DALHOUSIE UNIVERSITY

Marine Affairs Program

Making Waves 2021

Graduate Project Presentations of the Master of Marine Management Class of 2021

Schedule and Abstracts

Thursday December 9, 2021
10:30 am to 1:30 pm AST

Friday December 10, 2021
10:30 am to 1:30 pm AST

Zoom connection details are outlined in the Schedule

Making Waves 2021 Schedule - Thursday December 9, 2021

Atlantic Standard Time

https://us06web.zoom.us/j/81512225350?pwd=RzRYTlY1UXIxODJJTVBBWWxGMlhPUT09

Meeting ID: 815 1222 5350
Passcode: 198825

	Name	Title
10:30 am	Introductory Remarks – Jerry Bannister, Director, Marine Affairs Program	
10:40 am	Stephen Tiller	Proposal for a Comprehensive Risk Framework for the Canadian Marine Shipping Industry: A Systematic Approach to Managing Transport Risks in Canadian Waters Based on an ISO 31000 foundation
11:00 am	Tianna Clarke	The Canadian maritime sector perception of the International Maritime Organization's (IMOs) short-term measures for greenhouse gas (GHG) emissions
11:20 am	David Marrack	Harbour Facilities and Marine Accessibility in British Columbia's Isolated and Coastal Communities
11:40 am		BREAK
11:50 am	Leah Fulton	Untangling the problem of abandoned, lost, and discarded fishing gear: Evaluating the benefits of side scan sonar as a gear detection method
12:10 pm	Lisa Baxter	Evaluating Canada's single-use plastic (SUP) mitigation policies via brand audit and beach cleanup data
12:30 pm	Aaron Cogger	A Climate Change Vulnerability and Data Gap Assessment of Arctic Marine Species in the Tallurutiup Imanga National Marine Conservation Area
12:50 pm	Kaitlyn Curran	Humanizing Marine Spatial Planning: a Salutogenic Approach
1:10 pm		**WRAP UP**

Each student is allotted 15 minutes for their presentation (10 minutes for presentation, 5 minutes for questions). There is a 1 - minute break for change-over of presenter.

Making Waves 2021 Schedule – Friday December 10, 2021
Atlantic Standard Time

https://us06web.zoom.us/j/82431620079?pwd=UTlXUDdtSTdKYVh0NS91V2V2dERXdz09

Meeting ID: 824 3162 0079
Passcode: 341284

Time	Name	Title
10:30 am	Welcome Back – summary of Previous Day	
10:35 am	James Barclay	A Potential Tool to Support the Prioritization of Blue Carbon Ecosystems in Canada
10:55 am	Jillian Conrad	Canada's ocean policy: Assessing enabling governance conditions for implementation of a national blue economy strategy
11:15 am	Lisa Chen	Developing an ocean literacy framework: Lesson from an analysis of Ocean Week Canada
11:35 am		BREAK
11:45 am	Francheska Krysiak	Linking human impacts to recent declines in coral reef fish communities in the Bay Islands
12:05 pm	Martin Ostrega	Evaluating Pragmatic Strategies for Conserving Bonefish (*Albula vulpes*) in Cuba: A Focus on Spawning Aggregation Management
12:25 pm	Jaclyn Franceschini	How Decision-Making in Fisheries Management Contributes to Changes in the Fishery: A Case Study of North Atlantic Swordfish
12:45 pm	Victoria Cullen	Exploring perceptions of commercial fisher representation in management: A case study of the North Atlantic right whale UME, 2017-2021
1:05 pm		**WRAP UP**

Each student is allotted 15 minutes for their presentation (10 minutes for presentation, 5 minutes for questions). There is a 1 - minute break for change-over of presenter.

Making Waves 2021 Abstracts
(in alphabetical order)

James Barclay

Barclay, J. 2021. A Potential Tool to Support the Prioritization of Blue Carbon Ecosystems in Canada [graduate project]. Halifax, NS: Dalhousie University.

