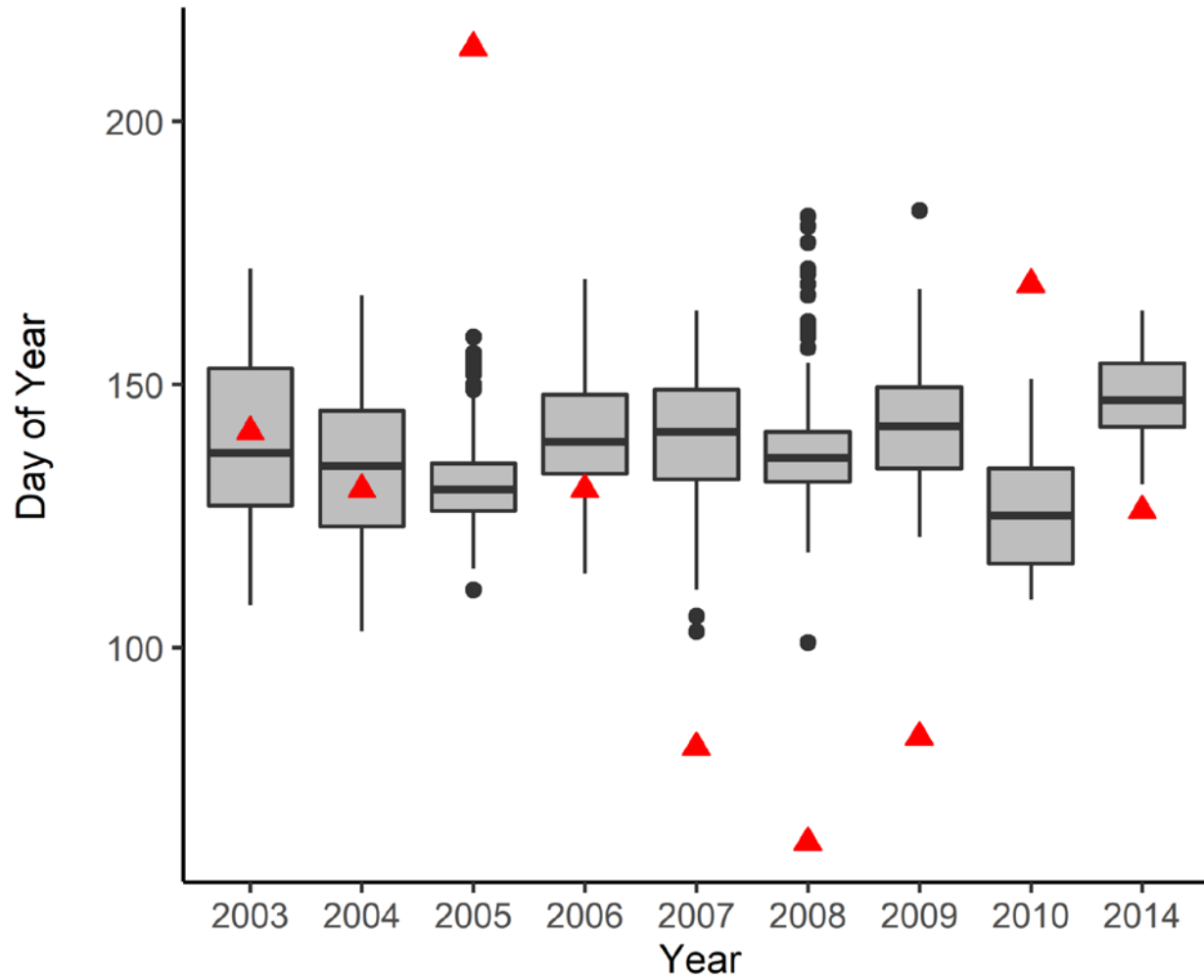
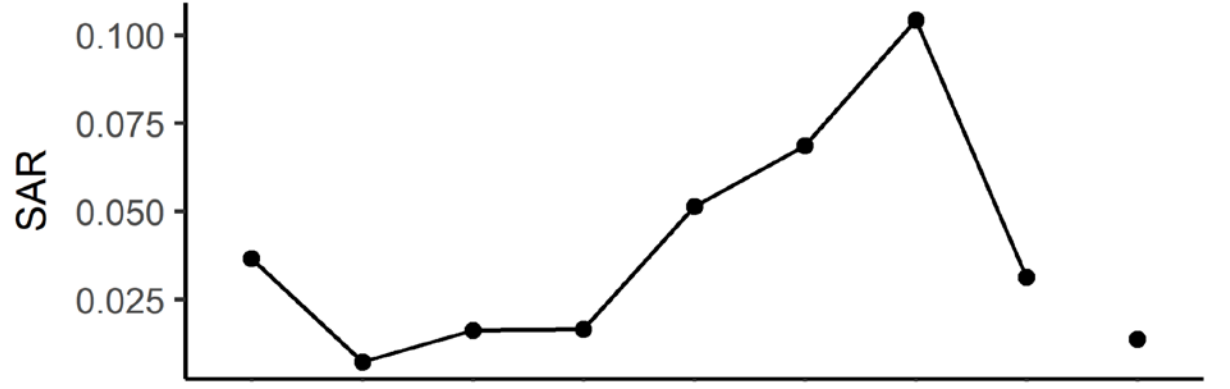


