

Making Waves 2020

Graduate Project Presentations of the Master of Marine Management Class of 2020

Schedule and Abstracts



Thursday December 10, 2020
10:30 am to 2:00 pm AST

Friday December 11, 2020
10:30 am to 1:30 pm AST

Zoom connection details are outlined in the Schedule

Making Waves 2020 Schedule - Thursday December 10, 2020

Join Zoom Meeting

<https://us02web.zoom.us/j/87429685048?pwd=a2E0Q3FFcGppYVdJQ3BiR1ZXNFo2QT09>

Meeting ID: 874 2968 5048

Passcode: 719731

Time (AST)	Name	Title
10:30 am	Introductory Remarks – Jerry Bannister, Director, Marine Affairs Program	
10:45 am	Jessica Cucinelli	<u>An Impact Assessment on Shipping in the Canadian Eastern Arctic: A Baffinland Mine Case Study – Phase 2 Project Proposal</u>
11:05 am	Noémie Blais	<u>Are Atlantic Leatherback Turtles (<i>Dermochelys Coriacea</i>) at risk of plastic pollution in the Northwest Atlantic Ocean?</u>
11:25 am	Morganne Robben	<u>Leaving space to roost: An examination of human disturbances to shorebirds in the Minas Basin, Bay of Fundy, Nova Scotia</u>
11:45 am	Rachel Rickaby	<u>Consideration of marine non-indigenous species in the planning, management, and monitoring of Canadian marine protected areas</u>
BREAK		
12:20 pm	Stefan Miller	<u>Electrically stimulated artificial mussel (<i>Mytilus edulis</i>) reefs to create shoreline protection and coastal habitat in St. Margaret's Bay, Nova Scotia</u>
12:40 pm	Jenna Morissette	<u>Identification of tools for implementing an ecosystem-based approach to species recovery under the Species at Risk Act</u>
1:00 pm	Catherine Thompson	<u>Influences to advice and decision-making in the DFO Maritimes Region: Opportunities for improving integrated coastal and ocean management</u>
1:20 pm	Bronwen Rowe	<u>Regional Response Planning (RRP) for Ship-Source Oil Spills in Canada: Assessing the Implementation Status of Recommendations and Integration into an RRP Framework</u>

Making Waves 2020 Schedule – Friday December 11, 2020

Join Zoom Meeting

<https://us02web.zoom.us/j/84533097188?pwd=b1FKb3FjK1U4MTM2dVdWVitWUUhBUT09>

Meeting ID: 845 3309 7188

Passcode: 443052

Time (AST)	Name	Title
10:30	Welcome Back – summary of previous day	
10:35 am	Shahriar Nazrul	Identifying institutional barriers to marine fisheries development projects in Bangladesh
10:55 am	Camille Mancion	Exploring traceability in small-scale fisheries: from harvest to landing
11:15 am	Delaney Ewing	Managing the Groundfish Industry on Sensitive Benthic Areas of Interest for Marine Protected Area Network Establishment in the Scotian Shelf Bioregion
11:35 am	Kiana Endrez	Understanding the ecological linkages between salt marsh ecosystems and nearshore fisheries
BREAK		
12:10 pm	Omar Sickander	Factors affecting IMTA (Integrated Multi-Trophic Aquaculture) implementation on Atlantic salmon (<i>Salmo salar</i>) aquaculture farms
12:30 pm	Shannon Wood	Drivers of social acceptability for bivalve aquaculture in Atlantic Canadian communities
12:50 pm	Noémie Roy	Fostering Ocean Literacy through Formal Education in Quebec, Canada: A Case Study of Saving a Coastal School
WRAP UP		

Making Waves 2020 Abstracts

(in alphabetical order)

Noémie Blais

Blais, N. 2020. Are Atlantic Leatherback Turtles (*Dermochelys Coriacea*) at risk of plastic pollution in the Northwest Atlantic Ocean? [graduate project]. Halifax, NS: Dalhousie University.

