

## Integrated Ecosystem Assessment Steering Group EGs Resolutions

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## Resolutions approved in 2022

### WGINOR - Working Group on Integrated Assessments of the Norwegian Sea

**2021/MA2/IEASG00** The Working Group on Integrated Assessment of the Norwegian Sea (WGINOR), chaired by Anna H. Ólafsdóttir, Iceland and Benjamin Planque\*, Norway, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2022	14-18 November	Tromsø, Norway	Interim report by 15 January 2023 to IEASG	New incoming Co-Chair, Benjamin Planque, Norway
Year 2023	November	Tórshavn, Faroe Islands	Interim report by 15 January 2024 to IEASG	
Year 2024	November	Reykjavík Iceland	Final report by 15 January 2025 to IEASG	

### Terms of Reference a) – g):

TOR	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	DURATION	EXPECTED DELIVERABLES
A	Perform integrated assessment of the pelagic ecosystem in the Norwegian Sea and develop a framework for identifying important signals for management.	Addresses needs in the Science Plan for developing understanding of the ecosystem and its responses to human impact and other pressures. In addition, start developing reporting formats to meet the needs of ecosystem-based advice.	6.5	years 1-3	WG report to SCICOM and ACOM January following each year
B	Utilize multi-species and ecosystem models to evaluate effects of single and multi-species harvest control rules on fishing yield and ecosystem state of the pelagic ecosystem in the Norwegian Sea.	Addresses needs in the Science Plan for developing ecosystem-based advice for sustainable use of marine ecosystems resources.	5.3	years 1-3	WG report to SCICOM and ACOM January following each year

C	Continue development of forecast products (1–5 years) for ocean climate and initiate development of forecast products for other ecosystem components in the Norwegian Sea.	Aims at providing better understanding of links between the physical environment and productivity of the pelagic ecosystem in support of integrated ecosystem assessment.	1.2	years 1-3	WG report to SCICOM and ACOM January following each year
D	Continue improvement of workflow, transparency, and replicability.	Develop data sharing plans towards FAIR data principles.	3.2	years 1-3	WG report to SCICOM and ACOM January following each year
E	Develop a two-way dialogue between WGINOR and relevant stakeholders and managers in Norway, Faroe Island, and Iceland.	Guiding the work of the group so that it addresses management needs.	6.4	years 1-3	WG report to SCICOM and ACOM January following each year
F	Compile information for future ecosystem overview revisions based on the ICES technical guidelines.	Summarize key achievements in developing an understanding of the ecosystem and its responses to human impact and other challenges.	6.5	year 1-3	WG report to SCICOM and ACOM January following each year
G	Annually review and revise the ecosystem status summary to report trends and recent changes	These summaries will provide information on annual trends will also provide the foundational material for the ecosystem overview revision.	6.5	year 1-3	Norwegian Sea ecosystem status summary

### Summary of the Work Plan:

Year 1	Work on ToRs a-g
Year 2	Work on ToRs a-g
Year 3	Work on ToRs a-g

### Supporting information

Priority	WGINOR aims to conduct and further develop Integrated Ecosystem Assessment for the
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	Norwegian Sea, as a step towards implementing the ecosystem approach, addressing core priorities in the ICES strategic plan.
Resource requirements	<p>Term of Reference a) The two international fish-plankton surveys in the Norwegian Sea have in recent years been developed in the direction of ecosystem surveys that capture several key components of the ecosystem. This provides a firm foundation for performing an integrated assessment of the Norwegian Sea pelagic ecosystem. A framework for assessing warning signals has been developed with input from relevant projects at the involved institutions and provides the platform for doing this part of the ToR.</p> <p>Term of Reference b) This will be supported by work conducted in the IMR-project “Sustainable multi-species harvest from the Norwegian Sea and adjacent ecosystems” (SIS harvesting project), which represents a continuation of the work done in WGINOR during the last three-year term.</p> <p>Term of Reference c) This will be supported by work conducted in the SIS harvesting project and by oceanographic information collected during cruises in the Norwegian Sea and surrounding waters and supplied by satellite-based monitoring. The SIS harvesting project provides resources needed to complete development of a forecast system.</p> <p>Term of Reference d) This will be based on experiences made during implementation of this ToR. Some support from ICES secretariat may be required to implement FAIR, TAF, data profiling, and related approaches.</p> <p>Term of Reference e) This will be conducted on a national basis, at the time/place of the WGINOR annual meetings. No additional support required.</p> <p>Term of Reference f) Update of the elements of the ecosystem overview will be done based on existing projects and management initiatives, such as the Norwegian ecosystem-based management plan for the Norwegian Sea. The new elements focusing on climate change will be developed with a basis in ongoing projects and other assessment processes, such as IPCC. Additional resources will be required in the participating institutions to complete the latter work, in particular related to projections and assessments of anticipated effects of climate change in future. ToR f’s expected deliverables was updated to be clearer on the group’s plans to support the ecosystem overview revisions.</p> <p>Term of Reference g) Was added as the result of discussions following a recommendation from WGINOR to ACOM about their plans to produce the Norwegian Sea ecosystem status summary annually.</p>
Participants	The Group is normally attended by some 15-20 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	WGWIDE
Linkages to other committees or groups	IEASG

Linkages to other organizations	The work done in the group is highly relevant to other assessment initiatives, in particular the Norwegian ecosystem-based management plan for the Norwegian Sea and OSPAR.
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## WGIAB – Joint ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea

**2021/FT/IEASG03** The ICES/HELCOM Working Group on Integrated Assessments of the Baltic Sea (WGIAB), chaired by Carolyn Faithfull\*, Sweden and Riikka Puntala-Dodd\*, Finland, will generate deliverables as listed in the Table below.

	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
<b>Year 2022</b>	To be announced	Online		Intersessional work by correspondence
	8-9 Nov (to be confirmed)	To be decided	E-evaluation	
<b>Year 2023</b>	To be decided	To be decided	ICES Scientific report	Intersessional work by correspondence
<b>Year 2024</b>	To be decided	To be decided	Final ICES Scientific report	

## ToR descriptors

TO R	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	DURATION	EXPECTED DELIVERABLES
<b>a</b>	Analyse and evaluate Baltic Sea food webs, and develop indicators to support ongoing assessment work in ICES and HELCOM	This ToR will evaluate food webs in different sub-basins of the Baltic Sea, aiming also to develop food web indicators in relation to requirements for MSFD reporting of D4. The work will build on previous work in ICES and HELCOM, and extend to e.g. HELCOM CG Foodwebs for identification of suitable outputs.	1.9, 6.3, 6.6, 6.5	3 years	-Research article(s) - Intermediate results reported in interim reports as well as the final report. -Contributions, as applicable, to Ecosystem overviews e.g. contribution to planned WK, and possible pipeline proposal.
<b>b</b>	Develop ecosystem knowledge to support the progression of ecosystem-based fisheries advice.	This ToR will investigate potential ecosystem indicators for advancing ecosystem-based fisheries advice in the Baltic Sea. The ToR is inspired by, and aims to contribute to, recent initiatives within e.g. WKEBFAB, building	6.1, 6.6	3 years	- Research article(s) - Intermediate results reported in interim reports as well as the final report. -Contribution, as applicable to ICES fisheries advice

		also on the work of other ICES EGs as relevant.			carried out within WGBFAS
<b>c</b>	Develop a wider range of decision-support tools for integrated ecosystem-based advice.	This ToR will develop decision support tools (e.g. Bayesian Belief Networks for ecosystem-based management in the Baltic Sea by combining a variety of information from models and expert knowledge, including human dimensions and ecosystem services. Additional tools and models to support the ToR are welcomed based on initiatives from within the group.	6.4, 7.1, 2.2	3 years	-Research article(s) - Intermediate results reported in the final report.
<b>d</b>	Revise the Baltic Sea Ecoregion Ecosystem Overview including review of the activity-pressure-state diagramme	Revisions of the EOs should occur every 5 years according to the EO technical guidelines. The last full revision was in 2018.	6.5, 6.6, 7.2	Year 3	- Revision of the Baltic Sea Ecosystem EO

## Summary of the Work Plan

<b>Year 1</b>	Annual meeting, intersessional work: Workshop April: Present decision tools and models for integrated ecosystem based management. Identify additional needs/developments for decision support tools. Establish clear internal working groups for the three ToRs and goals for intersessional work. Initiate planning the EO revision
<b>Year 2</b>	Annual meeting, intersessional work across all ToRs, Revise the Baltic Sea Ecosystem Overview
<b>Year 3</b>	Annual meeting, intersessional work across all ToRs
<b>All years</b>	Group leaders ToRs: a) Carolyn Faithfull and Lena Bergström b) Maciej Tomczak c) Laura Uusitalo and Riikka Puntala-Dodd d) To be decided in April

## Supporting information

<b>Priority</b>	WGIAB aims to conduct and further develop Integrated Ecosystem Assessments for the different sub-systems of the Baltic Sea, in support of implementing the ecosystem approach in the Baltic Sea.
<b>Resource requirements</b>	Assistance of the Secretariat in maintaining and exchanging information and requirements data to potential participants. Assistance of especially the ICES Data Centre to collect and store relevant dataseries.
<b>Participants</b>	The Group is normally attended by some 20 members and guests.
<b>Secretariat facilities</b>	None.
<b>Financial</b>	No financial implications.
<b>Linkages to ACOM and groups under ACOM</b>	WGBFAS
<b>Linkages to other committees or groups</b>	WGINOSE, WGNARS, WGEAWESS, WGINOR, WGIBAR, WGCOMEDA, WGSOCIAL, WGMARS, SICCME, WGCERP, WKEFAB
<b>Linkages to other organizations</b>	HELCOM

#### WKASCAPES - Workshop on ASsessing CAPacity to supply Ecosystem Services

**2021/WK/IEASG04** The **Workshop on ASsessing CAPacity to supply Ecosystem Services** (WKASCAPES), chaired by Andrea Belgrano\*, Sweden, and Gerjan Piet\*, Netherlands, will be established and have an online pre-meeting (date to be decided) and will meet in person at ICES Secretariat, Copenhagen, 14–18 November 2022 to:

- a) Review the existing knowledge on functions and processes of ecosystem components in terms of their potential to contribute to the capacity to supply ecosystem services;
- b) Evaluate whether and how the existing EO approaches for assessing and prioritizing the main stressors, i.e. human activities and their pressures, can be adapted to enable the assessment of direct impacts on the capacity to supply ecosystem services;
- c) Evaluate feasibility of the other IEA approaches and frameworks (risk assessment, mental modeller, EwE and others) to identify where these can be applied to incorporate / enable assessment of the direct impacts to the capacity to supply ecosystem services;
- d) Develop an Ecosystem Overviews pipeline proposal on Ecosystem Services. This product should also include an appropriate glossary.

WKASCAPES will report by 16 January for the attention of the ACOM/SCICOM.

#### Supporting information

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Priority	This Group will be established based on WKTRANSPARENT recommendation and will provide the basis for improved Ecosystem Overviews by evaluating existing IEA/EO approaches with the perspective of extending them to include Ecosystem Services (ES). This should also allow relevant ICES expert groups to fill the knowledge gaps for each ecoregion and contribute to the pipeline proposal. Consequently, these activities are considered to have a very high priority.
Scientific justification	<p>Term of Reference a)  Within many ICES WGs there is knowledge on the functioning of the various ecosystem components. This knowledge has not been used in relation to the ecosystem capacity to supply ecosystem services. This WK will provide that link.</p> <p>Term of Reference b)  The aim of this ToR is to obtain improved Ecosystem Overviews by evaluating existing EO approaches with the perspective of extending them to include Ecosystem Services (ES). Ultimately this should result in an approach that can identify for each ecoregion the main stressors, i.e. human activities and their pressures, which compromise the ecosystem capacity to supply services.</p> <p>Term of Reference c)  The aim of this ToR is to explore and evaluate how additional/other frameworks/approaches already in use by IEA groups can contribute to this approach.</p> <p>Term of Reference d)  The result of the previous ToRs is an agreed robust framework that can be applied to evaluate the effect of the main stressors that compromise the capacity to supply ecosystem services (ToR b) with an overview of the knowledge gaps in terms of functioning (ToR a) and potential contributions of other frameworks/approaches (ToR c). This provides the basis to develop a pipeline proposal to involve the relevant ICES expert groups. As this involves many different ICES WGs a glossary explaining all the relevant elements of the approach is necessary.</p>
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 20–30 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to advisory committees	Direct link to ACOM
Linkages to other committees or groups	WGCEAM, WGRMES, WGECON, WGSOCIAL, WGICA, WGINOSE, WGINOR, WGIBAR, WGEAWESS, WGCAMEDA, WGIAB, WGIEAGS, WGIAZOR, WGITMO, WGMME, WGZE, WGSAM, BEWG, JWGBIRD, WGSFD, WKCONSERVE, WKTRANSPARENT, WKINTRA3, WGECO, WKSIHD-BESIO, WGMARS, WGNARS
Linkages to other organizations	EC, OSPAR, HELCOM, NEAFC, PICES, NOAA IEAs, etc.

