FERN

FUNDY ENERGY RESEARCH NETWORK

Annual Newsletter

Issue 2 Spring 2012

What's Inside...

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FORCE
Fundy Ocean Research Center for Energy

Hosted by

ACADIA ESTUARINE CENTRE FOR RESEARCH

ACADIA UNIVERSITY

Message from the FERN Coordinator

On behalf of the FERN Executive Committee, I am pleased to present Issue 2 of the FERN Newsletter. The 1st issue was distributed widely both in Canada and internationally and has been well-received by the tidal energy community. In this issue, we are featuring updates from FORCE, OEER, DFO and other partners as well as work being done by up and coming researchers in the field of tidal energy—i.e. students and young professionals.

It has been a busy year for FERN. Several collaborative research projects have been conducted with our member and partner associations (e.g. DFO, NRCan and NS Energy / OEER), who are looking to FERN, on an increasingly regular basis, for scientific and research guidance (e.g. Pathways of Effects Project, p.3).

FERN's subcommittees have been active in building research relationships and working on numerous projects aimed at fostering and facilitating research in their respective fields. The Socio-economics Subcommittee recently completed a Socio-economics Scoping Study (p.2) and, in January, the Biological & Ecological and Hydrodynamics & Geophysics Subcommittees worked together with FORCE and ONCCEE to hold the 1st of a series of Workshops on Environmental Monitoring Tools & Systems (p.2).

I look forward to another active and productive year and to working with the members of FERN.

Lisa Isaacman
(lisa.isaacman@acadiau.ca)

Photo: Colin Buhariwalla

FERN Activities and Accomplishments

Fundy tidal energy environmental monitoring tools and systems technical workshop

FERN, FORCE, Ocean Networks Canada Centre for Enterprise and Engagement (ONCCEE) and the Acadia Tidal Energy Institute (ATEI) co-hosted a successful 2-day technical experts workshop, focused on tidal energy environmental monitoring tools and systems, during 10-12 January 2012 at the Prince George Hotel in Halifax, NS. The 38 attendees from Canada and the US included scientists with expertise in marine environmental monitoring, industry representatives with core knowledge of marine environmental monitoring tools / systems and emerging technologies, and representatives from tidal energy demonstration and development sectors. The purpose of the workshop was to address Bay of Fundy tidal energy science needs, challenges and gaps in monitoring technologies, and instrument and infrastructure requirements for effective monitoring in high flow, high energy locations.

Working groups were chaired by Graham Daborn, Richard Karsten, Gary Melvin and Brian Polagye. This technical workshop is expected to be followed by a series of small, focused science and industry workshops that will address specific environmental monitoring challenges for the developing marine renewable energy sector, both regionally and nationally. Advances in monitoring technologies and their use at and near tidal energy development sites will inform project developers and governments and help address environmental concerns posed by marine renewable energy regulators, ENGOs and the public. A report on the workshop will be available via the FERN website in late spring.

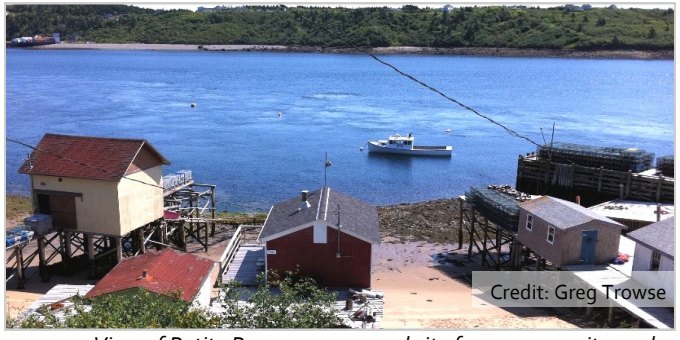
Workshop Co-leads:
Anna Redden, FERN/Acadia
(anna.redden@acadiau.ca)
Scott McLean, ONCCEE
(sdmclean@uvic.ca)
Jennifer Matthews, FORCE
(jennifer.matthews@fundyforce.ca)


Credit: Anna Redden

Socioeconomics scoping study for tidal power in Nova Scotia

While significant work has been accomplished in the natural and applied sciences with respect to tidal energy, lacking is a comprehensive understanding of the socioeconomic variables associated with in-stream tidal energy.

Commissioned by the FERN Socioeconomics Subcommittee, with funding from the NS Department of Energy and the OEER, the FERN Socioeconomics Scoping Study provides a state-of-knowledge comprehensive review of the socioeconomic issues associated with in-stream tidal energy. Highlighted in the report are issues identified as important to developing a robust in-stream tidal energy industry and ensuring socio-economic benefits at local and regional levels.


Credit: Greg Trowse

View of Petite Passage, proposed site for a community-scale in-stream tidal project.

