

Workshop on development of an Interactional Map of the Social-Ecological System for American Lobster (*Homarus americanus*) in the Maritimes region

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ABSTRACT

Pourfaraj, V., Parlee, C.E., Tam, J.C., and Cook, A.M. 2022. Workshop on development of an Interactional Map of the Social-Ecological System for American Lobster (*Homarus americanus*) in the Maritimes Region. Can. Tech. Rep. Fish. Aquat. Sci. 3490: v + 21 p.

A virtual workshop to develop an Interactional Map of the Social-Ecological system (IMSES) of the American lobster (*Homarus americanus*) fishery was held by DFO Maritimes on 3-4 June 2021. Participants comprised a cross-section of DFO Maritimes including DFO Science, Policy and Economics, Aquatic Ecosystems, Indigenous Relations and Partnerships (IRP) Hub, Resource Management, and Indigenous Fisheries Management as well as two graduate students from Dalhousie and Memorial Universities. The main objectives of the workshop were to identify components of the social-ecological system for lobster in its current state, decipher linkages among them and gather evidence supporting the validity of these linkages. The Canadian Fishery Research Network's (CFRN) Sustainable Fisheries Framework was used as the foundation to describe the four dimensions of sustainability and to frame discussions. A detailed Table of Evidence (ToE) showing the relationships among components of the system was produced by the end of the workshop. The ToE is being used by the DFO Blue Economy Lobster Team (BELT) to support the development of an IMSES. The resultant IMSES will be instrumental in describing the current state of the system and will help us explore the adaptability of the system when disrupted.

RÉSUMÉ

Pourfaraj, V., Parlee, C.E., Tam, J.C., and Cook, A.M. 2022. Workshop on development of an Interactional Map of the Social-Ecological System for American Lobster (*Homarus americanus*) in the Maritimes Region. Can. Tech. Rep. Fish. Aquat. Sci. 3490: v + 21 p.

Un atelier virtuel visant à élaborer une carte interactionnelle du système socio-écologique (CISSE) de la pêche du homard d'Amérique (*Homarus americanus*) a été organisé par la région des Maritimes du MPO les 3 et 4 juin 2021. Les participants constituaient un échantillon représentatif de la région des Maritimes du MPO et ceux-ci comprenaient notamment des représentants des secteurs des Sciences, des Politiques et des services économiques, des Écosystèmes aquatiques, du Centre Relations et partenariats avec les Autochtones (RPA) et de la Gestion des pêches autochtones, ainsi que deux étudiants diplômés des universités Dalhousie et Memorial. Les principaux objectifs de l'atelier étaient de déterminer les composantes du système socio-écologique du homard dans son état actuel, de déchiffrer les liens entre elles et de recueillir des preuves de la validité de ces liens. On s'est servi du Cadre pour la pêche durable du Réseau canadien de recherche sur la pêche (RCRP) comme base pour décrire les quatre dimensions de la durabilité et pour diriger les discussions. À la fin de l'atelier, on a produit un tableau de preuves détaillé montrant les relations entre les composantes du système. L'équipe de l'économie bleue du MPO qui se penche sur le homard se sert de ce tableau de preuves pour soutenir l'élaboration d'une CISSE. La CISSE qui sera produite nous aidera à explorer la capacité d'adaptation du système en cas de perturbation.

INTRODUCTION

Fisheries and Oceans Canada's (DFO) Blue Economy Lobster Team (BELT)¹ is a group of social and natural scientists working together to develop and provide advice on the sustainability of the lobster fishery. Within the current decision-making framework in DFO, science advice is developed from a peer review process conducted through the Canadian Science Advice Secretariat (CSAS) office focusing on the natural science/stock productivity perspective. At present, CSAS lacks a formal framework for the inclusion of social sciences data and analyses into the scientific peer review processes.

Part of the integration of social sciences into the advice provided to Resource Management involves understanding the current knowledge within DFO, and of Indigenous Groups, Harvesters, and Academics about American lobster (*Homarus americanus*). This knowledge can then inform the development of a conceptual map that can be used as a communication and analytical tool for sharing and providing scientific advice. Gathering such knowledge is best done through direct engagement, in this case, in the form of a workshop and the development of conceptual maps where participants can interact, converse, and collaborate.

Conceptual maps are network diagrams that represent relationships between related concepts or ideas. They have been used in ocean management for a variety of reasons including resource management (Reum et al. 2021), conservation (Melbourne-Thomas et al. 2013), and ecosystem assessments (DePiper et al. 2017). They allow for the inclusion of different types of data into a dynamic model, including qualitative information such as social science data (job satisfaction, well-being, sustainable communities, etc.), Indigenous knowledge (oral histories, traditional knowledge), as well as quantitative ecosystem and biological information. Conceptual maps are useful engagement tools to present and record input from rightsholders, stakeholders, subject matter experts, and the public, as they lay out the complexity and interconnectedness of the system. Here, we present the first meeting of DFO representatives/parties on the development of a conceptual map for the lobster fishery in the Maritimes Region of DFO.

This meeting was designed to help create a baseline for engagement both internally within DFO and externally with relevant user groups for transdisciplinary projects regarding specific fisheries, in this case, lobster. We developed this meeting as a two-day process to elicit expert opinion within the department on the components to be included in a conceptual map of the social-ecological System of the American lobster (*Homarus americanus*) in the Maritimes Region, called the Interactional Map of the Social-Ecological System (IMSES). Day 1 involved a presentation of the objectives for creating the IMSES and brainstorming to identify components that are relevant to the current state of the lobster fishery and should be included in the IMSES. Day 2 focused on developing a Table of Evidence (ToE). The ToE shows the relationships among

¹ The Blue Economy Lobster Team is hired under the Results Reserve Fund. At the time of the IMSES workshop, the BELT was comprised of Vahab Pourfaraj and Courtenay E. Parlee.

components of the system and contains qualitative and quantitative evidence for including the model components into the IMSES.

