

SCOPE

December 2007 -- Volume 1, Issue 3

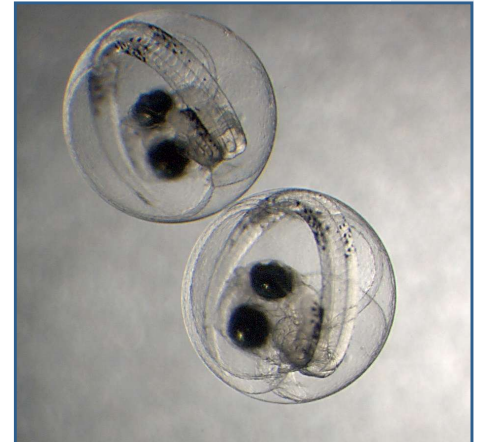
Probiotics for Aquaculture

In 2001 the New Brunswick Research and Productivity Council was awarded a 1.5 million dollar project to develop probiotics and other novel bacterially derived products for use in aquaculture. This project, funded by the Atlantic Canada Opportunities Agency (ACOA) and the Department of Agriculture and Aquaculture allowed RPC to establish significant expertise in the areas of probiotic discovery, testing and application, and in the related areas of bio-prospecting.

Probiotics are bacteria which confer benefit to their environment. In Atlantic Canada and elsewhere, rearing of alternative species such as cod and haddock has often been plagued by very low survival rates at the larval stages,

as low as 3-5% survival in some cases. The use of probiotics (live beneficial bacteria) developed within this project has resulted in significant improvements in larval survival. This is due to the ability of the probiotics to encourage the development of a healthy bacterial community with the larvae and exclude the establishment of harmful pathogens.

This green solution to a common hurdle in the rearing of alternative species is expected to boost the productivity of the aquaculture industry in Atlantic Canada and provide a viable alternative to the use of antibiotics. If you are interested in knowing how our probiotics or expertise in bio-prospecting may help you please contact us.



Atlantic cod eggs one day prior to hatch. Once the larvae emerge from the egg their chances of survival can be enhanced through the application of probiotics.

RPC Expands Capacity for Bioinformatics

Bioinformatics is the application of computer technology to the management of biological information.

Such technology has been an essential component in the collection and analysis of information on over 1500 marine bacterial isolates collected from the coastal areas of New Brunswick. In addition to housing information on each isolate, the database also serves as a repository for biological information derived from a variety of experiments involving each strain. In this way, large amounts of data from high throughput screening assays can be analyzed to uncover trends and correlations that would not otherwise be evident. This tool has been instrumental in the

discovery of rich sources of marine bacteria expressing traits of interest, optimizing the selection of strains for use in experimental trials, and in the characterization of new isolates.

The ability to store biological information such as DNA sequence, genetic fingerprints, and antibiotic resistance data on each isolate adds a powerful complement to our existing fish health work. Information on bacterial and viral pathogens can be stored and used to assist in epidemiological studies aimed at examining the movement of particular pathogenic strains and to examine the evolution or emergence of different pathogens.

Did you know...

Not all bacteria are bad. Many are useful and materials derived from them have been used in a variety of products and applications that include:

- Thickeners for foods and cosmetics
- New antibiotics for fish and humans
- New drugs for disease treatment
- Pigments
- Enzymes for use in industrial processes
- New biopolymers
- Probiotics for fish
- Remediators of environmental contamination

rpc

The Technical Solutions Centre

www.rpc.ca

Innovations



Dr. Ben Forward on board the HMS Research Vessel W.B. Scott.

Under our AIF funded project, lead scientist Dr. Benjamin Forward has established a collection of over 1500 bacteria derived from a variety of New Brunswick's unique coastal marine environments.

Many of the bacteria in the library appear to be new species as well as those which have not been previously cultured. These bacteria are being screened for probiotics and antimicrobials for use in aquaculture.

With such a relatively large number of bacteria, the development of high throughput screening methodology was a necessary and a significant innovation in the project. High throughput methodology developed at RPC

transformed the process from 50 assays per day to 2000 assays per day with reasonable demands on time and materials. Hence, no longer constrained to a limited set of assay conditions, the entire library can be screened using a variety of conditions to increase the probability of discovering candidate strains for further study.

Preliminary screening of the bacterial library has identified over 50 different probiotic candidates, 30 bacteria with antimicrobial properties, 39 bacteria with agarolytic activity, and 3 bacteria producing elevated levels of EPA (an omega-3 fatty acid). This bacterial collection represents an important resource for the identification and development of completely novel bioactive compounds and other useful materials, and we welcome inquiries from organizations interested in using our high throughput technologies and expertise to identify novel probiotics for their specific aquaculture or environmental applications.

In The News...

Within the last year RPC signed Memorandum of Understandings (MOUs) with two collaborators having longstanding involvement in the marine sciences.

In July, RPC and the Coastal Zones Research Institute (CZRI) of Shippagan, agreed to collaborate on several key research initiatives aimed at improving sustainability and profitability of local fisheries and aquaculture sectors.

Formalization of the partnership came following several years of collaborative research involving projects ranging from fish health to genetics. The partnership will capitalize on the strengths of each organization and includes a joint plan for further research initiatives and publications. Under the new agreement, RPC and CZRI will expand their collaboration to include research in the areas of alternative aquaculture species development, shellfish rearing, fish processing improvements, and the development of value added products

and co-products from the sea. One of the major catalysts to the formation of this partnership has been an ACOA-funded Atlantic Innovation Fund (AIF) project awarded to RPC for the development of probiotics for use in larviculture of alternative finfish species.

In November 2006, RPC and the Institute of Marine Research (IMR) in Bergen, Norway agreed to establish a research collaboration aimed at optimizing methods for developing and identifying new probiotics, and characterizing and testing the efficacy of probiotics *in vitro* and *in vivo*. The main, but not exclusive, targets of these studies will be cold water aquaculture species and associated microbial communities. In the future the collaboration is expected to expand into the areas of fish health, typing of fish pathogens and probiotics, and development of new methods for fish health research which will benefit from the combined expertise and perspectives of both organizations.

Technology

corner

Profiling Bacterial Populations

PCR DGGE is a rapid method which can be used for profiling bacterial communities like those in fish hatchery tanks and water or those associated with any surface, material or organism. This method is employed routinely at RPC and relies on Polymerase Chain Reaction (PCR) amplification of the highly conserved bacterial 16S rDNA gene.

Following PCR, the reaction products are subjected to Denaturing Gradient Gel Electrophoresis (DGGE) to separate the products on the basis of differences in their DNA sequence. This process reveals a pattern of bands with each one representing a different species from the original sample. Individual bands are then subjected to DNA sequencing and database searches to determine the identity of the bacterial species present.

In this way, entire bacterial communities can be profiled over time to get an idea of how communities change and evolve naturally or in response to various treatments.

rpc

The Technical Solutions Centre

921 College Hill Rd.
Fredericton, NB E3B 6Z9
Canada

Tel: 506.452.1212
Fax: 506.452.1395
e-mail: info@rpc.ca

www.rpc.ca