Specific issues and needs identified include:

- Development of a strategic plan for the development and deployment of in-stream tidal devices, in line with Canada's Marine Renewable Energy Technology Roadmap (released in November 2011);
- Jurisdictional and regulatory clarity;
- Streamlining of the evaluation, permitting and decommissioning process;
- Community buy-in to projects and protecting lower-income Nova Scotians from severe energy rate increases;
- Clarity on how benefits to the community will be incorporated into development agreements.

The Scoping Study Report provides a foundation for stakeholder engagement and further research into the socioeconomic issues associated with in-stream tidal. The Final Report is available at http://fern.acadiau.ca.

Project Leads:
John Colton (john.colton@acadiau.ca)
Shelley McDougall (shelley.mcdougall@acadiau.ca)
FERN Socioeconomics Subcommittee

Pathways of effects and strength of evidence for marine renewable energy

Pathways of effects (PoE) are conceptual representations of predicted relationships between human activities, their associated pressures or stressors and the environmental effects they may have on specific ecological components or receptors. Based on available scientific information and consultations with experts, FERN staff recently finalized a series of PoE logic models for wind, wave, in-stream tidal and in-river hydrokinetic energy technologies. These are supported by a Strength of Scientific Evidence synthesis document. This work was conducted, on behalf of DFO, to inform scientific research needs in support of effective and efficient regulation and governance of the marine renewable energy industry.

Seven main stressors were identified that apply, to varying degrees, to all four technologies. The main stressors are:

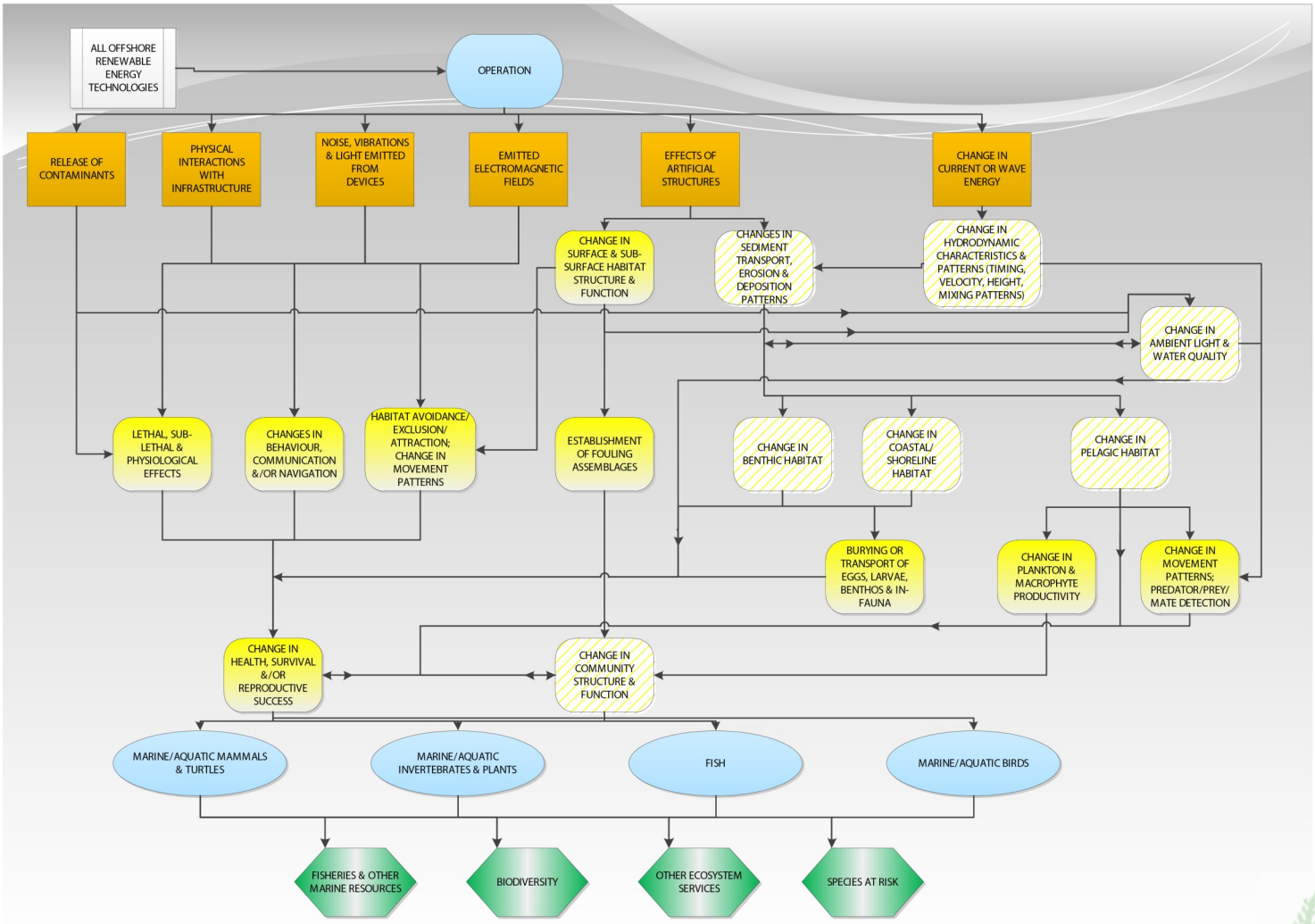
- Physical alteration of habitat;
- Physical interactions with infrastructure (e.g. strikes);
- Changes in ambient light and acoustic regimes;
- Changes in current and wave energy;
- Changes in electrical and magnetic fields;
- Release of contaminants; and
- Disturbance and/or translocation of fauna.