Abstract

The production of plastic has greatly increased since the early 20th century resulting in an overwhelming abundance on land and in the sea. The solid waste pollution found in the ocean poses sublethal to lethal threats to marine turtles through ingestion, entanglement, and habitat degradation. The Leatherback turtle (*Dermochelys coriacea*) is a migratory species that inhabits terrestrial and marine environments and is better known for its migrations from mid to higher latitudes. Out of the seven species, it is the only marine turtle to migrate in Canadian cold-water for the sole purpose to forage on gelatinous zooplankton (i.e. jellyfish) which are easily mistaken with plastic bags. This project provided an ecological risk assessment of plastic debris to the endangered Northwest Atlantic Leatherback subpopulation through a comprehensive literature review and an analysis of data on plastic litter found on the shorelines of select Canadian Maritime provinces. Findings show that plastic pollution continues to accumulate on the shorelines of Nova Scotia, and Prince Edward Island, and Newfoundland and Labrador, despite there being regional solid waste management strategies, national legislation, engagement, education, and outreach programs. Of these plastics, most originate from land-based sources (i.e. shoreline and recreational and smoking-related activities). Moreover, these plastics are a hazard and may pose a risk to the leatherbacks in waters surrounding Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. To provide the level of risk, additional research is needed on the pathways of effect and the effects of plastics on the leatherback turtle. This study concludes with management recommendations to minimise the potential risk of plastics to leatherback turtles.

Keywords: Leatherback turtles, *Dermochelys coriacea*, Northwest Atlantic Ocean, plastic, ingestion, marine litter, marine debris, waste management, Nova Scotia, Ecological Risk Assessment

Noémie completed her internship at Dalhousie University under the supervision of Dr. Wilf Swartz. During her internship, she contributed to the Marine Litter project by compiling information on the causes associated with ghost gear in Nova Scotia, Canada. She did this by drawing from online literature and findings from interviews with civil society organizations working with fisheries and on fishing gear retrieval projects. Her internship provided Noémie with the opportunity to gain valuable interpersonal and research skills.

Jessica Cucinelli

Cucinelli, J. 2020. An Impact Assessment on Shipping in the Canadian Eastern Arctic: A Baffinland Mine Case Study – Phase 2 Project Proposal [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Sea ice is melting at an unprecedented rate, improving access to the Arctic and greatly increasing development opportunities such as mining. The Baffinland Iron Mines Corporation Phase 2 project proposal aims to expand iron ore production at the Baffinland mine facility in Nunavut. If approved, this development will extend the shipping season beyond open-water season as well as increase vessel traffic from the port in Milne Inlet, through Eclipse Sound and out into Baffin Bay. This will increase the likelihood of shipping hazards such as the introduction of aquatic invasive species, underwater noise pollution, chemical pollution, habitat disturbance, and vessel strikes (with marine mammals), likely posing serious environmental and socio-cultural impacts, threatening local wildlife and neighbouring Inuit communities (e.g. the Hamlet of Pond Inlet). This study is threefold as it identifies shipping hazards and their potential impacts on valued-ecosystem components; reviews Baffinland's proposed management measures to reduce adverse impacts; and provides a high-level assignment of the likelihood and severity of impacts from shipping given Baffinland's proposed management plans. This study addresses the above research objectives through employing both a literature and policy review, while an impact matrix was developed to identify potential management gaps and areas of management priority. Recommendations were provided to further minimize adverse impacts from shipping hazards. The results suggest a need for Baffinland to strengthen their proposed management plans prior to project approval.

Keywords: Arctic shipping, shipping hazards, Baffinland Iron Ore Mine, impact assessment, impact management, Arctic wildlife, Inuit, Eclipse Sound, Pond Inlet

Jessica completed her internship with the World Wildlife Fund (WWF) Canada as part of the Wildlife and Industry Team, under the supervision of Kimberley Dunn and Miako Ushio. She was tasked with developing a research project on methods for reducing impacts from commercial vessel traffic in federally designated Marine Protected Areas (MPAs). She conducted semi-structured interviews with government and local experts to evaluate the current monitoring and compliance protocols in place for commercial shipping. The result of her research was a comprehensive report titled “Reducing impacts from shipping in MPAs: Evaluating tools for monitoring and compliance” that will be incorporated into the “Shipping in MPAs Toolkit” project, providing guidance for future research. During her time at WWF, Jessica also had the opportunity to participate in many high level engagements with government, industry and environmental groups as well as collaborated on a project advocating for slowdown zones to protect SARA listed cetaceans off the coast of BC, Canada. Although separate from her graduate research, this internship allowed Jessica to explore various aspects of shipping governance and marine technology while gaining practical experience working for a worldwide NGO