## Resolutions approved in 2021

### WGICA - ICES/PICES/PAME Working Group on Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean

**2021/FT/IEASG01** A joint ICES/PICES/PAME Working Group on Integrated Ecosystem Assessment (IEA) for the Central Arctic Ocean (WGICA), chaired by Sei-Ichi Saitoh (Japan), Lis Lindal Jørgensen (Norway) and Martine van den Heuvel-Greve (Netherlands) will work on ToRs and generate deliverables as listed in the Table below.

	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
Year 2022	11–13 October	ICES HQ in Copenhagen, Denmark or Online (TBC)	ICES Scientific Report, 15 November to the Integrated Ecosystem Assessments Steering Group (IEASG)	
Year 2023	April and October	Town, Country TBD (incl. online possibility)	ICES Scientific Report, 15 November to IEASG	
Year 2024	April and October	Town, Country TBD (incl. online possibility)	Final ICES Scientific Report by 15 November to IEASG	To plan for the 2025 publication of the Cooperative Research Report (CRR)

### ToR descriptors

TOR	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	DURATION	EXPECTED DELIVERABLES
A	<b>Identify and prioritize the relevant social, economic, and ecological (SEE) questions to be asked for the CAO in collaboration with the PAME CAO project.</b>	To be used in identifying which key questions are relevant to stakeholders in the CAO	1.1 1.2	Year 1-2	Relevant stakeholders and SEE questions for the present and future summer-ice free CAO.
	<b>Identify relevant audience/stakeholders to the CAO-integrated ecosystem assessment (IEA).</b>				
B	<b>Identify priority semi-quantitative and quantitative methods for doing <i>relevant</i> IEA for the CAO based on existing information already compiled in the WG's reports, EOs and CRR.</b>	To link the social, economical, physical, chemical and biological CAO ecosystem to the human activities, pressures and impacts	2.1 2.2	Year 2-3	Overview of available datasets, methods and tools (qualitative, quantitative & semi-quantitative as appropriate), assessment methods, and initiation of analyses. Identification of key knowledge gaps.

C	<b>Integrate and prioritize scientific SEE questions into the IEA for the CAO, this will include collaboration and development of methods with relevant IEASG and HAPISG groups.</b>	To provide tentative figures showing qualitative and semiquantitative/quantitative linkages between identified components of the IEA, including risk and confidence based on existing socio, economic and ecologic information.	3.1	Year 2-3	One or more output(s) (e.g. risk assessment, ITA, conceptual and ecosystem models) of the CAO IEA to be published in the open source ICES reports series.  Begin drafting the Cooperative Research Report (CRRs) on Human Activities and existing Management Bodies and Integrated Ecosystem Assessment methods and processes.
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### Summary of the Work Plan

Year 1	Identify the stakeholders and key scientific questions for an IEA of the CAO
Year 2	Identify and initiate IEA method(s) to address the key scientific questions
Year 3	Begin drafting the CRR section on IEA methods and processes to be included as part of the final report for this term

### Supporting information

Priority	The current activities of this Group will lead ICES-PICES-PAME into issues related to the development of an Integrated Ecosystem Assessments for the Central Arctic Ocean as a step towards implementing an ecosystem approach in the region. These activities are considered to have a very high priority in this rapidly changing ecosystem and will also contribute towards advancing ecosystem science as identified as a priority of the ICES Science Plan.
Resource requirements	Assistance of ICES Secretariat in maintaining and exchanging information and data to potential participants, especially the services of the ICES data centre to generate data tables for analysis from selected variables held in the database and potentially webhosting relevant material. Assistance in the steps of the IEA process. Reporting support.
Participants	20-50 ICES-PICES-PAME members and guests
Secretariat facilities	Meeting support (both in person and online)
Financial	No financial implications identified
Linkages to ACOM and groups under ACOM	ACOM (CRR will advance sections of the CAO Ecosystem Overview)
Linkages to other committees or groups	IEASG and its working groups, especially WGINOR (Norwegian Sea), WGIBAR (Barents Sea), and WGIEAGS (Greenland Sea), and WGIEANBS-CS (Bering and Chukchi Seas) as these regions encircle the CAO and the Atlantic and Pacific gateways. Other relevant ICES groups conducting work on SEE-related topics include WGBESEO, WGECON, and WGSOCIAL.
Linkages to other organizations	PICES, Arctic Council working groups, and the Provisional Scientific Coordinating Group (PSCG) of the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean

## Resolutions approved 2020

### WGINOSE - Working Group on North Sea Integrated Ecosystem Assessment

**2020/FT/IEASG01** The Working Group on North Sea Integrated Ecosystem Assessment (WGINOSE), chaired by Andrew Kenny, UK and Morten Skogen\*, Norway, will work on ToRs and generate deliverables as listed in the Table below.

	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
Year 2021	10 – 14 May	Online meeting	E-evaluation	Change of chairs: Morten Skogen, replacing Erik Olsen.
Year 2022	9-13 May	ICES HQ	E-evaluation	
Year 2023	TBD April/May	ICES HQ	Final ICES Scientific Report by 31 May to IEASG	

### ToR descriptors<sup>1</sup>

TO R	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
a	Update and operationalise strata specific ecosystem trends analysis including the development and/or application of ‘warning’ indicators of ecosystem state by working closely with WGECCO, WGSFD and WKINTRA. Investigate methods for communicating trends in ecosystem state, especially significant changes, using ecosystem summary sheet or report card style approaches.	a) Science Requirements b) Support Advisory Requirements c) Requirements from other EGs	1.1, 2.1	3 years and on-going annually	Review paper on report card/ESS methods in supporting IEA science that supports advice

<sup>1</sup> Avoid generic terms such as “Discuss” or “Consider”. Aim at drafting specific and clear ToR, the delivery of which can be assessed

b	Operationalise the integration of human activity and pressure data, including data pathways, into strata specific IEAs for the Greater North Sea Ecoregion distinguishing between fixed structures (e.g. pipelines, windfarms) and on-going activities (e.g. dredging, fishing, shipping, underwater noise, litter) by working with WGSFD, WGSHP, WGCEAM to establish appropriate methods for CEAs	a) Science Requirements c) Requirements from other EGs	4.1	3 years and on-going annually	Updated dynamic map of assessed human activities, pressures and impacts for WGINOSE webpage.
c	Continue to develop and test/validate strata specific decision support tools to support ecosystem management and advice (e.g. through mental models, bow-tie and EwE/Ecospace models and network analysis)	a) Science Requirements	2.2, 2.3, 3.2	3 years and on-going annually	Paper on application of validated qualitative ecosystem models in supporting ecosystem assessments and management advice
d	Update the greater North Sea Ecosystem Overview as required	a) Science Requirements b) Advisory Requirements c) Requirements from other EGs	1.2, 2.1	As required - ongoing	Updated North Sea ecosystem overview

### Summary of the Work Plan

Year 1	The first year will focus on further development of strata specific trend analysis and communication, especially in relation to 'warning' indicators and scoping ecosystem summary sheet/report card reporting at the North Sea scale. Work will also begin on drafting a review paper on trend analysis methods and communication approaches for IEA science that supports advice. Updates on human activities, pressures and impacts, especially in relation to CPUE and fisheries data from the English Channel will be undertaken. Further development of ecosystem assessment support tools, especially in relation to validating conceptual model outputs will be undertaken and a paper describing the integration of quantitative/qualitative models will be finalised.
Year 2	In addition to continuing work on the above items, a stakeholder workshop will be convened for the Kattegat so as to update stakeholders and managers on the validation and refinement of the Kattegat assessment tool/model, effectively as a follow on to WKKEMSSP. Plans will also be initiated to implement additional strata specific EwE models of the North Sea (e.g. Southern Bight and Norwegian Trench) so as to initiate subsequent follow-up engagement with stakeholders in these two regions. An update of the North Sea ecosystem overview will also be initiated this year.
Year 3	In addition to continuing with activities initiated in year 1 and 2, additional stakeholder workshops will be organised as follow-on to either the Norwegian Trench and/or Southern Bight strata.

### Supporting information

Priority	The current activities of this Group will lead ICES into issues related to the development of Integrated Ecosystem Assessments for the North Sea (a data rich ecosystem) as a step towards implementing the ICES Science Plan and the ecosystem approach, these activities are considered to have a very high priority.
Resource requirements	Assistance of the Secretariat in maintaining and exchanging information and data to potential participants, especially the services of the ICES data centre to generate data tables for analysis from selected variables held in the database and potentially web-hosting relevant material
Participants	The Group is generally attended by 10–20 members and guests.
Secretariat facilities	None.
Financial	No financial implications.
Linkages to ACOM and group under ACOM	Relevant to the work of ACOM and SCICOM
Linkages to other committees or groups	There is a very close working relationship with all the IEASG working groups. It is also very relevant to the following ICES expert groups: WGSFD, WGECO, WGSHP, WGCEAM, WKINTRA, WGBESIO, WGFBIT
Linkages to other organizations	OSPAR, NAFO, DG-ENV, DG-MARE

## WGSOCIAL - Working Group on Social Indicators

**2020/FT/IEASG02** The **Working Group on SOCIAL indicators** (WGSOCIAL), chaired by, Amber Himes-Cornell, FAO, and Marloes Kraan, Netherlands, and will work on ToRs and generate deliverables as listed in the Table below.

	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
	30 March	Online meeting		
<b>Year 2021</b>	17 May	Online meeting	E-evaluation	Lisa L. Colburn will step down by end-2021
	10,11,15,17,18 June	Online meeting		
<b>Year 2022</b>	9-10 May	Online meeting	E-evaluation	
	16-19 May	Online meeting		
<b>Year 2023</b>	TBD	Europe	Final ICES Scientific report by (TBD) 2021	

## ToR descriptors 2021 – 2023

ToR	DESCRIPTION	BACKGROUND	<a href="#">SCI-ENCE PLAN CODES</a>	DU-RATION	EXPECTED DELIVERABLES
a	To continue building capacity for social science in ICES, giving consideration to research and institutional needs in all ICES member countries, as well as useful connections to international marine/ fisheries social science organizations, such as the Society for Applied Anthropology and the Centre for Maritime Research (MARE).	This builds on the initial scoping exercise within ICES to expand social science capacity building efforts, but also ensures coordination of activities with other international bodies and links to the wider scoping work in the Strategic Initiative for the Human Dimension (SIHD).	5.4, 6.6	Years 1 –3	Annual reporting
b	To identify and report on culturally relevant social indicators and community data gaps that point to priorities for data collection, research, institutional needs, and training in all ICES member countries; and where possible propose systems to collect missing data.	To aid prioritization of data collection, management and analysis to enable qualitative and quantitative analyses of social issues for Ecosystem Overviews, Integrated Ecosystem Assessments and future advice requests. The ToR also links to ICES Data Centre.	4.2, 5.4, 6.6, 7.1, 7.2, 7.7	Years 1 –3	Annual reporting, potentially also scientific manuscript

c	To investigate the approaches, methods, tools and information flow needed to provide trade-off analysis of the impacts of alternative management measures on communities and stakeholder groups	To develop a system to support potential future advice requests and development of Ecosystem Overviews and Integrated Ecosystem Assessments.	5.4, 5.8, 6.5, 7.3, 7.5, 7.6	Years 1 –3	Annual reporting
d	To assess and report on the social and cultural significance of commercial fishing and its management for selected coastal regions in the ICES area	To support future potential advice requests and development of Ecosystem Overviews and Integrated Ecosystem Assessments.	2.7, 5.8, 6.6, 7.1, 7.2, 7.7	Years 1 –3	Annual reporting, potentially also scientific manuscript(s)
e	To coordinate the provision of culturally relevant social indicators and analysis as part of integrated socio-ecological evaluations in support of Ecosystem-Based Management.	To contribute to the development of a framework for integrated assessment of alternative scenarios for marine fisheries, as part of broader Ecosystem-Based Management approaches.	2.7, 4.3, 6.5, 6.6,, 7.1, 7.2, 7.7	Years 1 –3	Annual reporting

### Summary of the Work Plan

<b>Year 1</b>	Continue the current work and identification of ongoing needs for social science in ICES (ToR a). Continue defining culturally relevant social indicators and identifying data gaps for specific contexts and applications (ToR b). Link with the work on social indicators of STECF. Start work on defining the information flow needed to provide trade-off analysis (ToR c). Develop and maintain connections with other relevant groups within and outside ICES (ToRs a and e). Collaborate with WGECON on shared case studies (ToR e). Produce Interim Report.
<b>Year 2</b>	Work toward completion of case studies with WGECON (ToRs b, c and d) and assessing the social and cultural significance of commercial fishing (ToR d). Work with other relevant groups within and outside ICES (ToR e). Produce Interim Report.
<b>Year 3</b>	Aim to complete ToR c, d, and e, including the planned manuscripts. Discuss and plan strategies and concrete steps for future work. Produce Final Report.