Separate models were developed to illustrate the specific stressor – effect pathways for each activity phase: Site Investigations; Construction/Maintenance/Decommissioning; and Operations. In December 2011, the models and strength of evidence underwent a Canadian Science Advisory Secretariat peer review process. The models and report will be available via the FERN website in the spring.

Project Leads:
Lisa Isaacman (lisa.isaacman@acadiau.ca), FERN
Graham Daborn (graham.daborn@acadiau.ca), Acadia University

Example of PoE model

(Isaacman & Daborn, 2011. Pathways of Effects for Offshore Renewable Energy)



Updates from FERN Partners

Update from FORCE

Capital

In October 2011, FORCE took possession of 11 kilometres of submarine cable to connect to four underwater berth sites. In November 2011, FORCE opened the Visitor Centre (which reopens in spring 2012). The FORCE substation is substantially complete with final equipment installation underway. Work on the overhead transmission line has begun.

Also upcoming in 2012, IT International Telecom will conduct dry runs of the submarine cable installation, leading up to actual installation. This work is in advance of the next TISEC device deployment.

Environmental Monitoring and Research

In November 2011, FORCE released the results of the first environmental monitoring report, available here: http://fundyforce.ca/monitoring. Oceans Ltd. has successfully completed FORCE's 2011 Acoustic Doppler Current Profiler (ADCP) program for the four berths, and are collecting additional ADCP data along the cable route in preparation for the cable lay. A six-month harmonics survey is also being planned.

A contract was awarded to CEF Consultants in late December 2011 to review the potential risks to marine organisms from electromagnetic fields associated with submarine power cables, with a focus on species in the Minas Passage. A final report will be available in spring 2012.

The final Seabirds and Mammals Observation Surveys were completed during the week of December 12th and the final report for all the 2011 surveys will be available shortly.

Matt Lumley, Communications Director, FORCE (matt.lumley@fundyforce.ca)

FORCE's submarine cable, for installation in 2012-2013; the cable will connect FORCE's berth sites to the grid.

View from the new FORCE Visitor Centre, Fall 2011.

Connecting science to the public

FORCE officially opened its $1.3 million, 3,000 square-foot visitor centre in Parrsboro on Nov. 7, 2011. The facility, which overlooks the tidal turbine demonstration site and Cape Split in the Minas Passage, offers visitors information, videos and interactive displays related to tidal energy and the Bay of Fundy. The centre also includes a small theatre and space for research and meetings.

Nova Scotia Premier Darrell Dexter with sample of the FORCE cable, 7 Nov 2011.

Several FERN members contributed information and served as scientific advisers in the design and content of the Visitor Centre's information displays.

FORCE Board Members and Staff. Left-Right: Sandra Farwell, Steve Marsden, Jean-François Ally, Anna Redden, John Woods, Joe Kozak, Jennifer Matthews, Frank LeBlanc and Mary McPhee

Updates from FERN Partners (cont'd)

Update from OEER

The Offshore Energy Environmental Research Association (OEER) is a not-for-profit corporation dedicated to leading offshore energy and environmental research initiatives, enabling the sustainable development of Nova Scotia's energy resources through strategic partnerships with academia, government and industry.

RFP: Strategic Environmental Assessment for the Cape Breton Coastal Region / Bras D'Or Lakes

OEER released a Request for Proposals (RFP) in mid-February to obtain consultant services to prepare a background report for the Cape Breton Coastal Region, inclusive of the Bras D'Or Lakes, on marine renewable energy. The background report will serve as an initial and critical component to developing and supporting the Cape Breton Strategic Environmental Assessment (SEA), and will provide a consolidation of information on the: a) existing environment, socio-economic context, and marine renewable technologies, b) potential environmental interactions, and c) data and information gaps. The deadline for submissions was March 16. More details can be found at: www.offshoreenergyresearch.ca

Tidal Marine Energy Research

In March 2011, OEER released a RFP that addressed topic areas in relation to Tidal In-Stream Energy Conversion (TISEC) devices. As a result, seven projects were awarded funding and all are currently underway. Additionally, OEER has another eight funded tidal marine energy projects in its portfolio that are all at varying stages of completion.

