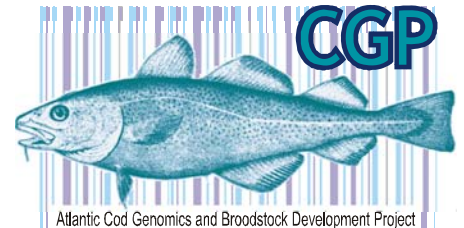




GenomeAtlantic

The Atlantic Cod Genomics and Broodstock Development Project



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Project Duration: 4 years
Project Budget: \$18M

For many years, the fishing industry in Atlantic Canada has been a major contributor to the region's cultural identity and economy. Declining fish stocks have brought many challenges to this



industry and to those dependent on the revenue it generated. The subsequent growth of the salmon aquaculture industry helped to revitalize the local economy but the aquaculture industry in the Atlantic Region would benefit from diversification in order to sustain growth.

While diversifying to other finfish species such as Atlantic cod seems a logical step, aquaculture often relies on wild populations for broodstock which do not always respond well to culture conditions. Therefore, the aquaculture industry would benefit significantly from strategies that allow selection of Atlantic cod that perform well in terms of growth, resistance to disease and stress, and other economically important factors, while ultimately giving good product quality. The Atlantic Cod Genomics and Broodstock Development Project (CGP), in partnership with the aquaculture industry, will identify and select these elite broodstock through the application of selective breeding and genomics.

The establishment of family-based selective breeding programs in New Brunswick and Newfoundland and Labrador will ensure that local stocks can be used for the benefit of the provincial industries. Valuable traits for the aquaculture industry will be measured and evaluated such as growth, health, sexual maturation, stress tolerance,

fillet quality and yield. In addition, the feasibility of incorporating specific traits in future breeding programs to ensure fast growing, healthy, high quality Atlantic cod, will be determined.

In parallel, thousands of cod genes will be sequenced to look for differences in these genes between individual fish. This will allow the identification of a set of molecular markers for use in cod, and to associate these markers with fish that perform well or badly under aquaculture conditions. A major factor limiting the directed improvement of cod broodstock is the scarcity of molecular tools currently available for this species. The CGP will dramatically increase the genomic resources available. Sequences generated will be used to identify variation in Canadian broodstock, develop gene-linked markers for use in broodstock management, for comparative genomics, and generate tools for expression analysis.

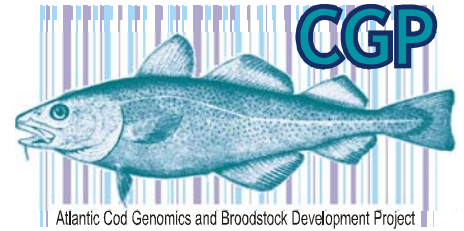
Researchers will work closely with CGP scientists and industry partners to examine ethical, environmental, economic, legal and social issues related to CGP research results (GE³LS). These researchers will examine ethical questions related to benefit sharing among research and commercialization partners, and other questions related to the status of elite Atlantic cod broodstock under Canadian environmental law.



For more information, please visit the CGP website: <http://www.codgene.ca/>



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Project Update October 2006

Broodstock Development

The broodstock programs in Newfoundland (NL), New Brunswick (NB) and New Hampshire (NH) were very busy during the first major spawning season of the CGP (Dec 05-Apr06). In NL, photo-manipulated wild broodstock were used to generate 68 families in total and a total of 39 families were transferred to rearing tanks for evaluation and trait analysis. Similarly, in NB/NH wild broodstock were used to generate 122 families with 50 transferred to individual family tanks and 74 families combined in a pooled group.

During the spring and summer family performance was evaluated related to growth, survival and health and significant variation in growth between the families was observed. In July/August the NB/NH pooled families were successfully transferred to the sea cages for evaluation. Surplus cod were also transferred, bringing the total to 95,863. Once family fish reach an average weight of 15g they are PIT tagged and assessed. At least 5000 PIT tagged cod from each family program will be transferred to commercial sea cages in October 06.

Genomics Update

Genomics activities began with collection of tissue samples from the broodstock. As different sets of genes are switched on in different tissues, a variety of samples were collected from tissues such as heart and body muscle, gut and reproductive tissues. These samples were used to generate the libraries used for gene sequencing. Approximately 25,000 sequences have been processed in total, and of these, more than 7,000 sequences are unique. These unique sequences represent our preliminary set of cod genes.

We have deposited some of our sequence into GenBank, a databank of public sequence serving the worldwide community, and have already more than doubled the number of sequences available for Atlantic cod. Many interesting genes have been identified, which give rise to proteins involved in building cell structures, in generating energy for cellular processes, in responding to attack from infection, and in many other vital functions. CGP researchers have started to examine this data to try and identify differences within genes which may be important to the cod aquaculture industry.

Other Project Activities

The goal of the CGP is to be as comprehensive as possible with studies to begin this fall on stress response, including cortisol variability, haemoglobin genotypes, acute and chronic thermal challenges. In addition, tissues from family fish are being collected to generate libraries enriched for genes involved in the response to stress and disease challenge. New external collaborations have been established related to aspects of cod rearing such as larval lipid analysis and disease studies. Several CGP members made their television debuts earlier this year on CBC's Land and Sea and Fisheries Now in NL.

Project Partners

