30 years MARINE AFFAIRS PROGRAM

Making Waves 2017

Graduate Project Presentations of the Master of Marine Management Class of 2017

Thursday December 7, 2017
9:00 am to 2:30 pm
&
Friday December 8, 2017
9:00 am to 1:00 pm

Room 1009
Rowe Management Building
6100 University Avenue
Dalhousie University, Halifax, NS

DALHOUSIE UNIVERSITY

Making Waves 2017 Schedule - Thursday December 7, 2017

Time	Name	Title
8:45	Coffee/Tea	
9:00	Introductory Remarks – Lucia Fanning, Acting Director, Marine Affairs Program	
9:15	Emilie Normand	Quantifying external benefits associated with the production of Fair Trade Certified™ seafood: Underprovided and undervalued
9:37	Rebecca Aucoin	Direct Marketing of Cape Breton Lobster and Its Impact on the Triple Bottom Line of Fishery Performance
10:00	Christina Callegari	Exploring consumer-facing traceability as a risk mitigation strategy for seafood producers in Nova Scotia
10:22	**Break**	
10:45	Joana Costa	Marine Protected Areas: Potential Tools for Sustainable Community Development.
11:07	Jessica Bradford	Underwater community gardens? Exploring community-based marine aquaculture as a coastal resource management strategy in Nova Scotia, Canada
11:29	Genevieve Renaud-Byrne	The Social-Ecological Resilience of the Sandy Island Oyster Bed Marine Protected Area to Climate Change
11:51	Simon Ryder-Burbidge	"I thought the horseshoe crabs were part of my family": Investigating ocean connectivity in Falmouth, Massachusetts
12:13	**Lunch**	
1:00	Jasmine Prior	Protection On The Move: Applying Dynamic Ocean Management to Address Shark Bycatch In Atlantic Canada.
1:22	Kalene Eck	Evaluating the Role of Technical Working Groups in Decision-making for Fisheries Management in Belize
1:44	Laura Steeves	Projections and perceptions: Predicted impacts of climate change on shellfish mariculture

Each student is allotted 20 minutes for their presentation (13 minutes for presentation, 7 minutes for questions). There is a 2- minute break for change-over of presenter.

Making Waves 2017 Schedule – Friday December 8, 2017

Time	Name	Title
9:00	Emma Marotte	Management solutions for an at-risk population of northern bottlenose whales (*Hyperoodon ampullatus*) in the international waters of the Sackville Spur
9:22	Ainslie McLeod	AIS Whale-alert! Assessing the fleet preferences for near real-time whale conservation in the Atlantic Canada
9:44	Kelly Fretwell	Exploring the issue of cumulative shipping impacts in the Salish Sea though a systematic focal species assessment framework
10:06		**Break**
10:30	Weishan Wang	Evaluating Institutional Arrangements for Marine Shipping Management within the Northern Marine Transportation Corridors Using Multiple Criteria Decision Analysis
10:52	Mikaila Bickford	Traditional Knowledge in Marine Spatial Planning: Using Inuvialuit Data for Marine Management in the Beaufort Sea
11:14	Taylor Brown	Reconciling Indigenous governance in marine spaces: Mi'kmaq engagement in tidal energy in the Bay of Fundy, N.S.
11:36	Noah Eisner	Coastal Infrastructure and its Effects on Local Social-Ecological Systems: A Case Study of Ashton Lagoon, Union Island, St. Vincent and the Grenadines
12:00		**Wrap Up/Lunch**

Each student is allotted 20 minutes for their presentation (13 minutes for presentation, 7 minutes for questions). There is a 2- minute break for change-over of presenter.

Making Waves 2017 Abstracts

(in alphabetical order)

Rebecca Aucoin

Aucoin, R. 2017. Direct Marketing of Cape Breton Lobster and Its Impact on the Triple Bottom Line of Fishery Performance [graduate project]. Halifax, NS: Dalhousie University.

Abstract

The lobster industry is the largest and most valuable fishery in Canada, generating revenues exceeding $1 billion annually. Although it is an economically rich industry, there are many actors within the seafood supply chain and the earnings are not distributed equitably. There is also a high degree of price volatility in the market which trickles down to fish harvesters, resulting in Lobster fishermen that have little control over where their catches are sold and what price they fetch at market. Alternative marketing strategies such as direct marketing have been proposed as a solution to solve both the issue of price volatility in the lobster fishery and of a lack of control over the supply chain structure. This study explored the feasibilty of and desire for direct marketing amongst lobster fishermen in Cape Breton using the triple bottom line metrics of ecology, economy, and community as fishery performance indicators. Highlighted in this study are the main perceived barriers and motivating factors for the direct marketing of Cape Breton Lobster identified by fish harvesters. Data was collected through wharf interviews (n=56) and participant observation. This report presents potential direct marketing strategies that could be employed within Cape Breton, enabling factors that would allow for an increase in direct marketing, as well as the potential impact that the use of these strategies would have on the triple bottom line of fishery performance.

