Marine Affairs Program

Making Waves 2018

Graduate Project Presentations of the Master of Marine Management Class of 2018

Thursday December 6, 2018
9:00 am to 2:30 pm
&
Friday December 7, 2018
9:00 am to 1:00 pm

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

DALHOUSIE UNIVERSITY

Making Waves 2018 Schedule - Thursday December 6, 2018

Time	Name	Title
8:40	Coffee/Tea	
8:55	Introductory Remarks – Claudio Aporta, Director, Marine Affairs Program	
9:00	Emma Giesbrecht	Acoustic Modelling to Inform Policies: Mitigating Vessel Noise Impacts on Arctic Cetaceans Within the Tallurutiup Imanga National Marine Conservation Area
9:22	Olivia Choi	Toward sustainable shipping: Minimizing impacts on Inuit traditional harvesting in Tallurutiup Imanga National Marine Conservation Area through integrated coastal and ocean management (ICOM)
9:44	Alexandra Cole	Modelling fishing effort displacement in the Southern Gulf of St Lawrence snow crab (*Chionoecetes opilio)* fishery: quantifying management measures for North Atlantic Right Whale (*Eubalaena glacialis)* entanglement prevention
10:06	Haley Welsh	Managing Canada's Endangered: An Analysis of Canada's Efforts to Mitigate Shipping Impacts on North Atlantic Right Whales
10:28	**Break**	
10:50	Meghan Terpenning	Stakeholder perceptions of the Nova Scotia aquaculture regulations implemented in 2015: A foundation for social license?
11:12	Ryan Maxwell	Key players in the Grieg NL Placentia Bay Atlantic Salmon Aquaculture Project: a social network analysis
11:34	Kaitlyn Harris	A youthful look at the future of Nova Scotia's coasts: Towards inter-generationally inclusive coastal management
11:56	Helena Cousins	Ecotourism and ecological restoration in Small Island Developing States
12:18	**Lunch**	
1:00	Andrea Mast	Bottom-up Engagement Increases Marine Protected Area Effectiveness
1:22	Lydia Ross	Mobilizing values: Using perceptions of barachois ponds in Cape Breton to advance informed management
1:44	Leah Sneddon	Barriers to implementing a bottom-up approach to coastal MPAs: A Canadian case study
2:06	Bryden Bone	Overview of marine protected areas in the eastern Canadian Arctic and their ability to mitigate current and future threats

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 2018 Schedule – Friday December 7, 2018

Time	Name	Title
9:00	James Crofton	Halifax Harbour integrated response plan for marine oil spills
9:22	Kristal Ambrose	Tools for marine debris management: A case study of beaches in South Eleuthera, The Bahamas
9:44	Alexander Desiré-Tesar	Rules of engagement: How and why are ocean and aquatic researchers communicating with the public
10:06	Curtis Martin	Using interpersonal communication strategies to encourage science conversations with lay audiences on social media
10:30		**Break**
10:52	Alexa Goodman	A Ghostly Issue: Managing abandoned, lost, and discarded lobster fishing gear in the Bay of Fundy
11:14	Seth Jenks	Pro-active Solutions for Atlantic salmon Management in Nova Scotia: A Roadmap for Recovery
11:36	Scott McIlveen	Sharks are Friends, not Food: An Analysis of the Practicality and Feasibility of a Toronto Shark Fin Ban
11:58	Emma Carmichael	Improving international fisheries management by prioritizing geopolitical issues: A case study on Atlantic shortfin mako management
12:30		**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 2018 Abstracts

(in alphabetical order)

Kristal Ambrose

Ambrose, K. 2018. Tools for marine debris management: A case study of beaches in South Eleuthera, The Bahamas. [graduate project]. Halifax, NS: Dalhousie University

Abstract

There is a paucity of information on the abundance and distribution of marine debris on beaches throughout The Bahamas, making it challenging to inform policy aimed at identifying sources and mitigating local contributions. This study provided the first report of the spatial distribution of macro and micro plastic debris on beaches in South Eleuthera and examined tools such as citizen science, beach debris monitoring, fetch modeling, relative exposure index modeling and predictive mapping to aid in mitigation and management strategies for marine debris in The Bahamas. Here, trained citizen scientists quantified debris type and abundance on 16 beaches within 3 coastal exposures; The Atlantic Ocean, Great Bahama Bank and The Exuma Sound in South Eleuthera, Bahamas. Marine debris, larger than 1mm, on each beach was monitored twice in one year between March-May 2013 and September-November 2013, at the same location, verified using GPS. Approximately, 93% of all debris types collected were plastic materials with plastic fragments ≤2.5 cm as the most dominant. There proved to be a spatial difference ($p=<0.0001$) in plastic debris abundance between coastal exposures with Atlantic Ocean beaches demonstrating larger amounts of plastic debris by weight and per length of shoreline. Such plastic deposits may be associated with Atlantic Ocean currents connected to waste leakages from the North Atlantic subtropical gyre.

Keywords: marine debris, marine litter, plastic pollution, citizen science, Eleuthera, Bahamas, Atlantic Ocean, Exuma Sound, Bahama Bank, policy, marine debris management, marine debris surveys, relative exposure index, predictive mapping, fetch modeling

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Kristal completed her internship at GRID-Arendal in Arendal Norway where she served as a marine litter intern. During her tenure with GRID, she worked to gain a better understanding of how plastic debris moved around beaches within South Eleuthera, Bahamas over space and time. Working closely with GRID's GIS team, they aimed to develop a shoreline map to define coastal areas with different likelihood of accumulating beach litter. The internship allowed for direct application of methods learned to Kristal's graduate research and provided a platform for growth and development within the field of marine litter. While in Norway, Kristal presented the keynote speech on her work with the Bahamas Plastic Movement at Arendalsuka, Norway's largest political meeting place.

Bryden Bone

Bone, B. 2018. Overview of marine protected areas in the eastern Canadian Arctic and their ability to mitigate current and future threats. [Graduate Project]. Halifax, NS: Dalhousie University.

