

# WORKING GROUP ON THE NORTHWEST ATLANTIC REGIONAL SEA (WGNARS)

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# ICES Scientific Reports

Volume 1 | Issue 82

## WORKING GROUP ON THE NORTHWEST ATLANTIC REGIONAL SEA (WGNARS)

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## i Executive summary

The Working Group on the Northwest Atlantic Regional Sea (WGNARS) aims to develop the Integrated Ecosystem Assessment (IEA) capacity in the Northwest Atlantic region to support ecosystem approaches to science and management. IEAs are an iterative process that incorporate all aspects of an ecosystem, including humans, during the decision-making process to better address trade-offs within and between sectors. The working group has developed a process for assessing and communicating indicators that has been incorporated into the State of the Ecosystem reports produced annually in the United States. The same suite of indicators have been used in an ecological risk assessment of the Mid-Atlantic Bight for the Mid-Atlantic Fisheries Management Council. The working group continues to develop alternative models that represent the marine ecology and human systems at multiple scales. The working group's annual meeting highlighted the work that has been accomplished through an open-science symposium that addressed the usefulness of the IEA approach as well as what needs to be done to move forward with an ecosystem approach to management. In the coming years, the working group will continue to focus on developing the capacity for IEAs within the United States and Canada. Emphasis will be placed on utilizing the advantages of open science principles to gain efficiency in product development as management requests are often faster than scientific processes. The working group will continue to emphasize the value of incorporating human dimensions and improving communication. The main goal will be to expand the scope of IEAs beyond fisheries and include another sector such as wind energy.

## ii Expert group information

<b>Expert group name</b>	Working Group on the Northwest Atlantic Regional Sea (WGNARS)
<b>Expert group cycle</b>	Multiannual fixed term
<b>Year cycle started</b>	2017
<b>Reporting year in cycle</b>	3/3
<b>Chair(s)</b>	Robert Gregory, Canada
	Sean Lucey, USA
<b>Meeting venue(s) and dates</b>	6-10 March 2017, Dartmouth, NS, Canada (18 participants)
	5-9 March 2018, Falmouth, MA, USA (22 participants)
	29 April – 3 May 2019, , Dartmouth, NS, Canada (23 participants)

### iii Term of reference

Term of reference	Addressed in this report
a. Develop the scientific support for an integrated assessment of the northwest Atlantic region to support ecosystem approaches to science and management. Compile and provide guidance on best practices for each step of integrated ecosystem assessment.	y
b. Adopt process for evaluating current suite of indicators and assess their ability to provide proactive management advice.	Y
c. Develop process for distilling information for management use.	Y
d. Assess system productivity under shifting oceanographic processes and improve integration into IEA products.	Y
e. Evaluate approaches to integrating multi-spatial scale models into integrated management advice.	Y
f. Evaluate ecosystem trade-offs using a range of management strategy evaluation (MSE) methods.	Y

# 1 Summary of work plan

Year 1: Develop process for assessing and communicating indicators, refine existing models.

Year 2: Develop alternative models representing marine ecological and human systems at multiple scales.

Year 3: Evaluate the robustness of alternative management strategies to achieve candidate operational objectives given alternate models developed.



## 2 List of outcomes and achievements of the WG in this delivery period

State of the Ecosystem reports available online at:

["https://www.integratedecosystemassessment.noaa.gov/regions/northeast/reports"](https://www.integratedecosystemassessment.noaa.gov/regions/northeast/reports)

Hardison, S., C.T. Perretti, G.S. DePiper, and A. Beet. "A simulation study of trend detection methods for integrated ecosystem assessment", *ICES J Mar. Sci.*, 2019, doi:10.1093/icesjms/fsz097

Gaichas, S.K., G.S. DePiper, R.J. Seagraves, B. Muffley, M. Sabo, L. Colburn, and A. Loftus. "Implementing Ecosystem Approaches to Fishery Management: Risk Assessment in the US Mid-Atlantic", *Front. Mar. Sci.*, 2018, 5:442.