Kiana Endrez

Endresz, K. 2020. Understanding the ecological linkages between salt marsh ecosystems and nearshore fisheries [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Salt marshes are some of the most productive ecosystems on the planet however they continue to experience severe threats from human activities. These ecosystems have been increasingly recognized for their capacity to sequester large amounts of carbon and potential to keep pace with sea level rise. Salt marshes provide numerous other ecosystem services including improving water quality and reducing flooding for coastal communities, however their importance for nearshore fisheries is often overlooked. Many species of marine fish and crustaceans including those that hold commercial value utilize salt marshes at some point throughout their life history. Salt marshes offer refuge and an abundance of food resources making them ideal nursery habitats. Salt marshes contribute more to nearshore fisheries than just the direct export of juvenile fish. When fish and other nekton move between salt marshes and nearshore environments they act as biological vectors moving energy and nutrients mainly in the form of their biomass. Large amounts of detrital matter from salt marshes are moved by the tides providing another important source of energy and nutrients to nearshore food webs. An improved understanding of this topic will strengthen the support for salt marsh conservation and restoration, which will in turn benefit nearshore fisheries.

Keywords: Salt marsh, energy and nutrient linkages, fish, biotic vector, abiotic vector

Kiana completed her internship with CB Wetlands and Environmental Specialists (CBWES). During her internship she assisted with conducting background desktop research on a variety of topics relating to salt marshes that was to be used for report writing. She gained experience working with tide charts and interpreting them when a tidal restriction is present. In the field, she became more familiar with salt marsh restoration techniques and understanding the transition that a salt marsh undergoes post-restoration. She assisted with monitoring work including vegetation surveys and fish sampling. During her internship she also had the opportunity to conduct a small pilot study for her graduate project. Overall, it was a great experience that enhanced her understanding of salt marsh ecosystems and provided awareness of the many salt marsh restoration projects that have occurred in Nova Scotia.

Delaney Ewing

Ewing, D. 2020. Managing the Groundfish Industry on Sensitive Benthic Areas of Interest for Marine Protected Area Network Establishment in the Scotian Shelf Bioregion [Graduate Project]. Halifax, NS: Dalhousie University.

Abstract

Increases to the number and extent of Marine Protected Areas (MPAs) in recent decades has been critical for the conservation of coastal and marine environments. Canada has met their original targets of conserving 10% of their oceans by 2020 and are intending to increase their commitments to conserving 30% of their ocean by 2030. This includes designating sites aimed at protecting coral and sponge species whose habitat-building capabilities may support entire ecosystems. These coral and sponge reefs may be at risk of smothering and physical disturbance from nearby fisheries operations, yet the socioeconomic necessity of the fishing industry must be considered in MPA development. Stakeholder identification and prioritization analyses were used to determine that those operating within the groundfish industry were likely to be significantly affected by benthic MPA designation on Canada's Scotian Shelf as a result of decreased fishing territory that could correlate into reduced quotas and increased costs of travelling to and from fishing grounds. A Marxan analysis with conservation targets ranging between 15-50% for sensitive benthic areas (SBAs) on the Scotian Shelf was performed to determine the optimal locations for an MPA network that minimally affected groundfish operators. The conservation targets were set against the locations of known groundfish industry operations. The 15% and 25% scenarios resulted in the best output of Areas of Interest for MPA designation because there was minimal overlap between SBAs and fisheries. Maintaining opportunities for Canada's coastal industries while conserving unique marine features is key for developing a sustainable economy.

Keywords: marine protected area; Nova Scotia; sensitive benthic areas; groundfish; commercial fishing

Delaney completed her internship at the Department of Fisheries and Oceans Canada, National Headquarters, within the Marine Conservation / Operations branch. Under the supervision of Chloe Ready and Elizabeth Edmundson and the rest of the MC Ops Team, Delaney helped to support the goals of the management team. Here, she completed research focused on socioeconomic, governance, and cultural indicators that can be applied to Canada's marine protected areas to measure success. During her internship, Delaney performed risk assessments and cost-benefits analyses for Canada's *Oceans Act* marine protected areas to be used in future reports. Although the work Delaney undertook for her internship was not directly related to her graduate project, the experience provided her with a unique opportunity to expand upon her research and networking skills, as well as gain critical insights into the management and establishment of Canada's marine protected areas.