Southwest Nova Scotia Tidal Resource Assessment

OEER received funding from the Nova Scotia Department of Energy to complete an assessment of the in-stream tidal resource opportunities in southwest Nova Scotia, defined as Shelburne, Yarmouth and Digby counties. In September 2011, Acoustic Doppler Current Profilers (ADCP) were deployed in Digby Gut, Grand Passage and Petit Passage and data analysis is underway. Sites for ADCP deployment in Spring 2012 are currently being finalized. The OEER, the Department of Energy and Fundy Tidal Inc. have also organized various community engagement sessions with local officials in southwest Nova Scotia. The sessions commenced in Deccember 2011 and will continue through to May 2012.

Laura Smith
Operations & Research Coordinator, OEER/OETR Associations
(l.smith@offshoreenergyresearch.ca)

Phase II—OEER-funded Projects

Acoustic Tracking of Fish Movements for the Assessment of Effects of Tidal Energy Devices in the Minas Passage
Dr. Michael Stokesbury and Dr. Anna Redden, Acadia University

Passive Acoustic Monitoring of Cetacean Activity Patterns and Movements Pre- and Post-deployment of TISEC devices in Minas Passage
Dr. Dominic Tollit, SMRU Ltd. and Dr. Anna Redden, Acadia University

Seasonal Erodibility of Sediment in the Upper Bay of Fundy
Brent Law, Tim Milligan, and Gary Bugden, Fisheries and Oceans Canada and Dr. Paul Hill, Dalhousie University

Turbulence and Bottom Stress in Minas Passage and Grand Passage
Dr. Alex Hay, Dalhousie University

Testing of Temporal Monitoring Techniques for Benthic Habitat Impacts from Tidal Power Development
Dr. Craig Brown, McGregor GeoScience Limited

Implications of Tidal Energy Extraction on Sedimentary Processes within Shallow Intertidal Environments
Dr. Danika van Proosdij, Saint Mary's University and Dr. Ryan Mulligan, Queen's University

Tracking lobster movements in the Minas Passage


Credit: Jeremy Broome

Acadia University has been conducting a lobster tracking study in the Upper Bay of Fundy. The goal of this study is to better understand seasonal movements of lobster within the Minas Passage, particularly within the FORCE turbine demonstration area.

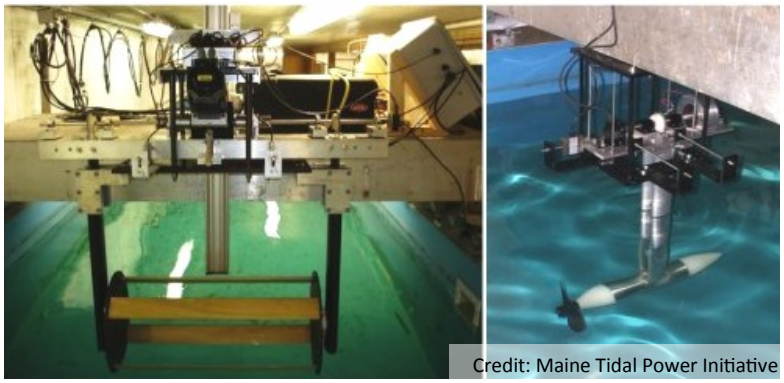
In November 2011, a total of 85 lobsters, collected from Minas Basin, were fitted with VEMCO acoustic transmitters (glued to the carapace) and ½" diameter yellow plastic disc tags (around the knuckle). A series of 29 receiver mooring stations in the Passage, initially established for ongoing fish monitoring studies, is being used to detect the movements of lobsters across the Passage during Fall 2011 and Spring 2012.

Jeremy Broome and Anna Redden,
Acadia University

Updates from FERN Partners (cont'd)

The Maine Tidal Power Initiative: tidal resources, seafloors, turbines, fish and people

Complex interactions and feedbacks among social, biophysical and technical components will influence the success of marine hydrokinetic (MHK) development. Linkages among these components are critical for sustainable development. The Maine Tidal Power Initiative (MTPI) is researching these linkages while developing resource and environmental assessment protocols to evaluate tidal energy resources and better understand the potential impact of this development on the environment. Although these protocols will be transferrable throughout Maine and the US, our site-specific work is focused on Cobscook Bay/Western Passage near Eastport, Maine, possibly the most viable commercial tidal energy site in the US. Protocols are being applied for initial scoping of additional MHK deployment locations in Maine.



Turbine test beds in UMaine tow tank.