### Supporting information

Priority	<p>Nations are concerned about the sustainability of fish stocks and marine ecosystems, not least because they can contribute to human well-being and food security; therefore, these natural resources have a societal value. The social dimension is increasingly an integral part of marine science and scientific advice regarding the use and conservation of marine resources.</p> <p>In 2017, ICES realised that the demand for science and advice to address social and societal considerations was increasing, and the Strategic Initiative on the Human Dimension (SIHD) has served to raise the profile of social science in ICES in the last few years. With WGSOCIAL, ICES has an EG that addresses social issues and focuses primarily on the development of social metrics and core social analyses that are demanded in parts of the ICES network (e.g., further development of ecosystem overviews).</p> <p>The benefits of expanding the engagement of ICES in social science were highlighted in the MSEAS meeting 2016, resulting in a second MSEAS meeting, planned for 2021.</p>
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	<p>The recent ICES webinar on COVID-19 also demonstrated the value of social science for marine science and ICES commitment to it. Although there has been no official request of social indicators as of 2020, it is clear that interest is growing for interdisciplinary approaches. DGMARE is also exploring what the social dimension of the Common Fisheries Policy is and can be. Within ICES there is recognition that it is desirable to add social metrics to ICES ecosystem overviews and thus to recognize people and their livelihoods as part of the ecosystem.</p>
Resource requirements	<p>The group will rely on ongoing international and national research projects to support involvement of WGSOCIAL members. WGSOCIAL will work with the ICES Data Centre to obtain port data in order to develop a socio-economic product for the ecosystem overviews.</p>
Participants	<p>41 participants, from 15 countries</p>
Secretariat facilities	<p>None.</p>
Financial	<p>No financial implications.</p>
Linkages to ACOM and groups under ACOM	<p>In the longer term the EG will be ready to support ACOM in addressing advisory requests from ICES clients if these are forthcoming.</p>
Linkages to other committees or groups	<p>The subject area of this EG has close linkage with the following ICES groups: WGEAWESS, WGBESEO, WKCONSERVE, WGMARS, WGCOMEDA, WGIMM, WGBIE, WGIAB, WGSEDA, WGECON, WGIMM, WGRMES, WGNARS, WGHIST and the Strategic Initiative SIHD.</p> <p>Frequent interaction with WGECON and SIHD is especially important to ensure the smooth and efficient introduction of further social and economic science into the ICES network.</p>
Linkages to other organizations	<p>Society of Applied Anthropologists (SfAA), NOAA Fisheries Human Dimensions and IEA Program, the Centre for Maritime Research (MARE), the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES), Organisation for Economic Cooperation and Development (OECD), Scientific, Technical and Economic Committee for Fisheries (STECF EWG 20-14), Coast Action, PICES, IMBER Human Dimension group, Future Coasts</p>

## WGIPEM - Working Group on Integrative, Physical-biological, and Ecosystem Modelling

2021/FT/IEASG06 The Working Group on Integrative, Physical-biological, and Ecosystem Modelling (WGIPEM), chaired by Solfrid Sætre Hjøllo, Norway, Sonja van Leeuwen, Netherlands, and Ute Daewel\*, Germany, will work on ToRs and generate deliverables as listed in the Table below.

	Meeting dates	Venue	Reporting details	Comments (change in chairs, etc.)
Year 2022	24-28 October	Royal Netherlands Institute for Sea Research, Texel, The Netherlands (remote participation possible)	ICES scientific report by 1 December	Ute Daewel, Germany, incoming Chair, Solfrid Hjøllo to continue for 1 year (knowledge transfer), Marie Maar as outgoing Chair.
Year 2023	March/April	ICES headquarters, Copenhagen, Denmark	ICES scientific report by TBD	Solfrid Hjøllo as outgoing Chair
Year 2024	March/April	Southern Europe	Final ICES scientific report by TBD	New incoming chair TBD, Sonja van Leeuwen to continue for 1 year (knowledge transfer).

### ToR descriptors

TOR	DESCRIPTION	BACKGROUND	SCI-ENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
a	<p>Improve model interaction between trophic levels by:</p> <ul style="list-style-type: none"> <li>- Investigating the importance of spatio-temporal scales for trophic match-mismatch</li> <li>- Assessing human activities on effects on ecosystems, including cumulative impacts</li> </ul>	<p>Fundamental science lying behind the structural and parametric needs for these types of model.</p> <p>Important for IEA groups and WKEWIEA.</p> <p>Linked to Marine Ecosystem Research Program</p>	2.2, 2.5	Annual	<p>Report or paper on how human activities affecting marine ecosystems can be described in models.</p> <p>Evaluation of the ICES ASC 2021 session on 'Impacts of human pressures on ecosystem components assessed by dynamic modelling, organized by the group; status, knowledge gaps and future perspectives.</p> <p>Further develop contact to the social science EG's.</p> <p>Where appropriate peer reviewed publications are endorsed.</p>

<b>b</b>	<p>Improving lower trophic level models by investigating:</p> <ul style="list-style-type: none"> <li>- Parameterization of functional diversity (community structure, traits) and adaptations</li> <li>- Patterns and drivers of plankton phenology and productivity across models and ecosystems</li> <li>- Benthopelagic coupling in models</li> </ul>	<p>More research is needed to improve model description of diversity, adaptation and traits in lower trophic level models.</p> <p>The benthopelagic coupling is important for nutrient and energy fluxes and should be better described in the models.</p> <p>IEA groups, WGZE and BEWG.</p>	1.3, 1.9	Annual	<p>Collaborative paper on productivity and drivers across models and ecosystems.</p> <p>Collaborative paper on productivity across ecosystems.</p> <p>Report on impacts of human pressures on ecosystem components assessed by dynamic modelling.</p> <p>Where appropriate peer reviewed publications are envisioned.</p>
<b>c</b>	<p>Improve higher trophic level models by investigating:</p> <ul style="list-style-type: none"> <li>- Effects of connectivity, climate and habitat on emerging species distribution, to support management and fisheries</li> <li>- Key process formulation (mortality, physiological rates, etc.)</li> <li>- Movement algorithms</li> </ul>	<p>Understanding the connectivity between networks of MPAs and biological hot-spots under influence of climate change is vital. Connectivity is also essential to defining the spatial structure of stocks and better understanding of the recruitment process.</p> <p>Fundamental research is needed to improve the description of key physiological processes in models.</p> <p>Important for IEA EG's, spatial planning EG's, BWEG, WGBIOP and for advice.</p>	1.3, 1.4	Annual	<p>Report on impacts of human pressures on ecosystem components assessed by dynamic modelling.</p> <p>Collaborative report or paper on movement algorithms used in modelling.</p> <p>Appropriate peer reviewed publications are envisioned.</p>
<b>d</b>	<p>Assessment of model skill evaluation methods by:</p> <ul style="list-style-type: none"> <li>- Comparison of existing guidelines and metrics of skill assessment using existing examples and applying these methods to models used by the group to conclude on the feasibility of the currently existing approaches and identify possible weaknesses</li> <li>- Investigate uncertainty analysis (structural, parameters, scenarios) including model ensembles</li> <li>- Exploring representativeness and use of observations for ecosystem model validation</li> </ul>	<p>The lack of systematic evaluation of ecosystem model performance and sensitivity currently limits their use in an operational and management context.</p> <p>Evaluation is challenged by the complexity of the models themselves, as well as model vs sparse dataset comparisons, where characterizing different types of variability (mean or trend; interannual or seasonal; rare or extreme events etc.) are needed.</p> <p>Links to all EGs using multispecies and ecosystem modelling (e.g. WGSAMS, WGIMM, working groups on integrated assessments).</p>	1; 3, 5.3	Annual	<p>Collaborative report or paper on representativeness.</p> <p>Appropriate peer reviewed publications are envisioned.</p>

### Summary of work plan

<b>Year 1</b>	Annual meeting to report on the state-of-the-art of the topics in ToRs a-d, planning of joint papers and specific workshops on selected topics.
<b>Year 2</b>	Annual meeting to report on the state-of-the-art of the topics in ToRs a-d and joint meeting with other expert groups. Specific workshop on some of the identified topics.
<b>Year 3</b>	Annual meeting and final report on the state-of-the-art of the topics in ToRs a-d, and joint meeting with other expert groups.

### Supporting information

<b>Priority</b>	This group's activities will support the ecosystem approach to fisheries science by combining knowledge of physical and biological processes, and modelling expertise that is required to strengthen our understanding of ecosystem functioning. The group will foster the development of and report on the application of "end-to-end" modelling tools. The activities of the group will foster international collaboration and networking among established and young scientists in a rapidly evolving science field, and should be given high priority.
<b>Resource requirements</b>	The research programs 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.
<b>Participants</b>	It is envisioned that this group will attract a large community of biologists / experimentalists, and modellers – with an annual meeting attended by some 15–25 members and guests.
<b>Secretarial facilities</b>	None.
<b>Financial</b>	No financial implications.
<b>Linkages to ACOM and groups under ACOM</b>	There are no obvious direct linkages, but discussion and/or workshops with other groups are envisioned.
<b>Linkages to other committees and groups</b>	There is a very close working relationship with all the groups of IEASG. It is also very relevant to WGSAM, WGBE, WGS2D, WGINOSE and WGSPF.
<b>Linkages to other organisations</b>	There are natural linkages to PICES Working Group 40: Climate and Ecosystem Predictability, and Joint IMBeR/Future Earth Coasts Continental Margins Working Group (CMWG), and the group will seek to establish communication with these organizations. Several members are involved with OSPAR ICG-EMO and with the Nansen Legacy and the European Marine Board. We also have several members employed at Joint Research Centres (EU). Member presentations at annual meetings ensure the group knows of developments within these organisations.

## Resolutions approved in 2019/2020

### WGEAWESS - Working Group on Ecosystem Assessment of Western European Shelf Seas

**2019/FT/IEASG01** The Working Group on Ecosystem Assessment of Western European Shelf Seas (WGEAWESS) chaired by Marcos Llope, Spain, Jacob Bentley\*, UK, and Sigrid Lehuta\*, France, will work on ToRs and generate deliverables as listed in the Table below.

Year	Meeting dates	Venue	Reporting details	Comments (change in Chair, etc.)
Year 2020	29 June – 3 July	Meeting online	E-evaluation	
Year 2021	11 February 5 – 9 July	Meeting online	E-evaluation	Outgoing chair: Debbi Pedreschi
Year 2022	2–5 May	Meeting online	Final ICES Scientific Report by to IEASG	Incoming Chairs: Jacob Bentley, UK, and Sigrid Lehuta, France

### ToR descriptors

ToR	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN</a> <a href="#">CODES</a>	DURATION	EXPECTED DELIVERABLES
a	Review and update the Bay of Biscay/Iberian Coast (BoB-IC) and Celtic Seas (CS) ecoregion Ecosystem Overviews (EO).	Linked to ICES advice and WKEO3.	6.1, 6.5, 6.6	Ongoing	Ecosystem overviews (EO).
b	Compare and contrast among sub-ecoregion level ITAs to identify and report on commonalities and divergences among areas, with a focus on climate variability.	Responding to requests for standardisation of ecosystem advice products and inclusion of climate change information in Ecosystem Overviews.  Linked to WKINTRA, WGS2D, WGOOFE and the commitment to provide advice in the context of EAFM.	1.4, 1.9, 6.5	3 years	Inform IEAs/E O.  Results in the final report or/and as a collaborative paper.
c	Investigate and report on the sub-regional spatio-temporal entities constituting the Bay of Biscay/Iberian Waters and Celtic Seas ecoregion, and the multiple pressures relevant at these scales in	Linked to WKEWIEA, WKIRISH, ToR B and previous group ToRs. Investigation of scaling issues related to summarising information from locally relevant scales/models.	1.3, 2.4, 6.5	3 years	Inform IEAs/EO.  Results in the final report or/and as a collaborative paper.

	support of ecosystem-based management.				
<b>d</b>	Explore and describe the potential for incorporating additional products (e.g. MSFD indicators, model outputs, social indicators) from ICES EGs and other processes (e.g., OSPAR, EEA, STECF) into the Ecosystem Overviews	Strongly linked to ToR A, WGCERP, WGSOCIAL, WKEO3 and MSFD. Maximising efficiency across relevant groups for EO development, eliminating redundancy.	4.1, 6.5, 6.6	3 years	<b>Ecosystem overviews. Collaborative network with improved workflow.</b>
<b>e</b>	High resolution Ecospace models for selected case studies within WGEAWESS ecoregions to identify opportunities to support marine spatial planning.	Working together with ToR C to explicitly incorporate spatial aspects into regional modelling work, investigating opportunities for trade-off analyses and inclusion of socio-economic considerations	6.1., 6.3., 6.6	3 years	<b>Regional modelling products</b>

## Summary of the Work Plan

	The main tasks will be related to drafting the outline for the papers/process for ToRs B&C, and identifying which group members can apply the agreed upon methodology (within their limited resources). Start the process for reviewing the BoB-IC Ecosystem Overviews.
<b>Year 1</b>	The group will continue to identify data and outputs that may be potentially valuable to IEAs, EAFM, and particularly the Ecosystem overviews (Tors A, D & E). The group will work to improve communication with other relevant groups (e.g. WGS2D, WGOOFE, WGSOCIAL, WGCOMEDA, WGIAB, WGMARS, WGBIE, WGIPEM).
<b>Year 2</b>	Continue with Year 1 activities while liaising with relevant ICES WG and external groups (e.g. OSPAR) as relevant. Progress agreed upon methodologies for ToRs B&C, write papers. Advance ToR E, developing regional models (scope of model development/ number of case studies will be dependent funding).
<b>Year 3</b>	Continue with Year 2 activities while liaising with relevant ICES WG membership. Finalise papers.