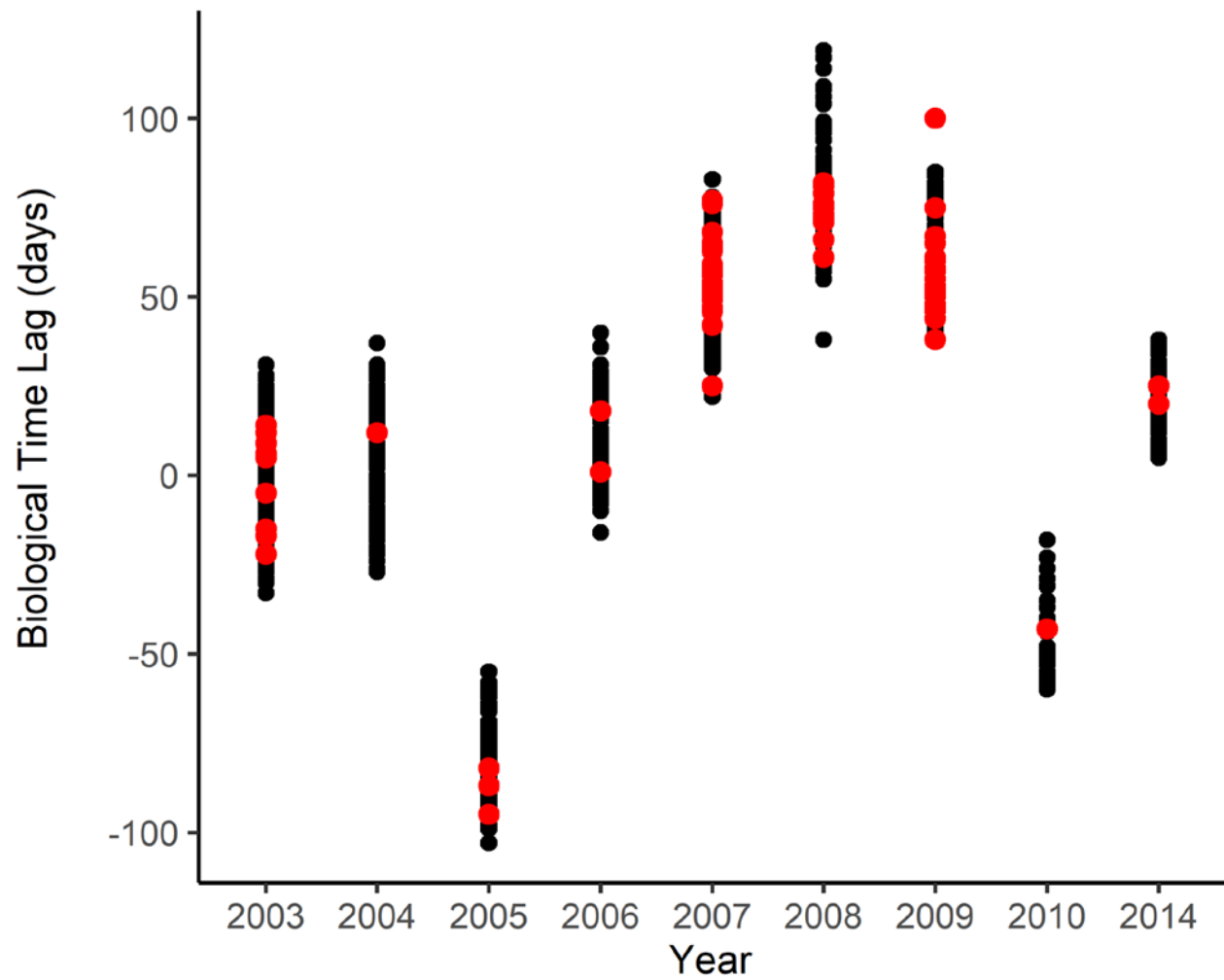
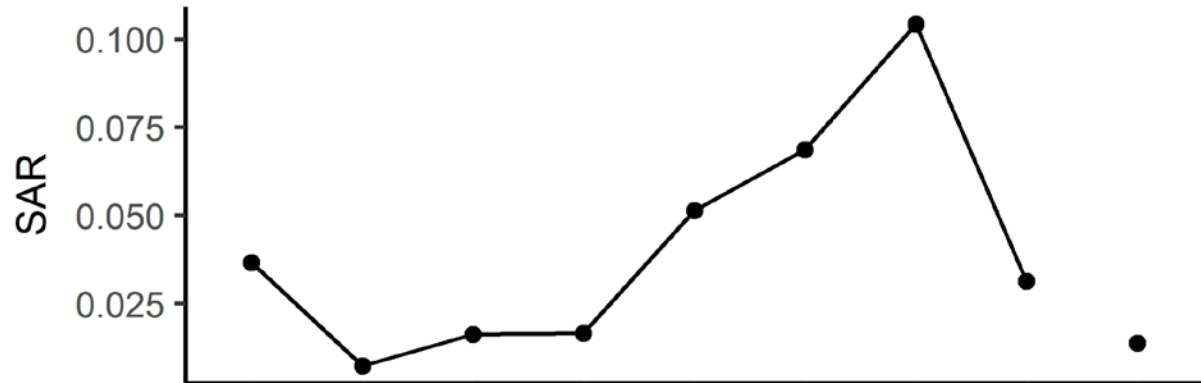
Zooplankton  
Abundance