Camille Mancion

Mancion, C. 2020. Exploring traceability in small-scale fisheries: from harvest to landing [graduate project]. Halifax, NS: Dalhousie University.

Abstract

As consumers and governments demand to know the origins of seafood products, there is a push for transparency across the seafood supply chain. However, for many small-scale fisheries (SSF), this growing demand for transparency is also serving as a barrier to markets and additional financial burdens as they are increasingly required to demonstrate traceability in their operations at sea. Through a literature review, this study outlines global traceability requirements from point of harvest to landing, including legal and recommended key data elements from large seafood importing countries. Overall, reporting requirements varied between countries at different stages along the supply chain. The study identifies some of the challenges faced by SSF in adopting traceability systems including cost, data sharing and privacy concerns, infrastructure limitations, poor governance and lack of incentives. With this information, an evaluation framework was developed as a tool for SSF to identify traceability systems appropriate for data collection and reporting at sea. Through a case study on Indonesian small-scale tuna fisheries, the framework evaluates three traceability tools. Well-implemented, traceability systems provide an opportunity for SSF to demonstrate their sustainability commitments and obtain a higher market price for their products. Highlighting the benefits of electronic traceability systems and developing appropriate incentives is key to increasing the adoption of traceability tools in SSF globally.

Keywords: traceability, small-scale fisheries, Indonesia, traceability technologies, reporting requirements, IUU fishing

Camille completed her internship remotely with the International Pole and Line Foundation (IPNLF), under the guidance of Roy Bealey (Fisheries Director) and Jeremy Crawford (Southeast Asia Director). IPNLF works to support environmentally and socially responsible pole-and-line and handline tuna fisheries. During her internship, Camille assessed traceability systems used in Indonesia's small-scale tuna fisheries and identified challenges to implementing traceability technologies. The evaluation framework developed in her graduate project served as a tool to assess different electronic traceability systems and identify traceability technologies well-suited for Indonesian small-scale vessels. This internship was instrumental in shaping her graduate project and Indonesia case study.

Stefan Miller

Miller, S. 2020. Electrically stimulated artificial mussel (*Mytilus edulis*) reefs to create shoreline protection and coastal habitat in St. Margaret's Bay, Nova Scotia. [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Infrastructure designed to protect coastal environments, such as seawalls, can have adverse effects on the area they are supposed to protect. Hard shore armouring can be expensive, disrupt hydrodynamic processes, eventually rebuilding, and impact the surrounding marine environment. Artificial reef structures built with mineral accretion technology (MAT) grow stronger over time and improve corals' and other reef-forming organisms such as blue mussels, growth, and survival. MAT reef structures develop through the seawater electrolysis reaction. By adding a current to a sacrificial anode, an electrical field envelops a cathode (the steel artificial reef structure), causing dissolved minerals to accrete. Seeding MAT installations with shellfish such as blue mussels add ecosystem services such as improved water quality through filtration and complex habitat creation to the reef structure. A literature review was conducted to determine the feasibility of a proposed MAT installation in St. Margaret's Bay, Nova Scotia, an atypical cold-water region with low dissolved carbonate mineral levels, to benefit blue mussel habitat construction. The ability to grow engineered living breakwaters with little electrical input and locally accessible materials presents a sustainable, cost-effective solution for coastal communities that require shoreline protection and marine habitat reconstruction.

Keywords: *Biorock™, blue mussel, reef, living shoreline, shoreline protection, marine habitat reconstruction, mineral accretion technology, engineered living breakwater*

Jenna Morissette

Morissette, J. 2020. Identification of tools for implementing an ecosystem-based approach to species recovery under the Species at Risk Act [graduate project]. Halifax, NS: Dalhousie University.

