

Growth trade-offs for spring- and autumn-hatched larvae

Results from a long-term experiment

Florian Berg, Gaute Seljestad and Arild Folkvord

SPF Symposium 2022

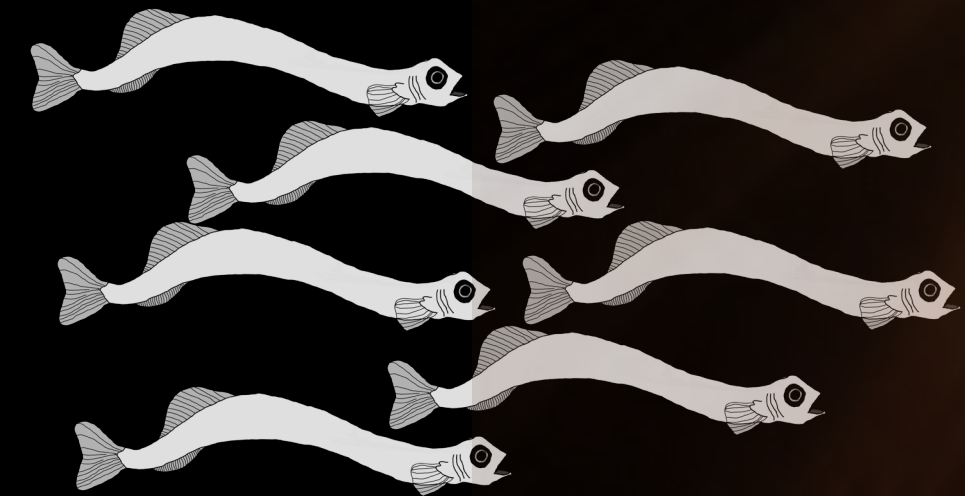
9. November

florian.berg@hi.no



Funded by the RCN project 254774 (GENSINC)

Survival needs of fish larvae



Winter solstice
(24h light cycle, 22.Dec)

Sun
never
rises

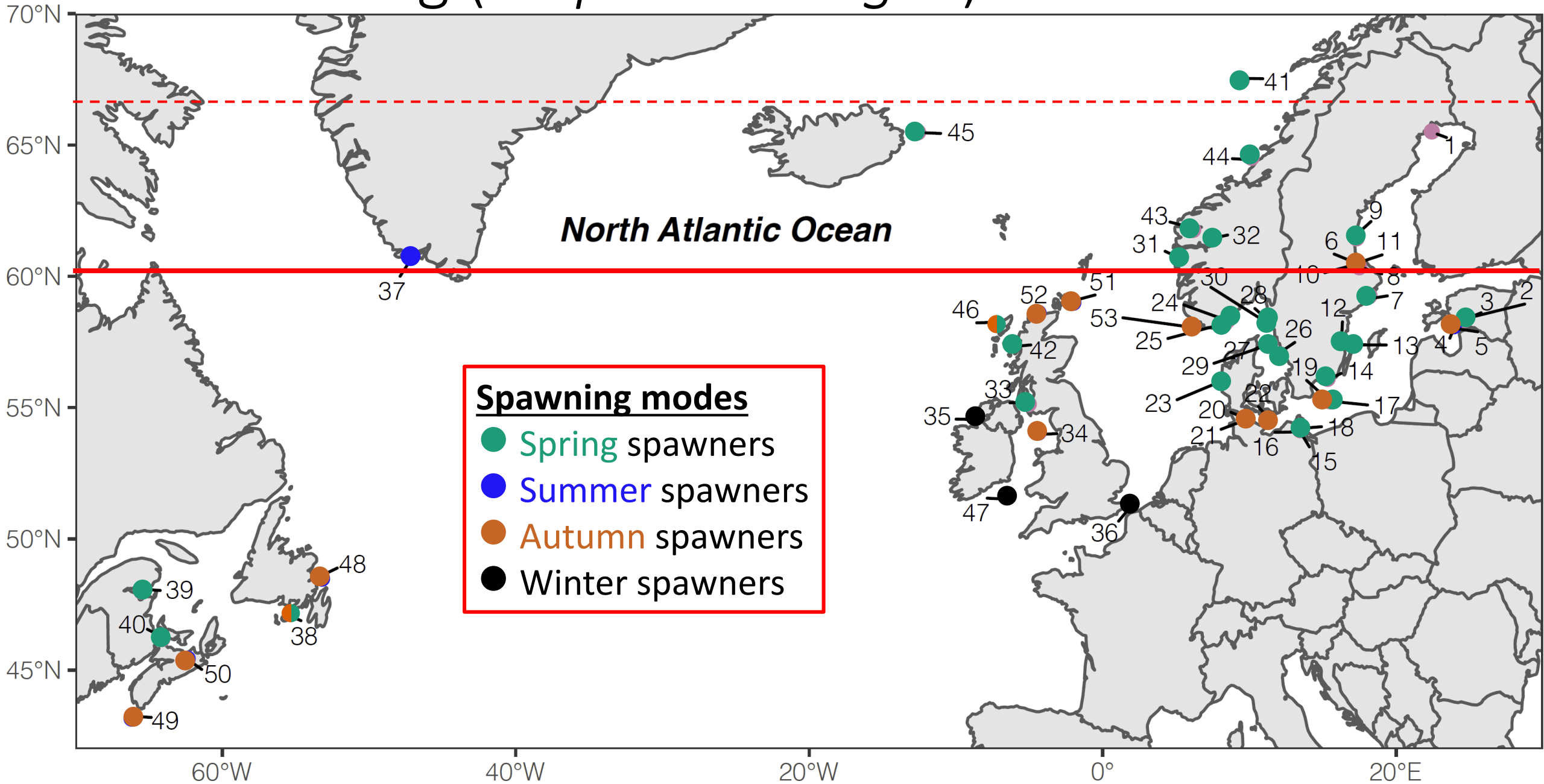
A circular diagram of Earth showing the winter solstice. The Earth is tilted such that the North Pole is tilted away from the Sun. The Arctic region is in complete darkness, indicated by a dashed red circle. The rest of the Northern Hemisphere is in partial shadow, and the Southern Hemisphere is in full daylight. The text 'Sun never rises' is centered within the dark Arctic region.

Summer solstice
(24h light cycle, 21. Jun)

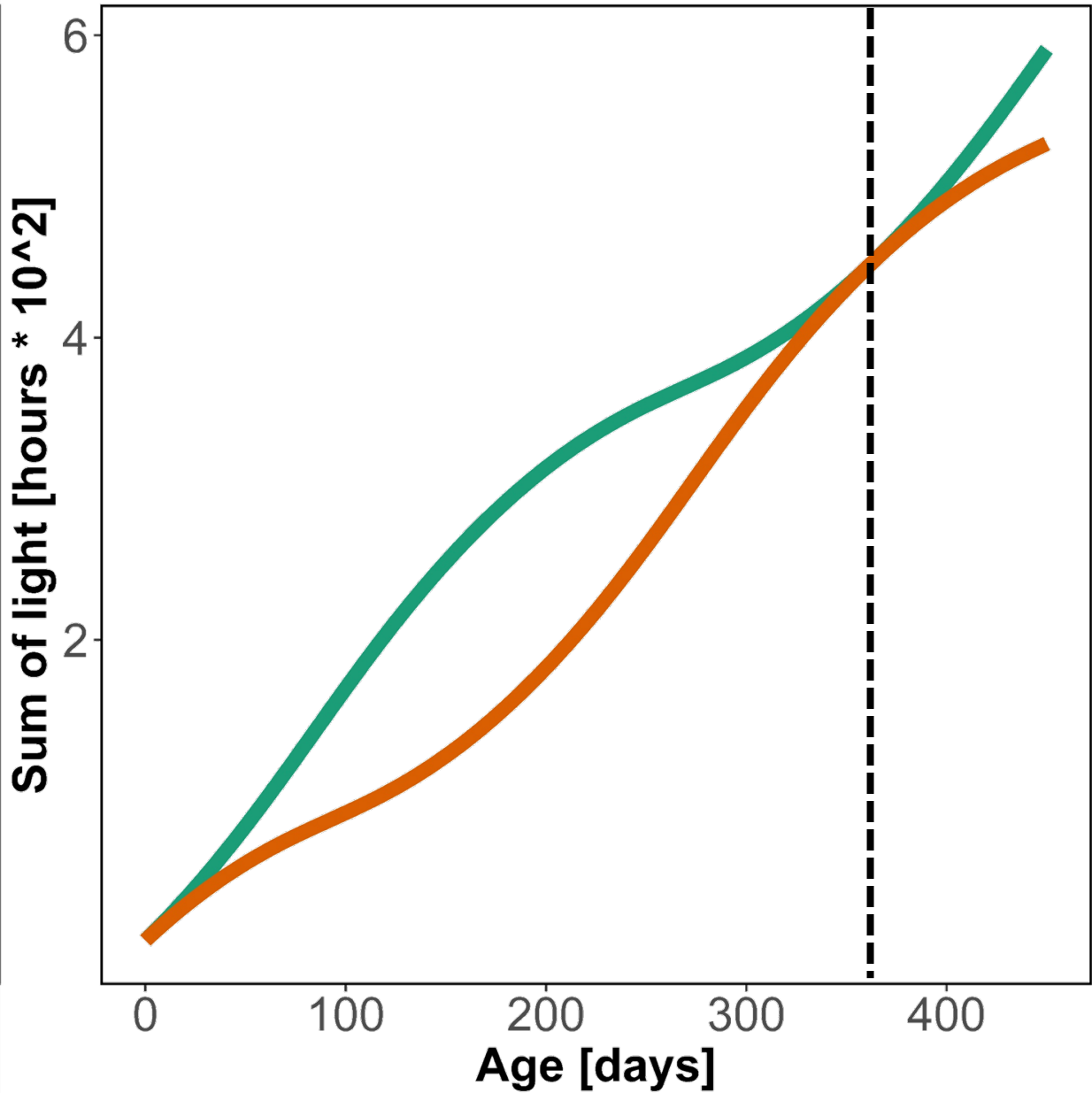
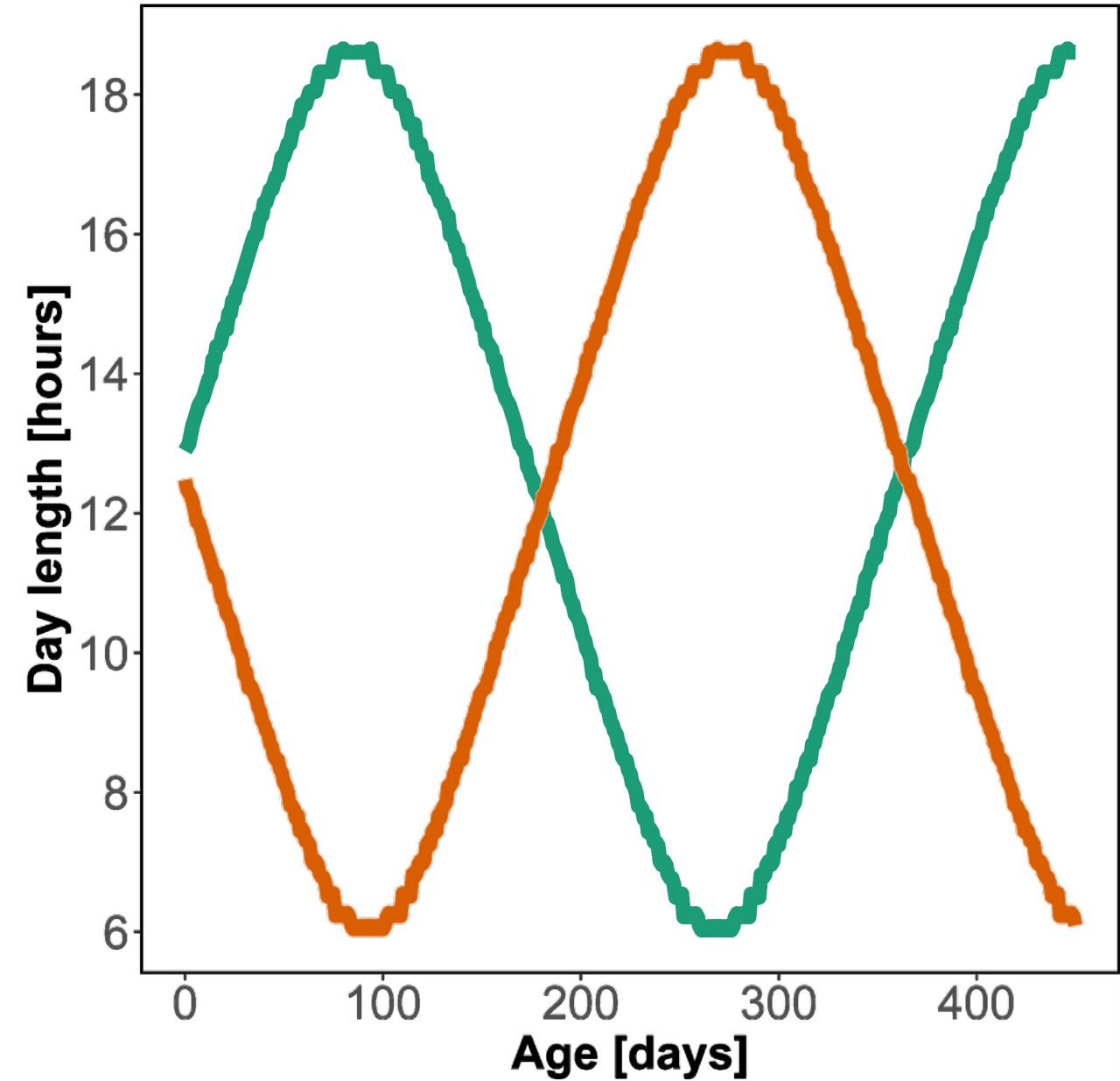
Sun
never
sets

A circular diagram of Earth showing the summer solstice. The Earth is tilted such that the North Pole is tilted towards the Sun. The Arctic region is in complete daylight, indicated by a dashed red circle. The rest of the Northern Hemisphere is in full daylight, and the Southern Hemisphere is in partial shadow. The text 'Sun never sets' is centered within the bright Arctic region.