Keywords: Direct marketing, seafood supply chain, lobster, Cape Breton, Triple Bottom Line, sustainability

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Becca completed her internship with the Cape Breton Fish Harvesters Association in Ingonish, Cape Breton under the guidance of Veronika Brzeski and the supervision of Dr. Megan Bailey. The primary goal of this internship was to allow Becca to undertake wharf interviews with lobster fishers from across Cape Breton Island in order to answer her research questions surrounding direct marketing. During her time in Cape Breton, she also assisted the Association in collecting biological data onboard lobster fishing boats and in conducting a partial survey of the lobster fishing workforce in the region. This internship allowed Becca to understand the inner workings of the Atlantic Canadian lobster industry and to network with many people working within this industry.

Mikaila Bickford

Bickford, M. 2017. Traditional Knowledge in Marine Spatial Planning: Using Inuvialuit Data for Marine Management in the Beaufort Sea [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Marine Spatial Planning (MSP) is a tool for comprehensive, integrated ocean management, used to mitigate anthropogenic impact on the environment and promote co-operation between ocean users. It requires the demarcation of use-specific areas in the ocean and management of conflicts of use, based on diverse data sets and reconciliation of this data. In the Beaufort Sea LOMA, Inuvialuit are the primary users of coastal resources, making them a significant and necessary stakeholder in the MSP process. Inuvialuit possess a substantial body of knowledge and expertise related to management of the environment, and the Traditional Knowledge (TK) held by the Indigenous community is a valuable source of information in the context of MSP.
In order for TK to be effectively integrated into MSP, problems related to TK data integration must be addressed, and practices for managing, analyzing, and using TK must be explored and crafted. This research addresses issues in using TK for environmental management, using an interdisciplinary approach to review best practices in TK integration, and suggest practices for using TK in MSP.

Keywords: Traditional Knowledge; Indigenous Knowledge; Beaufort Sea; Inuvialuit; Marine Spatial Planning; Coastal Zone Management; Western Arctic; Inuvialuit Settlement Region

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Mikaila completed her internship at Dalhousie University, working on a project contracted by WWF-Canada to assist them in preparing for the Oceans Use Workshop hosted by the Beaufort Sea Partnership in Inuvik in October 2017. The project focused on the potential for marine spatial planning in the Beaufort Sea, using the Beaufort Sea Integrated Oceans Management Plan as a foundation for future management initiatives. During her internship, Mikaila conducted a stakeholder analysis for the Beaufort Sea area, assisted in a data gap analysis, and processed geospatial data for analysis. Under the guidance of Dr. Claudio Aporta, Leah Beveridge, and Adrian Gerhartz Abraham, Mikaila was able to gain insight into the complexities of marine management in the Arctic, processes related to initiating marine spatial planning.

Jessica Bradford

Bradford, J.I., 2017. Underwater community gardens? Exploring community-based marine aquaculture as a coastal resource management strategy in Nova Scotia, Canada [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Aquaculture is one of the world's fastest growing food production sectors and presents an opportunity for rural, coastal community development that can support livelihoods. An ecosystem approach to aquaculture (EAA) has been recommended to facilitate socially and environmentally sustainable development, yet there remains a need to better involve people in planning and operational aspects. Community-based management presents a possible option to advance an EAA in this way; however, context-specific research is needed to understand its potential application and suitability. This research explores community-based marine aquaculture (CBMA) in Nova Scotia (NS), Canada, on provincial and local-scales, using a mixed methods approach, which includes stakeholder interviews, geographic information system (GIS) analysis, and surveys, to examine its suitability as a coastal resource management strategy. Findings suggest that CBMA is a feasible approach to future aquaculture development in NS and its possible implementation is conceptualized. This research also initiates pilot methods that can be used to determine suitability of coastal communities, which factor the importance of community perceptions into the planning and operationalization process. Although this research was undertaken in the context of a NS, it has implications that can help to further opportunities for CBMA in other regions of the world, supporting the advancement of the EAA.

Keywords: community-based management, marine, aquaculture, ecosystem approach, livelihood, rural development, coastal communities, well-being, planning, Nova Scotia

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Jessica completed her internship with the Conservation of Change Lab out of the School of Environment and Sustainability at University of Saskatchewan with Dr. Philip Loring. For the first part of her internship in Saskatoon, Saskatchewan, her work included conducting desktop research in collaboration with other graduate students at the Conservation of Change Lab related to food security, climate change vulnerability, and conflict for several different fisheries on Canada's Pacific Coast, including the Haida Gwaii herring fisheries and Fraser River salmon fisheries. The second part of the internship was spent on Vancouver Island in British Columbia supporting and participating in Parks Canada's science and culture camps that take place at the clam garden sites in the Gulf Islands National Park Reserve. She was involved with the camps by supporting activities and speakers at each of the stations, helping with interpretive walks and educational sessions held at the clam gardens, and participating in clam garden restoration. This unique opportunity gave her insight into the clam gardens as an example of ancient community-based marine aquaculture practices, as the gardens support community livelihoods through food security and knowledge sharing, while also attracting and encouraging biodiversity.

Taylor Brown

Brown, T. 2017. Reconciling Indigenous governance in marine spaces: Mi'kmaq engagement in tidal energy in the Bay of Fundy, N.S. [graduate project]. Halifax, N.S: Dalhousie University.

