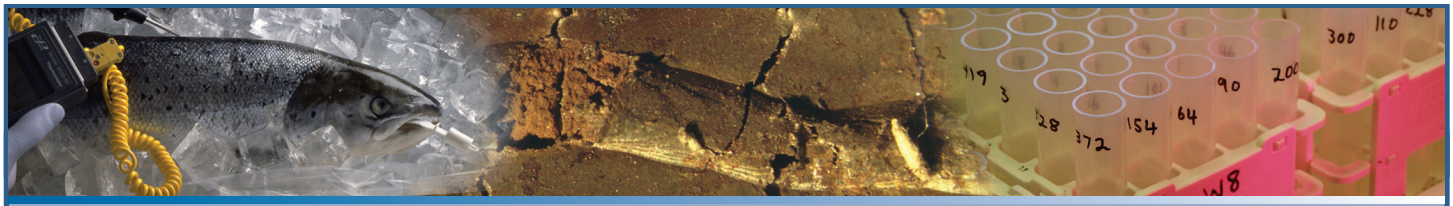

SCOPE

June 2008

RPC Welcomes New Scientist

In May, Dr. Tony Manning joined RPC's Food Fisheries & Aquaculture Group. Dr. Manning is a fish physiologist with experience in Atlantic cod, Atlantic salmon, haddock, and marine flatfishes. His doctoral research focused on fish reproduction, specifically sexual maturation, growth-reproduction interactions, and sex-control through triploidy induction. Prior to joining RPC, Dr. Manning worked as a post-doctoral research fellow at the NRC-Institute for Marine Biosciences in Halifax where he performed gene expression studies in larval fishes using techniques such as microarray and quantitative PCR. He was also part of a multidisciplinary team investigating vaccination measures against furunculosis in Atlantic salmon where his focus was on antibody responses and immunological memory in salmon following vaccination.

Dr. Manning is undertaking projects, on-going and new, where his expertise will be applied to scientific investigations that benefit our clients in the aquaculture industry. He is currently involved in several funded by the Department of Fisheries and Oceans (DFO) and the Atlantic Canada Opportunities Agencies (ACOA). Read more about these projects below.

Above: Dr. Tony Manning dissects fish samples for on-going projects at RPC.

Current Research Activities

Salmon-immune response to ISAV vaccination and infection

This project will be performed in collaboration with Novartis Animal Health (NAH) Canada Inc. The goal of the project is to determine which immune responses of Atlantic salmon provide protection against the infectious salmon anaemia virus (ISAV). The immune response to pathogen infection involves numerous defence mechanisms and the integration of different organs and cell types. The complexity of the immune system makes it very difficult to assess how an animal resists disease. Knowing which physiological mechanisms are activated to help fight ISAV infection is vital for the development of an effective vaccine. This information can be obtained by examining the genes that are expressed in the lymphatic tissues of salmon that have been able to survive an ISAV infection. One powerful method to help in this objective is the use of microarray technology. Microarray systems will permit the assessment of thousands of genes and will help to identify biomarkers and pathways involved in salmon ISAV resistance. Following careful analysis, this data can be used to develop vaccines that specifically activate the immune mechanisms that result in protection against ISAV. Comparative studies of gene expression patterns following natural infection or vaccination will help to ensure that the proper immune components are being targeted by a new generation of vaccines.

Did you know...

Genomics is the study of an organism's entire genome, that is, all the hereditary information (DNA or, for some viruses, RNA)

Genomics can be used to study how an organism responds to treatments at a molecular level.

DNA microarrays are often used in genomic studies to examine the expression of thousands of genes simultaneously.

Melatonin is approved in some countries as an agent to help reduce jet-lag.

Fish can be vaccinated to help protect them from disease.

Current Research Activities *continued...*

Fish Health Research in support of Multitrophic Aquaculture

Blue mussels are filter feeders and get their food by filtering out suspended particles in the water. Particles can include things like inorganic matter, zooplankton, phytoplankton, bacteria and viruses. With the introduction of Multitrophic Aquaculture into the Bay of Fundy, which involves co-culture of seaweeds and blue mussels alongside salmon cages, it was of interest to determine if mussels have an influence on the transmission of bacterial and viral diseases from pen to pen or site to site. To answer this question, Cooke Aquaculture, RPC and DFO have teamed up to test mussels and determine their ability to remove viruses such as Infectious Salmonid Anemia Virus (ISAV), Nodavirus, Infectious Pancreatic Necrosis Virus (IPNV), and bacterial pathogens such as *Renibacterium salmoninarum*, the causative agent of bacterial kidney disease (BKD), and an atypical strain of *Aeromonas salmonicida*. To examine this question, patogens were added to tanks of mussels and their abundance in the water was measured over a 24 hr period. Samples of mussel tissues were also sampled after 24 hrs to determine if the mussels were accumulating the pathogens. Results of these experiments are pending and will be presented at an upcoming meeting and reported in a scientific journal.

The assessment of the efficacy of supplementary lighting on salmon

Photoperiod plays a significant role in the development and maturation of salmon. Alterations in photoperiod can accelerate or decelerate smoltification or reproductive maturation. Appropriate manipulation of photoperiod can control spawning to allow for a year-round supply of eggs, control smoltification for the production of out-of-season smolts, and reduce grilse rates during grow-out thus resulting in enhanced growth and improved quality of the marketable product.

Artificial light therapy imposed during the natural dark cycle has been adopted by the salmon industry to delay sexual maturation through the disruption of seasonal cues. To fully optimize this treatment, consideration must be given to the optimum time of year to initiate the photoperiod treatment, the light and dark cycle regimen, the duration of treatment, as well as the intensity and spatial arrangement of light sources needed to adequately trigger the desired delay among all fish in a cage. Geographic location is an additional variable in the optimization process due to latitudinal differences in photoperiod and natural light intensity. Treatment regimes optimized for salmon in Norway may not be effective for salmon on the East Coast of Canada.

The focus of this study is to investigate the circulating levels of the neurohormone melatonin in salmon under natural and manipulated photoperiods in the Bay of Fundy region. Melatonin communicates information on seasonal changes in photoperiod, and is thus one of a number of factors that regulate reproduction. Light therapy during the night should decrease peak melatonin levels compared to fish under natural photoperiod. Melatonin levels will be related to grilse rates, fish weight, water temperatures, family/stock origin and light intensity measurements. This data should provide information on the effectiveness of the lighting regimes being used in reducing melatonin levels and give insight on how grilse rates might be further reduced.

Technology corner

NEW! Parvalbumin analysis at RPC: Testing for fish allergens

Seafood allergies result from an overreaction by the immune system to shellfish, finfish, or crustaceans and can cause severe physical symptoms in affected individuals. Parvalbumin is a calcium-binding protein that has been identified as a major seafood allergen in some fish. RPC can test for the presence of parvalbumin in seafood samples using an ELISA assay.

The ELISA (enzyme-linked immunosorbant assay) is performed in a microtitre plate which is coated with antibodies for fish parvalbumin. Samples are added to the plate and any parvalbumin present becomes bound by the coated antibodies. A second antibody to parvalbumin is then incubated in order to detect the bound parvalbumin. This “detecting” antibody has an enzyme attached which can cause a colour change in the presence of a specifically formulated solution. Parvalbumin concentration is determined by comparison with the proportional colour change seen within a calibration curve of known amounts of parvalbumin. The assay takes 24 hours to complete.

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