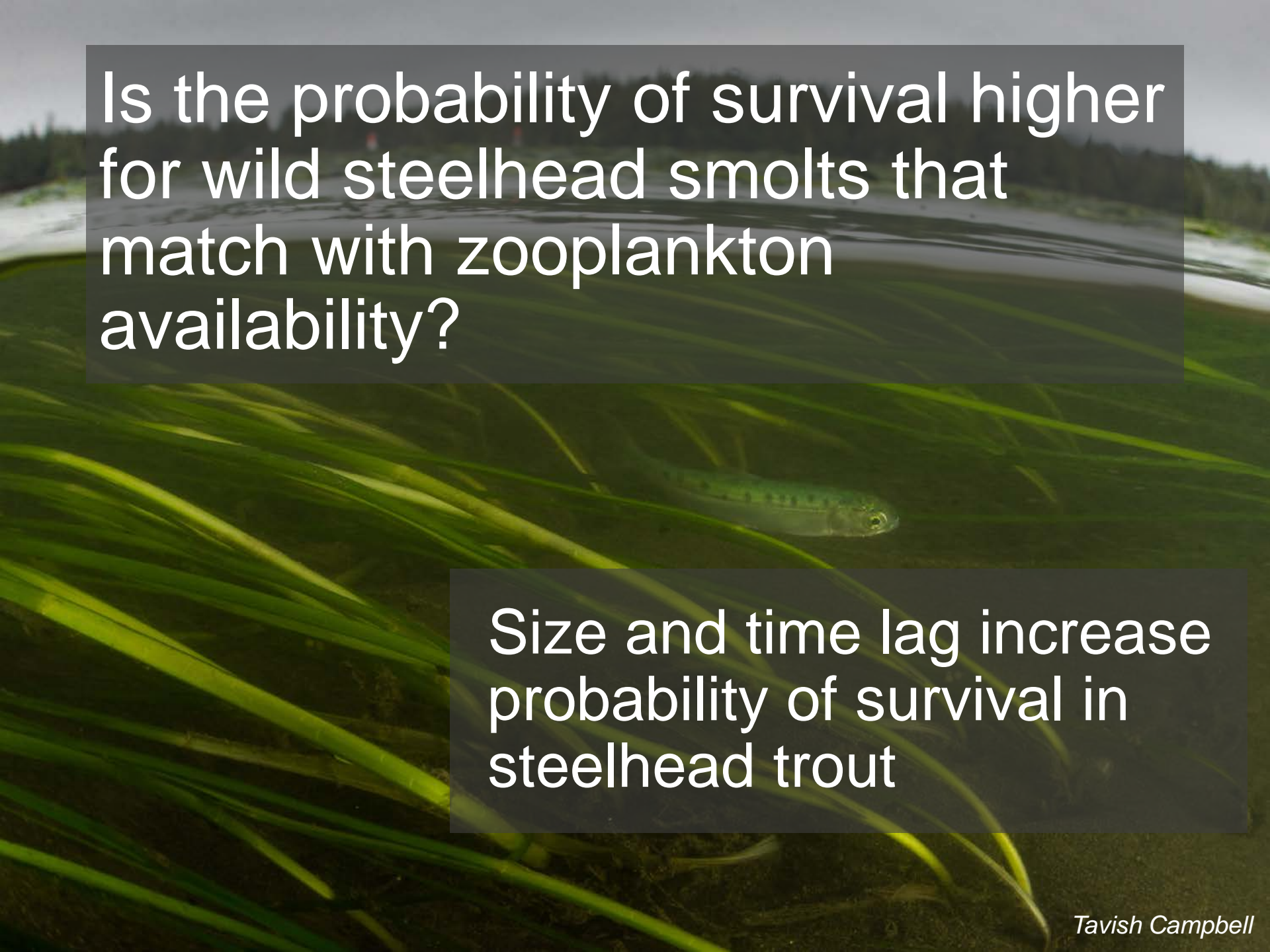
# Survival ~ FL + time lag + site







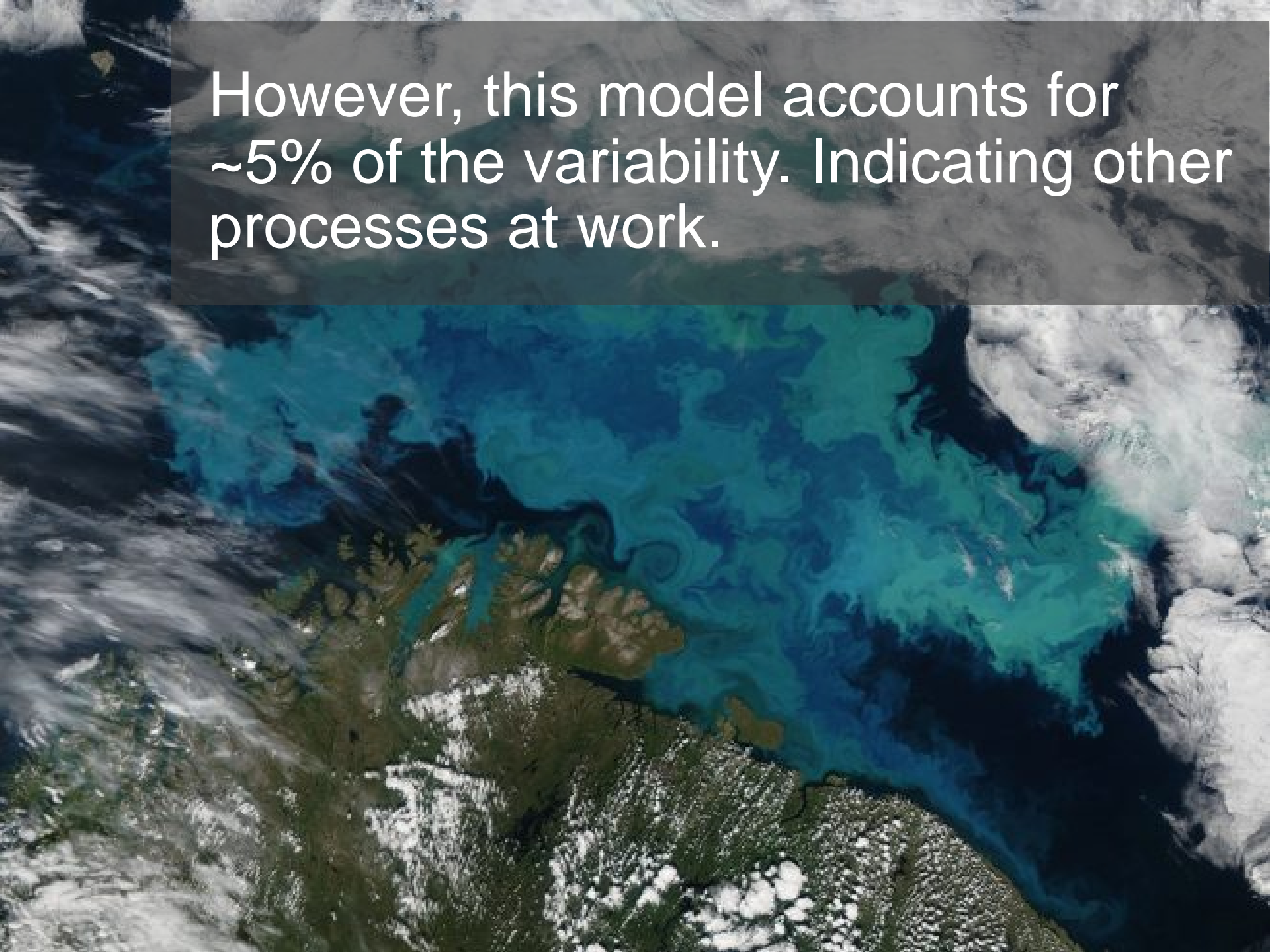


A steelhead trout is swimming in a stream. The foreground is filled with long, green reeds that are slightly out of focus. The water is clear, and the background shows a forested shoreline under a grey, overcast sky. The text is overlaid on a semi-transparent dark grey box in the upper left quadrant.

Is the probability of survival higher for wild steelhead smolts that match with zooplankton availability?

Size and time lag increase probability of survival in steelhead trout

However, this model accounts for ~5% of the variability. Indicating other processes at work.

