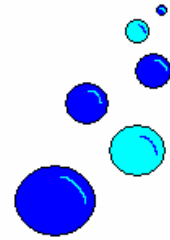




The
Huntsman Marine Science Centre
In Depth



This newsletter provides a summary of the educational and research activities taking place at the Huntsman Marine Science Centre (HMSC).

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International Aquatic Innovation Centre (IAIC) Research Activities Oct-Dec 2006:

- **Atlantic Cod Genomics and Broodstock Development project: NB Program.**
Researchers: Dr. Jane Symonds, Dr. Seumas Walker, Dr. Amber Garber, Dr. Ed Trippel (SABS), Dr. Andy Robinson (University of Guelph), Frank Powell (Cooke Aquaculture Inc), George Nardi (GreatBay Aquaculture).

Description:

Cod family rearing and evaluation:

122 cod families were generated in 2006 with 50 reared in individual family tanks (Group 1) and 74 families combined in a pooled group (Group 2), 42 of which were shared with Group 1 families to enable performance comparisons at harvest.

Data were collected on 16,062 juvenile cod at tagging on 49 families. Preliminary data analysis has revealed significant variation between families in observed body weight and the initial heritability estimate for this trait is high. This estimate is encouraging as it demonstrates the possibility for improvement of important



commercial production traits such as growth in the developing cod aquaculture industry.



Cooke Aquaculture's L&J marine site for cod

Sea cage transfers:

The Group 2 families were transferred to a single commercial cage in July/August 2006 (~ 41,532 individuals) at a mean weight of ~8 g. In November 2006 the PIT tagged Group 1 families were transferred to two commercial marine sites (~5,000 individuals per cage). Family survival is being monitored and will be part of the overall family evaluation and selection program.

The Group 1 families will be reared for an additional year in the cages before a preliminary assessment is conducted (body weight and length, sex assessed by ultrasound and sexual maturation status). The final harvest assessment of the Group 1 and Group 2 families, and subsequent genetic evaluation and elite broodstock selection, will take place after approximately two years in the cages, assuming a three year generation cycle. Family identification of the Group 2 families will be determined post-harvest by microsatellite DNA analysis. In addition to sea cage performance trials, families will also undergo stress response, thermal tolerance and disease challenge tests to determine the heritability of these traits and to assess their potential for future incorporation into a marker assisted selection program.

Wild broodstock collections:

New wild broodstock were successfully collected from two locations, Cape Sable and Georges Bank. Prior to spawning (Jan-Feb 07), fin clips obtained from the PIT tagged broodstock were used to obtain genotypes for six microsatellite loci. The microsatellite genotyping was conducted by the Research and Productivity Council, Fredericton, NB, and the data were analyzed using the MER program to generate relatedness estimates between all pairwise combinations of broodstock. Only unrelated individuals will be crossed during spawning based on this estimate.

There are a number of publications on the Cod Project in press.

Dates: Oct-Dec 2006, ongoing.

Location: Research is being performed at the HMSC, the St Andrews Biological Station (SABS) and at Cooke Aquaculture's two cod marine sites.



PIT tagging juvenile cod

- **Atlantic Salmon and Trout Feed Trials**
Researcher: Dr. Greg Page (Mapleleaf Foods, Shur-Gain AgResearch)
Description: Ongoing. Trout feed trial was completed Dec 2006.
Dates: Oct-Dec 2006
Location: The Broodstock Technology Building and Cove Greenhouse on the lower HMSC campus.
- **Atlantic sturgeon Broodstock rearing – for restocking the Baltic Sea**
Researchers: Dr. Joern Gessner (Society to Save the Sturgeon) and Dr. Jane Symonds
Description: Three shipments of Atlantic sturgeon broodstock (30 fish total) were successfully air freighted to Germany in November 2006. This project is now complete.
Dates: Oct-Nov 2006
Location: Green Quonset on the lower HMSC campus.
- **American eel research priorities**
Researchers: Dr. Jane Symonds and Mitchell Feigenbaum (South Shore Trading Co)
Description: Review eel research priorities for aquaculture and stock enhancement and provide technical advice.
Dates: Dec 2006
Location: South Shore Trading Co's aquaculture facility in Port Elgin (NB) and HMSC.