### 3 Open Science Symposium

This year marked the tenth year of WGNARS. To mark the occasion, WGNARS hosted an open science symposium at the Bedford Institute of Oceanography on April 30, 2019. The purpose of the symposium was to highlight the work conducted in both the US and Canada with respect to IEAs. The agenda was broken into four sections: The what and the why of IEAs, At the interface of science and fisheries management, science for Integrated Ecosystem Assessments, and moving forward with IEAs and WGNARS (Annex 3). There were panel discussions at the end of the morning and afternoon sessions on “Are IEAs useful” and “Moving forward with Ecosystem Approaches, operationalizing and new ideas.” In total there were 12 oral and 4 poster presentations included in the symposium from researchers from both the US and Canada as well as Norway and South Africa.

Prof Jarre, who attended WGNARS from South Africa, expressed her sincere gratitude for having been able to participate in the WGNARS Open Science Symposium and the WGNARS meeting itself. Although framed differently there are strong parallels between the research pursued in the Benguela in support of an ecosystem approach to fisheries management and that in the North Atlantic Regional Seas. It is her hope that closer collaboration will evolve in the near future. Should the current project proposal “Mission Atlantic” under the CEC’s Atlantic Ocean Research Flagship call (supported by WGNARS following a presentation of Prof St. John last year) be successful, it would present an immediate opportunity.

## 4 Progress report on ToRs and work plan

This meeting marked the culmination of the current 3-year Term of References for WGNARS. Progress made by the working group is summarized below by ToR.

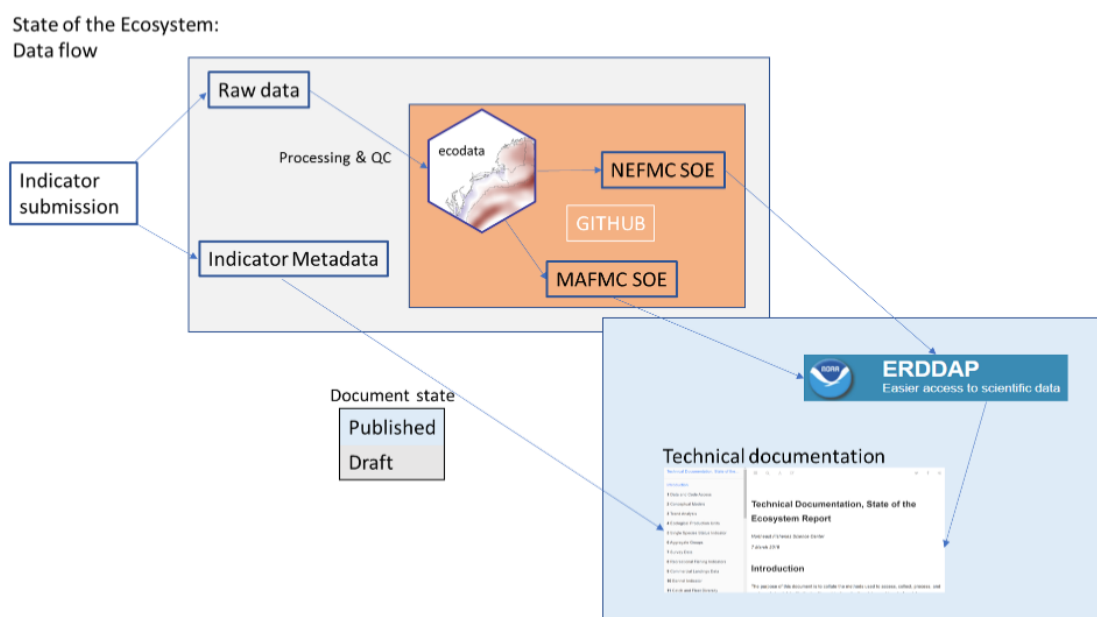
### 4.1 ToR a) Develop IEA capacity, and detail IEA best practices

Every year during this progress period, WGNARS has received updates from the USA, Canada, and Northwest Atlantic Fisheries Organization (NAFO) as to their involvement in ecosystem-based management activities. Below are the updates from this past meeting.

#### Northeast NOAA Integrated Ecosystem Assessment Program

Integrated Ecosystem Assessment (IEA) efforts in the USA are led by the NOAA IEA program out of the Office of Science and Technology in Silver Spring, Maryland. The program is regional in nature with the spatial extend of WGNARS led by the Northeast NOAA IEA team based out of the Northeast Fisheries Science Center (NEFSC) in Woods Hole, Massachusetts.

