PROJECT: OPTIMIZE
SYSTEM: Flow-through system
PARTNERS: NORCE, University of Bergen
CONTACT: Patrik Tang (ptan@norceresearch.no)

CtrlAQUA

Thermal optimization of post-smolt on- and off-season transfer and rearing strategies

HYPOTHESIS:

Seasonal thermal disturbances during post-smolt transfer and rearing strategies in SW can compromise fish health and welfare status.

DURATION: 2017-2020

FISH SIZE TESTED: 100-300 g

SALINITY TESTED: Salt water (SW)

HIGHLIGHTS:

- Post-smolt transfer from 13 °C down to 10 °C was the most optimal transition in terms of health and welfare for SW adapted post-smolt.
- Post-smolt transfer down to 4-7 °C or up to 16-18 °C impacted health and welfare, indicating elevated stress loads. Despite this, low temperatures still progressed good physiological adaptation to the thermal challenge. Conversely, post-smolt transfer to the high temperatures inhibited physiological capacities suggesting stress overload and compromised health and welfare status.
- Post-smolt transfer to colder temperatures may on average contain lower production risks compared to higher ones.

RECOMMENDATION:

- It is recommended to avoid post-smolt transfer when delta T > 3 °C.
- During cold (<10°C) and warm (>13°C) season months, improved welfare monitoring is recommended for post-smolts during the early SW phase.
- Thermal control using sea-based CCS, may provide important measures to stabilize year-round temperatures to secure good fish adaptation, health and welfare and mitigate production risks during the early SW phase.

READ MORE:

Tang, P. A., Gharbi, N., Nilsen, T. O., Gorissen, M., Stefansson, S. O., & Ebbesson, L. O. (2022). Increased Thermal Challenges Differentially Modulate Neural Plasticity and Stress Responses in Post-Smolt Atlantic Salmon (Salmo salar).

Tang, P. A., Stefansson, S. O., Nilsen, T. O., Gharbi, N., Lai, F., Tronci, V., ... & Ebbesson, L. O. (2022). Exposure to cold temperatures differentially modulates neural plasticity and stress responses in post-smolt Atlantic salmon (Salmo salar). Aquaculture, 560, 738458.

Alfonso, S., Gesto, M., & Sadoul, B. (2021). Temperature increase and its effects on fish stress physiology in the context of global warming. Journal of Fish Biology, 98(6), 1496-1508.

Schulte, P. M. (2014). What is environmental stress? Insights from fish living in a variable environment. Journal of Experimental Biology, 217(1), 23-34.

Schulte, P. M. (2015). The effects of temperature on aerobic metabolism: towards a mechanistic understanding of the responses of ectotherms to a changing environment. The Journal of experimental biology, 218(12), 1856-1866.

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