PROJECT: BENCHMARK 2, OPTIMIZE, ROBUST
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CtrlAQUA

Energy status after seawater transfer in Atlantic salmon post-smolts with different life history in RAS

HYPOTHESIS:

The plasma biochemistry reflects the fish's nutritional, welfare, and health status. We aimed to evaluate the energy status in salmon post-smolts with different production protocols in RAS (photoperiod, salinity, size at transfer), 12 weeks after seawater transfer to different water temperatures and photoperiods.

DURATION: 2021-2023, target life stage: post-smolts 12 weeks after seawater transfer

FISH SIZE TESTED: Ponding weight: 300 and 800 g. Final weight: 750 and 1500 g

HIGHLIGHTS:

Growth:

- The growth rate (calculated from individually tagged fish body weight measurements at the moment of seawater transfer and 12 weeks after being in seawater) was higher for smolts transferred at 300 g seawater to a 12 weeks grow-out in seawater compared to those transferred at 800 g to grow-out in 12 weeks in seawater (Fig. 1).
- In both sizes, post-smolts reared in 12 °C seawater, showed significantly higher growth rates compared to 6 °C (Fig. 1).

Metabolites and Life History:

- RAS life history (photoperiod and salinity) did not play a major role in plasma metabolites in 300 g seawater transferred fish at both temperatures nor in 800 g ones reared at 12 °C.
- However, RAS photoperiod history (timing and length of the winter signal) significantly modulated the energy level (except for glucose) in 800 g seawater-transferred fish reared at 6 °C.

Metabolites and Seawater Temperature:

- When pooling the data from each temperature, we found that, in 300 g seawater transferred fish, all metabolites (except for glucose), showed significantly lower levels at 12 °C compared to 6 °C (Fig. 1).
- In 800 g seawater-transferred fish, the opposite trend was observed; all metabolites (except for triglycerides) showed significantly higher levels at 12 °C (Fig. 1).
- In both size groups, glucose followed the growth rate trend, being higher at 12 °C, compared to 6 °C (Fig. 1).

RECOMMENDATION:

- Plasma protein level is a good indicator of the nutritional status of fish. Suboptimal nutrition and stress could lead to alterations in this parameter because of amino acid oxidation or peripheral proteolysis.
- Poor rearing conditions could also reduce plasma triglycerides and cholesterol, as these energetic substrates might need to compensate for reduced lipogenesis.
- Transfer of 300 gram fish to seawater at 12 °C might not be optimum, as they are still growing fast and require more energy. Therefore, depletion of energetic substrates may occur at this high temperature, when still keeping up with high energy demands for high growth rates.

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

- On the other hand, 800 gram fish seem to be able to be transferred to seawater at 12 °C, and still maintain the capacity to grow and have high energy levels at plasma.

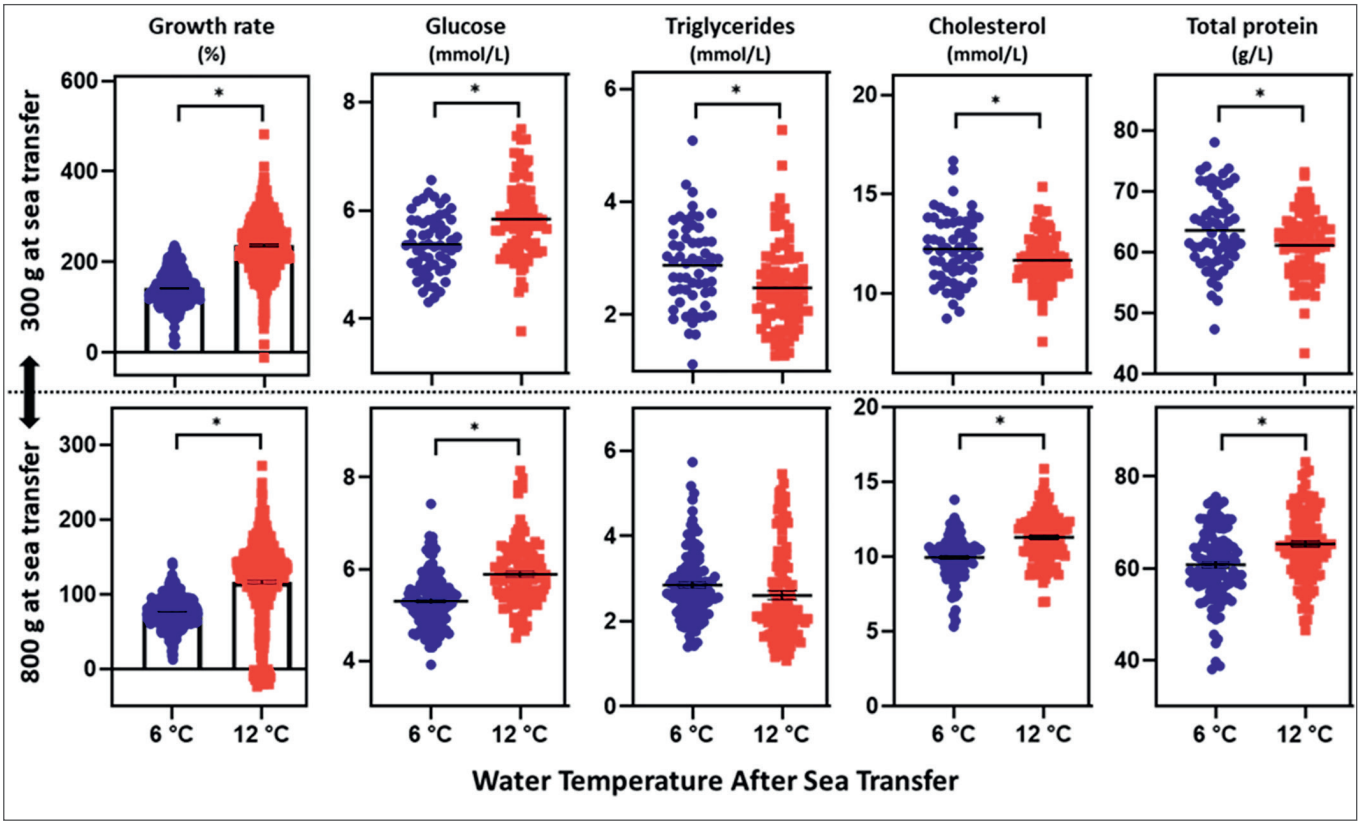

Figure 1. Effect of seawater temperature on growth rate and plasma metabolites in Atlantic salmon post-smolts. (*) denote significant differences between 6 and 12 °C, according to the Unpaired t-Test ($p < 0.05$).