

Sexual maturation in post-smolt Salmon

Study on how temperature and photoperiod affect early maturation in post-smolt male Atlantic salmon in recirculating aquaculture systems (RAS).

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Abstract

New production strategies in Norwegian salmon farming are highly influenced by expanding production periods in land-based systems. In recirculating aquaculture systems one can facilitate environmental parameters to optimize growth. However, when intensifying the production early sexual maturation in male Atlantic salmon may occur. This study investigates the relationship between temperature and photoperiod regulation. Our analysis shows a correlation between early maturation and specific photoperiods and high temperatures.

Materials and methods

Study species

- Male Atlantic salmon (*Salmo salar*) in RAS

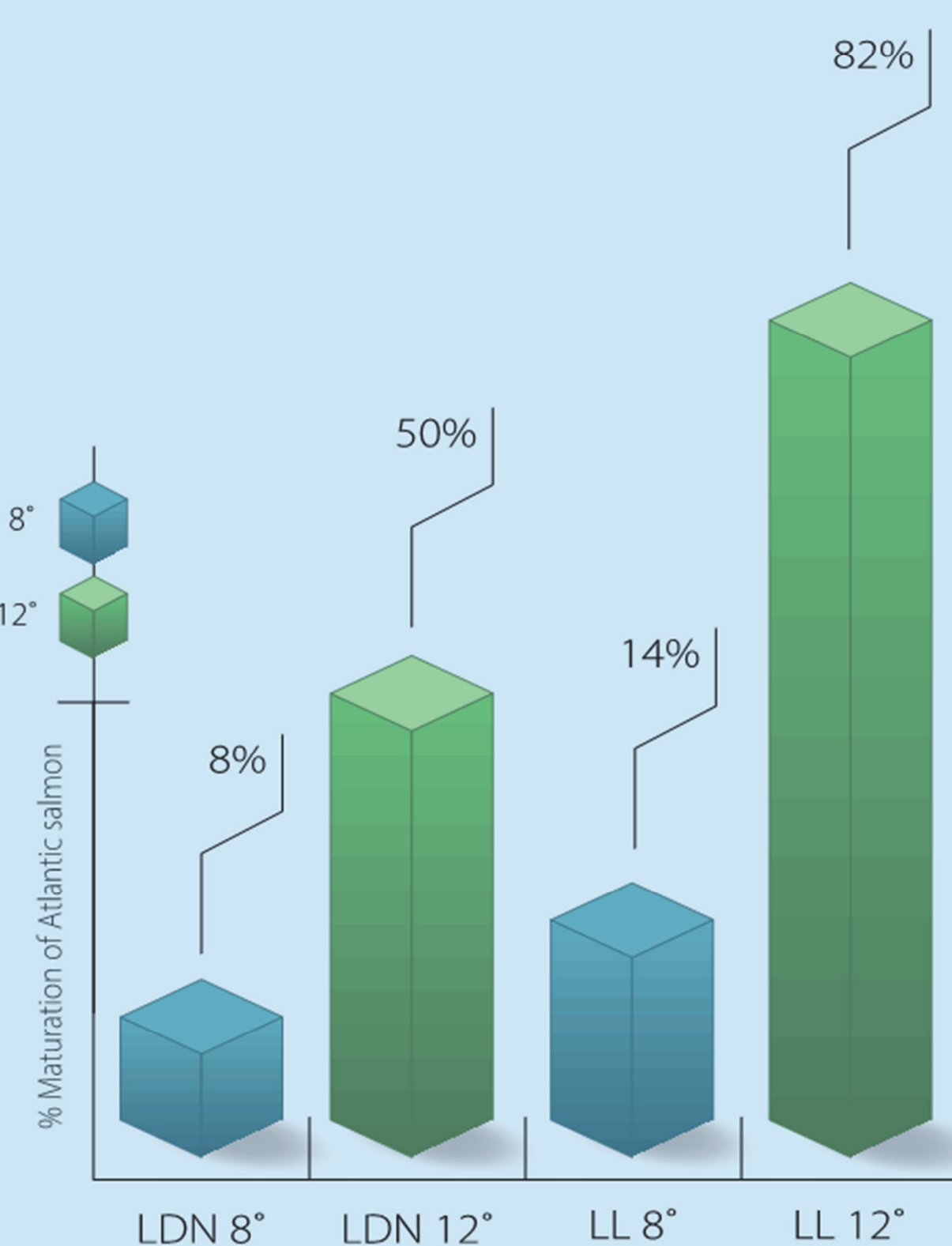
Variables

- Light
 - Continuous light
 - Natural light
- Temperature
 - 8,3 °C
 - 12,7 °C

Response

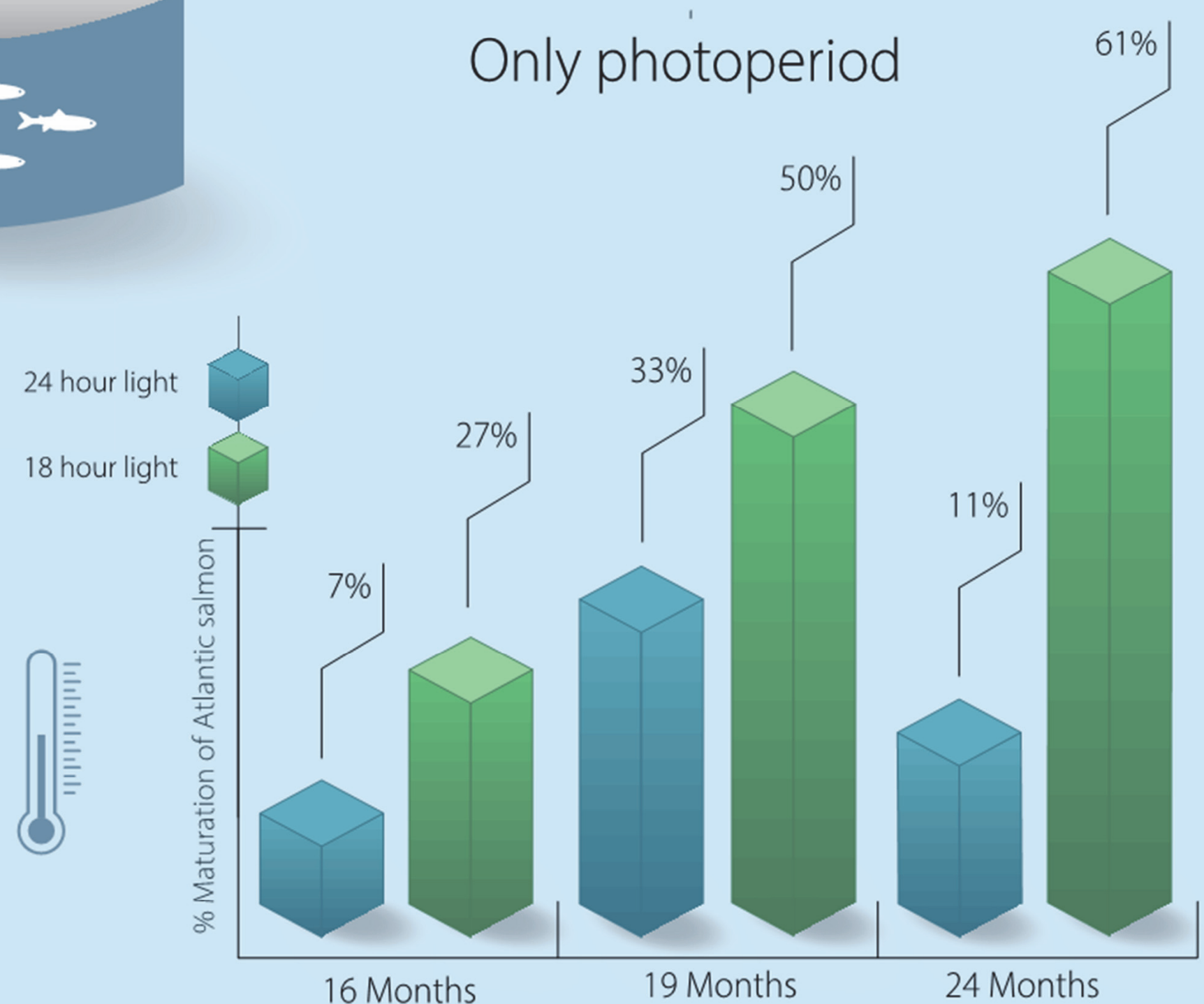
- Sexual maturation

Both photoperiod and temperature



Photoperiod and temperature effect on maturation of male Atlantic salmon modelled from data Imsland et al. (2014). LDN= simulated natural photoperiod (blue), LL = continuous light (green).

Only photoperiod



Photoperiodic effects on early maturation in male Atlantic salmon from post hatch. Modelled from Christopher Good et al. (2015), with variation in light regimes 24 h light (Blue) vs 18:6 h light (green).

