



**Setting A Course For  
DEEPER KNOWLEDGE**

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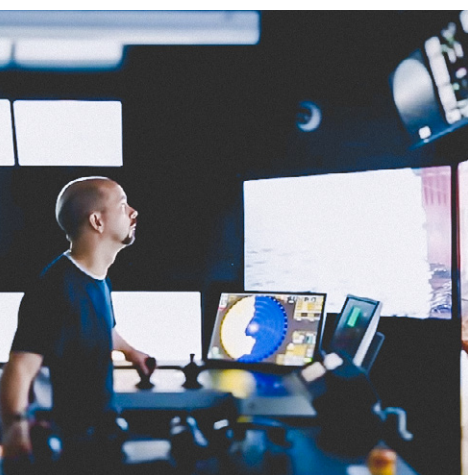
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# Ad Excellentiam Nitere

STRIVE FOR EXCELLENCE  
*FISHERIES AND MARINE INSTITUTE OF  
MEMORIAL UNIVERSITY OF NEWFOUNDLAND*

# Provehito in Altum

LAUNCH FORTH INTO THE DEEP  
*MEMORIAL UNIVERSITY OF NEWFOUNDLAND*

We are the  
**MARINE INSTITUTE**

Located in St. John’s, Newfoundland and Labrador, Canada, at the edge of the North Atlantic Ocean, the Fisheries and Marine Institute of Memorial University of Newfoundland (Marine Institute or MI) was established in 1964 and has grown to become the most comprehensive oceans institute in North America. A prominent campus of the University, MI combines world-class facilities, strong educational programs, and highly qualified people to pursue its vision of being a world oceans institute, ever advancing its global reputation for ocean excellence.

It’s a reputation supported by three schools and seven industrial training and applied research centres that link teaching and learning, research and creative activity with the needs and opportunities of students, alumni, and industry partners. MI’s Office of Research and leading researchers champion a hands-on approach and a results-oriented culture to deliver innovative, industry driven solutions. It’s Department of Academic and Student Affairs, together with faculty and staff, foster student and alumni success and ensure the growth and development of Marine Institute’s academic programs.

\*  
**The overall scope of the Marine Institute falls into three categories: education and training, applied research, and industry partnerships.**

## Comprehensive Expertise

**“Our research is practical, it’s applied, it’s hands-on. We are about solving problems through science, technology and innovation, on a global scale.”**

CAREY BONNELL, HEAD — SCHOOL OF FISHERIES \*

The Marine Institute’s **School of Fisheries (SOF)** is a global centre of excellence for fisheries research that is helping to guide world fishing practices. Utilizing some of the finest facilities on the planet, such as the world’s largest flume tank, the School’s highly qualified experts can tackle any fisheries question, from harvesting sustainability, fisheries science, sustainable aquaculture to maximizing value and quality. Added to their education and training expertise and ever-growing base of strong graduate students, no other institution comes close to matching their level of experience and expertise.

The School of Fisheries’ primary areas of education, products and services are:

- Undergraduate and Graduate Programs in Marine Environmental, Aquaculture, Fisheries Resource Management, Water Quality, Food Safety and Marine Spatial Planning
- Short-Course Industry Training (Fish Harvesting and Aquaculture)
- Global Fisheries Sustainability
- World-Class Research, Including Fish Stocks and Climate Change Strategies

Through the School of Fisheries, the Marine Institute is helping to introduce sustainable aquaculture development and **reduce the post-harvest loss** of developing fisheries around the world, particularly in Africa and Southeast Asia, where wastage is a significant issue due to poor fishing and post-harvest practices. It is also a key player in the **Prime Fish initiative**, funded through the European Union’s Horizon 2020 program. As Canada’s representative in this €5 million endeavour — aimed at providing tools to industry in order to facilitate better decision making for marketing and promoting products across Europe — the School will provide cutting edge market intelligence and value chain information.



Photo by Scott Grant 1



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The Marine Institute is increasingly gaining a reputation as the **go-to institute internationally in the area of fishery science** and has big plans to build on this reputation in the future. Its School of Fisheries is currently developing its own research-based Masters and Ph.D. programs and is also recruiting two research Chairs, with plans for more down the line. The aim is to maintain a focus on applied training and research that will directly benefit industry, and continue to gain MI international recognition for its scientific and industry-focused programming.

**1 Frozen fish:** Through the School of Fisheries, the Marine Institute provides short-course industrial training for the fish harvesting, seafood processing and aquaculture sectors. Key work includes the provision of training to the aboriginal community in the Canadian Arctic, preparing Inuit beneficiaries to work in the rapidly emerging offshore fishing industry.

**2 Top tank:** The Marine Institute's position as a global centre of excellence for the fisheries industry is bolstered by its world-class facilities. SOF is home to

the largest flume tank in the world, used to test related equipment in simulated underwater and near-surface conditions.

**3 Voyage of discovery:** Through its School of Fisheries, MI utilizes research platforms to conduct a range of research activities, including acoustic surveys on cod fish and studies used to inform climate change adaption strategies. Graduate students, research scientists and technicians undertake many voyages of cutting-edge discovery.

## \* School of Fisheries

The School of Fisheries encompasses four applied research and training units: The **Centre of Fisheries Ecosystems Research**; the **Centre for Sustainable Aquatic Resources**; the **Centre for Aquaculture and Seafood Development**; and the **Centre for Community Based Education Delivery** unit. Through its School of Fisheries, the Marine Institute covers the entire seafood value chain, including fishery science, aquaculture, sustainable harvesting, handling, processing, and supply chain logistics. It also delivers training for the food and marine environmental industries.

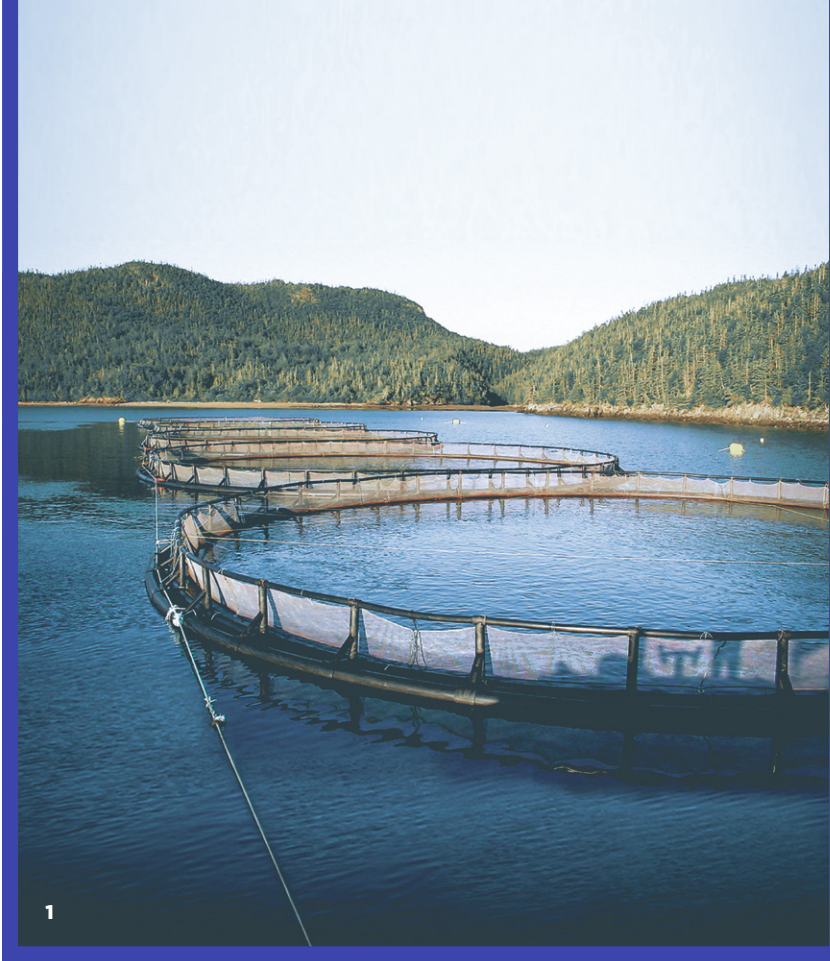
For more information on the School of Fisheries, please contact us at 709 778 0441, [sof@mi.mun.ca](mailto:sof@mi.mun.ca)



3



Leading Research



“We are the only research organization in Canada with comprehensive pilot-scale facilities dedicated to seafood and aquaculture.”

