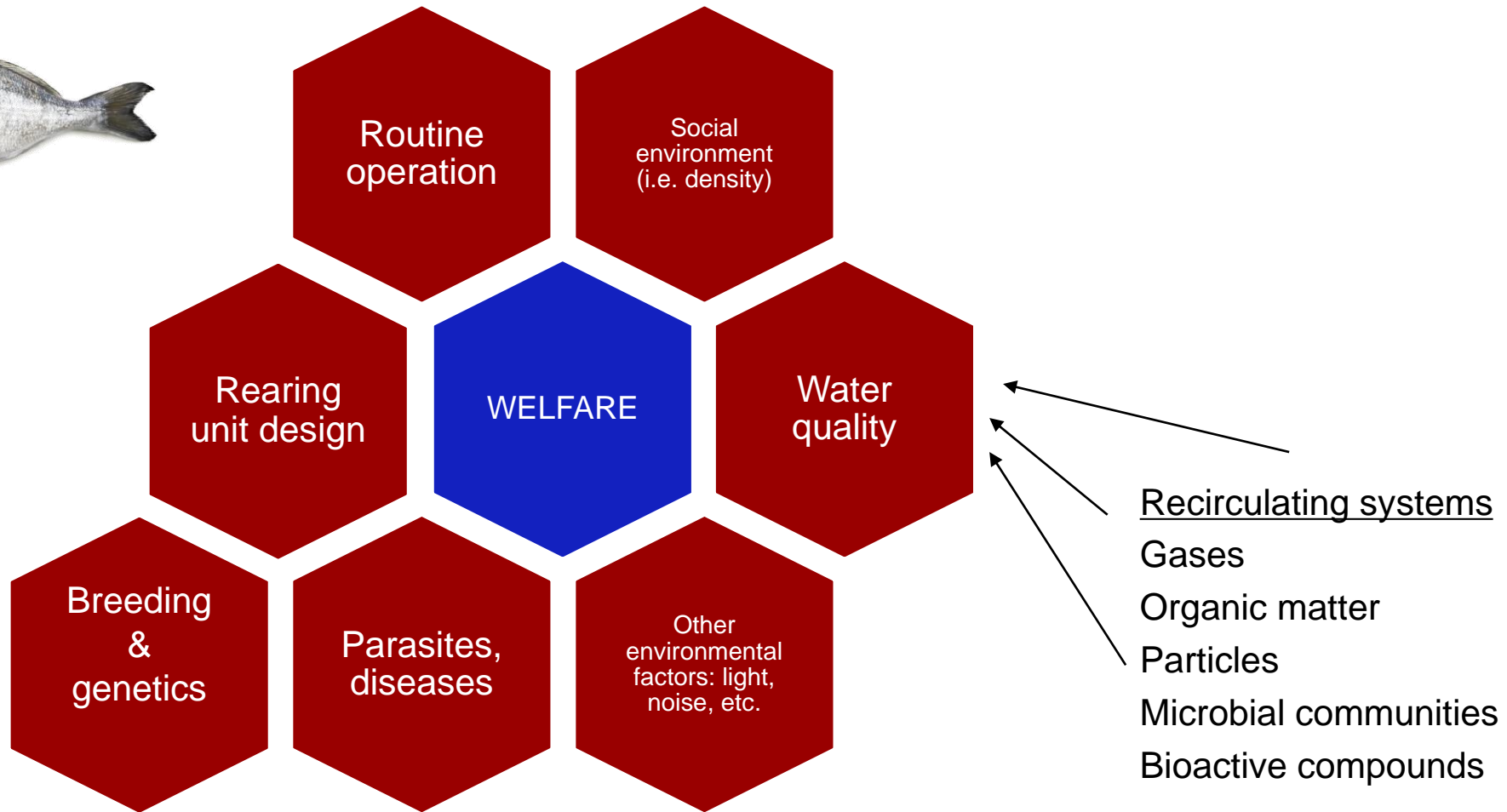




Manuel Gesto

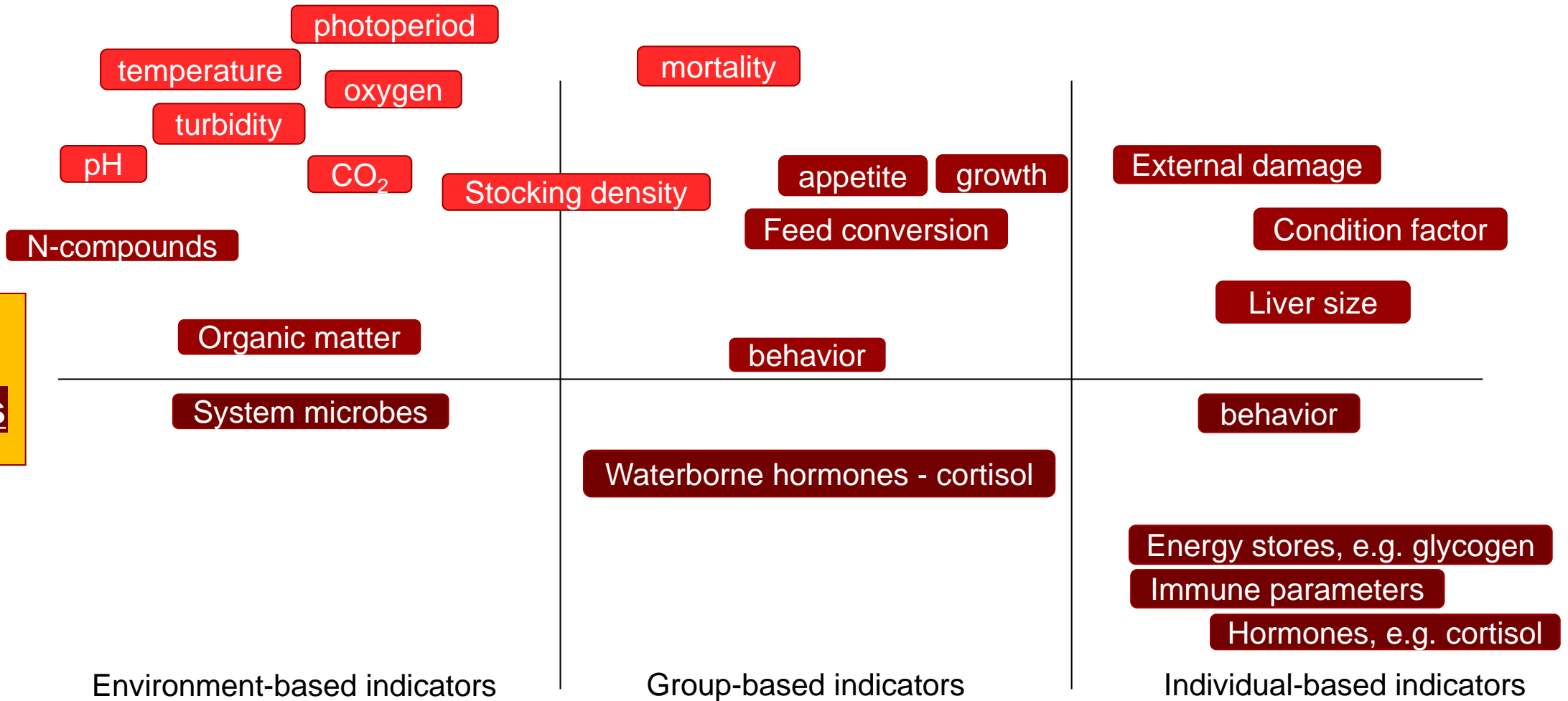
Fiskevelfærd i recirkulerede anlæg

Welfare in aquaculture



Evaluation of welfare in fish farms

OWIs
LABWIs



Evaluation of welfare in fish farms

Lack of information about fish-based welfare indicators in fish farms (Denmark and worldwide)

Aim of this case study:

- Investigate the functionality of different **fish-based indicators** (both OWIs and LABWIs) in Danish trout RAS farms to see how informative they are about fish welfare in a real scenario.
 - Real scenario: We took advantage of an episode of high mortality in a farm. Good case since there were high mortality and low mortality units in the same RAS system (so all environmental conditions were similar both units)