The **Fish Assessment Study Team (FAST)** is committed to determining the effects of MHK devices on fish, particularly their behaviour and water column distribution. Multiple gears and approaches are used in a rigorous scientific framework to develop protocols that allow industry, management agencies and stakeholders to make informed decisions. Research since 2009 has focused on the Ocean Renewable Power Company's (ORPC) tidal generating device. Active acoustics data collected at proposed deployment and control locations (May, June, August, September, 2010 and 2011) are being used to understand the relationship between fish behaviour and fish presence at proposed deployment depths. In addition, fish interactions with a full-scale test device have been assessed using acoustic imaging fore and aft of the device. Interaction data were collected day and night over multiple tidal cycles. Sampling periods covered current speeds of up to 2.5 m s^{-1} (5 knots). Given the poor visibility in the bay and the need for both day and night observation, the acoustic imaging system, DIDSON, proved to be a useful tool to assess near-field responses of fish to the device. More fish were observed around the device at night, likely reflecting general activity patterns in the region. Individuals were observed both moving through the device and actively avoiding the device. Implications of this work for ultimate bottom-mounted deployments are being considered. Plans for post-deployment monitoring of fish interactions with the device include near-field monitoring using down- and side-aspect split beam acoustics.

The **Resource Assessment Team** is developing objective *in situ* and modeling methods to assess MHK tidal resources, documenting the accuracy and uncertainties associated with different methods, and assessing the impacts of energy extraction on hydrodynamics. The **Turbine Engineering Team** focuses on characterizing baseline MHK systems to provide industry benchmarks to evaluate and compare emerging turbine technology with regard to energy extraction performance. This focus includes the design and testing of standard turbine types and the development of experimentally validated design codes to assist the design of new turbines. The **Seafloor Geomechanics Team** is researching solutions and options for efficient and robust foundations for both fixed bottom and floating tidal energy devices. The **Human Dimensions Research Team** is investigating factors that influence public support and identifying engagement practices that allow stakeholders to shape the direction of research, make informed decisions about MHK development and improve the use of research in future energy policy-making.

FAST team: James McCleave, Garrett Staines, Haley Viehman, Jeffrey Vieser, Gayle Zydlewski

Other team leaders: Michael L. Peterson (Mechanical Engineering), Huijie Xue (Physical Oceanography), Richard Kimball (Engineering), Teresa Johnson (Social Science), Melissa Maynard (Civil Engineering)

Partners: University of Maine, Maine Maritime Academy, Tidal Energy Device Evaluation Center, S.W. Cole Engineering, Inc., Maine Sea Grant, Cobscook Bay Resource Center, Chewonki Foundation, Town of Wiscasset, Homeowner Pleasant Cove Association, Maine Energy Investment Corp.

Funders: US Department of Energy, Ocean Renewable Power Company, National Science Foundation - Maine EPSCoR Award.

Gayle B. Zydlewski, FAST Lead
University of Maine, School of Marine Sciences
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Updates from FERN Partners (cont'd)

Fisheries and Oceans Canada and marine renewable energy

For the past year, DFO has been consulting experts regarding research needs to support regulatory approvals for the future deployment of Marine Renewable Energy (MRE) devices in Canadian marine and aquatic ecosystems. FERN staff recently completed a Pathways of Effects (PoE) document, on behalf of DFO, which has provided a useful tool to identify environmental effects associated with the various forms of MRE and helped to focus discussions on regulatory / governance and research needs right across the country.

In early November, DFO Ecosystem and Science Directorate hosted a Canadian Science Advisory Secretariat – CSAS meeting to peer review the PoEs. The meeting was held in Montreal and participants included representatives from industry, provincial governments, other federal departments and a number of scientific experts from DFO Science, US government, academia and other entities. The CSAS process attempts to build consensus. Based on the recommendations of the group, the PoE figures and supporting narrative were revised and finalized in late December. DFO recently (January 31 – February 1, 2012) hosted a follow up meeting based on a workshop format to apply the PoEs to MRE case studies – representative commercial scale projects for each form of energy. The case studies included a tidal power scenario in the Minas Passage, a large array of hydrokinetic devices in the St Lawrence River, an offshore wind project in Lake Ontario, and a wave energy project off Vancouver Island. The discussions were very interesting and productive. The Workshop Proceedings are in preparation and will be available in spring 2012.

Positioning New Energy Corp. 5KW turbine for testing in Grand Passage.

Ted Currie,
Senior Environmental Analyst &
Marine Renewable Energy Advisor, DFO
(ted.currie@dfo-mpo.gc.ca)

Upcoming Tidal Energy Events

Nova Scotia Energy Research & Development Forum
World Trade and Convention Centre, Halifax, NS
May 16 -17, 2012
www.offshoreenergyresearch.ca

CMOS Congress 2012
Montreal, PQ, May 29 - June 1, 2012
Includes special session on Ocean Renewable Energy.
www.cmos.ca/congress2012/en/index.shtml.