HEATHER MANUEL, DIRECTOR - CENTRE FOR AQUACULTURE AND SEAFOOD DEVELOPMENT \*

**1 In deep:** Aquaculture shows great promise for providing the world with nutritious, sustainable seafood. The Centre for Aquaculture and Seafood Development works with industry partners globally, applying its scientific and technical expertise to bring products to market. The **Centre for Aquaculture and Seafood Development's (CASD's)** mandate is to promote the profitability and sustainability of Newfoundland and Labrador's seafood and aquaculture sectors. Its seafood processing and marine bioprocessing pilot plants are the only examples of their kind in Canada, and among just a handful in North America, allowing for large-scale, pre-commercial research projects. The Centre undertakes contractual **research for the seafood and aquaculture industries** and provides support for entrepreneurs focusing on **marine biotechnology and bioprocessing**, encompassing innovative, non-traditional approaches in these areas.

Marine bioprocessing has taken priority for the Centre for Aquaculture and Seafood Development in recent times — specifically, the areas of **waste mitigation and biosecurity**. Groundbreaking research conducted at the Centre, in close coordination with industry, seeks to quite literally extract more value from leftover raw materials. Through the only fish oil extraction system in Atlantic Canada, the team is examining **enzymatic technology** and methods that **increase yields** and control while **reducing environmental implications**, when compared to conventional heat process extraction methods. In addition, the Centre is leading research into issues related to salmon aquaculture waste that will light the way for improved waste management processes in the globally growing aquaculture industry.



In a world where seafood production and aquaculture are ever on the rise, the Centre for Aquaculture and Seafood Development is a leader in managing and mitigating this industry's global impact. Working seamlessly with experienced industry professionals, the Centre's **highly qualified scientists and researchers** are leading the way to a secure and scientific future for the world's fisheries. The Centre undertakes between **thirty and forty industrial research projects every year** — within Newfoundland and Labrador, throughout Atlantic Canada, and around the globe.



**2 Shelling out:** The Centre is home to MI's marine biotechnology and bioprocessing research. This includes cutting-edge research not conventionally seen in traditional seafood processing or aquaculture streams, such as drawing nutraceutical extracts from shellfish.

**3 The A-Team:** A strong culture of collaboration runs throughout the Marine Institute. The Centre for Aquaculture and Seafood Development takes the approach of putting together teams comprised of experts that best suit a specific industry client's needs and areas of focus.

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**The Centre for Aquaculture and Seafood Development's primary areas of education, products and services are:**

- **Seafood Processing**
  - **Aquaculture**
  - **Marine Bioprocessing**
  - **Waste Reduction and Management**
- 

**\* Centre for Aquaculture and Seafood Development**

**The Centre for Aquaculture and Seafood Development** is an industrial response unit focusing on three key areas of applied research: seafood processing, aquaculture, and marine bioprocessing. To aid in this research, the centre avails of four world-class facilities: a 20,000 sq. ft. seafood processing pilot plant, a 2,000 sq. ft. marine bioprocessing pilot plant, an analytical laboratory, and an aquaculture recirculation facility, utilized by a staff of eighteen highly-qualified scientific and research personnel.

**For more information on the Centre for Aquaculture and Seafood Development, please contact us 709 778 0532, [casd@mi.mun.ca](mailto:casd@mi.mun.ca)**

Critical At-Sea Research



“We are doing at sea fisheries research that nobody has done, and nobody else is doing.”

THOMAS BROWN, ADMINISTRATIVE DIRECTOR  
- CENTRE FOR FISHERIES ECOSYSTEMS RESEARCH \*

The Marine Institute’s **Centre for Fisheries Ecosystems Research (CFER)** regularly takes to the sea, battling the harsh conditions of the frigid North Atlantic Ocean in its quest to answer the fisheries industry’s most biting questions. Since 2010, MI has chartered a research vessel to conduct critical at-sea research and to answer specific questions and challenges put forward by the fisheries industry. CFER is using this, and a **close relationship with Fisheries and Oceans Canada**, to identify and address research gaps and data shortfalls — utilizing its research scientists and graduate students to fulfill industry’s real-world needs.

In recent times, cod-related research has reassumed centre stage, and CFER has been utilizing **cutting-edge satellite pop-up tagging technology** to examine changes in cod migration, allowing the movements of individual fish to be accurately tracked for an entire year.



Photo by Victoria Neville





The goal of this research is to learn whether the migration patterns of the cod have changed from the pre-moratorium days of the 1980s. This research was one of the first examples of the **innovative tagging technology** being applied to cod, and provides critical information. The same technology is being used on Atlantic halibut in the Gulf of St. Lawrence.



**1 Dream team:** The CFER team brings serious skills to the table. It's comprised of marine biologists, Ph.D.-level researchers, post-doctoral fellows and Masters and Ph.D. students.

**2 All aboard:** As much of its research is conducted out on the ocean waves, the Marine Institute uses its ocean-going platforms to conduct industry-driven studies in the Northwest Atlantic Ocean.

**3 Into everything:** The Centre demonstrates the diverse nature of MI's research, conducting innovative projects such as growing larval capelin, in addition to its large-scale offshore survey projects.

Through CFER, the Marine Institute continues to gain strength and recognition as a **leader in fisheries research** and will build on this momentum into the future. Plans are in place to develop a unique graduate program in the area of fisheries. While the Centre's focus remains the waters off the coast of Newfoundland and Labrador and the North Atlantic Ocean, it is already exploring new waters, expanding its research north and south, studying ecosystems with a keen eye on climate change.

**The Centre for Fisheries and Ecosystems Research's primary areas of education, products and services are:**

- **Industry-Driven, At-Sea Research**
- **Graduate and Post-Graduate Fisheries Science Education**
- **Publication in Scientific Literature**



**\* Centre for Fisheries Ecosystems Research**

The **Centre for Fisheries Ecosystems Research** distinguishes itself from others in Canada by its more direct involvement in fisheries research, including time-at-sea research, use of advanced fisheries technology such as acoustic and geographic information systems, and a focus on the North Atlantic and Newfoundland and Labrador fisheries. CFER was created to bring fishery science into the Marine Institute and train the next wave of fisheries scientists, researchers and technicians. The Centre is designed to complement and collaborate with Fisheries and Oceans Canada, filling identified gaps in fisheries research and mentoring graduate students.