Abstract

The Arctic marine environment is defined by a number of ecological, cultural, and social dimensions, including endemic organisms, rare environmental features (e.g. polynyas), and Inuit social and cultural practices. Marine protected areas (MPAs) offer one available protection tool, yet the current extent of the MPA network is insufficient to adequately conserve the ecological, cultural, and social dimensions present. This research quantified the risk associated with industrial activities (i.e. mining, commercial shipping, tourism, commercial fishing, and hydrocarbon activities), climate change, and improper mechanisms of Inuit participation to the ecological, cultural, and social dimensions in the eastern Canadian Arctic. Three assessment locations (i.e. Cumberland Sound, Eclipse Sound, and Clyde River) and two timeframes (i.e. current extent and 15-year future) were included in analysis to elucidate spatial and temporal differences. Climate change was consistently assessed as having the highest risk score across locations and timeframes. MPAs offer mitigation potential for all industrial activities, though this will depend on specific design and conservation objectives, and effective inclusion of Inuit in governance. Recommendations from this research include creation of legislation to support the implementation of Indigenous protected areas and creation of protected spaces in the eastern Canadian Arctic before the footprint of industrial activities increases.

Keywords: Canadian Arctic, risk assessment, Baffin Island, climate change, marine protected areas, risk mitigation, Indigenous protected areas

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Bryden completed internships with Fisheries and Oceans Canada (DFO) Aquatics Ecosystems Division, and Oceana Canada. With DFO, under the supervision of Maxine Westhead, Bryden undertook various activities related to the Eastern Shore Islands Area of Interest, including the production of communication materials and work on the marine transportation section of the ecological risk assessment. With Oceana, under the supervision of Bob Rangeley and Alexandra Vance, Bryden undertook a scoping exercise for a potential Oceana Canada Arctic marine habitat campaign expedition. Though neither internship was directly focused on his graduate project, both experiences provided valuable insight and direction towards completion.

Emma Carmichael

Carmichael. E.L. 2018. Improving international fisheries management by prioritizing geopolitical issues: A case study on Atlantic shortfin mako management [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Managing internationally-shared fish stocks is incredibly difficult and requires international cooperation. The International Commission for the Conservation of Atlantic Tunas (ICCAT) is the regulatory body responsible for managing tuna and tuna-like species in Atlantic and adjacent seas fisheries. Although ICCAT has a strong conservation mandate, the abundances of pelagic species they manage have plummeted under their oversight. Furthermore, a lack of transparency regarding Commission meetings and the geopolitical relationships between Contracting Parties (CPCs) make understanding the ICCAT regime difficult. Semi-structured interviews were conducted with individuals from various backgrounds who had past involvement attending ICCAT meetings. Interviews were analyzed to determine how participants perceive what goes on during ICCAT meetings, and analysis determined that not only are geopolitics playing a role in fisheries decision-making, but as are other factors, especially those not directly related to fisheries. Overall, factors which are unrelated to fisheries management accounted for 62% of references made in relation to ineffective decision-making at ICCAT. Of those, institutional factors, such as ICCAT's failure to adapt to institutional inertia and the complex diversity of CPC's, were among issues referred to the most by interview participants as having an impact on effective decision-making. This research explores these factors which are infiltrating fisheries negotiations, using recent management decisions for threatened Atlantic shortfin mako stocks to further consider how factors are operating in real fisheries negotiations. This study also aims to prioritize factors, both related and unrelated to fisheries that are considered in fisheries negotiations to inform improvements to decision-making for international fisheries forums.

Keywords: ICCAT; internationally shared fisheries; regional fisheries management organizations (RFMO); pelagic species; Atlantic shortfin mako; geopolitics; decision-making; fisheries negotiations; Commission meetings; prioritization

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Emma completed her graduate internship with the Ecology Action Centre, located in Halifax NS., under the supervision of Shannon Arnold and the guidance of Dalhousie Marine Affairs professor, Dr. Megan Bailey. The Ecology Action Centre is a community-based environmental charity which aims to promote awareness and take leadership in addressing critical local and global issues impacting our natural environment. Emma's work focused on reviewing international policy with a focus on management of pelagic shark species, in particular the Atlantic shortfin mako. During her internship, Emma was able to use the resources and professional networks provided by the Ecology Action Centre to connect with individuals that have attend ICCAT meetings. She conducted semi-structured interviews with these individuals to contribute to her graduate research and further her understanding of international fisheries negotiation and decision-making.

Olivia Choi

Choi, O. 2018. Toward sustainable shipping: Minimizing impacts on Inuit traditional harvesting in Tallurutiup Imanga National Marine Conservation Area through integrated coastal and ocean management (ICOM) [graduate project]. Halifax, NS: Dalhousie University.

Abstract

With the decline in sea-ice cover in the Canadian Arctic, shipping is expected to increase in the Canadian Eastern Arctic Gateway. While sea ice is often perceived as a threat to marine transportation, Inuit rely on the sea ice for travel and hunting. Thus, the loss of sea ice and increasing shipping activity threatens Inuit traditional way of life and food security. Tallurutiup Imanga/Lancaster Sound is a proposed National Marine Conservation Area (NMCA) in the North Baffin Region of Nunavut. Commercial and recreational fishing, shipping and tourism are permitted and will continue to be regulated under federal legislation. This region has been identified as a high-risk shipping corridor due to the presence of environmentally sensitive areas and the likelihood to affect Inuit harvesting areas and travel routes. However, the potential impacts of shipping on traditional harvesting and the seasonal variability of these interactions are not well understood. This study aims to identify management strategies that will support the continuation of the Inuit way of life and access to sustainable country foods within TINMCA. Harvest and vessel traffic/automatic identification system (AIS) data were mapped and analyzed to identify spatial and temporal trends, and potential conflicts between the uses in two communities adjacent to the NMCA, Arctic Bay and Pond Inlet. An analysis of the regulatory and non-regulatory measures for Arctic shipping in Canadian waters was undertaken to identify potential management gaps in the current governance framework. This study proposes integrated coastal and ocean management (ICOM) be adopted as the management approach for TINMCA to minimize shipping impacts on traditional harvesting and to ensure the protection of marine and coastal areas which Inuit rely upon for subsistence.