Abstract

The objective of the *Species at Risk Act* (SARA) is to protect and recover at-risk species and their habitat. However, limitations have been identified for its implementation with aquatic species. These include taxonomic biases, economic considerations, slow listing and plan development, and poor critical habitat protection. This study aims to assess if the utilization of alternative tools under an ecosystem-based approach (EBA) could strength conservation efforts in Canada, using the Stewiacke River in Nova Scotia as a case study, based on the objectives of SARA. Tools were identified in current processes in Canada, such as those resulting from the *Oceans Act* and *Fisheries Act*, and evaluated for potential use. Additionally, to help inform recommendations, the results of other countries such as Australia and New Zealand who have adopted EBAs in their conservation programs were evaluated for comparison. Overall, analysis of EBA tools in Canada displayed a potential to strengthen conservation efforts by providing more information about the species of interest, the identification of critical habitat, and the development of recovery measures. Secondly, data gaps were identified for the effectiveness of available tools in Australia and New Zealand, but similarities are presented when compared to Canadian tools. Additionally, there is an opportunity for the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to draw upon the Australian threatened species listing framework to incorporate EBAs. Lastly, Ecologically Significant Areas (ESA) and provincial watershed planning were suggested as potential tools to mitigate threats of at-risk species in the Stewiacke River.

Keywords: Species at Risk Act, aquatic species at risk, ecosystem-based management, tool identification

Jenna completed her summer internship with Fisheries and Oceans Canada at the Bedford Institute of Oceanography. Under the supervision of Dr. Sarah Tuziak, she worked with Integrated Planning under the Fish and Fish Habitat Protection Program. During her internship, she conducted a case study on the Stewiacke River in Nova Scotia. The case study focused on the ecological information, ecological and anthropogenic threats, and current conservation/stewardship initiatives of four at-risk species (Atlantic salmon, American eel, brook floater, and striped bass). Using this information Jenna was able to compile a report on the Stewiacke River determining if the Stewiacke River was appropriate for ecosystem-based approach tools, and if so, what tool(s) may be suitable for the benefit of the four at-risk species.

Shahriar Nazrul

Nazrul, K. M. S. 2020. Identifying institutional barriers to marine fisheries development projects in Bangladesh [graduate project], Halifax, NS: Dalhousie University.

Abstract

Marine waters of Bangladesh are amongst the most biologically diverse in the world. With financial and technical support from international organisations, several large-scale projects have been implemented to support the development and sustainable management of its marine fisheries. Although the majority of immediate objectives for these projects are generally achieved, in most cases, their development aspirations such as sustainable resource management, institutional capacity building, fisheries co-management are rarely attained. The objective of this research is, therefore, to understand why these projects fall short on attaining sustained outcomes beyond the life of the project through assessments of two recently completed projects (Bangladesh Marine Fisheries Capacity Building Project and Empowerment of Coastal Fishing Communities for Livelihood Security Project). The study identifies five categories of institutional barriers within the Ministry of Fisheries and Livestock and Department of Fisheries that are potentially affecting the long-term effectiveness of these development projects: legal limitation; strategic limitation; coordination gap; capacity limitation; and bureaucratic bottleneck. This paper conclude with recommendations on possible ways in reducing the impacts of these barriers, including periodic reviews of regulatory instruments, development of a comprehensive fisheries management plan, improving coordination through memorandum-of-understanding, adopting long-term career plan for technical staffs, and instituting mechanisms for evaluating project progress at each stage of the project implementation. With greater awareness of potential institutional barriers within Bangladesh's fisheries governance structure, future development projects should benefit from improved design and implementation.

Keywords: Bangladesh, marine fisheries, international development projects, sustained outcome, institutional barrier.

Shahriar completed his summer internship with Nippon Foundation Ocean Nexus Program, under the supervision of Dr Wilf Swartz, who was also his Graduate Research Project supervisor. His internship was basically desktop research. During this period, Shahriar investigated the role of microcredit in the fisheries sector of Bangladesh. Although his internship did not directly align with his Graduate Research Project, the information gathered from the internship provided valuable evidence for one of his two case studies.