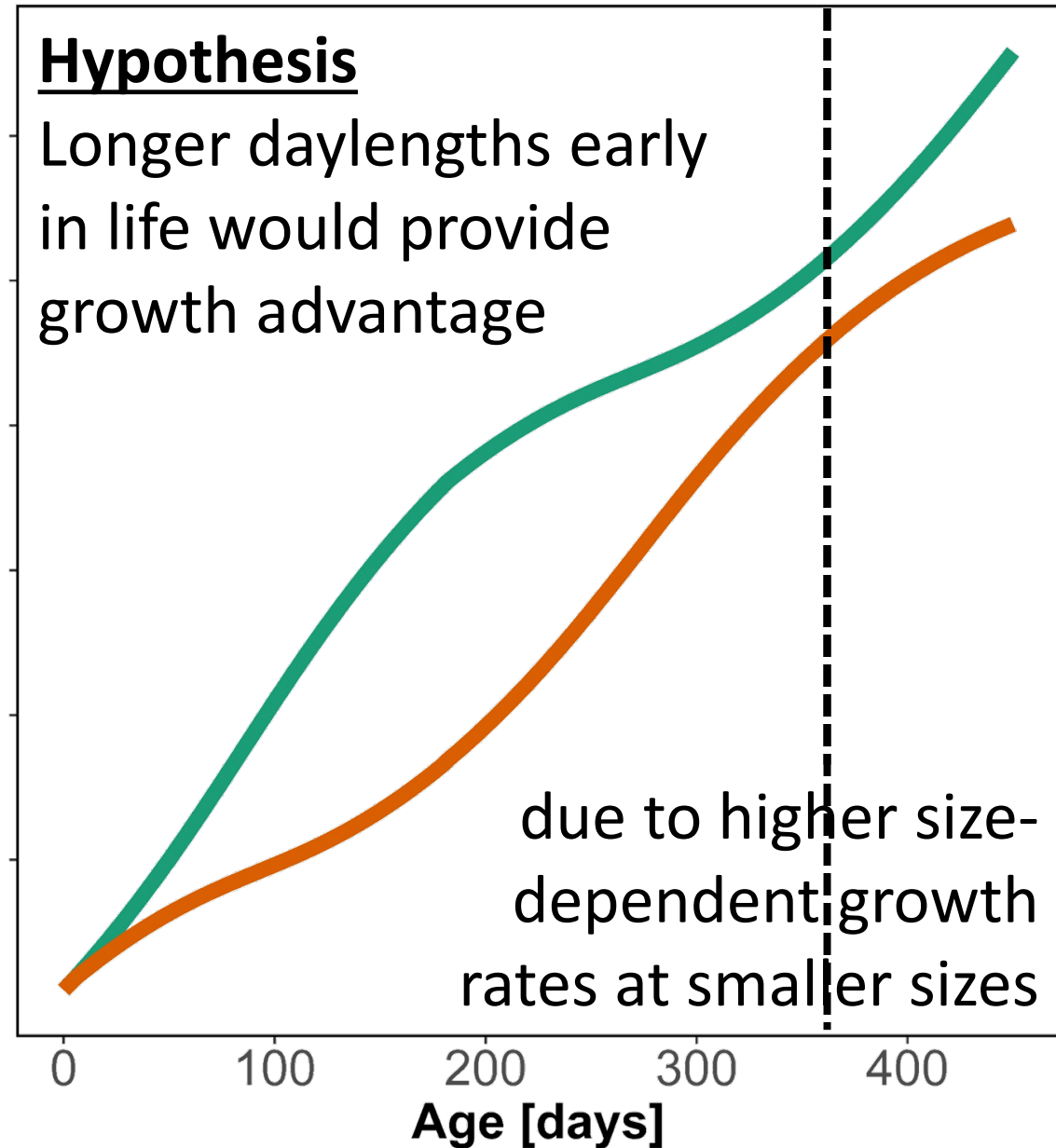
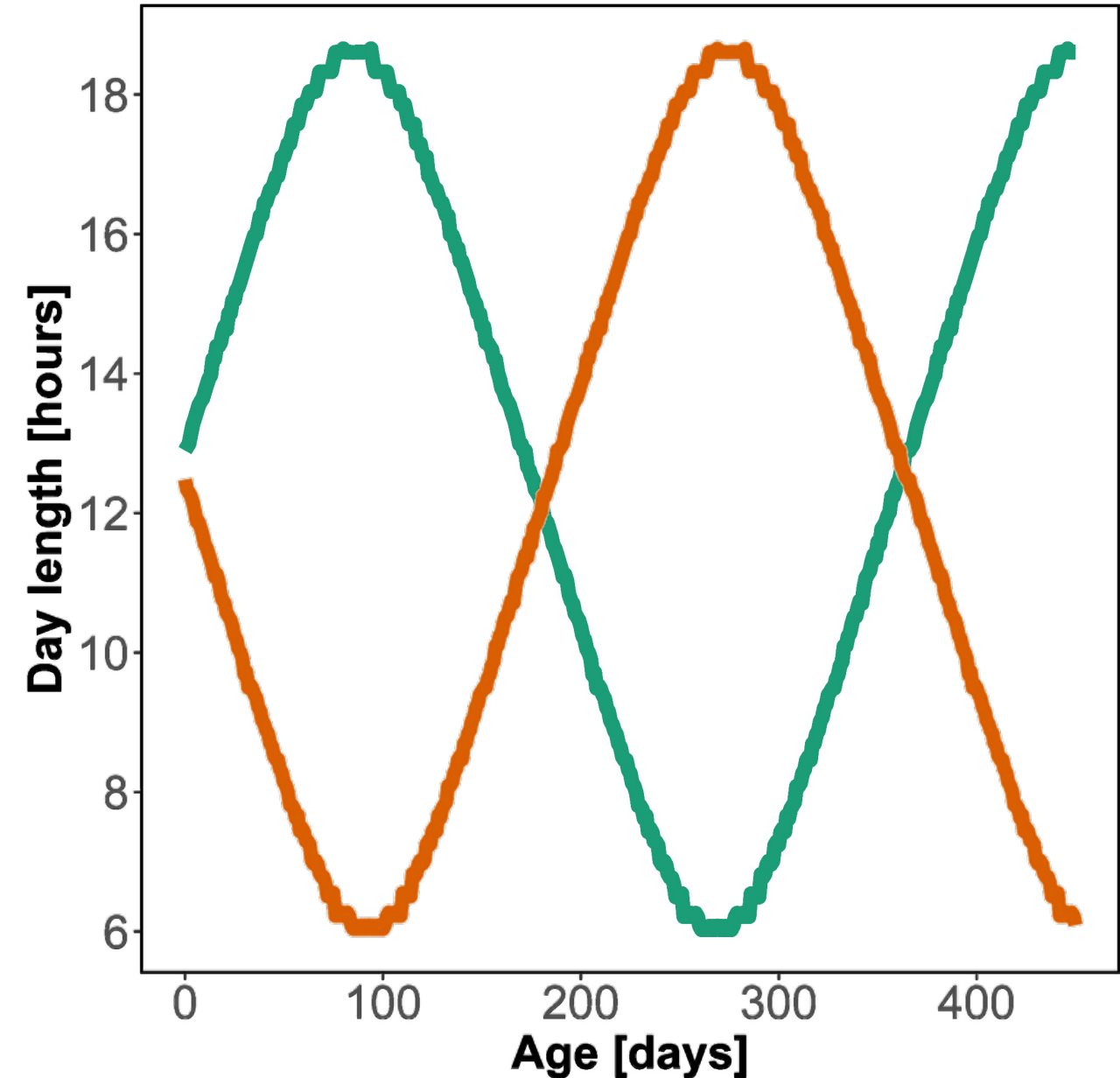
Atlantic herring (*Clupea harengus*)



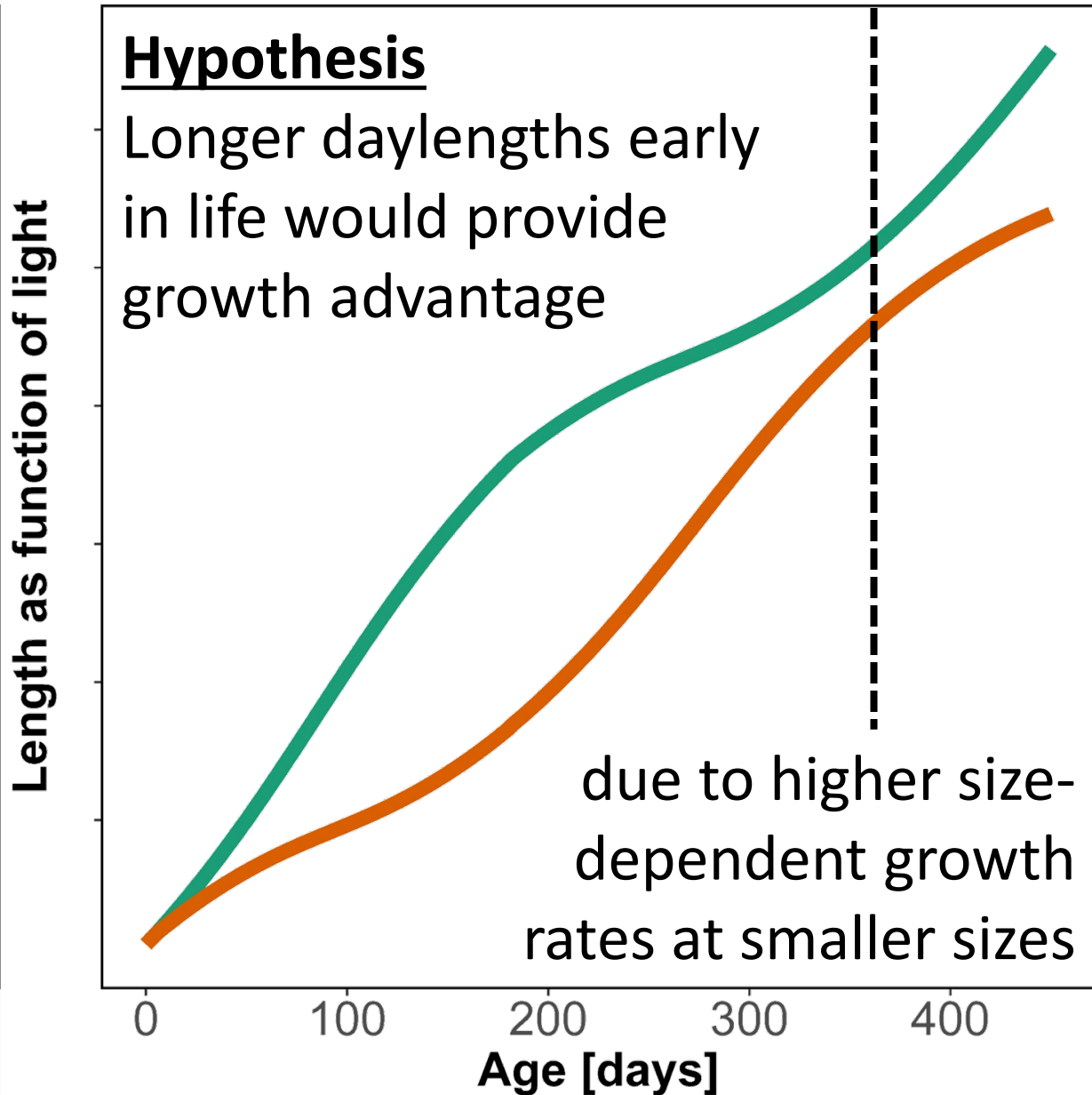
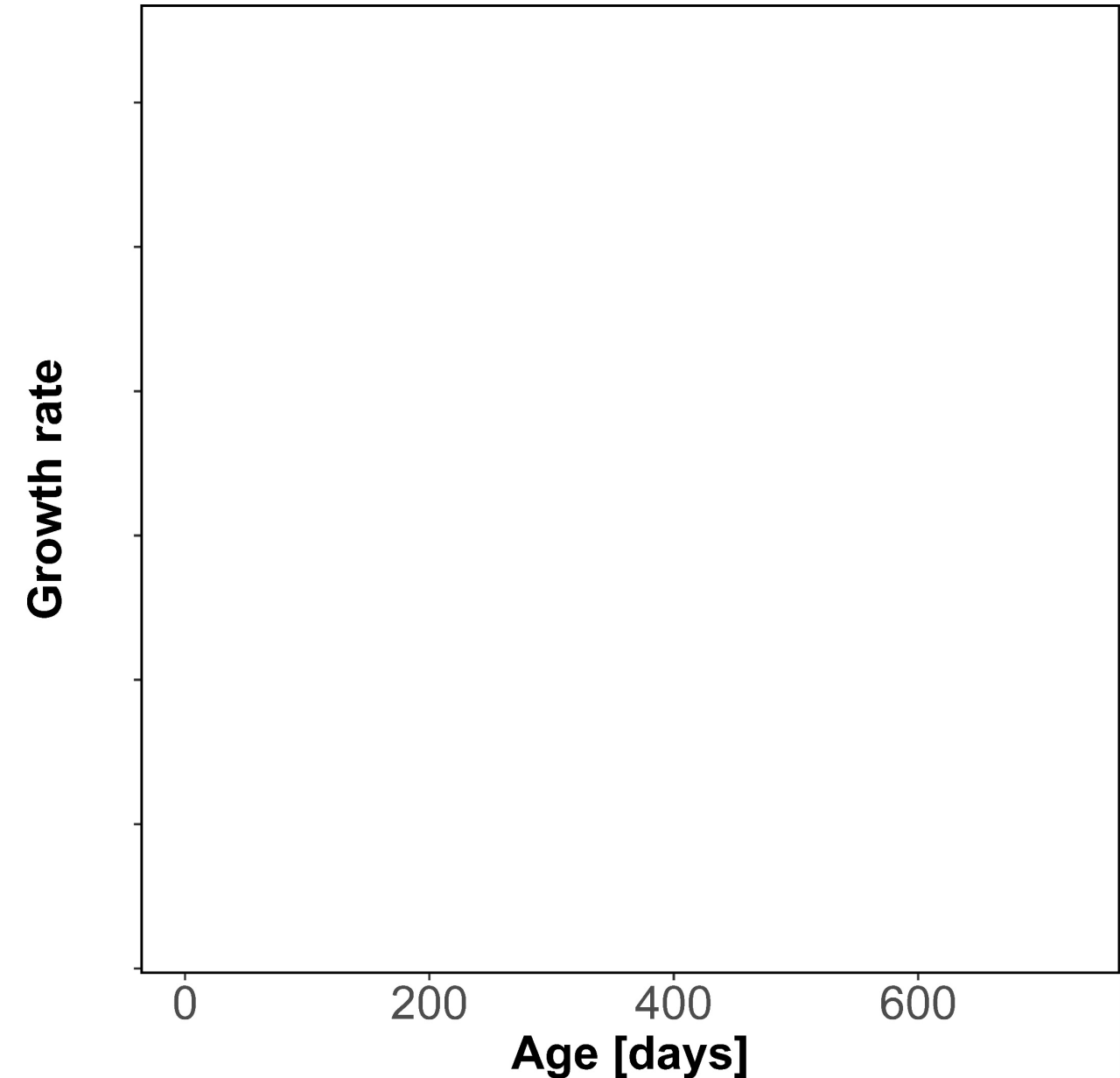
Spring vs. Autumn spawners



