



Huntsman Marine Science Centre executive director Bill Robertson, right, shows some of the tidal energy research sites to New Brunswick Minister of Natural Resources, Donald Arseneault, at a news conference to announce the awarding of 11 potential sites for investigation to Irving Oil in collaboration with the Huntsman.

Huntsman partners with Irving in major tidal energy announcement

IRVING OIL ANNOUNCED May 26 that it has received approval from New Brunswick's Department of Natural Resources to explore the feasibility of tidal power development within the Bay of Fundy.

Minister of Natural Resources Donald Arseneault and Energy Minister Jack Keir made the announcement at a news conference at the Huntsman.

Irving Oil is partnering with the Huntsman to conduct a two-year research program on 11 potential power generating sites in the Bay of Fundy, including regions extending from Cape Enrage, near Chignecto Bay, down to the Western Passage areas of

Passamaquoddy Bay.

During the two-year research period, information on the natural environment, tidal patterns, climatic conditions and behaviour of aquatic life in the selected areas will be collected and studied to determine the suitability for development.

"When we shared the news that we were seriously exploring the possibility of Eider Rock, the broader community was excited but also wanted to know that our company would focus on environmental performance and explore renewable forms of energy," said Kenneth Irving.

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\$18 million cod hatchery project officially opened

Officials of the Huntsman Marine Science Centre and Genome Atlantic joined with representatives of government, research institutions and industry May 20 to celebrate

the opening of a new multi-million dollar, high-tech fish cultivation facility in St. Andrews.

The new state-of-the-art facility at the

Grade 6 program a success

THE PILOT PROJECT of the Grade 6 Ocean Discovery Program at the Huntsman, undertaken in conjunction with the Government of New Brunswick, has been deemed a success by staff at the centre.

Developed by Huntsman education staff, with guidance from the NB Department of Education, to meet the curriculum outcomes of the Grade 6 Science-Diversity of Life Unit, the program is an overnight lab and field trip experience that was enjoyed by 10 schools from the Fredericton and Moncton areas and Charlotte County.

Over 300 students, along with teachers and some parents, visited the Huntsman for the experience.

The students had an opportunity to perform some basic scientific experiments, see marine life first-hand, and participate in labs and field trips, and in a workshop conducted by Paturel International, a contributor to the project. For some students, not only was this an educational trip, but it was also their first stay away from home.

[See comments from students on page 2](#)



The latest addition to the Huntsman Marine Science Centre is a new vessel. The *Fundy Spray*, which will be re-named in the near future, will be in use at the centre by the summer.

Huntsman will be used to raise Atlantic Cod. It is equipped with tank arrays, a new seawater supply system and mechanical rooms.

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Marketing muscle for mussels

A joint branding initiative is necessary if mussel farming is to increase in Atlantic Canada, notes a paper prepared for Agriculture and Agri-Food Canada by Bill Robertson, Executive Director of the Huntsman Marine Science Centre, and Mr. Dan Stechey. Agriculture and Agri-Food Canada, in partnership with industry, provincial governments and other federal agencies, established the Seafood Value-Chain Roundtable (SVCRT), to foster collaborative industry-government actions that secure a competitive advantage for Canada in domestic and international markets.

The SVCRT formed the Farmed Mussel Working Group (FMWG), to look at the sector's issues in more detail. Mussel farming is growing in Atlantic Canada, but production is shifting from Prince Edward Island to Newfoundland and Labrador.

The eastern Canadian mussel farming sector consists of approximately 550 farm sites, 10 processing operations, and 10 sales and marketing companies. The sector produces about 23,000 tonnes of fresh, live mussels, at a value of \$33 million, is being produced, with a third being exported to the European Union and the U.S. markets.

The PEI operations currently represent 80 per cent of this output, however, the Bay of Fundy offers excellent opportunities for aquaculture growth in New Brunswick waters, with the potential for 7,000 to 9,000 tonnes of new production per annum.

The FMWG, in its study, perceived an oversupply problem, with new production coming online without a market outlet.

The group noted, among its findings, that there is currently a buyers' market, the economics of the various farms varies, producers cannot compete with frozen

products, the EU market will be impacted by supply from cheaper imports from other areas, and that there is a lack of coordinated

supply to various market segments, along with low consumer awareness of the product.