Rachel Rickaby

Rickaby, R. J. 2020. Consideration of marine non-indigenous species in the planning, management, and monitoring of Canadian marine protected areas [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Marine protected areas (MPAs) are considered to be an important tool for protecting marine environments. They can help conserve biodiversity, protect endangered species and critical habitats, regulate anthropogenic activities, and preserve social, economic, and cultural values. Despite these benefits and the increasing use of MPAs, some stressors can jeopardize the effectiveness of an MPA. One important stressor is marine non-indigenous species (NIS), which includes any marine species living outside its native range. These species can cause widespread damage to ecosystems and threaten biodiversity; because MPAs lack physical boundaries between them and surrounding waters, they are not immune to invasion. Marine NIS are a key management concern for many scientists worldwide. However, there is evidence suggesting marine NIS are not adequately considered during MPA planning, management, or monitoring. This research aimed to determine how marine NIS are considered in Canada's federal MPAs during MPA planning, management, and monitoring. The study included a review of all available federal MPA management plans and structured interviews with MPA practitioners and aquatic invasive species (AIS) practitioners. The results indicate that marine NIS are not given enough consideration in Canadian MPAs. Recommendations include incorporating marine NIS into MPA management plans, increasing inclusion of marine NIS during MPA planning, increasing collaboration between MPA and AIS practitioners, developing marine NIS awareness and outreach specific to MPAs, and increasing funding for marine NIS management, monitoring, and research.

Keywords: marine protected areas; marine non-indigenous species; non-indigenous species management; aquatic invasive species; Canada

Morganne Robben

Robben, M. 2020. Leaving space to roost: An examination of human disturbances to shorebirds in the Minas Basin, Bay of Fundy, Nova Scotia [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Every year, up to 1.4 million shorebirds, such as the Semipalmated Sandpiper (*Calidris pusilla*), use the Bay of Fundy and the Minas Basin as a stopover site before continuing their transoceanic migration to their southern wintering grounds. According to the 2019 State of Canada's Birds report, shorebird populations have declined an average of 40% since the 1970s due to various threats. One such risk is anthropogenic disturbances to roosting shorebirds on migratory stopover sites. If disturbed while roosting, shorebirds will attempt to avoid the threat, often taking flight and leaving the area in search of a safer roosting site. This unnecessary energy expenditure is detrimental as it depletes the fat stores used to supply them with enough energy to complete their migration. This research aimed to identify the frequency and nature of anthropogenic disturbances to roosting shorebirds caused by recreational beach users in the Minas Basin, Nova Scotia, Canada. It also examines the level of awareness and the attitudes the users have toward migratory shorebird conservation issues in the area. Through observation of disturbances at roosting sites, it was determined that the three recreational activities which cause the most disturbance to shorebirds in the Minas Basin are: walking, fishing, and wildlife photography. This finding in the 2020 season was consistent with disturbance data dating from 2016 onward. Surveys were conducted with recreational beach users, finding that many users were aware of migratory shorebirds in the Minas Basin but did not know about the detrimental effects of human disturbances.

Keywords: shorebird conservation; migratory shorebirds; human disturbance; Minas Basin; Bay of Fundy; conservation; roosting shorebirds; high tide roosting

Morganne completed her internship with Birds Canada in Halifax, Nova Scotia. During her internship, Morganne worked alongside Laura Bartlett, the Nova Scotia Program Coordinator at Birds Canada. Morganne worked as a shorebird stewardship biologist as a part of Birds Canada's Space to Roost Project, monitoring disturbances to migratory shorebirds on roosting sites in the Minas Basin, Nova Scotia. She managed data collection for the project and created a set of interviews for recreational beach users in the Minas Basin to gauge their understanding of conservation efforts in the area. She also performed outreach and education initiatives with local community members to increase awareness of both the project and the detrimental effects of disturbances to migratory shorebirds.

Bronwen Rowe

Rowe, B. 2020. Regional Response Planning (RRP) for Ship-Source Oil Spills in Canada: Assessing the Implementation Status of Recommendations and Integration into an RRP Framework [graduate project]. Halifax, NS: Dalhousie University.

Abstract

In 1995, the National Oil Spill Preparedness and Response Regime (NOSPRR) was established by Transport Canada. Although there has not been a major spill in Canadian waters since NOSPRR was implemented, experts have indicated that Canada remains at risk for a spill. Recent statistical modelling suggests that Canada could experience a major marine oil spill every year, and a catastrophic spill once every fifteen years. In 2013, the Tanker Safety Expert Panel (TESP) published a review of Canada's National Oil Spill Preparedness and Response Regime, and recommended that Canada shift to an area-based planning approach. In 2014, a nationwide Area Risk Assessment (ARA) indicated that there are regional variations in the level of risk (probability) and/or impact (consequences) of a marine oil spill.