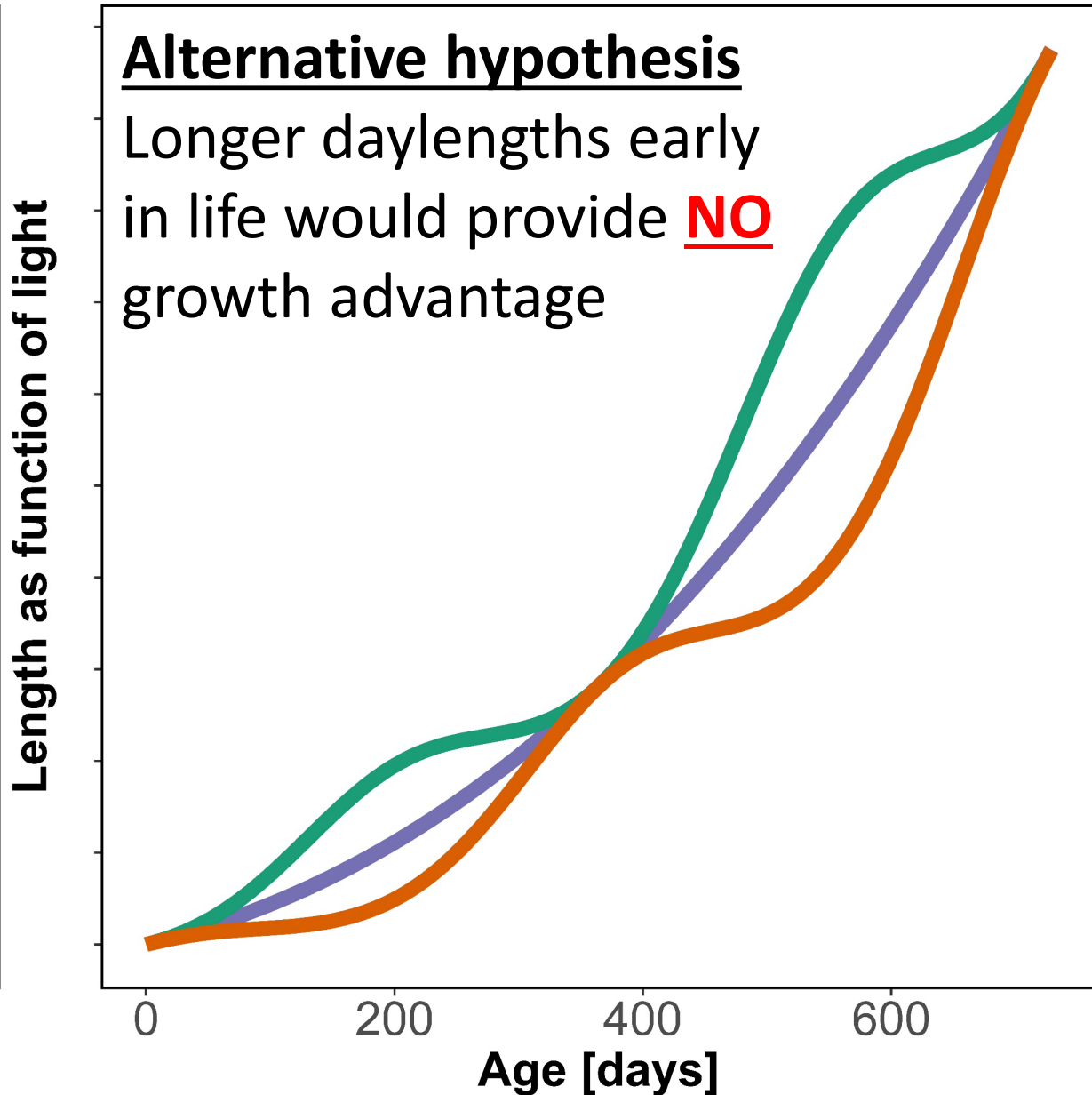
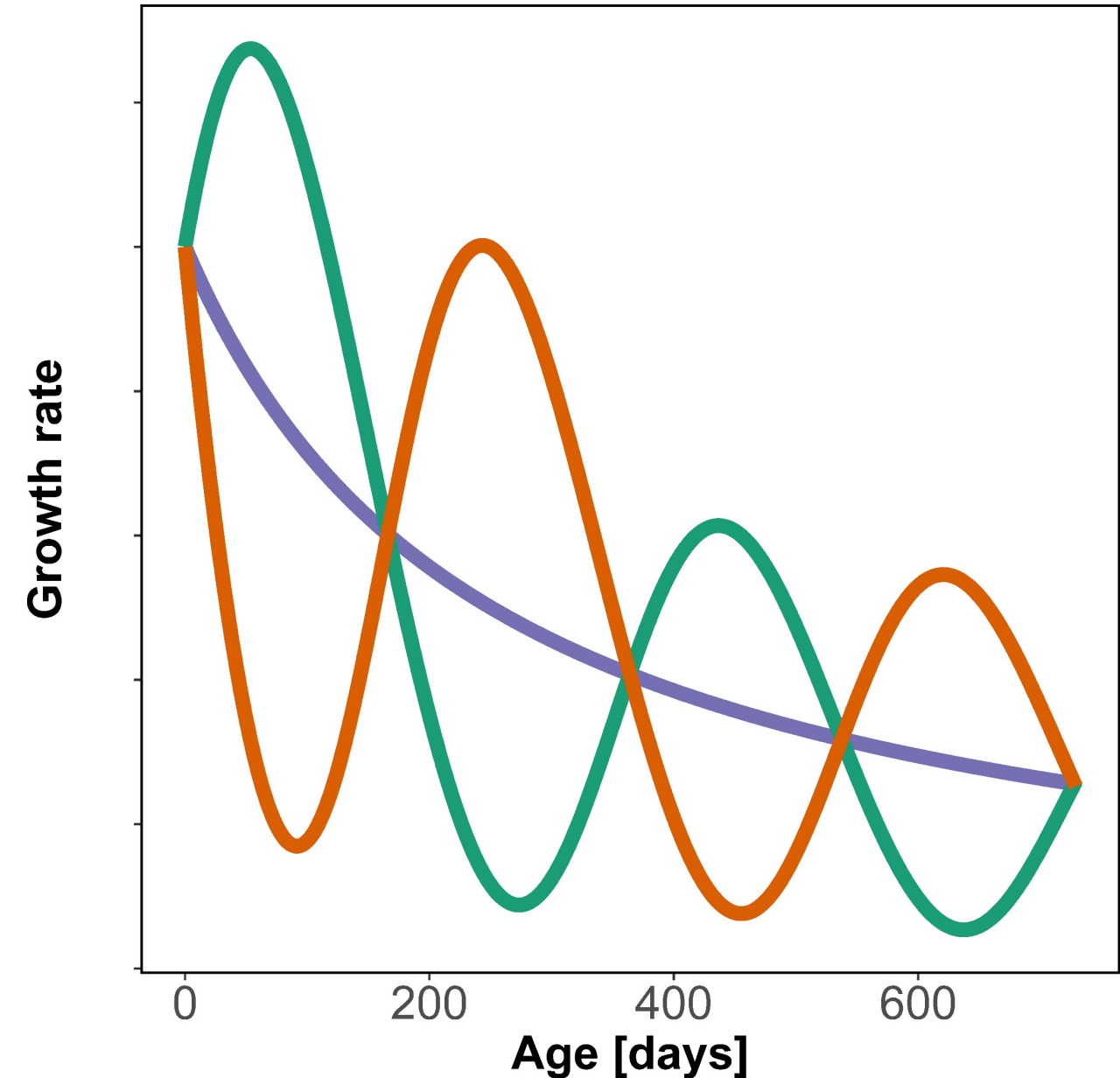
Spring vs. Autumn spawners



