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STUDYING ROBUSTNESS IN SALMONIDS BY EXTRACTING SENSITIVITY AND RECOVERY CAPACITY FROM PHYSIOLOGICAL AND BEHAVIORAL TEMPORAL PATTERNS

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By being resistant and resilient to acute environmental perturbations, robust fish are increasingly studied in the light of global change and sustainable breeding. Stress mechanisms are underlying key components of the robustness and provide, in particular, information on the sensitivity and the ability to recover from an acute perturbation. In parallel, new technologies based on video analysis or biosensor will in a near future help monitoring fish and produce important dynamical data on behavioral and physiological stress mechanisms. New approaches need therefore to be developed to capture, integrate and compare key information on robustness from these various dynamic responses. Here we present a generic model developed to extract numerical and comparable robustness features from temporal patterns.

The model was tested on physiological and behavioral responses in rainbow trout facing a confinement challenge.

For that purpose, oxygen consumption, cortisol release rate but also group dispersion and group activity of two isogenic lines of juvenile rainbow trout were followed before, during and after a four hours confinement challenge.

In total 16 aquaria were followed and their temporal patterns for each responses were analyzed using a model developed in analogy to a physical model. The model (we called "SYPER") fitted correctly to the observed data (see example figure 1) and was able to characterize each aquarium on its resistant and resilient characteristics. The two lines showed very divergent results in their corticosteroid reactivity, whereas no correlation was observed between physiological and behavioral sensitivity or resilience in these lines. However, multivariate analysis based on the extracted characteristics showed interesting results on the between aquarium and the between line variability in coping strategies.

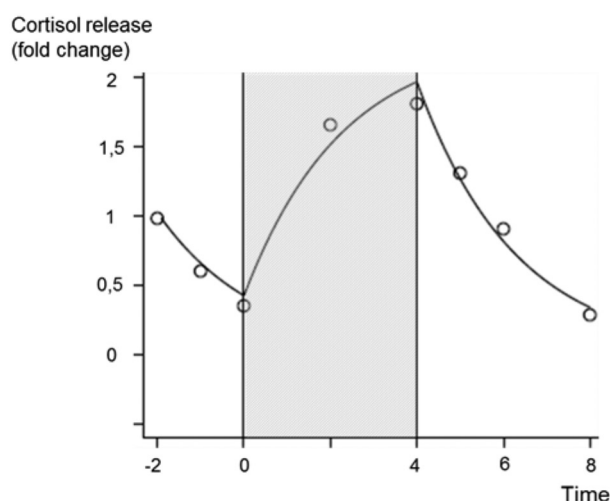


Figure 1. Fitting the SYPER model on water cortisol release rate data in a confinement challenge (shaded rectangle) experiment. The line represents the simulated data, the points the real data for one aquarium.