Day 1:

The workshop was facilitated by Tana Worcester and Catalina Gomez. It began with a land acknowledgement recognizing that the workshop was taking place on the traditional and unceded territory of the Mi'kmaw Peoples, a reflection on the impact of colonization on Indigenous Peoples in Canada, introductions, and some organizational statements. Participants (Appendix I) represented DFO Science, Policy and Economics, Aquatic Ecosystems, Indigenous Relations and Partnerships (IRP) Hub, Resource Management, Indigenous Fisheries Management as well as Dalhousie and Memorial Universities. Participants were asked to complete a pre-workshop survey to gather perspectives about the relative importance of ecological, economic, management and social-cultural dimensions to achieve a sustainable lobster Fishery in Maritimes Region. Tracy MacKeracher from Dalhousie University (Halifax, Nova Scotia) and Claudia Friedetzky from Memorial University (St Johns, Newfoundland) participated as rapporteurs of the workshop, and Vahab Pourfaraj (DFO Science) created the conceptual map during the meeting. The workshop agenda is presented in Appendix II.

PRESENTATION

Prior to the mapping exercise, a presentation was given in order to provide context and scope for the IMSES for the Maritimes Region lobster fishery.

Title: Interactional Map of the Social-Ecological System for the Maritimes Region Lobster Fishery

Presenters: Courtenay Parlee and Adam Cook

Presentation began with land acknowledgment and encouraging participants to reflect on traditional Indigenous territory. The following topics were then presented:

Overview of the process

An overview of the process began with a description of the mechanism for scoping and identifying the links among the various components of the fishery to develop a map of the system in its current state. The resultant interactional map will be instrumental in developing an Ecosystem Based Management (EBM) approach for the lobster fishery, as we will be able to visualize the complex system dynamics, identify gaps in our understanding and guide future research.

To facilitate the discussion based on a full spectrum of components that relate to the sustainability of a fishery, the Canadian Fishery Research Network's (CFRN) Sustainable Fisheries Framework (Stephenson et al. 2018; Foley et al. 2020) was introduced. The CFRN

sustainable Fisheries Framework recognizes four pillars (Table 1) for a sustainable fishery and offers a list of objectives under each pillar (hereafter, these pillars are referred to as dimensions). These objectives are derived from legislation (e.g., *Fisheries Act*, *Oceans Act*, *Species at Risk Act*), policy, and international agreements (e.g. Paris Agreement and Aichi Biodiversity Targets). The framework offers a more balanced distribution of ecological, economic, social-cultural, and institutional/governance elements under each dimension compared to alternative management frameworks and can be used in fisheries management when applying a social-ecological approach. Social-ecological systems reflect the highly interconnected relationship among subsystems (e.g. users, governance regimes, natural resource etc.) which produce goods and services (Ostrom 2009). The CFRN Framework also offers quantitative and qualitative performance metrics that can be used to compare different scenarios. Table 1 integrates the CFRN Framework with mechanisms from a Theory of Access (Ribot & Peluso 2003; Parlee et al 2021.) This table was introduced to workshop participants in order to draw their attention to the broad spectrum of factors that can make up a social-ecological system and influence the ability to achieve objectives identified in the CFRN Framework.

Table 1. Four dimensions for a sustainable fishery and mechanisms/factors that influence access to, and benefits from the fishery (adapted from Parlee et al. 2021).

Dimension objectives	Mechanism
Ecological Dimension e.g., Productivity & trophic structure, Biodiversity, Habitat & Ecosystem Integrity	<u>Biophysical/Environmental</u> : Climate changes, shifts in distribution & abundance, spatial proximity (intertidal, offshore, territorial waters, exclusive economic zones, high seas), tides, migratory versus fugitive species
Economic Dimension e.g., Economic/financial value, viability & prosperity, distribution of access & benefits, regional economic benefit, sustainable livelihoods	<u>Technology</u> : vessel, gear maps, fish finding tools, electronic navigation, fish aggregating devices, fish processing equipment and facilities, mooring, cold storage, monitoring tools, certifications, transportation <u>Capital</u> : credit, loans, price fixing, inter-locking credit arrangements, research grants, banks, subsidies, surplus capital, incomes, financial assets, expenditure <u>Markets</u> : sales, supply chains, consumers, middlemen, wholesalers, retailers, transporters, volatility of fish prices, monopoly, competition, exclusionary practices, collusion, competition, dept relations, gender norms, proximity of market, value added processing and branding, food safety <u>Labour</u> : crew share, regular wages, subsidies, social relations, credit/capital arrangements, pay advances, loans kinship ties, occupational diversity and/or multiplicity, recruitment

Management Dimension (Institutional/Governance) Dimension e.g., Legal obligations including to indigenous Peoples, Good governance structure, effective decision-making	<u>Knowledge:</u> Traditional or local ecological knowledge, intellectual property, skills & expertise (legal, experiential, scientific, technical), education, cultural taboos and practices, ethics, training, qualifications <u>Management:</u> Legislation, regulation, permits, licenses, quota, ownership, title, deeds, communal access, customary rights and/or recognition, treaty rights
Social-Cultural Dimension e.g., Sustainable Communities, Health & Well-being, Ethical Fisheries	<u>Access to authority:</u> Lobbying, allocation of labour opportunities, allocation of use rights, Favours, trust, participation <u>Access to social identity:</u> age, gender, ethnicity, status, lineage, profession, place of birth, historical claim, heritage, attachment, occupational connections and importance, religion, common education <u>Access to social relations:</u> social ties (dependent/independent), trust, loyalty, friendship, kinship, reciprocity, patronage, relations of production, communication, conflict, gender relations, debt relations, exchange relations, coercion, bribes.

What is Ecosystem Based Management?