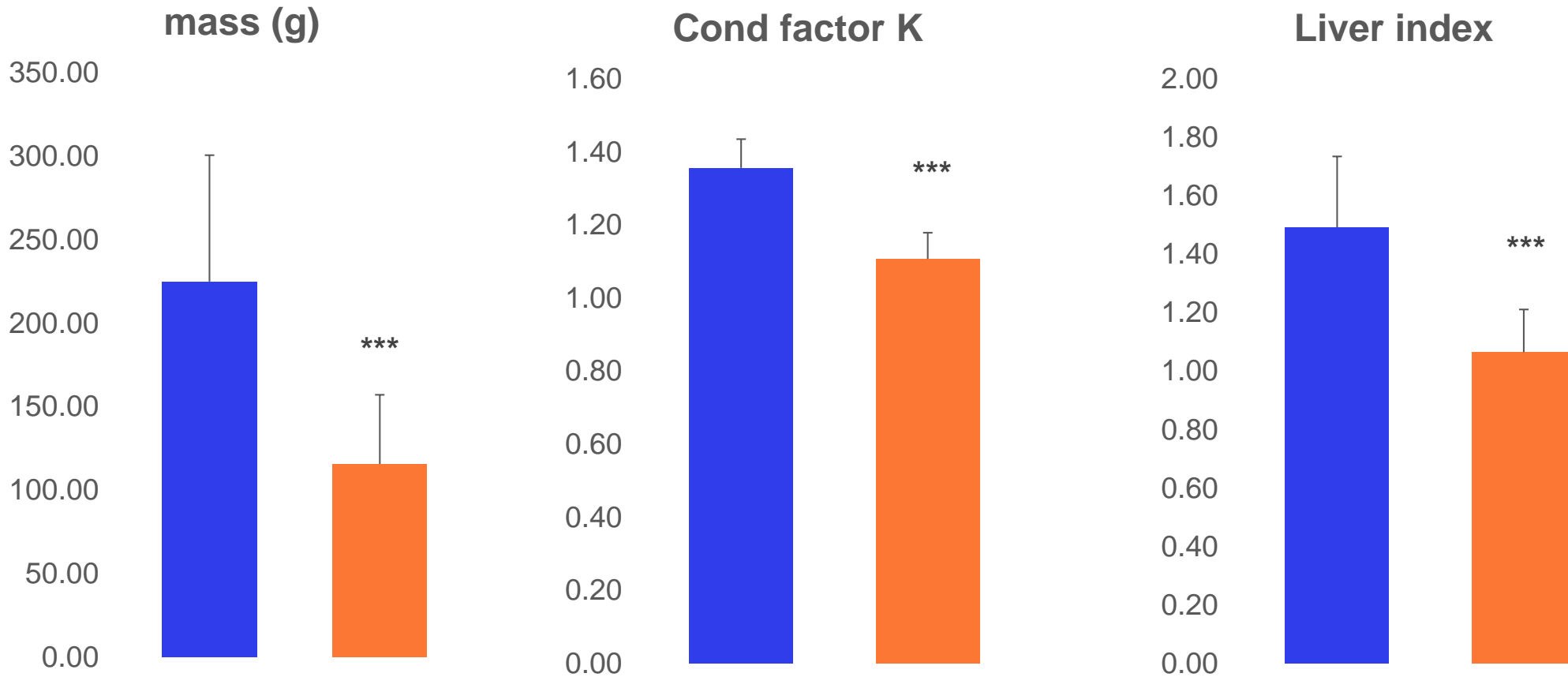
Methods/sampling

- Fish sampled in the case farm on two different occasions (only data from first sampling shown).
- Fish individuals were sampled from two units in the same RAS system. Units were reported to differ in daily mortality for some weeks.
- Welfare indicators measured:
 - Growth performance: Fish mass, length, condition factor
 - Nutritional status: liver size
 - External condition: Damage on fins, skin, operculum, snout/mouth, eyes + gill condition
 - Stress-related hormones/metabolites in the fish blood: Cortisol, glucose, lactate, lysozyme.