Retailers, the report argues, have no incentive to carry fresh mussels, as the profit margin is low, and they take up space from more profitable products. However, many retailers they must include mussels to offer a full product line for customers.

The sector has experienced declines in the gross selling price; but, rather than being influenced by declining markets, the FMWG found that inter-company competition is responsible for the losses.

The FMWG noted that there is little interest among growers and producers in combining to provide a single selling desk concept, which could be served by an Eastern Canadian Mussel Institute, the mandate of which would be to advance the development and prosperity of the sector. The institute would coordinate promotion, distribution, research and market development.

Among the group's recommendations are calls for a better understanding of the marketing function: to distinguish between marketing and selling, understand why predatory pricing is short term, introduce realistic mechanisms for generic promotion, understand emerging markets, and implement a strategic brand process.

The phases of the brand process would be a strategic review, brand audit, brand components, creative developments, and implementation plans.

Exemplifying this need for investigation is the fact that the frozen mussels market in the U.S. is twice that of fresh mussels, yet fresh mussels are seen by customers as more desirable.

The FMWG concluded that opportunities for growth in the mussel industry exist and would be increased by a united approach to marketing, an increased pro-

motion of the product, and a joint branding initiative with standardization of quality parameters.



Grade 6 students from Lou McNarin School, in Dieppe, enjoy looking for life on the beach.

Grade 6 Program [from page 1](#)

According to one of the teachers who accompanied students from Lou McNarin School, in Dieppe, N.B., the program met the science unit needs well, and also covers a large number of curriculum outcomes from the new Social Studies program: 'Studying the interdependent relationship of people and their environment and the implications for a sustainable future.'

Grade 6 student Bianca Gruenewald said, "My favourite part out of the whole experience was going to Brandy Cove. We got to explore all of the amazing sea creatures and actually hold them in our hands! At the cove, there were beautiful waterfalls and a wonderful view."

Jessica Bohnet added, "When we looked at the amazing plankton in the powerful microscopes it was educational and very fun! We had groups of two students and we each had a slide with different plankton types: zooplankton and phytoplankton. The phytoplankton types are always simple shapes and the zooplankton types are weird shapes." Teacher Annette White stated that this will be a lasting experience for these students. "Thank you again for the best-ever class outing!" she concluded.

The long-term objective is to have every Grade 6 student in the Province of New Brunswick come to the Huntsman – at no cost to schools or students.

Huntsman work “important and relevant”



Left to right, Dr. Ed Trippel, co-leader of the Atlantic Cod Genomics and Broodstock Development Project, and a research scientist with the Department of Fisheries and Oceans, Minister of Veterans Affairs, Greg Thompson, Huntsman Marine Science Centre executive director Bill Robertson, and Dr. Steve Armstrong, president and CEO of Genome Atlantic.

A second broodstock facility has been configured next to the hatchery to house the parent broodstock, and a new filtration building will soon be under construction. The new hatchery complex is an important element of the Atlantic Cod Genomics and Broodstock Development Project (CGP), an \$18 million, four-year project managed by Genome Atlantic.

This element of the CGP was funded by Genome Canada, the Atlantic Canada Opportunities Agency (ACOA) Atlantic Innovation Fund, the New Brunswick Innovation Foundation, and the New Brunswick Department of Agriculture & Aquaculture. The Honourable Greg Thompson, Minister

of Veterans Affairs, participated in the official opening on behalf of the Honourable Peter MacKay, Minister of National Defence and Minister of ACOA, and the Honourable Jim Prentice, Minister of Industry.

“Our Government is committed to taking research and development out of the lab and into the marketplace,” said Minister Thompson.

“A thriving aquaculture industry has the potential for significant and sustainable opportunities for southern New Brunswick and the entire region.”

While the traditional fishing industry in Atlantic Canada has been a major contributor to the region’s cultural identity and econ-

omy, declining fish stocks have created a challenge to this industry. The growth of salmon aquaculture has helped to revitalize the local economy, but aquaculture industry experts agree that diversification to other finfish, such as Atlantic Cod, is one of the keys to a sustainable future.

A major challenge for cod aquaculture has been the reliance on wild populations for breeding (broodstock).

Other aquaculture industries, like salmon, have developed breeding programs where fish are selected for performance according to traits such as growth or resistance to disease and stress. Researchers with the CGP have been building an elite broodstock program for cod through the application of selective breeding and genomics.