Keywords: eastern Arctic; traditional knowledge; Tallurutiup Imanga; Lancaster Sound; shipping; traditional harvesting; food security; integrated coastal and ocean management

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Olivia completed her internship with the Ocean Frontier Institute (OFI) at Dalhousie University, specifically Module N: Safe Navigation and Environmental Protection, under the supervision of Dr. Claudio Aporta. During her internship, she researched Inuit perspectives of Arctic shipping and the regulatory framework for sustainable Arctic shipping in Canadian waters. In addition, she assessed shipping impacts on Inuit communities and how to incorporate Inuit traditional knowledge (IQ) into the management of Arctic coastal and marine environments. Olivia presented her research at the OFI Module N workshop to stakeholders from industry, government, civil society, and academia.

Alexandra Cole

Cole, A. (2018). Modelling fishing effort displacement in the Southern Gulf of St Lawrence snow crab (*Chionoecetes opilio)* fishery: quantifying management measures for North Atlantic Right Whale (*Eubalaena glacialis)* entanglement prevention [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Anthropogenic mortality is the leading factor inhibiting the recovery of the endangered North Atlantic right whale (NARW), in which 85% of human-induced deaths are attributed to entanglement in commercial fishing gear. In 2017, a large number of NARW entanglements and deaths occurred in the Gulf of St Lawrence, many of which were attributed to the snow crab fishery. This led to the establishment of new management measures, including spatio-temporal fishery closures in the form of static and dynamic exclusion zones that encompassed 90% of the 2017 NARW sightings. This raised concerns related to the costs to the fishery and effectiveness of entanglement prevention. Using fishing data from 2005 through 2012, a model was built that predicted weekly fishing effort displacement caused by these closures, the approximated socio-economic costs of movement, and relative change in co-occurrence, or risk, of a NARW coming into contact with fishing gear. The model examined four alternative closure arrangements in order to evaluate which management strategies maximize NARW protection while minimizing costs to the fishery. Results show that lost fishing opportunity was minimal, and estimated costs were highest and most variable in the current strategy, and lowest and most consistent in a strictly dynamic management regime. While displaced effort resulted in a fishing-the-line scenario, all strategies were successful at reducing the threat of entanglement. This study quantifies and examines the trade-offs of spatio-temporal fishery closures for species-at-risk protection, while providing managers with an adaptive management tool in the form of the displacement model.

Keywords: spatial closures, fisheries impacts, entanglement, North Atlantic right whale, fishing effort displacement; conservation

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Alex completed her internship with the Canadian Wildlife Federation (CWF), under the supervision of Dr. Sean Brillant, senior conservation biologist of marine programs, at Dalhousie University. CWF is a non-profit organization dedicated to the conservation of wildlife and their habitats, and the sustainable use natural resources. They operate through a cooperative approach to deliver educational programs, conduct research projects, and challenge government and industry to improve environmental legislation and practices. Alex's work as a research assistant, quantifying fisheries management measures for North Atlantic right whale protection, specifically from fishing net entanglement. During her internship Alex had the opportunity to conduct independent desk research and develop an operational predictive model that calculates fishing effort displacement from spatial closures. Alex learned the valuable skills of data management and examination, technical skills in R programing, and ArcGIS with the goal of examining how scientific evidence can be used to support management decisions. Additionally, Alex was involved in CWF's outreach participation for World Oceans Day at the Maritime Museum of the Atlantic. Alex has been given to opportunity to continue her internship research with CWF to further examine whale and fishery interactions, and deliver her model as a real-time management tool for fisheries and conservation management.

Helena Cousins

Cousins, H. 2018. Ecotourism and ecological restoration in Small Island Developing States [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Ecotourism is the fastest growing sector of tourism, and is being used as a tool for sustainable development and conservation globally. As a subsection of 'sustainable tourism', ecotourism should not only act as a non-extractive industry, but should contribute to the wellbeing of local people while supporting environmental conservation and education. Small island states with limited resources often rely on tourism as a major economic sector. Ashton Lagoon, located in St. Vincent and the Grenadines, is examined as a case study, where an abandoned marina development left devastating changes to the marine and coastal environment. For over 20 years, the lagoon has been left in a stagnant and unproductive state, until the proposal for its restoration was approved and initiated in 2015. Residents of Union Island were interviewed to reveal local perception of ecotourism's ability to contribute to ecological restoration projects and community capital. The relationship between tourism and forms of capital (*natural, economic, human, physical, social,* and *cultural*) is described, and barriers to ecotourism development and management options are identified.

Keywords: ecotourism; sustainable tourism; ecological restoration; Small Island Developing States; sustainable development; community capital; Grenadines

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Helena completed her internship through the Queen Elizabeth Scholarship program with Sustainable Grenadines Inc. (SusGren), located on Union Island, St. Vincent and the Grenadines. SusGren is a transboundary NGO based on that aims to empower communities in Grenadines to sustainably manage their natural resources. Helena primarily worked on the Ashton Lagoon Restoration Project—a pilot project to develop resilient coastal infrastructure and sustainable livelihood opportunities at an ecologically degraded site. Helena spent the first part of the internship planning and coordinating the 'Caribbean Birding Trail (CBT) Interpretive Guide Training Workshop' with BirdsCaribbean, a U.S. based NGO. The remainder of the internship was mainly spent gathering content for SusGren's website, and creating educational products for visitors to Ashton Lagoon. Other tasks included creating an ecotourism market demand survey for tourists to complete online, planning field research with SusGren's community researchers, and planning a community clean-up and Summer Camp Birding Day in Ashton Lagoon.