Abstract

As the activities in coastal and marine spaces in Nova Scotia continue to increase, the spatial availability for new development is becoming much more challenging. The shift toward renewable energy has sparked industry to begin the development of In-Stream tidal energy in the Bay of Fundy. Although space is limited, the potential of the development's contribution is being considered to meet the renewable energy targets set in Nova Scotia's Renewable Electricity Plan. Managing conflict with other marine users in the Bay of Fundy has become one of the biggest challenges in implementing marine renewable energy. Therefore, significant management decisions about the spatial planning of the Bay of Fundy should be made to ensure its sustainability for current and future generations. Management decisions that are made from a co-governance perspective can help to identify and mitigate issues. Involving Indigenous governance in managing marine spaces can assist the federal government toward reconciling a nation-to-nation relationship that has been discussed in both the public media and federal mandate. In addition, to reconcile and develop the nation-to-nation relationship with Indigenous peoples in marine spaces, it will be necessary to develop a standard of meaningful engagement for both government and industry. This research explores the importance of reconciling indigenous governance in the Bay of Fundy and highlights the necessity for meaningful engagement with Indigenous nations on behalf of the proponent in the development of the emerging tidal energy project in the Bay of Fundy, Nova Scotia.

Keywords: Indigenous governance, Mi'kmaq nation, in-stream tidal energy, co-governance, tripartite relationship, reconciliation, Bay of Fundy, engagement.

Taylor completed her internship at Emera in Halifax, Nova Scotia, under the supervision of Carys Burgess; a Marine Affairs alumni. At her internship, she worked with the special projects team on an internal report for the Cape Sharp Tidal project in the Bay of Fundy on Indigenous engagement. For this report, Taylor had the opportunity to use both desktop research as well as speak with a variety of stakeholders to develop her knowledge of Indigenous engagement in renewable energy projects in Nova Scotia. Through this internship, Taylor gained a better understanding of what it is like to work within a corporate setting and acquired useful skills such as project management, report writing, and indigenous engagement.

Christina Callegari

Callegari, C. 2017. Exploring consumer-facing traceability as a risk mitigation strategy for seafood producers in Nova Scotia [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Nova Scotian producers and consumers are continuously faced with the complexity of global seafood supply chains. Recent studies on seafood mislabeling, fraud, and the newly uncovered issue of slave labour, has led to increased information demands and a push for change in the way seafood supply chains operate by adopting new international regulations and initiatives. This naturally creates a risk to industry actors who fail to comply with these changes and new regulation standards. While seafood traceability has been present within the global food supply chain for decades, consumer-facing traceability (CFT) has newly emerged as an innovative way to communicate provenance and distinguish brands within the market. This research aims to assess under what context and for which seafood sector consumer-facing traceability may be a feasible risk mitigation strategy for producers. This question is addressed through semi-structured interviews from a variety of actors along the supply chain within Nova Scotia, supply chain mapping of major species, and a simplified risk assessment. Results highlight the necessity for traceability to combat pressing issues such as mislabeling and illegal cash fisheries within the industry, as well as the willingness to engage if benefits outweigh costs. While CFT's role in mitigating risk for mainly small-scale producers was not evident and challenges, such as competition and lack of transparency inhibits CFT adoption, shellfish aquaculture producers are seen as the most prepared to take on consumer-facing traceability to mitigate risk and reap the most benefit by differentiating their product within the market. Finally, this study provides insights into the seafood supply chain in Nova Scotia and offers recommendations to shift toward a transparent seafood industry benefiting producers and consumers.

Keywords: seafood; consumer-facing traceability; Nova Scotia; producers; seafood supply chains; market; regulation; risk mitigation.

Christina completed her internship at Afishionado Fishmongers, a fishmonger in Halifax who sells locally sourced, sustainable seafood. During her internship, she developed a traceability pilot project for the business, which assessed the potential to improve both internal and external traceability systems within their supply chains, assessed risk, and provided recommendations to maximize value and safety. Megan Bailey was her academic supervisor. While working with Afishionado, Christina also worked on a variety of tasks such as setting up a market, organizing events, leading projects for the creation of marketing materials such as labels for products, and writing blog posts.

Joana Costa

Costa, J. 2017. Marine protected areas: Potential tools for sustainable community development [graduate project]. Halifax, NS: Dalhousie University.

Abstract

While the ecological benefits of marine protected areas (MPAs) are widely accepted, the non-ecological benefits of MPAs are still debated. Furthermore, environmental protection tools like MPAs are often considered to be anti-development. This study looks at the potential use of a coastal MPA as a tool for sustainable community development. An online survey was conducted to better understand public perceptions surrounding the potential establishment of a MPA off of Sambro, Nova Scotia, as well as the possible effects it could have on local user groups. An analysis of the effects that a coastal MPA could have on the Sambro community was also conducted through the lens of the seven forms of community capital essential for sustainable development: natural, built, financial, political, social, cultural, and human. Possible changes in community capital are discussed and the overall balance needed for sustainable development assessed.