Atlantic Reference Centre (ARC) Research Activities:

- **Benthic invertebrates found in the muddy bottoms of the deep waters of Jordan Basin.**
Researchers: Ashley Holmes, Dr. Gerhard Pohle and Mary Greenlaw
Description: Investigating the macrofaunal biodiversity of the soft bottom sediments of the deeper waters (220-240m) of Jordan Basin. I am currently identifying specimens from the Class Polychaeta. I presented my findings (to date) at the 7th BOFEP Bay of Fundy Science Workshop held in October, 2006. I will be presenting an update on my progress at the upcoming Biodiversity Discovery Corridor Workshop in February, 2007.
Dates: September 2005 – March 2008
Location: Atlantic Reference Centre, University of New Brunswick Saint John.



Ashley Holmes and Jordan Basin Grab Samples, ARC

- **Antarctic zooplankton taxonomy** (for Woods Hole Oceanographic Institute)
Researchers: WHOI: Dr. Karin Ashjian, Nancy Copley; ARC: Dr. Gerhard Pohle, Mary Greenlaw and Karen Ross
Description: Identification, staging and abundance determination of zooplankton (mostly copepods and krill) from the Antarctic (vicinity of Marguerite Bay) as part of the international GLOBEC (GLOBAL ocean ECosystems dynamics) research program organized by oceanographers and fisheries scientists to address the question of how global climate change may affect the abundance and production of animals in the sea.
Dates: March 2006-April 2007
Location: ARC, Woods Hole Oceanographic Institute (WHOI)
- **Newfoundland zooplankton taxonomy** for Department of Fisheries and Oceans (DFO) Newfoundland
Researchers: DFO: DR. Pierre Pepin; ARC: Dr. Gerhard Pohle, Mary Greenlaw and Karen Ross
Description: Identification, abundance and biomass determination of zooplankton from subarctic waters around Newfoundland, as part of an ongoing DFO monitoring program.
Dates: Ongoing
Location: ARC, DFO Nfld.
- **NB Aquatic Insects Taxonomy** – (for Kouchibouguac National Park)
Researchers: Kouch: Marc-André Plourde; ARC: Dr. Gerhard Pohle, Mary Greenlaw and Karen Ross
Description: Identification of freshwater insects and other invertebrates from Kouchibouguacis stream in Kouchibouguac National Park
Dates: October 2007
Location: ARC, K. National park
- **Biodiversity monitoring beneath salmon sea cages using ROV technology**
Researchers: Dr. Gerhard Pohle, Rebecca Milne and Lou Van Guelpen. (Industrial Partner: Ocean Horizons Ltd.)
Description: With the help of the Environmental Trust Fund, the Gulf of Maine Council on the Marine Environment, the Industrial Research Assistance Program of



the National research Council, and Ocean Horizons Ltd., the Atlantic Reference Centre has acquired a remotely operated vehicle (ROV). Colour and low light, black and white cameras are used for navigation, as well as the capture of high resolution video feed and still images. Scanning sonar and a positioning system also aid in navigation. In association with Shark Marine Technologies Inc., a one-of-a-kind pneumatic sampler has been produced which allows for the collection of sediment cores. These are used for geochemical analysis of the substrate to help detect possible environmental impacts. The ROV is also equipped with a manipulator arm and clamshell device for other modes of sample collection. With the help of a dedicated technician (Rebecca Milne), the ROV is currently being evaluated for its potential in environmental monitoring for the aquaculture industry. As aquaculture sites move further off-shore, the ROV should prove to be safer and more efficient than divers, as it is not limited by depth. Beyond this, the ROV has the capacity to be used in other areas of research and education, and for which partnerships are being sought. The hope is to develop the ROV technology as a new activity sector for all of the HMSC

Dates: April 2006-May 2007
Location: ARC, Passamaquoddy Bay, Lime Kiln Bay



ROV at surface



ROV photo taken from black and white camera

- **Ecology of passive pockmarks in Passamaquoddy Bay**

Researchers: Dr. Gerhard Pohle, and Dr. David Wildish (ARC Research Associate)

Description: Basic research investigating the biological characteristics of persistent geological features resembling crater-like depressions that are found in large numbers in Passamaquoddy Bay and elsewhere in the world.

A paper on this research has recently been submitted.

Dates: April 2006-March 2007 and beyond

Location: ARC, Passamaquoddy Bay

- **NaGISA**

Researchers: ARC: Dr. G. Pohle and Lou Van Guelpen

Description: Natural Geography of InShore Areas is an international initiative, headquartered in Japan and part of the Census of Marine Life, developed to better understand the state of the world's coastal areas. The HMSC is opening a regional office representing the North Atlantic

(http://www.nagisa.coml.org/north_atlantic.htm) to help promote cooperative activities among partners in that sector to monitor coastal sites and to contribute to a global database.