## Supporting information

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<b>Priority</b>	<p>Heavy pressure on shelf seas (biodiversity loss, climate changes, fisheries), lack in understanding of large marine ecosystem functioning and the context of ecosystem health indicators development for the Marine Strategy Framework Directive require to address those research topics at the relevant scale i.e. the regional approach. Recently questions have arisen in relation to how to identify relevant scales for various processes, and how to summarise ecoregion level information from disparate, non-continuous data (e.g. surveys using different gears, different modelling approaches, and different socio-economic contexts). Furthermore, standardisation of approaches has become a key topic, particularly as ecosystem assessment moves more towards the realms of advice. This presents particular challenges in the face of such diversity.</p> <p>The EAWESS working group will focus on North Atlantic European continental shelf. Regional area of interest includes the Celtic Seas (Celtic Sea, Irish Sea, West of Scotland), Bay of Biscay (French continental shelf, Cantabrian Sea) and Western Iberia (Iberian Upwelling, Gulf of Cadiz), involving five countries (Ireland, UK, France, Spain and Portugal).</p>
<b>Resource requirements</b>	<p>There is no resource implication for ICES. Working group program is based on synthesis of data and results from existing data sources and in line with existing funding/ scientific programs. Scope of activities is dependent on this funding. Assistance from the ICES Secretariat and IEA Steering group Chair will be useful in identifying and making connections with relevant groups.</p>
<b>Participants</b>	<p>The Group is normally attended by some 8 members plus guests.</p>
<b>Secretariat facilities</b>	<p>None.</p>
<b>Financial</b>	<p>No financial implications.</p>
<b>Linkages to ACOM and groups under ACOM</b>	<p>Direct link to IEA steering group, ICES advice.</p>
<b>Linkages to other committees or groups</b>	<p>There is a very close working relationship with all the groups of IEASG. It is also very relevant to the Working Group on WGECO, WGCERP, WGSAM, WKIrish, along with stock assessment groups such as WGHANSA, WGBIE, WGCSE, WGMIXFISH. Collaborations for the new ToRs have been instigated with WGSOCIAL, WGS2D, WGCOMEDA and WGMARS. The work and membership of this group is also critical to workshops such as WKEWIEA and WKINTRA which are co-chaired by group members, and feedback to the work of WGEAWESS.</p>
<b>Linkages to other organizations</b>	<p>DC- MAP- DG MARE, MSFD DG ENV, OSPAR.</p>

## WGMARS - Working Group on Maritime Systems

**2019/FT/IEASG02** A Working Group on Maritime Systems (WGMARS), chaired by Patricia M. Clay, USA, Leyre Goti, Germany, and Jennifer Bailey, Norway, 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	20-24 April	Online meeting	ICES Scientific report by 1 June 2020	Johanna Ferretti, Germany outgoing and Leyre Goti, Germany incoming
Year 2021	3-7 May	Online meeting	ICES Scientific report by 20 August	Jennifer Bailey incoming additional Chair
Year 2022	23-27 May	Online meeting	Final ICES Scientific report by 31 August	Patricia M. Clay, USA; outgoing.

### ToR descriptors

ToR	Description	Background	<a href="#">Science plan codes</a>	Duration	Expected Deliverables
a	Analyse how inter- and transdisciplinary science can improve management and advice	ICES has prioritized the investigation of sustainability dimensions with a view to maritime uses and responses and the integration of different types of knowledge and evidence. One approach to do so are IEAs which are based on a premise of EBM. IEAs and EBM require both social and natural sciences as well as engagement with stakeholders.	3.6, 6.6, 7.4	3 years	Peer-reviewed papers, ICES reports, workshops
b	Analyse how the use of behavioural economics can support IEA/EBM implementation	Policy evaluation in IEA requires insight into human behaviour in order to (1) predict how users respond to policy interventions, and (2) how stakeholders judge trade-offs between conflicting objectives.	6.3, 7.4, 7.5	Years 1,2,3	Peer-reviewed paper on behavioural economics for policy evaluation

c	Review and provide guidelines for conceptual modeling to assist Regional Seas WGs	Conceptual modeling, including through the use of, for instance, Mental Modeler or Bow-Tie Analysis, can aid scientists from different fields, as well as scientists and stakeholders, to facilitate improvements to their IEA activities.	5.3, 6.2, 7.5	Year 1, 2, or 3	At least one workshop with one or more ICES Regional Seas or other IEA-related WGs
d	Evaluate the current use of ICES IEAs in support of management and advice	ICES has prioritized the use of IEAs, e.g., in the Regional Seas WGs, as a tool for understanding tradeoffs in fisheries policies.	1.9, 3.2, 6.1	Years 1,2	Peer-reviewed paper on the current status of IEAs in the regional seas WGs
e	Apply Social Network Analysis as a tool to assess ICES network connectivity and preparedness to address IEAs and the ICES Science Plan	Review of existing SNA paper drafts and relevant reports from previous WGMARS work; finish and submit the current SNA draft that was initiated with the ICES Science Fund; initiate updated analyses for ICES IEA EGs.	6.3, 7.4, 7.5	Years 1,2,3	Peer-reviewed paper on the SNA of ICES
f	Analyse and compare the implementation and linkages of IEA/EBM/MSP and fisheries in the EU, individual European member states, and the US	ICES supports the use of EBM and IEAs, while many EU states support MSP. There is a need to connect science done for both purposes and IEA (supported by ICES) is a tool that could be used with either EBM or MSP.	7.4, 6.1, 6.6	Years 1,2	ICES Report

### Summary of the Work Plan

<b>Year 1</b>	MAP THE USE OF EBM, IEA, AND MSP IN A VARIETY OF CONTEXTS.
Year 2	Explore techniques for understanding stakeholder behaviour as well as facilitating stakeholder involvement.
Year 3	Explore uses of our work and how ICES stakeholders interact to support ICES advice.

### Supporting information

<b>Priority</b>	The current activities of this Group will lead ICES into issues related to the ecosystem effects of fisheries and ecosystem-based maritime management, especially with regard to the integration of different sustainability dimensions in the consideration of human maritime activities. Consequently, these activities are considered to have a very high priority.
<b>Resource requirements</b>	Resource requirements are covered by WGMARS members, including through already funded projects and in some cases with institutional support.

<b>Participants</b>	The Group is normally attended by some 10-15 members and guests.
<b>Secretariat facilities</b>	None.
<b>Financial</b>	No financial implications.
<b>Linkages to ACOM and groups under ACOM</b>	There are no obvious direct linkages.
<b>Linkages to other committees or groups</b>	There is a very close working relationship with the IEASG. WGMARS is also very closely connected to the Strategic Initiative on Human Dimensions and involved in its activities.
<b>Linkages to other organizations</b>	WGMARS is very relevant to the Regional Seas Working Groups, and involved in Workshops such as WKINWA, WKBESIO, WKCONSERVE, and others. WGMARS reaches out to various stakeholders and EBM professionals outside of ICES.

### WGCOMEDA - Working Group on Comparative Ecosystem-based Analyses of Atlantic and Mediterranean marine systems

**2019/FT/IEASG03** The **Working Group on Comparative Ecosystem-based Analyses of Atlantic and Mediterranean marine systems** (WGCOMEDA), chaired by Sofia Henriques, Portugal, Maria Cristina Mangano, Italy, Paris Vasilakopoulos, Italy and Romain Frelat, Netherlands, will work on ToRs and generate deliverables as listed in the Table below.

YEAR	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
Year 2020	21-25 September	by correspondence	No reporting	Four new co-chairs to pursue the development of WGCOMEDA activities
Year 2021	4-7 October	Online meeting	No reporting	
Year 2022	3-7 October	University of Palermo (Distem), Palermo, Italy	Final ICES Scientific report by July 2022	

#### Tor descriptors

TOR	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	DURATION	EXPECTED DELIVERABLES
a	Assess the <b>functional biodiversity</b> of demersal and benthic assemblages across Mediterranean and Atlantic systems	A) The topic is a follow up from the work in the previous cycles aiming to improve: (1) the use of functional traits to assess the structure and functioning of marine assemblages (integrating different taxonomic groups) and (2) the assessment of functional biodiversity patterns across Mediterranean and Atlantic systems	1.4; 1.9; 2.2	3 years	1. Define the <b>core functional traits</b> across different taxonomic groups in order to integrate the current approaches  2. <b>Compile trait data</b> for phytoplankton, zooplankton, fish and invertebrate species to standardize the use of traits

		B) The topic will provide better understanding of ecosystems functioning and improve our ability to predict the impact of environmental and human-induced changes.			3. Identify possible methods to deal with <b>dynamic traits on space and time</b> , i.e. Those which are demographic (e.g. Fecundity) or ontogenetic (e.g. Diet) dependent
					4. Understand spatio-temporal dynamics and patterns of <b>functional diversity and respective drivers</b> (trait biogeography; co-occurrence of traits)
					5. Understand functional changes to different human pressures and <b>predict the vulnerability and stability of Mediterranean and Atlantic ecosystems</b> (resilience indicators).
b	Integrate the complexity of marine biota to understand how <b>ecosystem structure and connectivity</b> support the stability of communities	A) The topic is a follow up from the work in the previous cycles and addresses issues on integrating multi-trophic interactions for IEA B) Ecosystem structure and connectivity is known to affect community stability, but empirical evidences are still weak. Embracing the complexity of marine ecosystems (e.g. By integrating trophic interactions) will strengthen the input and guidance for ecosystem-based management.	1.4; 1.9; 5.2	3 years	1. Review existing <b>food webs models</b> across Mediterranean and Atlantic systems  2. Identify possible methods to <b>predict species interactions from traits</b> and extend multi-trophic interaction network in data-poor regions  3. Understand spatio-temporal dynamics of food webs and identify the <b>link between structure and stability</b> across ecosystems  4. Understand past and <b>predict future vulnerabilities</b> of communities to fishing disturbances or biological invasions.
c	Investigate <b>resilience and mechanisms of change</b> in complex marine systems im-	A) The topic is a follow up from the work in the previous cycles and aims to study systems undergoing changes in the NE Atlantic and the	1.3; 1.9; 6.5	3 years	1. Review and update existing information on the <b>temporal development of ecosystems</b> in the

pacted by anthropo- Mediterranean to uncover synchro- NE Atlantic and the Mediterra-  
 genic and environmen- nies and analogies across them. nean.  
 tal drivers

B) Several complex marine systems have been shown to respond to environmental and/or anthropogenic drivers with abrupt regime shifts. Comparative analysis of different systems will elucidate the exact role of different drivers in eroding or reinforcing the resilience of specific system states and help anticipate future tipping points. The impact to both ecosystems and fisheries can then be evaluated.

2. Develop and test different types of **Integrated Assessments**: e.g. Ecosystem-based, traits-based, population-based etc.

3. Quantify the **resilience of different system states** and elucidate the specific role of different stressors.

4. Compare the system dynamics and **temporal occurrence of shifts** in different ecosystems of the NE Atlantic and the Mediterranean Sea.

5. Improve our **prediction capability on future shifts** in complex marine systems through a better understanding of the past dynamics.

d	Explore options to integrate ecological and socio-economic dimensions to support integrated fisheries advice and marine management	A) New topic incorporating social and cultural aspects in order to support the implementation of IEA in regional ecosystems.	6.6; 7.1; 7.2;	3 years	1. Scoping exercise mostly focused in the Mediterranean Sea to check for existing literature and to ensure coordination of activities with other international bodies and existing wgs within and outside ICES (e.g. ICES wgsocial, JRC, GFCM).
		B) The tor will be organised around 3 main activities and expected deliverables: scoping and systematic review, evidence mapping and synthesis, comparative analysis of case studies.			2. Evidence mapping to highlight the current work and identify future needs and gaps for social science in Med.
					3. Case studies assessing and reporting the social and cultural significance of commercial fishing (coastal regions in both the Med and Atlantic). Selection and provision of relevant indicators

and analysis with economic and ecological information.

4. Framework for collective reporting (database) to support future potential data collection, data analysis and advice development in a context of integrated ecosystem assessments.

5. Trade-off exploration to assess the socio-cultural and economic significance of commercial fishing (work with other relevant ICES wgs).

## Summary of the Work Plan

### Year 1

1.1 Definition of the core functional traits across different taxonomic groups. This activity will be developed in order to integrate the current approaches among trophic levels (i.e. What traits should we use to understand linkages between plankton, fish and benthic invertebrates) - Deliverable tor a1. Then, we will start the collection and compilation of standardized trait data for phytoplankton, zooplankton, fish and invertebrate species in order to create a common trait database – toward Deliverable tor a2.