According to Huntsman Executive Director Bill Robertson, “This hatchery gives us the platform we need for our future finfish research and development programs. With worldwide food shortages looming on the horizon, we see our broodstock work at the Huntsman becoming increasingly important—and relevant to Canadians.”

Genome Atlantic President and CEO, Dr. Steve Armstrong, added.

“We are excited to see the successful completion of this important CGP milestone and applaud Huntsman and all the funding partners for their parts in making this happen.” He went on to say, “This hatchery will not only enhance the level of ongoing research, but it will also prove pivotal to achieving the ultimate goal of the CGP—which is to help enable a sustainable cod aquaculture industry in Atlantic Canada.”

“Demand for fresh seafood is increasing worldwide and this facility will help New Brunswick be a leader at the forefront of innovation in developing alternate species for aquaculture,” Agriculture and Aquaculture Minister Ronald Ouellette said.

“Investments in innovation are essential in order for the aquaculture industry to continue to be an important player in the objective of New Brunswick achieving self-sufficiency by 2026.”

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Swordfish feeding ecology

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Swordfish (Figure 1) is a high-value species prized by Maritime longline and harpoon fishermen. Swordfish is a large species with a maximum size of 455 cm and 650 kg (<http://en.wikipedia.org/wiki/Swordfish>). They are found in temperate and tropical waters around the world from the surface to depths greater than 1000 m (Scott and Scott 1988). This highly migratory species is fished in the warmer months by longline and harpoon when it enters Canadian waters to feed. The Canadian swordfish harpoon fishery is located on the northeast peak of Georges Bank. In 2003 the value of swordfish landed in Atlantic Canada was approximately \$10,900,000 (http://www.dfo-mpo.gc.ca/communic/fish_man/ifmp/swordfish/index_e.htm#3).

Most swordfish landed here are exported to the US.

The swordfish undertakes extensive seasonal migrations, leaving Canadian waters during the colder months for the warmer offshore Gulf Stream or for more southerly regions. They also exhibit pronounced daily migrations, usually from great depths during the day to surface waters at night, probably to feed. In the daytime swordfish resting on the bottom have been observed from submersibles (Scott and Scott 1988).

However, large fish often bask on the surface where they are targeted by the harpoon fishery.

This article briefly describes an ongoing study examining 1) a persistent area of swordfish concentration off Georges Bank, 2) the phenomenon of swordfish homing behaviour to this area from tagging data, 3) vertical and horizontal migration of swordfish from recaptured tags, and 4) how swordfish feeding may relate to basking behaviour. Swordfish concentrations were determined from fishing effort data. Information on horizontal and

vertical movements was obtained from conventional fixed tags and pop-up satellite archival tags (PSATs). Tags were implanted in swordfish by harpoon with no apparent impact on the fish. From 2005-07 a total of 45 PSATs were implanted with a very high return rate of 34 tags as of December 2007. The function of PSATs was well described by Patterson *et al.* 2004 (http://www.afma.gov.au/research/reports/2004/r00_0786.pdf) "Once attached to a fish, they record depth, temperature and light data every minute. The tags are pre-programmed to release on a certain date. Once they detach from the fish they float to the surface and transmit summary data to satellites which is sent to the researcher electronically." (Note - A conventional "spaghetti" type numbered tag remains in the fish.)

"Analysis of this data allows for the researcher to estimate a likely track that the fish took between the deployment location and the pop-up position and to examine depth and temperature preferences."

Stomachs were collected by harpoon fishermen in 2007 for stomach content analysis (25 intact stomachs and photographs of stomach contents from 204 swordfish).

Harpoon fishing effort examined from 2004-07 showed the persistence of a "summer" swordfish concentration off Georges Bank (Figure 2).

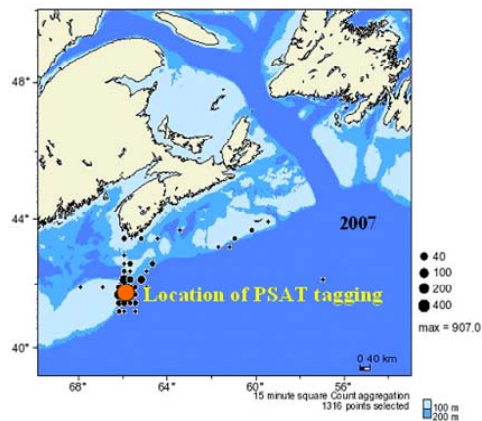


Figure 2. Location of swordfish concentration (black symbols) and PSAT tagging (orange symbol).