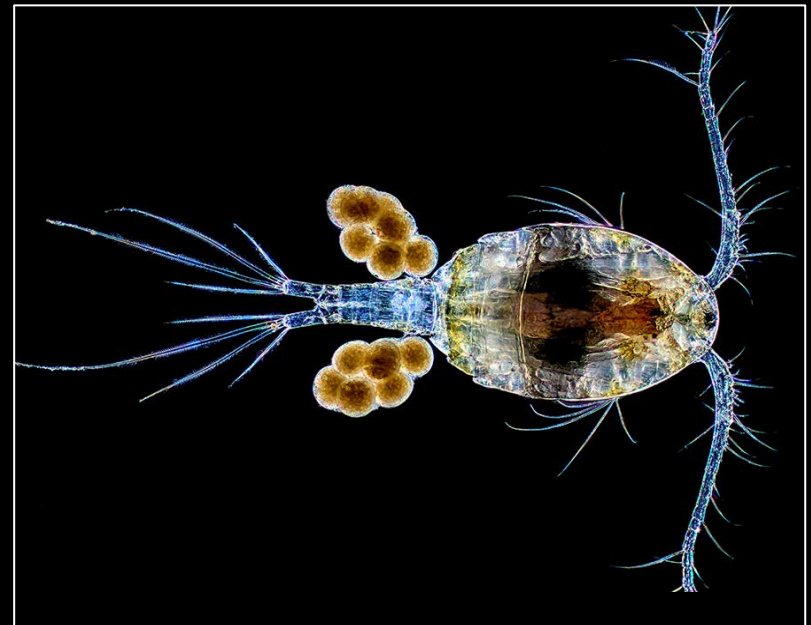


# Early Marine Survival

Predators



Prey



# Thank You!

Thomas Buehrens (WDFW)\*

Patrick Cockran (WDFW)

Jennifer Fisher (NOAA)\*

Ian Perry (DFO)

Susan Allen (UBC)



American Fisheries Society

WASHINGTON - BRITISH  
COLUMBIA CHAPTER