James Crofton

Crofton, J. 2018. Halifax Harbour integrated response plan for marine oil spills [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Shipping has played a vital role in the globalization of trade, allowing goods to be transported between continents efficiently and cost-effectively. While safety standards have improved dramatically, the increasing scale of the industry still poses threats to the marine environment. Canada's approach to oil spill response has relied on National planning standards across the country despite certain regions transporting a disproportionate amount of oil. Area Response Planning is a new endeavor of the federal government, and led by Transport Canada (TC) and the Canadian Coast Guard (CCG), that considers the risks and conditions specific to a geographic area. This project continues that trend and has been developed for CCG's Environmental Response program to help organize and coordinate a response to an emergency marine oil pollution event in the Halifax Harbour. To provide tangible examples of response operations, five oil spill scenarios have been created based on vessel traffic and density, past spill events in the study area, and proximity to local sensitivities. These scenarios reveal how spills under a variety of circumstances lead to different roles and responsibilities for CCG and other agencies involved in response. They also highlight the sensitivities throughout the study area that may be affected and the needed response efforts to mitigate impacts. By focusing on the unique characteristics that define a region, this project allows response planning to be specific to its geographic region and can help inform the creation of further response plans in areas of a similar geographic scale.

Keywords: Halifax Harbour, Canadian Coast Guard, oil, oil spill, response plan, sensitivities, environmental response, risk, risk mitigation

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James completed his internship with the Canadian Coast Guard (CCG) Environmental Response (ER) program at their regional base in Dartmouth. Ronald Pelot was his academic supervisor. He collaborated with people from various branches of the federal government to develop an integrated response plan for marine oil spills in the Halifax Harbour. Through this internship, James gained a better understanding of how the federal government operates and gained valuable experience in report writing, the contents of which will be used to inform future CCG-ER response plans.

Alexander Desiré-Tesar

Desiré-Tesar, A. 2018. Rules of engagement: How and why are ocean and aquatic researchers communicating with the public [graduate project]? Halifax, NS: Dalhousie University.

Abstract

In marine-management contexts, public engagement is increasingly being incorporated into the decision-making process. As governments devolve more responsibility for the management of marine space and resources, and ocean and coastal spaces become increasingly contested, it is more important than ever to establish effective communication between scientists and the public. However, the extent to which scientists embrace their role as communicators varies, as do the channels and methods of engagement they pursue. Scientists have historically relied on a "deficit model" of communication, which holds scientists and scientific information in a privileged position relative to the public. The public engagement with science field has repeatedly criticized this model, citing its repeated failures to improve science literacy or enhance support for science. Rather, they argue that scientists must engage with the public by becoming more open and responding to their interests and concerns. This study focuses on researchers affiliated with the Ocean Tracking Network (OTN), a global acoustic-telemetry network that collects data on aquatic animals for the purposes of informing management. Through surveys and interviews, data was collected to help understand the factors that encourage or discourage ocean and aquatic researchers from engaging with the public. Findings suggest that participants had a very positive view of "engagement" as a whole but differed in their interpretation of what engaging with the public entailed. Many participants also reported frequent contact with the public and media but little formal communications training. Recommendations include increased communications training for scientists at the post-secondary level, as well as future case studies that examine interactions between scientists and the public in specific marine-management contexts, such as aquaculture siting.

Keywords: science communication, public engagement with science, deficit model, science-media interface, strategic communication

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Alexander completed his internship at the Ocean Tracking Network (OTN) under the supervision of Brendal Townsend, a MAP alumna and the organization's senior project manager. He worked primarily on evaluating OTN's previous strategic plan, eventually delivering an internal report to OTN senior management and Council. He also helped the communications team finalize OTN's 10-year anniversary report. Additionally, OTN provided critical support to his research project: participants were drawn from contact information housed in the OTN Data Centre. Senior management (including executive director Fred Whoriskey and scientific director Sara Iverson) provided input on the construction of the study. The internship provided Alexander with an opportunity to understand how a major research institution functions. He also had the opportunity to tag blue sharks, an exceptional experience unrelated to his project.

Emma Giesbrecht

Giesbrecht, E. (2018). Acoustic Modelling to Inform Policies: Mitigating Vessel Noise Impacts on Arctic Cetaceans Within the Tallurutiup Imanga National Marine Conservation Area [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Vessel traffic throughout the Canadian Arctic has tripled over the past 20 years and is not expected to decline. With the recent announcement of the Tallurutiup Imanga National Marine Conservation Area (TINMCA), the three endemic Arctic cetaceans species are protected from hydrocarbon development, but vessel traffic is still permitted. To understand the potential impacts shipping noise could have on cetaceans within the TINMCA boundaries, a probabilistic model was developed for each term in a simplified sonar equation. The received (RL) and sound exposure levels (SEL) were calculated using a probability distribution of source levels (SL) derived from four years of ship traffic data. The calculated SLs, RLs and SELs did not reach temporary threshold shift limits as set out by the National Oceanic and Atmospheric Administration. Due to limited studies conducted on these three cetacean populations it cannot be assumed that they are not impacted or disturbed by vessel noise. Modelling the spread of underwater noise from the vessels transiting through the TINMCA, helps develop spatial and vessel management tools. These tools can be used to mitigate the risks associated with vessel noise and the three charismatic Arctic cetaceans.

Keywords: Arctic; cetaceans; beluga; narwhal; bowhead; underwater noise; acoustic modelling; Tallurutiup Imanga; NMCA; RL; SEL; impacts

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Emma completed her internship with WWF-Canada, Arctic Shipping Division in Ottawa, Ontario under the guidance of Melissa Nacke and Andrew Dumbrille, and the supervision of David Barclay and Ronald Pelot. The primary goal of the internship was to allow Emma to work closely with the organization and understand the relationship between mariners and managers, which was done through the development of a Western Arctic/Beaufort Sea Mariner's Guide. The internship allowed Emma to understand the inner workings of an NGO, and to network with many stakeholders working in the Arctic shipping industry.