Abstract

Globally, climate change and various anthropogenic activities have contributed to a significant decline in blue carbon ecosystems over the past few decades. These ecosystems can be prolific at accumulating and sequestering carbon dioxide and can be a vital, natural resource to mitigate increasing atmospheric carbon dioxide concentrations. Canada has the longest coastline of any country, and it has a responsibility to protect and restore these productive ecosystems. Sea-level rise is a predominant factor influencing coastal marsh's ability to remain a carbon sink in the future. Here I highlight a potential decision-making tool utilizing the Sea-level Affecting Marshes Model and Natural Capital Projects Coastal Blue Carbon model in a Canadian context. Requirements to improve the accuracy of using these models in Canada are isolated, and their integration into Canadian coastal management efforts are discussed. A high-level quantification of current and future carbon storage and sequestration in blue carbon ecosystems throughout Canada can aid future protection and restoration ambitions.

Keywords: Blue Carbon, Carbon Modelling, Coastal Ecosystems, Coastal Management, Salt Marshes, Atlantic Canada

---

James completed his internship with World Wildlife Fund (WWF) Canada as part of the resilient habitats team, under the supervision of Sarah Saunders. He worked on their blue carbon initiative, examining a methodology that has been used to quantify carbon sequestration of salt marshes over time in other parts of the world, but thus far had limited uptake in Canada. Using two case studies to guide the project, James demonstrates how the work could help prioritize blue carbon ecosystems for protection and restoration in the future.

Lisa Baxter

Abstract

Single-use plastics (SUPs) represent a major threat to marine environments and require proactive policies to reduce consumption and improper disposal. A range of SUP mitigation strategies are available to deter SUP use and mitigate environmental impacts, including extended producer responsibility (EPR), deposit-return schemes, SUP bans, and public outreach and education strategies. Within Canada, current SUP management is fragmented, and proposed federal approaches may be insufficient to adequately minimize SUPs. Through this study, brand audit and beach cleanup data were analyzed for multiple locations across Canada including densely populated cities and a remote island (Vancouver, Toronto, Montréal, Halifax, and Sable Island) to determine efficacy of ongoing SUP mitigation measures in Canada. Results support that current Canadian SUP measures do not adequately address EPR, and overall, current measures appear to be insufficient to address improper disposal of SUPs into the environment. Recommendations to strengthen current SUP management strategies and mitigate marine plastic pollution are suggested with the goal of improving future Canadian SUP reduction policies.

*Keywords***:** Single-use plastics; marine litter; SUP policy; SUP mitigation; Canada; brand audit; beach cleanup

---

Lisa completed her internship remotely with the Department of Fisheries and Oceans Canada, Maritimes Region. Under the supervision of Elise Will, Lisa contributed to a variety of projects within the Marine Planning and Conservation Team. During her internship, Lisa helped compile and summarize literature to support the development of decision support tools and risk assessments. Further, this internship allowed Lisa to delve into a more socio-economic lens through evaluation of coastal MPA impacts to local communities via wellbeing indicators. Although the internship did not directly relate to Lisa's graduate project, the experience provided opportunities to gain practical experience, develop skills learned in MMM, and give valuable insight into marine conservation processes within Canada.

Lisa Chen

Chen, L.S.Y. 2021. Developing an ocean literacy framework: Lesson from an analysis of Ocean Week Canada [graduate project]. Halifax, NS: Dalhousie University.

Abstract

The UN Decade of Ocean Science and the Canadian Ocean Literacy Strategy (the 'Strategy') have led to increased recognition of the need for ocean education at all levels to increase ocean literacy. According to the Strategy, ocean literacy in Canada is multi-dimensional and includes ocean knowledge, values, and actions. This research project focuses on developing a multidimensional Framework using a multidisciplinary literature review and discussions with subject experts to better understand and evaluate ocean literacy. It applies the Framework through online anonymous surveys with Ocean Week Canada participants. The results indicate that this annual ocean celebration is crucial to fostering ocean connections. However, the event currently draws a non-random audience who are mostly young highly educated females and are already engaged with the ocean. Results demonstrate that other than measuring the ocean literacy levels of the respondents, the Framework and surveys can provide feedback to identify deficiencies and enhance ocean literacy initiatives. The author recommends that ocean literacy researchers and educators use the results as a tool to systematically evaluate ocean literacy initiatives while considering the interconnectedness between ocean knowledge, values, and actions. Ocean literacy initiatives should use an adaptive, collaborative, and integrated approach to ocean education to ensure that they are accessible, diverse, equitable, and inclusive.