Keywords: marine protected areas; sustainable development; community capital; public perceptions

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Joana completed her internship with WWF-Canada in Halifax, Nova Scotia. During her internship, she worked on an internal report under the supervision of Sarah Saunders, the marine protection and renewables specialist. The focus of her report was on the potential benefits of marine protected areas on nearby communities. For this report, Joana had the opportunity to conduct independent desktop research, as well as to create and conduct an online survey on the public perceptions surrounding the potential establishment of a marine protected area off of Sambro, NS. The information gathered in this report will be used to inform future WWF programs.

Kalene Eck

Eck, K. 2017. Evaluating the role of technical working groups in decision-making for fisheries management in Belize [graduate project]. Halifax, NS: Dalhousie University.

Abstract

The use of scientific information for evidence-based decision-making is a critical component in addressing marine environmental issues. However, ensuring that the "right" information is available for addressing these issues can be a challenge as this information often resides in different organizations with different management mandates. Consequently, many governmental organizations have utilized a range of approaches, including technical advisory committees, and working groups, to promote the development of robust solutions and recommendations for coastal and ocean management. This study examined the role of multiple stakeholders participating in technical working groups designed to assist in marine fisheries decision-making in Belize. Through interviews with three working groups – The National Hicatee Conservation Network, the Spawning Aggregation Working Group, and the Managed Access Working Group – and decision-makers in the Belize Fisheries Department, the processes of information production and pathways for policy uptake were investigated. The complexities of the science-policy interface associated with each working group were revealed. Common enablers and barriers related to knowledge exchange were identified. Recommendations for improving knowledge exchange, e.g. knowledge brokering, at the science-policy interfaces are presented.

Keywords: information use, decision-making, interdisciplinarity, working groups, fisheries management, policy making, barriers and enablers, knowledge exchange, knowledge broker, Hicatee (central American river turtle), Spawning Aggregations

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Kalene completed an internship with the Environmental Information: Use and Influence (EIUI) research program in the School of Information Management, Faculty of Management, Dalhousie University. Her internship was supervised by Prof. Bertrum Macdonald (research lead) and Dr. Suzuette Soomai. Kalene completed weekly readings on the characteristics of the science-policy interface with regard to information use and she participated in related discussions in weekly EIUI meetings. Kalene also studied methods of measuring information use to enable her to design the methodology used in her graduate research project. As a member of the EIUI research program, Kalene participated in a lecture presented to the International Ocean Institute (IOI) 2017 summer training program on ocean governance where she presented her research proposal. Kalene has gained invaluable skills and experiences in qualitative data collection and analysis. She has also developed a network of organizations and stakeholders within the context of this research on information use in decision-making.

Noah Eisner

Eisner, N. 2017. Coastal Infrastructure and its Effects on Local Social-Ecological Systems: A Case Study of Ashton Lagoon, Union Island, St. Vincent and the Grenadines [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Coastal infrastructure is already extensively in place across coastlines throughout a variety of geographical regions around the globe, with the rate of coastal development projects predicted to keep increasing in the future. Oftentimes these coastal development projects are situated within semi-sheltered areas with reduced water flow, which is only lessened further by many forms of coastal infrastructural emplacements. Ashton Lagoon, of Union Island, St. Vincent and the Grenadines is one such place. A megadevelopment project, although incomplete due to bankruptcy, was constructed in the area in 1994. This lead to a severe reduction in water flow, and extensive environmental changes. This study would like to investigate the impact of reduced water flow by analyzing the biological and social components of the lagoon. This will be done by recreating past transect studies for a cross comparison of modern and historical data sets, as well as the use of aerial imagery across a time series to visually assess changes to the local environment. Additionally, human use patterns in the area, and any changes that may have occurred with the introduction of the hard engineering works left behind by failed development project will also be assessed. Social ecological systems theory will be utilized to analyze the biological and social datasets, so that proper management methods can be developed in the future, as the area is assuredly going to see more development in the years to come.

Keywords: flow rate; coastal infrastructure; Ashton Lagoon; ecology; human use patterns; Social ecological systems theory

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Noah completed his internship with Sustainable Grenadines Inc., an NGO that is designed to empower local communities to develop sustainable methods for resource use and development. The internship took place on Union Island, of Saint Vincent and the Grenadines, and was facilitated through the Queen Elizabeth Scholarship Program. While on Union Island Noah worked to collect ecological baseline data on Ashton Lagoon, the site of a failed development project in 1994, before a scheduled remediation project was earmarked to take place in the fall of 2017. By studying the ecological effects that can occur through poorly planned hard coastal infrastructural works, Noah was able to gain an increased understanding of how flow rates within a highly integrated system (corals, seagrass beds and mangroves) can alter habitat structures, and consequently flora and fauna assemblages. While Noah has a background in anthropology, his two supervisors, Dr. Tony Walker, and Ramon Filgueira, helped with data procurement and analysis, and effectively expanded his repertoire of skills pertaining to sustainable coastal management.

Kelly Fretwell

Fretwell, K.F. 2017. Exploring the issue of cumulative shipping impacts in the Salish Sea though a systematic focal species assessment framework [graduate project]. Halifax, NS: Dalhousie University.