Alexa Goodman

Goodman, A. 2018. A Ghostly Issue: Managing abandoned, lost, and discarded lobster fishing gear in the Bay of Fundy [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Abandoned, lost, and discarded (ALD) fishing gear contributes to economic losses across fisheries and can be a significant hazard to conservation and safety at-sea. Lobster fishers (n = 32) and management agencies (n = 5) were interviewed from the Scotia-Fundy Region to determine how to estimate and mitigate ALD fishing gear. Results show that fishers across all lobster fishing areas (LFAs) regularly lost gear and that it was not always retrieved, although fishers informally notify each other of gear that was lost and often returned gear that was found. Fishers will, however, avoid retrieving old gear that is unidentifiable, because possession of this gear is prohibited by their licenses. New regulations to manage ALD are expected in the coming years, but through these interviews, regulatory and community-based solutions were identified that can potentially help estimate and mitigate ALD fishing gear.

Keywords: lobster; Bay of Fundy; fishing gear; ghost gear; marine debris; fisher; community-based management; decision-making; fisheries management.

Alexa completed her internship at Fundy North Fishermen's Association (FNFA) in St. Andrews, New Brunswick, where she worked on their decadal Ghost Gear Retrieval Project and her research project. During her time working on the Ghost Gear Retrieval Project, Alexa connected fishers and landscapers to initiate using old lobster traps as building materials for retaining walls, designed and led repurposed rope weaving workshops, and lead a ghost net retrieval. Additionally, Alexa identified areas of priority for ghost gear removal, based on abandoned, lost, and discarded (ALD) gear hotspots that fishers identified during interviews, overlaid with critical habitat for species listed under the Species At Risk Act (SARA) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Under the supervision of Sean Brilliant, with guidance from Maria Recchia, and conversations with fishers and management agencies the Bay of Fundy Region, Alexa has a deepened understanding of ALD fishing gear in the Bay of Fundy's lobster fishery and has been working towards communicating her findings and potential solutions with relevant stakeholders.

Kaitlyn Harris

Harris, K., 2018. A youthful look at the future of Nova Scotia's coasts: Towards inter-generationally inclusive coastal management [graduate project].Halifax, NS: Dalhousie.

Abstract

Natural resource management initiatives often aim to manage resources for the benefit of future generations; however, the input and perceptions of the youth who make up those future generations are rarely included in the management process. When resource management initiatives fail to consult, engage and solicit the participation of youth, they are subsequently at risk of being inter-generationally blind, unimaginative and contribute to individual and community development gaps. This research explores the extent to which Nova Scotia's coastal management initiatives have been inter-generationally blind and considers the potential for better and more comprehensive youth engagement and participation moving forward. Youth perceptions of Nova Scotia's coastal management are analyzed for their potential to enhance Nova Scotia's coastal management initiatives, and the feasibility of including these perspectives in provincial coastal management is assessed. Results from this study suggest that youth perceptions have traditionally been overlooked in coastal resource management in Nova Scotia, and this represents a missed opportunity for enhancing Nova Scotia's youth retention, fostering community-youth development and, sourcing creative and youthful solutions to increasingly complex problems.

Keywords: youth engagement; coastal management; participation; decision-making; inter-generational

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Kaitlyn completed her internship with the Harrison Lewis Coastal Discovery Centre and the Nova Scotia Environment Protected Areas Branch under the guidance of Jessica Bradford and Sally Steele, and the supervision of Dr. Claudio Aporta and Dr. Georgia Klein. At her internship, Kaitlyn coordinated public outreach and education events for a pending coastal nature reserve on Nova Scotia's south shore. This position involved liaising with community members, organizing educational and stewardship events and designing and delivering hands-on educational programming. Kaitlyn learned valuable skills in building and maintaining stakeholder networks and working collaboratively with communities in management projects.

Seth Jenks

Jenks, S. 2018. Pro-active Solutions for Atlantic salmon Management in Nova Scotia: A Roadmap for Recovery [Graduate Project]. Halifax, NS: Dalhousie University

Abstract

The Atlantic salmon (*Salmo salar*) is an anadromous fish species native to Nova Scotia that has significant economic, ecological, and cultural value to the people of the province. Atlantic salmon have been in decline throughout the province for over 100 years due to anthropogenic factors such as acid rain, habitat destruction, construction of dams, increasing water temperatures, poor fishery management, introduction of invasive species, and a multitude of unidentified contributing factors causing high mortality at sea. The commercial fishery has been closed for over 20 years, while the recreational fishery is mostly confined several rivers in the Cape Breton region that host salmon populations in an abundance above the conservation limits set by the Department of Fisheries and Oceans Canada (DFO). While Atlantic salmon are still greatly at risk in the province, a recent moratorium on the Greenland commercial fishery which is suspected of being one of the major causes of at sea mortality came into effect and will continue for at minimum 12 years. With one of the major barriers to at-sea survivorship rates removed, ensuring that the freshwater and estuarine environments are pristine for an increased influx of spawning adult fish is paramount to rebuilding the Atlantic salmon population in Nova Scotia. The objective of this research is to identify on which rivers managers should focus restoration and conservation efforts, and determine the most successful salmon restoration techniques and practices that should be considered in these rebuilding efforts.

Keywords: Atlantic salmon, Nova Scotia, Recovery, Pro-active Management

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Seth completed his internship with Wild Salmon Unlimited throughout Cape Breton and Mainland Nova Scotia with guidance from Patrick Wall of WSU and supervision from Dr. Megan Bailey and Dr. James Duston of Dalhousie University. The goal of this internship was to examine the efficacy of and perspectives surrounding Atlantic salmon stock enhancement in Nova Scotia. This was done through examining the body of scientific literature and by interviewing various government agencies, NGOs, volunteer organizations, academic experts, and knowledgeable individuals in the Maritimes. This internship helped Seth to better understand the organizational relationships and how these assist and hinder restoration efforts in the province, as well as leading to a greater understanding of the current environmental threats salmon face.