1.2 Reviews and update databases of (i) existing food webs models, (ii) temporal development of ecosystems and (iii) socio ecological systems approaches across Mediterranean and Atlantic systems - Deliverables tor b1, tor c1 and tor d1. All the 3 tors (b, c and d) start with a revision activity of data from the scientific and grey literature as well as a survey of current work from participants of the working group. Temporal dynamics of ecosystems could be informed by time-series of the abundance of different taxa (e.g. From scientific surveys) and/or fisheries-related data (e.g. Fisheries landings) - Deliverables tor c1. The scoping exercise of socio-ecological systems is followed by an evidence mapping (data analysis from the systematic review - Deliverables tor d1) that will depict the current work and identify future needs and gaps for social science when dealing with ecosystem-based approach - Deliverable tor d2.

1.3 Networking activities to ensure coordination with other international bodies and existing wgs within and outside ICES.

### Year 2

**2.1 Completion of the common trait database** - deliverable tor a2 - and identification of methods to deal with dynamic traits on space and time, i.e. Those which are demographic (e.g. Fecundity) or ontogenetic (e.g. Diet) dependent - deliverable tor a3 - and to predict species interactions from traits and extend multi-trophic interaction network in data-poor regions - deliverable tor b2.

**2.2 Development and testing of different types of Integrated Assessments** (e.g. Traits-based linking to tor a2, ecosystem-based, population-based) - deliverable tor c2, in order to quantify the resilience of different system states and elucidate the specific role of stressors - deliverable tor c3.

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**2.3. Case studies assessing and selecting relevant indicators dealing with socio-ecological systems** - Deliverable tor d3, e.g. The social and cultural significance of commercial fishing (coastal regions in both the Mediterranean and the Atlantic).

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**Year 3**      **3.1 Spatio-temporal analysis of functional diversity dynamics** - deliverables tor a4 - **and of food webs structure** - deliverables tor b3 – in order to understand past dynamics and identify drivers of change across ecosystems in NE Atlantic and the Mediterranean Sea.

**3.2 Assessment of future vulnerability and stability of Mediterranean and Atlantic ecosystems to different human pressures**, through looking at functional changes and developing resilience indicators - deliverables tor a5 – and by using food web structure to indicate the ecosystem resilience to disturbances (e.g. Fishing disturbances or biological invasions) - deliverables tor b4.

**3.3 Comparison of the temporal occurrence of shifts in different ecosystems of the NE Atlantic and the Mediterranean Sea** to improve our prediction capability on future shifts in complex marine systems through a better understanding of the past dynamics - Deliverables tor c4 and c5.

**3.4 Collective reporting (database) to assess the socio-cultural and economic significance of commercial fisheries** and support future potential data collection, data analysis, trade-off elaboration and advice development in a context of integrated ecosystem assessments of commercial fishing - Deliverables tor d4 and 5.

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## Supporting information

### Priority

The aim of this working group (WG) is to investigate both cross-systems and system-specific key questions to guide research and improve the ecosystem approach to management of living marine resources of the European Seas. To this end, we use existing data and analysis from regional systems of the North East Atlantic Ocean and Mediterranean Sea. A **comparative approach of marine ecosystems** is essential to learn how Mediterranean and Atlantic ecosystems are structured, how they function, and also to identify which are the more sensitive species or ecological processes to be managed within the ecosystem dynamics. Therefore, this WG aims at strengthening the scientific basis for regional and integrated ecosystem approach of coastal and marine living resources through a comparative platform of research.

During the previous two cycles, WG COMEDA established a strong network of collaboration that will continue contributing to the comparative knowledge of Atlantic and Mediterranean systems. The new tors build up on past research of the group and propose to use novel approaches to assess the **functional diversity, resilience, connectivity and complexity of marine assemblages**, both across biological groups and between Mediterranean and Atlantic systems. Additionally, a new topic (tor d), related with ecosystem services, aims to **integrate the socio-economic dimension** with the advanced biological knowledge in order to better understand the effects of both anthropogenic changes and management options in the ecosystems.

Close collaboration with other wgs of the SCICOM/ACOM Integrated Ecosystem Assessments Steering Group (IEASG) such as WGIAB, WGEAWESS, WGSOCIAL and WGMARS will provide a solid basis to develop the research topics and tor d of this new COMEDA cycle. Furthermore, during this new cycle

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we will invite colleagues working on ecosystem services and on linking socio-economic and ecological dimensions to the meetings to develop and improve COMEDA's current knowledge. The new tor d shows the commitment of the group to develop applied research to support integrated fisheries advice and marine management.

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**Resource require-  
ments** Information from ICES, GFCM, and JRC – STECF WG databases are the main input for this group. No additional resources are identified, although participation of some experts (especially early career scientists) to working group meetings depends on funding availability.

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**Participants** The Group is normally attended by some 20–25 members and guests.

The preliminary list of possible participants is the following:

- Romain Frelat (University of Hamburg, Germany) – Chair and expert on Atlantic ecosystems (North Sea and Baltic Sea).
  - Sofia Henriques (University of Lisbon, MARE, Portugal) – Chair and expert on Atlantic ecosystems, global meta-analysis and functional diversity.
  - Paris Vasilakopoulos (European Commission - JRC, Italy) – Chair and expert on Mediterranean ecosystems and resilience.
  - Maria Cristina Magano (distem,, University of Palermo, Italy) – Chair and expert on Mediterranean ecosystems.
  - Marta Coll (ICM-CSIC, Spain) – Expert on Mediterranean ecosystems and food webs.
  - Manuel Hidalgo (IEO, Spain) – Expert on Atlantic and Mediterranean ecosystems.
  - Hilmar Hinz (IMEDEA-CSIC, Spain) – Expert on Atlantic ecosystems and invertebrates' biodiversity and assemblages.
  - Christian Möllmann (Univ. Of Hamburg, Germany) – Expert on Atlantic ecosystems.
  - Evangelos Tzanatos (University of Patras, Greece) – expert on Mediterranean ecosystems.
  - Bastian Merigot (University of Montpellier, France) – expert on Atlantic and Mediterranean ecosystems.
  - Françoise Le Loch (IRD, France) – Expert on Atlantic and Mediterranean ecosystems.
  - Konstantinos Tsagarakis (Greece) – Expert on Mediterranean ecosystems (Aegean Sea).
  - Martin Lindegrem (DYU-AQUA, Denmark) – Expert on Atlantic ecosystems (Baltic Sea).
  - Rita Vasconcelos (IPMA, MARE, Portugal) – Expert on Atlantic ecosystems, fisheries management and global meta-analysis.
  - Silvia de Juan (IMEDEA-CSIC, Spain) – Expert on Atlantic ecosystems and invertebrates' biodiversity and assemblages.
  - Lucia López (IEO, Spain) – Expert on Mediterranean ecosystems and food webs.
  - Michele Casini (Swedish University of Agricultural Science, Sweden) – expert on Atlantic ecosystems (Baltic Sea).
  - Thorsten Bleckner (Stockholm Resilience Center, Stockholm University, Sweden) – expert on Atlantic ecosystems (Baltic Sea).
  - Henn Ojaveer (University of Tartu, Estonia) – expert on Atlantic ecosystems (Baltic Sea).
  - Sheila Heymans (SAMS, UK) – expert on Atlantic ecosystems (Western Scotland).
  - Marian Torres (University of Algarve , Portugal) – expert on Atlantic ecosystems.
  - Eider Andonegi (AZTI, Spain) – expert on Atlantic ecosystems (Cantabric Sea).
  - Joachim Claudet (CRIOBE, France) – expert on Pacific and Mediterranean ecosystems.
  - Heino Fock (Thuener, Germany) - expert on Atlantic and Arctic ecosystems (Greenland).
  - Ignacio Catalàn (IMEDEA, Spain) – expert on Atlantic and Mediterranean ecosystems.
  - Jaime Otero (IIM, CSIC, Spain) – expert on Atlantic and Arctic ecosystems.
  - Laurène Pécuchet (DTU-AQUA,Denmark) – expert on Atlantic and Mediterranean ecosystems.
  - Mariano Koen-Alonso (DFO, Canada) – expert on Atlantic ecosystems (West Canada).
  - Raul Primicerio (University of Tromsø, Norway) – expert on Arctic ecosystems (Barents Sea).
  - Marcos Llope (IEO, Spain) – expert on Atlantic ecosystems
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<b>Secretariat facilities</b>	None
<b>Financial</b>	No financial implications for ICES.  To facilitate the participation of early-career scientists, WG chairs will apply to marine research consortiums to find financial support for early-career researchers who need travel funding.
<b>Linkages to ACOM and groups under ACOM</b>	There are no obvious direct linkages.
<b>Linkages to other committees or group</b>	There is a very close working relationship with all the groups IEASG, and especially <ul style="list-style-type: none"> <li>– Working Group on Integrated Assessments of the Baltic Sea (WGIAB)</li> <li>– Working Group on Ecosystem Assessment of Western European Shelf Seas (WGEAWESS)</li> <li>– Working Group on SOCIAL indicators (WGSOCIAL) (especially tor d)</li> <li>– Working Group on Maritime Systems (WGMARS) (especially tor d)</li> </ul> It is also very relevant to the Working Groups: <ul style="list-style-type: none"> <li>– Working Group on the Integrated Assessments of the Barents Sea (WGIBAR)</li> <li>– Working Group on Integrated Assessments of the North Sea (WGINOSE)</li> <li>– Working Group on Integrated Ecosystem Assessment for the Central Arctic Ocean (WGICA)</li> <li>– Working Group on the Northwest Atlantic Regional Sea (WGNARS)</li> <li>– Working Group on Biodiversity Science (WGBIODIV) (especially tor b)</li> <li>–</li> </ul>
<b>Linkages to other organizations</b>	None

## WGIBAR - Working Group on Integrated Assessments of the Barents Sea

**2019/FT/IEASG04** A Working Group on the Integrated Assessments of the Barents Sea (WGIBAR), chaired by Elena Eriksen, Norway, and Anatoly Filin, Russia, 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	24-28 February	Bergen, Norway	ICES Scientific Report by 30 March	
Year 2021	2-4 March	Online Meeting	ICES Scientific Report by 31 May 2021	
Year 2022	21-25 February	Online Meeting	Final ICES Scientific Report by <b>TBD</b>	

**ToR descriptors**

ToR	Description	Background	<a href="#">Science Plan codes</a>	Duration	Expected Deliverables
a	Prepare relevant data sets that can be used for the integrated assessments of the Barents Sea	Science and advisory requirements	6.1	Year 1, 2, 3	Updated data sets
b	Perform an integrated analysis of multivariate data sets and other relevant information including model outputs	Science and advisory requirements	1.3; 1.4	Year 1, 2, 3	Annual reports
c	Analyse spatial patterns and trends with special emphasis on shifting distribution of communities and species, and valuable and vulnerable areas	Science and advisory requirements	2.2; 2.4	Year 1, 2, 3	Annual reports
d	Prepare an annual report on the status and trends of the Barents Sea ecosystem	Science and advisory requirements	1.3; 2.1; 6.5	Year 1, 2, 3	Annual reports
e	Provide support to ongoing ecosystem assessments and evaluations in the Barents Sea	Science and advisory requirements	2.2; 2.7; 6.1	Year 1, 2, 3	Annual report
f	Evaluate the current monitoring of the Barents Sea ecosystem	Science and advisory requirements	3.1; 3.2	Year 1, 2, 3	Annual reports

**Summary of the Work Plan**

<b>Year 1</b>	<p>Prepare relevant data sets and other relevant information, including biotic and abiotic ecosystem components and human pressure, that can be used for the integrated assessment of the Barents Sea.</p> <p>Perform an integrated analysis of multivariate data sets and other relevant information including model outputs</p> <p>Prepare an annual report on the Barents Sea ecosystem status and describe fluctuations and changes based on trend analyses and integrated analysis of multivariate data sets</p> <p>Evaluate the current monitoring of the Barents Sea ecosystem</p> <p>Provide support to ongoing ecosystem assessments and evaluations in the Barents Sea</p>
<b>Year 2</b>	<p>Prepare relevant data sets and other relevant information, including biotic and abiotic ecosystem components and human pressure, that can be used for the integrated assessment of the Barents Sea.</p> <p>Perform an integrated analysis of multivariate data sets and other relevant information including model outputs</p>

	<p>Prepare an annual report on the Barents Sea ecosystem status and describe fluctuations and changes based on trend analyses and integrated analysis of multivariate data sets</p> <p>Evaluate the current monitoring of the Barents Sea ecosystem</p> <p>Provide support to ongoing ecosystem assessments and evaluations in the Barents Sea</p>
<b>Year 3</b>	<p>Prepare relevant data sets and other relevant information, including biotic and abiotic ecosystem components and human pressure, that can be used for the integrated assessment of the Barents Sea.</p> <p>Perform an integrated analysis of multivariate data sets and other relevant information including model outputs</p> <p>Prepare an annual report on the Barents Sea ecosystem status and describe fluctuations and changes based on trend analyses and integrated analysis of multivariate data sets</p> <p>Evaluate the current monitoring of the Barents Sea ecosystem</p> <p>Provide support to ongoing ecosystem assessments and evaluations in the Barents Sea</p> <p>Revise the Barents Sea ecoregion description in the ICES Ecosystem Overview, including overview of the ecosystem, its current state and changes under the environmental and anthropogenic impacts</p>