Keywords: ocean literacy, framework, evaluation, case study, Ocean Week

---

Lisa completed her internship virtually at Fisheries and Oceans Canada with the Marine Environmental Quality (MEQ) team at the national headquarters in Ottawa. Under the supervision of Carrie Yan, Senior Science Analyst, and the rest of the MEQ team, Lisa supported tasks related to the development of the Ocean Noise Strategy, and the update of the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP). During her internship, Lisa developed case studies on the Gully Marine Protected Area and the Placentia Bay to highlight key research and management efforts on assessing, monitoring, and mitigating underwater noise. She also worked on drafting a background paper on ocean noise, and a factsheet on the approach of the SOCP update. Although her internship did not align with her graduate research, Lisa enhanced her skills in science communication while obtaining hands-on experience in integrating ocean literacy concepts into policy development.

Tianna Clarke

Abstract

In April 2018, the International Maritime Organization (IMO) adopted the Initial Strategy (IS) on reduction of greenhouse gases (GHGs) emissions, contributing to global climate efforts under the Paris Agreement. The Strategy presents a framework to achieve three levels of ambition towards GHG emissions reductions and includes short-, mid- and long-term measures to be adopted by member States. Globally, the contribution of GHGs from the shipping industry is expected to increase approximately 50% by 2050, under a business-as-usual scenario. Short-term measures proposed in the IS are anticipated to only have a modest impact on decarbonization effects and have been criticized by experts. Presently, there is no systematic understanding of the Canadian maritime shipping industry's perception of the proposed short-term measures. This study sought to bridge this knowledge gap through a series of semi-structured interviews. Using this qualitative approach, results from six stakeholders demonstrated a diverse range of perspectives. A collection of topics revealed a spectrum of ideas, whereby perceptions appeared to be largely influenced by stakeholder role within the sector. The results of this study demonstrate the need to facilitate engagement with more Canadian maritime shipping stakeholders such that future regulations and policy can be best informed. Greater research and engagement with more players must occur to ensure strategic building of IMO targets for a plan for Canada to better align with Paris Agreement temperature goals.

Keywords: greenhouse gases, shipping industry, Canada, stakeholders, engagement, policy, International Maritime Organization

---

Tianna completed her internship with the World Wildlife Fund for Nature (WWF Canada) under supervision of both Sam Davin and Elissama Menezes. Throughout her internship, she conducted semi-structured interviews to gather insight from members of the broader Canadian shipping community. Through these conversations, perspectives on the International Maritime Organization's (IMOs) strategy to reduce GHGs from the shipping sector were explored. Tianna gained valuable experience networking through WWF and connecting with industry members to discuss carbon emissions and the climate crisis.

Aaron Cogger

Cogger, A. 2021. A Climate Change Vulnerability and Data Gap Assessment of Arctic Marine Species in the Tallurutiup Imanga National Marine Conservation Area. [Graduate Project]. Halifax, NS: Dalhousie University.

Abstract

Arctic marine ecosystems are warming at twice the rate of oceans worldwide, resulting in a loss of sea ice and available habitat for many marine species. While new conservation policies are required to protect the increasingly vulnerable marine species in Northern Canada, the data gaps associated with Arctic marine ecosystems make it difficult to prioritize which species need to be protected, along with the best methods to do so. This project assessed the vulnerabilities of several cetaceans, pinnipeds, and fish present in the Tallurutiup Imanga National Marine Conservation Area to climate change under the RCP 8.5 emissions scenario to determine which species will be most at risk by 2055. A digital literature review was conducted to obtain life history information for each species, which was then used on two trait-based vulnerability assessment frameworks to determine the risks of climate change related impacts. Results showed that Arctic char, Arctic cod, and Atlantic walrus are most sensitive to climate change with vulnerability scores of 16/16 (Very High), while all other species were given a score of 12/16 (Very High). Cetaceans were found to be the most data rich taxon overall, followed by pinnipeds and then marine fish with the most data gaps present. The most pressing data gaps include outdated or nonexistent abundance measurements and a lack of natural mortality rates in marine mammals, making it difficult to assess the intensity of anthropogenic disturbances. The creation of more well-defined management groups, coupled with more frequent abundance and population age structure surveys would be beneficial to filling in these data gaps. For fish, a lack of knowledge about reproductive behavior, timing, and locations were the most pressing data gaps, which can be resolved through tracking seasonal movements and observation of suspected areas of importance.