DFO recognizes the importance of taking an EBM approach (e.g. Daly et al. 2020). While there is a long list of definitions for EBM (see McLeod et al. 2005), that of Long et al. (2015) was presented as it encompassed the core concepts for the development of our conceptual map:

Ecosystem-based management is an interdisciplinary approach that balances ecological, social and governance principles at appropriate temporal and spatial scales in a distinct geographical area to achieve sustainable resource use. Scientific knowledge and effective monitoring are used to acknowledge the connections, integrity and biodiversity within an ecosystem along with its dynamic nature and associated uncertainties. EBM recognizes coupled social-ecological systems with stakeholders involved in an integrated and adaptive management process where decisions reflect societal choice.

The CFRN Framework is being used to guide the development of the Maritimes Region EBM Framework (Daly et al 2020). The introduction and discussion of the CFRN Framework, and EBM were not meant to be prescriptive but to elicit dialogue on the four dimensions of sustainability as they relate to the lobster fishery. The BELT is undertaking several initiatives that will contribute to the development and implementation of the EBM framework with the lobster Blue Economy project as a case study. This workshop is one initiative that served as a starting point in the development of an IMSES for the lobster fishery in the Maritimes region.

Why develop a Map of the social-ecological System in support of Ecosystem Based Management?

Recent changes to the *Fisheries Act R.S.C., 1985, c. F-14* through Bill C-68 were outlined including: Section 2.5 considerations for decision-making, Section 6.1 measures to maintain fish stocks and limit reference points, and Section 6.2 plan to rebuild. These changes placed greater prominence on new environmental conditions in addition to social, cultural, and economic considerations. Further changes statements that the Minister ‘may’ and ‘shall’ put greater weight on the legal requirement to implement EBM measures for Canadian Fisheries. In order to respond to these new considerations, data, methods and methodologies from both social and natural sciences are required.

There are aspirations to hold three additional workshops separately involving Indigenous groups, harvester groups, and academics to collect further data and knowledge to enhance our understanding of the social-ecological system. Based on Klein et al.’s definition (as cited in Haapasaari et al. 2012) this type of work is transdisciplinary in nature as it includes scientific and experiential knowledge. Collectively, these workshops can capture broader perspectives and information which is crucial to fill gaps in our understanding of the system. This will also be an opportunity to engage with rightsholders and stakeholders. Any subsequent conceptual maps will be brought together into one IMSES. The final map will be a visual representation of a system which communicates the core components of the Maritimes region lobster fishery, their linkages and the evidence which supports those linkages. It will establish a comprehensive understanding of what the lobster fishery looks like in its current state; essentially creating a baseline for the fishery which has many applications to support an EBM approach including:

1. Identifying gaps in information and data required to understand and assess objectives for the lobster fishery (Melbourne-Thomas et al. 2013).
2. Exploring trade-offs among different objectives and decision-making scenarios (Voss et al. 2014; Pittman et al. 2020).
3. Directing and guiding social and natural science research that can support EBM (DePiper et al. 2017) of the Maritimes Region lobster fishery.
4. Examining major components that influence and link to objectives of EBM and how important those influences are to the vulnerability, adaptability, and sustainability of the lobster fishery (Holsman et al. 2017).
5. Providing proactive scientific advice on the social-ecological system (which is the ultimate objective of this workshop).

Lenses of research analysis

The presentation ended with an outline of the lenses being used by the BELT. It is important to highlight that a descriptive lens was used during the workshop to capture the current state of the lobster fishery.

Descriptive: The current state of the social-ecological system can provide details on how adaptable it is presently. Descriptive analyses are comprised of the conceptual map of the system, stock assessments, and social science research which will be conducted through interviews and focus groups.

However, there are various other initiatives that are undertaken by the BELT that fall under other lenses.

Historical: How the social-ecological system has evolved over time. This is being addressed through a literature review of social science research conducted on the lobster fishery, stock productivity changes and the development of a transdisciplinary timeline of the lobster fishery.

Normative: Aspiration for the social-ecological system or what relevant stakeholders want to work towards. These questions will be examined through interviews and focus groups, and management objectives articulated in, for example, the integrated fisheries management plan.

Preparedness: Preparation for what could happen if the social-ecological system were to be disrupted in some way (e.g., by impacts of climate change). This lens will be studied through quantitative and qualitative modeling approaches (using hindcasting and forecasting; see below) to understand the ability of the system to adapt, and trade-offs that may be made among the ecological, social-cultural, economic and institutional dimensions (see Table 1) and management objectives.

These lenses of research analysis contribute to both the hindcasting and forecasting of any fishery. Hindcasting is the collection and analysis of historical data to develop a more comprehensive understanding of a social-ecological system. It is through hindcasting that data can be collected to improve forecasting. Forecasting is a participatory approach and structured process that equip managers with a variety of scenarios that are realistic and cohesive. This approach often disagrees with the assumption that future will follow a 'business as usual trajectory' (Hobday et al. 2020). Forecasting exercises for the lobster fishery include: a) incorporating lobster fishery objectives and indicators into various assessments, b) management approaches to develop science advice, and c) workshopping scenarios and trade-offs through various models and frameworks to assess the short and long-term viability and adaptability of the Maritimes lobster fishery.

WORKSHOP WORKFLOW

Catalina Gomez introduced the workshop website (<https://sites.google.com/view/imses/home>) and the type of information that can be accessed on the website. The website contains background information about why and how the workshop was held, as well as the agenda, presentations, notes from breakout groups and data that were gathered during the workshop. Catalina also presented the workflow of the workshop, including a brief explanation of each step and expected outcomes.

Identifying the dimensions of the lobster fishery

To provide context for a discussion on the development of the IMSES, the attendees were reminded of the four pillars of sustainable fisheries developed by the CFRN (Stephenson et al. 2018). The CFRN Framework and A Theory of Access were used to facilitate discussion through the workshop as it provides a broad spectrum of objectives across all four dimensions (See Table 1 for more details).