Summary of results

Growth performance and nutritional status

■ Unit A: Low mortality
■ Unit B: High mortality
 *both units in same RAS



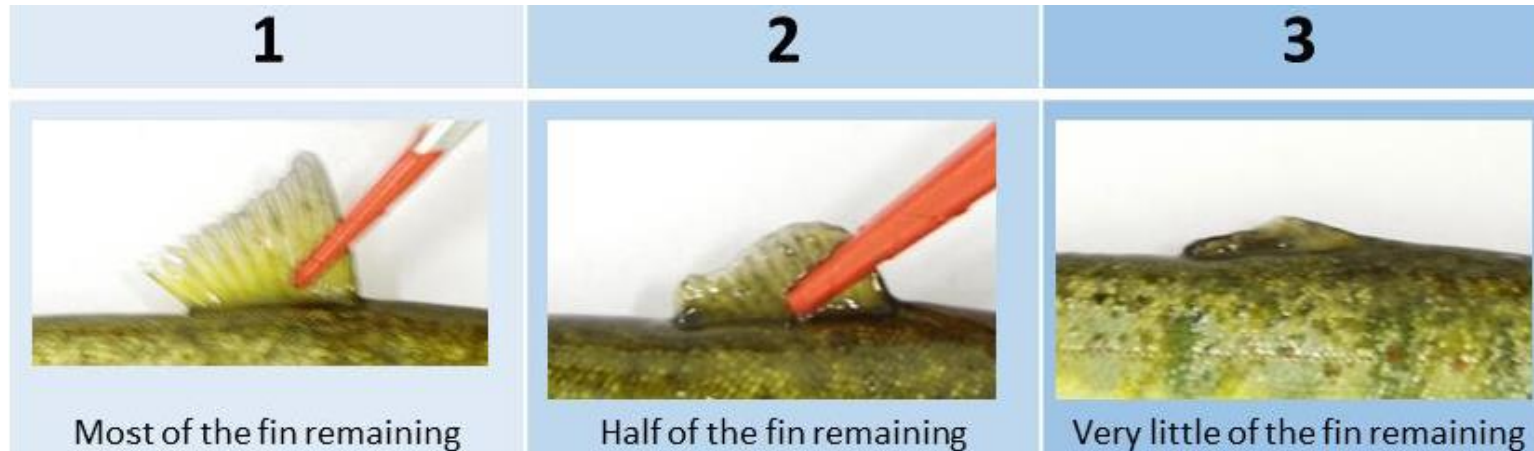
External damage scores

External damage was scored for: fins, skin, snout/mouth, gill, operculum, eye.

4-step scale from 0 (no damage), to 3 (severe damage)

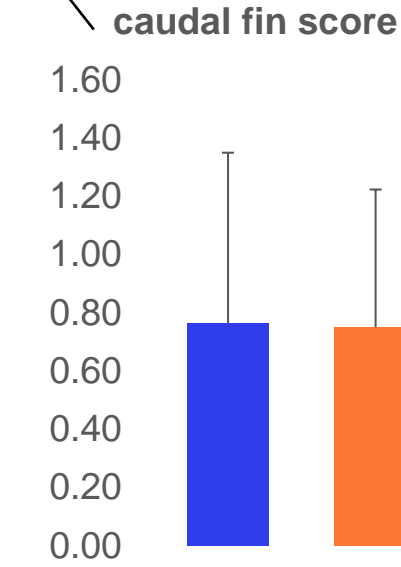
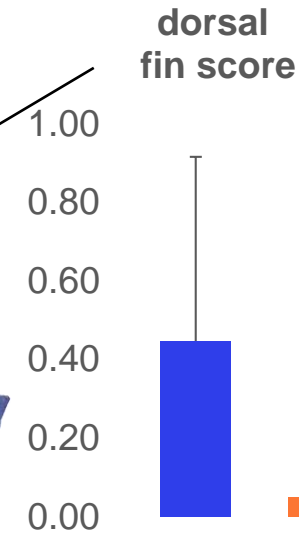
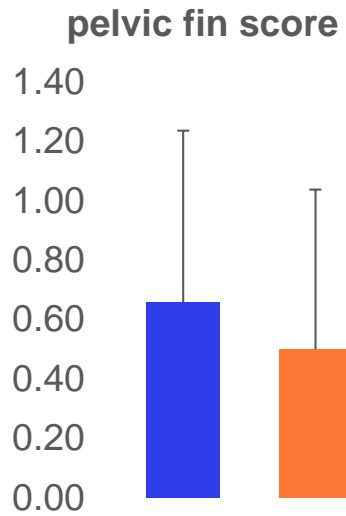
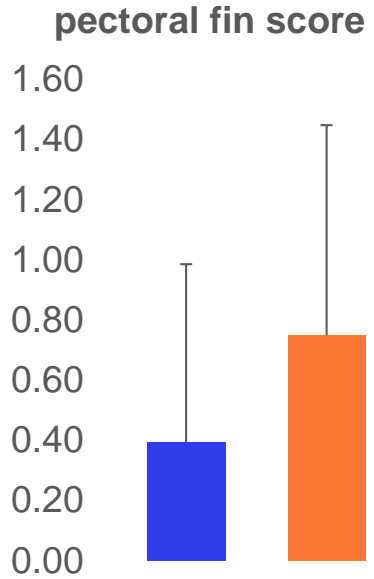
Only fins and gill showed relevant damage

Example:

