

Post-smolt performance in seawater; effect of winter signal, salinity and timing of sea transfer

HYPOTHESIS:

A prolonged land-phase in RAS and transfer at a larger size will improve seawater performance of Atlantic salmon

DURATION: 2016-2018

FISH SIZE TESTED: 100-4900 g

FISH SIZE TESTED: Brackish water, fresh water (set ppts 12 ppt and 0 ppt)

SALINITY TESTED: 24h light and a winter signal of 6 weeks (12:12 light:dark)

HIGHLIGHTS:

- Seawater survival and growth performance was compared in salmon given a winter signal in RAS or using 24 light the entire RAS period. Both photoperiod treatments were replicated in freshwater and in brackish water RAS. The control group received a winter signal and was transferred to sea in August at the optimum smolt window when they were 100 g.
- 24 h light and 12 ppt had a positive effect on growth in RAS.
- After ponding in seawater, 24 h light in RAS led to slightly reduced growth rate measured as TGC (thermal growth coefficient) compared to fish given a winter signal in RAS when fish were transferred at 200 g.
- For fish transferred at 600 g, there were no effects of photoperiod in RAS on growth in seawater.
- Salinity in RAS prior to ponding did not affect seawater growth.
- Fish on 24 h light in RAS were bigger at slaughter compared to fish given a winter signal in RAS due to their larger size at sea transfer.
- Timing of sea transfer had the largest impact on growth in seawater; fish transferred at 600 g in December had lower TGC in seawater than fish transferred in September and October at 100 and 200 g respectively and lower final weight (Figure 1).
- Light regime and salinity in RAS did not affect survival in seawater. Mortality was slightly higher for fish transferred at 600 g (6.3%) compared to at 200 g (4.8%) and 100 g controls (5.1%).

PRACTICAL CONSIDERATIONS:

The performance in seawater cannot be directly compared among the size groups since they were transferred in August, September and December. However, fish transferred at 600 g had the highest day degree sum in the trial (RAS + seawater = 4857) and the lowest final bodyweight (4.1 kg). The 100 g control had the lowest day degree sum in the trial (4587) but



the highest final bodyweight (4.9kg). The 100 g controls spent 454 days in seawater and the 600 g transfer 344 days. Salmon transferred at 600 g would need another 35 more days in seawater to reach the same slaughter weight as the control fish, but the total time in seawater would still be 75 days less than the control. (= 4857) and the lowest final bodyweight (4.1 kg). The 100 g control had the lowest day degree sum in the trial (4587) but the highest final bodyweight (4.9kg). The 100 g controls spent 454 days in seawater and the 600 g transfer 344 days. Salmon transferred at 600 g would need another 35 more days in seawater to reach the same slaughter weight as the control fish, but the total time in seawater would still be 75 days less than the control.

RECOMMENDATION:

- To avoid negative effects on growth and survival after sea transfer, it is considered safe to keep salmon on land until they are 200 g, and then transfer them to sea.
- A winter signal in RAS may not be necessary for fish transferred at 200 and 600 g. Fish above 200 g produced with 24h light in RAS was largest at slaughter for both transfer sizes, and mortality in seawater was similar

The factsheet is ready for implementation, but with the note that the testing has not been done for all industrial relevant conditions.

for both photoperiod regimes. However, all of the larger smolt groups did not have the same performance as 100 g controls produced with winter signal and ponded in August.

- Using 12 ppt gave better growth in RAS compared to using freshwater, particularly for fish on 24h light. Thus, using 12 ppt in RAS may be beneficial when fish are not given a winter signal to induce smoltification.
- Transfer at 600 g can despite lower growth in seawater still be beneficial due to reduced time in seawater, which is important in areas heavily affected with salmon louse.

READ MORE:

- Nofima-report 38/2018: Hva betyr fremtidens produksjonsstrategier for ytelse, helse og velferd i sjøfasen (BENCHMARK). ISBN 978-82-8296-576-7 (pdf)
- Ytrestøyl et al., 2022. <https://doi.org/10.1111/jwas.12880>.

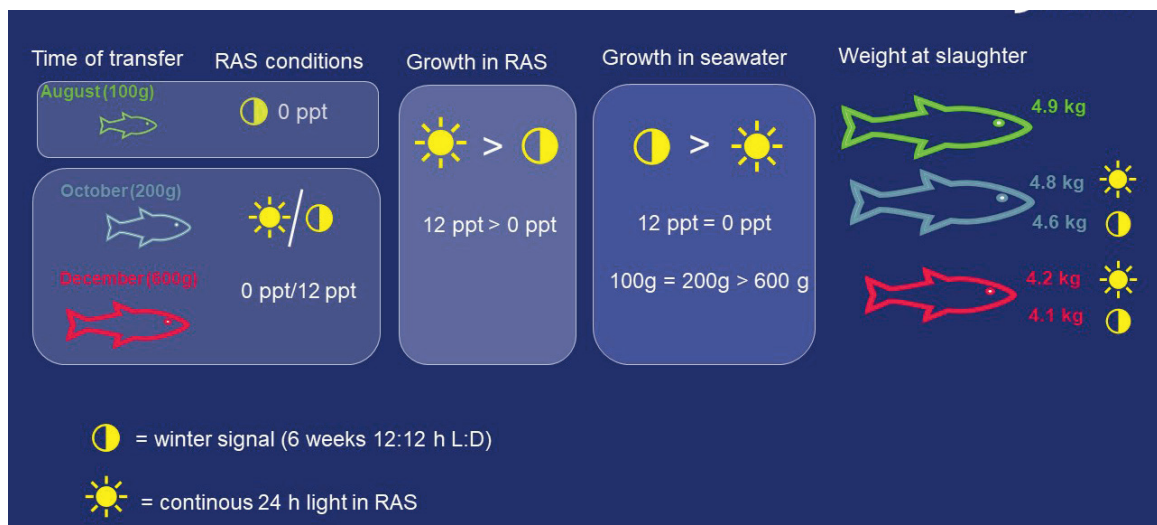


Figure 1: Effects of photoperiod, salinity in RAS on growth in RAS and in seawater in fish transferred to seawater at the optimal smolt window in August at 100 g (control), in October (at 200 g) and in December (at 600 g).