Identifying components for each dimension

To identify model components of each dimension of sustainability two methods were used. The first method was an online survey conducted before the workshop (See Appendix III) where participants were asked to rate the importance of each dimension and identify the top 10 components that have an influence on or are influenced by the lobster fishery. They were also asked to categorize each component under one of the four dimensions. The second method was a brainstorming exercise to get participants thinking about different dimensions of the system and the respective components (Appendix IV). Components under each dimension were compiled to develop a master list of components (Appendix V). The master list was reviewed and validated by participants to address potential gaps and duplication of information.

Linking components

A Table of Evidence (ToE) was produced based on the master list of components. Participants were organized into three break-out groups and asked to establish linkage between components and to document them in the ToE (for example, Table 2) that ultimately supports the interactional map. Groups were advised to assign a note taker and a person to report back to the plenary. They were encouraged to provide as much evidence as possible (to support the linkages drawn) whether it was citing scientific sources, news from the media or knowledge of any sort. This way, each group focused on areas of interest and expertise.

Table 2. Format of Table of Evidence (ToE) used to document the linkage between components.

Components and linkages: please use master list of components available here	Evidence text	Citations or knowledge (alphabetical order)
Temperature -> lobster habitat suitability	Absolute and percent change in projected habitat suitability of lobster will increase with projected ocean temperature changes from two future scenarios (Greenan et al. 2019)	Greenan, B. J. W., Shackell, N. L., Ferguson, K., Greyson, P., Cogswell, A., Brickman, D., Wang, Z., Cook, A., Brennan, C. E., & Saba, V. S. (2019). Climate Change Vulnerability of American Lobster Fishing Communities in Atlantic Canada. <i>Frontiers in Marine Science</i> , 6(September), 1–18. https://doi.org/10.3389/fmars.2019.00579

Mapping components and linkages

After the first break-out session, participants discussed the identified linkages and the supporting evidence. Using MindManager® mapping software and based on directions received from the breakout groups, Vahab Pourfaraj started developing a conceptual map by linking components and attaching relevant tags. The resultant map (IMSES version 1.0) at the end of first day was used as a template to invoke ideas and facilitate the discussion about various components of the lobster fishery for the rest of the workshop.

Day 2:

The second day started with Tana Worcester reflecting on Day 1, presenting the workflow for day 2, and showing the draft IMSES v 1.0 from Day 1. It was also discussed whether components of the lobster fishery need to be generic or specific and it was emphasized that the map should focus on what the fishery looks like in its current state. To ensure that all elements of the sustainability framework were included, participants were reminded of the four dimensions. For the sake of time and to avoid lengthy discussions about distantly related topics, groups were encouraged to focus on topics such as future climate change, increased fishing effort, occupational pluralism, the *Marine Mammal Protection Act* of the United States, community culture, and market dynamics. It was also emphasized that participants should consider vulnerabilities of the fishery when thinking about components and their linkages.

There were two more break-out sessions in which participants continued to discuss the relationship among components of the fishery and added evidence to support linkages.

WORKSHOP WRAP-UP AND NEXT STEPS

At the end of the workshop, participants were given an opportunity to fill out another survey. The post-workshop survey was similar to the pre-workshop survey. The only exception was that the post-workshop survey included a few additional questions about different aspects of the workshop itself (e.g., tools used, timing, workflow, etc.; see Lessons Learned, below). Comparing results of the two surveys suggested that while the ecological dimension received highest scores regarding its importance in both surveys (see Appendix III and Appendix VI), all dimensions became more important from participant's perspective after the workshop. It should be noted that most participants were experts in natural science thus, much of the workshop was spent identifying linkages among ecological components. However, participants also spent a considerable amount of time talking about other dimensions of the system. The abundance of information gathered on economic, management and social components of the system is an indication of their importance and highlights the need for increasing capacity and including more experts from those disciplines in similar processes.

The final product of the workshop was a very detailed ToE that identifies different components of the social-ecological system in its current state. Participants also provided a substantial amount of scientific, empirical and experiential evidence that has been refined and organized after the workshop and will be used to support linkages among components on the interactional map of the system that is being developed.

Since the workshop, Jill Campbell-Miller and Jamie Tam have joined the BELT. The team is now working to refine the interactional map in a way that can be used for exploring future projections as well as an engagement tool.

LESSONS LEARNED

As mentioned, the BELT anticipates hosting more workshops of this type to engage with Indigenous Peoples, stakeholders and academics. Developing this report has helped us to reassess the engagement and interactional model process and to gain a better perspective of the operational limitations and obstacles that impact participatory processes. The following is a list of what we learned through this process, and is applicable to similar engagement processes:

1. We could not achieve what we did without our facilitator and rapporteurs. It cannot be emphasized enough how crucial it is to have a facilitator(s) to manage time and priorities, and to direct discussion in a meaningful way. Facilitators can use a suite of tools and strategies to encourage people to engage in discussions and to facilitate contributions. Furthermore, having rapporteurs record the workshop proceedings will ensure that the knowledge gained and lessons learned are documented. Detailed documentation is critical for next steps and as hybrid meetings are becoming more

common, collaborative note-taking would be a useful tool in creating such documentation.