### Supporting information

<b>Priority</b>	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.
<b>Resource requirements</b>	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 (ToR c and e) is needed.
<b>Participants</b>	The Group is normally attended by some 20–25 members and guests.
<b>Secretariat facilities</b>	SharePoint site, secretariat support for reporting
<b>Financial</b>	No financial implications.
<b>Linkages to ACOM and groups under ACOM</b>	Stock assessment groups in particular AFWG and WGWIDE.
<b>Linkages to other committees or groups</b>	There is a very close working relationship with all the groups WGINOR and WGICA. It is also very relevant to the groups WGSAM, WGOH, WGEKO.
<b>Linkages to other organizations</b>	<p>The Joint Russian-Norwegian Fisheries Commission, in charge of joint fisheries management in the Barents Sea.</p> <p>The Joint Russian-Norwegian Environmental Commission, in charge of joint environmental management in the Barents Sea.</p> <p>The Norwegian Ministry of Climate and Environment, in charge of Norwegian holistic ecosystem-based management plan for the Norwegian part of the Barents Sea.</p> <p>Relevant groups within the Arctic Council. PAME/ICES workshop, PICES/ICES workshops.</p> <p>Norwegian monitoring group under the Norwegian Management Plan</p>

## WGIEAGS - Working Group on Integrated Ecosystem Assessment of the Greenland Sea

2019/FT/IEASG05 **Working Group on Integrated Ecosystem Assessment of the Greenland Sea (WGIEAGS)**, chaired by Jesper Boje, Denmark/Greenland, and Colin Stedmon, Denmark, 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	11-13 February	Copenhagen, Denmark	ICES Scientific report by 16 March 2020	
Year 2021	1-5 March	Nuuk, Greenland	ICES Scientific report by 5 April	
Year 2022	7-11 November	Nuuk, Greenland	Final ICES Scientific report by 9 December	

### ToR descriptors

ToR	Description	Background	<a href="#">Science Plan codes</a>	Duration	Expected Deliverables
a	Assemble relevant data for describing spatial and temporal changes in the Greenland Sea	The database will contain physical, chemical and biological (incl. higher trophic levels) oceanographic data.	1.1	Years 1-3	Merged database. Metadata to be reported to ICES.
b	Review and consider methodological approaches and analytical tools for conducting integrated ecosystem assessment for the Greenland Sea	Before starting data analysis, basic discussions on suitable methodological/analytical approaches are required. This can be started after initial datasets are assembled.	1.1	Years 1-3	Report to ICES
c	Report on the status and trends of the Greenland Sea, based on integrated analysis of multivariate datasets, incl. associated with major hydroclimatic changes and human activities	This ToR will be based on activities and advancements of the above. It is a hope to produce scientific manuscript.	1.1	Years 2-3	Report to ICES. Manuscript to be submitted to peer-reviewed science journal
d	Prepare an Ecosystem Overview for the Greenland Sea	This is advisory requirement.	1.3	Year 1	Ecosystem Overview submitted to ICES

e	Identify knowledge gaps and priority research needs to improve future integrated ecosystem assessments. Provide recommendations for improvement of data collection and monitoring in the ecoregion	To further advance the IEA for the region, identification of knowledge and data gaps is inevitable, together with considering improvements in data collection.	1.1, 3.1, 3.2	Year 3	Report to ICES
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## Summary of the Work Plan

Year 1	<p>Start assembling relevant data that can be used to describe spatiotemporal changes in the Greenland Sea. Create first merged database containing physical, chemical and biological (incl. higher trophic levels) oceanographic data.</p> <p>Develop Ecosystem Overview (as advice request).</p> <p>Start discussions on methodological approaches and analytical tools for conducting integrated ecosystem assessment.</p> <p>Identify additional scientists/partners and invite them to join the EG.</p>
Year 2	<p>Continue assembling relevant datasets and update the database.</p> <p>Continue discussions on methodological approaches and analytical tools for conducting integrated ecosystem assessment. Prepare first analysis on the ecosystem status and trends.</p>
Year 3	<p>Finalise the database.</p> <p>Prepare manuscript on the status and trends of the Greenland Sea ecosystem.</p> <p>Identify knowledge gaps and priority research items that can improve future integrated ecosystem assessments and provide recommendations to improve the monitoring.</p>

## Supporting information

<b>Priority</b>	High. A status for the region is currently lacking and at the same time the region are experiencing change and is a potential candidate to continue severe changes.. Arctic amplification of global warming and increaseing meltwater flux from Greenland icesheet are changing the oceanographic conditions. Biological resources are subsequently also shifting in response. This effort will set the baseline in the process to permit sustainable development regional fisheries.
<b>Resource requirements</b>	<p>Past and current research programs will provide the data. These will be gathered from public databases and through research networks. There are no current external funds to support the initiative so it will be started with in kind contributions from DTU and GINR in the form of person months. Once underway national funds will be sought via respective national ministries.</p> <p>The research initiatives that may arise from the activity have the opportunity to align with EU framework funding.</p>
<b>Participants</b>	Initiated by DTU and GNIR participation will be sought from Iceland and Norway, with expertise spanning oceanography and fisheries. Participants from other nations are also welcomed.
<b>Secretariat facilities</b>	SharePoint site. Support for meetings at ICES HQ, when appropriate
<b>Financial</b>	No financial implications
<b>Linkages to ACOM and groups under ACOM</b>	Link to ACOM through development of Ecosystem Overview, NWWG and WGWISE.

<b>Linkages to other committees or groups</b>	All ICES IEASG expert groups, several EGs under HAPISG (human pressures) and EPDSG
<b>Linkages to other organizations</b>	Arctic Council, PAME, IASC, NEAFC

## WGNARS - Working Group on the Northwest Atlantic Regional Sea

**2019/FT/IEASG06** The **Working Group on the Northwest Atlantic Regional Sea (WGNARS)**, is chaired by Jamie Tam, Canada, and Kimberly Hyde\*, USA, 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	8 May	Online meeting	No reporting	Incoming Canadian Chair Jamie Tam from January 2020
Year 2021	7-10 June	Online meeting	No reporting	
Year 2022	16–19 May	Online meeting	Final ICES Scientific Report by 1 July to IEASG	Sean Lucey, USA outgoing and Kimberly Hyde, USA incoming

### ToR descriptors

ToR	Description	Background	<a href="#">Science plan codes</a>	Duration	Expected Deliverables
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)	<ul style="list-style-type: none"> <li>Refined understanding of the system through conceptual models</li> <li>Exploratory application of risk assessment to a Canadian region</li> <li>Analysis of cumulative effects including, for example, offshore energy</li> </ul>
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)	<ul style="list-style-type: none"> <li>List of research products developed from reaching out and including members of under-represented disciplines and research communities (e.g. papers, reports, indicators)</li> </ul>

	communities, including those in the social sciences			
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)	<ul style="list-style-type: none"> <li>• Tested and evaluated new indicators that are responsive to a changing environment or other conditions (e.g. SMART indicators)</li> <li>• Completed threshold analysis of existing indicators</li> <li>• Framework for developing spatial indicators</li> </ul>
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)	<ul style="list-style-type: none"> <li>• Worked example of a decision support tool</li> </ul>
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)	<ul style="list-style-type: none"> <li>• Workshop on best practices for improving efficiency, transparency, and workflow</li> <li>• Timely provision of information to managers (e.g. annual SOEs, Risk assessment)</li> <li>• Improved data accessibility</li> <li>• Manuscript on best practices</li> </ul>
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)	<ul style="list-style-type: none"> <li>• Examples of effective communication tools for various audiences</li> </ul>

### Summary of the Work Plan

<b>Year 1</b>	ToRs a, b, c, d and f
<b>Year 2</b>	ToRs a, b, c, d, and g
<b>Year 3</b>	ToRs a, b, c, d and e

### Supporting information

<b>Priority</b>	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.
<b>Resource requirements</b>	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.
<b>Participants</b>	The Group is normally attended by some 20–25 members and guests.
<b>Secretariat facilities</b>	None.
<b>Financial</b>	No financial implications.
<b>Linkages to ACOM and groups under ACOM</b>	There are no obvious direct linkages.
<b>Linkages to other committees or groups</b>	There is a very close working relationship with all the groups in the IEASG.
<b>Linkages to other organizations</b>	The NAFO Working Group on Ecosystem Science and Assessment has made progress towards similar objectives and will be a resource for collaboration.

### WGIAZOR - Working Group on Integrated Assessment of the Azores

**2019/FT/IEASG08 Working Group on Integrated Assessment of the Azores (WGIAZOR)** chaired by Régis Santos\*, Portugal, and Maria de Fatima Borges, Portugal, will work on ToRs and generate deliverables as listed in the Table below.

	<b>Meeting dates</b>	<b>Venue</b>	<b>Reporting details</b>	<b>Comments (change in Chair, etc.)</b>
Year 2020	25-29 May	Online meeting	No reporting	
Year 2021	24-28 May	Online meeting	No reporting	
Year 2022	23-27 May	Online meeting	ICES Scientific Report deadline 8 July 2022	Outgoing Chair: Mario Pinho (Portugal). Incoming Chair: Régis Santos

## ToR descriptors

TOR	DESCRIPTION	BACKGROUND	SCIENCE PLAN CODES	DURATION	EXPECTED DELIVERABLES
a	Providing input for the Fisheries Overviews in 2020 (see Summary of the Work Plan)	Linked to ICES advice.	5.3, 5.4, 6.6	2020	Fisheries Overviews draft and underlying data
b	Explore and describe further regional knowledge and products (e.g. MSFD indicators, model outputs), to contribute to a future review and update of the Ecosystem Overview of the Azores (EO)	Linked to ICES advice, to WKEO3 and MSFD. Maximising efficiency across relevant groups for EO development, eliminating redundancy.	4.1, 6.1, 6.5, 6.6	Ongoing	Ecosystem overviews (EO) and collaborative network (IEA groups) with improved workflow.
c	Compare and contrast among sub-ecoregion level Integrated temporal assessments (ITA) to identify and report on commonalities and divergences among sub-areas, with a focus on climate variability.	Responding to requests for standardisation of ecosystem advice products and inclusion of climate change information in Ecosystem Overviews.  Linked to WGEAWESS, WGIEAGS and the commitment to provide advice in the context of EAM.	1.4, 1.9, 6.5	3 years	Inform IEAs/EO.  Results in the final report or/and as a collaborative paper.
d	Investigate and report on the sub-regional spatio-temporal entities constituting the ecoregion, and the multiple pressures relevant at these scales in support of ecosystem-based management.	Linked to WKEWIEA, WKIRISH, ToR C and previous group ToRs. Investigation of scaling issues related to summarising information from locally relevant scales/models.	1.3, 2.4, 6.5	3 years	Inform IEAs/EO.  Results in the final report or/and as a collaborative paper.
e	Apply high resolution Ecospace models for selected case studies within WGIAZORecoregions to identify opportunities to support marine spatial planning.	Working together with ToR D to explicitly incorporate spatial aspects into regional modelling work, investigating opportunities for trade-off analyses and inclusion of socio-economic considerations	6.1., 6.3., 6.6	3 years	Regional modelling products

## Summary of the Work Plan

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For the aim of providing input for the Fisheries Overviews, consider:

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|---------------|-----------------------------------------------------------------------|
|               | i) descriptions of ecosystem impacts of fisheries                     |
| <b>Year 1</b> | ii) descriptions of developments and recent changes to the fisheries  |
|               | iii) mixed fisheries considerations, and                              |
|               | iv) emerging issues of relevance for the management of the fisheries; |
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<b>Year 2</b>	The main tasks will be related to drafting the outline for the papers/process for ToRs C&D, and identifying which group members can apply the agreed upon methodology (within their limited resources). Start the process for reviewing the Azorean Ecosystem Overviews.
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The group will continue to identify data and outputs that may be potentially valuable to IEAs, EAFM, and particularly the Ecosystem overviews (Tors B & E). The group will work to improve communication with other relevant groups as WGIEAGS, WGEAWESS, etc.