Curtis Martin

Martin, C. 2018. Using interpersonal communication strategies to encourage science conversations with lay audiences on social media [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Citizens are increasingly being asked to participate in decision-making processes, and with the internet now a primary source of information, it is critical that policy-relevant research is communicated effectively online to equip lay people with the information they require to participate in decisions. Social media have the potential to facilitate two-way conversations needed for strong science communication; however, research communicators often struggle to reach lay audiences on these media. In this research project, the Twitter and Instagram activity of four individual science communicators in North America and Europe is compared with the activity of three marine-focused non-governmental organizations (NGOs) (local, national, and international), paying particular attention to strategies that encourage audience engagement in two-way conversations. The study includes: 1) an analysis of public Twitter and Instagram data of each of the seven communicators 2) interviews with the individual and NGO communicators; 3) a survey of audience members involved in two-way conversations and 4) an audience "biography" analysis. The results of this study show that a combination of interpersonal communication strategies, and how they are integrated throughout the social media activity of communicators via platform affordances, especially in Instagram, can have an important effect on the level of lay user engagement in two-way conversations over time. Further application of the interpersonal communication strategies could promote greater public engagement with science, including involvement with critical marine management issues that exist at the science-policy interface.

Keywords: science communication; dialogic communication; digital media; social media; Instagram; Twitter; organizational communication; interpersonal communication

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Curtis completed two internships in Halifax, NS, the first with the Environmental Information: Use and Influence (EIUI) research program under the supervision of Dr. Bertrum MacDonald, and the second with the MEOPAR (Marine Environmental Observation, Prediction and Response) Network under Dr. Ronald Pelot, Stefan Leslie, and Heather Desserud. During his time at EIUI, Curtis completed research into the characteristics of the science-policy interface and participated in related discussions at weekly EIUI meetings, attendance at a conference, and preparation of blog posts. Curtis also developed his research methodology and design for his graduate project with the aid of numerous EIUI team members, who contributed their diverse expertise. As an EIUI team member, Curtis spent a week working with researchers in the Social Media Lab at Ryerson University to learn about social media research methodologies and further develop his graduate project. During his time with MEOPAR, Curtis worked with the Knowledge Mobilization (KM) team to help scope and initiate an impact assessment of the Network's Cycle I research projects. To accomplish this, Curtis helped develop an impact assessment framework and interview guide, and interviewed principal investigators from selected research projects to summarize their KM impact and potential for further work. Both internships provided Curtis with knowledge and skills on science communication and KM that were critical for completing his graduate project.

Andrea Mast

Mast, A. 2018. Bottom-up Engagement Increases Marine Protected Area Effectiveness [graduate project]. Halifax, NS: Dalhousie University

Abstract

Marine Protected Areas (MPAs) have been shown to provide benefits for biodiversity conservation within marine habitats, by reducing direct human impacts and restoring fish populations that provide critical ecosystem functions. Protected areas can be established and governed in different ways, primarily through bottom-up arrangements that involve local people and multiple stakeholders, or top-down decisions imposed by government agencies. Yet little is known about how these two governance strategies compare in terms of the protection and benefits they provide to MPAs globally. Using an extensive data set of MPA conditions, a set of Bayesian hierarchical models were developed to understand the role of top-down versus bottom up governance on the net reef fish biomass differences between MPA and adjacent non MPA areas from 218 global MPAs. The results suggest that collaborative governance, or co-management, provides larger positive effects on reef fish biomass differences between MPAs and adjacent open areas than top-down, or federal arrangements. Additionally, while total gross domestic product is positively related to net biomass, there is a negative relationship with the human development index. The results illustrate the importance of stakeholder participation for improving ecological outcomes, with the policy recommendation that existing MPAs transition to collaborative management where possible.

Keywords: marine protected area, top-down management, bottom-up management, co-management, reef fish biomass difference

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Andrea completed her internship in the Integrated Fisheries Lab in the Biology Department at Dalhousie University under the supervision of Dr. Aaron MacNeil, who is also her graduate project supervisor. During the internship, she conducted literature reviews on marine protected areas, management systems, and coral reefs. She also worked on developing Bayesian hierarchical models in the Python programming language. Andrea gained valuable quantitative analysis skills, specifically through the building of mathematical models, and understanding how the results can be interpreted and applied to provide management recommendations in the field of marine policy.

Ryan Maxwell

Maxwell, R. 2018. Key players in the Grieg NL Placentia Bay Atlantic Salmon Aquaculture Project: a social network analysis [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Global aquaculture is one of the fastest growing food industries, accounting for approximately half of all finfish and invertebrate production as of 2016. In Canada, both the federal and provincial governments are pushing strongly for the development of the industry, which creates a problem in that governments are both regulators and promoters of the industry. In Newfoundland (NL), a recent aquaculture development, the Grieg NL Placentia Bay Atlantic Salmon Aquaculture Project, was controversial due to the waiving of an environmental impact assessment (EIA) by the NL Government, resulting in a court case. Here, the Grieg NL case was studied to understand how stakeholders operate in salmon aquaculture developments, specifically when governments waive critical procedures such as EIAs. A social network analysis was accompanied by semi-structured interviews to identify key players associated with the Project and their underlying motivations. The results indicated that ENGOs and aquaculture industry were the two key stakeholder groups with opposing views on the Project, the former being opposed to the Project and the latter being supportive of the Project. The four underlying motivations from the semi-structured interviews included: (1) social and economic benefits associated with the Project, (2) farmed salmon as healthy/unhealthy food, (3) environmental concerns, and (4) government regulation. This study highlights the growing importance of the term social licence to operate (SLO) in aquaculture developments, and stresses the practicality of using social network analysis and semi-structured interviews to better understand the different stakeholders that are involved in the granting/withholding of SLOs.

