

**ARE BEHAVIOUR AND BODY COLOURATION  
EFFECTIVE DIAGNOSTIC TOOLS FOR ASSESSING  
ENVIRONMENTAL STRESS IN FISH?**

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**EXTENDED ABSTRACT ONLY – DO NOT CITE**

Physiological determinants of environmental stressors generally require either invasive or terminal sampling techniques, themselves imposing further stress and constraints on the animal subjects. Non-invasive methodologies utilising stress induced behavioural changes have resulted in successful studies of sub-lethal effects of stress. Video monitoring of behavioural interactions and general activity have been used within our laboratory in an attempt to integrate these observations within the known physiological and metabolic consequences of environmental stress.

For some time, there has been anecdotal evidence for colouration ('darkness') being a useful indicator of general stress in fish, but there are few published examples of quantification of this method in relation to environmental factors. A recently published study has quantified the effects of social stress and hierarchy on colour changes in salmon (O'Conner et al. 1999). In our presentation, we would like to focus upon this technique by examining the effects of environmental factors on these colour changes.

Using aluminium as the model stressor, we exposed brown trout (*Salmo trutta*) to a sub-lethal concentration of Al ( $13 \mu\text{g.l}^{-1}$  ramping from zero over a period of six hours) following acclimation to soft water and pH 5.2. Observations of swimming behaviour and body colour were made using CCTV and video

recording over 40 days exposure to these and control conditions. Correlations were made with physiological condition in parallel groups and by terminal sampling.

### **Reference**

O'Conner, K.I., Metcalfe, N.B., and Taylor, A.C. 1999. Does darkening signal submission in territorial contests between juvenile Atlantic salmon, *Salmo salar*? *Animal Behaviour* 58: 1269-1276.