Keywords: Climate change, Tallurutiup Imanga National Marine Conservation Area, Arctic ecosystems, Trait based vulnerability assessments, Data gap analysis, Sea ice, Bowhead whale, Beluga Whale, Narwhal, Atlantic walrus, Ringed seal, Bearded seal, Greenland shark, Arctic cod, Arctic char

---

Aaron completed his internship with World Wildlife Fund Canada under the supervision of Erin Keenan. During his internship, he helped to identify data gaps present in Arctic marine ecosystem conservation in the Canadian Arctic, and suggested where future research opportunities are present. By conducting literature reviews to supplement WWF Canada's newly released Canadian Arctic Marine Priority Areas for Conservation (CanPAC) report, he also provided assistance with making suggestions on where future marine protected areas should be created in the Canadian Arctic. This internship gave Aaron many opportunities for growth regarding teamwork in interdisciplinary projects, appropriately scoping personal goals, and gaining inspiration for his own graduate research.

Jillian Conrad

Abstract

The world has reached an international consensus regarding the need for sustainable ocean management practices to ensure the health and wealth of our global ocean. Such practices can be implemented through various marine-based strategies for sustainable development that focus on ecological, social, and economic domain integration, broadly known as Blue Economy development. States such as Seychelles and Australia have existing Blue Economy strategies; however, many maritime nations have yet to develop similar government-supported plans. Canada is in the initial phases of developing a Blue Economy strategy, which will build upon and integrate current marine development programs. These programs are supported by regulatory tools such as legislative and policy instruments; intrinsically, governance capacity for Blue Economy development must be evaluated prior to successful implementation. This study conducts a two-part federal policy and legislative analysis to determine Canada's regulatory capacity for developing a national Blue Economy strategy. First, a brief natural resource assessment was conducted across seven Canadian ocean sectors. Second, an analysis of enabling federal governance conditions was conducted based on federal legislation, policies and strategies supporting Blue Economy pillars and respective indicators identified by the Blue Economy Capacity Framework (BECF) (Cisneros-Montemayor et al., 2021). Overall, governance capacity is well-developed across environmental sustainability and economic viability domains, though department-specific regulations are lacking across multiple subsets of social equity. Further development of equitable federal policies and legislation will allow Canada to optimize marine and coastal industry processes and identify new areas for expansion while recognizing diverse coastal needs.

Keywords: Blue Economy, Canada, legislation, policy, social equity, environmental sustainability, economic viability

---

Jillian completed two internships, one for the Nippon Foundation Ocean Nexus Program under the supervision of Dr. Wilf Swartz, and the other with the Government of Nova Scotia Department of Fisheries and Aquaculture (NSDFA). During her Ocean Nexus internship, Jillian conducted opportunity assessments based on existing policies and legislation that support Blue Economy development, alongside various supporting research projects relating to international fisheries marine policy and sustainable trade initiatives. Through this role, Jillian learned to critically analyze large policy and legislative datasets to identify gaps for future refinement. Through her NSDFA internship, Jillian was responsible for assessing multilevel marine protection approaches to fisheries and aquaculture development, used to advise and improve upon local business advancement. This internship helped shape Jillian's skillset for identifying stakeholder priorities and developing creative, evidence-based management recommendations that balance economic, environmental, and social priorities. Through the completion of two internships, Jillian was able to diversify her management capabilities by refining her area of expertise while challenging herself to explore an unfamiliar area of interest.