**For more information on the Centre for Fisheries Ecosystems Research, please contact us at 709 778 0562, [cfer@mi.mun.ca](mailto:cfer@mi.mun.ca)**









## Excellence at Sea

In 2010, the Marine Institute established a **\$4 million marine base in Holyrood, NL** to help develop its **at-sea research and training capability** in order to pursue growing global opportunities. This world-class marine base currently features a six thousand square-foot, multipurpose centre; storage facility; fully modernized wharf/slipway; floating docks; and support vessels. Its favourable location allows for unobstructed year-round access to relatively sheltered, environmentally clean ocean waters.

Upon completion of its Phase II development, Holyrood Marine Base will become the new home of all MI's ocean technology applied research and at-sea safety and survival training operations. This continued development will expand the Institute's capability to provide access to the ocean for critical at-sea, in-water and sub-sea education and research activities, including ROV and AUV training and testing; expansion of graduate programs; intensive cold-ocean and marine environmental undergraduate courses; and ocean rescue, safety and survival training.

Through a strategic partnership with the community, MI is helping to build an ocean technology cluster in Holyrood and support the town's Oceans Holyrood initiative, designed to foster, enable, and accelerate an oceans industries community of practice. The collaboration is fostering regional and rural development, and making Holyrood a gathering place for local, national and international researchers, scientists, instructors and students in the oceans sector.





► **The Journal of Ocean Technology**

The Journal of Ocean Technology (JOT) is the Marine Institute's peer-reviewed periodical. Published quarterly and circulated to subscribers in some fifty countries, The Journal serves all segments of the global ocean technology community by expanding knowledge, publishing cutting-edge research, and promoting innovation. The Journal is composed of three sections: peer reviewed essays; accredited research papers; and Spindrift, which features interviews with leading oceans experts.

**Marine Spatial Planning** ◀

Ever at the forefront of ocean study, MI has created a graduate program in **Marine Spatial Planning and Management (MSP)** — the first program of its kind in Canada. The program is focused on balancing the demands of economic development and environmental conservation placed on the world's oceans and coastal areas, creating a spatial vision and comprehensive management plans for their use.



Greater Depth

From in-depth youth ocean programming aimed at encouraging the next wave of ocean experts, to the publishing of world-leading research papers, the Marine Institute is showing the world the way.



### Northern Impact Presence

Working with its partners, the **Nunavut Arctic College (NAC)** and the **Nunavut Fisheries and Marine Training Consortium (NFMTC)**, MI delivers nearly all the fisheries and marine training in the Canadian Arctic, training an average of three hundred clients per year. Arctic research, particularly fisheries and ecology, navigation, and ocean technology, is a key part of MI's research growth, helping support industry aspirations and fulfill data gaps in Arctic regions.



Photo by Laura Wheeland



### Youth Engagement

The Marine Institute is committed to **involving young people in the wondrous world of ocean exploration, study, and technology**. **MI Ocean Net** engages youth from as young as six, through the teen years when they take part in the **Youth and Oceans Conference**, right through to enrolment in and graduation from the Marine Institute. Each year, MI also plays a central role in **World Oceans Day**, where children get to take part in exciting educational activities relating to our oceans. Meanwhile, high school students are invited to design, build and race a model ship in an annual competition, and older students from around the world compete each year in the **Marine Advanced Technology Education (MATE) Centre's** renowned **International Remotely Operated Vehicles (ROV) competition**.



Photo by Fred Lemire, Nunavut Tourism

### Ocean Innovation Conference

Uniting all segments of the oceans community — public, private, and academic — the **Ocean Innovation conference** has been hosted annually by the Marine Institute since 2001. The theme of the conference changes with each iteration, but topics of focus include maritime safety, operational efficiencies, and sustainability. The conference attracts notable speakers, exhibitors and stakeholders from around the world.





## Impacting Marine Life

Sustainability is a key component of fisheries around the world, and the Marine Institute is a global leader in the development of fishing technologies that reduce negative ecological impacts, including bycatch of non-targeted animals, fuel consumption, and seabed impacts. Its Centre for Sustainable Aquatic Resources (CSAR) utilizes a number of research tools to take innovative fishing systems from concept to commercial use. These include advanced numerical modelling software, scaling and construction of working engineering models for evaluation in their flume tank, and at-sea comparative fishing experiments aboard industry vessels.

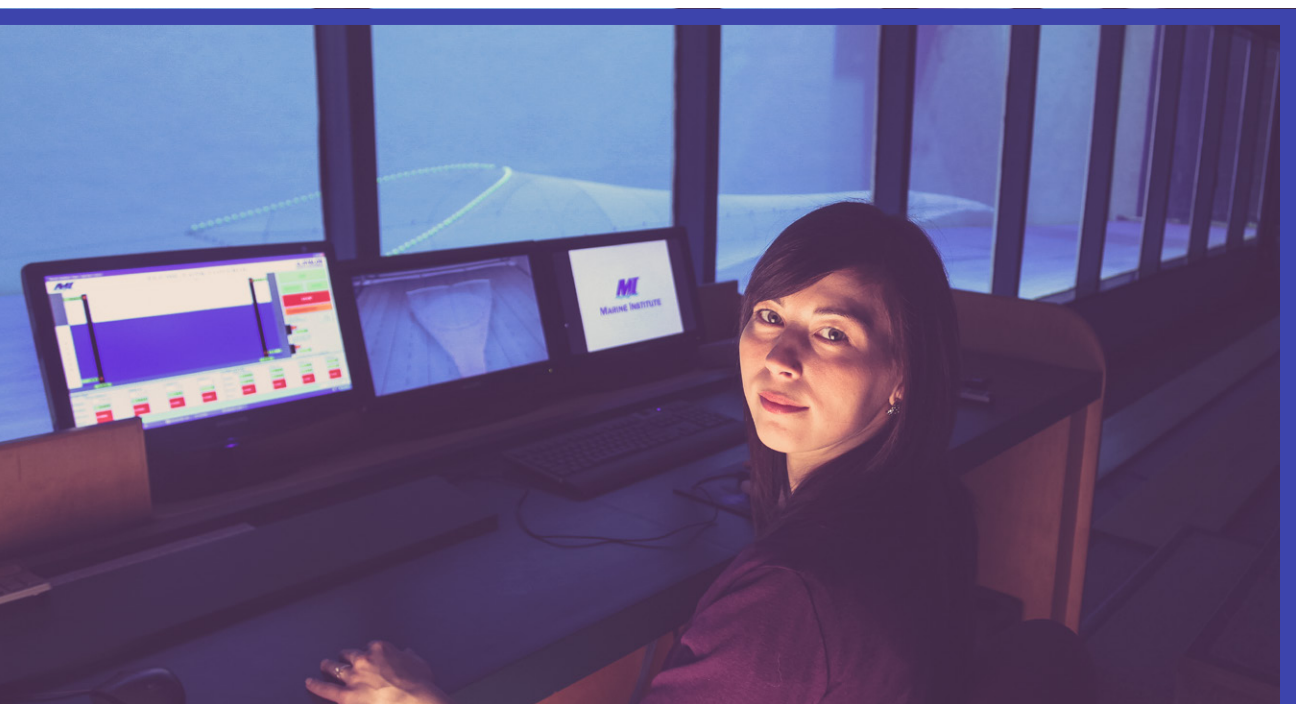
The Centre has assisted with **trawl designs for operators as far afield as Europe and South America**, but it is in local waters that one of its most enthralling trawling successes has been seen. Northern cold-water shrimp is currently one of the major



Photo by Greg Furey

# “We are world class experts in fishing technology and fisheries sustainability.”

DR. PAUL WINGER, DIRECTOR - CENTRE FOR SUSTAINABLE AQUATIC RESOURCES \*





fisheries off the coast of Newfoundland and Labrador, with around ten fish plants processing these small crustaceans and approximately three hundred trawlers fishing shrimp throughout the summer months. Because the shrimp are so small, the only economically viable way to catch them is with a small-mesh bottom trawl, **necessitating the need for a sustainable fishing technology.**

CSAR developed a number of **behavioural and mechanical sorting devices** that select other fish from these shrimp trawls. The trawls can achieve a catch that is composed of 98 per cent shrimp, an amount previously unheard of in the industry and is the first Canadian fishery to be Marine Stewardship Council certified. The shrimp trawls are just one of numerous examples of how MI research is **making fishing practices more sustainable**, worldwide.