Spring vs. Autumn spawners



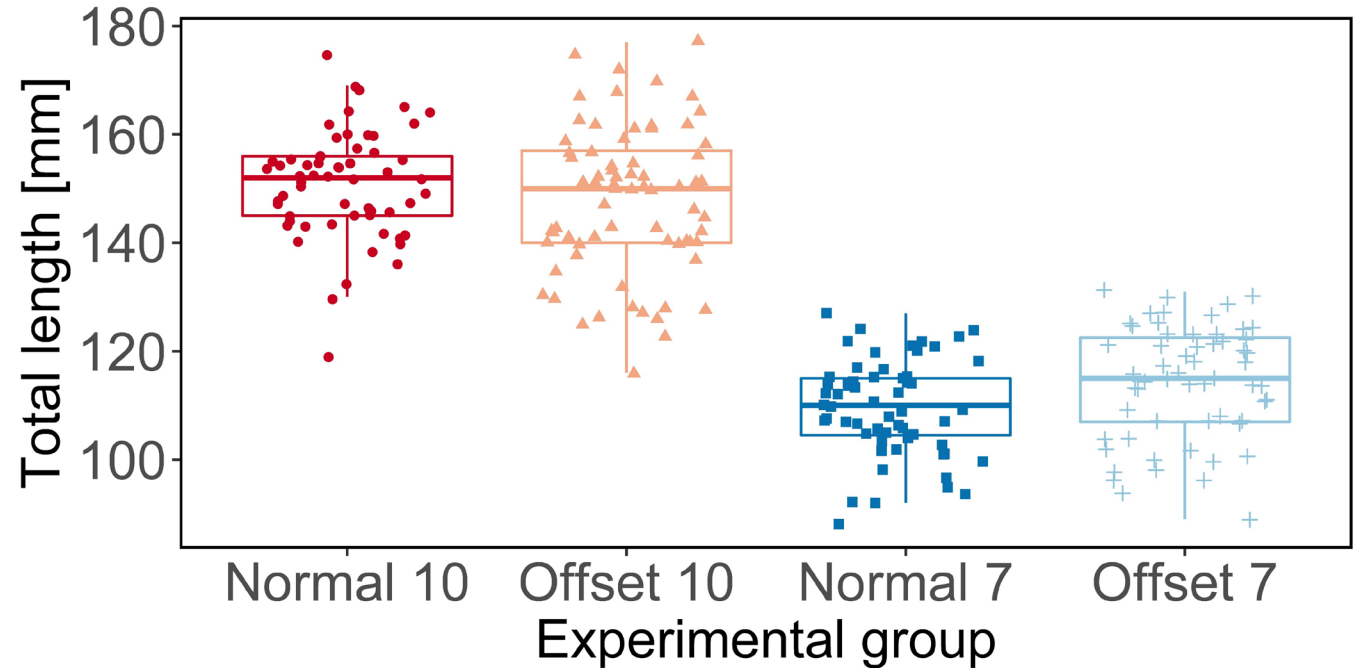
Spring vs. Autumn spawners



Conclusion – Take home message

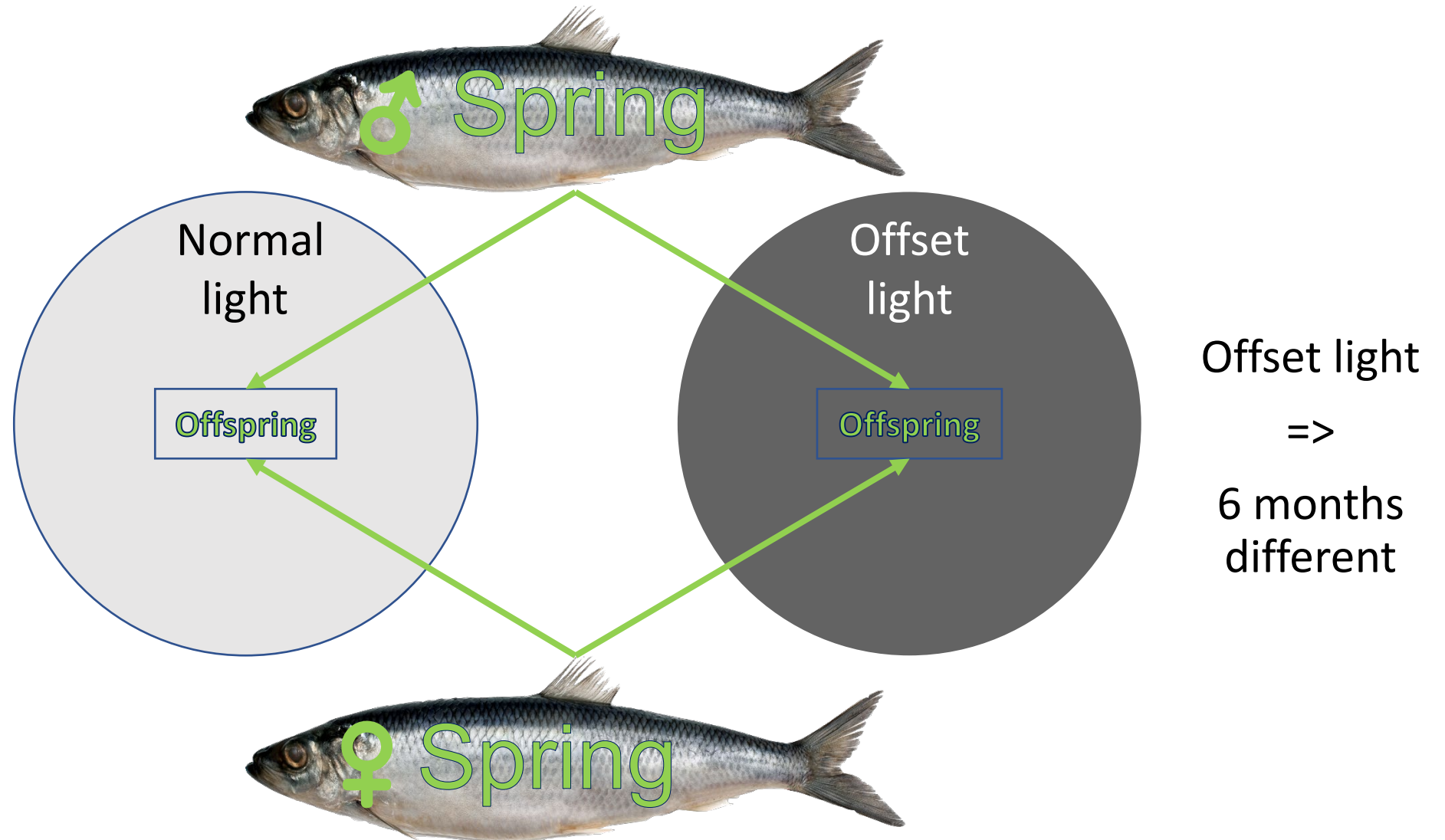
Hypothesis

Longer daylight lengths early in life will provide growth advantage

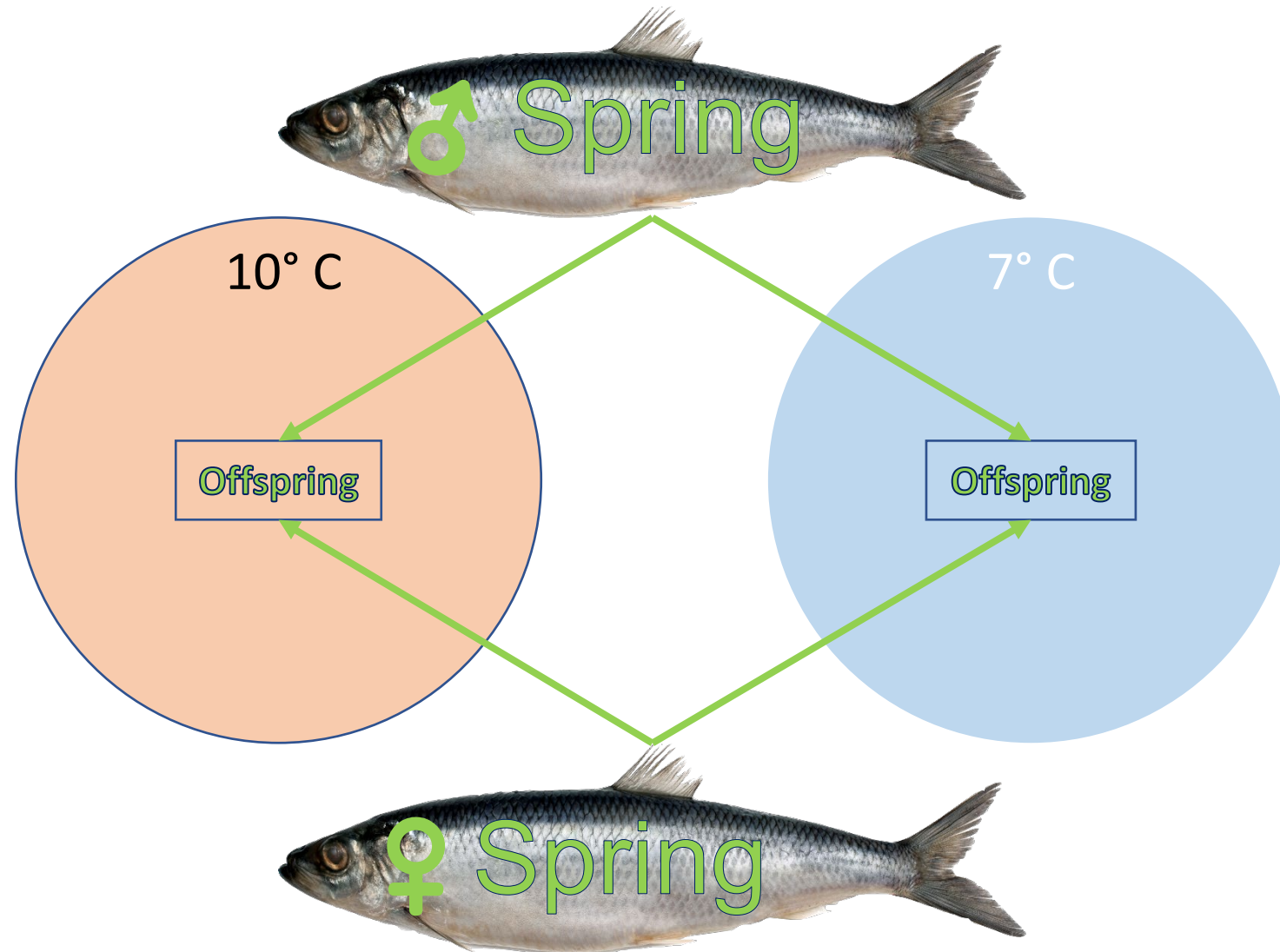


→ offspring with initial autumn conditions had the same size after one year = same amount of light