Both conventional and PSAT tags showed a persistent homing behaviour to this region as exhibited by PSAT tag 56404 (Figure 3).

Figure 1. Swordfish, *Xiphias gladius*. (photo courtesy Of FishBase www.fishbase.org/home.htm picture (Xigla_u0.jpg) by Archambault, C.)

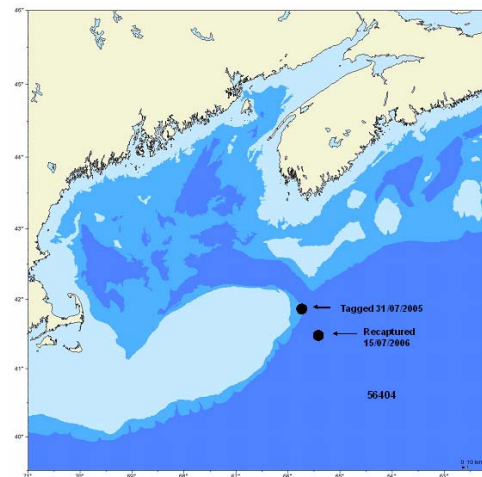


Figure 3. PSAT tag 56404. Fish was tagged 31 July 2005 and harvested 15 July 2006 only 72 km from the tagging location.

Though at large for a year this fish was recaptured only 72 km from its point of tagging. PSAT-tagged swordfish showed a consistent southward migration in the fall-winter and return northward in spring/summer (Figure 4).

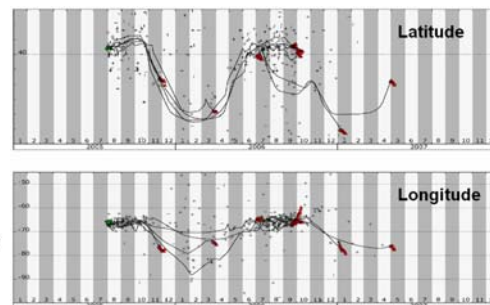


Figure 4. Seasonal north-south migration from PSAT tags.

Data from PSATs consistently showed daily vertical migration but the patterns were equivocal (Figure 5).

Continued on page 5

Swordfish feeding ecology

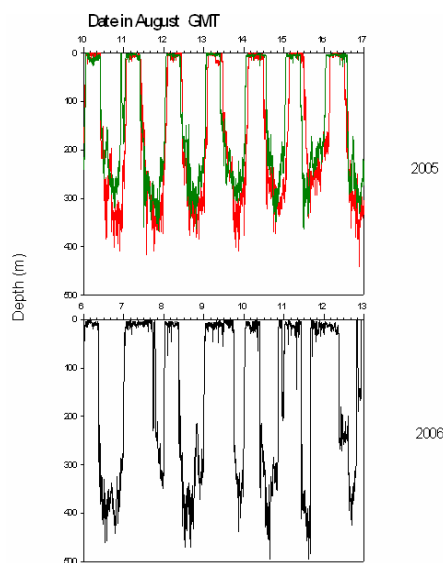


Figure 5. Daily vertical migration from PSAT tags.

Two fish in 2005 were at the surface at night, but the 2006 fish was at the surface in the

early morning. Further PSAT data are needed to resolve this issue.

The swordfish is an apex predator described by Scott and Scott (1988) as an opportunistic feeder focussing on Atlantic mackerel, barracudinas, silver hake, redfish, herring, lanternfishes, and cephalopods (chiefly shortfin squid).

Our results were similar. In the 25 intact stomachs shortfin squid, barracudinas, and lanternfishes were most common (Figure 6). In the 204 photographs of stomach contents shortfin squid, redfish, and barracudinas predominated.

Relating swordfish feeding to basking behaviour based on our results is problematic. Shortfin squid are found in surface waters during feeding migrations in the northern part of its range (as far north as Labrador); in other regions it lives near the bottom (Nesis 1982). Ocean Biogeographic Information System (<http://www.iobis.org/>) records for shortfin squid in our study region are mostly between 40 to 120 m.