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<b>Year 3</b>	Continue with Year 2 activities while liaising with relevant ICES WG and external groups (e.g. OSPAR) as relevant. Progress agreed upon methodologies for ToRs C&D, write papers. Advance ToR E, developing regional models (scope of model development/ number of case studies will be dependent funding). Finalise papers.
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## Supporting information

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<b>Priority</b>	Pressure on seas (biodiversity loss, climate changes, fisheries), lack in understanding of large marine ecosystem functioning and the context of ecosystem health indicators development for the Marine Strategy Framework Directive require to address those research topics at the relevant scale i.e. the regional approach. Recently questions have arisen in relation to how to identify relevant scales for various processes, and how to summarise ecoregion level information from disparate, non-continuous data (e.g. surveys using different gears, different modelling approaches, and different socio-economic contexts). Furthermore, standardisation of approaches has become a key topic, particularly as ecosystem assessment moves more towards the realms of advice. This presents particular challenges in the face of such diversity.
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The WGIAZOR will focus on the Azorean seas

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<b>Resource requirements</b>	There is no resource implication for ICES. Working group program is based on synthesis of data and results from existing data sources and in line with existing funding/ scientific programs. Scope of activities is dependent on this funding. Assistance from the ICES Secretariat and IEA Steering group Chair will be useful in identifying and making connections with relevant groups.
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<b>Participants</b>	The Group is normally attended by some 8 members plus guests.
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<b>Secretariat facilities</b>	None.
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<b>Financial</b>	No financial implications.
<b>Linkages to ACOM and groups under ACOM</b>	Direct link to IEA steering group, ICES advice.
<b>Linkages to other committees or groups</b>	There is a very close working relationship with all the groups of IEASG. It is also very relevant with stock assessment groups such as WGDEEP, WGWIDE, WGEF, WGCSE, WGMME.
<b>Linkages to other organizations</b>	DC- MAP- DG MARE, MSFD DG ENV, OSPAR.

### WGBESEO - Working Group on Balancing Economic, Social, and Ecological Objectives in Integrated Assessments

**2019/FT/IEASG10** The **Working Group on Balancing Economic, Social, and Ecological Objectives in Integrated Assessments (WGBESEO)**, chaired by David Goldsbrough, Netherlands, David Langlet, Sweden, and Paulina Ramirez-Monsalve, Denmark, to work on ToRs and generate deliverables as listed in the Table below.

YEAR	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
Year 2020	15-16 April	Online meeting		
	8 June	Online meeting		
	30 September	Online meeting		
	29 October	Online meeting		
	26 November	Online meeting	ICES Scientific Report by 20 December 2020	
Year 2021	14 January	Online meeting		
	25 March	Online meeting		
	27 May	Online meeting		
	23 September	Online meeting		
	25 November	Online meeting	Interim E-eval	
Year 2022	3-7 October 2022	ICES HQ, Copenhagen, Denmark	Final ICES Scientific Report by 18 November 2022	

ICES is broadening the scope of advice that it provides to its clients. The advice now includes catch opportunities, fisheries overviews and ecosystem overviews. Special requests to inform discussions about trade-

offs are also made by clients. ICES advice provides analysis and data on the trade-offs of different decisions and the advice must take into account the management context and relevant management objectives. Understanding and describing the management scope and context is crucial for designing a salient, legitimate and credible advisory process and for the development of long-term management plans.

A variety of social, economic, and ecological (SEE) objectives which are relevant for managing marine resources have been set out in legal and policy documents. Having a systematic comprehension of such objectives and information on potential trade-offs among them enables decisions to be made with better comprehension of the societal implications of alternative courses of action. It also enhances the potential for transparent communication about the significance of uncertainties and knowledge gaps.

The Working Group forms part of a broader aim, following the Strategic Initiative on the Human Dimension (SIHD) Roadmap, to integrate the consideration and use of SEE objectives into ICES work in an effective manner, strengthening the overall societal relevance of ICES advice. The working group answers the call for identifying and including management objectives in Ecosystem Overviews (EO) as reported in WKEO3<sup>2</sup>.

The Working Group aims to develop a methodology for identifying and characterizing/classifying SEE objectives in a multi-level governance setting, thus providing a tool for the practical integration of such objectives into future analysis and evidence for advice provided by ICES. The mere identification and cataloging of specific objectives is not sufficient since such objectives change over time, as do their legal character and the forms in which they are expressed. Any mapping will thus soon become outdated. This necessitates the focus on development of a generic methodology that can be applied repeatedly by various ICES groups and in different geographic settings. However, the group's work will involve identifying and cataloging objectives as a means of evaluating proposed methodologies. The work requires involvement of stakeholders, including decision makers, to ensure the practical relevance of the methodology and the resulting "landscape" of objectives. This work will be carried out in close consultation with ICES advisory processes (ACOM & secretariat).

The focus of the Working Group is on identifying social, economic, and ecological objectives derived from legal and policy documents. Unfortunately, these policy objectives tend to be dispersed over various documents, and/or be defined at a high level of abstraction and thus not being directly linkable to indicators. Therefore the group will develop a framework to facilitate (1) the elicitation of the relevant policy objectives for marine management, (2) characterize/classify the objectives in terms of their binding or nonbinding nature and the level of governance at which they occur (possibly also if they are specified/quantified/have time limits, etc.), (3) support specification of the policy objectives in terms of social, economic and ecological indicators and (4) link these objectives and indicators to institutions and instruments.

Developing this framework relies on interaction with decision makers to discuss and elaborate on the identified and characterized objectives. To ensure that the objectives are specific and applicable in the ICES scientific community close collaboration with ICES expert groups is essential.

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<sup>2</sup> ICES. 2019. Workshop on the design and scope of the 3rd generation of ICES Ecosystem Overviews (WKEO3). ICES Scientific Reports. 1:40. 46 pp. <http://doi.org/10.17895/ices.pub.5445>

Developing and finalizing the framework will require several sessions conducted in collaboration with IEA groups, as well as with other ICES expert group, and with the involvement of decision-makers<sup>3</sup>. Interviews, workshops and case studies will be used to develop the framework. As far as possible, the work should also draw on the experiences of scientists with policy analysis expertise from several ICES member countries.

The framework as eventually developed should be applicable to regional seas and provide the required input to contribute to the next generation of ecosystem overviews. The end goal is being able to provide decision makers with a suit of management options including the associated implications for relevant objectives that will support their decision-making process.

Considering the core and well-established role of fisheries in all ecoregions (ICES Fisheries overviews), fisheries policy is a logical starting point for an analysis of policy objectives. This will then be further expanded to other important human activities in eco-regions. In developing the framework, we will draw on Integrated Ecosystem Assessment (IEA) experience from others areas, such as North America. The current Working Group on Maritime Systems (WGMARS) analysis of ICES IEA group work will also provide useful input for designing the framework.

Workshops with regional seas groups and ICES Expert Groups to develop and test the framework would be the preferred development path. The developed framework will enable the identification of management objectives for specific ecoregions in line with the ecosystem overview ‘pipeline process’, and as envisioned in the findings from WKEO3 (ICES, 2019).

#### ToR descriptors

ToR	DESCRIPTION	BACKGROUND	<a href="#">SCIENCE PLAN CODES</a>	DURATION	EXPECTED DELIVERABLES
a	Synthesize existing information on social, economic and ecological management objectives, in particular how these can be mapped and systematized, from legislation, ICES expert groups, various marine research projects and the scientific literature	Lots of information exists on policy objectives, but this info is scattered over many different sources, and thus inconvenient to use for IEA scoping studies. It is important to explore the extent to which methods for identifying and systematizing such objectives also exist.	6.3 6.4	1st year	Overview report: availability of objectives and existence of methodologies, schemes for systematization.  Overview of existing governance work within ICES ecoregion WGs.
b	Identify, in dialogues with relevant stakeholders the most relevant trade-offs between SEE objectives in selected geographical and regulatory contexts. This will be carried out in close consultation with ICES advisory processes (ACOM & secretariat).	It is important that the development of a working methodology for identifying and characterizing/classifying SEE objectives enables addressing the most relevant trade-offs encountered by decision makers and that any	6.3 6.4	1 <sup>st</sup> – 2 <sup>nd</sup> year	Overview Report: description of most relevant trade-offs identified and the associated SEE objectives.

<sup>3</sup> Involvement of decision-makers will be done in close consultation with the ACOM leadership, SCICOM, and ICES Secretariat.

		scheme for characterization/classification corresponds to stakeholder needs.			
c	Identify, in dialogues with relevant stakeholders, distinctive characteristics of SEE objectives as a basis for characterization/classification. This will be carried out in close consultation with ICES advisory processes (ACOM & secretariat).	Relevant characteristics may include legally binding/non-binding; policy level where the objective is formulated (subnational, national, EU, international), etc.	6.3 6.4	1 <sup>st</sup> – 2 <sup>nd</sup> year	Overview report: where appropriate, list of distinctive characteristics of SEE objectives as a basis for characterization/classification applicable to ICES IEA regions.
d	Develop a methodology for carrying out the identification and characterization/classification of SEE objectives in national and international/supra-national governance settings.	The system for characterization/classification of SEE objectives should incorporate the characteristics identified under (c) and be adjustable to different regional/regulatory contexts.	6.3 6.4	2 <sup>nd</sup> and 3 <sup>rd</sup> year.	Overview report: description of draft methodology.
e	Test the methodology by identifying and characterizing/classifying SEE objectives in one or more relevant governance settings.	The methodology needs to be tested to verify that it is simple and robust enough to be applied by different users and yields a result that will be practically relevant.	6.3 6.4	3 <sup>rd</sup> year.	Overview report: description of methodology, including result of its testing.

### Summary of the Work Plan

Year 1	Repository set up, general White paper
Year 2	Workshops with stakeholder involvement, peer reviewed publication, white paper on evaluation schemes
Year 3	Elaboration of methodology, peer reviewed publication

### Supporting Information

<b>Priority</b>	High. This Working Group is seen as a key strategic element of the SIHD in IEAs and the IEA Steering Group to expand the knowledge base for supporting comprehensive integrated advice containing social, economic and ecological considerations.
<b>Scientific justification</b>	A lot of work has been done on trade-off analyses, social, economic and other objectives and issues; however, the knowledge basis is not available in a structured and organized way for ICES. In addition, there is a need for a robust methodology for identifying and characterizing/classifying SEE objectives in different governance settings. Relevant ICES working groups should be able to apply the methodology when called for by their work and also to repeat the identification and characterization/classification of SEE objectives regularly to ensure that the objectives they incorporate in their work are relevant and current.
<b>Relation to Strategic Plan</b>	The group will directly feed the work of the IEA working groups as well as feed into the ecosystem, fisheries and aquaculture overviews.
<b>Resource requirements</b>	The group will rely on ongoing international and national research projects with active involvement of ICES IEA groups and supporting WGs, such as WGSOCIAL and WGECON. The proposed repository will be set up on a working group ICES SharePoint.

<b>Participants</b>	Interested scientists, IEA group chairs or members, IEASG chairs, SIHD chairs, WGMARS, WGECON, WGSOCIAL, WGINOSE, WGSEDA, WGRME, WGHIST, EU project leaders (e.g. GAP1 and GAP2, JAK-FISH, MEFEPO, ODEMM, MESMA, SOCIOEC, MYFISH, AQUACROSS, CERES), ICES Secretariat
<b>Secretariat facilities</b>	SharePoint site, secretariat support for reporting, for facilitating the WebEx meetings (three to four a year) and for hosting physical meetings (at least two per year). Active support by the scientific officers to link the work with relevant initiatives within ICES desired.
<b>Financial</b>	None
<b>Linkages to advisory committees</b>	ACOM
<b>Linkages to other committees or groups</b>	IEASG, SIHD, all IEA groups, WGIMM, WGSA, WGMARS, WGSEDA, WGHIST, WGRME, SICCM, WGSOCIAL, WGECON.
<b>Linkages to other organizations</b>	North Pacific Marine Science Organization (PICES) Human Dimension Group, International Institute of Fisheries Economics & Trade (IIFET), National Oceanic and Atmospheric Administration (NOAA), Protection of the Arctic Marine Environment Working Group (PAME), Integrated Marine Biosphere Research (IMBeR), Ecosystem Studies of Subarctic and Arctic Seas (ESSAS), European Union institutions and bodies involved in the IMP (Integrated Maritime Policy) .

## WGIEANBS-CS – ICES/PICES Working Group on Integrated Ecosystem Assessment of the Northern Bering Sea-Chukchi Sea

**2019/FT/IEASG11** A ICES/PICES Working Group on Integrated Ecosystem Assessment of the Northern Bering Sea-Chukchi Sea (WGIEANBS-CS), chaired by Elizabeth Logerwell, USA, and Yury Zuenko, Russia, will work on ToRs and generate deliverables as listed in the Table below.

YEAR	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
2021	14 April	Online meeting		Extension granted to start 2021 instead of 2020
	23 September	Online meeting	Interim e-evaluation	
2022	September (ICES ASC)	TBD	Interim e-evaluation	Date/venue tbd
	October (PICES AM)	TBD		
2023	September (ICES ASC)	TBD	Final e-evaluation and ICES Scientific Report by end of November	
	October (PICES AM)	TBD		
	September (Arctic community workshop)	TBD		

Other intersessional meetings and workshops will occur as the opportunities arise.