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The Centre for Sustainable Aquatic Resources' primary areas of education, products and services are:

- Industry Relevant Research
  - Fishing Gear Design and Evaluation
  - Fish Capture Behaviour
  - Sustainable Fisheries and Seafood
  - Graduate Student Training
- 

Fisheries sustainability is a long-term subject and MI's Centre for Sustainable Aquatic Resources has been at its forefront for almost thirty years. As a centre within the Institute's School of Fisheries, its research is not tied to a specific professor or project; it is a mainstay of the University that will continue to tread new depths of knowledge long into the future. Given existing challenges to global seafood sustainability, the Centre will seek to **grow as a resource for the world in sustainability and conservation**, while training the next generation of experts in this area.

**1 Emerging fisheries:** Atlantic waters are home to many species that do not suit the palettes of local people; however, species such as sea urchins, whelk and hagfish are greatly enjoyed by consumers overseas and provide export opportunities. The porcupine crab is a current subject of study.

**2 Big tank:** MI's flume tank is the largest of its kind anywhere in the world, and the only one of its kind in the Western Hemisphere, enabling research that simply cannot be conducted anywhere else. It is a key tool for taking fishing gear designs from concept to commercialization.

**3 Caught on camera, not in nets:** CSAR studies fish behaviour around fishing gear, continually refining trawls and other gear types to ensure the right fish are caught and the wrong ones get away.



Photo by Philip Walsh

## \* Centre for Sustainable Aquatic Resources

The **Centre for Sustainable Aquatic Resources**, part of the **School of Fisheries**, is an arm of MI that is mainly focused on applied research. While the Centre offers short courses, workshops and other training opportunities, its key mandate is to provide industrial research and development, and technology transfer to the fishing industry. CSAR has been in operation since 1988, when MI constructed and began operating the world's largest flume tank. It is staffed by a team of research scientists, biologists, gear technologists, and engineers, supported by a group of research-based graduate students. Projects range from two-day flume tank tests to multi-year, multi-million dollar research and development endeavours.

**For more information on the Centre for Sustainable Aquatic Resources, please contact us at 709 778 0521, [csar@mi.mun.ca](mailto:csar@mi.mun.ca)**

## Transforming Training



**1 Safety first:**

CBED's programs helps fishers stay current with required Transport Canada regulations under which they must operate.

**2 Processing**

**power:** Courses on subjects like seafood processing are increasingly being delivered online, further increasing ease of accessibility for students.

**3 Bringing the classroom to the people:**

CBED removes barriers to education by conducting on-site training to fisheries operators, often in remote areas.

**“When you can teach people in their own communities, training becomes less intimidating and more accessible.”**

**CRAIG PARSONS - DIRECTOR, COMMUNITY BASED EDUCATION DELIVERY UNIT \***





This is an example of how CBED **works collaboratively with industry**, utilizing personnel from within their sectors of focus to bolster their roster of instructors. In unison with CBED's own instructors, these highly qualified professionals pass along invaluable and extensive first-hand field experience to students, through a combination of classroom, online, and on-site instruction. The latter is a key feature of CBED's approach, breaking down barriers and removing any intimidation students may feel by bringing the training to them, often in small communities, in remote corners of the province and even into the Canadian Arctic.



**The Centre for Community Based Education Delivery Unit's primary areas of education, products and services are:**

- Fish Harvesting
- Seafood Processing
- Aquaculture
- Environment

As is the case throughout the Marine Institute, **CBED enjoys a close-knit, mutually beneficial relationship with industry**. It serves an important function in Newfoundland and Labrador's fishing industry, updating the skills and knowledge of even the smallest operators; in the most remote parts of the province. Its innovative model of utilizing industry professionals to assist with training, and bringing the classroom to the people is a blueprint for success that is attracting keen interest across the world. Future plans include continuing to answer the ever-increasing demand for online course delivery.

MI's **Community Based Education Delivery Unit (CBED)** has **transformed aquaculture training** over the course of the past few years. In response to a growing demand from industry for more knowledge in the field, the unit developed a technical certificate consisting of twelve short-course programs and a work experience component. A wide range of subjects are covered, from health and biosecurity in the aquaculture industry, to operational training, such as boat operation and meeting Transport Canada regulations on first-aid. Hundreds of people have received training under this innovative new program, and industry has greatly benefited from the resulting enhancement of skills and knowledge.

**\* Centre for Community Based Education Delivery Unit**

The **Centre for Community Based Education Delivery Unit** is an industrial training arm for the Marine Institute's **School of Fisheries**. The unit oversees training in four key areas: fish harvesting, seafood processing, aquaculture, and environment, offering short-course programs of 12 weeks or less. CBED also undertakes industrial projects — both curriculum- and industry-based — and assists with new technology development.

**For more information on the Community Based Education Delivery Unit, please contact us at 709 778 0623, [cbed@mi.mun.ca](mailto:cbed@mi.mun.ca)**







internationally. Through its **Centre for Applied Ocean Technology (CTec)**, the Institute’s ocean mapping efforts are often industry-driven, and include mapping pre-Quaternary geology in the Gulf of St. Lawrence; improving the sustainability of the yellowtail flounder fishery on Canada’s east coast; and development of a web-accessible digital seabed atlas.

MI experts love to test their sea legs. The Institute **operates two sophisticated training and research vessels** — the MV Anne S. Pierce and the MV Inquisitor. On a larger scale, the **Centre for Fisheries Ecosystems Research (CFER)** charters a research vessel to conduct fisheries science in the North Atlantic.

Through its **Centre for Sustainable Aquaculture Resources (CSAR)**, MI is assisting with the design and testing of evermore selective fishing gear, and developing new and existing fisheries and gear types. Meanwhile, the **Offshore Safety and Survival Centre (OSSC)** sends its experts offshore to provide critical training to workers, on-site.

## Life on the Ocean Waves

The Marine Institute may boast some of the finest land-based ocean simulation research facilities in the world, but it also takes its research and training to sea. There is no better laboratory than the high seas themselves.

The Institute is **heavily involved in ocean mapping**, locally, nationally, and



## Stellar Maritime Education

**“There is no other maritime school in Canada that has the full scope of what we are able to offer, in terms of our programs – from entry level right up to Master’s degrees.”**

CATHERINE DUTTON

HEAD, SCHOOL OF MARITIME STUDIES \*

The Marine Institute’s **School of Maritime Studies** is plotting a course for the future of marine transportation. A culture of innovation, dedication and determination has propelled the School to the very **forefront of nautical insight and invention**, a position recognized by some of the biggest, best-known industrial partners in the world.