Key findings

The largest proportion of sexually mature post-smolts was observed at high temperature (12°C) and continuous light (LL).

Light regimes had a lower effect on the proportion of sexually mature fish compared with temperature. Continuous light (LL) led to the largest proportion of sexually mature fish, in both temperatures (8 and 12 degrees Celsius). The largest proportion of sexually mature post-smolts was therefore observed at high temperature (12°C) and continuous light (LL).

Discussion

Our analysis identifies a correlation between early maturation, increased temperatures and photoperiod. Combining water temperatures and specific light regimes result in rapid growth and further a higher abundance of early matured male Atlantic salmon.

References:

Imsland, A.K., Handeland, S.O., Stefansson, S.O., 2014. Photoperiod and temperature effects on growth and maturation of pre- and post-smolt Atlantic salmon. *Aquacult Int* 22, 1331–1345. <https://doi.org/10.1007/s10499-014-9750-1>
Good, C., Weber, G.M., May, T., Davidson, J., Summerfelt, S., 2016. Reduced photoperiod (18 h light vs. 24 h light) during first-year rearing associated with increased early male maturation in Atlantic salmon *Salmo salar* cultured in a freshwater recirculation aquaculture system. *Aquaculture Research* 47, 3023–3027. <https://doi.org/10.1111/are.12741>



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