Abstract

The cumulative impacts of shipping on the Salish Sea ecosystem have been an issue of concern in recent years, exacerbated by a number of project proposals that could substantially increase the already high levels of ship traffic. Potential threats from ship traffic include chronic and catastrophic oil spills, acoustic and physical disturbance, ship strikes, and wake wave disturbance. These primarily incremental and cumulative impacts are going largely unheeded by project-level cumulative effects assessments (CEAs), which are poorly-placed to address cumulative impacts. Determining which indicator or focal species to evaluate impacts against is a key part of environmental assessments, particularly CEAs, however there is currently little guidance in how species are selected. This project explores the need for a regional assessment of the cumulative effects of shipping in the Salish Sea, as well as the need to ensure proper selection and evaluation of species used in such assessments. A systematic focal species assessment framework is tested in this context, by evaluating 94 marine species that are at-risk, ecologically important, and/or culturally important against the framework. The results provide a suite of potential focal species that could be assessed in a regional cumulative effects assessment of shipping in the Salish Sea, as well as recommendations for furthering the focal species tool. Recommendations for addressing the issue of cumulative shipping effects in the Salish Sea are provided based on the broad issues explored within this research as well as specifically the results of the assessment and the test of the framework.

Keywords: Salish Sea, cumulative effects, environmental assessment, regional cumulative effects assessment, shipping, focal species, indicator species

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Kelly completed her internship with the Raincoast Conservation Foundation in Victoria, British Columbia, under the supervision of Ross Dixon and with guidance from Raincoast biologists Dr. Paul Paquet and Dr. Caroline Fox. Raincoast is a conservation organization that uses peer-reviewed science and community engagement to take an 'informed advocacy' approach to its work on the BC coast. Kelly's work with Raincoast consisted of researching and writing a report on the rationale and scope for an assessment of the cumulative effects of shipping activity in the Salish Sea, an ecologically rich and multi-jurisdictional inland sea that spans the border between Canada and the United States on the west coast of North America. This research formed the basis of Kelly's graduate project.

Emma Marotte

Marotte, E. 2017. Management solutions for an at-risk population of northern bottlenose whales (*Hyperoodon ampullatus)* in the international waters of the Sackville Spur [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Recent visual and acoustic evidence has indicated the presence of a previously undescribed population of northern bottlenose whales (*Hyperoodon ampullatus*) around the Sackville Spur, an undersea sediment drift that borders the Flemish Pass in the international waters east of Newfoundland. The area is subject to intense fishing pressure, ongoing hydrocarbon exploration activities and shipping traffic, all of which overlap with where this new population is thought to occur. As a result of these activities, the population is threatened by acoustic disturbance, entanglement, vessel strike and exposure to contaminants and marine pollution. Because of how little is currently known about these whales and in light of the serious negative impacts they are likely experiencing, protective measures are required. However, the situation is complex due the lack of clear regulatory and governance mechanisms that exist to guide conservation of sensitive marine species in international waters. To address this issue, a risk analysis was conducted to identify which threats most required management intervention. Solutions to address those threats were then compiled and evaluated based on their perceived feasibility and effectiveness, and formed the basis of a series of management recommendations. Among others, stronger policy and legislation to address the effects of marine noise, better adoption of the ecosystem approach by regional management bodies, and the implementation of subsidy and incentive programs for various marine industries represent solutions that may best help ensure the long-term survival of this new population in the absence of an existing international framework.

Keywords: northern bottlenose whale, species at risk, areas beyond national jurisdiction, risk analysis, threat management, international cetacean conservation

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Emma completed her internship with Fisheries and Oceans Canada's Oceans and Coastal Management Division at the Bedford Institute of Oceanography. Emma had the opportunity to be involved in a variety of projects. She assisted with obtaining and analyzing cetacean sightings data to support the design of coastal MPAs off Nova Scotia and investigated the feasibility of an acoustic monitoring program to better inform cetacean presence in the Sambro Ledges area. These experiences taught Emma a great deal about spatial protection for large pelagic species in Canada. She was also involved in outreach and education initiatives by assisting with World Oceans Day events and advising the Museum of Natural History on their most recent "Mission to the Gully" permanent exhibit. Emma also had the opportunity to assist with fieldwork during an expedition to the Flemish Cap to collect more data on the population of northern bottlenose whales she studied for her graduate project. This experience was highly rewarding and provided Emma with a deep appreciation for the vulnerability of the whales that live there and work that must continue to protect them.

Ainslie McLeod

McLeod, A.J. 2017. AIS Whale-alert! Assessing the fleet preferences for near real-time whale conservation in the Atlantic Canada [graduate project]. Halifax, NS: Dalhousie Univeristy

Abstract

North Atlantic Right Whales are an endangered species that face many anthropogenic threats, including vessel strikes. A recent morality event in Atlantic Canada has emphasized the need to implement a flexible method to monitor and protect right whales in real-time. Passive Acoustic Monitoring (PAM) technology is currently used in conjunction with ocean glider technology to detect and identify whales and their location in near real-time based on vocalizations. This novel technology can allow for real-time whale conservation by linking PAM to vessel communication technology, such as the automatic identification system (AIS), to broadcast whale locations directly to vessels in the local fleet. The implementation of the MEOPAR (Marine Environmental Observation, Prediction and Response) AIS Whale Alert is nearing completion, but a paucity of information remains about the fleet's preferences and limitations towards implementing this real-time conservation technology into the bridge protocol. In my study, I surveyed and characterized the fleet and determined the implications for real-time management. The survey results provide insight to fleet receptivity and perceived utility of receiving real-time alerts, as well as their preferred response protocol. AIS analyses determined the Atlantic Canada fleet is dynamic with a high turn over rate. The information gained from this study will inform management plan to implement this novel conservation technology based on stakeholder needs and preferences. The dynamic nature of the ever-changing fleet requires special consideration. By considering fleet preferences towards implementing this technology, it is more likely that the fleet will comply with real-time conservation in Atlantic Canada.