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The School of Maritime Studies’ primary areas of education, products and services are:

- Naval Architecture
  - Marine Engineering Systems Design
  - Nautical Science
  - Marine Engineering
  - Maritime Management
- 

**Lockheed Martin** is among the esteemed industry players forging partnerships with the maritime studies wing of the Institute, working with experts and students from the School of Maritime Studies in developing its **VISTA product** to create **simulated training for the maintenance of diesel engines**. The School plans is to use this globally significant partnership to enhance its own training, as well as to potentially market it to other schools.

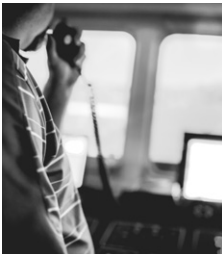
The training will enable students to practice the steps of corrective maintenance and troubleshooting a diesel engine without needing to take an actual engine apart, greatly benefiting the School’s students. In the longer-term, this **new approach to critical training** has the potential to be marketed around the world.



The School of Maritime Studies contributes greatly to the Marine Institute’s status as a world-leading oceans institute, and plans are to continue to build upon this stellar reputation. This begins with the expansion of programs and industrial involvement, as well as examining new ways to provide professional development to those in the marine transportation industry. Existing programs, such as the Bachelor of Maritime Studies, are constantly evolving, and the course-based Master’s Degree will soon be supplemented with a research-based Master’s — all part of a wider plan to expand the School’s programs to service more people, nationally and internationally. The School will also continue to forge industry partnerships and expand its research capacity, ensuring it creates services that align with industry’s wants and needs.

**1 A good icebreaker:** Through its School of Maritime Studies, the Marine Institute is breaking new ground in the area of Arctic and Northern shipping transportation. A dedicated unit within the school will seek to advance this area of study over the next few years.

**2 In parallel:** The School’s programs are directly driven by the needs of industry, with courses designed to meet national and international regulations, and continuous dialogue with industry to align research mandates.



**\* School of Maritime Studies**

The **School of Maritime Studies** focuses on the full scope of design, operation and maintenance of ocean-going vessels. Its programs include Nautical Science, Marine Engineering, Naval Architecture and Marine Engineering Systems Design. In addition to training the next generation of maritime experts through diplomas, Bachelor and Master’s Degree programs, the School services all aspects of the marine transportation industry, through applied research and partnerships. Its staff is comprised of approximately sixty faculty members, including marine engineers, master mariners, naval architects, system engineers and academics, many with direct industry experience that provides practical insight into projects and programs.

**For more information on the School of Maritime Studies, please contact us at 709 778 0370, [SMSinfo@mi.mun.ca](mailto:SMSinfo@mi.mun.ca)**





# Simulation Technology

**1 Motion sickness:**

The Full Motion Ship's Bridge Simulator is the Centre's most iconic. Featuring a surround theatre and hydraulic motion platform, it is capable of simulating almost any seafaring vessel in any conditions, on any ocean in the world.

**2 Sim city:** CMS is home to the largest suite of simulation technology in the world. Its twenty-four simulators include a new Anchor Handler Bridge, along with simulators for ballast control, cargo handling, dynamic positioning, propulsion, tug, and navigation.



When you operate from a subarctic location in the frigid North Atlantic, geography could easily be seen as a disadvantage. Not so for the Marine Institute, which has turned its location in Newfoundland and Labrador to a major competitive and strategic advantage for oceans research, especially in the area of ice-infested waters.

There is perhaps no other Centre within the Institute that better demonstrates how to overcome harsh environmental challenges than the **Centre for Marine Simulation (CMS)**. Home to one of **the most comprehensive suites of simulation technology anywhere in the world**, CMS is turning what sounds like tomorrow's science fiction into today's science fact.

“Clients recognize this is the place to be for ice management operations, and they come from all over the world to do it.”

CAPTAIN CHRISTOPHER HEARN - DIRECTOR, CENTRE FOR MARINE SIMULATION \*



This is evidenced in its ongoing research and development of technology that will **enable vessels to maintain station at sea in varying ice conditions**. Utilizing a dynamic positioning system that automatically controls the vessel's thrusters, such systems have never previously been designed with the added variable of ice in mind. CMS-developed technology will process immense amounts of data and algorithms to make such endeavours possible — particularly in the area of drilling exploration in ice-infested oceans.

It is its breadth of high-tech equipment and the depth of knowledge and experience that allows CMS to conduct this level of research and development, simulating and prototyping such groundbreaking new technology that will make the impossible, possible.

The Centre for Marine Simulation’s primary areas of education, products and services are:

- Marine Simulation and Training
- Applied Research and Development
- Industrial Response



Life at CMS is all about predicting what is going to happen in the future, utilizing some of the most advanced simulation technology in the world to **foresee complex machinery-human-ocean interactions in extreme conditions**. As the Centre’s staff looks forward to its own bright future, they will mirror the exploits of their industry partners in pushing back the boundaries of what’s possible. An increased focus on the human element of extreme marine exploration is on the horizon, with projects examining situational awareness, fatigue, and the effects of colour blindness and hearing loss on a person’s ability to perform their duties on a ship’s bridge.

\* **The Centre for Marine Simulation**

The **Centre for Marine Simulation** is a multipurpose facility within the Marine Institute, providing training, industrial response, and applied research for the shipping and offshore industries. It is home to an unparalleled suite of twenty-four marine simulators, giving it the capability to simulate any ocean-going vessel in any sea state, anywhere in the world. A highly qualified and experienced team of around twenty-five faculty and staff, among them marine experts, naval architects, computer programmers and software engineers, complements this unique capacity.

For more the information on the **Centre for Marine Simulation**, please contact us at 709 778 0304, [cms@mi.mun.ca](mailto:cms@mi.mun.ca)



At-Sea Safety

“We’re very fortunate to have an instructional team with very diverse backgrounds. That’s really what makes us unique.”

FRED ANSTEY - DIRECTOR,  
OFFSHORE SAFETY AND SURVIVAL CENTRE \*

The OSSC and SERT Centre’s primary areas of education, products and services are:

- Safety and Survival Simulation and Training
- Firefighting and Emergency Response
- Industry Support
- Applied Research

The Marine Institute’s **Offshore Safety and Survival Centre (OSSC)** and **Safety and Emergency Response Training (SERT) Centre** seek to expose operators to the worst possible emergency scenarios, before they may be faced with them on land or the world’s oceans. OSSC and SERT are where world-leading expertise and cutting edge technology combine to **provide critical safety, survival and emergency response training** for some of the harshest environments and most challenging situations in the world.



MI’s **Indoor Training Tank HUET** (Helicopter Underwater Escape Trainer) and **Environmental Theatre** in Foxtrap, NL is where OSSC simulates what it would be like to be trapped inside a helicopter crashed at sea, and what first responders will be faced with at such a scene. No detail is overlooked, with waves, rain, wind, and even light and sound (thunder and lightning, helicopters overhead) accurately simulated to provide a vividly real and visceral experience.



**1 Fired up:** Along with an air crash training field, the SERT Centre has specialized faculties to conduct firefighter and emergency response training.