Experimental design – Light

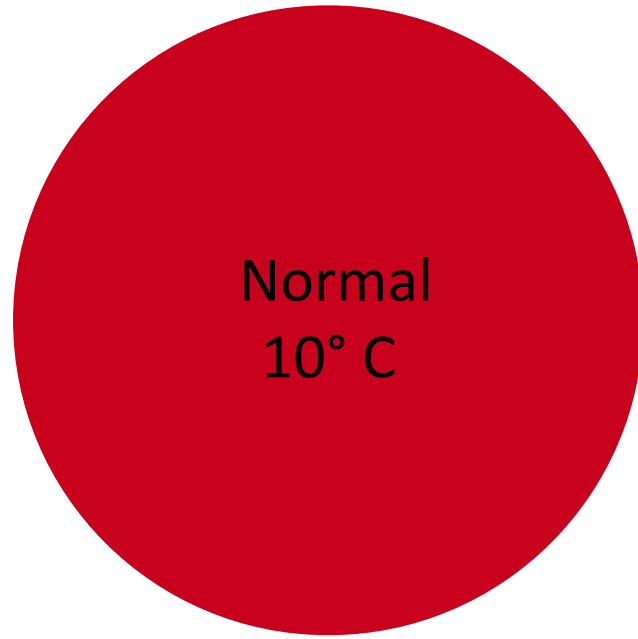


Experimental design – Temperature

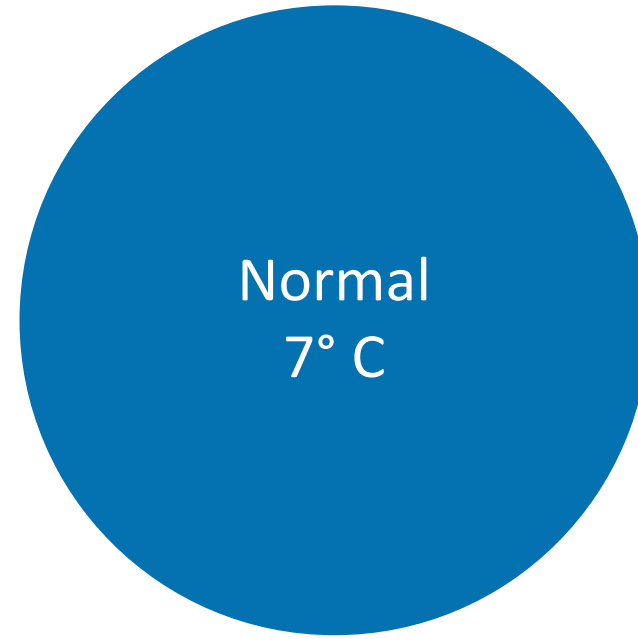


Final design

3 parental cross

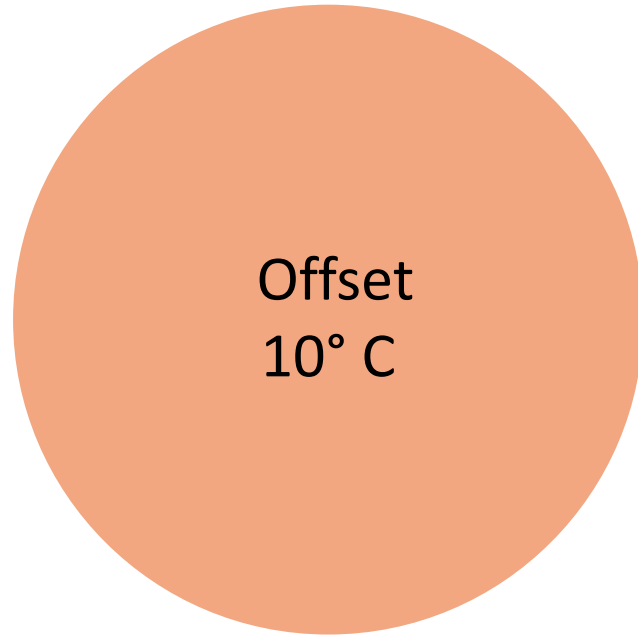


Normal
10° C

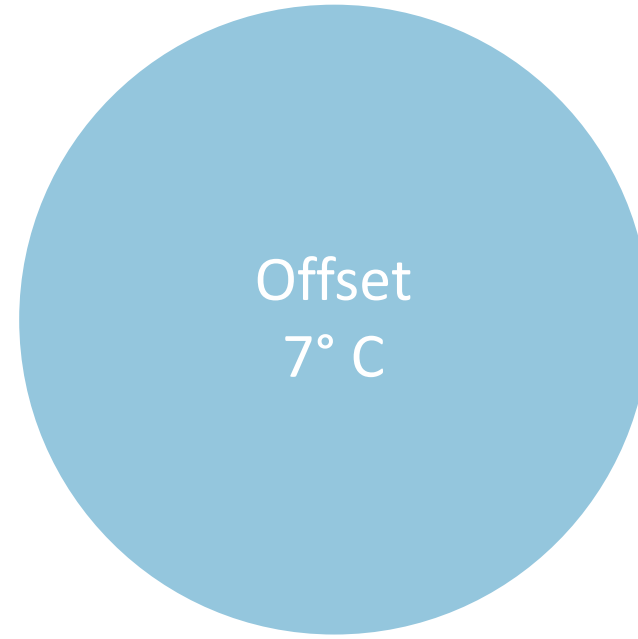


Normal
7° C

2 replicates
per treatment
à 1500 larvae



Offset
10° C

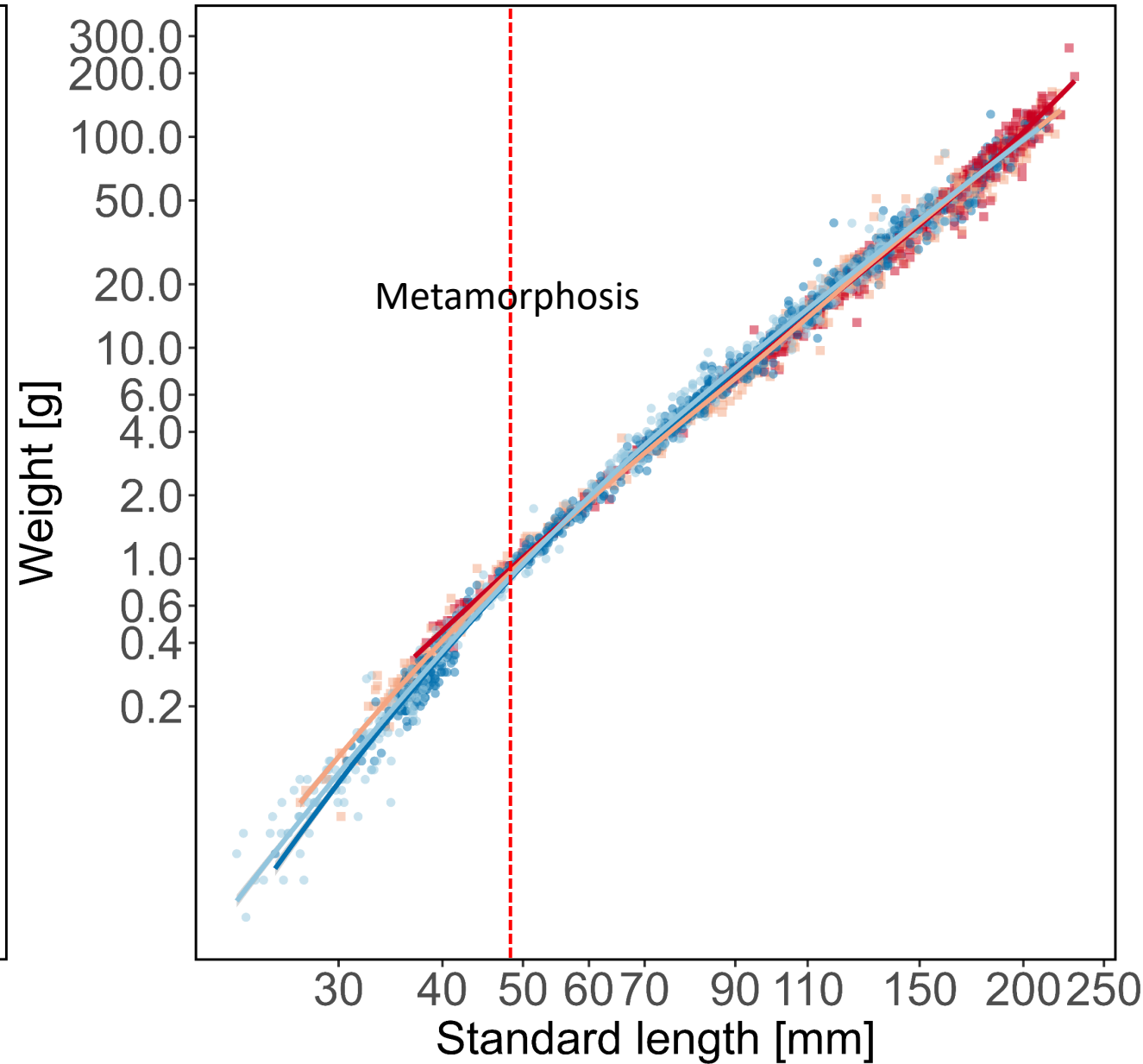
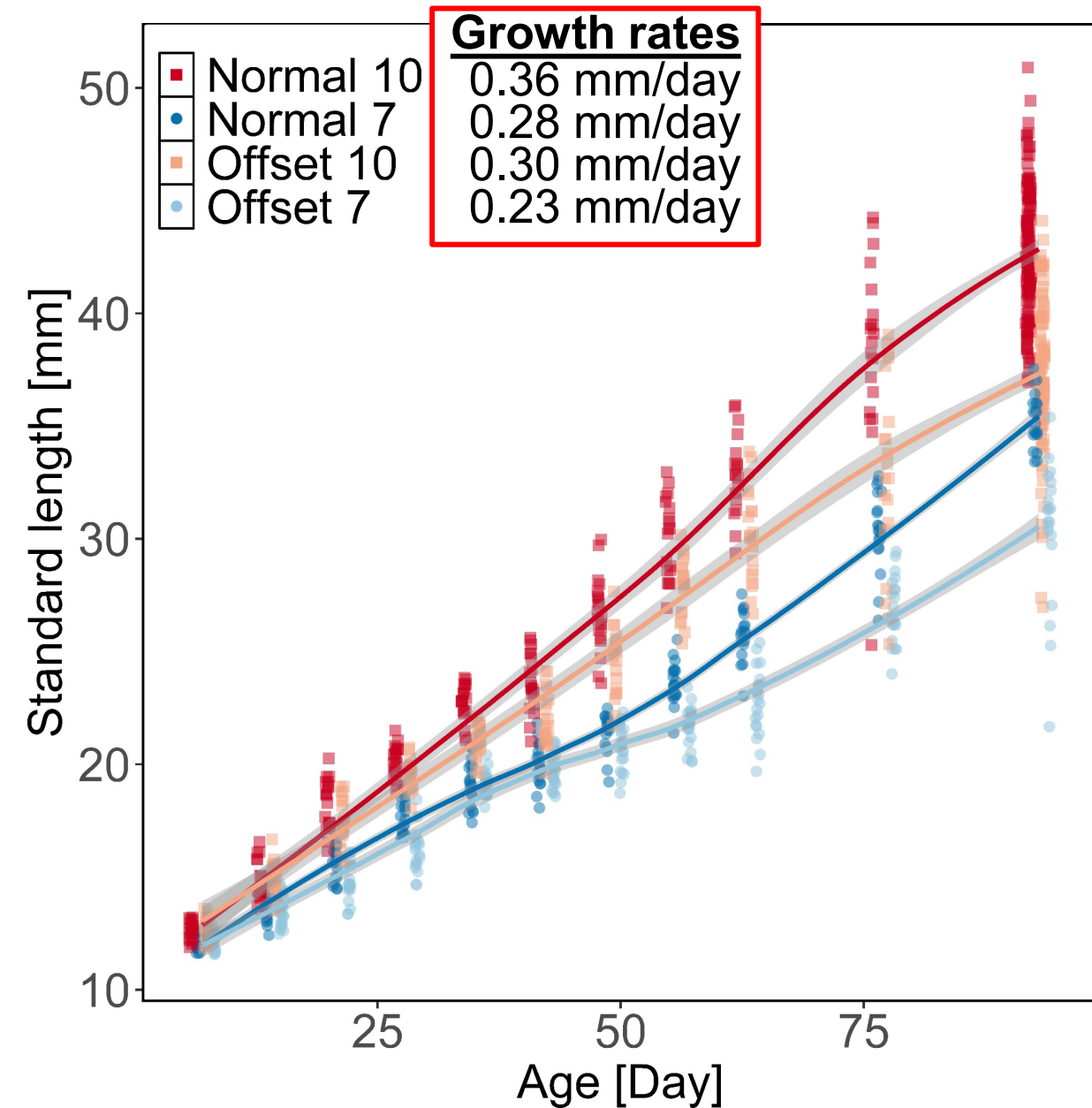