2. We found it useful to divide participants into smaller (breakout) groups as it enabled open discussion and provided an opportunity for collaboration. However, plans should be in place for documenting discussions in each group.
3. This type of engagement process is categorized as transdisciplinary, and our experience suggests that in such settings attention should be paid to ensuring an even representation of disciplines. There should be a balanced number of social and natural scientists, economists, and managers when the full spectrum of sustainability is being discussed.
4. There was a high degree of variation in terms of how much people/groups chose to engage in discussion. It is ideal to engage people in discussion based on their knowledge and comfort level as much as possible. The role of facilitators is crucial in the sense that they can direct the discussion towards the objectives of the meeting, suggest topics of interest, and conclude lengthy discussions when they deem it appropriate.
5. Organizers need to be mindful of the time and effort requested from the participants and make sure that the engagement process is beneficial for all parties. This is especially important when engaging with people external to the department. We will keep this in mind when holding workshops in the future with right holders and stakeholders to foster an engagement process in which all participants get a chance to share ideas and raise concerns in an inclusive and respectful setting.
6. People need to be given time to prepare for workshops of this nature where a plethora of topics are discussed. We recommend distributing relevant information (agenda, presentation files, data resources) ahead of time to make sure people get enough time to prepare for the meeting. Receiving too much information just prior to the meeting can be overwhelming and can lead to the exclusion of some from discussions.
7. Having a website for the workshop helped us to use it as a placeholder and for keeping track of processes and information. There is also value for participants to refer to the website during and after the workshop. If developed before the meeting, organizers can point participants to the website for all necessary information about the process, keeping everything organized in one easy-to-find location.
8. Lengthy online meetings can be challenging to navigate and facilitate. It is best to schedule a shorter workshop over the period of a couple of days rather than compressing it in one day. Additionally, it is important to schedule enough time for health breaks as it helps participants stay energized and engaged.
9. While we used Mindmanager software for this workshop, there are other free software options that are available to help facilitate the development of an interactional map such as mental modeler (<https://www.mentalmodeler.com/>) and Kumu (<https://kumu.io/>) among other options (ICES 2022). It is important to remain current and conscious of the available tools to help facilitate productive workshops.

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APPENDICES

APPENDIX I: Attendee list

Name	Affiliation
Armsworthy, Shelley	DFO Maritimes / Population Ecology Division
Bennett, Charlene	DFO Maritimes / Employment Equity, Diversity and Inclusion
Bundy, Alida	DFO Maritimes/ Ocean Ecosystem Science Division
Campbell, Mike	DFO Maritimes/Policy and Economics
Cook, Adam	DFO Maritimes / Population Ecology Division
Denton, Cheryl	DFO Maritimes / Population Ecology Division
Docherty, Verna	DFO Maritimes/ Resource Management
Element, Geraint	DFO Maritimes / Population Ecology Division
Friedetzky, Claudia	Graduate student at Memorial University of Newfoundland
Gomez, Catalina	DFO Maritimes / Data Management
Gurney-Smith, Helen	DFO Maritimes / Resource Management
Howe, Tom	DFO Maritimes / Indigenous affairs
Howse, Victoria	DFO Maritimes / Population Ecology Division
MacKay, Glen	DFO Maritimes / Fisheries Management Officer
MacKeracher, Tracy	PhD Candidate at Dalhousie University
Parlee, Courtenay	DFO Maritimes / Population Ecology Division
Pitre-Arsenault, Sophie	DFO Maritimes/Indigenous Relations and Partnerships hub
Pourfaraj, Vahab	DFO Maritimes / Population Ecology Division
Prall-Dillman, Sheila	DFO Maritimes/ Policy and Economics
Quigley, Sara	DFO Maritimes/Resource Management and Licensing
Stanley, Ryan	DFO Maritimes/ Coastal Ecosystem Science Division
Stansfield, Kaitlyn	DFO Maritimes/ Policy Analyst
Stephenson, Rob	DFO Maritimes/ Population Ecology Division
Wainwright, Hillary	DFO Maritimes/ Fisheries Management Officer
Worcester, Tana	DFO Maritimes/ Executive Advisor
Zisseron, Ben	DFO Maritimes / Population Ecology Division

APPENDIX II: Workshop agenda

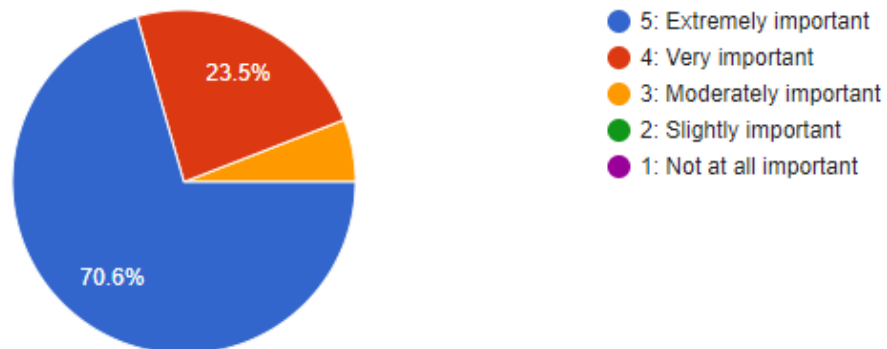
Thursday, June 3, 2021		
Time	Item	
9:00 - 9:35 am	Welcome! Round table and operating principles	Tana Worcester
9:35 - 10:00 am	Goals and scope of this event	Adam Cook & Courtenay Parlee
10:00 - 10:15 am	Google site and Workshop workflow	Adam Cook & Catalina Gomez
10:15 - 10:20 am	Jamboard ! Introducing the concept, and Q&A	Tana Worcester
10:20 - 10:40 am	Break	
10:40 - 12:00 am	Jamboard conversation: Workshop participants to identify components and tags for the interactive system	Conversation facilitated by Tana Worcester
12:00 - 12:45 m	Lunch break	Workshop organizers to develop tables with all components and tags identified by participants; additional volunteers are welcome!
12:45 - 1:00 pm	Silent Meeting: Participants to review master list of components to validate information, identify potential gaps or duplication of information	
1:00 - 2:20 pm	Break-out (Session 1): Tables of evidence in support of the interactional map - Introducing the concept, Q&A. The goal of the break-out sessions for participants to identify linkages between components and document them in the tables of evidence .	Courtenay Parlee & Adam Cook Find your break-out group here .
2:20 - 2:30 pm	Plenary	
2:30 - 2:45 pm	Break!	
2:45 - 3:30 pm	Plenary: Break-out group to report back to start building the Interactional Map of the Social-Ecological System (IMSES)	Tana Worcester & Vahab Pourfaraj