Victoria Cullen

Cullen, V., 2021. Exploring perceptions of commercial fisher representation in management: A case study of the North Atlantic right whale UME, 2017-2021 [graduate project]. Halifax, NS: Dalhousie University.

Abstract

There is a growing recognition of the importance of involving stakeholders in marine governance and management to enable the inclusion of the knowledge and interests of those whose livelihoods are directly linked to the marine ecosystems. This study aims to understand the perceptions of fish harvester organizations as mechanisms to represent the interests of commercial fish harvesters during a resource use conflict in Atlantic Canada. It employs a case study approach, utilising semi-structured interviews and qualitative analysis to evaluate the perceptions of fisher representation during the development of the mitigation measures to protect the critically endangered North Atlantic right whale from fishing gear entanglements. The North Atlantic right whale population have faced an Unusual Mortality Event (UME) with 34 confirmed fatalities since 2017, with human interaction by gear entanglements and vessel strikes as the leading cause of death. This case study has been selected for its urgency and the consequences of the mitigation measures on the operations of commercial lobster and snow crab fish harvesters throughout the Gulf of St. Lawrence. It is argued that the effective participation of fish harvesters in the design and implementation of mitigation measures can contribute to improved outcomes, whereby fishers can contribute to measures that are reflective of local priorities. The outcomes of this study indicate that there is a clear and valuable role for fisheries organization in the governance of Atlantic Canadian fisheries, but that strategic efforts are needed to overcome barriers of distrust and poor governance.

Victoria completed her internship at Dalhousie University under the supervision of Dr. Wilf Swartz, as a research assistant under the Nippon Foundation Ocean Nexus Center. Victoria conducted policy and socioeconomic research on topics of fisheries economic vulnerability in response to shocks. This research included a comprehensive and thorough evaluation of all peer reviewed and grey literature regarding the inshore lobster fisheries in Atlantic Canada, as well as a synthesis of news article, statistics and other forms of data. During her internship, Victoria drew connections between the issues of vulnerability and representation for fish harvesters in relation to her graduate project research. The outcomes of the internship were focused more generally on impacts such as Covid-19 and fleet structure, however, the North Atlantic Right Whale is one example of the type of cumulative shock that weakens fisher resilience at an individual and community level.

Kaitlyn Curran

Abstract

Despite the growing acknowledgement within the academic literature that human well-being is an important aspect of marine spatial planning (MSP), research and practice continue to neglect this concept. Specifically, the consequences of marine development and climate change on human health is largely absent from ocean governance processes and needs to be addressed. This study argues that human health and spatial planning frameworks may be employed in combination to investigate this issue. Guided by the concept of salutogenesis (health promotion), this study utilized online participatory mapping in conjunction with a questionnaire to explore study participants' perceptions of the health benefits of and barriers to participating in coastal activities within Halifax Regional Municipality (HRM), Nova Scotia, Canada. Results from this study indicated that participating in coastal activities in HRM is perceived to be very important for human health. Criteria for salutogenically significant areas (SSAs) were developed by referring to the CBD criteria for biologically and ecologically significant areas, which included uniqueness, diversity, productivity, importance for underserved populations and vulnerability. Recommendations have been made for gathering SSA criteria information while enabling marine managers to make more informed decisions about how to best consider human health objectives within MSP. Further application of this participatory mapping approach to gather human health data, particularly to collaborate or partner with diverse and underserved population groups is recommended.

Keywords: Marine spatial planning (MSP); blue space; salutogenesis; human health; oceans and human health (OHH); health equity; planetary health

---

Kaitlyn completed her internship at Dalhousie University under the supervision of PhD candidate Kayla Hamelin. During her internship Kaitlyn supported projects that investigated recreational mackerel fishing in Nova Scotia as a research assistant. She was responsible for conducting field work on fishing wharfs throughout Halifax Regional Municipality and providing reports on different aspects of recreational fishing in the Maritimes. Additionally, Kaitlyn helped distribute survey information materials regarding recreational mackerel fishing in Nova Scotia. Conducting this research required strong communication skills as facilitating positive interactions with the public was crucial to ensuring a comfortable and non-intrusive environment for the fishers. Building trust with the fishers was another component of this work and was guided by Kaitlyn's ability to have an open mind, value diverse perspectives, convey active listening, and gain rapport.