Offset
7° C

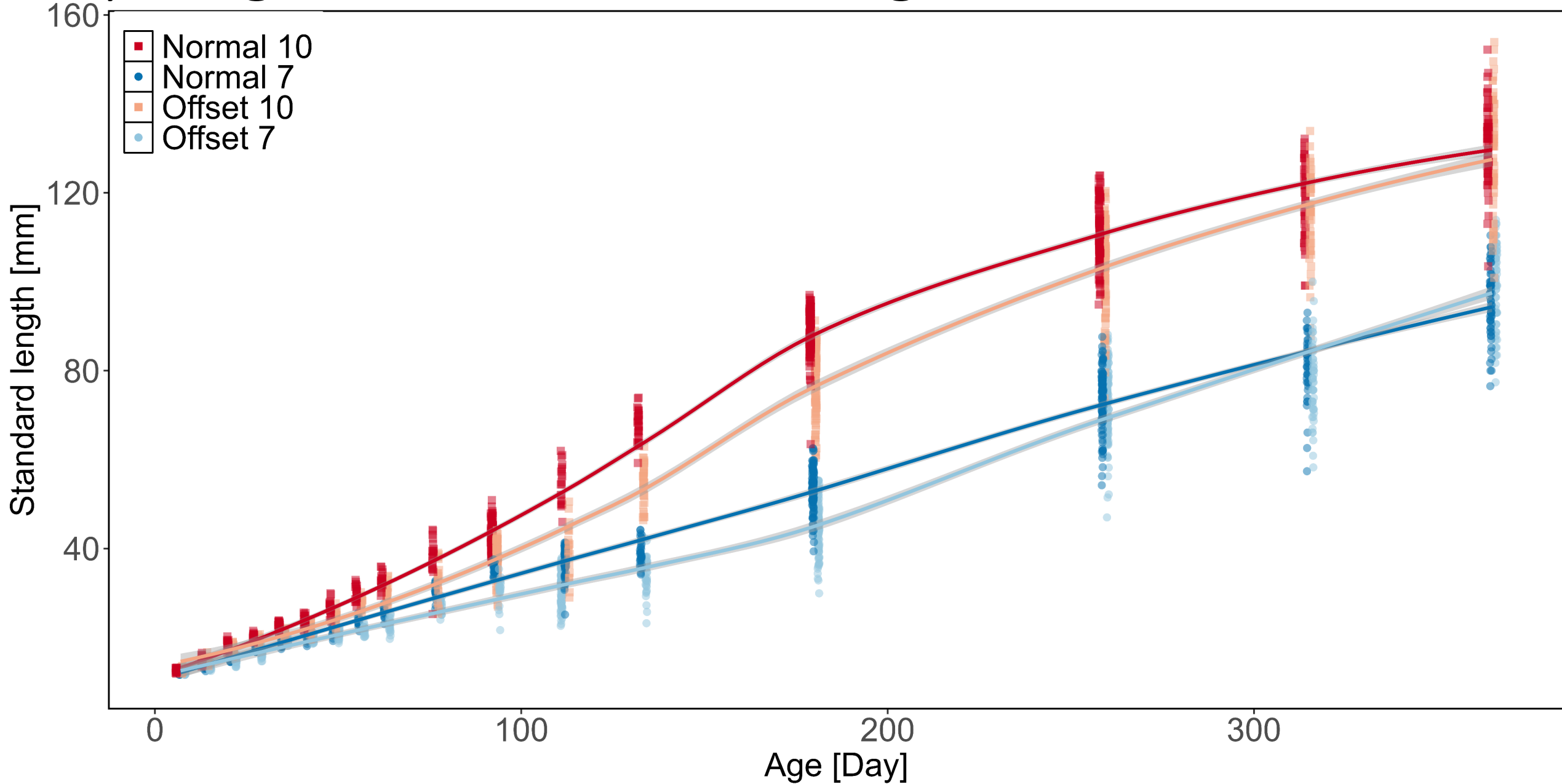
Fed in excess

Kept for 3.5 years

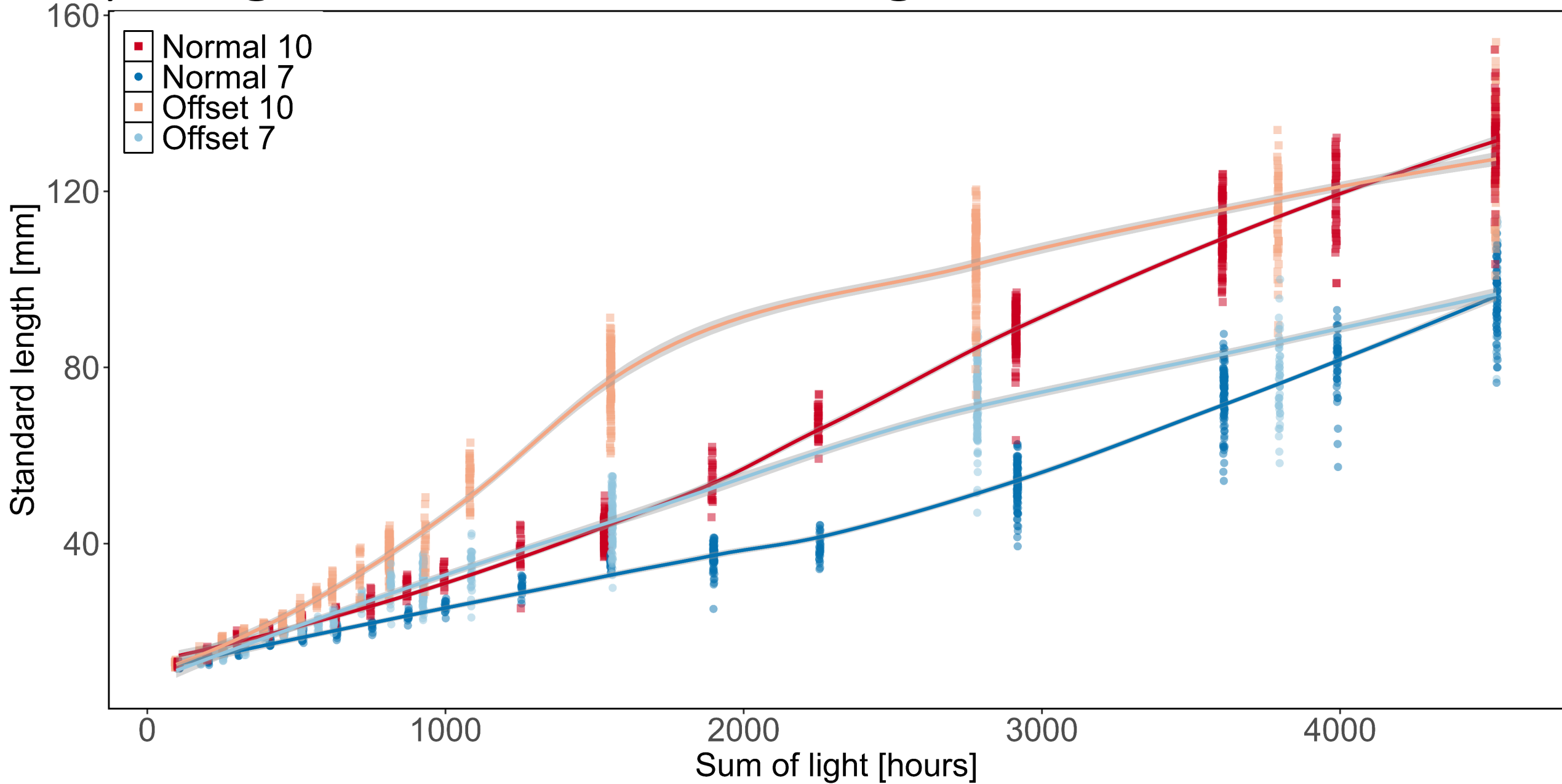
Growth trajectories of offspring



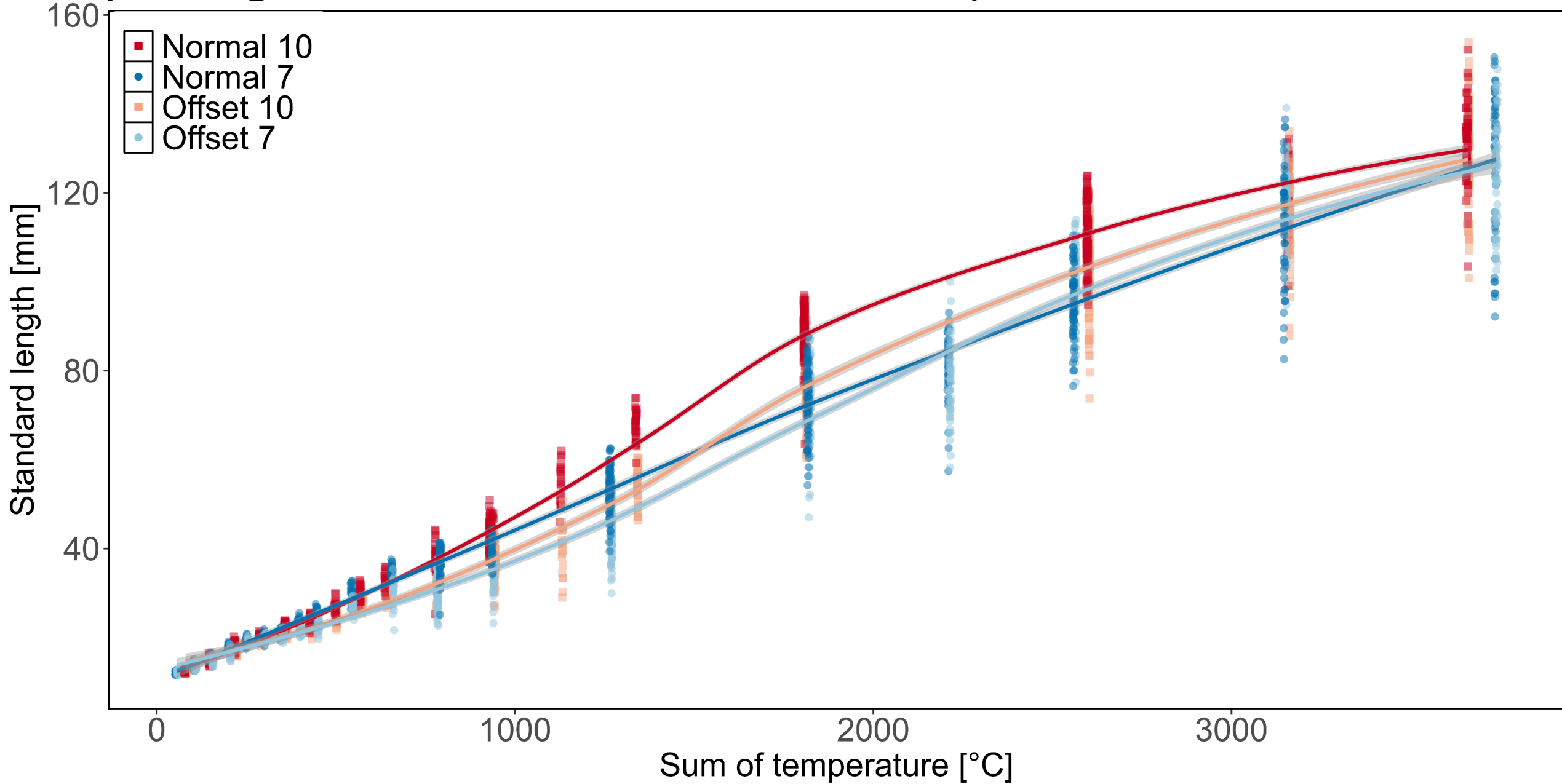
1st year growth in relation to age



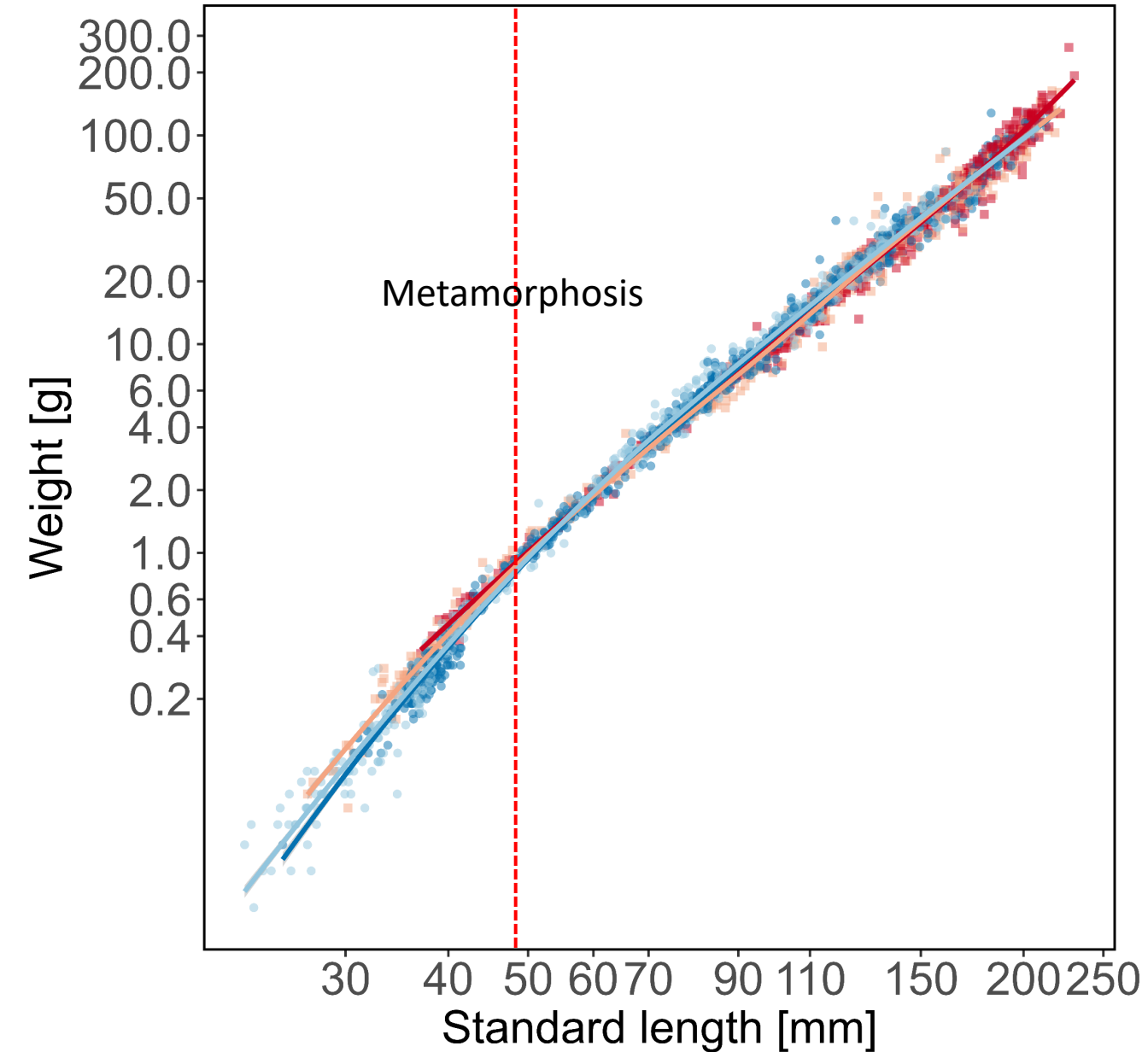
1st year growth in relation to light



1st year growth in relation to temperature



Seasonal conditions

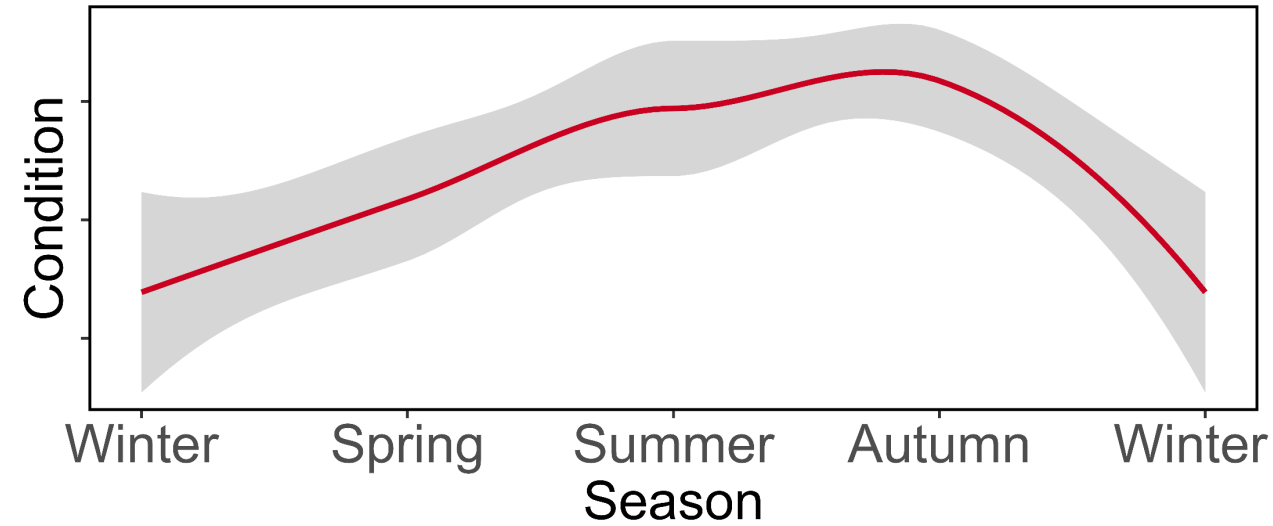


Estimated length-weight relationship

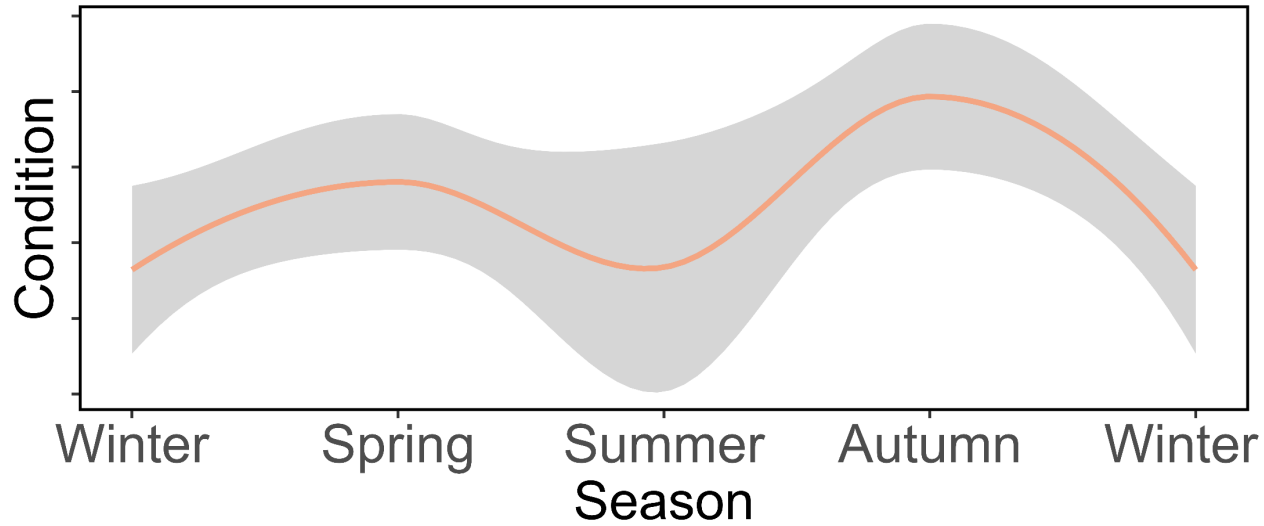
→ Used residuals as indicator for condition