Through the NOAA IEA approach, the NEFSC has developed two regional State of the Ecosystem (SOE) reports for the regional fisheries management councils they support (Mid-Atlantic Fisheries Management Council and the New England Fisheries Management Council). This was the second year of an extended process that included a workshop attended by many of the data providers as well as a follow-up synthesis meeting to examine the interconnectiveness of the various indicators. Unfortunately, that process was a bit accelerated this year due to the partial government shutdown in the USA.



**Figure 1. Flow of data from the NEFSC's State of the Ecosystem reports. Data efficiency achieved by using tools like GitHub and Rmarkdown.**

The NE NOAA IEA team was still able to pull together the reports in a large part due to the advances they have made in data efficiency using tools like GitHub and Rmarkdown (Fig. 1).

These tools have allowed them to expand the scope of their ecosystem reporting to include a new product called an Ecosystem Context for Stock Assessments (ECSA). The first ECSA was used during the Summer flounder, *Paralichthys dentatus*, stock assessment in [get date from Sean].

The Mid-Atlantic SOE was used to update the ecosystem risk assessment for the Mid-Atlantic Council as discussed in previous WGNARS reports. The ecosystem risk assessment is forming the basis for a management strategy evaluation (MSE). More details on this process are available in section 4.6.

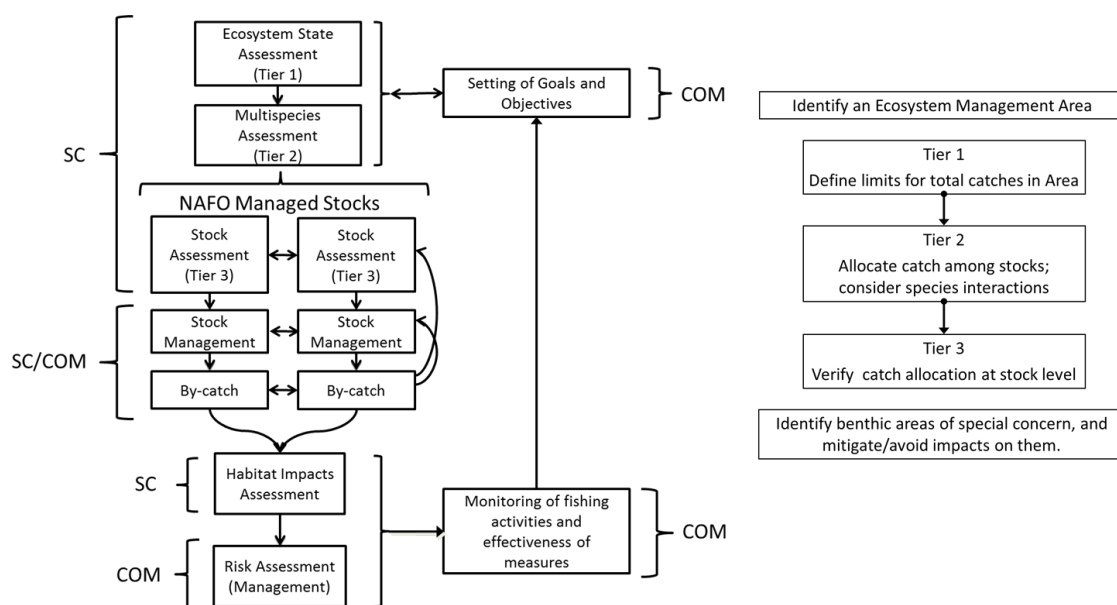
### **Fisheries and Oceans Canada**

Fisheries and Oceans Canada recently released their “State of the Ocean report”. This report covers the entire East coast of Canada. Due to the geographic expanse of the report much of the topics are covered in a superficial manner. The report is expected to be repeated on a four year cycle with other parts of Canada releasing similar reports in the interim. The report did highlight climate change and was accompanied by the Environmental Canada Climate Change (ECCC) report. There was good engagement with the public via social media. The report itself is a good public relations document as it is easy to read and understandable by the general public. However due to the nature of the document it is not a technical document. There is also no human pressures included in the report.