Though not strictly at the surface where swordfish bask, these depths are within easy reach. For our other common prey items,

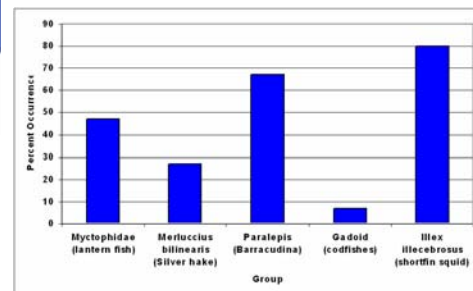


Figure 6. Percent occurrence of prey items in 25 swordfish stomachs.

redfish live near the sea bottom, and barracudinas and lanternfishes are characteristic of the deep mesopelagic realm though they occur from the surface to mid-depths. Should diel vertical migration of these species bring them to the surface at night they would not be taken by basking swordfish as this behaviour occurs during the day. Based on these results our conclusion is that swordfish basking is not related to their feeding at the surface.

Literature Cited

Nesis, K.R. 1982. Cephalopods of the world: squids, cuttlefishes, octopuses, and allies. In: Burgess, L.A. (ed.). 1987, English translation by T.F.H. Publications, Inc., Ltd., Neptune City, N.J. 351 pp.

Huntsman partners with Irving in major tidal energy announcement

“It’s very early in the development of tidal power, and there’s still a lot we don’t know, but we wanted to respond to our community’s aspirations. The New Brunswick Energy Hub is about supporting Self-Sufficiency with energy projects that perform the best both economically and environmentally. We hope that tidal power becomes a key spoke in the Hub.”

“This announcement gives us the platform we need to investigate an energy stream based on a renewable resource that will not only meet the standards of sustainability, but will also provide leadership in the development of ocean energy technology in Canada,” said Bill Robertson, Executive Director of Huntsman Marine Science Centre.

“We’re really excited to be partnering with a progressive energy company like Irving Oil, who shares our commitment to long-term sustainability. This is a winning partnership

and proposition.”

“This research will evaluate the potential for development of in-stream tidal power,” Arsenault said.

“Information on the natural environment, climatic conditions, and the behaviour of wildlife in these areas will also be collected to determine the suitability for development.”

Keir said, “With the highest tides in the world, we have an opportunity to create an industry around clean, renewable, low-impact electricity generation. We are positioning New Brunswick to be a province with a growing and responsible renewable energy portfolio.”

The project involves sampling and survey work conducted using mostly boat-mounted sampling equipment. However, the deployment of floating stationary sampling devices is also planned. These devices will be

moored to the bottom of the bay and left in place for about 30 days at a time. A more detailed baseline study program may be undertaken for areas that show the highest potential for in-stream tidal-power generation. These studies would include field-sampling programs to collect data on the marine environment.

Jeff Landry, Manager of Business Development for Irving Oil, said, “We look forward to working with Huntsman Marine Science Centre to explore the potential of this innovative, alternative source of energy. The Centre is a leader in marine education and research, and a great partner.”

The 11 study sites, measuring 25 hectares in size, are located in four regions in the Bay of Fundy: Head Harbour Passage, Western Passage, Cape Enrage, near Chignecto Bay, and Cape Spencer, near Saint John. Earlier this year, Irving Oil submitted its proposal on tidal power generation to the Department of Natural Resources, in response to the government’s Request for Proposal on tidal power research.

The research continuum at the Huntsman

Atlantic Reference Centre (ARC) Research Activities:

New Research Activities

Compilation of biodiversity research in Discovery Corridor waters

Researchers: Rebecca Milne, Lou Van Guelpen
Description: Updating of 2005 compilation

Ongoing Research Activities

NaGISA: Coastal monitoring in the Bay of Fundy

Researchers: Dr. Gerhard Pohle, Lou Van Guelpen
Description: Processing of samples, data compilation, quality control
Dates: ongoing

Benthic Coastal Monitoring in Africa (for NaGISA)

Researchers: Dr. Gerhard Pohle; Dr. Tom Trott (Suffolk University)
Description: Expansion of HMSC-led Atlantic Ocean coastal monitoring sites into west Africa
Dates: Starting March 2008 (preparations presently ongoing)