### ToR descriptors

TOR	DESCRIPTION	BACKGROUND	<a href="#">Science plan codes</a>	DURATION	EXPECTED DELIVERABLES
a	Determine approach and methodology for conducting an IEA in the Northern Bering – Chukchi Sea	Before starting data analysis, basic discussions on suitable methodological/analytical approaches are required. This can be started after initial datasets are assembled.	1.1, 1.3, 7.1	Year 1	Reports submitted to ICES and PICES
b	Compile an inventory of scientific metadata	The inventory will contain physical, chemical and biological (incl. higher trophic levels) oceanographic data.	1.1, 1.3	Year 1	Meta-database
c	Development of indigenous knowledge sharing with knowledge holders, to facilitate co-production of knowledge while protecting intellectual property as per the UN Declaration on the Rights of Indigenous Peoples (Articles 11.2, 31).	There are several indigenous Alaskan and Russian communities that can provide specialized Indigenous and Traditional Knowledge unavailable from other sources about characteristics and changes of the Northern Bering – Chukchi Sea LME	1.1, 1.3, 7.1	Year 1	Reports submitted to ICES and PICES
d	Compile an inventory of institutions and programs active in the region	There are several institutions and programs active in the NBS-CS that could contribute to the IEA	1.1, 1.3, 7.1	Year 1	Inventory. Reports submitted to ICES and PICES
e	Describe the key physical, biological and human elements of the ecosystem	Identification of key characteristics is needed to develop conceptual models of the ecosystem	1.1, 1.3, 7.1	Year 2	Reports submitted to ICES and PICES and/or paper submitted to peer-reviewed journal
f	Develop shared conceptual models including both Indigenous Knowledge and science; and review of hypotheses for ecosystem dynamics. Identify potential indicators. Describe goals and targets; and objectives and values	A dynamic description of the ecosystem can be achieved or supported through construction of conceptual models. This should encompass human activities along with the natural (non-human) components and processes of the system. Development of	1.1, 1.3, 7.1	Year 2	Reports submitted to ICES and PICES and/or paper(s) submitted to peer-reviewed journal

		these conceptual models be done in close collaboration with Indigenous Peoples and relevant stakeholders, using Indigenous/Traditional and Local knowledge (TLK) along with knowledge from physical, biological and social sciences.			
<b>g</b>	Assess ecosystem status and trends. Identify potential impacts/risks at the LME-scale; and at the local scale with emphasis on human use and Indigenous Knowledge	This ToR will be based on activities and advancements of the above. It is a hope to produce scientific manuscript.	1.1, 1.3, 7.1	Year 3	Reports submitted to ICES and PICES and/or paper(s) submitted to peer-reviewed journal, possibly a special issue
<b>h</b>	Knowledge gap analysis	To further advance the IEA for the region, identification of knowledge and data gaps is inevitable, together with considering improvements in data collection.	1.1, 1.3, 7.1	Year 3	Reports submitted to ICES and PICES and/or paper(s) submitted to peer-reviewed journal, possibly a special issue

### Summary of the Work Plan

<b>Year 1</b>	During Year 1, the foundation will be created for conducting an IEA of the NBS-CS. Meetings will take place remotely via web/teleconferences. Cultural awareness training for WG members will be offered. The WG will determine the approach and methodology for the IEA and will compile information about existing datasets (as metadata), institutions and programs. The WG will also develop methods and approaches to facilitate co-production of knowledge.
<b>Year 2</b>	During Year 2, the key elements of the ecosystem will be described and shared conceptual models including both Indigenous Knowledge and science will be developed. Meetings will take place at ICES ASC and PICES ASM; and other venues as opportunities arise with preference to those in Arctic communities.
<b>Year 3</b>	Year 3 will see the culmination of the first two years of preparatory work. Meetings will take place at ICES ASC and PICES ASM; and in an Arctic community. An IEA of the NBS-CS will be published. This report (and collection of scientific papers) will assess the ecosystem status and trends; identify impacts/risks at the LME-scale and at the local scale with emphasis on human use and Indigenous Knowledge; and report on knowledge gaps.

### Supporting information

<b>Priority</b>	The Northern Bering Sea-Chukchi Sea (NBS-CS) region is experiencing unprecedented ocean warming and loss of sea ice as a result of climate change. Seasonal sea ice declines and warming temperatures have been more prominent in the northern Bering and Chukchi seas as almost all other portions of the Arctic. As an inflow shelf, the Chukchi Sea provides essential sources of nutrients, freshwater and heat to the Arctic Ocean, affecting processes in adjacent shelf systems as well as the deep basin. Chronic and sudden changes in climate conditions in this Arctic gateway are increasingly impacting marine species and food-webs and expanding opportunities for commercial activities (shipping, oil and gas development and fishing), with uncertain and potentially wide-spread cumulative impacts. There are strong concerns about the impacts of climate change and industrial activities, and these impacts may be particularly pronounced in Arctic indigenous communities dependent on the health and stability of the ecosystem. The combination of unprecedented, rapid change and increased interest in the Arctic in general and the NBS-CS specifically make this an opportune time for a synthesis of issues and knowledge. An Integrated Ecosystem Assessment (IEA) can accomplish this synthesis.
<b>Resource requirements</b>	No resource requirements from ICES
<b>Participants</b>	The group is expected to attract between 25 to 35 members and guests with broad coverage of ecosystems within ICES and PICES regions; and with representation from Indigenous/Traditional Knowledge as well as science.
<b>Secretariat facilities</b>	The group will request meeting rooms / times associated with the ICES ASC, for a half-day meeting. This will require some assistance from members of the secretariat organizing those events. Similar requests will be made of the PICES secretariat.
<b>Financial</b>	No financial requirements from ICES
<b>Linkages to ACOM and groups under ACOM</b>	There are no obvious direct linkages.
<b>Linkages to other committees or groups</b>	There is a very close working relationship with all the groups IEASG. It is also very relevant to the Working Groups on Ecosystem Assessment in other regions, such as WGEAWESS, WGIAB, WGIBAR, WGIEAGS and particularly WGICA.
<b>Linkages to other organizations</b>	<ul style="list-style-type: none"> <li>• Joint partnership between ICES and PICES: the proposal has been approved by PICES;</li> <li>• International Arctic Science Committee (IASC), interest in co-sponsorship has been expressed</li> <li>• Arctic Council Protection of the Arctic Marine Environment (PAME), interest in co-sponsorship has been expressed</li> <li>• NOAA Integrated Ecosystem Assessment Program, interest in co-sponsorship has been expressed</li> <li>• Bering Sea Elders Group</li> </ul>

## Resolutions approved in 2018

### WG CERP - Working Group on Common Ecosystem Reference Points

**2018/MA2/IEASG05 A Working Group on Common Ecosystem Reference Points (WG CERP)**, chaired by Mary Hunsicker, USA, Xiujuan Shan, China, Benjamin Planque, Norway, and Saskia Otto, Germany, will work on ToRs and generate deliverables as listed in the Table below.

	MEETING DATES	VENUE	REPORTING DETAILS	COMMENTS (CHANGE IN CHAIR, ETC.)
Year 2019	September 2019	Gothenburg, Sweden	ICES Scientific report by 1 December 2019	
Year 2020				Meeting cancelled
Year 2021	2-4 November	Copenhagen, Denmark	Interim e-evaluation	Election of new chairs Hybrid meeting
Year 2022	September	Dublin (tbc)	Final ICES Scientific report by TBD 2022	

### ToR descriptors

ToR	Description	Background	<a href="#">Science Plan codes</a>	Duration	Expected Deliverables
<b>a</b>	Review regional and national policy and management drivers for the establishment of reference points across ICES member nations.	The motivations behind establishment of reference points vary between nations. This needs to be described and understood before developing common reference points.	6.2, 6.3	year 1	Report of the review in ICES or as peer reviewed publication. Combined review based on ToRs a-e
<b>b</b>	Review previous efforts to identify suitable ecological/ecosystem indicators relevant to fisheries management in the ICES areas. (Year 1)	Some reference points for ecological/ecosystem indicators already exist. They need reviewing in the light of ToR a) before developing common reference points.	5.3, 6.1	Year 1	Report of the review in ICES or as peer reviewed publication. Combined review based on ToRs a-e
<b>c</b>	Produce shortlist a set of indicators that are applicable in most systems studied and cover: single populations, communities, trophic interactions, food webs and spatial distributions.	Some indicators have been (or have the potential to be) used in many different ecosystems. Building on work by e.g. WGECCO, HOLAS II, OSPAR, these key indicators need to be shortlisted before reference points can be evaluated.	1.3, 6.2, 6.6	Year 1	Report of the review in ICES or as peer reviewed publication. Combined review based on ToRs a-e
<b>d</b>	When ecosystem reference points already exist, identify the		1.3, 6.2	Year 1	Report of the review in ICES or as peer reviewed publication.

	methodology used for their determination.				Combined review based on ToRs a-e
e	When ecosystem reference points already exist, identify if they could change (or have already changed) under different climatic or ecological regimes		1.3, 2.2, 6.2	Year 1	Report of the review in ICES or as peer reviewed publication. Combined review based on ToRs a-e
f	Develop conceptual models to examine ecosystem drivers (climate forcing, fishing) and responses using selected ecosystem reference points.	Ecosystem indicators are attached to mental (conceptual) models of ecosystems. The conceptual models need to be explicitly presented together with the reference points.	1.3, 2.2, 6.2	Year 2	Contribution to ICES ecosystem overviews through the provision of conceptual models of ecosystem functioning.
g	Establish a framework to test the performance of the selected indicators and of the calculation of the associated reference points, using simulated data.	Similar to what is done in MSE (management strategy evaluation), ecosystem reference points need to be evaluated through simulation studies...	4.1	Year 2	Report within ICES and as peer reviewed publication. Combined with ToR h.
h	Evaluate the performance of selected - existing and proposed - ecosystem reference points for single species populations, communities, trophic interactions, food webs and spatial distributions in the ICES areas.	...and these simulation studies should be performed on a set of representative case studies.	4.1, 5.1, 5.3	Year 3	Report within ICES and as peer reviewed publication. Combined with ToR g.
i	Provide a set of recommendations for integrated assessment working groups and Ecosystem overviews for the definition of ecosystem indicators and their limit reference points.	IEA groups thrive to produce quantitative assessments of ecosystem state that are well grounded in policy, scientifically sound, experimentally tested and interpretable in a management context.	6.1, 6.3, 6.6	Year 3	Recommendations to ICES IEA groups and for the further development of Ecosystem Overviews. Peer review publication.

### Summary of the Work Plan

<b>Year 1</b>	Review and synthesis of existing policy drivers and methodological developments for ecosystem indicators and associated reference points to support EAFM/EBFM in the ICES areas.
<b>Year 2</b>	Develop methodologies to assess the performance of ecosystem indicators and associated reference points.
<b>Year 3</b>	Evaluate the the performance of ecosystem indicators and associated reference points in selected case studies. Use the results as a basis to provide guidelines to IEA groups for establishing ecosystem reference points.

## Supporting information

<b>Priority</b>	Legal national and international frameworks such as the EU MSFD , HELCOM and OSPAR convention require the determination of ecosystem status based on indicators and their reference points. While the selection of suitable indicators has advanced substantially the determination of reference points is still debated and presently lacking clear management and scientific underpinning. Thus the priority should be considered high. The work planned in WGCERP will directly address ICES science priority area 6 Developing tools, knowledge and evidence for effective conservation and management and some elements of priority are 2 (Understanding ecosystems) and 3 (Impacts of human activities).
<b>Scientific justification</b>	ICES groups on integrated ecosystem assessment provide a number of indicators of ecosystem status and trend to support ecosystem based fisheries management, also through inclusion in the Ecosystem Overviews. Earlier, ICES Expert Groups have recognised that for these indicators to be used in a management framework, there is a need for the establishment of reference points. The scientific background for reference points is well established for single species. A similar scientific effort is required to support the establishment and evaluation of reference points for ecosystem/ecological indicators.
<b>Resource requirements</b>	No major resourcing
<b>Participants</b>	Researchers from across the ICES network.
<b>Secretariat facilities</b>	Support for meetings at ICES HQ, when appropriate.
<b>Financial</b>	No financial implications for ICES.
<b>Linkages to ACOM and groups under ACOM</b>	Link to ACOM through the development of Ecosystem Overviews and advice.
<b>Linkages to other committees or groups</b>	Within ICES links across all ICES IEA working groups and to WGECO, WGBIODIV, JWGBIRD, WGCOMEDA. The planned work of WGCERP build up from previous ICES workshop, namely WKFooWI, WKFISHDISH and WKECOFRAME.
<b>Linkages to other organizations</b>	Links to PICES Working Groups working on similar topics (WG36 WG28, WGCEP, S-CCME WGNPESR).

## EGs dissolved in 2021

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Res. Code	EG name	Chairs
2019/WK/IEASG09	<b>WKINTRA3 - The third workshop on integrated trend analyses in support to integrated ecosystem assessment</b>	Saskia Otto, Germany, and Benjamin Planque, Norway
2020/WK/IEASG04	<b>WKSHOES - Workshop on Stakeholder Engagement Strategy</b>	Vera Köpsel, Germany, and Alan Haynie, US
2020/WK/IEASG03	<b>WKCCMM - ICES/EUOMARINE Workshop on Common Conceptual Mapping Methodologies,</b>	Debbi Pedreschi, Ireland, Maria Cristina Mangano, Italy, and Marcos Llope, Spain
2020/WK/IEASG05	<b>WKCLIMAD - Workshop on pathways to climate-aware advice</b>	Kirstin Holsman, USA, Michael Rust, USA and Mark Dickey-Collas, ACOM