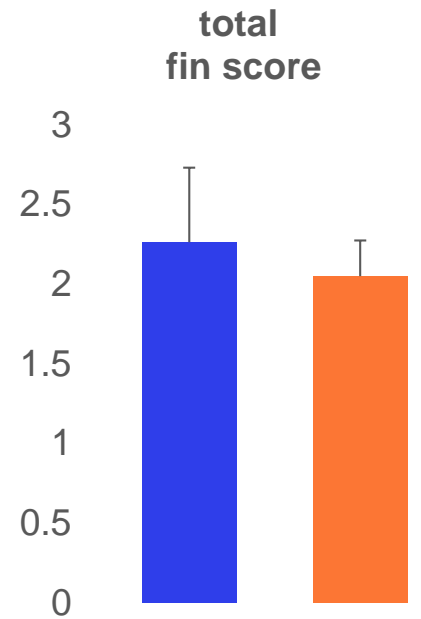


Noble, C., Gismervik, K., Iversen, M. H., Kolarevic, J., Nilsson, J., Stien, L. H. & Turnbull, J. F. (Eds.) (2020). Welfare Indicators for farmed rainbow trout: tools for assessing fish welfare 310 pp

Fin damage

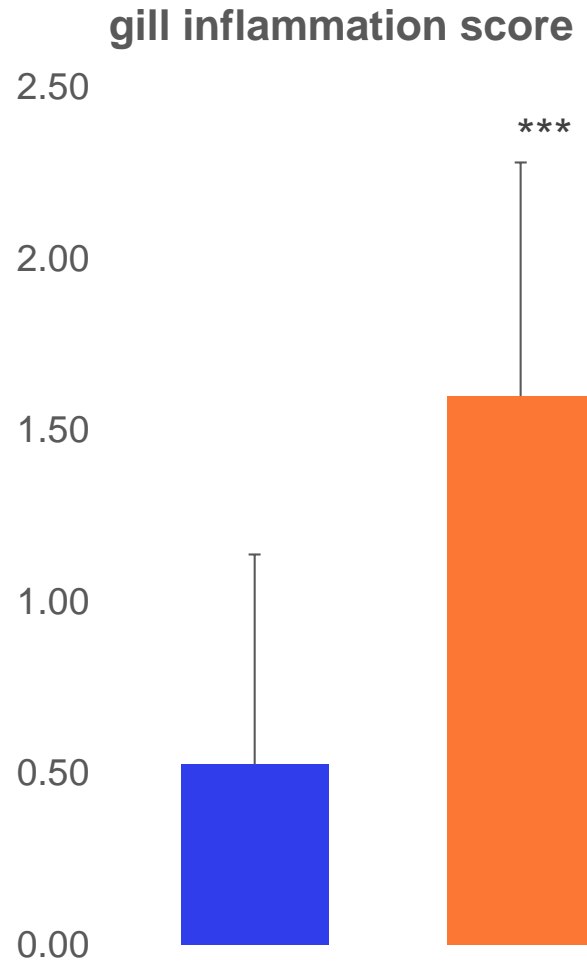


■ Unit A: Low mortality
■ Unit B: High mortality
 *both units in same RAS

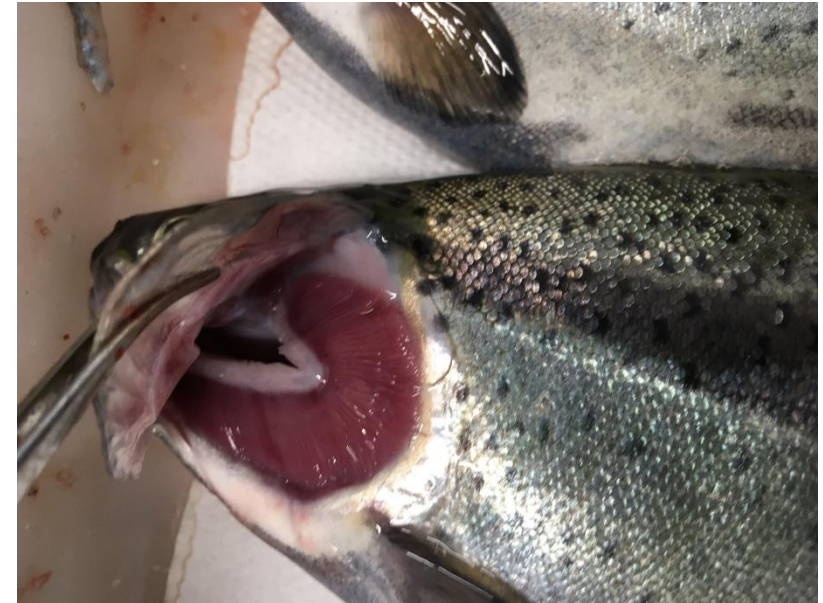


■ Unit A: Low mortality
■ Unit B: High mortality
 *both units in same RAS

Gill status (macroscopic)