Jaclyn Franceschini

Abstract

Fisheries management must constantly adapt to changes in stock status, shifts in effort, and national and international policy. The North Atlantic Swordfish Fishery is an interesting case study because of the migratory range of the target species, variability of the stock status, and the variety of management actions applied at national and international scales over the past six decades. Despite the dynamic nature of this fishery, there is a lack of documentation of the management history and how behaviour of the Canadian fleet changed in response to national and international agreements, new gear types, and different quota allocation schemes. The objectives of this project are (1) produce a timeline of the management changes affecting the Canadian North Atlantic Swordfish Fishery, and (2) examine for relationships between management changes and patterns in the fleet over time. Potential connections between fleet behaviour are identified as: (1) anticipatory effects prior to the international percentage allocations in 1995, and (2) a temporal shift in the Canadian fishery after the introduction of the ITQ system in 2002. These outputs will support the creation of improved North Atlantic Swordfish population models and management measures that better account for fleet dynamics. Although focused on the Canadian fleet, this project could be applied to other fleets in the international swordfish fishery.

Keywords: swordfish; fleet behaviour; fisheries management; ICCAT; stock assessments; Canadian longline; anticipatory effects; ITQ.

Jaclyn completed her internship with the Department of Fisheries and Oceans Canada at the St. Andrews Biological Station. Under the supervisor of Dr. Kyle Gillespie and Dr. Alex Hanke, she joined the Large Pelagics team in the Population Ecology Division. She worked in the bluefin tuna laboratory, helping prepare samples for an ageing, growth, and genetics project. Additionally, she conducted a case study on the North Atlantic Swordfish fishery and created a timeline of the management changes impacting the Canadian fleet. This internship was instrumental in the information gathering phase of her graduate project.

Leah Fulton

Fulton, L. 2021 Untangling the problem of abandoned, lost, and discarded fishing gear: Evaluating the benefits of side scan sonar as a gear detection method [graduate project]. Halifax, NS. Dalhousie University.

Abstract

Abandoned, lost, or otherwise discarded fishing gear (ALDFG) has surfaced as a significant conservation issue that continues to compromise the economic, social, and ecological aspects of the marine environment. To alleviate these concerns, methods of gear detection can be applied to increase the precision of derelict gear retrieval and potentially improve the likelihood of success. Targeted in Canada's most productive American lobster (*Homarus americanus*) fishing area, 27 side scan sonar (SSS) transects were conducted over a 12-day survey period in Clark's Harbour, Nova Scotia, to evaluate the benefits of gear detection in large-scale retrieval missions. Results show that a hotspot of reported gear losses is apparent in Clark's Harbour. Of the 114 potential ALDFG contacts visually identified during gear detection, only one item was confirmed retrieved. Despite this, a large volume of ALDFG was retrieved in areas where there was no SSS coverage based on fisher's knowledge. This finding indicates retrieval efforts without the use of SSS can yield a high rate of ALDFG removal success. While gear can be located using SSS, greater grappling precision and full coverage SSS surveys is recommended at smaller geographic scales, such as sensitive benthic areas. Organizations should consider the cost of SSS surveys versus retrieval missions based on fisher's knowledge in future applications.

Keywords: American lobster; Southwest Nova Scotia; Clark's Harbour; ghost gear; ALDFG; gear detection; side scan sonar; gear retrieval missions; geospatial analysis; cost-benefit analysis; fisheries management.

Leah interned as a Ghost Gear Mapping Assistant for Coastal Action on the "Collaborative Remediation of Abandoned, Lost, And Discarded Fishing Gear (ALDFG) In Southwest Nova Scotia." In this role, she helped support the Coastal Action team by completing spatial analysis from retrieved ALDFG data, developing a side scan sonar survey alongside the Ocean Tracking Network, and creating an ArcGIS StoryMap to enter a global storytelling competition. In addition, Leah obtained a summer position as a Park Planner with the Government of Nova Scotia, Department of Lands and Forestry, Parks and Recreation Division. Here, she developed a park analysis of Martinique Beach Provincial Park to guide future management planning, participated in a Climate Adaptation Leadership Program, and assisted a team in developing a Parks Vegetation Management Strategy. Combining her experience in both roles, Leah led a collaborative pilot project between Nova Scotia Provincial Parks, Coastal Action, and Department of Fisheries and Oceans Canada to install end-of-life fishing rope barrier fencing at Lawrencetown Beach Provincial Park and Martinique Beach Provincial Park with the goal to educate, protect, and restore dune ecosystems from human impacts and keep our oceans free of marine debris.