### **North Atlantic Fisheries Organization**

The Northwest Atlantic Fisheries Organization (NAFO) convention formally commits the organization to “apply an ecosystem approach to fisheries management in the Northwest Atlantic that includes safeguarding the marine environment, conserving its marine biodiversity, minimizing the risk of long term or irreversible adverse effects of fishing activities, and taking account of the relationship between all components of the ecosystem”.

This commitment is being acted upon through the NAFO Roadmap for the development and implementation of an Ecosystem Approach to Fisheries (EAF) (Koen-Alonso et al 2019). The Roadmap key elements are a hierarchical approach to define exploitation rates, and the integration of the impacts from fishing on benthic communities (e.g. Vulnerable Marine Ecosystems – VMEs-) (Fig. 2).



**Figure 2. NAFO Roadmap to EAF (right) and synoptic key conceptual steps involved (left). SC: Scientific Council, COM: Commission.**

While the Roadmap is being operationalized across the organization, two working groups are key to this process. The Scientific Council (SC) Working Group on Ecosystem Science and Assessment (WGESA) is responsible for generating the bulk of the science and assessment work related to EAF, while the joint Commission (COM) - SC Working Group on Ecosystem Approach Framework to Fisheries Management (WGEAFFM) is responsible to examine and discuss the science advice provided from a management and implementation perspective. These working groups are embedded within the NAFO management cycle, providing the fora and mechanisms for progressive EAF adoption and deployment.

## 4.2 ToR b) Evaluation of current suite of indicators and assessment of ability to provide proactive advice

In 2017 and 2018 extensive work was done on indicator selection and indicator test-ing.

In year one of our current ToRs the working group received an overview of indicator selection and vetting process conducted by Fisheries and Oceans Canada and published literature on indicator selection criteria was reviewed (ICES 2017). As a result, the group narrowed down an expansive list of indicators to be tracked as proxies for the following ecosystem attributes: Biodiversity, Ecosystem structure and function-ing, ecosystem stability and resistance to perturbations, and resource potential. Further work was proposed on applying the approach of Tam et al. (2017) to access thresholds for both the biological system and the socio-economic system. Work still remains on identifying thresholds especially for the human dimension indicators which may require different interpretations for thresholds. The working group pro-poses to continue work towards threshold analysis as part of the new ToRs.

In year two (2018) the working group was presented with preliminary results of a Monte-Carlo simulation that tested the performance of statistical models to identify trends in time-series of varying lengths and degrees of autocorrelation. Results indi-cated that our ability to identify long-term trends with weak autocorrelations is good but our ability to detect short-term trends may be severely limited. That work has subsequently been published (Hardison et al. 2019?).

Work was identified to assess spatial approaches to indicator assessment to test spatial, but not temporal, heterogeneity that is complementary to current time-series trend analysis. [Was anything done?]

### **4.3 ToR c) Best practices on communication of indicator meaning, uncertainty, and results to stakeholders**

Geret DePiper of the Northeast Fisheries Science Center and Brandon Muffley of the Mid-Atlantic Fishery Management Council (MAFMC) reviewed the 2018 MAFMC Risk Assessment update. The original assessment was completed and adopted by the MAFMC in December 2017, with the intent that it would be used to inform strategic decision-making, and updated annually to ensure continued relevance to managers (Gaichas et al. 2018). The 2019 update was delivered in conjunction with the 2019 MAFMC State of the Ecosystem report at the April 2019 Council meeting (<http://www.mafmc.org/briefing/april-2019>). Although the entire assessment was updated and provided to the Council, the risk assessment discussion focused only on changes from the prior assessment. This was a decision made by drafters of the report due to the fact that a substantial number of indicators overlap with the State of the Ecosystem Report, and to focus attention on the most relevant components of the update.

These changes were binned into the following categories:

- 1) Decreased Risk: Indicators which presented a decrease in risk between 2018 and 2019
- 2) Increased Risk: Indicators which presented an increase in risk between 2018 and 2019;
- 3) Re-evaluation of Risk: Indicators for which new information might warrant a re-evaluation of risk criteria in 2019;
- 4) Potential New Indicators: Indicators developed to address specific requests by the MAFMC in 2018;

The majority of the discussion surrounding this update focused on the process by which the original Risk Assessment. Details of this process can be found in Gaichas et al. (2018). Briefly, the Risk Assessment was developed jointly with both stakeholders (through both outreach meetings and MAFMC meeting open comment periods) and managers (MAFMC Council through both their Ecosystem and Oceans Planning Committee, a subset of Council Members, and the full Council itself).