Keywords: salmon aquaculture, government regulation, environmental impact assessment, social network analysis, stakeholders, social licence to operate

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Ryan completed two internships, the first with the Ocean Frontier Institute in Newfoundland, interviewing different stakeholders associated with the Grieg NL Placentia Bay Atlantic Salmon Aquaculture Project. This work was co-supervised by Dr. Ramon Filgueira at Dalhousie University and Dr. Charles Mather at Memorial University. The second internship was with the Maritimes Region Aquaculture Management Office at Fisheries and Oceans Canada (DFO). While working with DFO under the supervision of Erin Laking, Ryan assisted with obtaining and entering data for the Aquaculture Activities Regulations (AAR) reporting, and helped manage the Nova Scotia Introduction and Transfers Committee. The second internship allowed Ryan to develop a better understanding of the federal government's role in regulating aquaculture.

Scott McIlveen

McIlveen, S. 2018. Sharks are Friends, not Food: An Analysis of the Practicality and Feasibility of a Toronto Shark Fin Ban. [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Shark populations around the globe have seen precipitous declines due to human exploitation. The shark fin trade has been one of the primary drivers in these declines, a trade that operates to meet the demands for the Chinese delicacy, shark fin soup. Though there have been some marked declines in the market for shark fin in China, consumption has become increasingly globally widespread fueling an epidemic that continues to this day. Far too frequently statistics on shark fin being traded are nearly impossible to accurately quantify and there is a lack of knowledge of what species are being traded. Knowledge of the market for shark fin, and shark products is needed in order to properly assess what management measures are needed for shark populations, and for the commodities being traded. Results of this research highlight a high proportion of species of conservation concern in the Toronto area, indicating a need for improved management. Governance responses, such as regional or municipal bans have emerged as a means to address the shark fin trade in countries where limited action has been taken by higher levels of government. Though relatively little is known on the impacts that these bans have on shark fin importations, they still may provide a means of spreading awareness and stimulating action. This study analyzes the practicality and feasibility of a Toronto shark fin ban; the second largest hub for shark fin trade in Canada.

Keywords: Shark fin trade, municipal ban, DNA barcoding, Toronto, CITES, IUCN, conservation

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Scott completed his internship with Shark Stewards, a San Francisco-based conservation organization. Working remotely in Toronto, the primary goal of the internship was to conduct research assessing species composition of the shark fin trade in Toronto markets. Scott spent time identifying potential shark fin vendors throughout the city and surrounding area. Shark fins were ultimately purchased from several vendors before being taken to Dr. Steinke at the University of Guelph for DNA sequencing.

Lydia Ross

Ross, L. 2018. Mobilizing values: Using perceptions of barachois ponds in Cape Breton to advance informed management. [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Barachois ponds or tidal lagoons are highly dynamic, incredibly productive, yet poorly understood wetlands across Nova Scotia and Cape Breton. Actively created by the partial or complete enclosure of a sand / gravel barrier forming a pond, barachois ponds are saline when open to the sea but can transform into a fresh environment if fully enclosed. These ecosystems form a mosaic landscape, ranging from pond, to tidal flat, to beach, to dune, to fringent salt marsh vegetation, to forest. They are critical habitats, nesting sites, and feeding grounds for migrating shore birds and mammals. Barachois ponds are also highly valued for their extensive ecosystem services such as natural harbours, oyster aquaculture, and simple charm. Yet, commonly applied environmental triggers for management such as freshwater and saltwater for distinguishing for between provincial and federal jurisdiction, become obscured in brackish water systems which shift constantly between stable states. Meanwhile, negative impacts to barachois ponds occur at the watershed scale, yet uncoordinated land-use policies across municipalities and First Nations Reserve lands further exacerbate the disjoint in management efforts. To inform management considerations, four dominant perspectives on the management of barachois ponds are revealed using Q-methodology mixed-methods. The values from 33 participants across academia, government, industry, local, and non-governmental organizations each shaped the four perspectives; 1- the Leave-Them-Be Conservationists (1-LTBC); 2- the Sustainable Developers (2-SD); 3- the Management Reformists (3-MR); and 4- the Science-Based Conservationists (4-SBC). Analysis and interpretation of the data and perspectives revealed six key issues for prioritizing future management strategies; 1) A type of Wetland Ecological Services Protocol for Atlantic Canada (WESP-AC) specifically for barachois ponds in Cape Breton; 2) an inventory and sub-classification system for barachois ponds; 3) Social and cultural importance criteria for designating Wetlands of Special Significance; 4) Alterations to barachois ponds; 5) Coordinating integrated management; and 6) Educating stakeholders.

Keywords: barachois ponds, coastal lagoons, Bras d'Or Lakes, coastal management, decision-making, perceptions, Q-methodology, integrated, brackish

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Lydia completed her internship at Unama'ki Institute of Natural Resources (UINR) in Cape Breton, with significant support from Shelley Denny for swift integration into the dynamic work environment and local community of Eskasoni, CB. Lydia was tasked with recording perspectives on barachois ponds using Q-methodology mixed-methods, to inform decision support tools for designating protection over development. These perspectives and her work will help inform the decisions of municipal, provincial, and Band governments as they look to responsibly develop coastal, land, and other natural resources.

Leah Sneddon

Sneddon, L. 2018. Barriers to implementing a bottom-up approach to coastal MPAs: A Canadian case study [graduate project]. Halifax, NS. Dalhousie University.

Abstract

Marine protected areas (MPAs) are employed as a conservation strategy across the world, protecting species and habitats and helping to rebuild declining populations. However, proposals for coastal MPAs are often met with resistance from local communities, where reserves are perceived to lead to negative social, economic, cultural and political impacts. Shifting from the traditional top-down governance structure to a more community-based or "bottom-up" approach is increasingly advocated as a means to secure local support and enhance the effectiveness of marine conservation measures. This research sought to identify site-specific barriers that may limit the application of a bottom-up management approach for a potential MPA, the Eastern Shore Islands area of interest. A literature review was first conducted to examine four previous resource management initiatives on the Eastern Shore, which provided a contextual background and lessons learned for current implementation processes. Potential barriers to community-based co-management of an Eastern Shore Islands MPA were then analysed using a framework for co-management. Key barriers identified include a history of mistrust, contrasting visions for coastal management, and a lack of local leadership supporting the process. As the initiator of the MPA, the federal government should assume responsibility in addressing these barriers, including taking time to mend past relations and build trust, and communicating with communities more effectively.