Keywords: real-time management, North Atlantic right whale, MEOPAR, AIS Whale Alert, research survey questionnaire, automatic identification system (AIS), vessel fleet, bridge protocol, Atlantic Canada, vessel-strikes, conservation

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Ainslie completed two internships in Halifax, NS, the first with the Ecology Action Center (EAC) under the supervision of Katie Schleit and the second with MEOPAR (Marine Environmental Observation, Prediction and Response) under the supervision of Dr. Christopher Taggart. During her short internship with the EAC, an environmental non-governmental organization, Ainslie spent time researching species of concern in Atlantic Canada, such at Bluefin Tuna and Shortfin Mako shark, to inform the EAC's website and future campaigns. Ainslie was also able to attend a Northwest Atlantic Fisheries Organization (NAFO) meeting in Halifax as an observer. Ainslie's second internship position with MEOPAR, a non-for-profit organization, was held throughout the summer. During her time with MEOPAR, Ainslie surveyed the vessel fleet in Atlantic Canada and characterized the fleet using Automatic Identification System (AIS) data. This work was used to inform a management plan to implement MEOPAR's real-time AIS Whale Alert technology based on the needs and preferences of the fleet. Through this internship, Ainslie also attended multiple inter-sectorial workshops, as well as North Atlantic Right Whale Consortium meetings. Both internships provided Ainslie with knowledge of how complex scientific information can be used to inform management, as well as emphasized the importance of stakeholder consultation.

Emilie Normand

Normand, E. 2017. Quantifying external benefits associated with the production of Fair Trade Certified™ seafood: Underprovided and undervalued.

Abstract

There is increasing recognition in global seafood markets that social sustainability is becoming the imperative of the day. The Fair Trade USA Capture Fisheries Standard (CFS) presents an opportunity to promote good social practices in small-scale fishing operations around the world, which are largely excluded from alternative certification schemes due to limited financial and informational capacity. The gains from achieving Fair Trade certification can manifest as the profit gains to a fishery from the emergent market opportunities and product differentiation, along with potential future returns by conforming to sustainable fishing practices. However, firm-level figures under-estimate the possible social impact that may accrue in compliance with the criteria of the CFS. As the CFS addresses social injustices that are prevalent in the fishing industry, attaining Fair Trade certification may have a positive impact on society on a greater scale. This research attempts to quantify the external benefits delivered to society associated with compliance to the CFS criteria. Estimates of external benefits are then used to assess the possibility that there is a market failure in the form of a positive production externality in order to identify third party beneficiaries. A general methodology to quantify selected indicators of external benefits associated with the criteria is demonstrated on two Fair Trade Certified™ fisheries: Indonesian yellowfin tuna and Mexican shrimp. Correcting for such a market failure is then discussed regarding the provision of certified products, primarily through government intervention.

Keywords: Sustainable seafood; social responsibility; Fair Trade USA; seafood certification; positive externality; seafood markets.

Emilie completed a joint internship with Fair Trade USA and the Environmental Defense Fund in San Francisco and Oakland, California. While at Fair Trade, Emilie was responsible for writing a scoping document to assess the potential certification of the West Coast groundfish fishery off the coast of California, Oregon, and Washington. This involved identifying the potential social and market benefits of certifying this fishery and the potential costs. In addition to this report, Emilie was responsible for creating documents that support the Capture Fisheries Standard, including an Environmental Responsibility Policy and a Guide to Premium Investments to help producers in the Fair Trade program make decisions about how to spend their Premium benefits.

Jasmine Prior

Prior, J. 2017. Protection on The Move: Applying Dynamic Ocean Management To Address Shark Bycatch In Atlantic Canada [graduate project]. Halifax, NS: Dalhousie University.

Abstract

The Canadian North Atlantic pelagic longline fishery for swordfish and tuna involves the unintended bycatch of porbeagle, shortfin mako, and blue sharks. This creates concerns for species-at-risk populations, ecosystem health, and fishermen safety and economic security. This study proposes that a Dynamic Ocean Management (DOM) application could mitigate the pelagic shark bycatch associated with this longline fishery. First, the research reviews published information on the focal shark species, the fishery, current marine spatial management tools used in Canada, and theory and applications of DOM. Following this, the study evaluates the attitudes of 14 primary stakeholders towards DOM through stakeholder group governance analysis and semi-structured interviews. The associated stakeholders who participated in the project include one participant from each of the regional RFMOs; NAFO and ICCAT, three participants from DFO, one participant from the Nova Scotia Swordfish Association, four NGO perspectives, two academic perspectives, and two private third-party interest groups. In the interviews, all individuals discussed their views on the bycatch challenge, the desirability and feasibility of applying DOM, and the current efforts undertaken by each group. The results of this study show that a DOM application is seen as a desirable potential solution by most and could be feasible depending on project structure and management style. Therefore, based on the considerations of the governance analyses and interview responses, a management plan is proposed and associated requirements, considerations, and concerns are discussed. Specifically, the plan proposes a management tool in the style of a phone app or website interface. This interface would allow fishermen to geo-tag areas where shark bycatch has impacted their catch in near-real time. When overlaid with other data streams, including historical seasonal data, ocean conditions and species tracking, it allows the whole fleet to strategically plan their next location to set their longlines, with an active consideration to avoid sharks.