3:30 pm	Adjourn	
Friday, June 4, 2021		
9:00 - 9:30 am	Welcome! Review Day 1, Workflow for Day 2 Interactional map of the Social-Ecological system v 1.0.	Tana Worcester, Adam Cook, Courtenay Parlee & Vahab Pourfaraj
9:50 - 10:45 am	Break-out (Session 2): The goal of the break-out sessions is for participants to identify linkages between components and document them in the tables of evidence .	Select your break-out group here .
10:45 - 11:00 am	Break	
11:00 - 12:15 m	Plenary: Break-out group leads to report back to continue to build the Interactional Map of the Social-Ecological System (IMSES)	
12:15 - 1:00 pm	Lunch break	
1:00 - 2:15 pm	Break-out (Session 3): The goal of the break-out sessions is for participants to identify linkages between components and document them in the tables of evidence . <ul style="list-style-type: none"> • Marine Mammal Protection Act (marine mammals) and bycatch more generally • Community Culture and Market Dynamics 	Select your break-out group here . Two break-out groups (ecological & socio-economic): Please consider all the elements of the sustainability framework!
2:15 - 2:30 pm	Break	
2:30 - 3:15 pm	Plenary: Break-out group to report back to continue to build the Interactional Map of the Social-Ecological System (IMSES) Wrap- Up Discuss Next Steps	
3:30 - 3:35 pm	Silent meeting: Participants to fill-in final survey https://forms.gle/uu3kwMjqrZc8Ywoq6	

APPENDIX III: Results of the pre-workshop survey

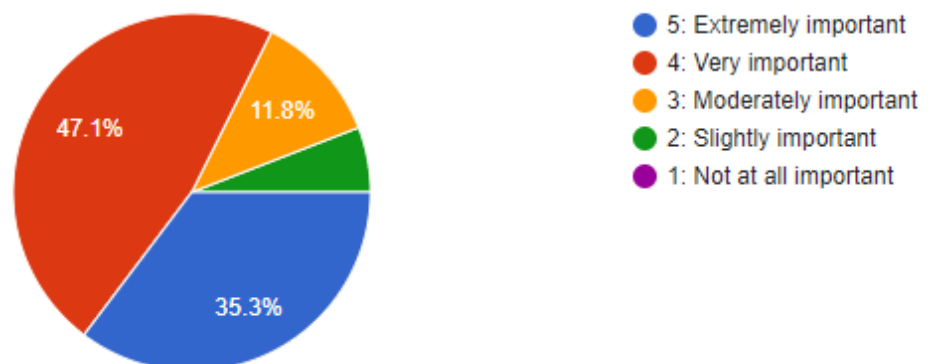
Based on your perspective, what is the relative importance of the ECOLOGICAL dimension to achieve a sustainable Maritimes Region Lobster Fishery? [ECOLOGICAL: Productivity & Trophic Structure, Biodiversity, Habitat & Ecosystem Integrity]

17 responses



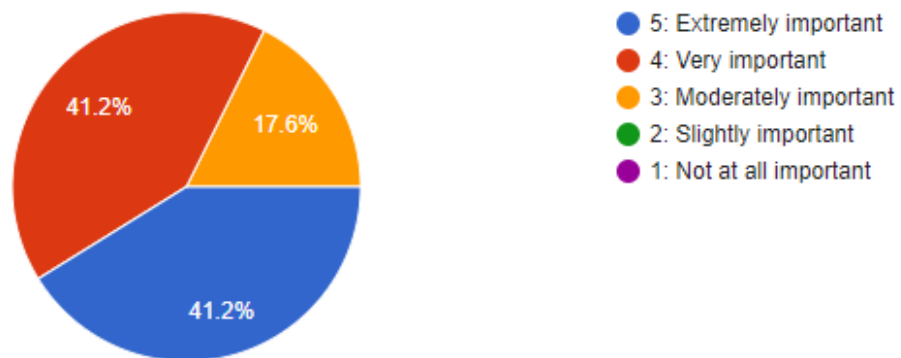
Based on your perspective, what is the relative importance of the ECONOMIC dimension to achieve a sustainable Maritimes Region Lobster Fishery? [e.g. Economic/financial value, viability & prosperity, distribution of access & benefits, regional economic benefit, sustainable livelihoods]

17 responses



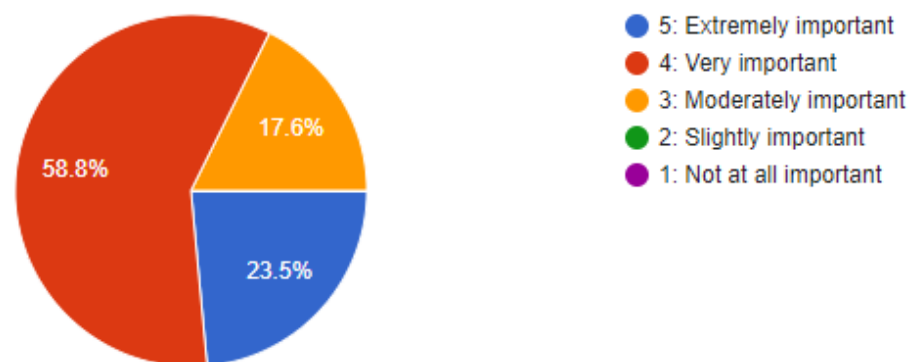
Based on your perspective, what is the relative importance of the MANAGEMENT (INSTITUTIONAL/GOVERNANCE) dimension to achieve a sustainable Maritimes Region Lobster Fishery? [e.g. Legal Obligations including to Indigenous Peoples, good governance structure, effective decision-making]