INORE 2012 US Symposium
Massachusetts Maritime Academy, June 17-21, 2012
http://inore.org/events/inore_2012_us_symposium/

OREG 2012 Annual Conference
Halifax, NS, September 13-14, 2012
http://oreg.ca/

4th International Conference on Ocean Energy (ICOE)
Dublin, Ireland, October 17-19, 2012
http://www.seal.ie/ICOE_2012/

4th Annual New England Marine Renewable Energy Center Technical Conference
Warwick, Rhode Island, October 30-31, 2012
http://www.msrec.umassd.edu/event/4thconference/

About FERN

FERN is an independent non-profit organization initiated by academic and government researchers as a forum to coordinate and foster research collaborations, capacity building and information exchange to understand the environmental, engineering and socio-economic factors associated with tidal energy development in the Bay of Fundy.

FERN was formalized in 2010 and currently has >100 members. Membership is FREE and open to all those involved or interested in tidal energy-related research, including academia, government agencies, environmental NGOs, consultants, and the private sector. For more information about becoming a member, please visit our website, http://fern.acadiau.ca.

Highlights of Student & Young Professional Research Projects

The following articles profile seven of the many dozens of projects involving young FERN member researchers.

Jump to…

Use of Minas Passage by a threatened striped bass population

The Bay of Fundy striped bass population is one of several species of concern currently being investigated using VEMCO (Halifax, NS) acoustic tracking technology. This study examines movement patterns, seasonality and swimming depth of striped bass within the migration pathway of the Minas Passage.

In spring 2010, 22 VEMCO VR2w acoustic receiver mooring stations (Figure 1) were deployed in Minas Passage. A total of 80 striped bass were surgically implanted with VEMCO V13P pressure sensing transmitters and released during spring and summer 2010 (Figure 2). Forty-three large adult fish (mean = 71cm total length) were tagged in the Stewiacke River, NS and 37 smaller juvenile fish (mean = 43cm total length) were tagged in the Minas Basin near Grand Pre, NS. Survival of striped bass post-surgery was in excess of 98%.

Receiver retrieval in late November indicated detection of 79 of the 80 tagged striped bass within Minas Basin and / or Minas Passage. Depth sensors in the tags indicated that striped bass swimming depths were variable, ranging from near surface to near bottom (> 95m). However, juvenile striped bass were detected less frequently within Minas Passage, and swimming depth was primarily in the top 15 m, above the depth of any turbine infrastructure. The larger adult striped bass were detected at water column depths ranging from the near surface to >95m. These results indicate that adult striped bass may be at risk of interaction with bottom fixed in-stream tidal energy conversion devices.


Credit: Derek Nevin

Implanting a VEMCO transmitter in a striped bass

During 2011, the second year of the tracking study, 40 additional striped bass were implanted with acoustic tags. Data analysis is ongoing. Receiver arrays were redeployed in Minas Passage during May 2012 and this year's tagging of striped bass will soon be underway. The three seasons of tracking data, collected prior to installation of operational in-stream tidal devices, will provide a clearer picture of movement patterns and depth selection by striped bass utilizing the Minas Passage, and will be useful in assessing risk of fish-turbine interaction.

Project funding and other support: OEER, FORCE, DFO, NSPI, VEMCO, Mitacs Accelerate, Ocean Tracking Network and Acadia University.

Jeremy Broome, MSc candidate,
Acadia University (jeremy.broome@acadiau.ca)


Credit: Colin Buhariwalla

Ready to deploy VEMCO receivers housed in SUBS buoys

Characteristics of the flow in the channels of Digby Neck

The development of small-scale tidal power is progressing in the passages around Digby Neck as a result of the collaborative effort between Fundy Tidal Inc., Acadia University and Dalhousie University. Plans are currently underway to install an in-stream turbine in 2014 and funding has been acquired to complete resource assessments of Digby Gut, Petit Passage and Grand Passage.

High resolution bathymetric data have been collected for each channel and several Acoustic Doppler Current Profilers (ADCPs) will be deployed beginning in February 2012. Using velocity measurements from the ADCPs, I plan to characterize the physical aspects of the flow in each channel. This includes determining the mean velocity variation with depth, as well as estimating the temporal and spatial scales associated with the unsteady flow. Previous ADCP measurements and numerical simulations suggest that pulses of high speed flow pass through the centre of the channels, which could place significant stress on in-stream turbines. Using the ADCP data in parallel with numerical simulations, I will attempt to determine whether the pulsations are a manifestation of resonant oscillations or a consequence of eddies shed from bathymetric features.

Diver taking current measurements in Grand Passage using an ADCP - Fall 2010.

Justine McMillan, PhD Candidate, Department of Oceanography, Dalhousie University (mcmillanjustine@gmail.com)

Ambient noise measurement and marine mammal monitoring in a high-flow environment: defining baseline conditions prior to tidal turbine installation

To date, the ability to measure ambient noise and detect marine mammals in high-flow environments, such as those that characterize tidal energy sites, have been severely limited by the production of pseudosound. The goal of this project is to explore and field test methods, using specialized acoustic instrumentation (Instrument Concepts hydrophones), to extend both the distance and frequency (Hz) ranges that marine mammals can be detected at a tidal turbine site.