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LIBER  ERO



# Thank You!

Contact me at:  
[swa130@sfu.ca](mailto:swa130@sfu.ca)



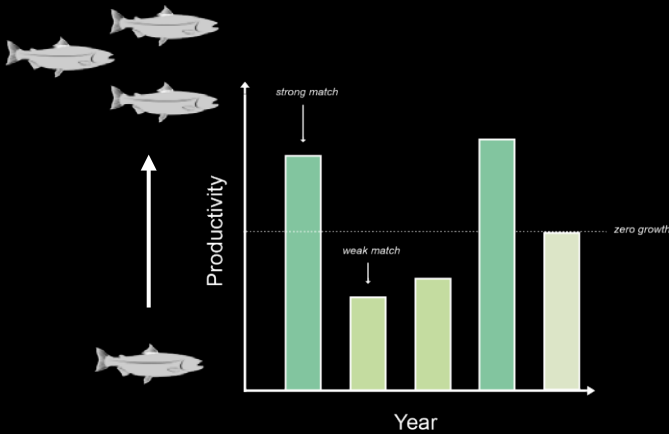
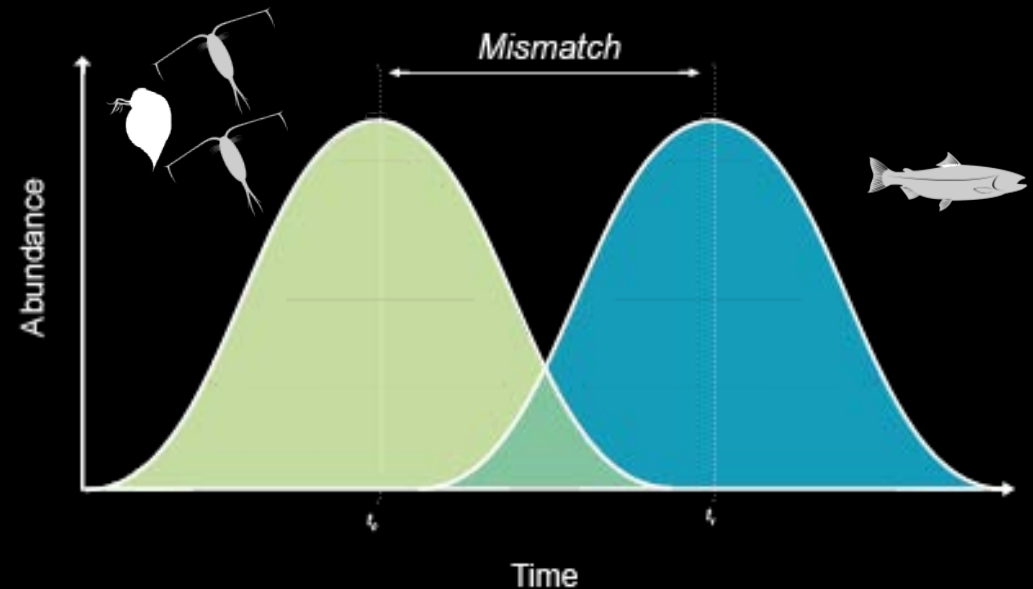
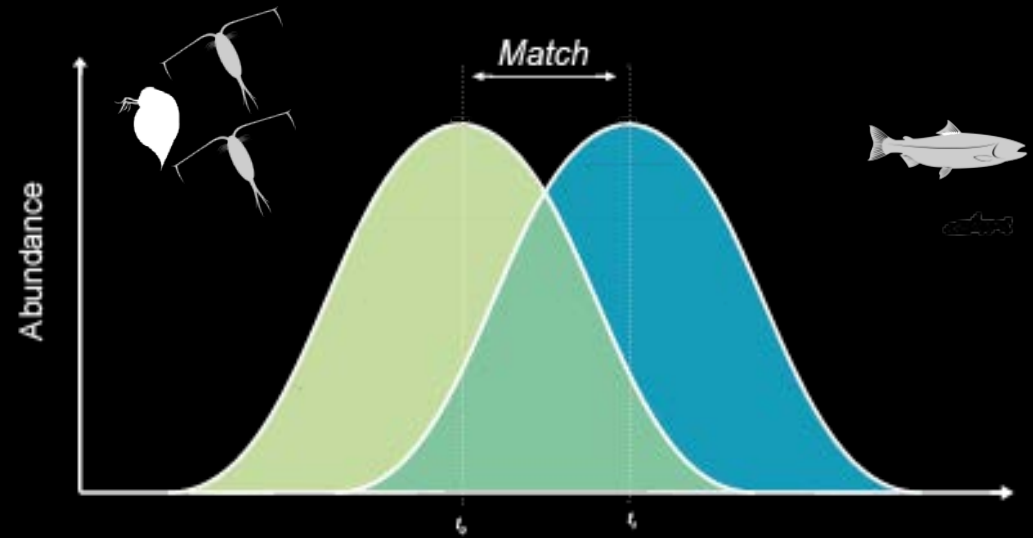
American Fisheries Society  
WASHINGTON - BRITISH  
COLUMBIA CHAPTER