17 responses

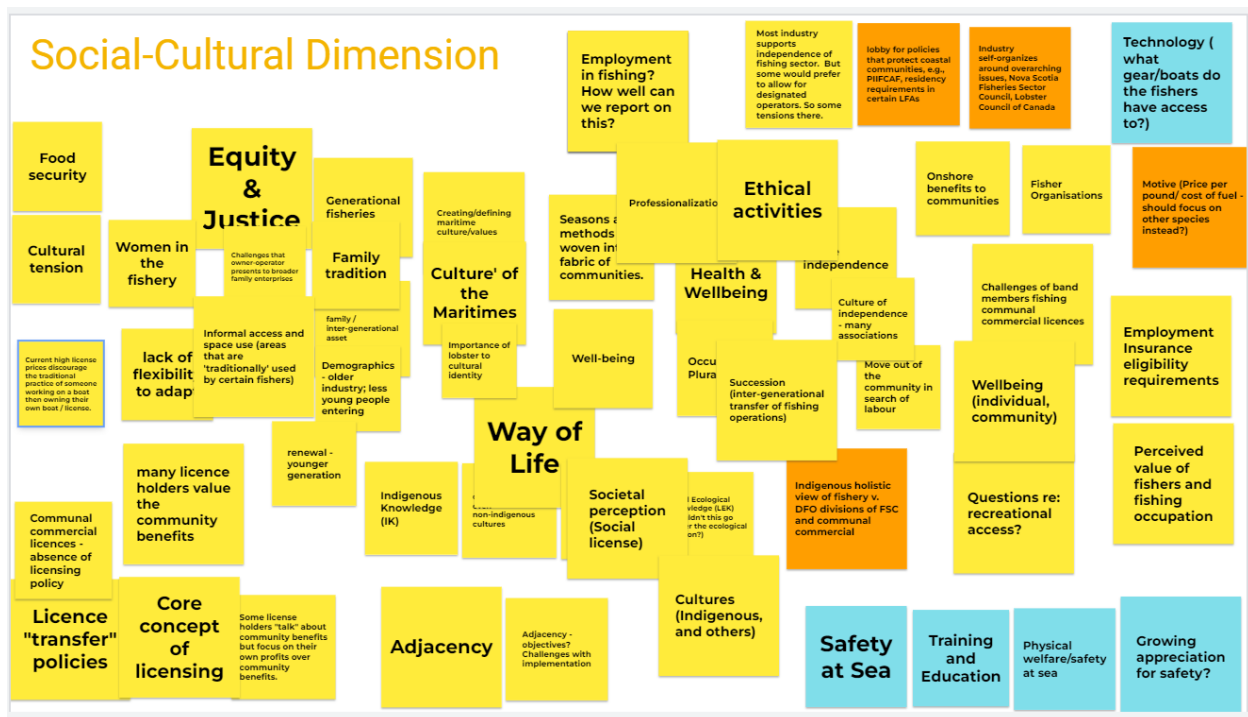


Based on your perspective, what is the relative importance of the SOCIAL-CULTURAL dimension to achieve a sustainable Maritimes Region Lobster Fishery? [e.g. Sustainable Communities, Health and Well-being, Ethical Fisheries]

17 responses



APPENDIX IV: Brainstorming exercise



APPENDIX V: Master list of components

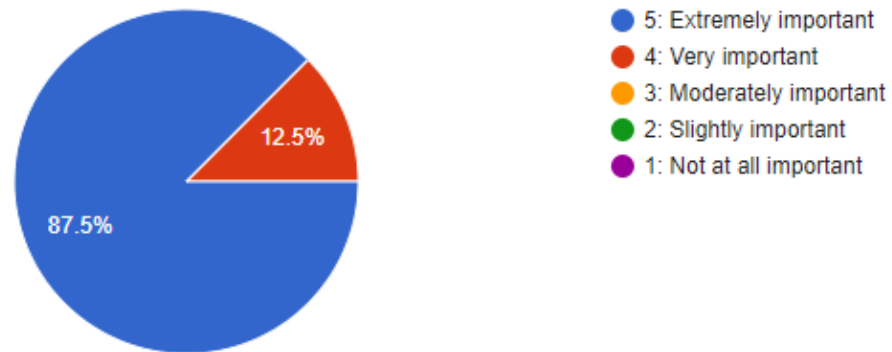
Dimension	Components
Ecological	Impacts of fishing, Fishing mortality, size-at-maturity, Lobster distribution, Lobster habitat, Lobster habitat suitability, Lobster abundance (adults), Lobster abundance (juveniles), Lobster egg-bearing females, Lobster larvae, Larval transport, Lobster population resilience, Lobster population productivity, Lobster life-history stages, Lobster population genetics, Lobster adaptive variation, Lobster migratory patterns (adults), Lobster migratory patterns (juveniles), Lobster fecundity, Lobster moulting cycle, Lobster recruitment, Lobster larval transport, shell disease, Lobster phenology, Lobster population size, Predators, Prey, Jonah crab abundance and distribution, Rock crab abundance and distribution, Sculpins, cunner, other groundfish (cusk, cod) abundance and distribution, Calanus abundance and distribution, Climate change, Ecosystem uncertainty, Regime shift, Storm events, Heatwaves, Bottom temperature, Sensitive benthic areas, pH, Currents, Pollution, Localized over-depletion, Right whale migration patterns, Right whale entanglement, Right whales abundance, Weather patterns and Decadal fluctuations
Economic	Market access, Exports, Live markets, Season timing influences on markets, Impacts on processors of right whale closures - delays/timing for markets, Costs of regulatory measures, Strength of US\$ / foreign currencies, Fleet