Seasonal conditions

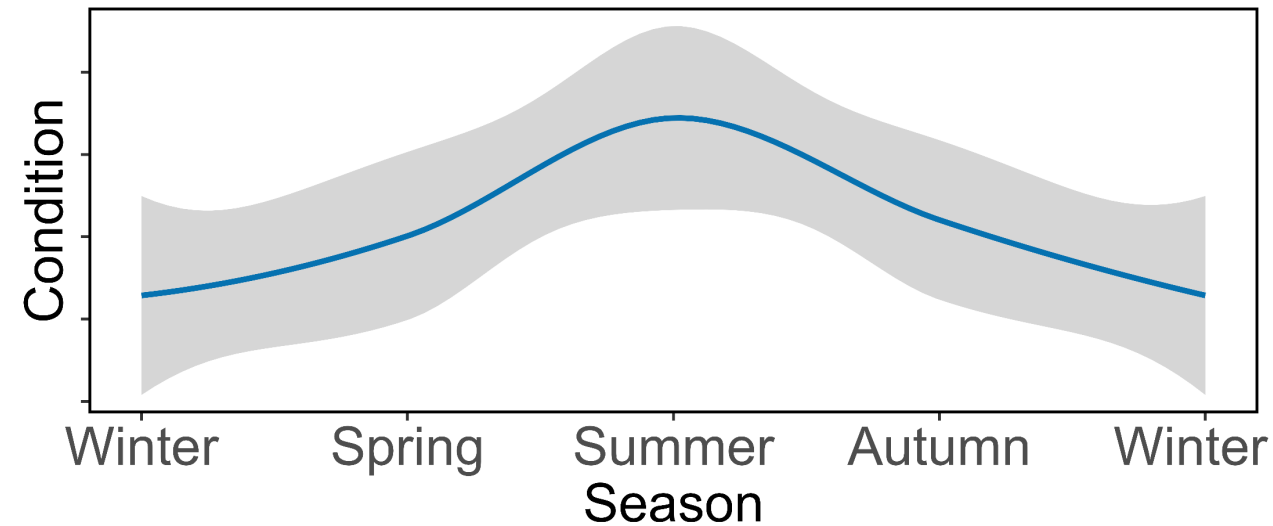
Normal 10



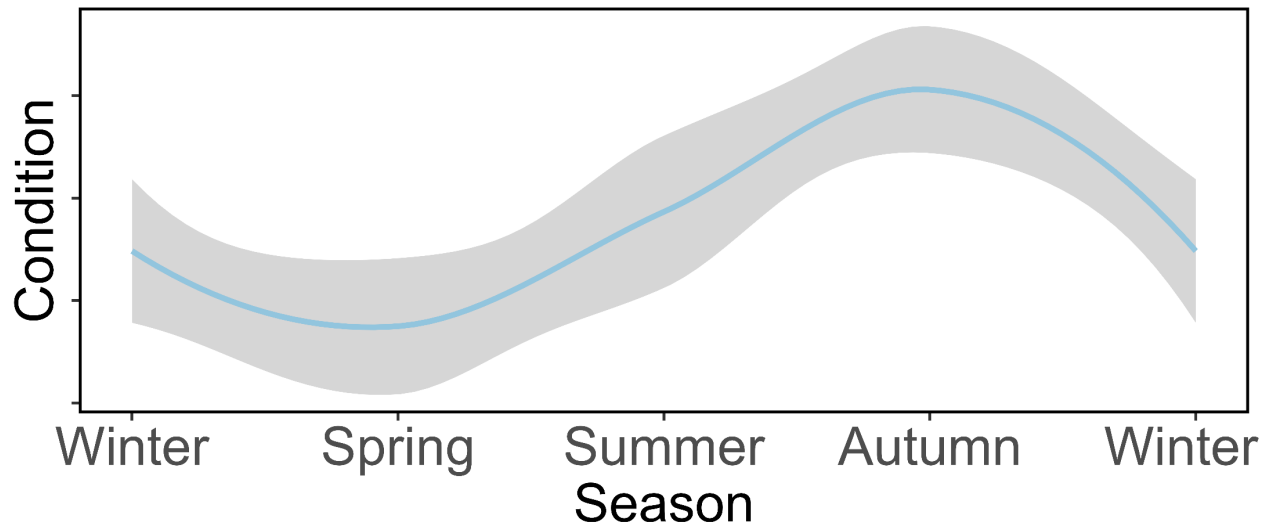
Offset 10



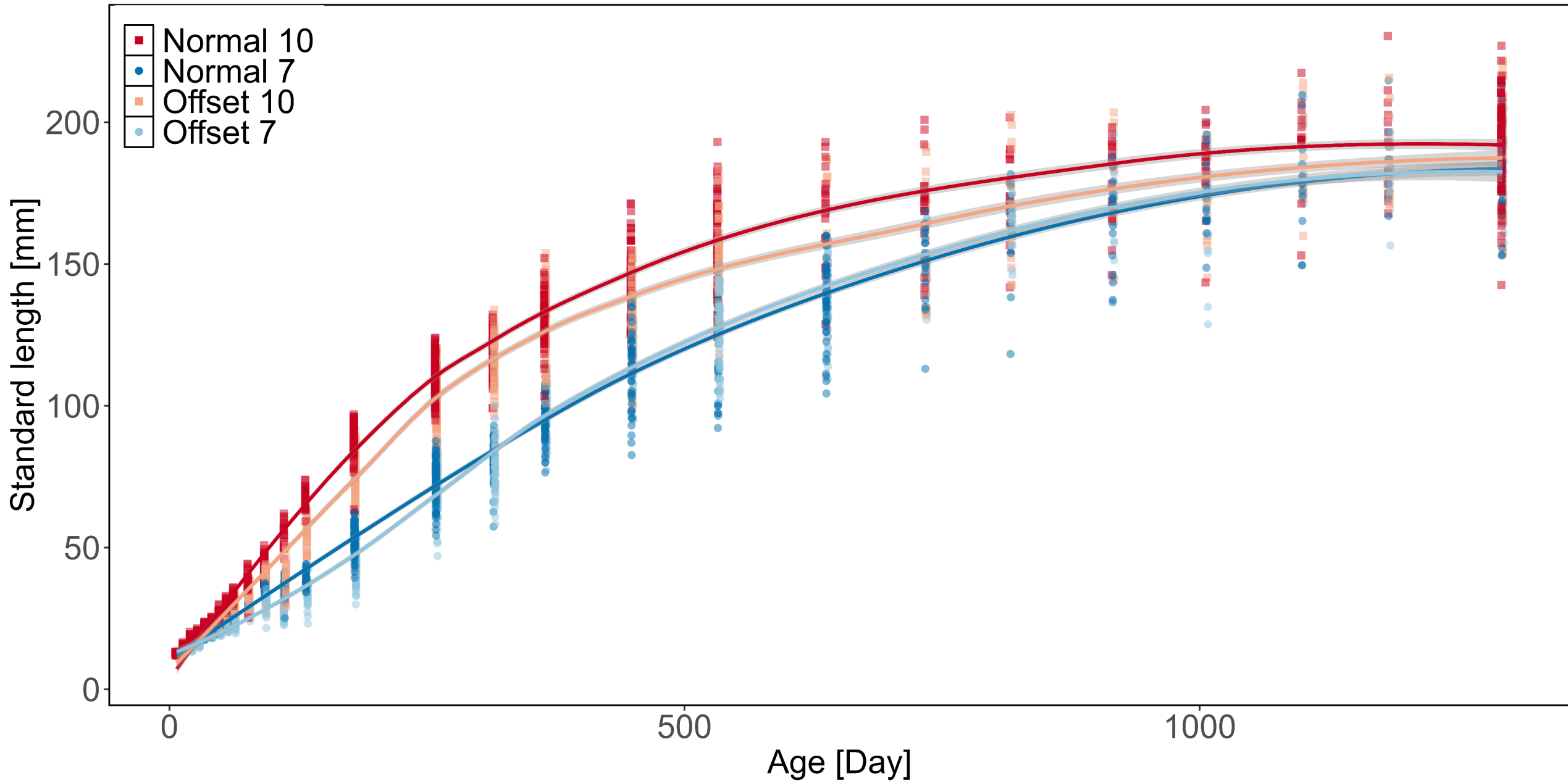
Normal 7



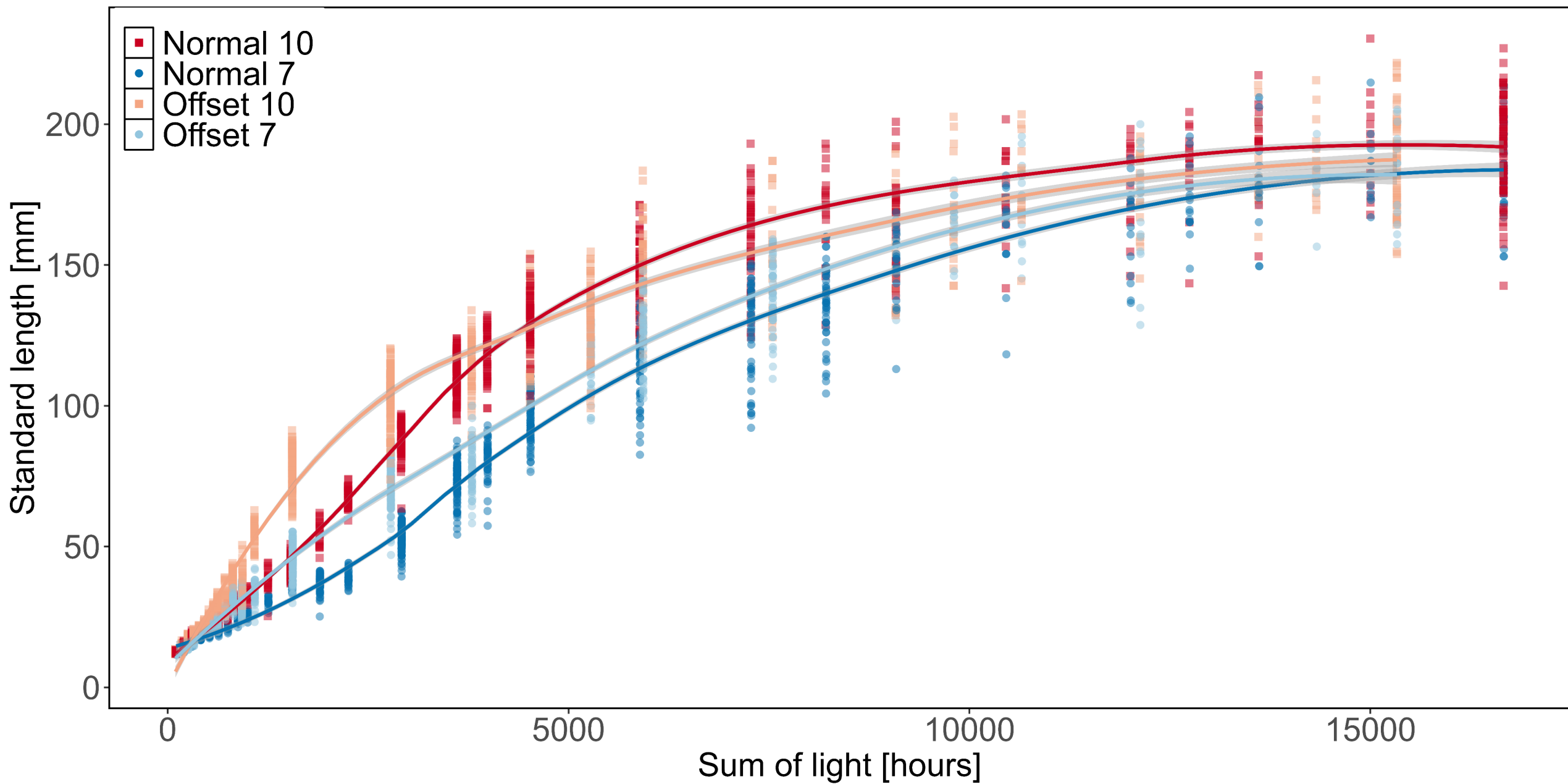
Offset 7



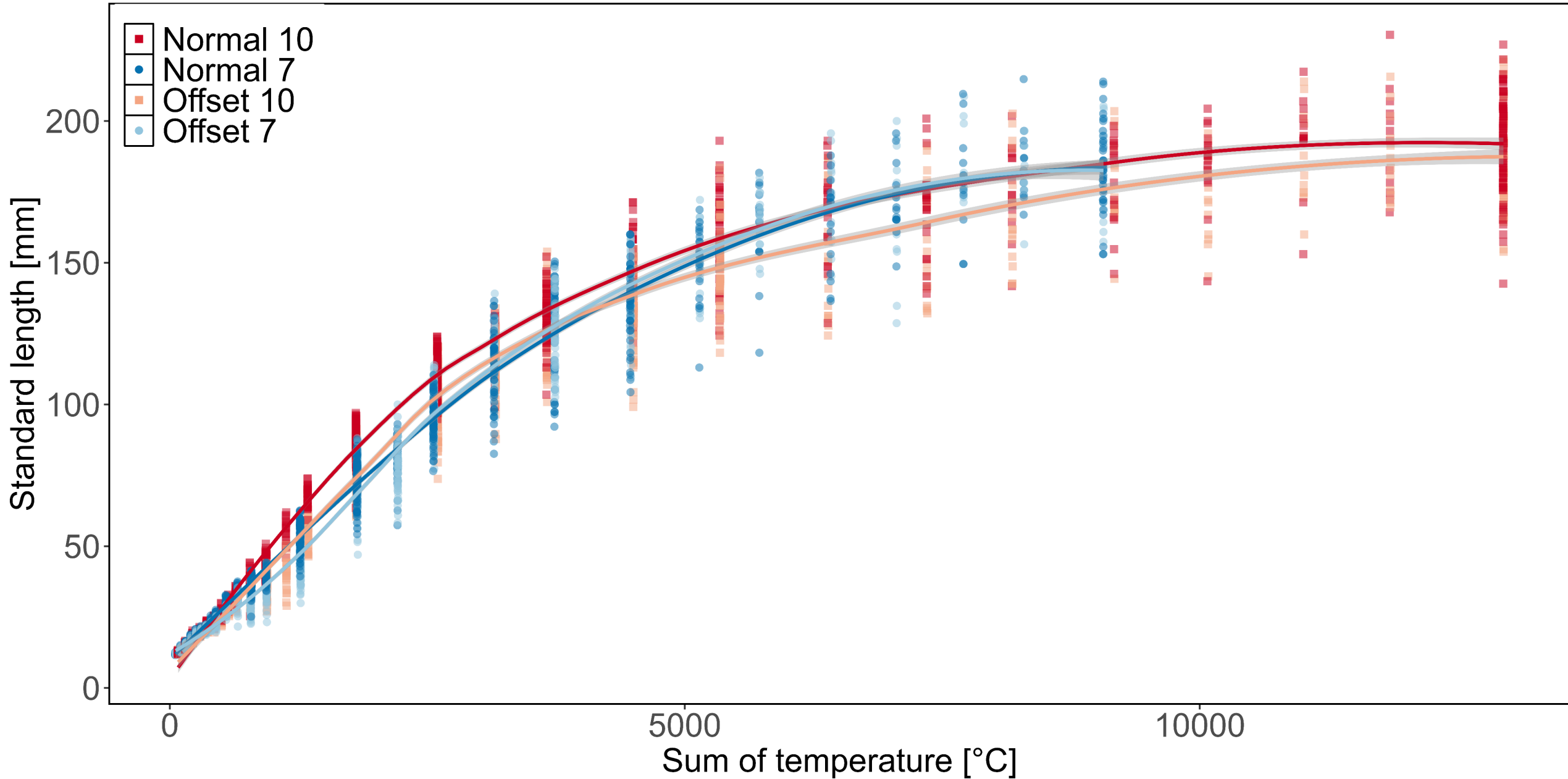
Growth in relation to age for 3.5 years



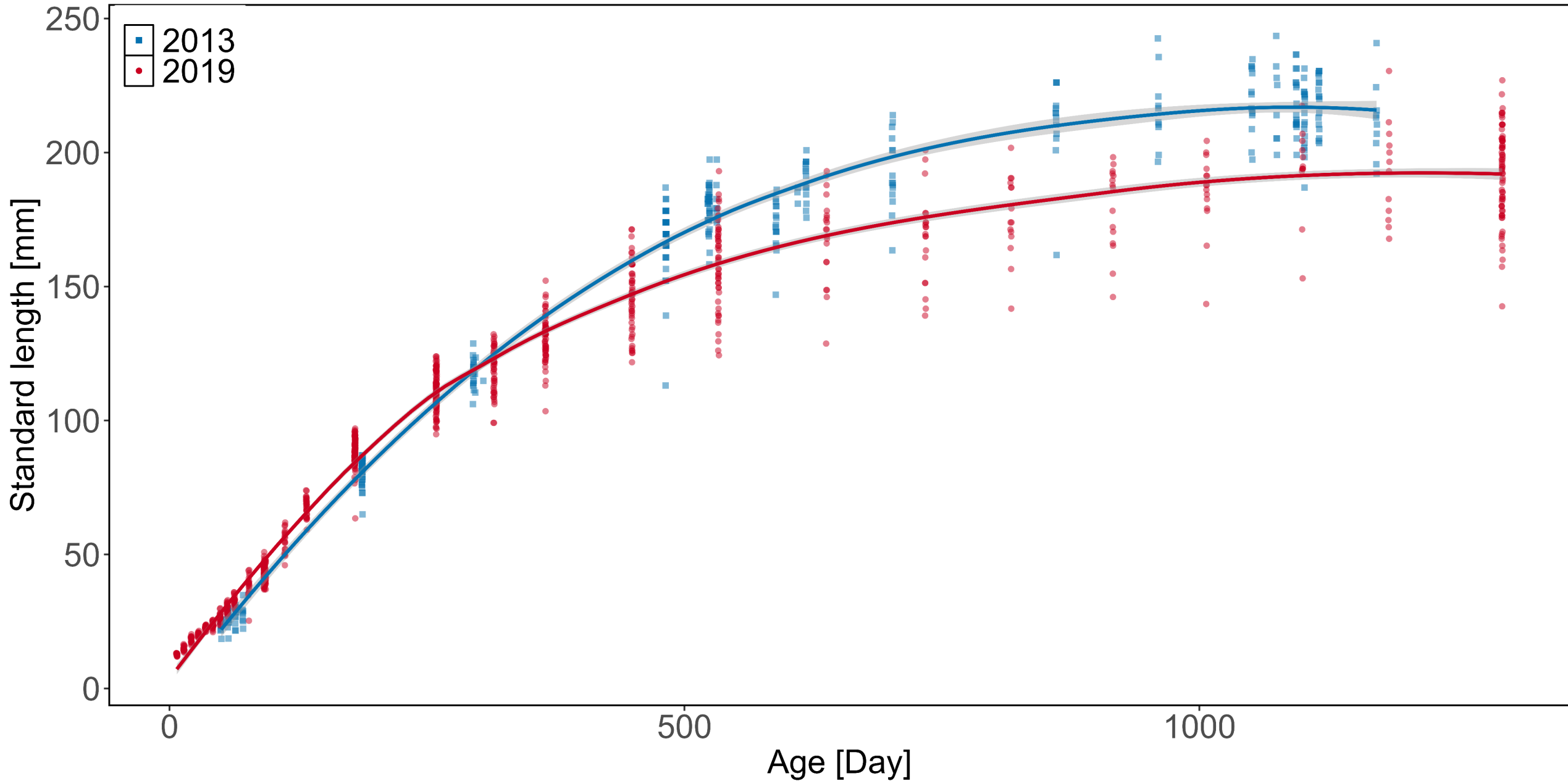
Growth in relation to light for 3.5 years



Growth in relation to temperature for 3.5 years



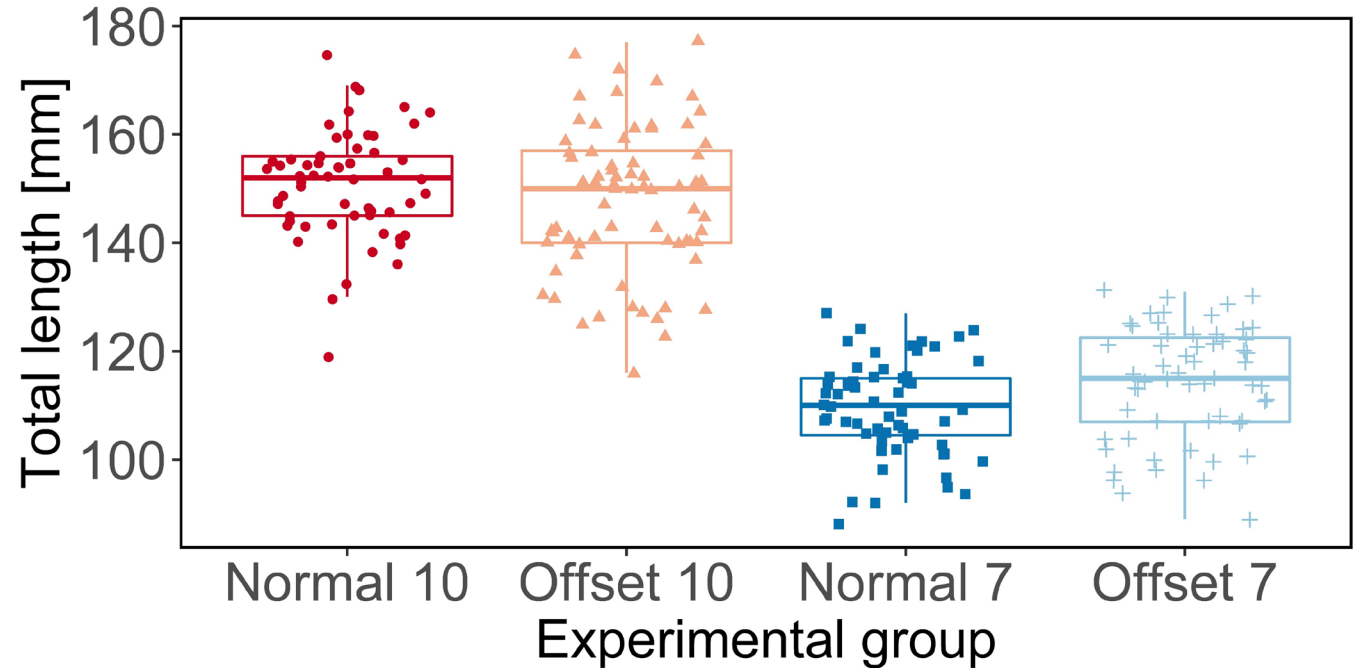
Growth comparison between experiments



Conclusion