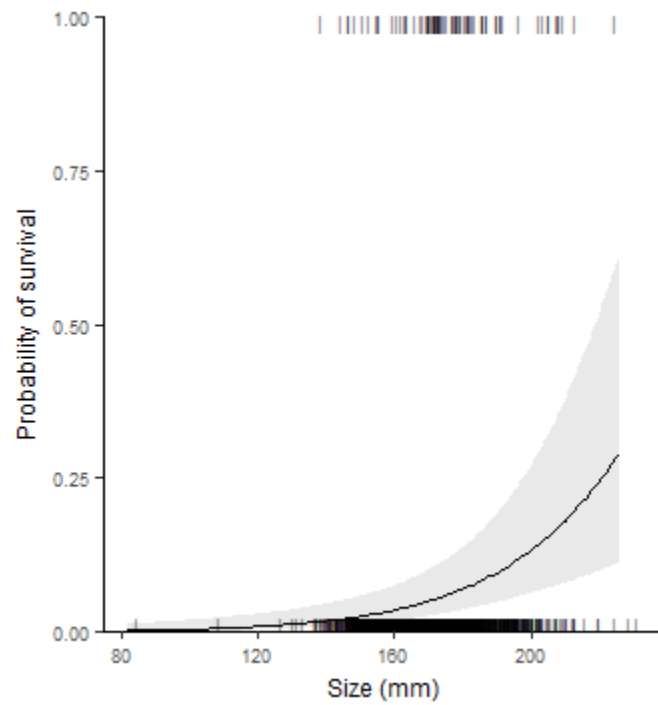


Bourses d'études  
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Scholarships