Keywords: Dynamic ocean management; species management; fisheries management; bycatch mitigation; pelagic longline; conservation; Northwest Atlantic; blue shark; porbeagle shark; shortfin mako shark; precautionary approach; adaptive management

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Jasmine completed her internship with Fisheries and Oceans Canada under the Oceans and Coastal Management Division at the Bedford Institute of Oceanography in Dartmouth, NS. Under the supervision of Maxine Westhead, her internship involved a variety of research and communication projects related to marine conservation in Canada's Maritime region. Research projects included the development of Indigenous Protected Areas and connecting fisheries management to marine protected area development. Communications projects included writing the management plan for the St. Anns Bank MPA and marine conservation fact sheets for the public and fisheries industry. Overall, this internship experience provided Jasmine with a wide variety of transferrable skills that can be used to develop a career in marine management.

Genevieve Renaud-Byrne

Renaud-Byrne, G. 2017. The Social-Ecological Resilience of the Sandy Island Oyster Bed Marine Protected Area to Climate Change [Graduate Project]. Halifax, NS: Dalhousie University.

Abstract

Climate change is likely to alter the physical and chemical properties of the ocean within the next century, having long-term and perhaps irreversible effects on the marine ecosystems upon which coastal communities are reliant for sustenance and livelihood. Extensive reef development within the Sandy Island Oyster Bed Marine Protected Area (SIOBMPA) off the coast of Carriacou, Grenada, provides neighboring communities with important ecosystem goods and services which are threatened by warming sea surface temperatures, ocean acidification and sea level rise. Building the capacity to cope, adapt and transform in response to climate change is thus imperative to the long-term welfare of the SIOBMPA and associated stakeholder community. This study provides an assessment of the current resilience of the SIOBMPA to climate change from the social-ecological system (SES) perspective. Through the understanding of the resilience of each individual subsystem (i.e. ecological and social), the interactions that exist between the two and the current and future impacts that will influence these interactions, this study identifies system components that may contribute to building or diminishing the resilience of the SIOBMPA SES. Findings suggest that functional group diversity and low anthropogenic influence in ecological systems enhance coping capacity when faced with long-term climate driven impacts, while the social system's ability to build institutions that foster communication, trust, social learning and the effective use of available capital promote adaptation and transformation. Based on the results yielded from this analysis, recommendations for marine management measures that promote SES resilience building are provided.

Keywords: Climate Change, Resilience, Social-Ecological Systems, Marine Protected Area, Adaptation, Resilience-based management

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Genevieve completed her internship with Sustainable Grenadines Inc (SusGren), a non-governmental organization located in the Grenadine Islands of the South-East Caribbean. SusGren is committed to empowering local communities to protect their environment and take part in sustainable livelihoods. Genevieve worked on the community-based Local Early Adaptation Planning (LEAP) project for climate change adaptation in Carriacou, as an initiative to increase the capacity of communities adjacent to the Sandy Island Oyster Bed Marine Protected Area. Under the supervision of Dr. James Lord and with the assistance of the Meghan Gombos, Genevieve undertook a predominant role in project planning, coordination, monitoring and evaluation for the first two phases of the project over the course of May-August 2017. Her responsibilities included material development for outreach, promotion and education, providing educational presentations to key stakeholders, facilitating community discussion, monitoring the project progress and documenting lessons learned. Queen Elizabeth II Diamond Jubilee Scholarships Program provided financial support for this internship placement.

Simon Ryder-Burbidge

Ryder-Burbidge, S. 2017. "I thought the horseshoe crabs were part of my family": Investigating ocean connectivity in Falmouth, Massachusetts [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Everybody is connected to the ocean. Previous research has identified several indicators to understand relationships between coastal communities and marine environments, but do those data reflect the perceptions of the people who live there? A growing body of literature identifies an important role for the integration of public perceptions into coastal decision-making processes. Here, a survey conducted in Falmouth, Massachusetts investigates how residents perceive connections to the ocean. Results point to strong intrinsic and sensory relationships linked to the coastal zone. Analysis provides recommendations on how public perceptions data can be used by science communicators and coastal planners in Falmouth, and proposes the application of relational values as a tool to frame connections in broader public discourse. Finally, discussion suggests that public perceptions could provide the foundation for a community-based Ocean Connectivity Index, to better quantify these connections across spatial parameters in the future.