Other than two pilot projects (the Area Response Planning Initiative (ARPI) and the British Columbia Regional Response Plan Project), there is no clear indication of a shift toward Regional Response Planning (RRP). An effective RRP framework would mitigate adverse impacts to the Canadian environment, economy, and society in the event of a catastrophic spill.

This paper proposes an adaptive RRP framework that can be applied to at-risk regions across Canada. The framework was built using recommendations from the TSEP and the ARPI. The framework begins with Initiation, and is followed by six phases: Region, Risk, Prevent, Prepare, Respond, and Review. This framework emphasizes: stakeholder and rightsholder engagement; expert involvement and science-based decision-making; open communication and data sharing between government departments; and establishment of a standard process for national use. Feedback loops are included to ensure the management (response) is adaptable and responsive to regional changes. Finally, an action plan is required to ensure RRP is implemented within a reasonable timeframe. Ideally, the development of an RRP approach to oil spill management should be a proactive rather than reactive process.

Keywords: marine oil spill; policy; regional based management; adaptive management; shipping; marine transportation; response organization

Noémie Roy

Roy, N. 2020. Fostering Ocean Literacy through Formal Education in Quebec, Canada: A Case Study of Saving a Coastal School [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Protecting coastal ecosystems, livelihoods, and identities require the active engagement of ocean literate citizens. Ocean literacy, or the understanding of the ocean's influence on us and our influence on the ocean, can be fostered through marine education. Yet, in Canada, marine education falls in a jurisdictional gap, with ocean conservation largely under federal jurisdiction and education under provincial jurisdiction. With little to no ocean literacy in curricula, teachers lack the time and resources to include the ocean in their classroom. Along the St. Lawrence Estuary, a rural community mobilized to save its middle school by developing an innovative program connecting the existing curriculum to the ocean. For instance, students practise physical education by learning scuba diving. My research project explores the rationale, barriers, and enablers to the inclusion of ocean literacy in schools through a case study of this program. I completed interviews and a survey with school community members and found that the program faces considerable barriers that threaten its sustainability, including the lack of an educational framework, educational resources and funding. Support from school community members and access to a program coordinator were the greatest enablers of the program. Students and adults involved in the program gained knowledge about the ocean and took actions to care for the ocean, showing the influence of the program on their ocean literacy. This case study acts as an example of how ocean literacy initiatives are challenging to implement in schools, but can support citizen engagement in coastal management.

Keywords: ocean literacy, coastal communities, formal education, whole-school approach, marine citizenship, case study, Quebec

Noémie completed two part-time internships. Her first internship was with the Canadian Ocean Literacy Coalition under the supervision of Dr. Julia Ostertag. Noémie wrote a report on youth and ocean literacy in Canada and helped organize a series of national and regional workshops with community partners of the Coalition. Her second internship was with Ocean Wise Education under the supervision of Danika Strecko. Noémie created and adapted online educational content on the ocean to the reality of francophone learners.

Omar Sickander

Sickander, O. 2020. Factors affecting IMTA (Integrated Multi-Trophic Aquaculture) implementation on Atlantic salmon (*Salmo salar*) aquaculture farms [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Aquaculture operations are currently the fastest-growing food production industry, increasing output over 20 times in the past few decades alone. Waste management on “fed” aquaculture farms, like Atlantic Salmon, is a massive issue for management and public perception. Integrated Multi-Trophic Aquaculture (IMTA) is the co-cultivation of species from different trophic levels instead of a single species (monoculture) on an aquaculture farm. From a theoretical perspective, in an IMTA farm, the metabolic waste and uneaten feed from the top-level species like Atlantic Salmon is used by lower-level trophic species like shellfish and macroalgae, minimizing the potential impact of these wastes on the ecosystem. Though this logic has long been used in polycultures in history, there is a theoretic rationale to support it commercially on a much larger scale. However, IMTA is currently not being applied as a mitigation measure in Atlantic Salmon aquaculture facilities. This graduate project explores and investigates current methods, applications, uses, and efficiency of IMTA to address challenges on salmon farms through an in-depth PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method literature review. In addition to completing the literature review, industry experts were surveyed to understand industry perspectives on IMTA effectiveness and the potential for use. The main goal of this research was to determine the current standards and processes of IMTA and if it can be effectively implemented on Atlantic Salmon aquaculture farms in a commercially viable manner.