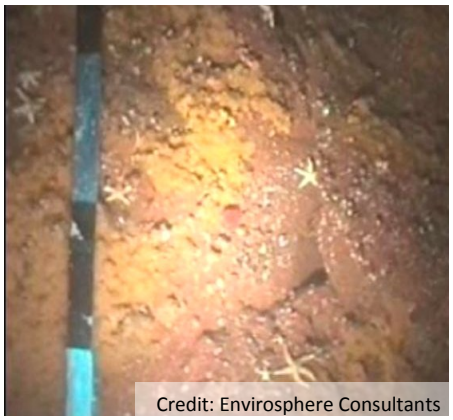
Hydrophones will be deployed this summer in Grand Passage, N.S. to measure ambient noise levels to establish baseline acoustic conditions. To reduce pseudosound, innovative turbulence noise cancellation techniques will be employed, including the use of a foam buffer surrounding the moored hydrophone. To account for the remaining effects of pseudosound, measurements in the high-flow environment will be compared to calibrations made in a no-flow environment. Sounds will be transmitted into the water with a projector, under source levels and frequencies mimicking that of marine mammals common to the area, in order to get an estimation of the hydrophone's effective detection range. Simultaneous measurements of flow and turbulence will be taken during the deployments to see how the detection range varies with varying speeds of flow in the tidal cycle. Acoustic software will then be used to determine under what conditions (distance away from the hydrophone, frequency and source level of sound, and tidal flow speed) the emitted sounds are detectable.

Deployment of ADCP equipment in Grand Passage, Fall 2010.

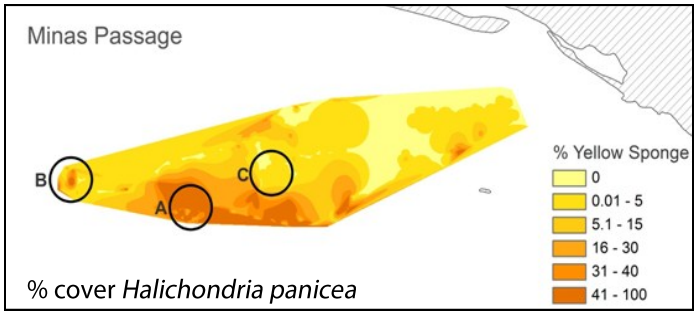
Funding: NSERC Engage Grant between Dr. Alex Hay (Dalhousie Oceanography) and Instrument Concepts.

Chloe Malinka, BSc. Candidate, Combined Honours in Marine Biology and Oceanography Co-op, Dalhousie University (chloe.malinka@dal.ca)

Benthic habitat characterization of the FORCE demonstration site in the Minas Passage, Bay of Fundy


Credit: Envirosphere Consultants

This study examines the seafloor and benthic habitat of the FORCE lease area and describes features on which tidal energy infrastructure will be installed. The study presents baseline data that will be useful in addressing potential environmental effects of demonstrating tidal energy technologies (i.e. turbines, moorings, cable). The benthic assemblages of three berth areas and their associated cable routes were examined via qualitative and quantitative analyses of videographic material collected in 2008-2009 by Envirosphere Consultants Ltd. ImageJ photo software was used to analyze 1197 still frames for geophysical features (substrate type, size) and abundance (or percent cover) of macrobiota. Relationships between epifauna and substrate type were examined. Although biodiversity in this high flow environment was low, the percent cover of *Halichondria panicea*, the yellow breadcrumb sponge, was often high and positively correlated with depth and degree of exposed bedrock. Other fauna present, but in low numbers, include two species of seastar, white sponge, and anemones. Macroalgae featured prominently in the shallow regions (<10m) of the cable routes. The biological and physical features of 3 berth areas (as designated in 2009) have been mapped.



% cover *Halichondria panicea*

Impacts of deployed infrastructure (turbines / moorings, subsea cable) on the epibenthic community within the FORCE test area are likely to be minimal due to the resilient nature of the dominant taxa residing within the site and the naturally low epifaunal diversity.

Kaycee J. Morrison, BSc (Hon),
Bachelor of Environmental Science, Acadia University
(kayceemorrison@gmail.com)

Far-field effects of energy extraction on salt marsh hydrodynamics and depositional processes in the Minas Basin

Understanding the far-field effects of energy extraction is a critical component of resource assessment ahead of commercial installation of in-stream tidal devices in the Minas Passage. Changes to the tidal regime imposed by turbines through increased flow resistance have been modelled and indicate reduced tidal prism in the Minas Basin. How this will impact fine-scaled processes in the intertidal zone and what this means for the overall ecological stability along the coast remains to be seen. The Intertidal Coastal Sediment Transport (InCoaST) Research Unit at Saint Mary's University is nearing completion of the initial phase of OEER-funded salt marsh and tidal creek research designed to address these intertidal issues. Measurements of current velocity and sediment deposition have been carried out at Starr's Point marsh (2009 & 2011) in a sheltered salt marsh creek, and at Kingsport marsh (2010) on an exposed salt marsh and mudflat boundary.

