

Non-invasive measurement of acute stress in pikeperch (*Sander lucioperca*): PLASMA CORTISOL VS. CORTISOL IN WATER

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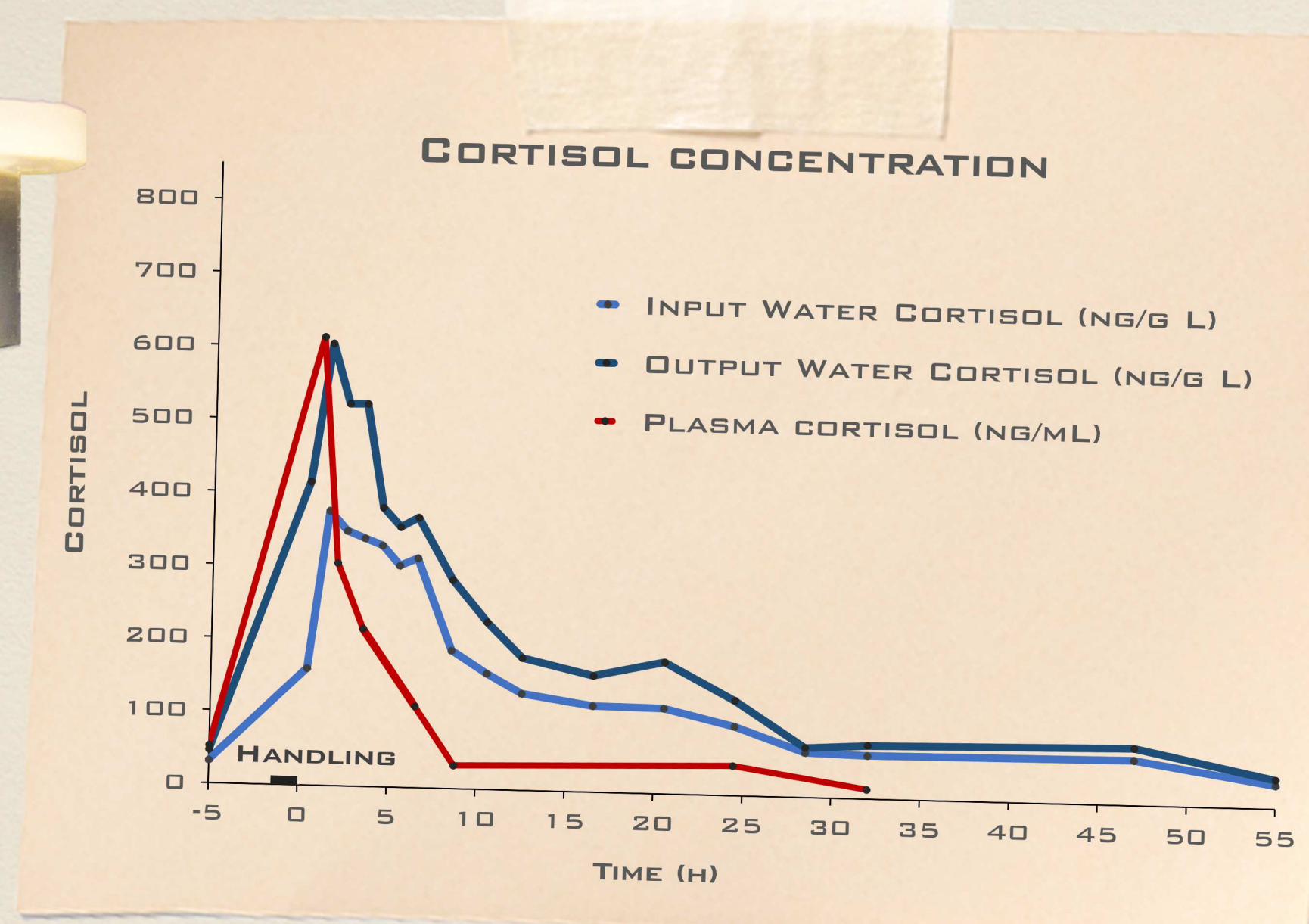
“Cortisol is the main corticosteroid in teleost fish and its plasma concentrations rises dramatically in response to stressful situations and therefore it is widely used for assessing stress. Some studies have shown that cortisol is one of the steroids fish release to the water and it is proportional to the concentration of free cortisol in plasma over a given period of time. Therefore, water cortisol could be used as non-invasive method to indicate stress levels in fish.”

The present study was performed to evaluate the non-invasive monitoring of cortisol excreted in water as a tool to assess the recovery of pikeperch from the stress experienced by handling.

[Ruane, N.M. and Komen, H. (2003); Aquaculture 218, 685–693; Ellis, T., et al. (2004); Journal of Fish Biology 44, 1233–1252; Scott, A. and Ellis, T. (2007); General and comparative endocrinology 153, 392–400; Fanouraki, E., et al. (2008); Behaviour 145, 1267–1281; Scott, A. et al. (2008); Behaviour 145, 1307–1328; Wong, S., et al. (2008); Behaviour 145, 1283–1305; Ellis, T., et al. (2013); Veterinary Medicine Austria 108, 255–269; Brüning, A., et al. (2014); Submitted paper.]

During 48 h post-handling pikeperch reared in a RAS:

- Plasma samples of 64 fish.
- 17 x 2 Water Samples of the system inflow and outflow.
- For extracting the cortisol of the water, samples pumped (10 ml/min) through short cartridges previously activated with 5 mL methanol.
- Steroid hormones eluted from each cartridge using 5 mL ethylacetate.
- Eluate evaporated under a nitrogen stream.
- Precipitate reconstituted with 0.5 mL buffer (PBS pH7.2 +5% EtOH+ 0.1% BSA)
- Cortisol concentration measured by an enzyme-linked immunosorbent assay (Cortisol ELISA, IBL).



RESULTS

- Cortisol concentration of the input water was lower than in the output.
- Cortisol concentration in water greatly elevated 30 minutes post-handling.
- Maximum cortisol concentration at ~1 h in plasma and ~1.5 h in water with a subsequent decrease.
- Increased cortisol concentration in water lasted longer (throughout 24 h post-handling) than in fish plasma (throughout 9 h post-handling).
- Cortisol concentrations in water and plasma closely related during all the studied period.

CONCLUSIONS

- Cortisol is released into water by pikeperch. ✓
- Strong evidence that cortisol levels in water increase in response to stress and are positively correlated with plasma cortisol levels. ✓
- Cortisol in input water lower than in output. Cortisol eliminated by the filter ←
- Measuring cortisol concentration in water can be used as a non-invasive method for the assessment of the stress status and improves animal welfare.