Keywords: marine protected areas; Nova Scotia; community-based; co-management; collaborative planning

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Leah completed her internship with WWF-Canada in Halifax, Nova Scotia. During the internship, she worked under the supervision of Sarah Saunders, the Specialist for Marine Protection and Renewables, and Hussein Alidina, the Senior Specialist for Oceans. Leah's work with WWF involved research for projects related to supporting a bottom-up approach to marine protection on Canada's Pacific and Atlantic Coasts. This involved refining common areas of interest for marine protection in Gitga'at Territory, and identifying potential barriers to community-based co-management of a potential Eastern Shore Islands MPA. As part of the internship, Leah was able to attend a community meeting on the Eastern Shore, which allowed her to better understand how the community perceives current MPA implementation processes.

Meghan Terpenning

Terpenning, M. 2018. Stakeholder perceptions of the Nova Scotia aquaculture regulations implemented in 2015: A foundation for social license?

Abstract

Nova Scotia is in need of socio-economic opportunities in coastal rural areas, which aquaculture may provide. However, aquaculture is a particularly contentious industry in Nova Scotia with public concern over the environmental impacts and potential conflicts with other marine activities. As a result, in 2014 an independent review, by two lawyers made a number of recommendations for an aquaculture regulatory reform in the form of the Doelle-Lahey Report (2014). This review incorporated input from a variety of stakeholders throughout Nova Scotia and was widely supported. The resultant regulations released in 2015 incorporated many, but not all of the recommendations of the Doelle-Lahey Report (2014). The new regulatory framework has received criticism from multiple stakeholder groups. The present research aims to understand how the province's reaction to the Doelle-Lahey Report (2014) in the form of the aquaculture regulations has affected industry development. A comparison between the current regulations and the Doelle-Lahey Report (2014) was undertaken followed by semi-structured interviews to understand how stakeholders perceived the identified differences and the industry more generally. Specifically, stakeholders in the academia, industry, and government categories tended believe that the current regulatory framework is sufficiently strong and more recommendations from the Doelle-Lahey Report should not be incorporated into the regulations. In contrast, stakeholders in the NGO and community categories would have preferred more recommendations from the Doelle-Lahey Report to be incorporated in the new regulatory framework. Further, it was found that stakeholders thought the regulations may have direct effects (e.g. the new regulatory process) and indirect effects (e.g. social acceptability due to transparency, legitimacy, accountability, and procedural fairness) on the industry. Increasing transparency should be prioritized in future decisions as it may also improve legitimacy, accountability, and procedural fairness and may ultimately result in more socially acceptable aquaculture practices.

Keywords: finfish aquaculture, social licence, transparency, accountability, legitimacy, procedural fairness, Nova Scotia, regulations.

Meghan completed her internship at the Aquaculture Association of Nova Scotia (AANS), a non-profit organization located in Halifax that represents the aquaculture industry in the province. During the internship, Meghan worked as an outreach facilitator. In this position, she helped plan and execute engagement events throughout Nova Scotia aimed at connecting communities and local sea farmers to allow for dialogues about aquaculture and relationship-building. Through this opportunity Meghan was able to engage with stakeholders in the aquaculture industry throughout the province. This internship provided Meghan with a better understanding of the aquaculture industry in Nova Scotia and how the general public perceives the industry.

Haley Welsh

Welsh, H. 2018. Managing Canada's Endangered: An Analysis of Canada's Efforts to Mitigate Shipping Impacts on North Atlantic Right Whales [graduate project]. Halifax, NS: Dalhousie University.

Abstract

North Atlantic Right Whales (NARWs) are vulnerable to anthropogenic impacts from commercial shipping and fishing practices. After the 2017 NARW season, that left 17 NARWs killed in Canadian and U.S waters, the U.S defined the situation as an "unusual mortality event". Necropsies confirmed that a large proportion of dead NARWs showed evidence of blunt force trauma, a trauma experienced through lethal vessel to whale interactions. In the past, management measures have been put in place to address ship-strikes and NARWs, however due to an unexpected presence of NARWs in the Gulf of St. Lawrence these management measures have been deemed ineffective. This research project involves the implementation of dynamic ocean management (DOM) in the Gulf of St. Lawrence in an attempt to mitigate ship-strikes on NARWs. This graduate project analyses the effectiveness of previous vessel measures, the challenges in implementing DOM and how the Government of Canada can protect NARWs in the years to come.

Keywords: Dynamic ocean management, North Atlantic right whales, commercial shipping, ship-strike, species management, adaptive management, marine mammal conservation, Government of Canada, policy analysis

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Haley completed her internship at Transport Canada in Ottawa, Ontario. During her internship, she worked with the Marine Safety and Security Team where she helped support their whale protection plan. This included daily operations of the dynamic shipping lanes in the Gulf of St. Lawrence for the protection of North Atlantic Right Whales (NARW), and support on mitigating shipping impacts for the protection of Southern Resident Killer Whales (SRKW) within the Salish Sea. At Transport Canada, Haley was responsible for putting together a report documenting all management measures historically and currently used by the Government of Canada for the protection of NARWs and SRKWs. For this report, Haley had the opportunity to shadow Government of Canada employees from Transport Canada and the Department of Fisheries and Oceans in order to identify related management measures and provide appropriate recommendations for the future. The information gathered in this report and from this internship formed the basis of Haley's graduate project and has provided her with invaluable skills and experiences from working in the public sector.