### **4.4 ToR d) Assess system productivity under shifting processes**

A sub-group of WGNARS led by Bob Gregory met to discuss best methods of incorporating habitat into IEAs. The sub-group discussed how best to quantify species distributions with regards to human-use footprints such as fishing. The core of the discussion was centered on whether there is a metric that could be developed to provide information on habitat quality/health/status in a way fisheries managers can use to make management decisions.

Habitat is inherently a spatial entity and related information can be packaged in several ways. Two main pathways were identified. The first organized habitat data through spatial mapping which is good for spatially oriented management decisions. The other way summarizes habitat metrics on a stock level to provide context but is not intended to be implemented as habitat management measures.

The sub-group determined that there is still a lot of work to do in order to identify important/productive habitats in regards to management. WGNARs will in the future identify different techniques for doing so and attempt to prioritize or value the different techniques. WGNARS also needs to expand its expertise in this area. Future work will entail reaching out to other experts to develop best practices for inclusion of habitat in a IEA framework.

#### **4.5 ToR e) Evaluate approaches to integrate multiple spatial scale models**

Work on comparing qualitative network model with more quantitative models by Jamie Tam and Sean Lucey was presented as part of the Open Science Symposium and further discussed as a break out group. The comparison was based on existing ecopath models of the Gulf of Maine and Western Scotian Shelf ecosystems. The two models were aggregated to similar levels to allow cross regional comparisons. The relative strengths of the interactions in the foodweb were then used to generate qualitative models of varying degrees of connectedness. These models consisted of ones with only strong links present (link strengths >50% of mortality or diet composition) to more highly connected food webs (>10% link strength). These were meant to represent qualitative model of increasing knowledge and to test how useful qualitative models can. This work is ongoing and will be expanded to use a simplified Bayesian synthesis algorithm called Ecosense to allow more appropriate comparisons between the qualitative network model and the quantitative model outputs.

#### **4.6 ToR f) Evaluate ecosystem trade-offs using a range of management strategy evaluation (MSE) methods**

As with the 2018 WGNARS meeting, this breakout session focused on supporting the MAFMC's assessment of Management Strategy Evaluation (MSE) Capacity. The work during the 2018 WGNARS meeting consisted of provided strawman examples of how the 2018 Risk Assessment could be used by the MAFMC to prioritize system components for development of a MSE. In October 2018, these strawmen were presented to the MAFMC, which ultimately used the Risk Assessment to prioritize Summer Flounder, a species of both recreational and commercial importance facing substantial shifts in numerous system drivers. At that time, the MAFMC tasked the Ecosystem Approach to Fishery Management (EAFM) workgroup to develop a list of 10 questions that could be answered through a Summer Flounder MSE. Previously, the MAFMC workgroup had tentatively agreed to develop questions around the highest risk elements of the Risk Assessment, using a conceptual model to identify the most important system linkages. This WGNARS breakout session was used to document data availability to track these system linkages. An example draft entry can be found in table 1. The data documentation is expected to continue through early Summer 2019, at which point the EAFM workgroup will use this information to draft the requested 10 questions.

Table 1. Example documentation of system linkages developed by the WGNARS in support of MAFMC MSE assessment.

<b>Risk Factor: Distribution Change</b>					
<b>Model Element</b>	<b>Justification for Inclusion</b>	<b>Data to support (Y/N)</b>	<b>If yes, identify and list out all data sources, analyses, model, Council project etc.</b>	<b>Spatial Component (North/South; Inshore/Offshore; Other - specify)</b>	<b>WG Member providin info</b>
Temperature		Y	SST back to 80's (Paula); Bottom temp from F-D survey (Kevin F) at seasonal/annual at stock boundry		WGNAR! group
Differential recruit success		Y	Productivity anom (ratio of small/large); NEAMAP; Stock Assessment		WGNAR! group
Spatial heterogeneity in fishing mortality		Y	VTRs; SSB Fishing Footprint maps;		WGNAR! group
Spatial heterogeneity in food availability		Y	NEFSC Food Habbits database;		WGNAR! group
Spatial heterogeneity in natural mortality		M	State/space model (T. Miller); Production model (C. Perretti)		WGNAR! group
Estuarine habitat					
Total abundance		Y	Stock assessment (age structure); Kevin/Charles/Tim work		WGNAR! group
Change in size structure		Y	Assessment work		WGNAR! group
Offshore habitat		Y	V. Guida - BOEM analysis; K. Friedland habitat occupancy		WGNAR! group