**2 At-Sea-Training:** OSSC training is all about making operations at sea safer for industry operators, but with such realistic simulation, it's also a critically important part of the Centre's training operations. Strict procedures and continuous feedback help ensure that realism is always balanced with safety.



**\* Offshore Safety and Survival Centre and Safety and Emergency Response Training Centre**

OSSC and SERT are fulfilling a new mandate that will set the foundations of a completely new school within the Marine Institute, focused on safety. While training will continue to be the key function of the Centres — providing critical support for the real-world challenges of the marine, fishing, municipal and aircraft sectors — a greater emphasis will be placed on applied research. A research Chair position has been created, along with three post-doctoral researchers. Undergraduate and Masters programs will be added, both with a strong emphasis on research. This transition will be bolstered by the continued modernization, adaptation and evolution of equipment, including synchronization with simulation technology for the purpose of enhanced emergency response training.

Like many of the Marine Institute's centres, the **Offshore Safety and Survival Centre** and **Safety and Emergency Response Training Centre** are best known for its facilities and equipment, but must be just as highly regarded for the world-leading skill set of its people. Their strength lies not only in the might of its machinery, but also in the intellect and ingenuity of its instructors, for the world's most realistic wave tank and firefighting facilities are nothing without the world's most skilled instructors. They range from master mariners to chief engineers, paramedics to rig personnel, firefighters to programmers. This diversity is one of the Centres' key strengths, and their instructors' keen eyes are able to spot trainees' sensibilities assist those who may have concerns right from the start. It is their team of dedicated trainers that truly sets the Centres apart from any competitor elsewhere in the world today.

**For more information on the Offshore Safety and Survival Centre, please contact us at 709 834 2076, [ossc@mi.mun.ca](mailto:ossc@mi.mun.ca)**

**For the Safety and Emergency Response Training Centre, please contact us at 709 643 5550, [sert@mi.mun.ca](mailto:sert@mi.mun.ca)**





▶ **Dr. Scott M. Grant**

Dr. Grant looks at the fish that the industry wants to see get away. An instructor and research scientist with a Ph.D. (Biology), he specializes in conservation-minded harvesting focused on avoiding the capture of juveniles and non-targeted species. He is also involved in sustainable fisheries research and the development of environmentally friendly fishing gear.

**Dr. Dominique Robert** ◀

Holding a B.Sc. (Biology) and a Ph.D. (Oceanography), Dominique's research includes pelagic ecology and fish population dynamics, with an interest in the factors driving variability in the distribution and recruitment of exploited marine fish stocks. This is all part of his role as a Fisheries Scientist at the Centre for Fisheries Ecosystems Research.



**Richard Kelly** ◀

Senior Project Engineer, Richard Kelly is exploring new depths of innovation in ocean technology, dealing with ocean observation systems and instrumentation. He is a key figure in the SmartAtlantic Project and a registered Professional Engineer with degrees in B.Eng. (Electrical Engineering) and B.Sc (Physics).



▼ **Susan Fudge**

Susan is a Fisheries Biologist and Sessional Instructor with a B.Sc. (Biology) and M.Sc. (Fisheries Biology). With over ten years of at-sea experience in fisheries research from Newfoundland and Labrador to the Arctic, Susan is an advocate for science outreach, and for women in science and engineering.



▼ **Carey Bonnell**

Carey is Head of the School of Fisheries. A major influencer in the seafood industry, he serves as President of the International Association of Seafood Producers and Industry Co-Chair of the Canadian Seafood Value Chain Roundtable.

**Captain John Ennis** ▼

Captain Ennis is Chair and an Instructor for the Nautical Science Program. A member of the Company of Master Mariners of Canada, John specializes in navigation safety, nautical astronomy, and bridge watchkeeping.



**Dr. Paul Winger** ◀

Dr. Winger is Director of the Centre for Sustainable Aquatic Resources. Holding a Ph.D. in Fisheries Science and Technology, Paul assists the global fisheries sector in harvesting technology, sustainable fishing practices, fish capture behaviour, and fisheries development.



**Captain Eben March** ▼

Captain March brings highly tuned experience sharpened on the seas to the Institute's outstanding simulation centre. A Master Mariner, Eben is an instructor at the Centre for Marine Simulation, including its Hibernia Offshore Operations Simulation Facility, providing critical training for global offshore operations.

▶ **Robert Brown**

Robert is an Engineer and Research Scientist engaged in cutting-edge research that makes venturing out onto the seas a safer endeavour. His interests include examining emergency response in maritime and offshore environments, human behaviour during evacuation from cruise ships and ferries, and evacuation modeling.



► **Roma Barron**

A graduate of the Institute's Nautical Science Program, Roma provides lifesaving training as an instructor at the Offshore Safety and Survival Centre.



► **Tracey O'Keefe**

An expert in propeller design and marine propulsion systems, Tracey serves as an instructor with the Marine Engineering Systems Design Program. With credentials including a Diploma in Marine Engineering Systems Design, B.Tech., B.Ed., M.Ed. and Power Engineer — 4th class, Tracey is well versed to provide engineering instruction and educational leadership.



► **Chris Connolly**

Chris is a Systems Analyst (M&S), specializing in systems analysis and design, 3D modeling, systems integration, GIS database development, simulation technical support, and visualization programming for the Centre for Marine Simulation.

**Cyr Couturier** ◀

Cyr is the Institute's Program Chair for Aquaculture. He is President of the Aquaculture Association of Canada and the Newfoundland Aquaculture Industry Association, and Vice President of the Canadian Aquaculture Industry Alliance. Cyr has worked in aquaculture R&D, extension and training across Canada and 18 countries, and has received national awards for contributions to sustainable aquaculture.



**Sonia Ho**

As International Student Coordinator with MI International, Sonia provides support to international students and projects at MI. She coordinates the annual MI Summer Institute — a five-week program that provides English training, hands-on ocean and marine instruction, and cultural learning activities. She is also a Board Member of the Atlantic Council of International Cooperation (ACIC).



**Stephen King**

Stephen is a Mechanical Engineer, breaking new ground in the automation of fish processing, and equipment design and development. His design work has contributed to two patent applications in the past three years. Stephen is currently working on applying ultra high-pressure, vision-guided robotics to crab processing.



**Craig Parsons**

Craig is the Director of the Community Based Education Delivery Unit within the School of Fisheries, bringing training to the fisheries industry across Canada for the aquaculture, environmental, fish harvesting and food processing sectors.

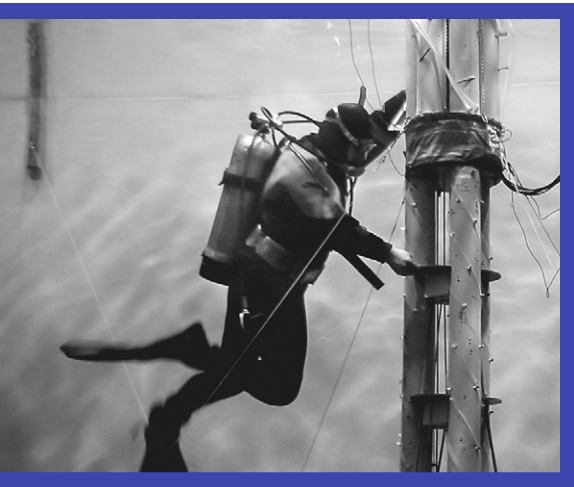


► **Georgina White**

Georgina is an instructor at the School of Ocean Technology, holding a Masters degree in Environmental Science, B.Tech. and D.Tech. She is engaged in ground-breaking ocean mapping and environmental science education and research.