Hypothesis

Longer daylight lengths early
in life will provide
growth advantage

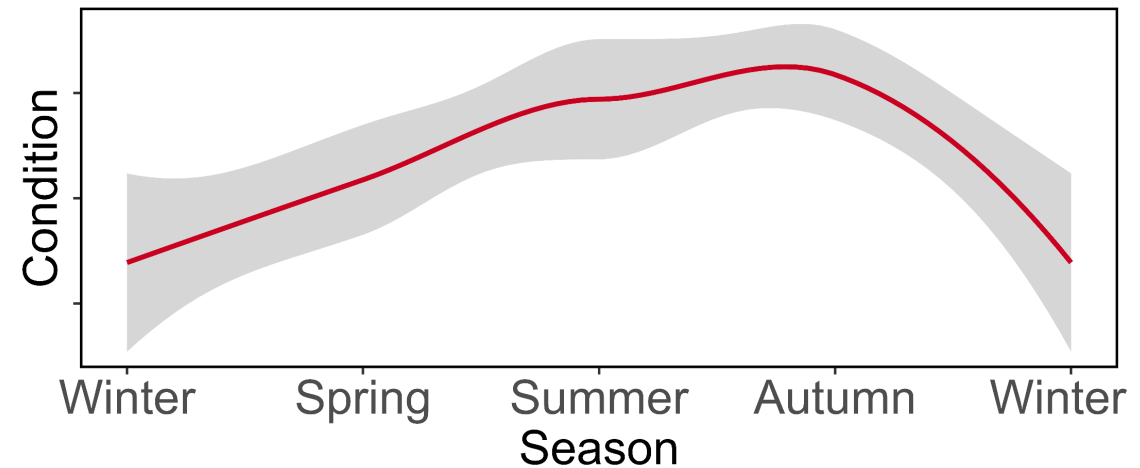
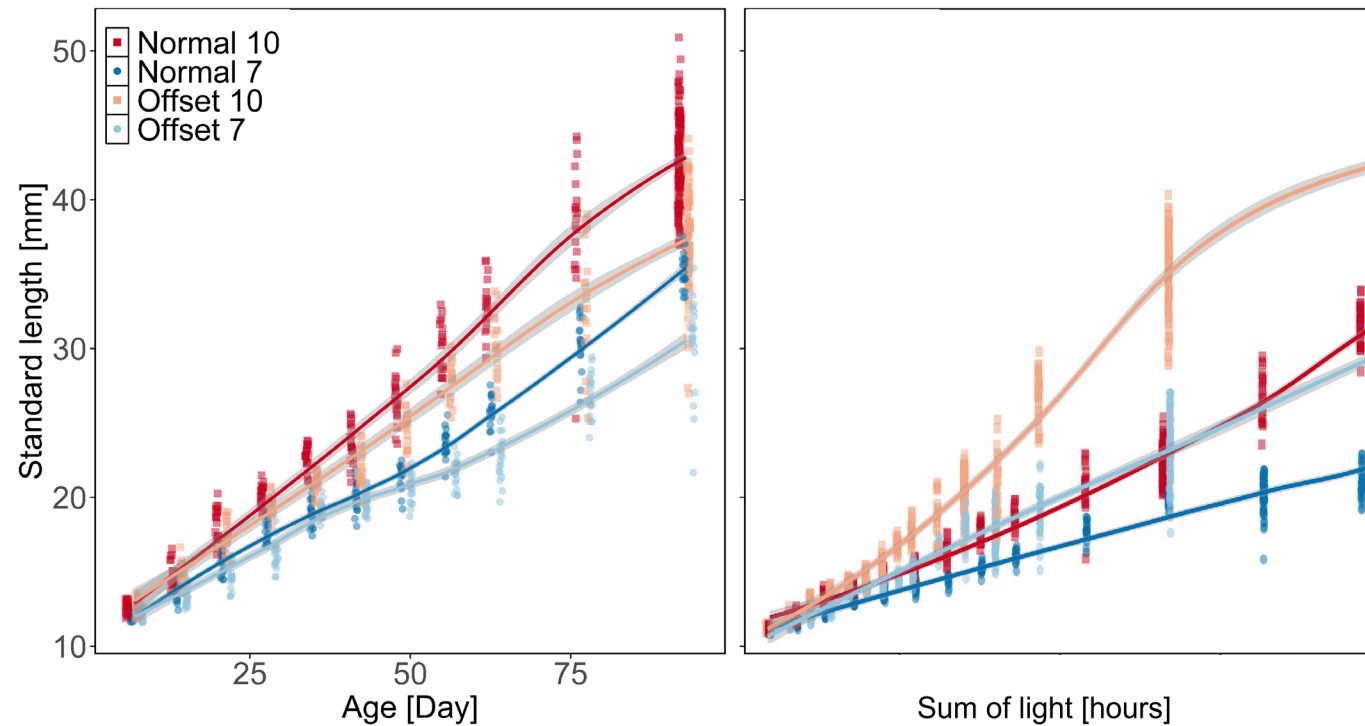


→ offspring with initial autumn conditions had the same size after one year = same amount of light

Conclusion

This long-term experiment shows

- the plasticity of Atlantic herring
- their ability to adapt to different environments
- their capability to scope with different trade-off situations



Thanks for your attention!





Questions

Please feel free to contact me:

→ florian.berg@hi.no