Franchesca Krysiak

Abstract

The Bay Islands of Honduras are home to hundreds of species of fishes, and vast areas of coral reefs, seagrass, and mangroves. While protection for the area was nationally established in 2003 and in 2010; numerous anthropogenic impacts persist (e.g., fishing, coastal development, land-based pollution, and tourism) and a decline of -44 to -56% of reef fish biomass was reported by the Healthy Reefs Initiative (HRI) in 2020. Underwater visual surveys on SCUBA (n = 4,101) were used to assess reef fish biomass and community composition in shallow coral reefs (0 – 30 m), across 83 sites in the Bay Islands from 2006 to 2021. Anthropogenic impact (fisheries, coastal development, changing population and demographic, land-based pollution, tourism, and climate change) were assessed. Both the rates of declines in reef fish biomass and intensity of anthropogenic impacts differed across the four subregions of Cayos Cochinos, Guanaja, Roatan, and Utila. Our results highlight declines in total and herbivorous reef fish biomass, as well as low quantities of commercially valuable reef fish (e.g., snappers and groupers). Fish assemblages in the Bay Islands are dominated by herbivorous fishes, and contributions from targeted fish species is very low (<5%). To mitigate further losses of reef fish biomass and address ongoing human impacts, four recommendations are provided including: i) begin government-led enforcement; ii) implement size and catch restrictions and record-keeping; iii) reduce sedimentation and land-based pollution; and iv) increase capacity for local organizations. Amplified initiatives to reduce human impacts that are degrading coral reef fish communities are integral to allow the recovery of fish populations and to sustain communities in the Bay Islands for years to come.

Keywords: biomass decline, marine management, community structure, Meso-American reef, reef fishes, Western Caribbean

---

Francheska completed her summer internship with Fisheries and Oceans Canada on the Marine Planning and Conservation team at National Headquarters. She contributed to the establishment process of marine protected areas (MPAs) by interpreting and summarizing technical reports, synthesizing large amounts of information into succinct 'Fact Sheets' for each proposed MPA, and assisting with the creation of a formal strategy between Science and Policy sectors. While her internship did not link directly to her graduate project, she gained valuable work experience while being able to complete the project of her choice. She hopes to improve marine conservation policies and implement sustainable solutions suitable for both coastal communities and marine ecosystems around the world.

David Marrack

Abstract

In British Columbia, growing concerns of economics, demographics, and infrastructure are impeding the traditional marine transporters that are a lifeline to the rest of Canada. Trying to offset increased costs of operating the service is one potential method of improving resilience in the transport sector, but a combination of literature review and interviews with operators and community members shows that this may not be practical. Despite similarities to other examples of "lifeline" services, such as the Orkney Islands off the north coast of Scotland, the distances, number, and variety of communities along the coast of British Columbia pose particular challenges. Dealing with problems experienced by the isolated coastal communities will provide resilience to the transport system as a whole. This project examines the current marine transport paradigm in British Columbia and makes a number of recommendations for the development of a comprehensive coastal transport management plan. Key among these is the need to conduct a survey of the communities involved, and identify facilities that exist in communities, the lack of which is a serious concern for "visibility" when developing a management plan.

Keywords: Coastal Transport, Coastal Communities, Transport Management, Resilience, British Columbia.

David completed his internship with BC Ferries' Nautical Equipment Management Office, under the supervision of Andrew Wetmore and Captain Graeme Bergh. Over the course of the summer, David was tasked with two projects, first working on the development of an improved management system for ship equipment, and then moving to the development of a new standard of mooring procedures for the vessels. While this was not directly linked to his graduate project, the exposure to the private sector of marine transport helped develop his situational awareness, and contributed to the general knowledge needed to write his graduate project. In addition to his formal internship, David sailed as the Navigating Officer on HMCS *Whitehorse* for most of June.