**World-Class Personnel**

The calibre of our people is the reason the Marine Institute has developed a reputation as one of the world's leading oceans institutes. Here are just a few of the people who helped to put the Marine Institute on the map.



### Flume Tank

The Marine Institute is home to the world's largest flume tank, used to carry out performance evaluations, gear tests and other equipment observations in simulated underwater and near-surface conditions. Constructed at a cost of **\$8.5 million CAD**, the MI flume tank first opened in 1988 and is used by fish harvesters and gear manufacturers worldwide. At eight metres wide, four deep and over twenty-two long, the tank can hold **1.7 million litres of water** when full.

It is located at MI's **Centre for Sustainable Aquatic Resources (CSAR)**.



### Indoor Training Tank HUET and Environmental Theatre

The **Offshore Safety and Survival Centre (OSSC)** in Foxtrap, NL is home to MI's world-class **Helicopter Underwater Escape Trainer (HUET)** and **Environmental Theatre** facility. Featuring an eighteen- by fourteen-metre indoor pool with wind, wave, rain, lighting and sound control, the facility allows for incredibly realistic simulation of emergency situations at sea.

Mean Machines

The Marine Institute's experts, partners, collaborators and clients go to work in some of the most advanced facilities on Earth.







► **Marine Bioprocessing Facility**

MI's **Marine Bioprocessing Facility** was established in December 2006 in response to the significant quantities of processing discards generated from the fishing and aquaculture industries in Atlantic Canada. Key to the Institute's **Centre for Aquaculture and Seafood Development (CASD)**, this two hundred and seventy square-metre facility enables clients to conduct tests on the isolation, purification and concentration of potentially valuable seafood byproducts, as well as pilot scale production testing prior to commercialization.



► **Food Processing Pilot Tank**

Housed at the **Centre for Aquaculture and Seafood Development (CASD)**, MI's **Food Processing Pilot Plant** enables clients to develop and process seafood products for the purpose of global test marketing; develop and evaluate new processing technologies; and conduct industrial training workshops. This eleven hundred square-metre plant features a product development kitchen, sensory analysis lab and a range of pilot scale food processing equipment.



**Aquaculture Facility**

Another outstanding feature of **Centre for Aquaculture and Seafood Development (CASD)**, MI's **Aquaculture Facility** is utilized by researchers and industry clients to conduct growth and performance trials in both fresh and salt water. It is also the venue for feed and health studies, and industrial training workshops. These functions are made possible by the facility's complex recirculating systems, feed preparation area, and laboratories for live food culture, quarantine, necropsy, bacteriology, and histopathology.

## Real-World Applied Research

**“With respect to the ocean; its exploration, monitoring, and intervention are only made possible through the application and innovation of new technologies.”**

PAUL BRETT

HEAD — SCHOOL OF OCEAN TECHNOLOGY \*



The Marine Institute is a global leader in the area of **ocean monitoring innovation**. This is perhaps best evidenced in its **Smart Bay** project in Placentia Bay, NL, which is one of the most advanced examples of its kind anywhere in the world.

Much of the oil drawn from the Grand Banks moves into Placentia Bay to be shipped around the world, but the bay is also home to seabirds, mammals and an active fishery. To add to the challenge, it also happens to be one of the foggiest places on earth and often host to high winds.

In order to mitigate the obvious risks, the **School of Ocean Technology (SOT)** proposed and established

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The School of Ocean Technology’s primary areas of education, products and services are:

- Ocean Instrumentation
  - Ocean Observation and Monitoring
  - Ocean Mapping
  - Underwater Vehicles
- 

an ocean observing system for monitoring conditions in the bay. Utilizing a complex system of sensors, the reams of data gathered are made available via the web and inform the decision making processes of both the oil and gas and fishing operators in the area.





As with many of MI's centres, schools and departments, the School of Ocean Technology is very much engaged in real-world applied research alongside its academic functions. In the future, the School plans to also move towards fundamental research aimed at answering bigger and broader questions relating to ocean theory. This shift aligns with the Institute's desire to be seen as a world oceans institute, leading the cause and championing the greater understanding of our planet's seas. To this end, plans are in place to introduce Masters and Ph.D. degrees aimed at preparing highly qualified people to answer the questions that will provide theoretical models of our still-enigmatic oceans.

**1 Clever buoy:** The Smart Bay buoys do a lot more than bob around on the ocean's surface. They are equipped with an array of sensors and continually transmit important data regarding conditions in the bay.

**3 Remote control:** Remotely Operated Vehicles (ROVs) are a particular area of expertise for the Marine Institute, and are employed to conduct critical underwater monitoring, maintenance and repair work.



**2 High traffic area:** Marine pilots answer nearly a thousand duty calls each year in Placentia Bay. The port handles more oil tanker traffic than any other in Canada, serving Newfoundland's oil rigs as well as tankers from around the world.

\* **School of Ocean Technology**

The Marine Institute's **School of Ocean Technology (SOT)** was established with the intent of applying technology to make ocean-based activities more safe, efficient, effective, environmentally sustainable, and profitable. Working in sync with industries such as maritime security, fisheries, offshore oil and gas, and marine transportation, the School's main goal is to produce HQP's (Highly Qualified People) to work within the industry, utilizing technology in a practical sense. The School works closely with industry to discuss any problems they may be facing and make recommendations on technologies that might appropriately address these challenges.

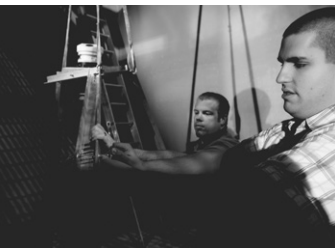
**For more information on the School of Ocean Technology, please contact us at 709 778 0460, [sot@mi.mun.ca](mailto:sot@mi.mun.ca)**





# Ocean Explorer

**1 Underwater overachievers:** MI is home to some world-class technology and infrastructure, such as CTec's underwater acoustics laboratory, used for design, development, testing and calibration of underwater acoustic devices. The Centre's purpose is not to develop new technologies, but to take existing technologies and apply them to the problems at hand.



“We need to explore our oceans for the same reasons we need to explore other planets.”

**RANDY GILLESPIE**

**DIRECTOR — CENTRE FOR APPLIED OCEAN TECHNOLOGY \***

The Centre for Applied Ocean Technology's primary areas of applied research are:

- Ocean Mapping
- Ocean Monitoring

Oceans cover over seventy per cent of our planet's surface, yet only ten per cent of them have been mapped, meaning we know less about them than we do about the surface of the moon. It is this enigmatic appeal that drives the work of the Marine Institute's **Centre for Applied Ocean Technology (CTec)**.

For a number of years, MI has been an advocate for ocean mapping on an international scale. CTec leads this drive, undertaking regional mapping projects, working diligently with Canadian stakeholders to build a national approach, and feeding into a global effort to unveil the secrets of our planet's uncharted watery depths.