Ichthyoplankton of Mill Cove, Maine

Researchers: Lou Van Guelpen, Mary Greenlaw, Karen Ross
Description: processing of Mill Cove plankton samples for fish eggs and larvae for Woodlot Alternatives, Inc. of Topsham, Maine
Dates: November 2006 – February 2008

Community structure of deep-sea bottom fishes in waters off Nova Scotia

Researchers: Dr. Ralph Halliday (BIO/DFO), Daphne Themelis (Mount Saint Vincent University), Lou Van Guelpen
Description: resolution of fish identifications from historic deep-sea research surveys to elucidate fish community structure
Dates: 1994, ongoing

Ocean Energy project

Researchers: Bill Robertson, Dr. Gerhard Pohle, Lou Van Guelpen, Suzanne Taylor, Gerald McEachern
Description: Feasibility study for establishing a pilot tidal in-stream electrical generating system in Head Harbour Passage. Our investigation includes a literature review and on-site ROV deployment to characterize the biological characteristics of the passage and a review of known environmental impacts of ocean energy systems.
Dates: completed March 2008

Compilation of biodiversity research in Discovery Corridor waters

Researchers: Lou Van Guelpen, Erin Herder; Bob Branton (BIO/DFO)
Description: Web site development
Dates: completed March 2008

Arctic zooplankton taxonomy (for Woods Hole Oceanographic Institute)

Researchers: Dr. Karin Ashjian and Nancy Copley (WHOI), Dr. Gerhard Pohle, Mary Greenlaw, Karen Ross
Description: Identification of Arctic plankton, with emphasis on copepods and krill
Dates: completed March 2008

Newfoundland zooplankton taxonomy (for Department of Fisheries and Oceans Newfoundland)

Researchers: Dr. Pierre Pepin (DFO), Dr. Gerhard Pohle, Mary Greenlaw, Karen Ross
Dates: completed March 2008, renewed 2009

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), Mary Kennedy (DFO)
Dates: ongoing

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)
Dates: ongoing

Benthic invertebrates in muddy bottoms of the deep waters of Jordan Basin

Researchers: Ashley Holmes, Dr. Gerhard Pohle, Mary Greenlaw, Rebecca Milne
Dates: ongoing

Christofor Research Lab (CRL) Research Activities

Ongoing Research Activities

Phenotypic variation in *Littorina obtusata* as a result of environmental variables.
Researchers: Dr. Remy Rochette, Jennifer Cuillerier, Monica Shaver and Mark Wilcox (UNBSJ).

Development of prophylactic measures to minimise the effect of potential pathogens of aquacultured cod. (NBIF Grant).

Researchers: Dr M.D.B.Burt (UNBF), Dr J.W.Smith (UNBF & WLU), Dr D.K.Cone (SMU), A.Frenette (UNBF)

Ontogeny of larval *Bothriocephalus scorpii* in calanoid copepods (NSERC Discovery Grant).

Researchers: Dr M.D.B.Burt and G.D.Brodersen (UNBF)

Determination of cestode biomass in *Hemitripterus americanus* in relation to size of fish (NSERC Discovery Grant).

Dr M.D.B.Burt (UNBF)

Host specificity of parasites in 2 sympatric perciform fishes (White perch, *Morone americana* and Yellow perch *Perca flavescens*) (NSERC Discovery Grant).

Researchers: Dr M.D.B.Burt and G.K.Cox (UNBF)

Diseases of wild and captive gadoids (NSERC CRD Grant)

Researchers: Dr. MDB Burt (UNBF), Dr. J.W. Smith (UNBF and Wilfrid Laurier University), Dr. D.K. Cone (SMU), H. Randhawa, G. MacLean, A. Frenette and G.D. Brodersen.

Parasites of sympatric species of *Fundulus*: *F. heteroclitus* & *F. diaphanous* (NSERC Discovery Grant)

Researchers: Dr. MDB Burt (UNBF), G. MacLean and G.Cox (UNBF).

International Aquatic Innovation Centre (IAIC) Research Activities

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), Keith Were (Genome Atlantic)

Ongoing Research Activities

Atlantic Salmon and Trout Feed Trials

Researcher: Dr. Greg Page (Mapleleaf Foods, Shur-Gain AgResearch)

Ongoing Education Research Activities

Passerine Migrations Monitoring

Researcher: Tracey Dean

CRYSTAL Project

Researcher: Peter Morrison (in association with UNB)