Martin Ostrega

Abstract

Species that congregate in large numbers for the purpose of reproduction in spatially and temporally distinct locations can be extremely susceptible to overexploitation. Many fishes, such as bonefish (*Albula spp.)* form spawning aggregations that are intentionally targeted for harvest, as fishermen can catch the largest number of fish with the least amount of effort. Because bonefish are important to Cuban societies, environments, and the economy, they need effective fisheries management. Here I use a literature review, surveys, and interviews with Cuban fisheries scientists and fishing guides to develop recommendations for management of bonefish pre-spawning aggregations (PSAs) in Cuba. An expert elicitation process was used to revise the PSA management strategies to ensure they are feasible, achievable, and representative of local context. It is vital to link site-focused partners to actively manage and cooperatively monitor bonefish PSAs to ensure this species is conserved in Cuba and throughout the Caribbean Region. Local ecological knowledge (LEK) and the flats fishing industry in Cuba should be integrated into management to support research, monitoring, and conservation of the species. The findings of this research provide guidance for implementing management strategies for bonefish spawning events, which will have positive social, economic, and environmental implications in Cuba.

Keywords: Bonefish, Cuba, Spatial Management, Pre-spawning aggregation, Fish spawning aggregation, Migration corridors, Flats fishery

---

Martin completed his summer internship with the Bonefish and Tarpon Trust (BTT), under the supervision of Dr. Aaron Adams, who was also his Graduate Research Project supervisor. During his internship, Martin learned about the roles and responsibilities of NGOs in international fisheries research and management, which helped him for his graduate project. He mainly focussed on his graduate project work, and completed surveys with fisheries scientists in Cuba, conducted desktop research, and underwent an expert elicitation process for the research. By completing the internship with BTT, Martin learned about various case studies for managing and researching bonefish and other species in the flats fishery in the Caribbean region, which helped him apply many similar aspects to his own project.

Stephen Tiller

Abstract

Marine shipping is an indispensable sector for the Canadian economy, with projections that both the number of vessels and size of vessels will increase in coming years. Although there are effective regulations in place, traversing Canadian waterways is relatively high risk, with an abundance of uncertainties arising from inevitable tangible and intangible hazards. As such, environmental and safety risks are evident. To mitigate risk from ships and risks to ships, effective risk management processes should be implemented. There is an array of risk assessment toolboxes, guidelines, and procedures for specific regions and shipping projects in Canada. However, a transparent, cohesive, and comprehensive risk framework (RFW) for the broad Canadian marine shipping sector that can be used as a guiding structure is still lacking. This paper proposes a RFW that can be utilized by risk practitioners, policymakers, researchers, etc., and people who are not necessarily experts in the field of risk. Drawing on an integrative literature review of secondary source data as the methodology, and using ISO 31000 as a guiding foundation, a RFW is proposed. The objective is for Canadian marine shipping transits to occur with as minimal risk as possible and become a leading nation in maritime sustainability and safety. This paper provides further research opportunities for best practices and quantifiability throughout Canadian risk management processes.

Keywords: risk framework, marine shipping, Canadian waters, maritime safety, shipping hazards, risk management, transparency, comprehensiveness

---

Stephen completed his internship with Clear Seas Centre for Responsible Marine Shipping. During his internship, he assisted with the Canadian Marine Shipping Risk Forum (CMSRF), which is a Community of Practice/ongoing initiative for organizations conducting research on shipping risk. He spent a large portion of his internship working on the CMSRF inventory project; a collaborative project between numerous agencies and organizations to develop an open-ended database for risk projects and studies in Canada. Various meetings and stakeholder consultations were necessary to develop a prototype for the CMSRF inventory. Furthermore, he was tasked with addressing other everyday needs of Clear Seas. Overall, it was great experience that enhanced his understanding and interest of maritime risk, and risk management/consultancy, in which he would like to further his career in this field.