## 5 Proposed next 3-year Terms of Reference

- a) Report on recent activities related to Integrated Ecosystem Assessments (IEA) within the United States, Canada, and Regional Fisheries Management Organizations

Deliverables:

- Regular reports from US/Canada/NAFO

- b) Expand the work already accomplished by WGNARS into other regional ecosystems and/or multiple ocean uses while considering the roles of women and remote, low income, and indigenous communities in the system

Deliverables:

- Refined understanding of the system through conceptual models
- Exploratory application of risk assessment to a Canadian region
- Analysis of cumulative effects including, for example, offshore energy

- c) Increase the cross disciplinary capacity of IEAs in the region by engaging with scientists and stakeholders from under-represented disciplines and research communities, including those in the social sciences

Deliverables:

- List of research products developed from reaching out and including members of under-represented disciplines and research communities (e.g. papers, reports, indicators)

- d) Continue to evaluate and test indicators which are responsive to a changing environment or other conditions, especially those that indicate shifting resources, changes in human behavior, habitat, or extreme events, or can be used as early warning signs of a pending change (leading indicators)

Deliverables:

- Tested and evaluated new indicators that are responsive to a changing environment or other conditions (e.g. SMART indicators)
- Completed threshold analysis of existing indicators
- Framework for developing spatial indicators

- e) Improve management advice by developing decision support tools that reconcile multiple ocean uses by explicitly addressing tradeoffs within an ecosystem context (e.g. structured decision making, management strategy evaluation, scenario planning)

Deliverables:

- Worked example of a decision support tool

- f) Develop best practices for increasing efficiency in product development that can lead to improved responsiveness to management requests

Deliverables:

- Workshop on best practices for improving efficiency, transparency, and workflow
- Timely provision of information to managers (e.g. annual SOEs, Risk assessment)
- Improved data accessibility
- Manuscript on best practices

- g) Develop best practices for communicating with a diverse group of stakeholders (i.e., managers, scientists, public), recognizing that effective communication tools may differ across audiences

Deliverables:

- Examples of effective communication tools for various audiences

## 6 Next meeting

The next meeting will be held in Woods Hole, MA, USA. Preliminary feedback indicates that 11 – 15 May will work in terms of participant schedules with a possible workshop either immediately preceding or following the meeting to be held in New Bedford, MA, USA. These dates will be refined and reported out as soon as possible.

## Annex 1: List of participants

[Text]

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## Annex 2: Resolutions

Working group meeting draft resolution for multi-annual ToRs (Category 2)

A **Working Group on the Northwest Atlantic Regional Sea (WGNARS)**, chaired by Sean Lucey, USA and Robert Gregory, Canada, will work on ToRs and generate deliverables as listed in the Table below.

	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
Year 2020	11- 15 May	Woods Hole, USA	Interim report by 19 June to IEASG	New Canadian Chair will be appointed
Year 2021	TBD	Halifax, Canada	Interim report by TBD to IEASG	
Year 2022	TBD	Woods Hole, USA	Final report by TBD to IEASG	New USA Chair will be appointed

