

**FRESHWATER TO SALTWATER:  
THE ROLE OF CRH IN MIGRATORY BEHAVIOUR  
IN JUVENILE SALMONIDS**

S.P. Clements,  
Oregon Cooperative Fish and Wildlife Research Unit,  
Department Of Fisheries and Wildlife, 104 Nash Hall,  
Oregon State University, Corvallis, OR 97331-3803, USA.  
Ph 541 7371964; Fax 541 7373590;  
email clemensh@ucs.orst.edu

C.B. Schreck,  
Oregon Cooperative Fish and Wildlife Research Unit, and  
U.S.G.S, Department of Fisheries and Wildlife, Oregon State University.  
email carl.schreck@orst.edu

**EXTENDED ABSTRACT ONLY – DO NOT CITE**

The physiological drivers of migratory behaviour in juvenile salmonids are at present unknown. Evidence suggests that hormones of the thyroid axis are associated with many of the behaviours exhibited by downstream migrants. Recently we have focussed on the behavioural effects of the neurohormone corticotropin releasing hormone (CRH). CRH is produced in response to a stressor and is thought to be the primary activator of the hypothalamic-pituitary-interrenal axis in fish. However, little is known about its role or secretion during times when the animal is not stressed. Amongst vertebrates CRH has activating effects on a number of behaviours commonly associated with the stress response including locomotor activity. CRH also appears to have similar activating effects within the central nervous system of fish. Application of this knowledge has led us to hypothesise that CRH may play a role in initiating the downstream migration of juvenile salmonids but also that migratory movements will be modified following the detection of a stressor. CRH is well situated to co-ordinate both the physiological and behavioural responses observed in smolting salmonids during both the parr-smolt transformation and in the response to a stressor.

To test these hypotheses we have conducted extensive radiotelemetry work on the Columbia River. Juvenile salmonids (*Oncorhynchus* spp.) were implanted gastrically with radio transmitters and released at several locations above and below the hydroelectric dams. Their migratory behaviour was monitored from the land, air and water. The results of this work suggest that the migratory behaviour of 'stressed' fish is significantly altered compared to 'unstressed' fish. Furthermore the behaviour of stressed fish significantly increased the likelihood of predation.

To investigate whether CRH has an effect on downstream swimming behaviour we conducted studies in the laboratory using artificial streams. The behaviour of both hatchery and wild fish was monitored following intracerebroventricular (ICV) injections of CRH or saline. The results of this study suggest that CRH does indeed have activating effects on downstream movement. However the response to ICV CRH appears to be a bimodal as several fish injected with CRH exhibited holding behaviour that is consistent with observations made on radio tagged fish.

Based on these results we suggest that modifications to the environment by human activities will disrupt normal migratory behaviour by activation of the stress response.