Keywords: aquaculture, Atlantic Salmon, IMTA, mitigation

Omar completed his internship with Nexus Coastal Resource Management Ltd., where he worked with the Kwilmu’kw Maw-klusuaqn Negotiation Office (KMKNO) to help develop a livelihood fishery evaluation report. This report is meant to aid in the development of sustainable livelihood-based fisheries throughout the province and commented on opportunities for diversification, job creation and value-chain development. In addition, he conducted independent background research and engaged with NEXUS on other projects currently in their pipeline.

Catherine Thompson

Thompson, C. 2020. Influences to advice and decision-making in the DFO Maritimes Region: Opportunities for improving integrated coastal and ocean management [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Integrated coastal and ocean management (ICOM) is an approach used by marine managers and practitioners to balance ecosystem health and preservation with the sustainable development of multiple ocean activities. In Canada, ICOM plans are developed and implemented by the Government of Canada, through the Department of Fisheries and Oceans (DFO). The experiences and expertise of DFO program staff can lend itself to the development of future ICOM plans and tools. Program staff from the Aquatic Ecosystems Sector at the DFO Maritimes Region frequently engage in decision-making processes as part of their regulatory responsibilities in addition to providing advice internally at DFO and to external partners. The purpose of the research project is to identify the factors influencing the advisory and decision-making processes of three key programs in the Aquatic Ecosystems Sector: Marine Planning and Conservation, Aquaculture Management, and the Fish and Fish Habitat Protection Program. Structured interviews (n=9) were conducted with program staff from the Bedford Institute of Oceanography, and content analysis was conducted to identify influences on advice and decision-making. Based on research results, this paper offers program specific recommendations as well as recommendations for advancing ICOM in the Maritimes Region.

Keywords: Integrated coastal and ocean management, advice, decision-making, Department of Fisheries and Oceans, Maritimes Region, Canada

Catherine completed her internship with the Department of Fisheries and Oceans (DFO) Marine Planning and Conservation Program. Catherine's internship and Graduate Project were closely linked. During her internship, Catherine began structuring her research project, conducted research on the programs involved in the study, and carried out and transcribed interviews with staff from the Aquatic Ecosystems Sector. As well, Catherine attended meetings and webinars and learned the ins and outs of working for DFO.

Shannon Wood

Wood, S. E. 2020. Drivers of social acceptability for bivalve aquaculture in Atlantic Canadian communities [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Aquaculture is a growing sector in Canada; while salmon remains Canada's largest export, bivalve aquaculture production is increasing due to its perceived sustainability. Despite similar environmental effects of bivalve aquaculture on most ecosystems, the socio-economic contexts of prospective sites may differ; some ongoing and proposed bivalve farming projects are under intense public scrutiny in Atlantic Canadian communities. This research explores the environmental, social, and economic effects that inform social acceptance of bivalve aquaculture in Antigonish Harbour, NS, and North Rustico Harbour, PEI. Using a quantitative approach that examined perceptions of bivalve farming through online surveys, findings suggest that perceptions of environmental effects were mixed, social effects were negative, and economic effects were positive. Perceptions of environmental effects were similar, while economic and social effects varied between communities, suggesting that socio-economic contexts should be considered as part of prospective site evaluations. Research should be conducted at the local level to address how bivalve aquaculture may interact with the community; localized research could better identify drivers of community perception for bivalve aquaculture and potentially increase general acceptability of the industry.

Keywords: *bivalve* farming, shellfish aquaculture, coastal communities, social acceptance, Atlantic Canada, Nova Scotia, Prince Edward Island

Shannon completed her internship at Dalhousie University under the supervision of IDPhD candidate Jenny Weitzman. During her internship, Shannon supported projects investigating the social acceptability of salmon aquaculture in Nova Scotia as a research assistant. She was responsible for recruiting government, fisheries, NGO, and other relevant stakeholders to participate in interviews regarding their experiences with salmon aquaculture. Additionally, Shannon helped distribute survey materials designed to assess general knowledge and perceptions of salmon aquaculture in Nova Scotia both in Halifax and in social media posts, as well as contacting media organizations for survey advertising purposes. Shannon's internship gave her experience with online survey software and recruitment methods, which proved invaluable for her own research.