### ToR descriptors

ToR	Description	Background	Science plan codes	Duration	Expected Deliverables
	This should capture the objectives of the ToR	Provide very brief justification, e.g. advisory need, links to Science Plan and other WGs	Use codes <i>(max 3 per ToR)</i>	1, 2 or 3 years	Specify what is to be provided, when and to whom
a	Report on recent activities related to Integrated Ecosystem Assessments (IEA) within the United States, Canada, and Regional Fisheries Management Organizations	a) Science Requirements b) Advisory Requirements c) Requirements from other EGs	1.1, 6.5	3 years (2020, 2021, 2022)	Regular reports from US/Canada/NAFO
b	Expand the work already accomplished by WGNARS into other regional ecosystems and/or multiple ocean uses while considering the roles of women and remote, low income, and indigenous communities in the system		1.2, 2.1, 6.5	3 years (2020, 2021, 2022)	Refined understanding of the system through conceptual models  Exploratory application of risk assessment to a Canadian region  Analysis of cumulative effects including, for example, offshore energy
c	Increase the cross disciplinary capacity of IEAs in the region by engaging with scientists and stakeholders from under-represented disciplines and research		2.7, 6.6, 7.5	3 years (2020, 2021, 2022)	List of research products developed from reaching out and including members of under-represented disciplines and research

	communities, including those in the social sciences			communities (e.g. papers, reports, indicators)
d	Continue to evaluate and test indicators which are responsive to a changing environment or other conditions, especially those that indicate shifting resources, changes in human behavior, habitat, or extreme events, or can be used as early warning signs of a pending change (leading indicators)	1.1, 7.1	3 years (2020, 2021, 2022)	<p>Tested and evaluated new indicators that are responsive to a changing environment or other conditions (e.g. SMART indicators)</p> <p>Completed threshold analysis of existing indicators</p> <p>Framework for developing spatial indicators</p>
e	Improve management advice by developing decision support tools that reconcile multiple ocean uses by explicitly addressing tradeoffs within an ecosystem context (e.g. structured decision making, management strategy evaluation, scenario planning)	2.7, 6.1, 6.4	1 year (2022)	Worked example of a decision support tool
f	Develop best practices for increasing efficiency in product development that can lead to improved responsiveness to management requests	4.1, 4.2, 4.3	1 year (2020)	<p>Workshop on best practices for improving efficiency, transparency, and workflow</p> <p>Timely provision of information to managers (e.g. annual SOEs, Risk assessment)</p> <p>Improved data accessibility</p> <p>Manuscript on best practices</p>
g	Develop best practices for communicating with a diverse group of stakeholders (i.e., managers, scientists, public), recognizing that effective communication tools may differ across audiences	1.1, 4.2, 6.4	1 year (2021)	Examples of effective communication tools for various audiences

### Summary of the Work Plan

Year 1	TORS A, B, C, D, AND F
Year 2	ToRs A, B, C, D, and G
Year 3	ToRs A, B, C, D, and E

### Supporting information

Priority	The current activities of this Group will lead ICES into issues related to the ecosystem effects of fisheries, especially with regard to the application of the Precautionary Approach. Consequently, these activities are considered to have a very high priority.
Resource requirements	The research programmes which provide the main input to this group are already underway, and resources are already committed. The additional resource required to undertake additional activities in the framework of this group is negligible.
Participants	The Group is normally attended by some 20–25 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and group under ACOM	There are no obvious direct linkages.
Linkages to other committees or groups	There is a very close working relationship with all the groups in the IEASG.
Linkages to other organizations	The NAFO Working Group on Ecosystem Science and Assessment has made progress towards similar objectives and will be a resource for collaboration.



## Annex 3: Open Science Meeting Symposium Agenda

ICES Working Group for the North Atlantic Regional Seas (WGNARS)  
 Open Science Symposium  
 April 30th, 2019  
 Bedford Institute of Oceanography  
 Ford Auditorium

### Early Morning Session: [The what and the why](#)

- 0830-0900: Poster set-up
- 0900-0905: Welcome & objectives by Alida Bundy and Jamie C. Tam (DFO, Maritimes Region)
- 0905-0925: Integrated Ecosystem Assessments in the perspective of ICES by Mette Mauritzen (Institute for Marine Research, Norway)
- 0925-0945: What is WGNARS and how does it matter? by Geret DePiper (NOAA, Northeast Fisheries Science Center)
- 0945-1000: Open discussion, general questions