Dates: October 2006 – October 2008



- **Impact of climate change on commercial marine species**
Researchers: Lou Van Guelpen, Dr. Gerhard Pohle and Dr. Gail Chmura (McGill University)
Description: This is a multi-year investigation of the impacts of a 4°C rise in global temperatures, predicted toward the end of the 21st century, on 33 marine species important to fisheries and aquaculture in Atlantic Canada. This study examines the thermal sensitivities for various life stages and pathogens of 33 economically important (aquaculture, bioinvader, capture fishery, prey) marine seaweeds, invertebrates, and fishes from nearshore waters of eastern Canada. We identify critical thresholds in their life stages and survival, thus their vulnerability and sensitivity to climate change and barriers to adaptation. Species are ranked by vulnerability to temperature change. Broad ecological and commercial impacts are considered for each species. A workshop was held in St. Andrews in October with invited stakeholders from government, universities, NGOs, and industry, which was well covered by the media. Remaining work involves incorporating feedback from stakeholders presented at the workshop, writing species accounts for a few species, and finalizing the project report and web site.
Dates: October 2002 – March 2007
Location: Atlantic Reference Centre and McGill University
- **Marine Species registers for the western North Atlantic as a standard for DFO datasets, and for DFO Maritimes research surveys**
Researchers: Lou Van Guelpen, Dr. Gerhard Pohle, Dr. Edward Vanden Berghe (Flanders Marine Institute), Bob Branton (DFO) and Mary Kennedy (DFO)
Description: The ARC began developing species registers, or lists, in 2001 and these have grown incrementally in geographic terms from the Bay of Fundy to encompass all of the western North Atlantic, and collaboratively to include the whole North Atlantic Ocean. ARC registers are compilations needing taxonomic validation. This task began in Q3 with DFO funding to make the registers the standard for the DFO national database “BioChem”.
Dates: registers – 2001 onward; BioChem November 2006 – March 2007
- **DNA barcoding of Canadian Atlantic fishes**
Researchers: Lou Van Guelpen, Dr. Stephen Clifford (Dalhousie University), Dr. Paul Bentzen (Dalhousie U.) and Dr. Ellen Kenchington (DFO)
Description: This research is based on the use of a short gene sequence from a standardized region of the genome to “barcode” species. It is a five year project to barcode 5-10 specimens each of the approximately 832 fish species in Canadian Atlantic waters, to develop DFO policy for molecular data, and to submit results to the Barcode of Life Data Systems (University of Guelph) and GenBank. To date we have processed approximately 232 species, 1420 specimens, and 1873 DNA samples, mostly prior to Q3. The role of the ARC is to take tissue samples, authoritatively identify the fishes and archive them in the ARC museum, and to collaborate in DFO policy development.
Dates: December 2005 – March 2010
Location: Atlantic Reference Centre, Dalhousie University, Bedford Institute of Oceanography, University of Guelph



- **Biodiversity informatics: metadata (Gulf of Maine Ocean Data Partnership)**
Researchers: Bob Branton (DFO) and Lou Van Guelpen
Description: The goal is to develop and implement protocols for validation, quality control, authority, and registration progress of metadata for datasets submitted to the Gulf of Maine Ocean Data Partnership. In Q3 emphasis was directed toward development of automated protocols, and prototypes were presented to the partnership at the AGM in December.
Dates: June 2006 onward
Location: Bedford Institute of Oceanography and Atlantic Reference Centre
- **Characterization of specimen identification problems on Gulf of St. Lawrence research surveys**
Researchers: Lou Van Guelpen, Dr. Jean-Denis Dutil (DFO)
Description: DFO Quebec has recognized that at-sea identifications of fishes has resulted in many errors in research survey datasets. In addition, the fish fauna of the northern Gulf of St. Lawrence is poorly known. Therefore, many specimens are being retained on research surveys and sent to the ARC for authoritative identification and curation in the museum. Identifications of fishes collected to date were completed in Q3, though cataloguing awaits funding. More collecting is anticipated in summer 2007. Publications are anticipated.
Dates: February 2006 onward
Location: Atlantic Reference Centre and Institute Maurine Lamontagne

Christofor Research Lab (CRL) Research Activities

- **Interactions between sub-adult American lobsters and European green crabs**
Researchers: Brian Lynch (UNBSJ) and Dr. Remy Rochette (UNBSJ)
Description: The American lobster, *Homarus americanus*, supports one of the most intense and valuable fisheries in the Bay of Fundy. The objective of this project is to quantify habitat use, activity patterns and interaction between the invasive green crab, *Carcinus maenus*, and sub-adult lobsters. As a component of this study, Brian is conducting a laboratory experiment at the HMSC on the long-term impacts of green crabs on sub-adult lobsters.
Dates: (on HMSC campus) September – December, 2006.



