

## **Report for 2001KY2341B: Where have all the yellow perch (*Perca flavescens*) gone: Are endocrine disruptors (Xenoestrogens) involved?**

- Conference Proceedings:
  - Lynn, Scott G. and Brian S. Shepherd, 2002, Herbicide Body Burdens and Endocrine Correlates in Yellow Perch (*Perca flavescens*) from Old Woman Creek (OWC) National Estuarine Research Reserve and Lake Erie, in Proceedings of the Ohio Valley Chapter of the Society of Environmental Toxicology and Chemistry (SETAC) Symposium entitled "Molecular Approaches to Toxicological Questions", University of Louisville, Louisville, KY, May 16-17, 2002.

Report Follows:

## **Problem and Research Objectives**

Growth, development and reproduction, in all vertebrates, are regulated through the orderly, but complex release of the pituitary hormones, growth hormone (GH) and prolactin (PRL). Adding to this complexity are pollutants that mimic/alter the actions of endogenous hormones. These hormonal mimetics are called "endocrine disrupting chemicals" (EDCs) or "xenoestrogens", because they possess estrogenic activities that can affect endogenous hormones in inappropriate ways. To date, studies have mainly focused on the effects of EDCs on physiological end-points, with little emphasis on the impacted endocrine pathways themselves. To understand the sub-lethal impacts of EDC exposure in aquatic vertebrates, an approach focused on determining the mechanism(s) of endocrine disruption is required. The study of an ecologically- and economically-important organism that responds uniquely to estrogen would facilitate our understanding in many ways. In this regard, our aim is to develop the yellow perch (*Perca flavescens*) as a model to study the effects of estrogenic EDCs on teleost endocrine physiology. An understanding of the endocrine physiology of this teleost will aid in future studies to improve the environmental monitoring and management practices of this important species in areas where endocrine disruption is suspected. To accomplish this, our immediate objective is to develop the molecular endocrine tools needed to investigate the endocrine mechanisms of development/growth in this teleost. Once characterized, the sub-lethal effects of EDCs on teleost physiology can then be explored.

## **Methods**

Molecular tools are being developed to characterize the hormonal pathways responsible for growth and development in yellow perch. We have obtained partial cDNA clones for PRL, GH (Courtesy of F. Goetz, Univ. of Notre Dame) and the estrogen receptor genes. RT-PCR procedures (5'-RACE) and automated DNA sequencing have been employed to clone and verify cDNA sequences. We also have partial cDNA clones for the pituitary hormone somatolactin (SL) and the insulin-like growth factors (IGFs I & II). Once full-length cDNAs are obtained, the sex-, tissue- and developmental-specific expression of these genes will be examined in yellow perch. In addition to our molecular studies, we are also working to purify native perch GH and PRL and to generate primary antibodies to these hormones. This will permit the development of assays to measure blood GH & PRL levels and receptor abundance, distribution and affinity in perch throughout the life-cycle and in those exposed to EDCs.

## **Principal Findings and Significance**

We have a full-length cDNA clone for perch GH (courtesy of F. Goetz, Univ. of Notre Dame), and partial clones for PRL and estrogen receptors-  $\alpha$  &  $-\beta$ . We have also cloned the hormones, somatolactin (SL: pituitary hormone), IGF-I & -II and will clone perch P-450 aromatase. We continue to obtain the full-length cDNAs for these clones and expect to have a paper describing expression patterns of GH, PRL and SL by the end of summer 2002. We have also collected pituitaries from approximately 6,000 animals for purification of native perch GH and PRL. Efforts to purify these hormones will be

well underway during summer 2002. This work was to be completed in collaboration with another lab, but this has not worked out. As a result, we have obtained a no-cost extension to set our laboratory up for this work. Also, in collaboration with Geoff Wall at (Ohio State Extension, Piketon, OH), we have begun rearing larval perch in order to examine developmental-specific patterns of gene expression. An understanding of the underlying endocrine physiology of yellow perch growth and reproduction will aid in future studies to improve the environmental monitoring, management practices and even the aquaculture and restoration of this important species.