Keywords: survey; public perception; intrinsic; sensory; relational values; community-based; Ocean Connectivity Index; coastal zone; Falmouth; Massachusetts

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Simon completed an internship with the Woods Hole Oceanographic Institution (WHOI). WHOI is a non-profit research organization specializing in ocean science, exploration, and education. As a visiting student with WHOI's Marine Policy Center, Simon's internship focused on identifying relationships between people and marine spaces for use in ocean governance processes. Under the guidance of Dr. Porter Hoagland, Simon conducted a public outreach campaign, and surveyed residents of Falmouth, Massachusetts to better understand how the community perceives connections to the sea.

Laura Steeves

Steeves, L. 2017. Projections and perceptions: Predicted impacts of climate change on shellfish mariculture [graduate project]. Halifax, NS: Dalhousie University.

Abstract

The impact of climate change on the aquaculture industry is becoming an increasingly relevant topic for farmers, managers, and researchers alike. The growth and expansion of this industry is contextualized by the changes in ocean properties both occurring and predicted to occur, as a result of climate change. In Atlantic Canada, planning for the future of bivalve farming should incorporate predictions of how species will be impacted by climate change, and as well how stakeholders perceive these impacts. This study coupled bioenergetic models for the eastern oyster (*C. virginica*), and the blue mussel (*M. edulis*), with high resolution climate models to predict the performance and growth of these species in the near future (2046-2050), compared to the past (1986-1990). Results indicate that changing sea surface temperatures may benefit *C. virginica* more than *M. edulis* in terms of future growth, due to their differing thermal physiologies. Furthermore, this study identified three main perceptions held by stakeholders regarding how climate change will impact bivalve aquaculture. Although stakeholders recognized the impacts of changing ocean properties on bivalve performance, it was less clear how farming costs, planning, and activities would be impacted. Further, a divide was identified between how farmers and managers perceive the effects of climate change on bivalve aquaculture. Results from this study should be used to plan for the future of bivalve farming in Nova Scotia and Prince Edward Island, two Canadian provinces heavily invested in bivalve aquaculture. Recognizing the importance of bridging the science-policy interface, information from both modelling efforts as well as stakeholder input should be used to create a resilient future for bivalve farming.

Keywords: aquaculture; bivalves; climate change; bioenergetics; dynamic energy budget modelling; stakeholders; perceptions; Q methodology

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Laura completed her internship at Dalhousie University under the supervision of Dr. Ramón Filgueira. Laura's work focused on the impacts of climate change on bivalve aquaculture from both a natural and social sciences perspective. During her internship, Laura used biological modelling tools, as well as stakeholder interviews to explore the relationship between bivalve aquaculture in Atlantic Canada and climate change. This summer Laura was provided with the opportunity to use Dalhousie's Aquatron facilities, working with blue mussels and eastern oysters. Additionally, she visited several mussel, oyster, and scallop farms in Nova Scotia and Prince Edward Island. Research from this internship aims to promote the sustainable development of the bivalve aquaculture industry in Nova Scotia and Prince Edward Island.

Weishan Wang

Wang, W. 2017. Evaluating Institutional Arrangements for Marine Shipping Management within the Northern Marine Transportation Corridors Using Multiple Criteria Decision Analysis [graduate project]. Halifax, NS: Dalhousie University.

Abstract

A promising policy framework called the 'Low Impact Shipping Corridors' (sometimes referred to as the Northern Marine Transportation Corridors - NMTC) was developed for managing marine shipping activities in the Canadian Arctic. However, this initial design of corridors overlaps with sensitive cultural areas and also presents risks and challenges to the marine ecosystem and coastal communities. Consequently, it is necessary to identify an appropriate and acceptable form of institutional arrangement for maritime governance and decision-making within the corridors. This paper aims to evaluate institutional forms and to propose best practices by using Multiple Criteria Decision Analysis (MCDA). First, this paper analyzes the drivers, impacts and the current situation of marine shipping in the Arctic and then identifies the stakeholders, alternatives and criteria for evaluating different institutional forms. The selected institutional forms are co-management, co-governance and shared leadership, which have been applied in Arctic related issues. Second, by using an MCDA matrix, the final result shows that co-management is the most appropriate arrangement for managing marine shipping activities within NMTC. This paper also demonstrates that MCDA can be used in evaluating forms of institutional arrangements and help decision makers select the appropriate one. Finally, discussion and some recommendations are presented for future applications of integrating these methodologies into the practical decision-making process for marine shipping management within NMTC.

Keywords: marine shipping; Arctic; Nunavut; Northern Marine Transportation Corridors (NMTC); co-management; co-governance; shared leadership; Multiple Criteria Decision Analysis (MCDA).

Weishan completed her internship with Maritime Activity and Risk Investigation Network (MARIN). This internship was co-supervised by Dr. Ronald Pelot and Dr. Jackie Dawson. This internship focused on developing co-management and decision-making process for Arctic shipping risks in Nunavut within the Northern Marine Transportation Corridors (NMTC) initiative. Weishan's internship aimed to review the current situation of shipping activities in the Canadian Arctic, in order to develop criteria, methods and processes for stakeholders to evaluate and select appropriate forms of institutional arrangements which can be used for maritime governance. An example of evaluation process was presented as a major outcome of this internship in preparation for the planned NMTC stakeholders' work shop which will be held in Iqaluit, 2018.