Brian Lynch with juvenile lobster and green crab
(JR Photography)



Brian Lynch with juvenile lobster
(JR Photography)



- **NSERC CRD Project: Diseases of wild and captive gadoids**
Researchers: Dr. MDB Burt (UNBF), Hon. Res. Assoc. J.W. Smith, H. Randhawa, Gillian MacLean and Garret Brodersen
Ongoing
- **Parasites of gastropod mollusks**
Researchers: Dr. MDB Burt (UNBF), HRA J.W. Smith
Ongoing
- **Parasites of sympatric species of *Fundulus*: *F. heteroclitus* & *F. diaphanous***
Researchers: Dr. MDB Burt (UNBF), Gillian MacLean and Georgina Cox
Ongoing

Public Education Research Activities

- **CRYSTAL Project**
Researcher: Peter Morrison (in association with UNB)
Description:
Three middle schools and three elementary schools in New Brunswick are participating in an after school science club called 'Science in Action'. A team of researchers from UNB, Science East and the Huntsman Marine Science Centre are studying the impacts these after school science clubs have on the students' attitudes and interests towards science.
I am currently developing the winter curriculum for the Middle School program called EcoAction. Included in the first two weeks of the winter curriculum is data collection via interviews and surveys with the students involved in the program. This data will then have to be analyzed promptly as it will be included in a series of four papers that are to be written by the end of February. These papers are then going to be presented at two international science education conferences in April 2007.
Dates: Ongoing
Location: HMSC Education Department, UNB Department of Education & 6 participating schools in New Brunswick (St. Stephen Middle, Princess Elizabeth Middle, Lorne Middle, St. Stephen Elementary, Princess Elizabeth Elementary and Centennial Elementary).



St. Stephen Middle School EcoAction



St. Stephen Middle School EcoAction
Anderson House October 2006



- **Huntsman Marine Science Centre Education Project**

Researchers: Tracey Dean and Peter Morrison

Description: With our participation in the Science in Action project, we have been given the opportunity to study how our high school education programs here at the HMSC impact the students participating in them. We will be looking at how/if their attitudes and interests toward science change, how much knowledge about the marine environment they gain, and if our programs have any impact on their decisions with regards to post secondary education.

In November 2006, our project was cleared by the Ethics Review Board at UNB Fredericton allowing us to begin our data collection. We have completed all of our surveys and interviews and will begin our data collection this spring as our first high school groups arrive on campus.

Courses on Campus

Public Education

- Kenner High School
- Orchard Park
- Sedburgh
- Saint John High School

University Programs

- UNBSJ Marine Semester, University of New Brunswick, Saint John, NB
- Oceanography, Universite de Moncton, Moncton, NB
- History Study Weekend, University of New Brunswick, Fredericton, NB



Marine Semester student holding Spiny Sunstar.

Upgraded Saltwater Delivery System

A new saltwater system has been designed to increase the seawater volume, and improve the water quality to the lower HMSC campus. Construction began in early October, 2006 and phase one was completed by January, 2007.

Phase one includes the addition of a second 20 hp pump, which increases the supply of seawater to the lower campus from 700 US gpm. (gallons per minute) to 1000 US gpm. A new 12” (30 cm) line was installed across the intertidal beach from the St. Andrews Biological Station to the HMSC lower campus.

Phase two will include the addition of automatic strainers that will remove particulate matter greater than 100 microns in diameter. The two 20 hp pumps will be replaced with two 90 hp pumps, thereby increasing the flow capacity to 2000 US gpm.

These upgrades in seawater flow and water quality will improve the facilities and services available to HMSC users. Plans including a new aquaculture Innovation Centre, a new public viewing and educational facility, as well as other marine enterprises, are now real possibilities with this significant improvement to the HMSC infrastructure.