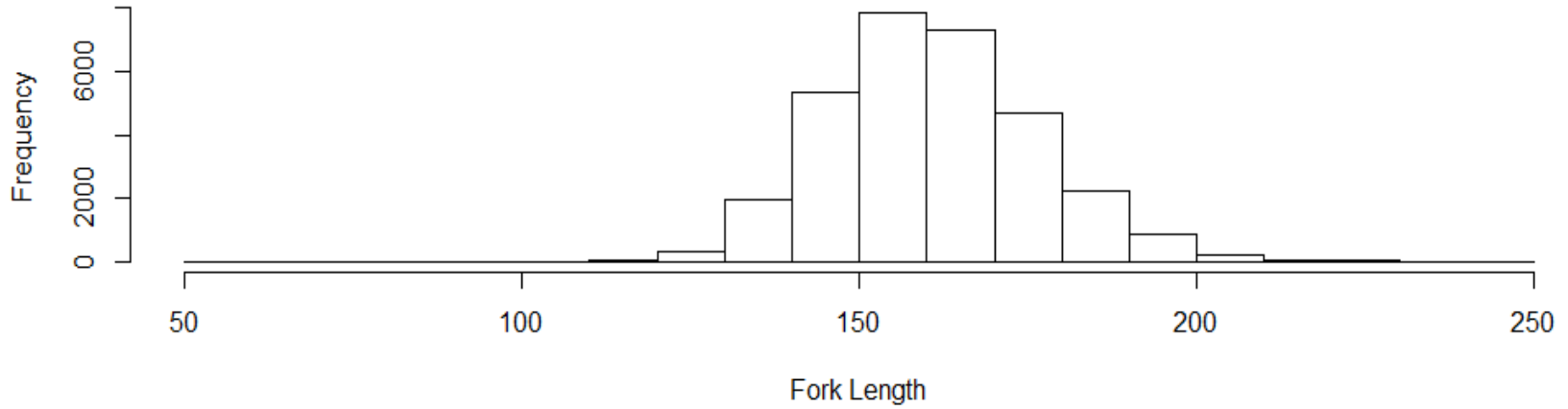
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# Match-Mismatch Hypothesis

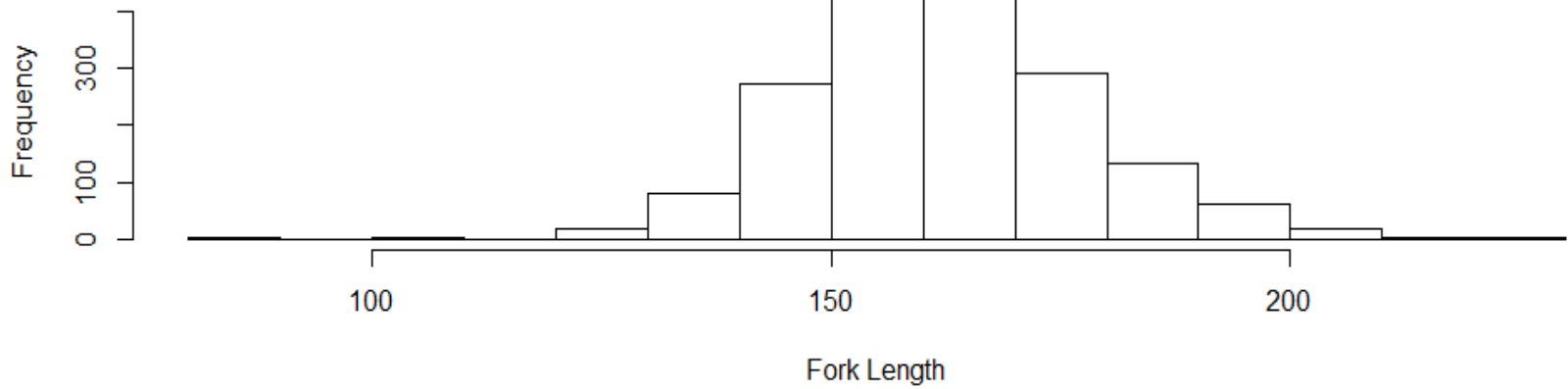




**All smolts tagged in Wind**



**BON and TWX subset smolts**





Days to Bonneville