Preliminary results show significant variations in deposition (on the order of 1000 g·m2 between tides) coupled with relatively low velocity conditions (< 1 m·s-1). Analyses are ongoing to investigate how particle size may be linked with tidal prism, current velocity, flocculation processes, and consequently sediment deposition.

Casey O'Laughlin, MSc Candidate, Masters of Applied Science Program (casey.olaughlin@gmail.com)
Emma Poirier, BSc (Hon) Candidate, Environmental Science Program (emmapoirier@hotmail.com)
Saint Mary's University


Credit: Casey O'Laughlin

Taking measurements of current velocity and sediment deposition at Starr's Point marsh.

Socio-economic benefits and challenges for communities in small-scale tidal energy development in the Bras D'Or Lakes, Cape Breton

This research will examine the socio-economic benefits and challenges for communities with small-scale tidal energy development in the Bras d'Or Lakes, Cape Breton. In September 2011, Fundy Tidal Inc. submitted Community Feed-In Tariff (COMFIT) applications to the Nova Scotia Department of Energy for two small-scale tidal energy projects on behalf of communities on the Bras d'Or Lakes. The proposed sites, the Great Bras d'Or Channel (500kW) and the Barra Strait (100kW), were identified based on preliminary tidal flow data and interest from the community. Small-scale tidal energy projects generally have low backward linkages to the local economy; however, under the community ownership model, the local area will capture the majority of income flows. An examination of the social and economic benefits of the community ownership model will be based on quantitative and qualitative data, including interviews with key stakeholders.


Credit: Bras d'Or Lake Biosphere Reserve Association

This research is supported by a Productivity and Innovation Voucher (Nova Scotia Department of Economic and Rural Development) awarded to Fundy Tidal Inc. The project report will serve as the researcher's final submission requirement for the Masters in Business Administration in Community Economic Development Program at Cape Breton University.

Amanda Tarr,
Masters in Business Administration in Community Economic Development, Cape Breton University
(Amanda_Tarr@cbu.ca)

Tidally-induced sediment transport patterns in the upper Bay of Fundy: a numerical study


Credit: Sherman Bleakney

The properties of the tidally-induced sediment transport in the upper Bay of Fundy, where significant changes in tidal processes may occur due to the recently proposed tidal power project, have been studied with a 3-D hydrodynamic model, an empirically-based sediment model and surface sediment concentration data derived from remotely-sensed images (Wu et al., 2011). The model was evaluated against independent observational data, which include tidal elevation, tidal currents (in the water column and bottom layer), tidal residual currents, tidal asymmetry indicators and sediment transport rate. The evaluation shows that the model is in good agreement with the observations, but some differences are apparent.

In Minas Channel, the sediment transport follows the structure of the tidal residual circulation, which features a large anticlockwise gyre. The sediment in Minas Passage moves eastward and deposits in the central Minas Basin. However, the sediment from the eastern part of the Basin moves westward and also deposits in the central Minas Basin. In the adjacent Cobequid Bay, sediment moves eastward and deposits in the upper Bay.

Reference

Wu, Y.S., Chaffey, J., Greenberg, D. and Smith, P. (2011) Tidally-induced sediment transport patterns in the upper Bay of Fundy: a numerical study. Continental Shelf Research 31, 2041–2053.

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Credit: Casey O'Laughlin

In Memoriam

Croyden Wood Jr.

On 20 January 2012, Croyden Wood Jr, lobster fisher and boat captain of the Cape Rose, Parrsboro, NS, and his brother tragically lost their lives to the Bay of Fundy while checking their lobster traps by ATV off the Parrsboro coast. Croyden was well known in the tidal energy research community. During 2008-2012, Croyden played a major role in the environmental monitoring and research programs for FORCE and local universities. His advice, efforts and willingness to share his knowledge and experience of the Minas Passage, and his kind, quiet and accommodating nature, will be long remembered.

Peter Underwood

On 24 March 2012, Peter Underwood passed away after a brief illness. A champion of environmental sustainability, Peter served Nova Scotia for 25 years. During that time, he worked in the departments of Natural Resources, Agriculture, Fisheries and Aquaculture, and most recently, as deputy minister in charge of special projects, including tidal energy. Peter was a dedicated member of the FERN Socioeconomics Subcommittee and a passionate supporter of environmentally responsible tidal energy development. His enthusiasm and contributions have fueled excitement in advancing knowledge for this nascent industry.

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We welcome your feedback on this issue and any suggestions for future issues of FERN's annual newsletter.

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