### Late morning session: [At the interface of Science and Fisheries Management](#)

- 1000-1015: Towards implementing Ecosystem-based Fisheries Management in the real world: Breaching the scientists-managers divide by Mariano Koen-Alonso and Fred Phelan (DFO, Newfoundland and Labrador Region, Science and Policy and Economics)
- 1015-1030: Tools and strategies to advance ecosystem considerations in Northeast US by Brandon Muffley (Mid-Atlantic Fishery Management Council)
- 1030-1040: Questions
- 1040-1100: Coffee break and Posters
- 1100-1200: Panel Discussion: "Are IEAs useful?"  
 Panel Speakers:  
 Tana Worcester (DFO, Maritimes Region, Science)  
 Brandon Muffley (Mid Atlantic Fishery Management Council)  
 Fred Phelan (DFO, Newfoundland and Labrador Region, Policy and Economics)  
 Mark Monaco (IEA Steering Committee, NOAA National Ocean Service)

An Integrated Ecosystem Assessment is a process framework for providing ecosystem based management advice. Yet it is important to align this scientific process with the needs of clients, namely managers and management agencies, because understanding objectives and tradeoffs among their needs is pivotal to providing EBM advice. Co-creation of knowledge for Integrated Ecosystem Assessment should therefore include managers, which requires an understanding of how IEAs and related processes are operationally useful. We invite managers and decision-makers to share their perspectives on how IEA products can be used in science-based management of living marine resources as part of a round-table panel discussion at the WGNARS open science conference.

- 1200-1300: Lunch (Order-in) and Posters

### Early afternoon session: [Science for Integrated Ecosystem Assessments](#)

- 1300-1310: Aligning habitat science with Ecosystem Approaches to Fisheries Management in the Northeast US by Jessica Coakley (Mid-Atlantic Fishery Management Council)
- 1310-1320: Marine Spatial Planning in the Maritimes Region by Glen Herbert (DFO Maritimes Region, Oceans)
- 1320-1330: Climate Change Induced Vulnerability of Lobster Fishing Communities by Kyomi French, Blair Greenan, Nancy Shackell (DFO Maritimes Region, Science)
- 1330-1340: The Ocean Tracking Network (OTN) and Northwest Atlantic Ocean ecosystem science and management by Fred Whoriskey (Dalhousie University)
- 1340-1350: Questions
- 1350-1400: A Simulation Study of Trend Detection Methods for IEA by Sean Hardison (NOAA, Northeast Fisheries Science Center)

- 1400-1410: Exploring Uncertainty in Qualitative Network Models by Jamie C. Tam and Sean Lucey (DFO Maritimes Region, NOAA Northeast Fisheries Science Center)
- 1410-1420: Atlantic herring population health in a large marine ecosystem by Daniel Boyce (Dalhousie University)
- 1420-1430: Linking jellyfish and leatherback sea turtle distributions in Atlantic Canada by Bethany Nordstrom (Dalhousie University)
- 1430-1440: Questions
- 1440-1500: Coffee Break and posters

**Late afternoon session: [Moving forward with IEAs and WGNARS](#)**

- 1500-1600: Panel Discussion: "Moving forward with Ecosystem Approaches, operationalizing and new ideas"
- Panel speakers:
- Ted Potter (DFO, Maritimes Region, Resource Management)
- Astrid Jarre (University of Cape Town, South Africa)
- Sean Lucey (WGNARS Co-Chair, NOAA-Fisheries Northeast Fisheries Science Center)
- Mette Mauritzen (Institute for Marine Research, Norway)

Ecosystem approaches to resource management have been recognized internationally to address the complex socio-ecological interactions that impact marine ecosystems. The ability to adopt and implement these approaches depends on governance structures and existing policy. Here we discuss differing pathways to operationalize IEA tools from different countries. How do we achieve short term goals in resource management cognizant of the overall long-term vision for IEAs?

- 1600-1615: Wrap up and overview by Bob Gregory (WGNARS Co-Chair, DFO, Newfoundland and Labrador Region, Science).
- 1615-1700: Posters and discussion

**List of posters:**

- Supporting system-based approaches to fisheries management in the Benguela Large Marine Ecosystem-Astrid Jarre (University of Cape Town, South Africa)
- Ordinary Linear Regression- Rick Danielson (DFO Maritimes Region, Science)
- Evaluation of a Bayesian decision network, Wellamo, for ecosystem-based management of the Georges Bank social-ecological system - Robert Wildermuth (University of Massachusetts Dartmouth)

The Science-Policy Interface for Managing Marine Ecosystems: Scientific Information Use in Coastal and Ocean Decision-Making-Bertrum MacDonald (Dalhousie University)