Score = 0

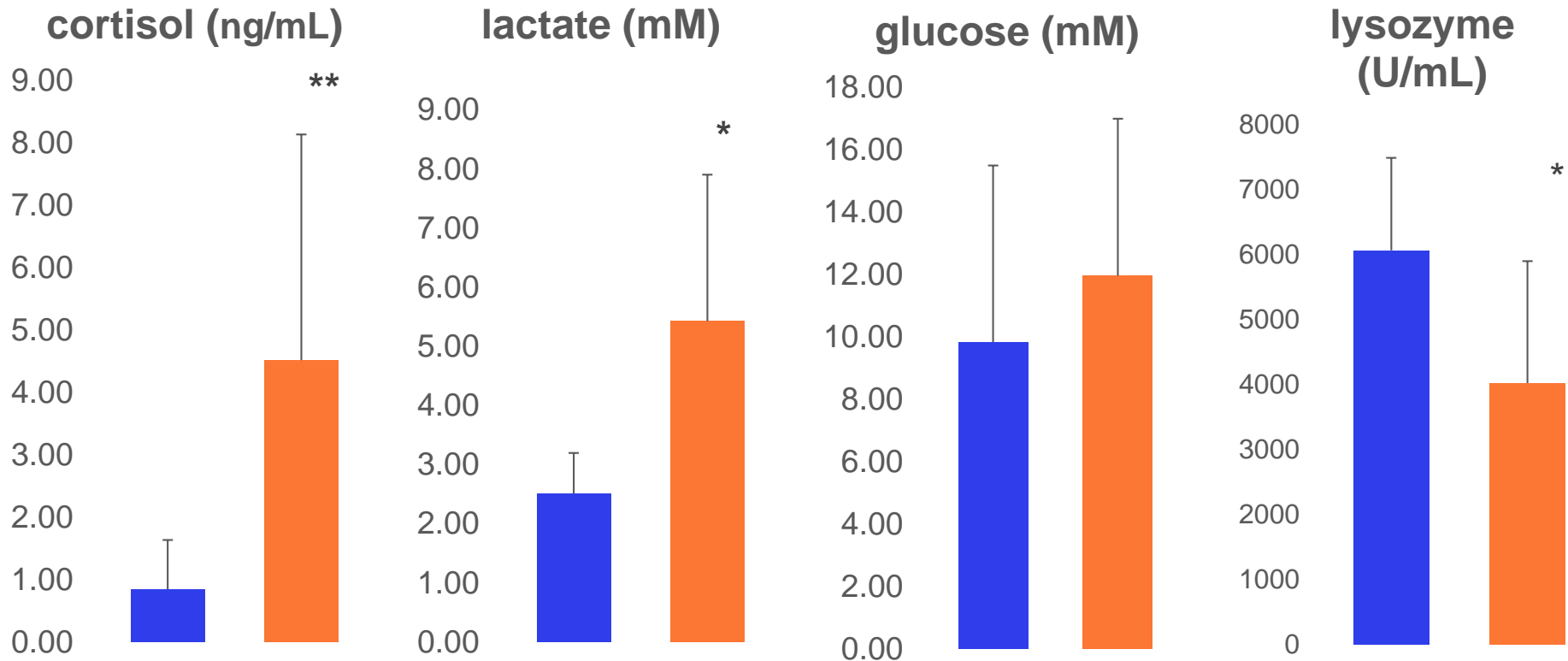


Score = 2



■ Unit A: Low mortality
■ Unit B: High mortality
 *both units in same RAS

Stress-related markers - blood



Conclusions/remarks

Growth, nutrition and stress indicators, together with gill external appearance, clearly demonstrate compromised welfare in the unit showing high mortality.

LABWI are generally more informative than many OWIs.

Value of specific welfare indicator can depend on the cause of poor welfare. An array of different indicators is important to assess Welfare, but also to infer the potential causes of poor welfare conditions.

Need to investigate the potential use of this markers as EARLY indicators of welfare condition and causes of potential issues – BEFORE mortality.

Urgent need of data to document/report fish welfare in Danish farms to detect strengths and weaknesses of Danish Aquaculture and come with solutions.

Farm-specific historic data is important to understand welfare and detect deviations from normal. Monitoring plans?