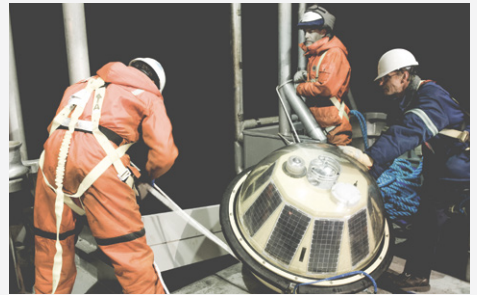
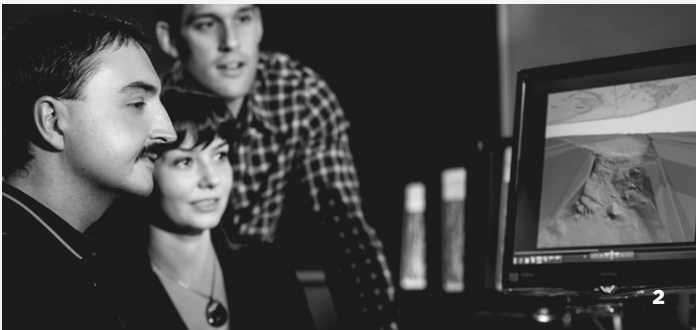
MI also provides consultancy for other international players seeking to go where no ocean explorer has gone before. Over a decade ago, CTec experts provided consultancy to Ireland, advising their national approach to ocean mapping — a process in which that country is now fully engaged.

Currently, a great deal of focus is being placed on applying MI's world-leading knowledge in waters closer to home. CTec specialists are deeply involved in efforts to coordinate Canada, the U.S. and the European Union in mapping the deep Atlantic Ocean, under the **Galway Agreement**. It is hoped that this effort will finally begin to shed light into vast areas of our planet that we have yet to see. Feeding into a global effort to map all deep ocean areas, the parallels to space exploration are emphasized all the more, with national boundaries and jurisdictions needing to be traversed in the interests of a coordinated, international effort with big implications for humankind.

## 2 Small team, big knowledge:

The CTec team is incredibly skilled and experienced. Its members have extensive backgrounds in geology, offshore surveying and ocean mapping and are supported by engineers, technologists and support staff.

**3 Can do:** As is the case throughout the Marine Institute, a 'can do' attitude is prevalent in the CTec culture. The Institute takes a responsive, collaborative approach and is known for consistently getting results. Much of this success can be attributed to the 'private sector culture' running through its centres, which operate much like small businesses.



## \* Centre for Applied Ocean Technology

The Centre for Applied Ocean Technology undertakes applied research in two key areas: ocean monitoring and ocean mapping. The first of these is concerned with the tools and technologies needed to track, in real time, the dynamic characteristics of the ocean. These are physical, chemical and biological observations such as sea levels and water quality. Meanwhile, ocean mapping is more concerned with the aspects of the ocean that don't change very rapidly, such as the seabed and near sub-bottom. As part of the Marine Institute's School of Ocean Technology, CTec's focus is very much on the importance of technology as the bridge between 'knowing' (engineering science) and 'doing' (commerce). The Centre brings forth the application of technology to serve both scientific and commercial needs.

**For more information on the Centre for Applied Ocean Technology, please contact us at 709 778 0754, [ctec@mi.mun.ca](mailto:ctec@mi.mun.ca)**



## International Dimension

“We engage globally through strategic institutional partnerships which help further our goal of becoming a world oceans institute”

**BILL CHISLETT**

**DIRECTOR — MI INTERNATIONAL \***

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MI International’s primary areas of education, products and services are:

- Internationalizing Marine Institute Programs
  - International Projects and Partnerships
- 

The Marine Institute’s reach is truly global and its reputation as a world oceans institute continues to grow. This owes much to its rare combination of three areas of international focus — sending faculty, staff, students and graduates overseas; engaging in international partnerships; and playing a key role in international projects.

**Tra Vinh University**, in southern Vietnam, is a great example of the latter. It represents a large-scale overseas project that the Institute has played a major role in realizing. Located on the **Mekong Delta**, this almost 10-million dollar project was part funded by the Canadian Government, and part funded by other sources, including the Government of Vietnam, which provided the physical infrastructure.

MI led the development of student information systems, human resource systems, and curriculum development processes for programming, with more than thirty Marine Institute employees having worked in Vietnam to date. Today, Tra Vinh University has well over twenty thousand students training for skilled employment and receiving university-level education.

The University’s success has had a huge positive impact on the people of the area, graduating highly qualified individuals and providing employment opportunities in a rapidly growing part of the country. In addition to producing valuable results for the people of the Mekong Delta this project and other MI initiatives in Vietnam have also had a tremendous positive effect on the Marine Institute, thus helping to achieve MI’s goal of becoming a true global institution.





In all corners of the Marine Institute, the goal of being recognized as a world oceans institute is on everybody's lips, and MI International exists to guide the Institute toward this goal. The department's efforts have already seen the Institute develop strategic partnerships in Southeast and North Asia, Sub-Saharan Africa, across Europe, and closer to home, throughout the Americas and Canada. It continues to provide an opportunity for its students to study in programs that will fully equip them to work in a global environment, and bring its industry-relevant, geographically tailored, and community-engagement approach to different corners of the planet.



Photo by Andrew Vickerson 2

\* **MI International**

The mandate of **MI International** is to bring an international dimension to everything that the Institute does. Primarily, the department engages in international projects that leverage the Institute's expertise. It also seeks out opportunities for MI students, faculty, staff, and graduates to work and study overseas, as well as attracting and providing support to students from all over the world to come and study in Newfoundland and Labrador. Finally, MI International strives for broader internationalization of the Institute, working with its schools and units to create programs and offerings that are evermore global in nature, and engaging with communities, both locally and overseas. The department employs eight full-time staff to lead in these important areas.

**For more information on MI International, please contact us at 709 778 0484, [miintl@mi.mun.ca](mailto:miintl@mi.mun.ca)**

- 1 A place in the world:** Through its suite of international internship offerings the Marine Institute is sending students and graduates out to all corners of the world. To date over 350 young graduates have been given the opportunity to gain valuable cross-cultural and international experience, mostly in the developing world (recently, South Africa and Cambodia), but also in the North and in western countries.
- 2 Sincere partnerships:** MI International's strength lies in its people, and their ability to truly engage with communities and students alike, be it locally, with various community organizations in Newfoundland and Labrador, or internationally. A sense of community and family prevails, which is appreciated in all corners of the world.
- 3 Getting out of the office:** MI International led a community development project in Mozambique to help reduce poverty through education and training in the fishing industry.



Photo by Nina Goudie

# World-Class Learning

## MARINE INSTITUTE PROGRAM LIST

### Diplomas of Technology

Marine Engineering  
Marine Engineering Systems Design  
Marine Environmental Technology  
Nautical Science  
Naval Architecture

### Joint Diploma of Technology / Bachelor of Technology

Food Technology  
Ocean Mapping  
Underwater Vehicles

### Technician Diplomas

Remotely Operated Vehicles (ROV Operator)

### Technical Certificates

Bridge Watch  
Fire Rescue  
Marine Diesel Mechanics  
Harvesting  
Aquaculture (Mussel/Salmonid)

### Advanced Diplomas

Food Safety  
Sustainable Aquaculture  
Water Quality

### Degrees

Maritime Studies  
Technology

### Post-Graduate Certificates

Food Safety - Post Graduate Certificate (Online only)  
Quality Management (Online only)

### Master's Degrees

Marine Studies (Marine Spatial Planning and Management)  
Marine Studies (Fisheries Resource Management) (Online only)  
Technology Management (Engineering/Applied Science Technology) (Online only)  
Technology Management (Aquaculture Technology) (Online only)  
Maritime Management (Online only)





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