	<p>viability, Price of lobster enterprises, Access to capital to purchase licenses, Fuel cost, Income/Prosperity, Over capitalization, Technological advancements (supported/initiated by fishers/the fishery), Vessel technology, Barriers/options for financing, Crew shares, Single species reliance versus portfolios, Partnerships, Occupational Pluralism, Employment Insurance, Onshore benefits to communities, Direct prosperity and the multitude of directions of financial dispersion; Distribution of access and benefits, Prices - variability impacts</p> <p>License stacking, Concentration of licenses, Controlling agreements, Generational fisheries, Demographics, Infrastructure, Resilience, Employment/Livelihoods</p>
Management	<p>Governance regime, Regulations, Traps, V-notching, Access through Rights, Legal obligations to First Nations, Moderate Livelihood, FSC</p> <p>Access through privilege, Owner operator policy, Limited entry licensing, License transfer policies, License categories, Communal commercial licenses - absence of licensing policy, Inertia/inflexibility of longstanding management measures, Fisheries Act and regulations, Lobster Fishing Areas (LFAs), Conservation measures, IFMP, Transboundary governance, SARA issues (e.g. Right whale avoidance), MPAs - conservation areas, Compliance monitoring and enforcement activities, Traceability (ex. boat to plate initiative; ThisFish), Free trade agreements, Indigenous participation and concerns, Fisher organizations, Ministerial discretion, Conflict Resolution, Political pressure and leverage, Stock assessment process, Collaborative science and governance, Accountability, Transparency, Other fisheries (season overlap/gear conflict), Illegal fishing/black market</p>
Social-Cultural	<p>Community geography (placement of fishing communities), History (what was done in fishery and why), Socio-cultural importance for coastal communities, Sustainable communities, Fishing Practices (and changes in), Way of life; Culture of supporting small scale, local fisheries among fishing communities, Specialization, Lack of ability to adaptability, Creating/defining maritime culture (change from historically low-value to its current high-valued), Development and stability, Community well-being and health, Independence among harvesters, Importance of lobster to cultural identity, Conservation ethos among harvesters, Education level of fishermen and training, Youth education, Tension, Perceived value of fishers and the fishery as an occupation, Equity & Justice, Consumption and celebration rituals (Including indigenous and non-indigenous), Fish as food (Rather than commodity), Food Security, Women in the fishery, Indigenous holistic view of fishery v. DFO, Traditional information/Knowledge, Indigenous Knowledge (IK)</p>

APPENDIX VI: Results of the post-workshop survey

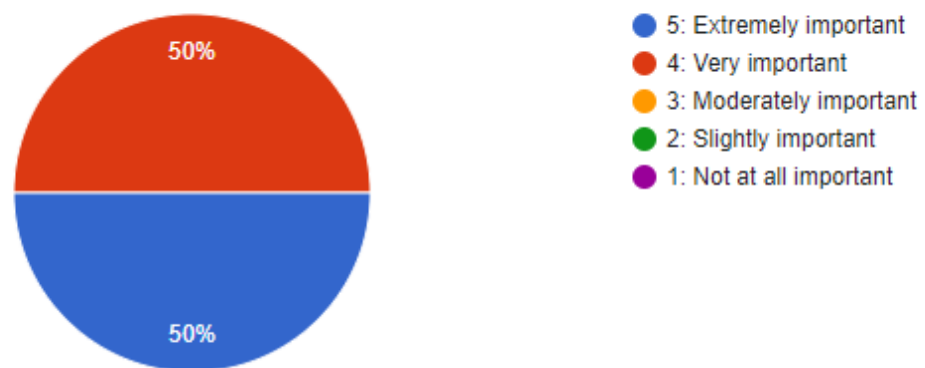
Based on your perspective, what is the relative importance of the ECOLOGICAL dimension to achieve a sustainable Maritimes Region Lobster Fishery? [ECOLOGICAL: Productivity & Trophic Structure, Biodiversity, Habitat & Ecosystem Integrity]

8 responses



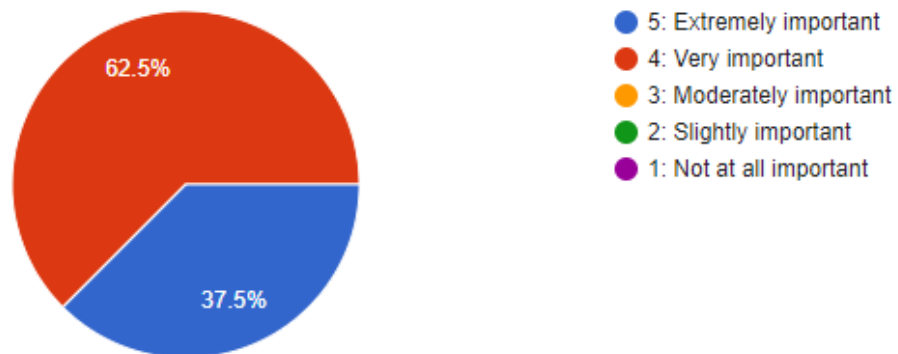
Based on your perspective, what is the relative importance of the ECONOMIC dimension to achieve a sustainable Maritimes Region Lobster Fishery? [e.g. Economic/financial value, viability & prosperity, distribution of access & benefits, regional economic benefit, sustainable livelihoods]

8 responses



Based on your perspective, what is the relative importance of the MANAGEMENT (INSTITUTIONAL/GOVERNANCE) dimension to achieve a sustainable Maritimes Region Lobster Fishery? [e.g. Legal Obligations including to Indigenous Peoples, good governance structure, effective decision-making]

8 responses



Based on your perspective, what is the relative importance of the SOCIAL-CULTURAL dimension to achieve a sustainable Maritimes Region Lobster Fishery? [e.g. Sustainable Communities, Health and Well-being, Ethical Fisheries]

8 responses

